Chapter 1

Summary of the *EES*, Introduction and Framework

The *EES* summarizes the methodology for my endogenous system that integrates theory and practice (its data) as Earth Endogenous Economics and answers the current unsolved economic problems; not to repeat bubbles and terrible inflation with unemployment. Of course, leaders and policy-makers have decided economic policies by country, sector (government and private sector), and year and over years, to match the current balance of payments and deficit, under the market principles and globalization. The *EES* stresses that the market principle is essentially neutral to the real assets by country. The endogenous system is endowed with the ability to reveal what is an essence at the real assets by country and by sector. The higher the spirituality of leaders and policy-makers, the more fruitfully people get results by country and among countries cooperatively. I was waked up by Paul Samuelson's (1937, 1942, and 1975) scientific discovery that guarantees stable growth under zero-deficit. I proved Samuelson's discovery wholly and empirically using my endogenous system and its database of KEWT 6.12, by country and by sector (Chapters 12 and 13). Also I could justify my endogenous-system by Ryuzo Sato's (1981) Conservation Laws, Theorem 6, based on the Lie theory (see Notes at the beginning of the *EES*). Compiling purely endogenous experiments, further I found a fact that the more the surplus (i.e., a minus deficit) the higher the growth rate of output and per capita output by country. Meanwhile, I found a fact that a rate of return is maximized at a minimum rate of net investment to output by using a related hyperbola, instead of using parabola that leads to the maximum principle. Net investment is not a necessary condition but remains a sufficient condition (see Chapter 14). These facts essentially bring about cyclical and green economies under limited resources of this world. These facts march together with my own discovery of the neutrality of the financial/market assets to the real assets (Chapter 2).

I got another discovery that the less the rate of change in population the higher the rate of technological progress (see Chapter 15). E.g., population growth of the US is significantly higher than those of other developed countries. This fact must reduce the rate of technological progress. Yet, only if the US decreases deficit by year and over years, the US will find full-employment, endogenously in reality. Contrarily Japan cannot get rid of deflation due to people's relying on others even under unbelievable debts. A low rate of unemployment in Japan is not because of economic robustness but because of compulsory soft-landing to the endogenous-equilibrium, where the marginal productivity of labor = the wage rate: Japan, without steady policies in the long run, has suddenly approached an endogenous condition compulsively under globalization (Chapter 14). In this way, using 86 countries at KEWT 7.13, the *EES* answers several grave and essential questions raised by Paul Krugman in *New York Times* in June and July, 2012.

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Krugman's proposal remained unchanged even in Oct 2013.

The *EES* focuses an organic aspect by chapter (for six organic aspect, see Notations), towards integration of economic policies over chapters. Endogenous results of six organic aspects express that the endogenous system under the endogenous-equilibrium is essentially cooperative with the market principle and the price-equilibrium in the literature. We people by country are now bright-minded to the future with no probability. Democracy and any political system march together with higher spirituality. Scientific discoveries are strictly accepted under a fixed level of spirituality (BOX 1-3, Chapter 1). Nevertheless the Earth and people are responsible to next generations. The level of spirituality will rise more readily and peacefully in the near future, as Keynes (1944) dreamed. In advance, G, H. Harcourt's (1972) justice is united with other academic schools (Chapter 16).

BOX S-1 Fundamental differences between the literature and the endogenous system

Under the price-equilibrium	**Under the endogenous-equilibrium**
continuous, dynamic, non-linear.	*discrete*, dynamic, non-linear.
financial/market assets-based.	controlled by real assets by sector.
after final redistribution of national income	just before redistribution; by sector
data analyses and recursive programming, independently *vs.*	endogenously matching.
Externally/exogenously (from the market)	**Purely endogenously**
the rate of interest.	the rate of return, $r = \Pi/K$.
the rate of inflation.	the rate of inflation/deflation, $r^* - \mathrm{HA}_{r^*(i)}$.
the rate of unemployment.	the rate of full/un-employment, $n_E = n$.
Assumptions, apparently unrealistic	**Under no assumptions,** in reality
1. marginal productivity of capital.	*MPK*=$r = r^* = r_0$
marginal productivity of labor.	*MPL*=w, where $w = W^*/L^*$.
marginal rate of substitution.	$MRS = \Delta(r/w)$.
elasticity of substitution, $\sigma = -\frac{\Delta k/k}{\Delta(r/w)/(r/w)}$.	σ=1.000000 by year in the transitional path.
perfect competition	turns to no assumption, as above.
2. cash follow-in & -out deficit=deficit, $S_G - I_G$.	based on the real assets, $S_G - I_G$.
3. closed/open economy.	based on $S - I = S_G - I_G + S_{PRI} - I_{PRI}$.
4. capital & labor, *homogenous*.	*heterogeneous*, endogenously, measured.
5. capital's flow and stock independently.	$A_{TFP(STOCK)}(t^*) = A_0(1 + g_{A(FLOW)}(t^*))^{1/\lambda^*}$.
6. no equation between growth & return.	$r^* = g_Y^*(\alpha/i \cdot \beta^*)$, as Phelps' endogenous.
7. maximum, parabolic, topology.	$r_{MAX}\ with\ i_{MIN}$, hyperbolic, measured.

Eventually the literature and the *EES* have the same goal, since actual statistics data moderately hold within a certain range of the endogenous data under the endogenous-equilibrium, and with dynamic and balanced.

Note 1: The author originally got the above ideas from Meade, J. E. (v-vii, 1-9, 1960), where assumptions were well integrated neo-classically under static closed equilibrium.

Note 2: The endogenous system (EES) at BOX S-1 holds under no assumption. No assumption, however, remains a sufficient condition of the *EES*. The *EES* is finally justified by the necessary condition, i.e., the Conservation Laws of Ryuzo Sato (xv, 439, 1981), based on the Lie theory. The author has used the constancy of the capital-output ratio originally presented by Samuelson (1477-79, 1970). And now the author perceives Sato's universe Conservation Laws. This is because the author's database could prove his Laws empirically, as shown in recursive programming by country. The author, on the other hand, could not empirically prove some continuous dynamic non-linear turnpike theories. For Sato's Conservation Laws, see **Notes** located after **Notations** and before **Preface**.

BOX S-2 The price-equilibrium and the endogenous-equilibrium, with real business cycle

1. Fundamental differences between the price-equilibrium and the endogenous –equilibrium exist, as were shown at the above BOX S-1 from the measurement point of view.
2. Nevertheless, the differences overlap completely. That is: it is impossible for us to replace the price-equilibrium by the endogenous-equilibrium. Both results are the same and show the same level of moderation of equilibrium. Each is just differently expressed. One is solely by price-changes while the other by the speed years and also by basic parameters and variables.
3. For example, deflation is a result of price-changes under excessive deficits and debts. The price-equilibrium cannot specify true causes of results. The same results specify true causes at the endogenous-equilibrium using seven parameters; e.g., with processes leading to deflation.
4. Real business cycle theory (RBC theory) explains business cycle by real (not nominal) shocks and denies the effects by fiscal and monetary policies. This is partially true at the endogenous-equilibrium and, remains half way. The endogenous-equilibrium holds under the neutrality of the financial/market assets to the real assets. Within a moderate range of equilibrium, both assets show the same results and no difference, which is proved in the *EES* by chapter, starting with Chapter 2 and reaching Chapter 14 that sums up empirical characteristics of business cycle.
5. The real assets are solely policy-change oriented and constitute a base for dynamic balances between actual and endogenous data, between the government and private sector, and between the real assets and financial/market assets. And, the market principle does not reinforce but only support the real assets. The financial/market assets only show results after getting to equilibrium and cannot be a controller of economic policies.
6. The price-equilibrium is based on individual utility and consumption but hardly consistent with an exogenous rate of technological progress. The endogenous-equilibrium wholly integrates and measures technology and preferences, by country, sector, and year and over years as a whole system, without later correction over years.
7. The price-equilibrium shows topology but cannot connect topology with accurate measurement of parameters and variables. The endogenous-equilibrium connects topology with its measurement using KEWT database as many as possible since topology is expressed by each hyperbola that is reduced form of endogenous equation under no assumption.

Chapter 1

1.1 Discover Whereabouts: Towards Purely Endogenous

(1) This manuscript composes of 16 chapters. Introduction first explains the endogenous system and its database, KEWT 6.12, 1990-2010 by sector and second, illustrates the framework of 16 chapters among/between chapters. The endogenous system is unity of theory, practice, and history. Endogenous macroeconomics and its system hold in social sciences yet, the endogenous system determines a base for social economic science. This is because social sciences need a common bone of numerical consistency as a whole. In this sense, social sciences and endogenous system march together cooperatively.

(2) Roughly the social science has its framework for strategies and tactics widely and, the endogenous system has its framework for economic policies, real, financial, market, and the central bank, by country and by sector (total, government, and private). Aggregate macro-level economics definitely occupies a core of economics, while micro-level economics follows aggregate macro-level. The endogenous stream inversely differs from the current economic literature, which is based on individual utility and consumption and the market principle for goods/services and, under the price-equilibrium. The endogenous stream, nevertheless, is consistent with the current economic literature. This is because the endogenous neutrality of the financial/market assets to the real assets at national accounts universally holds when endogenous holds 'purely endogenous' at its system. The author defines 'purely endogenous' as 'endogenous under no assumption.' As a result, the endogenous neutrality consistently connects endogenous data with actual statistics data by country, by sector, and by year and over years.

(3) Economics and econometrics do not prove theories using actual statistics data since statistics data change over years. It is impossible for actual data to prove theories empirically. It is definitely possible for endogenous data to prove theories empirically. This is because causes and effects/results simultaneously occur at the real assets of national accounts, and because changes of policies are absorbed into 'seven' endogenous parameters by year (for seven, see Notations). Seven endogenous parameters determine all the parameters and variables within the endogenous system. This is due to the use of a 'discrete' Cobb-Douglas production function. The continuous Cobb-Douglas production function never reveals seven endogenous parameters and has to depend on differential/ integral regardless of linear or non-linear. Not only Keynesian and neoclassical researchers but also any school researchers have not formulated the discrete Cobb-Douglas production function.

(4) Why the literature does not separate the private sector from the government sector? This is partly traced back to individual utility and partly due to A System for National Accounts (the SNA 1993, 2008), whose purpose is to record (not policy-focused). Redistribution of disposable national income drives consumption to households and profits to enterprises. Besides, we assume that real-deficit as saving less net investment at the government sector equals government cash flow-in less government cash flow-out, where the rate of return in the government sector is zero and accordingly, the profits of the total economy equal those in the private sector.

(5) Further, the current economic literature illustrates topology. The first appearance of topology in economics is Ramsey, F. P. (1927), to the author's knowledge. Then, Samuelson, P. A. (1950) used topology by dimension based on individual utility. Even currently, topology appears everywhere in econometrics. Topology, with empirical proofs in economics, has not been 'purely endogenously' proven up to date. The author has investigated this fact as one of identities for so many years. Essence of Earth Endogenous System states this fact and its background, simply and historically. The endogenous system sets up endogenous equations, which are each reduced to hyperbolas. Topology has been replaced by various hyperbolas in the endogenous system. The *EES* does not present hyperbolas in each chapter (see Appendix).

1.2 Endogenous Data and System

(6) Kamiryo Endogenous World Table (KEWT) database shows endogenous data by country, sector, and year and over years. The KEWT database started as 1.07; the first version for nine countries, 1960-2005, where the total economy was presented. KEWT 2.08, the 2nd version, includes database of 32 countries, 1990-2006. KEWT 3.09, the 3rd version, 61 countries, 1990-2007; and KEWT 4.10, the 4th version, 63 countries, 1990-2008, where the endogenous-equilibrium has been measured rigidly by sector (the aggregate economy, the government sector, and the private sector). KEWT 5.11, the 5th version, 63 countries, 1990-2009, is the last version that the rate of unemployment was used as a final adjustor to maintain the endogenous-equilibrium. The previous 6th version of KEWT 6.12, 81 countries, 1990-2010, principally holds under full-employment. The current 7th version of KEWT 7.13, 86 countries, 1990-2011, definitely holds under full-employment. Readers are welcome to compare KEWT 7.13 with KEWT 6.12, for a bounds research lying between unemployment and full-employment.

(7) The original database comes from *International Financial Statistics Yearbook* (*IFSY*), IMF. The *IFSY* is published in Nov./Dec., each year. Soon after the yearly publication, the author renews the KEWT database. The KEWT database originally takes in 'ten' real asset values and 'fifteen' financial and market asset values each available at the *IFSY*. In the endogenous system, all the data turn to endogenous by year and over years. This process connects actual statistics data with endogenous data. The KEWT database, except for the *IFSY* corrections, has been unchanged once measured; no later correction occurs. This constitutes one of characteristics of the KEWT database. 'Purely endogenous with no assumption' is accomplished when the rate of technological progress is endogenously measured and also *GDP* is replaced by *Y* = net income = expenditures = output (see, Meade, J. E. (1962, Revised) and Meade, J. E., and J. R. N., Stone (1969)). The Cobb-Douglas production function is reborn at the discrete time; no room for growth accounting, elasticity, and differential. The discrete Cobb-Douglas production function extracts seven endogenous parameters, where the relative share of capital or labor at the continuous C-D production function is endogenously measured as one of seven endogenous parameters.

(8) Why is the endogenous system required? In a word, there has been no theoretical values and ratios in A System for National Accounts (SNA, 1993, 2008), whose purpose is to 'record' national accounts by year. The endogenous system intends to have plan-to-see economic policies executed by leaders and policy-makers by country and globally in the world. Record is one and policy-setting is the other. The endogenous system is a sustainable economic methodology as a universal container or receptacle. This methodology holds regardless of whether or not philosophy and political system differ. The endogenous system holds at any spiritual level of human decision-making, regardless of whether policy-makers follow monism or dualism in terms of mind and body. Endogenous results by year reflect these differences.

(9) The endogenous system treats money numerically common to every country, using the exchange rate. The level of methodology, nevertheless, is far behind that in physics and element chemistry, macro and micro, whose researches are already close to truth, Absolute, Nature, and uniqueness. A reason why the current economics and its methodologies are behind natural sciences is that human is greedy in money. Effects and/or results that activate the endogenous system differ by spiritual level of people by country; the closer to absolute existence the more happy human life is, peacefully and without fighting.

(10) The object of the endogenous system is macroeconomics. What are differences between the economic literature and the endogenous system? The endogenous system has totally absorbed the effects of the economic literature. Improvement in the endogenous system has been realized solely by historical accumulation of researchers' efforts and performances. Nevertheless the differences between the literature and the endogenous system are decisive; incompletely partial versus universal as a whole system. And, the differences jointly own the market principle. What is the turning point of these two, besides the above 'under assumptions or no assumption'?

It is traced back to various definitions in macro and micro economics. In the literature, the endogenous is used much more freely and partially while in the endogenous system 'endogenous' is used most strictly and to the extreme. For example, 'purely endogenous' exists only when initialization data are not given but turn to endogenous; consistently over years and with no correction later even after 50 years by country and by sector. Linear does not satisfy required conditions. The first priority of required conditions is the measurement of the rate of technological progress as the product of the net investment and the quantitative/qualitative net investment coefficient, *beta*. Without this accurate measurement endogenous could never be complete. With this measurement, all the parameters and variables, hundreds and thousands, are simultaneously measured consistently over years, based on seven endogenous parameters.

(11) Back to the discrete Cobb-Douglas production function, Neo and New Keynesians use no production function while Neo-classicists use various production functions but only in the continuous form. As a result, for example, Harberger, Arnold, C. (1998) uses the discrete time and ex post total factor productivity as a residual and, estimates and forecast an internal rate of return but, without connecting the rate of return with the growth rate of output. Croushore, D., and Stark, Tom (2003) uses the continuous time and utilizes Log growth rate but, without a connection with the rate of return. Nevertheless, both schools have a common feature. What is the common feature? It is the market principle as the second best. Both schools have no endogenous base at the real assets of the SNA. Both schools have to rely on the financial assets of the SNA and follow the price-equilibrium, where the price values and the changes in prices appear in equilibrium. A definite deficit of the price-equilibrium is that it cannot express various processes changing from disequilibrium to equilibrium. New Keynesians accept the defects of Neo Keynesians: For example, Davar Ezra (2011) raises flaws of New Keynesians yet does not reveal how to solve problems related to the transition between disequilibrium and equilibrium. What causes do reveal effects?

(12) The current stream of two schools in the literature is commonly based on the micro, where individual utility started with Cass, David (1964) and Koopman, Tjalling, C. (1967). The author raises a question. Why does the capital-labor ratio fully justify maximized consumption, without rigidly measuring individual utility at the SNA? The author advocates that macro utility must be measured based on the macro level. Macro utility is measured, backing to Fisher, Irving (1933) and creating macro-based utility since macro is a base for micro. Incomplete reliance on vertical (by market) concept of the market dependence must be corrected. Policy-makers must measure and clarify numerical processes shifting from disequilibrium to equilibrium universally as a whole. It is a universe fact that the financial assets are wholly neutral to the real assets; the real assets are host and the financial assets are guests and remain confirmations. This fact is empirically proved comparing the exchange rate, money stock, and the ten year debt yield at the financial assets with corresponding endogenous data at the real assets.

The endogenous equilibrium is directly measured by the speed years for convergence by country and by sector. Meanwhile, the endogenous equilibrium is indirectly and implicitly measured by basic variables such as the rate of return and the growth rate of output. When moderate equilibrium falls into close-to-disequilibrium or disequilibrium, the same shock occurs differently to parameters and variables. Business cycle is formed with the same shock. Yet, business cycle is not bad but welcome and, maintains economic growth in the long run.

(13) In the 1980s and 1990s, the author, for comparisons by country, had used OECD and UNU data-sets, with the data-sets of the SNA by country. Survey of national accounts, Luxembourg/New York/Paris/Washington DC, (1993, 693p.) published "*System of National Accounts 1993, Eurostat, IMF, OECD, UN, and World Bank* ." The author admires their tremendous efforts in confirming a common base of the SNA by organization and by country. Nevertheless, capital stock has not been available by country. Capital stock in several countries is estimated principally using permanent inventory method (PIM) but, capital stock is inconsistent with the rate of return. For example, Cambera No. 7 (1997) has stopped discussing capital stock. Also, the BEA, the Dept. of Commerce, the US, turned to 'estimate profits' from 'capital stock estimation' since 2007. Capital stock was available in OECD at some interval for ten or so countries but not consecutively and, only for corporate sectors as designed and estimated by Schreyer, Paul (2001, 2002, 2004a, b, 2007). PWT 6.2 and its EPWT v. 4.0 publish the capital-labor ratio but, without the relationship between the capital-labor ratio and the capital-output ratio. EU KLENS database is published by the Conference Board yet, real-time Log growth rates are estimated and forecasted. These data hold, starting with investment as flow and developing vintages and index numbers. These data, however, cannot accurately measure the relative share of capital or labor. This fact raises a serious doubt to the current representative databases. This is because the relative shares are related to the rate of return and thus, these data cannot universally connect the rate of return with the growth rates.

(14) In short, the literature stands at discrete or continuous and cannot bridge between discrete and continuous at the same time. This fault was earlier indicated by Samuelson, P. A. and Solow, R. M. (562, 1956): "Finally, replacing continuous time by discrete time, integrals by sums, and derivatives by differences would bring to the discrete case from which Leonhard Euler, 1707-83, deducted his external condition as a limit, but no one seems to have worked out the full Hamiltonian theory for this discrete case." Naturally, databases today follow the same limit of data-setting.

(15) Fundamentally, economic phenomena change minute by minute and never repeat the same. Despite economics and econometrics are destined to look for repeating roles, patterns, and scientific discovery. Is this non-sense? No, never. Why? Actual statistics data are always within a certain range of purely endogenous data, as empirically proved in the *EES* over chapters. We must approve surprising progress in econometrics. The author dreams that if endogenous data are set as a theoretical base, econometrics will more speedily determine bright future ahead; not only estimating and forecasting the data but also dynamically realizing the effects of integrated policies and recovering the balances between actual and endogenous and between government and private.

1.3 Framework of the *EES*

The *EES* is summarized using BOXES to clarify its framework.

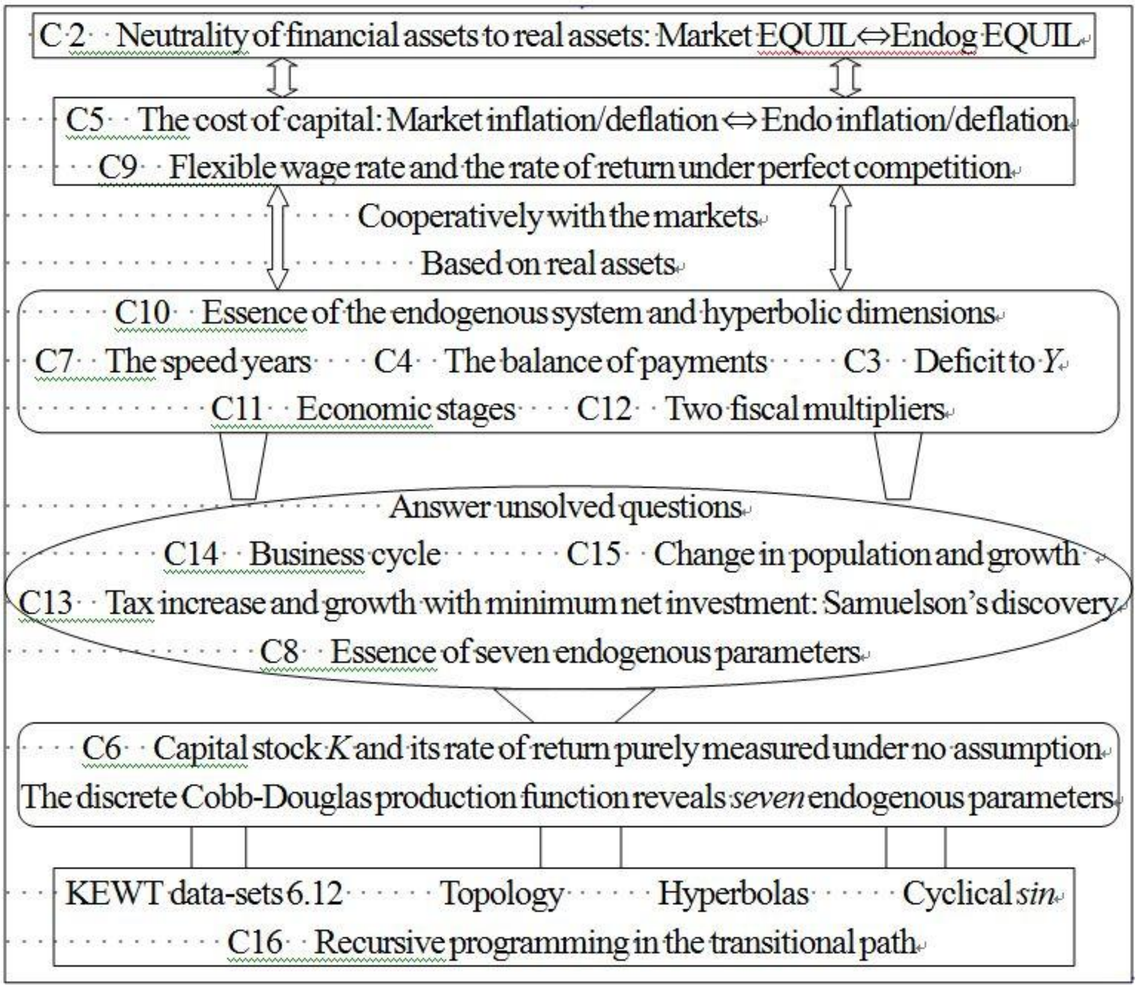
Essential interrelations among 16 chapters are summarized as BOX 1-2 with BOX 1-1. The difference between the price-equilibrium (market EQUIL) and the endogenous-equilibrium (endog EQUIL) strictly exits. Other differences related to final redistribution of disposable income, no assumption, perfect competition, and deficit, real-based versus cash flow-in and -out, each exist between the endogenous system and economic literature. These differences, nevertheless, cooperatively march together and overwhelmingly, are expressed as endogenous data. When statistics data approach endogenous data, any difference disappears, where we find eternal peaceful cooperation, globally and individually, by national taste, culture, and history. It is in reality.

BOX 1-1 Order of 16 chapters, with special notes

Chapter 1 Introduction and illustrative framework.
Chapter 2 Money neutrality: data 1990-**2005**, cooperatively with the market principles.
Chapter 3 Proof of deficit to output, 3 %, by country. ⇒more essentially, Chapter 13.
Chapter 4 Limit of market debt yield, 7 %, cooperatively with the market principles.
Chapter 5 Cost of capital (Hyperbolas by country), cooperatively with the market principles.
<u>Chapter **6** Capital stock and its rate of return, **1960-2010**, purely measured under no assumption.</u>
Chapter **7** The speed years (Hyperbolas by country); as a base for endogenous equilibrium.
<u>Chapter **8** Essence of seven endogenous parameters. ⇒more essentially, Chapter 13.</u>
Chapter 9 Wage rate and the rate of return, with its flexibility: data 1990-**2009**.
<u>Chapter 10 Endogenous system with its dimensions (Hyperbolas by country): data 1990-**2009**</u>.
Chapter 11 Economic stages: data 1990-**2009**, historically. ⇒more essentially, Chapter 15.
Chapter 12 Taxes and the multiplier, as a bridge between endogenous system and the literature.
<u>Chapter **13** Government spending and tax multipliers and Samuelson's (1942, 1975) scientific discovery: Answer Krugman's righteousness (July, 2012) (Hyperbolas by country).</u>
<u>Chapter **14** Business cycle: Hicks' (1950) sin, **1960-2010,** by country (Hyperbolas by country).</u>
<u>Chapter **15** Change in population, technology, and growth (Hyperbolas by country).</u>
<u>Chapter **16** Recursive programming, in the transitional path; consistently with KEWT.</u>
Appendix Hyperbola and its attribute by function; wholly arranged with calculation.

Note: (1) Chapters underlined are essential-oriented, bold-number chapters are wholly-oriented and, years bold stressed. (2) Chapters are divided into two; 1 to 10 (Part I) and 11-16 (Part II). Part I deepens each organic aspect step by step. Part II widens the range from each focus to whole as a system. (3) Nature-aspects are spread over 16 chapters, repeatedly since six nature-aspects are inseparable characteristics. The author carefully avoids jump up three Axioms in each chapter. This is because the author's motto is learning by doing. As a result, readers will understand and willingly accept three Axioms.

BOX 1-2 Functional clusters of sixteen Chapters



The author, first of all, presents Essence of Earth Endogenous System with three Axioms and six Nature-respects. Then, Notations and Notes of Samuelson (1970) and Sato' (1981), before Preface at the beginning of the *EES*. Notations contain five items: 1) notations by sector, 2) seven endogenous parameters, 3) basic endogenous equations in the discrete time, 4) six organic aspects in the endogenous-equilibrium by country and, 5) structural hyperbolas as a base. For equations, readers might use the above Notations like a dictionary. Each chapter (from C1 to C16) shows related equations so that readers could perceive the identity. The author, however, does not always show the processes to formulate each equation (in detail, see the first/original appearance listed at the end of Preface). Endogenous equations are consistent as a whole system and measure each parameter and variable by country and sector and, over years, as tested repeatedly.

Finally, the author presents a diagram that is common to natural, social, and behavioral sciences. D. W. Jorgenson (1963) proves: the growth rate of output/input of total factor productivity includes overlapping errors in its calculation. Jorgenson' title is 'capital theory and investment behavior.' The author was stimulated by his use of behavior.

The use of 'behavior' in the *EES* must be permitted within the range of scientific discoveries. We generally approve economic and econometrics under a fixed spiritual level. Any discovery, otherwise, is not included in scientific science. The author intends to have 16 chapters scientific throughout. Thus the author framed BOX 1-3 as below.

Any decision-making is scientific when the spiritual level is fixed. Mankind marches with history and climbs the spiritual level step by step, gradually passing thousands of years. Difference of the spiritual level should not be included in academic sciences and scientific discoveries and, empirical proofs. The *EES* of Earth Endogenous System (EES) follows this principle. The author is against behavioral economics if different levels of spirituality were taken willfully into the current behavioral economics.

BOX 1-3 Cross-Roads Scientific Discovery (C-RSD) Diagram: positioning of natural, social, and behavioral sciences on a two dimensional topology

1. **Natural** science:
(1) Natural science moves only on the x axis since no mankind is included.
(2) No decision-making of mankind. Nature does not approve the area formed by the y axis.
2. Earth Endogenous System (***EES***):
(1). *EES* has its final goal at the point of the origin of two dimensions by taking scientific ranges on the x axis and spiritual levels on the y axis.
(2). Transition of statistics data and endogenous data on the horizontal line at a fixed level of spirituality on the y axis.
(3). Controllability of dynamic balances at *EES* falls into a narrow range close to the origin, where static is in reality. Narrow range is called 'moderation' in Positive and Negative in olden China.
3. **Social** science:
(1) Social science can accept the cross-roads as it is.
(2) Moderation does not deny the existence of two extreme results, good and bad.
4. **Behavioral** science:
(1) Range of behavioral science spreads over Cross-Roads Scientific Discovery.
(2) Behavioral science has much room for expansion in the universe.

A device for the author to find new discoveries: (1) the use of exponential discount rate in Samuelson (1937, 1967) consistently connected individual utility in the literature with the utility at the macro-level of the author's endogenous system (see Chapter 6). (2) the use of two fiscal multipliers in Samuelson (1942; 1975, with revisit Salant, W. S.) was the first scientific discovery of sustainable and robust growth by country (see Chapter 13), which was typically, wholly, and empirically proved in the *EES*. Statistics data from the current representative databases are always within a certain range of endogenous data.

Chapter 2

Endogenous I-S and External L-M Diagram in Equilibrium: Towards the Neutrality of Financial/Market Assets to Real Assets

2. 1 Introduction

This chapter focuses on the endogenous I-S and L-M diagram, towards the neutrality of the financial and market assets to the real assets, exceptionally using earlier KEWT data-sets 3.09 for 58 countries by sector (the government and private sectors) and by year, 1990-2007. Chapter 4 proves the same issue of neutrality, to solve a market 7% problem to primary balance in budgetary deficits, by using KEWT 6.12, 1990-2010 for 81 countries by sector. This chapter endogenously replaces the illustrative 'I-S and L-M diagram' in the price-equilibrium with 'the $r^*(i)$ and $\boldsymbol{m_K = M2/K}$ diagram' in the endogenous-equilibrium measured by country and year. $r^*(i)$ is the rate of return ($\boldsymbol{r}^* = \Pi/K$) hyperbola to the ratio of investment to output/income ($i = I/Y$), where capital K is measured simultaneously with the rate of return. M2 is the currency money supply (=demand) corresponding with K, where $r^* = r_0$ is set as a base for connecting the actual data with endogenous data in parallel. The above reformed diagram aims at clarifying the essential relationship between the real assets and the markets, and present urgent policies to improve abnormal situations such as the current crisis. For this endogenous diagram, the neutrality of the markets to the real assets is required and proved using the above data-sets. Under this neutrality, the illustrative I-S and L-M diagram turns to a measurable diagram because market indicators cannot be formulated consistently with the real assets.

For the above neutrality, the author uses three indicators, (1) the above *M2*, (2) $\boldsymbol{r_{M(DEBT)}}$ as 'ten year debt yield,' and (3) $e_{(US)}$ or $e_{(EU)}$ as the exchange rate shown by 'ae', each in *International financial Statistics yearbook*, IMF (2007/8). The author uses three key ratios for the test of neutrality connecting with these indicators: (1) $\boldsymbol{m_K = M2/K}$, (2) $\boldsymbol{r^* - r_{M(DEBT)}}$, and (3) $e_{(US)}/e^*_{(US)}$. The exchange rate key ratio, $\boldsymbol{e_{(US)}/e^*_{(US)} = e_{(US)}/(e_{(US)} + (r^* - r^*_{(US)}))}$, is in fact neutral to the difference of the rates of return between two countries so that in the endogenous diagram the author does not include the exchange rate. The test of neutrality differs from *M*. Friedman (1977, 451-472) and R. R., Jr., Lucas (1995, 246-265), but endogenously absorbing their approaches.

The core of the diagram is shown by $\boldsymbol{r^{*}} - \boldsymbol{r_{M(DEBT)}}$. This is because $\boldsymbol{r^{*}} - \boldsymbol{r_{M(DEBT)}}$ is equal to the difference of two inflation rates, endogenous and external, whose level suggests urgent policies for recovering from the current crisis. Inflation rates are sensitively involved in the difference between equilibrium and disequilibrium, while resultant $\boldsymbol{m_K = M2/K}$ is roughly constant even at the crisis. Ranges of equilibrium and disequilibrium are measured using the speed of convergence hyperbolic function, *speed*(*i*). This *speed*(*i*) is related to *r**(*i*), whose common base is i = *I*/*Y*. When the diagonal crosses the hyperbolic curve of *speed*(i), the radius of curvature is measured using Pythagoras equation under right triangle, with the corresponding point of i_{BASE}. The optimum point of equilibrium and *r**(*i*) exists at a point lower than i_{BASE}. The center at the effective range of *i* = *I*/*Y* for *speed*(*i*) and *r**(*i*) is set i_{BASE}. And $\boldsymbol{m_K = M2/K}$ diagram also follows this effective range.

Each value of the above KEWT data-sets is endogenously measured without depending on econometrics, correlations, elasticity, probability, expectation, and filters (such as Kalman, Hodrick-Prescott, and Band-pass filters). The data-sets are justified by an endogenous Cobb-Douglas production function, which reveals hidden parameters such as *beta* for technology, *delta* for diminishing returns, and *lambda* for the speed of convergence, each as policy-oriented parameters. Finally, the author's motivation at this chapter started with Paul, A. Krugman's (Home Page: Figure 2, 2008) four I-S and L-M diagrams because his Figure 2 is intuitively suggestive yet remains immeasurable versions.

2.2 The Function to Determine the Endogenous I-S Diagram in Equilibrium

The endogenous I-S diagram is based on the rate of return function of the ratio of net investment to output, *r**(*i*), where *r** is the rate of return to endogenous capital *K* and, i=$\boldsymbol{I/Y}$ is the ratio of net investment to endogenous output=income *Y* (see soon below). Each of endogenous values differs from each of statistics values. Statistics and endogenous values differ partly in that each statistics value comes from a system of national accounts while each endogenous value is one before statistics-taxes are redistributed into consumption and saving, given the balance of payments and budget surplus/deficit.

First let the author raise endogenous values with related parameters and variables, and then, focus on the explanation of *r**(*i*). Endogenous national disposable income, *Y*, differs from *GDP* and any disposable income in statistics. In the endogenous growth model, *Y* is measured consistently using the data-set by country, by sector (government and private), and by year and over years. Other endogenous values used in this chapter are *C*=consumption, *S*=saving, *W*=wages, and *Π*=returns. Then, $Y=C+S=W+\Pi$ holds in equilibrium by sector at the real assets (compare it with the SNA 2008 at References). The relationship between C and W (adversely, S and Π) is measured using national taste function of the propensity to consume, $(\boldsymbol{rho/r}) = (\boldsymbol{C/Y})$, where the endogenous equation between per capita capital, the rate of return, and the wage rate, $\boldsymbol{k} = (\boldsymbol{\alpha}/(\boldsymbol{1}-\boldsymbol{\alpha}))/(\boldsymbol{r/w})$, must be simultaneously used. As a result, capital and the rate of return are consistently measured, as shown in KEWT 3.09 data-sets 1990-2007 by country and by sector.

In KEWT 3.09 (as shown at home page), basic parameters that remain unchanged in the transitional path are (1) the ratio of investment to output, $i=\boldsymbol{I/Y}$, (2) the relative share of capital, $\alpha=\Pi/Y$, and (3) the growth rate of population, $\boldsymbol{n} = (\boldsymbol{L_t} - \boldsymbol{L_{t-1}})/\boldsymbol{L_{t-1}}$. The n is given from statistics as an exception but the corresponding rate of change in population in equilibrium, $\boldsymbol{n_E}$, is measured in the data-set by country. The difference between n and $\boldsymbol{n_E}$ shows the rate of unemployment in equilibrium as discussed in a few other chapters. Basic parameters that change in the transitional path are (4) the capital-output ratio, $\boldsymbol{\Omega}^* = \boldsymbol{\Omega_0} = \boldsymbol{K/Y}$, (5) the ratio of quantitative share of investment at convergence, *beta**, (6) the diminishing returns to capital coefficient, *delta*$_0$, and (7) the speed of convergence, $1/\lambda^*$. Variables are (8) the rate of return, $\boldsymbol{r_0} = \boldsymbol{r}^* = \boldsymbol{\Pi/K}$, and (9) the growth rate of output, g_Y^*, where $r^* = \left(\frac{\alpha}{i\cdot\beta^*}\right) g_Y^*$ holds as an endogenous golden rule, differently from Phelps, E. (1961, 638-643). In the transitional path, the current situation is shown with 0 and the value at convergence in equilibrium is shown with *. In the literature, the current value is directly compared with estimated or reversely calculated value using data in statistics, as shown in De Grauwe, P. (2005, 253-260). In equilibrium, with $\boldsymbol{\alpha}/(\boldsymbol{i}\cdot\boldsymbol{\beta}^*)$, the difference of values between the current situation and at convergence is used for changes in policies, where $\boldsymbol{\Omega}^* = \boldsymbol{\Omega_0} = \boldsymbol{K/Y}$ and $\boldsymbol{r_0} = \boldsymbol{r}^* = \boldsymbol{\Pi/K}$ ensure to clarify the difference.

Second, the author clarifies the characteristics of $\boldsymbol{r}^*(\boldsymbol{i})$ as the clue to the endogenous I-S diagram, stating with each formulation of the rate of return and the capital-output ratio:

$$r^* = \alpha\left(\frac{i\,(1-\beta^*)(1+n)+n(1-\alpha)}{i\cdot\beta^*(1-\alpha)}\right), \text{ where } r^* = \frac{\alpha}{\Omega^*} \text{ and } \Omega^* = \left(\frac{i\cdot\beta^*(1-\alpha)}{i\,(1-\beta^*)(1+n)+n(1-\alpha)}\right) \quad (1)$$

Using $y = \frac{cx+d}{ax+b} + e$, $a = \beta^*(1-\alpha), b = 0$, $c = \alpha(1-\beta^*)(1+n)$, $d = \alpha\cdot n(1-\alpha)$, $af = cx + d$, and $e = \frac{\alpha(1-\beta^*)(1+n)}{\beta^*(1-\alpha)}$,

$$r^* = \frac{\alpha(1-\beta^*)(1+n)}{\beta^*(1-\alpha)} + \frac{\alpha \cdot n(1-\alpha)}{i \cdot \beta^*(1-\alpha)} \tag{2}$$

Using Eq. 2, a hyperbolic function of $r^*(i)$ is formulated. The vertical asymptote (VA) of $r^*(i)$ is zero: $i_{VA} = 0$. If $a \cdot f = \alpha \cdot n \cdot \beta^*(1-\alpha)^2 > 0$, the curve locates at the first quadrant. The horizontal asymptote (HA) of $r^*(i)$, r^*_{HA}, is defined as an endogenous inflation rate, $inf.rate^*_{HA}$. Thus, the 'real' rate of return in equilibrium, r^*_{REAL}, is shown by:

$$r^*_{REAL} = r^* - inf.rate^*_{HA} = r^* - r^*_{HA}, \text{ where } r^*_{HA} = \frac{\alpha(1-\beta^*)(1+n)}{\beta^*(1-\alpha)} \tag{3}$$

If the relative share of capital α>0, the *H.A.* locates at the first quadrant and shows the inflation rate (+), where $r^* > r^*_{REAL}$. If α< 0, the *H.A.* locates at the second quadrant and shows the deflation rate (–), where $r^* < r^*_{REAL}$. If $\beta^* = 1.0$, with no technological progress, $r^*_{HA} = 0$, where 'nominal' equals 'real.' $r^*_{HA} = g^*_A \cdot \frac{(1+n)}{\beta^*(1-\alpha)}$ implies that the endogenous inflation rate is a function of the rate of technology $g^*_A = \alpha(1-\beta^*)$: for example, if g^*_A is minus, the inflation rate, $inf.rate^*_{HA}$, turns to a deflation rate, as shown in many cases of government sector, due to huge deficit. There is no possibility that $r^*_{HA} > 0$ holds under deflation, as the author confirmed this fact using 58 countries by sector. This fact rigorously reverses the shape of the I-S curve; in accordance with 'from α >0 to α <0.'

However, the endogenous inflation rate is free from the markets. Since the inflation rate is mostly related to the markets, the author here uses an external inflation rate such as the rate of change in consumers' price index (*CPI*): $inf.rate_M = g_{CPI}$. Then, the real rate of return will be:

$$r_{M(REAL)} = r_{M(DEBT)} - inf.rate_M \tag{4}$$

Eqs. 3 and 4 each holds in parallel to the real and financial assets. Then, using both assets, the third inflation rate is derived as a composition of the market, $r_{M(DEBT)}$, and endogenous real, r^*_{REAL}. This is the composite inflation rate, $inf.rate_{COMP}$, as shown in Eq. 5

$$r_{M(DEBT)} = inf.rate_{COMP} + r^*_{REAL} \tag{5}$$

Eq. (5) produces $r_{M(DEBT)} - r^* = inf.rate_{COMP} - inf.rate^*_{HA}$. If $r_{M(DEBT)} - r^* = 0$, the real assets match the financial assets, where market inflation equals endogenous inflation. For the rate of return, $r_{M(DEBT)} - r^*$ and/or $r_{M(DEBT)}/r^*$ are key ratios to examine the level of the neutrality of the financial assets to the real assets. Without measuring the rates of return and related inflation rates, external and endogenous, the essence of the I-S diagram is not revealed.

2.3 Money Supply and the Exchange Rate: Comparing with Endogenous Real Assets

To test the neutrality of financial assets to the real assets, the author selects three items in the markets: (1) Currency money supply (prefers *M*2 to others of money when *M*2 is available in *IFSY*, IMF), (2) ten year debt yield, $\boldsymbol{r_{M(DEBT)}}$, and (3) the exchange rate as country's currency per US Dollar or Euro ('*ae*' of *IFSY*, IMF). These market items are related to each other. The level of neutrality at $\boldsymbol{M2}$, $\boldsymbol{r_{M(DEBT)}}$, and the exchange rate are essential before finalizing the author's I-S and L-M diagram and each tested using the data-sets of 58 countries. These tests are satisfied by comparing with capital, the rates of return, and the growth rate of per capita output in equilibrium between two countries. Test of neutrality was executed earlier by Friedman, M. (1959, 25p; 1977, 451-472) as the positive theory. The difference of approaches between the two tests is whether or not endogenous parameters and variables are used for the tests.

More importantly, even under the proof of the neutrality, movements of $r_{M(DEBT)}\text{-}r^{*}=inf.rate_{COMP}\text{-}inf.rate^{*}_{HA}$ differ significantly and, this enables policy-makers to cope with recent crisis towards sustainable resuscitation.

For $M2$, the author just refers to purchasing power parity (PPP). PPP uses general price level relying on the markets and is based on quantity theory of money. The author's $m_K = M2/K$ is related to Marshall's *k* or $m = M2/Y$. But, m_K and *m* are connected with endogenous capital-output ratio, *Ω,* where capital *K* is endogenous, independent of the markets:

$$m \equiv \Omega \cdot m_K, \text{ where } m = M2/Y \text{ and } m_K = M2/K \qquad (6)$$

Turing to the exchange rate test, the author first shows Krugman's arbitrage equation (hp, Japan still trapped, 2008; for the background, see Krugman, P. A. and Obstfeld, M., 2005, 418-442). Then the author formulates his endogenous equation. Krugman's notations are: 'e' is the logarithm of the 'real' exchange rate, 'e_L' is that of the long-run equilibrium real exchange rate, 'r' and 'r^*' are the domestic and foreign real interest rates (imagining that expected returns on domestic and foreign bonds are equalized), and 'g' is a fraction of the gap per year between the actual and long run rates:

$$e = e_L - (r - r^*)/g, \text{ from } r - r^* = g(e_L - e) \qquad (7)$$

On the other hand, the author starts with local currency per US Dollar, $e_{(US)}$='ae' at *IFSY*, IMF (or Euros per US Dollar, $e_{(EU)}$='ae') by country and defines $e^*_{(US)}$ as $e_{(US)} + (r^* - r^*_{(US)})$, where Krugman's real interest rate is replaced by the rates of return at convergence, r^* *and* $r^*_{(US)}$. If $e_{(US)}/e^*_{(US)} \neq 1$, the exchange rate reflects the difference of the rates of return between the two countries. $e_{(US)}/e^*_{(US)} = 1$ implies that the foreign exchange market satisfactorily works, based on the rate of return measured at the real assets. In short, the level of matching is tested using:

$$e_{(US)}/e^*_{(US)} = e_{(US)}/\left(e_{(US)} + (r^* - r^*_{(US)})\right) \quad (8)$$

When the rate of return, r^*, is formulated with the growth rate of output at convergence, g^*_Y, as below, anyone is able to test the neutrality of financial and foreign exchange markets more widely than before. And, this g^*_Y is tightly related to the growth rate of per capita output, g^*_y, and the rate of technological progress, g^*_A.

$$r^* = \left(\frac{\alpha}{i \cdot \beta^*}\right) g^*_Y \qquad g^*_Y = g^*_y(1+n) + n$$

$$g^*_y = i(1-\beta^*)/(1-\alpha), \text{and } g^*_A = i(1-\beta^*) \quad (9)$$

The three determinants of the relationship between r^* and g^*_Y is (1) the relative share of capital α, (2) $i = I/Y$, and (3) the ratio of quantitative to qualitative and qualitative investment β^*. As a typical case, the government sector's relationship between r^*_G and $g^*_{Y(G)}$ clarifies an interesting result: $r^*_G = (\alpha_G/i_G \cdot \beta^*_G) g^*_{Y(G)}$. When the ratio of deficit to output, $\Delta d = \Delta D/Y$, is high, r^*_G turns to minus while $g^*_{Y(G)}$ remains plus, due to minus values of r^*_G and the government relative share of capital α_G. The above proves the mechanism of deflation that starts with deficit.

When the neutrality is accepted using the following tests, the author is able to reform the I-S and L-M diagram. For the financial market test, ten year debt yield is compared with r^*. If $r_{M(DEBT)} = r^*$, the neutrality of the financial market holds. For the exchange rate test, the author examines not only the above Eq. 7 of

$e_{(US)}/e^{*}_{(US)}$ but also $e_{(US)}/g^{**}_{y}$ (for the EU, similarly using $e_{(EU)}$). In these tests, $g^{**}_{y} = g^{*}_{y}/g^{*}_{y(US)}$, $r^{*} - r^{*}_{(US)}$, and $g^{*}_{y}/g^{*}_{y(US)}$ are involved. Furthermore, using Eq. 8, the cost of capital $r^{*} - g^{*}_{Y}$, the valuation value ratio $V = \Pi/(r^{*} - g^{*}_{Y})$, and the valuation ratio $v = r^{*}/(r^{*} - g^{*}_{Y}) = V/K$ are measured. Then, macro leverage is derived, where if $g^{*}_{Y} = 0$, $K=V$ holds and if $r^{*} = g^{*}_{Y}$ or $\alpha = i \cdot \beta^{*}$ holds, the Petersburg paradox happens without using probability, differently from D. Durand (1957, 348-363):

$$l_{EV} \equiv D/(D + v \cdot K) \qquad (10)$$

When the neutrality of currency money *M2* using $m_{K} = M2/K$ is empirically proved, the above leverage is substantially used for policy-makers, similarly to $r_{M(DEBT)} - r^{*} = inf.rate_{COMP} - inf.rate^{*}_{HA}$.

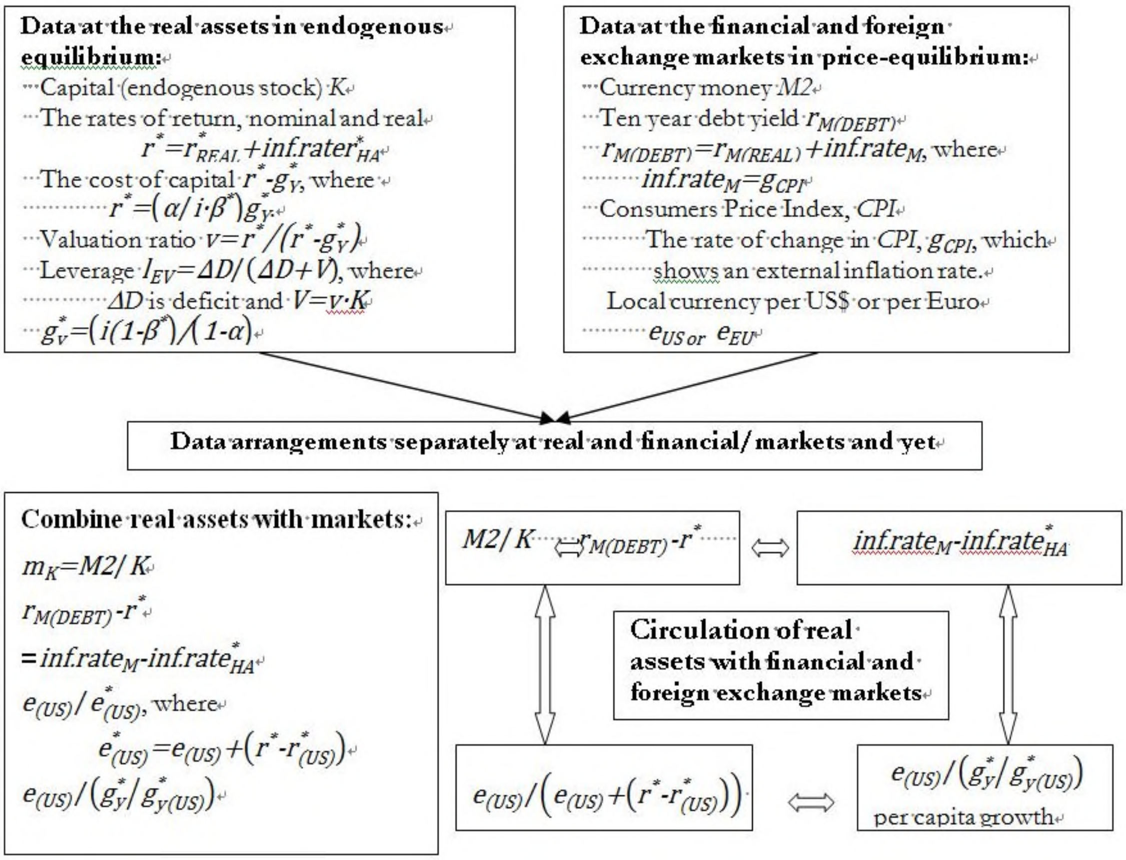
2.4 Tests of the Neutrality of the Markets Using 58 Countries by Sector

The author tests the neutrality of the financial and exchange markets to the real assets, by using key ratios available in KEWT 3.09, 1990-2007, as '58 country' data-sets by sector, and its 'three area' on weighted average. For delicate movements, see Figure N1 for $M2$ and the exchange rate, and Figure N2 for the series of rates of return, including endogenous and external inflation/deflation rates at the end of this chapter. The tests become a base not only for the endogenous diagram of this chapter but also for stopping bubbles which have occurred once or twice in a decade. Does the existence of the I-S and L-M diagram still remain when the tests clarify that the markets are neutral to the real assets? Yes, it remains. The existence of the diagram clarifies the importance of policy-making towards sustainable economy, by revealing the essence of the diagram. This essence is to watch the relationships between the market key ratios and the series of rates of return, with endogenous and external inflation/deflation rates, as shown in equations above. Policy-making and the neutrality do not contradict. Policy-making must control When inflation/deflation rates, endogenous, external/market, and composite, are controllable, policy-making ensures its foundation, where the financial and market assets still support the real assets.

The outline of the tests is shown in **BOX 2-1**. First, the author tests currency money *M2*, using the ratio of $M2$ divided by endogenous capital *K*: $m_{K} = M2/K$. This ratio becomes stably constant in developed countries: much more stable than the Marshall's k or $m = M2/Y$ by country (among 58 countries). The tests were successful, based on endogenous capital (measured by (1) the labor function of the propensity to consume with national taste and (2) an accounting identity of wage rate, the rate of return, the capital-labor ratio, and the relative share of capita).

As a special case of currency money$M2$, the Euro currency area (thirteen countries aggregated at the KEWT), after 1999, has unique exchange rate of Euro: m_K stays at an extremely narrow range of 0.337 and 0.347. This verifies not only neural money supply but also accurate endogenous capital measurement, without influenced by changes in the exchange rate.

BOX 2-1 Endogenous I-S; external L-M diagram, supported by the neutrality of financial and foreign exchange markets to the real assets



Second, the author tested ten year debt yield, $r_{M(DEBT)}$, using $r_{M(DEBT)} - r^*$ and/or $r_{M(DEBT)}/r^*$. National debt produces interest yields as a whole, regardless of whether or not bond is issued. The fact is that developed countries each show $r_{M(DEBT)} < r^*$ while developing countries each show $r_{M(DEBT)} > r^*$. However, most countries, including Euro currency area after 1999, have shown $r_{M(DEBT)} < r^*$. This implies that a bud of bubbles has been gradually accumulated in the 2000s and that policy-makers must watch both $m_K = M2/K$ and $r_{M(DEBT)} - r^*$ at the same time. In this respect, the central bank needs the information of both endogenous K and a series of rates of return in equilibrium.

Star ups often occur in some countries and in some consecutive fiscal years. The main reason is traced back to the deficit and returns at the government sector, which influences results of the total economy significantly even if the government share of output is less than one-fourth. At the government sector, the relative share of capital equals the rate of return (since national taste is neutral to the propensity to consume): $\alpha_G = r_G^*$. In other words, if the rate of return is minus, the relative share is also minus. The author sets a hypothesis that extreme deficit causes deflation, as expressed in Figure N2. Policy-makers need to clarify the government sector's reversed hyperbola to recognize the level of deflation rate.

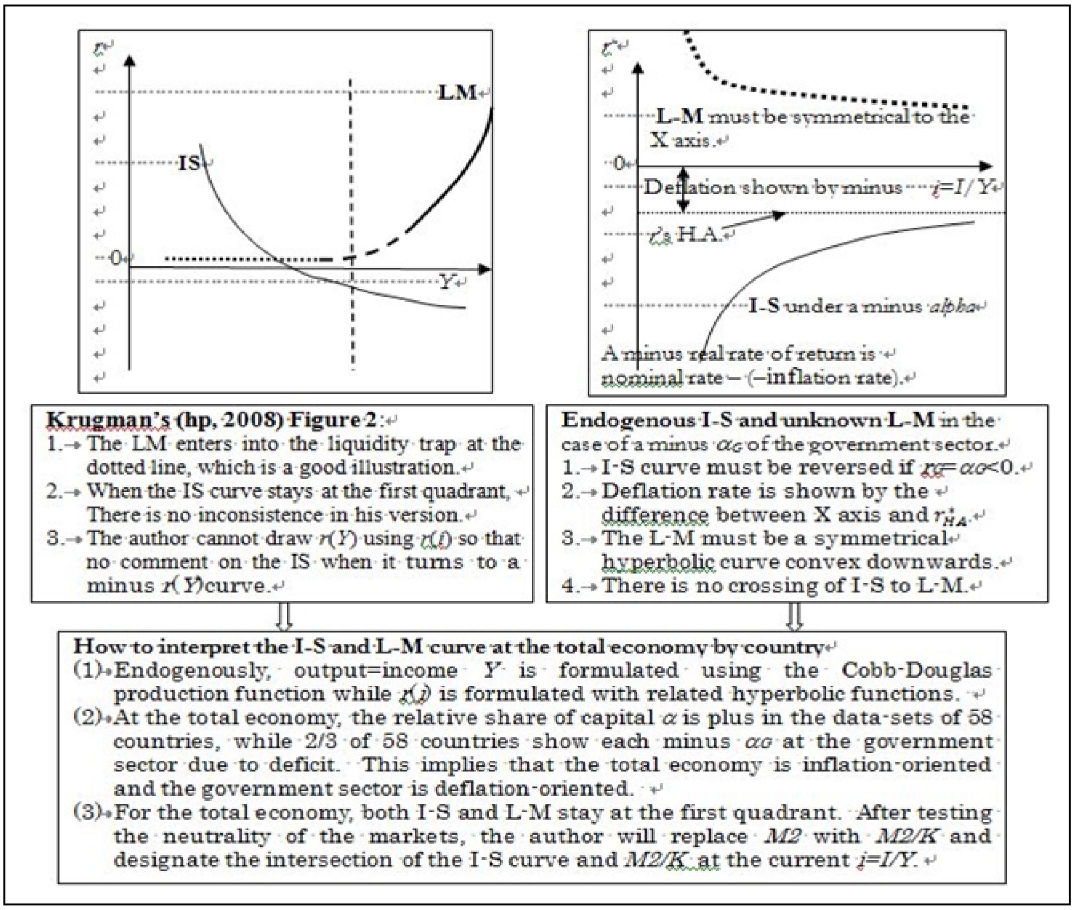
The author cites all the cases of plus/minus government relative share of capital α_G in 1990 to 2007, classifying into four:

1. Plus α_G : Ireland, Luxemburg, Czech Republic, Slovenia, Latvia, Slovak, Switzerland, Turkey, Mexico, China, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand, Vietnam, Argentina, Chile, Peru, Iran, Kazakhstan, Egypt.
2. Minus α_G , within several years: Austria, Netherlands, Portugal, Bulgaria, Denmark, Iceland, Latvia, Russia, Canada, Australia, New Zealand, Brazil, Kenya, Tanzania.
3. Minus α_G, roughly one half of years: Belgium, Finland, Spain, Norway, Sweden, India, Columbia, Kuwait, Saudi Arabia.
4. Minus α_G, almost all the years: France, Germany, Greece, Italy, Hungary, Poland, Romania, the UK, the US, Japan, Pakistan, Nigeria, South Africa, where the level of Japan is the worst.

The case of (1) stimulates inflation. The case of (4) leads to a lower inflation due to the deflation of the government sector. Surplus/deficit is cash flow yet, expressed as the difference between saving and investment at the government sector. Therefore, deflation of the government sector is measured and deflation is inevitable when democracy cannot control huge deficit, as typically shown in Japan. When the size of government (measured by endogenous taxes), the level of deflation is not serious as shown in some countries. Developed countries, in particular, the Euro currency countries suffered from deflation before 1999.

Third, the author tested the exchange rate $e_{(US)}$ or $e_{(EU)}$, using $e_{(US)}/(e_{(US)} + (r^* - r^*_{(US)}))$ and $e_{(US)}/(g^*_y/g^*_{y(US)})$. Endogenous results were in favor of the neutrality test, in particular justified by the fact of $r^* - r^*_{(US)} = 0$. The result is typical in thirty countries other than the EU area. Note that each country has a different range of $e_{(US)}/(g^*_y/g^*_{y(US)})$, according to economic stage by country (see Figure N1). Developing countries will have robust movements before entering into matured stage. This implies that the neutrality of the markets only shows one aspect of real assets key ratios.

BOX 2-2 From Krugman's (2008) Figure 2 to the author's version of the I-S and L-M diagram



2.5 From the Illustrative I-S and L-M to Endogenous Diagram: Its Policy-Oriented Implication

The author first revisits J. R. Hicks (1937) that illustrates the framework of Keynes J. M. (1936), using Hicks' illustrations and second compares P. Krugman's (2008) illustration with the author's version, where the author still stays at a version of currency money shown by the L-M curve. Third, the author summarizes the three steps to endogenous diagram, where the L-M curve is replaced one intersection of $m_K = M2/K$. This diagram is justified by the proof of the above neutrality. The author presents implications of this diagram and furthermore challenges for how to cope with the current crisis, despite the neutrality of the markets to the real assets.

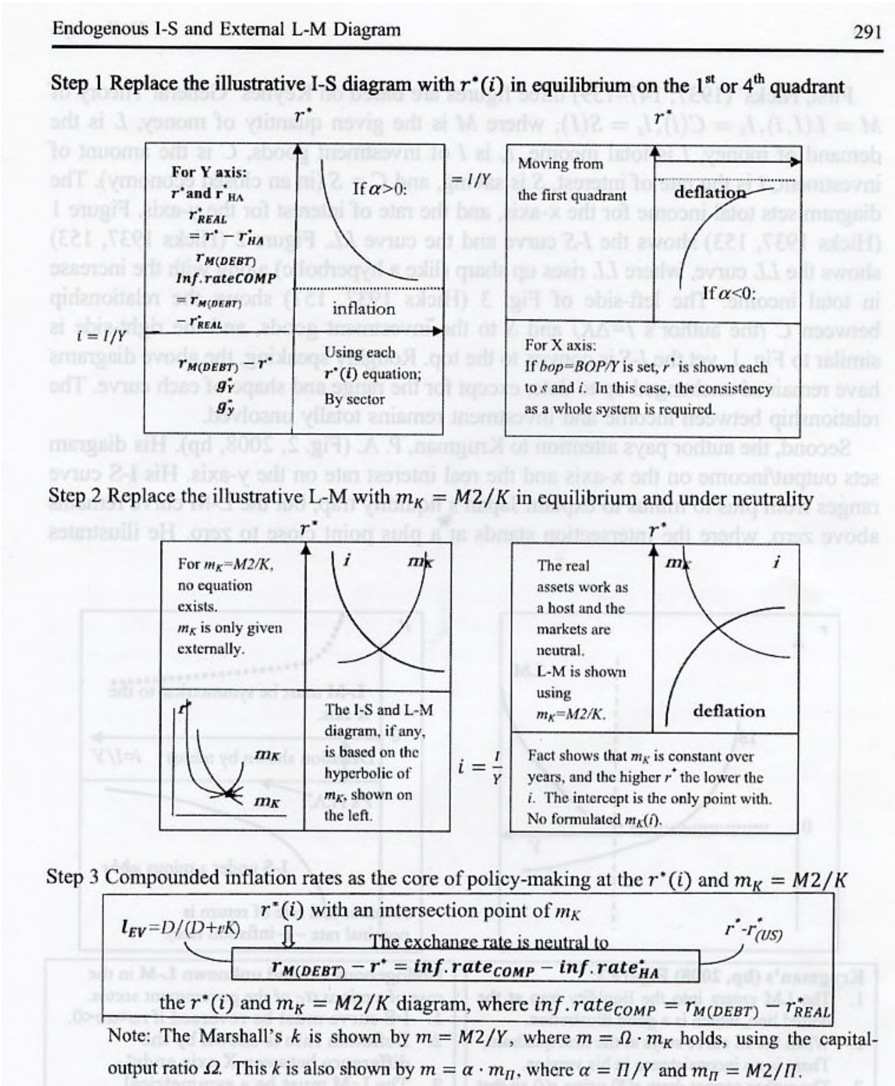
First, Hicks' (ibid., 147-159) three figures are based on Keynes' General Theory of $M = L(I, i), I_X = C(i), I_X = S(I)$, where M is the given quantity of money, L is the demand of money, I is total income, I_x is I of investment goods, C is the amount of investment, i is the rate of interest, S is saving, and C=S (in an closed economy). The diagram sets total income for the X axis and the rate of interest for the Y axis. His Figure 1 (ibid., 153) shows the *IS* curve and the curve *LL*. Figure 2 (ibid., 153) shows the curve *LL,* where *LL* rises up sharp (like a hyperbolic) along with the increase in total income. The left-side of Figure 3 (ibid., 157) shows the relationship between C (=the author's I=ΔK) and S to the investment goods and the right-side is similar to Figure 1, yet the *IS* is convex to the top. Roughly speaking, the above diagrams have remained unchanged up to date, except for the range and shape of each curve. The relationship between income and investment remains totally unsolved.

Second, the author pays attention to Krugman, P. A. (Figure 2, 2008, hp). His diagram sets output/income on the X axis and the 'real' interest rate on the Y axis. His I-S curve ranges from plus to minus to explain Japan's liquidity trap but, the L-M curve remains above zero, where the intersection stands at a plus point close to zero. He illustrates that the Japanese economy falls into a liquidity trap at the range such that the L-M curve remains a horizontal line close to the X axis. Now let the author compare his illustration with the author's preliminary version of the I-S and L-M diagram (see **BOX 2-2**).

The preliminary version takes the ratio of investment to output/income, $i = I/Y$ on the X axis. The author cannot directly formulate the relationship between $i = I/Y$ and output/income Y, since Y is complicatedly formulated using hidden endogenous parameters in an endogenous Cobb-Douglas production function.

If the author replaces his real rate of interest by the endogenous real rate of return at convergence, $r^*_{REAL} = r^* - inf.rate^*_{HA} = r^* - r^*_{HA}$, his liquidity of trap is well expressed supported by endogenous rates of return, and without touching the L-M curve. His diagram is true in the case of total economy, whose relative share of capital α is plus. However, for the government sector, the deficit as cash flow is expressed as $S_G - I_G$ and this solves problems of the government sector. His diagram does not holds under α_G<0. Two third of 58 countries suffers from heavy deficit, resulting in α_G<0. This implies the I-S curve at the government sector is reversed and it is difficult to draw the L-M curve as shown at the right figure of BOX 2-2. Furthermore, money supply=money demand holds in the price-equilibrium or at the markets. The L-M curve must be replaced by a key ratio that is consistent with the I-S curve in endogenous equilibrium: that is $m_K = M2/K$. This condition is justified by the neutrality of the financial and market assets to the real assets.

BOX 2-3 Three steps from illustrative to endogenous diagram, connecting real asset measurements with those at financial/market assets



Third, the author shows three steps to the author's endogenous diagram that holds under the neutrality. Then, how can policy-makers foresee economic crisis that starts with markets and what key ratios can be used for the overcoming the crisis? Three steps are shown in **BOX 2-3** above.

Step 1 shows the I-S diagram using $r^*(i)$, comparing an inflation case with a deflation case. The shape of the hyperbolic curve is reversed according to the sign of the relative share of capital. Step 2 shows the relationship between the I-S and L-M diagram using $r^*(i)$ and $m_K = M2/K$, where m_K remains an illustration, as in the literature. Step 3 shows the implications of the diagram under the neutrality. Step 3 also shows how to cope with the economic crisis by using hidden key ratios of $r_{M(DEBT)} - r^* = inf.rate_{COMP} - inf.rate^*_{HA}$ and $l_{EV} \equiv D/(D + v \cdot K)$ (see Eqs. 5 and 10).

For the implications of the final diagram, the author first interprets $m_K = M2/K$ with key determinants of the neutrality to the real assets, and then discusses how to foresee and conquer bubble and crisis. As shown in BOX 2-1 for testing the neutrality, $m_K = M2/K$ is related to the rates of return in equilibrium and the market rates of return. Under the neutrality of $m_K = const$, the difference between $r_{M(DEBT)}$ and r^* differs by country and by year. This difference is low in the Euro currency countries but fluctuates widely among all the countries except for the Euro currency countries. This implies that policy-makers must watch much more cautiously than *M2* and $m_K = M2/K$. Of course, slight movement of $m_K = M2/K$ is a sign towards bubbles. Note that the exchange rate of a country to the US shows in $r^* = r^*_{(US)}$, in particular thirty countries other than the EU area. This proves that the foreign exchange market is completely neutral.

Then, why do bubbles start from the financial assets-side under the neutrality of financial assets to the real assets? This is partly because some speculative funds absorb extra money supplied by the central bank and these funds produce profits (apart from the real assets). These funds and their returns are mostly out of disclosure; globally accumulated at tax heavens. Yet, published currency money also reflects some part of hidden money, resulting in slightly abnormal movements. At the same time, extra money runs into robust countries such as China, India, and Brazil through direct investment. These phenomena will raise the external (flow) inflation rate such as the rate of change in *CPI*. Yet, the trigger of bubbles starts with asset (stock) inflation, which is accelerated by real estate-price level. Policy-makers foresee bubbles by these signs.

Then, how can policy-makers stop bubbles? Flag of justice is endogenous capital *K* measured by sector. Policy-makers, first of all, send a signal to the markets by (1) raising official interest rate, (2) directly regulating borrowers who are in favor of real estate-price jumping, and (3) regulating leverage of $l_{EV} \equiv D/(D + v \cdot K)$ and the valuation ratio of $v = r^*/(r^* - g_Y^*) = V/K$ in cooperation with BIS regulation. A target of sustainable economies is to stabilize the value of $inf.rate_{COMP} = inf.rate_{HA}^* + (r_{M(DEBT)} - r^*)$. Deficit does not help economies but lower growth in the long run. Abnormal assets inflation contradicts sound real and financial assets. It seems that there exists no different policy but, conventional policies are reproduced by endogenous capital *K* and a series of rates of return by sector in equilibrium, and endogenous inflation rate.

2.6 Conclusions

The real assets express the essence of an economy, but still needs some cooperation with the markets. It is a new fact that currency money *M2* exists in proportion to endogenous capital *K*. The endogenous diagram of this chapter is expressed as 'the $r^*(i)$ and $m_K = M2/K$ diagram.' A hidden core of the diagram is an equation of $r_{M(DEBT)} - r^*$, which is equal to $inf.rate_{COMP} - inf.rate_{HA}^*$. This implies that endogenous and external inflation rates are deeply involved in the markets. The so called I-S and L-M diagram, external and/or endogenous, will not be used for policies without clarifying involved inflation rates. Under equilibrium, if the horizontal asymptote of $r^*(i)$ is zero, ten year debt ratio is equal to the rate of return at convergence, where no inflation exists between endogenous and external. This constitutes a zero base for the inflation rate. Policy makers must watch a sign of bubbles and set up urgent policies for stable economies, controlling involved inflation rates. These policies do definitely hold if and only if endogenous capital is endogenously measured with the series of rates of return in equilibrium.

The author was stimulated by four figures of Krugman (home page, 2008). His figures now turn to a measurable diagram by applying two functions in equilibrium: the speed of convergence function and the rate of return at convergence function, each to the ratio of net investment to output. The author's diagram does not directly express the balance of payments and deficit, yet both are involved in endogenous equilibrium of the real assets. Also, the author's diagram holds by sector.

More than two-third among 63 countries, 1990-2007, showed deflation at the government sector in KEWT 3.09. Currently 81 countries show deflation endogenously except for a dozen countries at the government sector in KEWT 6.12, due to heavier burden of deficits (see Chapters 3, 4, 5). Note that at the total economy almost all the countries show inflation as a weighted aggregate average of the government and private sectors.

Therefore, the author's diagram stays at the first quadrant, with a normal curve of $r^*(i)$, and under the endogenous-equilibrium. Without measuring the deflation rate due to huge deficit at the government sector, the endogenous diagram is incomplete. Without externally estimating the inflation rates at the total economy, the endogenous diagram does not work for policy-making. This is because most policy-makers first understand actual facts empirically and then they bravely execute their policies.

At the current crisis, even if $m_K = M2/K$ moves slightly apart from a constant value, policy-makers must watch and take actions against unstable changes in $r_{M(DEBT)} - r^* = inf.rate_{COMP} - inf.rate^*_{HA}$ and the valuation ratio, $v = r^*/(r^* - g^*_Y) = V/K$. Even under the existence of neutrality, there is much room for detecting a bud of bubbles and immediately taking action not to have next bubbles; consistently with and beyond the current empirical macro EMU rules and proposed micro BIS regulations (for detail, go to the next three Chapters and then, Chapters 12 and 13).

Acknowledgements:
The author got Permissions of the use of "Endogenous I-S and External L-M Diagram in Equilibrium towards Policy-Making" originally published in 2010 in Volume 16, Issue3 of *International Advances in Economic Research*, from this Journal dated on Oct 12, 2012, with the signature of Dr. Katherine S. Virgo, Acting Editor in Chief. The author is grateful to Dr. John M. Virgo, the Founder of International Atlantic Economic Society and the Society.

Roadmap: Neutrality of the financial/market assets to the real assets, along with chapters; with limited monetary and financial policy at the Bank of Japan

This chapter presented an original paper itself published by *International Advances in Economic Research*, 16, 282-296, 2010 and, with a few paragraph up-dated. Chapters 5 and 9 also present original papers published at *Forum for Economists International*, Amsterdam, 2011 and 2012. Thirteen others chapters were newly written, to make conspicuous each essence by aspect, using the current KEWT 6.12, 1990-2010 and/or 1960-2010, by sector. Ideas and researches of thirteen other chapters are mostly originated to the author's papers published by *Papers of the Research Society of Commerce and Economics* and *Journal of Economic Sciences*.

Endogenous I-S and External L-M Diagram in Equilibrium: Towards the Neutrality of Financial/Market Assets to Real Assets

This roadmap includes the following three points in equilibrium:

Point 1 Essence of Mundell, R. A. (97-109, 1965) that topologically clarifies the relationship between financial/market assets and real assets under the price-equilibrium.

Point 2 Implication of purchasing power parity (PPP) doctrine reappraised by Balassa, Bela (584-596, 1964).

Point 3 Samuelson's (111-154, 1964) consciousness anguished on 'Theoretical notes on trade problems.'

Readers paying attention to the Roadmap may understand why the author did not step into the PPP at Chapter 2 that focuses the neutrality of the financial/market assets to the real assets (the neutrality, hereunder).

Point 1: Mundell (1965)

Point 1 fairly and evenly explains the relationship between financial/market assets and real assets under the price-equilibrium. The base is $MV=PY$ (Eq. 1), where M is money supply, V is velocity, P is price level, and Y is output. Productivity of capital, ϕ, is defined as output divided by capital (Eq. 3). Finally, ϕ is maximized by solving parabola equation (Eq.35 and Figure 2). Then, Figures 3 and 4 are each shown by topology using the rate of inflation, π, on the x axis and velocity, W, on the y axis. $dW/dt = \pi - \rho$ (Eq. 32) holds, where $\rho = (dM/dt)/M$. The use of parabola and its topology is inevitable under the price-equilibrium and represents the literature. Of course, the rate of inflation is external. The author pays attention to $\phi = 1/\Omega$, where Ω is the author's capital-output ratio. Recall Chapter 8, where the capital-output ratio in the endogenous-equilibrium is a key for controlling seven endogenous parameters. Ω connects the literature with the endogenous system. The endogenous system measures capital and the rate of inflation simultaneously at Chapter 6. As a result, the neutrality is simultaneously proved theoretically and empirically.

Point 2: Balassa (1964)

The PPP is closely related to the price-equilibrium. The PPP is a tool within the price levels and price indexes. There is no other tool/method so that the PPP has been utilized hitherto. The endogenous system has the neutrality. The neutrality exists as a foundation of the PPP when the neutrality discovery sets one of three neutralities the exchange rate. The neutrality constitutes a starting point of the endogenous system and, prevails into the *EES*. The PPP is useful to sector and industry analyses at the micro level, as estimated at Balassa's Figures 3, 5, and 6.

Towards the micro level, see 'D. Future home task at the *EES* revolving to the micro-level from the current macro level alone,' in Postscript of the 1st edition.

One recognizes that the market principle fairly exists just like God's decision. It is true in the long-term. Yet, the market principle does not express any definite cause, while the real assets exclusively clarify causes and effects hidden behind the market principle. The *EES* simultaneously reveals the causes and effects. Suppose that there exists no endogenous system like the KEWT database and its recursive programming. Then, people have to rely on the relationship between the exchange rate and the PPP. The author accepts inevitable default of price indexes that have quality-character changed at least once or twice in a decade. The author appreciates external existence of various price indexes. This is because it is modest for the *EES* to compare endogenous results with the price indexes, as shown in Chapter 2.

Point 3: Samuelson (1964)

'Theoretical notes on trade problems' by Samuelson's (111-154, 1964) impressed the author. The author feels the scientific discoveries of Samuelson (1937, 1939, 1940, 1941, 1942; 1975) at each chapter of the *EES* (see References at the end). This is because Samuelson's lifework is most vast yet, real assets-oriented in bottom. Samuelson (111-154, 1964) starts with maximum and minimum under the price-equilibrium, similarly to Mundell (97-109, 1965). Naturally, Samuelson treats the PPP for the exchange rate, similarly to Balassa, Bela (584-596, 1964). Nevertheless, in his (153, ibid.) conclusion, the following sentence appears in terms of direct investment of the US:

> *The prime element in all this is the reducing of the technological miracle gap between America and the less-than-most-affluent nations.*

Samuelson perceives that the rate of technological progress is a core of the real assets. The rate of technological progress has actually been a bottleneck of macroeconomics in the literature. The *EES* is surprisingly fortunate to have the rate of technological progress measured consistently by country, sector, year, and over years.

Conclusively: First look at Essence of Earth Endogenous System: Three Axioms and six Nature-Respects at the beginning of the *EES*. Chapter 2 is a unique core of the *EES* and will last with the market principles forever. Soon after the publication of the 1st edition of the *EES* (15 May 2013), the author set up six nature-aspects based on essence of the *EES*. Six nature-aspects are connected with other. Their Father is Money-neutral (**Nature-aspect 1**). Money-neutral is another expression of the neutrality of the financial/market assets to the real assets, yet more deeply, broadly, simply, and universally. Money-neutral prevails by country, by sector, ands by year and over years, based on just before the redistribution of taxes to households and enterprises and absorbed by other five nature-aspects.

Money-neutral is most closely related to Deficit-neutral and *RRR*=0 (**Nature-aspect 4**). *RRR*=0 is the real rate of return equals zero, where the nominal growth rate of output equals the rate of inflation/deflation. When deficit=0, the nominal growth rate of output=the rate of inflation/deflation=0 holds. This is Utopia economy and realized when leaders by country decide to eliminate real causes continuously (tightly connected with Politics-neutral and Spirituality-neutral).

Limited monetary and financial policy at the Bank of Japan

Under the lack of the endogenous system, some money-oriented interest groups pressure the Bank of Japan: The author burns with righteous indignation to the movements to change the law related to the Bank of Japan. According to "Annual Review 2012" published on Ended March 31, 2012, 'The Bank's Business Operations' are the following seven:

I. Monetary Policy.
II. Financial System Policy.
III. Enhancement of Payment and Settlement Systems and Market Infrastructure.
IV. International Operations.
V. Issuance, Circulation, and Maintenance of Banknotes.
VI. Services Relating to the Government.
VII. Communication with the Public.

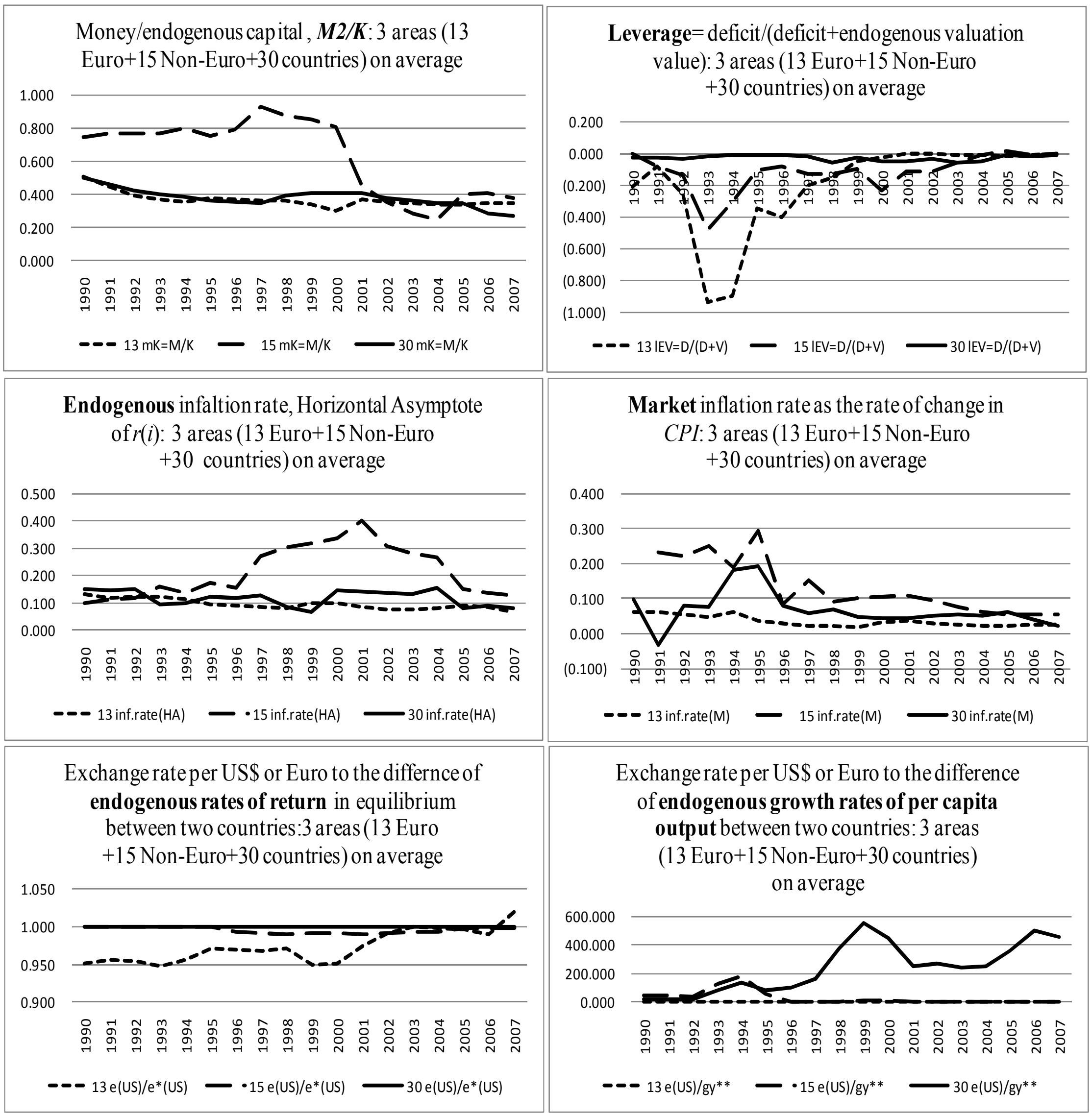
The author does not blame persons but person's money first at the costs of households and family people. The author lists partial, wrong, or avaricious statements against robust central bank policies as follows:

1. Increase boldly the supply of money printed by the Bank of Japan. Then, an economy is stimulated with inflation and business be activated.
2. First take growth strategies and then tax revenue increase naturally.
3. The balance of payments is good so that deficit be utilized for the recovery of business activities.
4. Actual circumstances reflect no policies taken by leaders and policy-makers.
5. Macro policies do not work for getting rid of deflation.
6. Deflation is independent of deficits accumulated over years.
7. Government savings must be solely utilized for business activities.

8. Crowing out is non-sense. Enterprises are just conservative and enough cash flows.
9. Government spending recovers business activities and decreases unemployment.
10. Deficit is independent of sustainable growth.
11. Tax reduction be ahead to recover business activities.
12. The Bank of Japan is responsible for growth and business activities in corporation with government.
13. The Bank of Japan be responsible for not only the financial and market assets but also for real assets.
14. Neutrality of the Bank of Japan to government is an empty theory.
15. Business cycle is positively related to the growth rate of population.
16. Consumption is one and technology is the other. Or, stop inequality first.

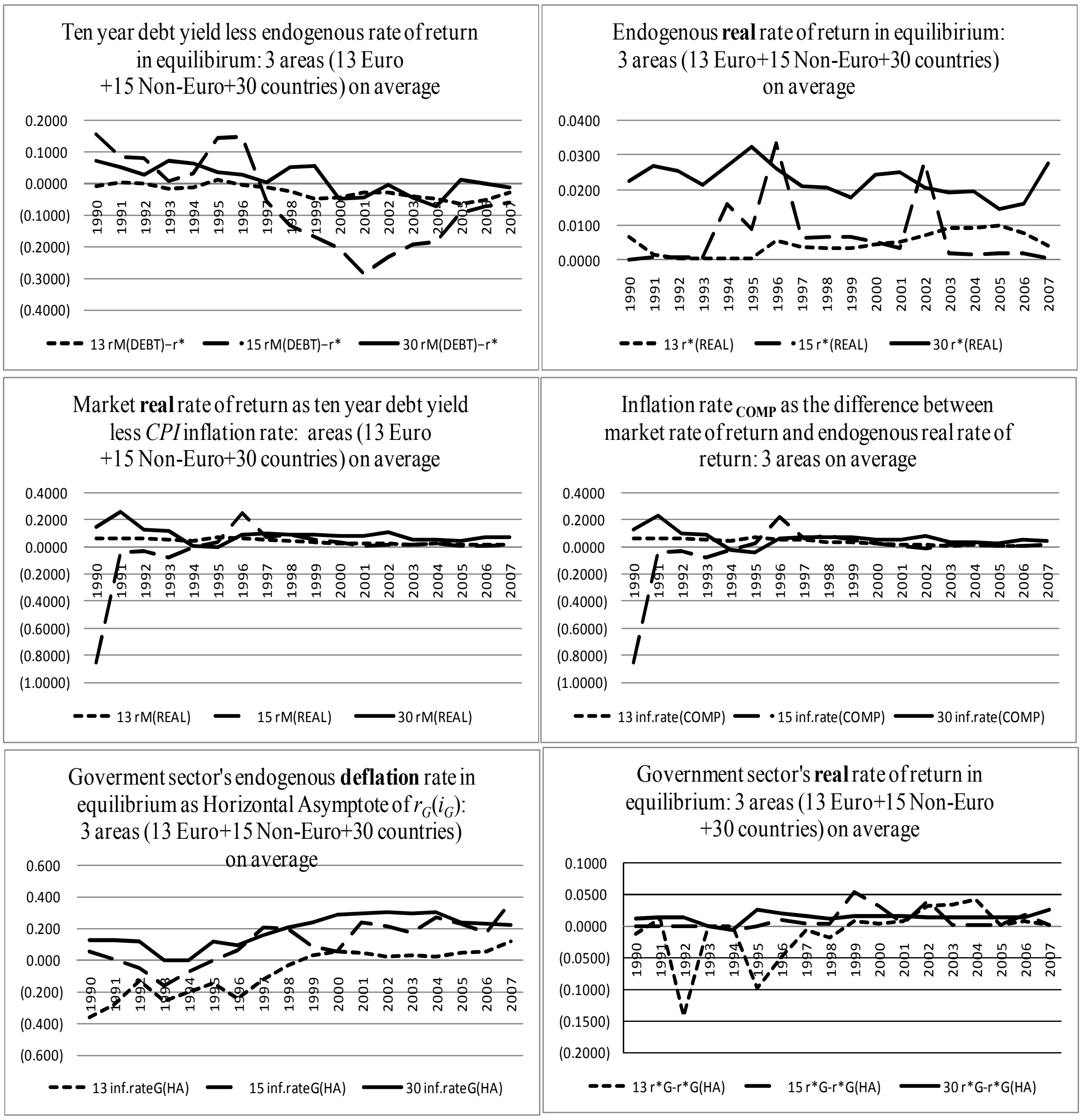
The author proves in Manuscript each reversal of the above sixteen statements, theoretically and empirically. In this respect, the author admires the resistance of the Bank of Japan against government pressure. The neutrality of financial/market assets to the real assets exists in the real assets. Some people know it intuitively. In short,
1. The Bank of Japan systematically manages monetary and financial policy.
2. Government most effectively contributes to sustainable and robust growth with deficit=zero, as Samuelson (1942) found as his scientific discovery and no others. Tax reduction and subsidies retard sustainable technological progress and growth.

Politicians may believe that it is possible for policy-makers to control policies for financial, market, fiscal, and economic. From the viewpoint of the endogenous system and its KEWT database, the integration of these policies is next to impossible. Economic growth and stability are only maintained by controlling the real assets, which include fiscal policy (for fiscal policy, see Chapters 12 and 13). The financial and market assets are external yet, author' neutrality of the financial/market assets to the real assets was discovered, as in Chapter 2. It implies that if the endogenous-equilibrium is within a certain range of moderation, money supply, increase in public investment, and central bank's function work temporarily. However, the true cause of deflation comes from huge deficits and debts over years. Deflation is out of control and extremely far from the moderate range of the endogenous-equilibrium. It is bitter to some enterprises yet bonus to citizens. A problem is seemingly unemployment but, the endogenous-equilibrium guarantees full-employment (see, Chapter 15). Deflation is a direct warning through the price-equilibrium. Deflation never recovers without sharp decrease in debts since the market intuitively knows this fact or uncontrollable policies (further, see C. M. Reinhart' (2008), eight hundred history of defaults at many countries in Chapter 4).



Note: Differences of economic stage, developing and developed, most influence on money supply=demand *M2* and also the exchange rate per US$ or Euro to growth rate in equilibrium, although after 2000 the neutrality of the markets to the real assets becomes more stabilized. (2) Changes in the series of rates of return clarify the back ground of figures as shown in Figure N1, even under the neutrality, (see the next Figure N2).

Figure N1 $M2/K$, endogenous leverage, endogenous versus external inflation rates, and exchange rate per US$ or Euro to endogenous variables; among three areas



Note: (1) $r_{M(DEBT)} - r^{*}=inf.rate_{COMP} - inf.rate^{*}_{HA}$ is a core of the series of rates of return, endogenous and market, where $inf.rate_{COMP}=r_{M(DEBT)} - r^{*}_{REAL}$ holds as a composite inflation rate. (2) for endogenous real, $r^{*}_{REAL}=r^{*} - inf.rate^{*}_{HA}=r^{*} - r^{*}_{HA}$ holds and for market real, $\boldsymbol{r_{M(REAL)} = r_{M(DEBT)} - inf.rate_{M}}$ holds. (3) The seismic centre of deflation is the government sector, whose deficit is huge. The deflation of the government sector due to deficit turns to inflation at the total economy due to the weighted average of the government and private sector.

Figure N2 Relationship between endogenous and market inflation rates in the total economy, compared with deflation at the government sector

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Chapter 3

Ratio of Positive Net Investment to Deficit Required for the Reinforcement of the 3% Golden Rule

3.1 Introduction: Preliminary Questions

This chapter, based on the theory and practice integrated by an endogenous system, reviews the 3% 'golden rule' as one of fiscal constrains at the Economic and Monetary Union (EMU), finds a unique condition of positive net investment after capital consumption by country, and proposes policy-oriented rules endogenously hidden in the balance of payments and deficit. The endogenous system is composed of the endogenous model and corresponding data-sets, KEWT, for 81 countries, whose original data come from *International Financial* Statistics *Yearbook*, IMF. The endogenous system is summarized with the literature and at the same time, KEWT is compared with the current databases.

The total economy shows the weighted aggregation of two sectors, the government and private, and reflects real-assets reality, calculated just before final distribution of wages to households and profits to enterprises/corporations at the system of national accounts (SNA). Endogenous results expressed at KEWT differ from the effects of econometrics estimated using the current databases. These effects remain partial yet, within a certain range of endogenous results that exist wholly as a system. For example, tax multiplier often discussed in the literature, most cases, shows a range of 2 to 7 times, each as the inverse of the ratio of endogenous taxes to output at KEWT, where if deficit is zero, government spending of consumption and investment in the literature equals endogenous taxes.

Questions to the methodology of econometrics: Is the methodology able to distinguish the result of increase in taxes with decrease in deficit simultaneously? Is the methodology able to specify the causes of deflation under heavy accumulation of deficit by year, as observed in Japan for the last twenty years after 1991 when government saving turned to negative? Is the methodology able to examine the relationship between a minus rate of inflation (deflation) and the growth rate of output in equilibrium? Do the market principles as the second best express disequilibrium just before recovering equilibrium? Since general equilibrium remains the price-equilibrium static, the methodology hardly controls vector and linear dynamically as a whole.

Suppose that the endogenous-equilibrium prevailing in KEWT holds as a surrogate for the price-equilibrium. Then, all the parameters and variables are simultaneously and rigidly measured--instead of estimated or forecasted; by year and over years; and by country and sector. The current databases correspond with flow-methodology under an assumption of perfect competition. The flow-methodology is continuous and log growth-oriented while databases have to be discrete. Typically, there has been no accurate measurement of the relative share of capital/labor.

Then, is the 3% golden rule accurately interpreted and politically reinforced with financial and market policies? Does individual utility function, $u(c)$, maximize consumption in reality and under globalization or, is individual utility by country compatible with globalization? Two questions need to get correct answers with solutions.

3.2 Brief Comparisons of the Literature and Databases Used for Econometrics with the Endogenous System

Economic models and analyses in the literature are all historically based on general equilibrium with price level by goods and consumption maximizing by individual. The current databases, published by OECD, UN and UNU, Penn World Table (PWT and EPWT), EU KLEMS of the Conference Board, and IMF and the World Bank, are all eligible for the price-oriented analyses. Models and data are separated. Mostly, economic models work at the continuous time and make use of Log growth. The databases are solely composed of flows without direct connection to corresponding stock: typical is the real-time analysis at EU KLEMS. Exceptionally, discrete models make use of Total Factor Productivity (TFP) as a statistics residual, as shown by Herberger, A. C. (1998). Ex-post TFP analysis makes it possible to estimate an internal rate of return. Common goal of continuous and discrete models is forecasting and consumption maximization. Towards this goal, econometrics has developed surprisingly since the first appearance of the framework of econometrics by Samuelson, P. A. (1941) when there were no appropriate data.

On the other hand, the endogenous system is based on the endogenous-equilibrium. The endogenous system is composed of a unique integration of theory and practice simultaneously measured within the system. There is no externality and all the parameters and variables are simultaneously endogenous within the system and consistent each other once measured over years, with no correction later. The endogenous differs from the endogenous in the literature and called ‘purely endogenous;’ whole as a system versus partial. ‘Purely endogenous’ holds only when externalities and assumptions are all disappear, as shown by scientific proofs of mathematicians at KEWT.

The endogenous system is traced back to the above Samuelson’s (ibid., 97-120) ‘stability of equilibrium: comparative static and dynamics.’ Linear, vector, and unknown variables are designed under the price-equilibrium between discrete and continuous time. Since then, econometrics as a methodology has progressively improved by year, using continuous time and utilizing flow data up to date. The endogenous system inserts a certain number of statistics data into KEWT, based on a discrete Cobb-Douglas production function, and endogenously measures the rate of technological progress, simultaneously with *seven* endogenous parameters that control the whole system. Seven endogenous parameters are totally policy-oriented and Lucas's (1976) critique is solved. Rival capital and labor work politically within the discrete C-D production function and cooperate with non-rival factors such as education, R & D, learning by doing, and human capital, each as a strategy to support policy-oriented rival capital and labor. Policies of real assets, financial assets, market values and ratios, are all integrated in the long run, each following the neutrality of the financial assets to the real assets in the system of national accounts (SNA, 1993).

The endogenous system is composed of non-linear equations, which are each reduced to hyperbolic equations. The endogenous-equilibrium requires no assumptions and thus, holds under perfect competition and constant returns to scale. The marginal productivity of capital (*MPK*) equals the rate of return and the marginal productivity of labor (*MPL*) equals the wage rate and also the marginal rate of substitution is measured as 1.0 by year, which is confirmed using recursive programming by the same year. The endogenous-equilibrium holds in an open economy supported by the structure of the balance of payments, deficit, and the difference between saving and net investment at the private sector, just before redistributing taxes into households and enterprises. *Y*=income=expenditures=output is rigidly measured and realizes the three equality of Meade, J. E. (1960, 1962) and Meade, J. E. and Stone, J. R. N. (1969).

The endogenous-equilibrium is directly measured by the speed years for convergence by country and sector and shows the processes from disequilibrium to equilibrium, with simultaneous causes and results at the real assets. Arrow, K. J. and Debreu, G. (1954, 265-290) has been a decisive article for equilibrium up to date. Wold, H. (1954, 168, 173) earlier arranged for the relationship between causality and econometrics. However, the price-equilibrium only shows the conditions immediately after recovering equilibrium and looks for hypotheses, expecting real, financial, and market causes to repeat towards the future, under unknown changes in policies by year.

This chapter examines the appropriateness of the 3% rule to *GDP* or *Y*. A problem is that the relative share of capital or labor is unknown in the current databases. Compensations/wages and profits/returns are estimated in econometrics and there is no connection between the rate of return and the growth rate of output. Phelps, E. S.(1961) theoretically proved the connection yet not empirically.

3.3 Simple Method: How to Endogenously Trace Back the 3% Rule

Fiscal policy proposal in this chapter is based on the real assets and presents a simple method. This method guarantees sustainable growth by country and year, and at any area. 'The ratio of deficit to *GDP* should be less than 3%'. This rule is plausible alone in the case of a closed economy or when the balance of payments is zero by country. In the case of open economies, cash flow-in and -out deficit must be replaced by an open structure of 'saving less net investment,' by sector and at the real assets. If net investment (=gross investment−depreciation) is negative as a result of excessive deficits over years, the rate of technological progress is hardly guaranteed at any country.

Why has the EMU 3% rule remained untouched up to date, while suffering from repeating bubbles? This rule was empirically set in Dec 1992. This rule must be a second best since the rule matches the endogenous system. Two questions: (1) Why is deficit often discussed apart from the balance of payments? (2) Why is deficit set the difference between the cash flow-in and -out at the government sector? The two questions are interrelated and present a clue for solution. There must exist a presumption that the cash flow-in and -out at the government sector equals the saving less net investment at the government sector. This presumption, however, remains unrealistic: The cash flow-in and -out does not produce returns while saving less net investment produces plus or minus returns. A fact is that the rate of return at the government sector is zero only if deficit is zero, where taxes equal government output and also government spending equals taxes in the endogenous equilibrium.[1] When the SNA aims at records for accounting, the SNA is justified.

What is an obstacle for mitigating the above presumption inherent in the SNA? The obstacle is a final distribution settlement of income such that returns/profits are absorbed by enterprises and wages by households. Due to this settlement, the rate of return is never calculated by sector. As a result, three-equality of national income, expenditures, and output, has remained unrealistic. Recall nine assumptions thoroughly arranged by Meade, J. E. (1962, 1-9) and also three-equality conceived by Meade, J. E. and Stone, J. R. N. (1969, 320-346). These two distinguished articles are alive even today and require a realistic solution.

Both Keynesians and neoclassicists rely on the market principles that work at plural markets, e.g., labor, money, capital, commodities and so on. The author respects the market principles since no other yet hits yet. The market principles express general equilibrium. Both schools, however, have not successfully integrated each market as a whole system, and this fact is unavoidable under a thought that the macro level is a result of the micro level. Further, both schools have to mix up the financial/market assets with the real assets. Financial assets and real assets are interrelated in the SNA and this system is unavoidable since purely endogenous idea has been out of thought. Relying on the market principles, prices are always indispensable means for theories. Prices, however,

[1] For proof: Define government spending, $E_G = C_G + I_G$. Then, $T_{AX} - E_G = (S_G - I_G)$ holds; C_G is consumption and S_G is saving at the government sector. Then, $T_{AX} = C_G + S_G$ holds, and thus, $T_{AX} = Y_G$ holds. As a result, when deficit, ΔD is zero, $T_{AX} = C_G + I_G$ since $T_{AX} - \Delta D = C_G + I_G$. $T_{AX} = C_G + I_G$ is simple: The higher the size of government, Y_G/Y, the more net investment. Remember, using the related hyperbola: a high net investment is against a maximum rate of return by a minimum net investment and also against stop-bubbles.

cannot simultaneously show causes and effects/results. This defect presents a limit of the market principles.

The endogenous system is organic and policy-oriented instead of records-oriented and answers the severe critique indicated by Lucas, R.E. (1976, 19-46). The endogenous system clarifies processes to close-to-disequilibrium, where simultaneous causes and results are two-way by sector and deny two ways of 'from causes to effects' and 'effects to causes.' Further, the endogenous system is based on the macro level just before final redistribution of income and, nine rigid assumptions all disappear. It is true that some assumptions are required at micro enterprises and corporations but, this is an issue to discuss separately from the macro level. The endogenous system measures the speed years as a quantitative unit to clarify the level of the endogenous-equilibrium. Disequilibrium, close-to-equilibrium, and moderate equilibrium, by country and sector, are each measured by the speed years. Marginal productivities of capital and labor, *MPK* and *MPL*, are each measured. The rate of return *r* and the wage rate *w* are separately each measured. And, *MPK*=*r* and *MPL* =*w* are each confirmed so that an assumption of perfect competition disappears.

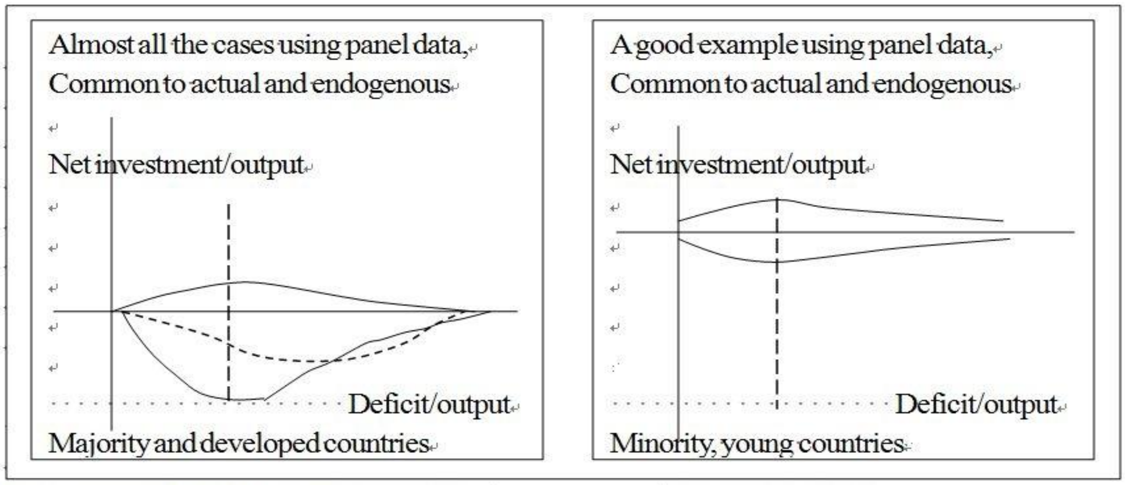
Why is the endogenous system able to clarify the above measurement? This is because non-linear equations are involved in the 'discrete' Cobb-Douglas (C-D) production function at the KEWT by year and at corresponding recursive programming for the transitional path by the same year. Econometrics in the literature preferably uses linear equations, by applying Taylor's theorem, often cutting quadratic equations and estimating indispensable errors. Econometrics methodology, therefore, is much more reinforced once linear data are compared with non-linear endogenous data, and able to contribute to sustainable economic growth and policy changes.

This chapter presents a simple method using a few vital endogenous data selected from all the related data for 65 countries. The ratio of net investment to deficit, $i/\Delta d$, is a base, where $i = I/Y$ is the ratio of net investment to output, $\Delta d = \Delta D/Y$ is the ratio of deficit to output and, three equality of output=income=expenditures is endogenously measured. The rate of technological progress is a unique core and shown by $g_A^* = i(1-\beta^*)$; $i = I/Y$ fluctuates by year while the qualitative net investment coefficient, $1-\beta^*$, changes totally as a system. Endogenous data well express personality--national taste/preferences, culture, and history--by country yet are compatible with globalization, as shown empirically by country. The individual feature by country is measured by a macro relative utility function, which is distinguished with micro utility functions prevailing in the literature. This is because the macro relative utility function works simultaneously with all the other parameters and variables consistently over years.

The simple method is illustrated by Figs. D1 and D2. Each figure is consistent with empirical results and divided into the LHS and RHS by sub-figure.

Let the author first explain **BOX 3-1**. BOX 3-1 takes net investment divided by output on the y axis and deficit divided by output on the x axis, to make it easier to compare net investment with deficit by using the ratio of each to output. Almost all the 65 countries respectively show up and down deficits over years, except for minority countries. On the LHS, (i) deficit countries express 'deep' mode, while net investments reduce to a lower level and (ii) some developing/young countries express 'shallow' mode and the range of deficits is widened, as shown by dotted line. The (i) and (ii) show a fact that deficit significantly decreases net investment. From the viewpoint of sustainable technological progress, any close-to-zero positive level of net investment and any negative level of net investment are rejected by nature. On the RHS, net investment unit is one-half unit on the LHS. The higher the net investment the shallower the mode of deficit is, and even if deficit becomes large, deficit is flexible by year. This shows a fact that some countries have deficit controlled by policy-makers. It implies that uncontrollable deficit sacrifices sustainable technology and growth over years.

BOX 3-1 Illustrative results common to four areas: using 81 country panel data, 1990-2010, for net investment/deficit, by area



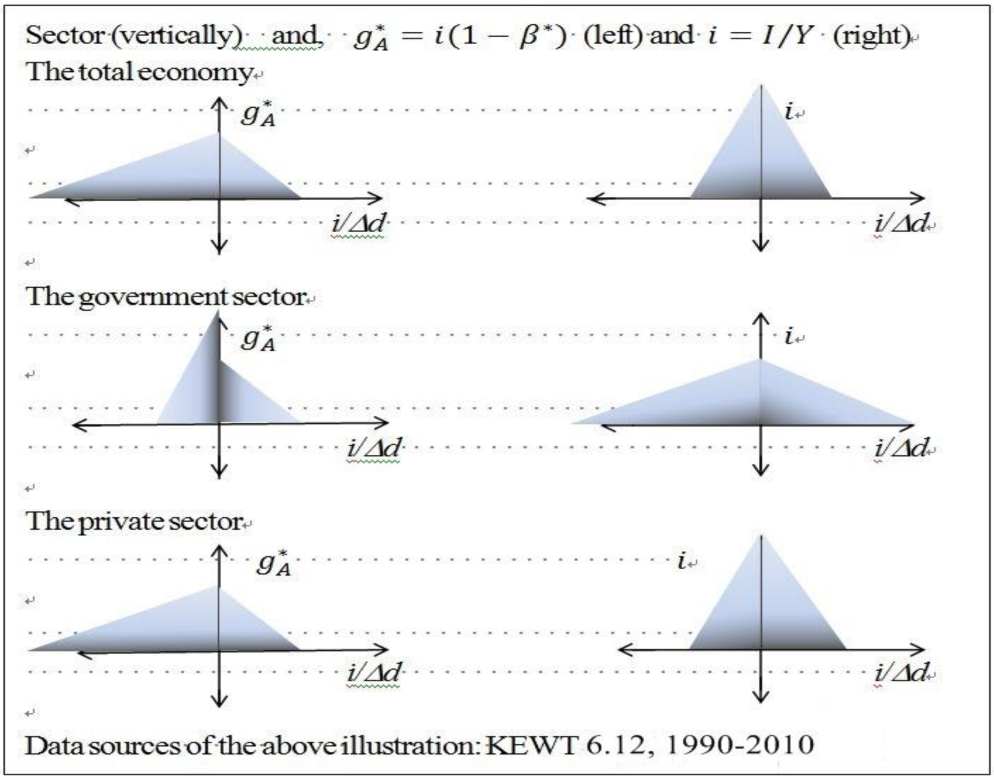
Data sources: KEWT 6.12, 1990-2010, for 81 countries

Next, let the author explain **BOX 3-2**. The LHS of BOX 3-2 takes the rate of technological progress, g_A^*, on the y axis and, deficit divided by output, $i/\Delta d$, on the x axis, comparing g_A^* at the total economy with $g_{A(G)}^*$ and $g_{A(PRI)}^*$ at the government and private sectors. The RHS takes net investment to output by sector on the y axis and, net investment to deficit by sector on the x axis and illustrates each sector's results. The government sector's movements generally differ from those at the total economy and the private sector. It is natural that the total economy and the private sector are similar since the private share is considerably high at the total economy. Yet, the results at the government sector are important since final distribution is absorbed into the private sector.

Fiscal policy, in fact, inherently determines the private sector and accordingly, the total economy as the weighted aggregation.

Results of the above simple method correspond with each inverse of the multipliers to taxes and government spending in the literature. The author tested the multipliers comparing with each inverse of endogenous ratios, by using KEWT. What are differences between the multipliers and their inverse ratios? Blinder and Solow (1973, 319-337) is exactly essential to understand the whole picture behind. Differently but, this chapter objectively answers the above question. Blinder and Solow pursues the conditions for price-equilibrium and clarifies the essence of the multiplier, by formulating equations that combine real and monetary items with some fixed parameters and by referring to Say's Law. Blinder and Solow hit an inevitable limit of the literature due to the price-equilibrium. The limit is that the multiplier and its inverse each show the same result but, the multiplier cannot clarify the causes at the real assets. Basic ratios made of endogenous parameters, each as the inverse of multipliers, contrarily disclose causes; causes and results are simultaneously one-way.

BOX 3-2 Illustrative results common to four areas: using 81 country panel data, 1990-2010, for the rate of technological progress and net investment/output



This chapter hereafter focuses the following two points to support the 3% rule of the EMU. The 3% rule needs its theoretical backbone, i.e., fiscal policy rules: i) Fundamental analyses of $i/\Delta d$ as a base, using $g_A^* = i(1-\beta^*)$ and $i = I/Y$ by sector. ii) Endogenous policy rules to reinforce the 3% rule of the EMU, forming a highlight at this chapter and driving ten endogenous facts and fiscal policy rules at Conclusions.

3.4 Core Analysis of $i/\Delta d$ as a Base: $g_A^* = i(1-\beta^*)$ and $i = I/Y$ by Sector

This section first explains the ratio of net investment to output, $i/\Delta d$, as a base and then, empirically clarifies the patterns of technology to net investment, using *four* Technology-Patterns. $i/\Delta d$ is immanently related to the rate of technological progress, $g_A^* = i(1-\beta^*)$, in the endogenous-equilibrium since deficit endogenously determines the size of government and net investment (see Note 1). The rate of technological progress is endogenously most fundamental: Once $g_A^* = i(1-\beta^*)$ is measured, other variables are wholly and simultaneously measured by country, sector, and over year. Principal ratios among other variables are the growth rate of output per capita, the growth rate of output, the rate of return, and the relative shares. Vital analysis of g_A^* to $i/\Delta d$ proves why deficit weakens the power to growth and profitability; particularly when $g_{A(PRI)}^*$ at the private sector is compared with deficit, ΔD or $\Delta d \equiv \Delta D/Y$, by year. The rate of return is connected with the growth rate of output: $r^* = (\alpha/(i \cdot \beta^*))g_Y^*$, where $r = r_0 = r^*$ is the rate of return and, $g_Y^* = (g_A^*(1+n)/(1-\alpha)) + n$, is the growth rate of output, as earlier proved by Solow, R. (1956). $\alpha/(i \cdot \beta^*)$ is defined as an 'endogenous' Phelps coefficient, which connects $r = r_0 = r^*$ with g_Y^* in the endogenous-equilibrium. The rate of change in population, n_E, equals the actual growth rate of population, *n*, under moderate equilibrium, where $n_E = n$ holds.

Before stepping into endogenous facts and logics/rules found in vital analysis, let the author summarize the figures used for vital analysis. Vital analysis of g_A^* to $i/\Delta d$ is shown by panel and time series figures, 1990-2010: (1) Panel data BOX 3-3 and BOX 3-4 for four area (Euro, Non-Euro, Asia & Pacific, and Rest area, where total number of countries is 65=14+15+17+19). (2) Time series data **Figures 1** to **3** for 14 countries at Euro currency area and similarly, **Figures 4** to **6** for 15 countries at Non-Euro Europe area. This section mainly uses BOX 3-3 and BOX 3-4 and the next section takes advantage of Figures 1 to 3 and Figures 4 to 6, to derive policy rules and evaluate and reinforce an appropriate 3% golden rule set empirically earlier.

BOX 3-3 for panel data is divided into (i) the rate of technological progress, g_A^* (the y axis) to $i/\Delta d$ (the x axis) and (ii) the g_A^* (the y axis) to the private net investment to output, $i_{PRI/Y} = I_{PRI}/Y$ (the x axis; where $i_{PRI} = I_{PRI}/Y_{PRI}$ should not be used), each at the total economy. BOX 3-4 for panel data is divided into (iii) the $g_{A(G)}^*$ (the y axis) to $i_G/\Delta d$ (the x axis) and (iv) the $g^*_{A(G)}$ (the y axis) to $i_G = I_G/Y_G$ (the x axis), each at the government sector.

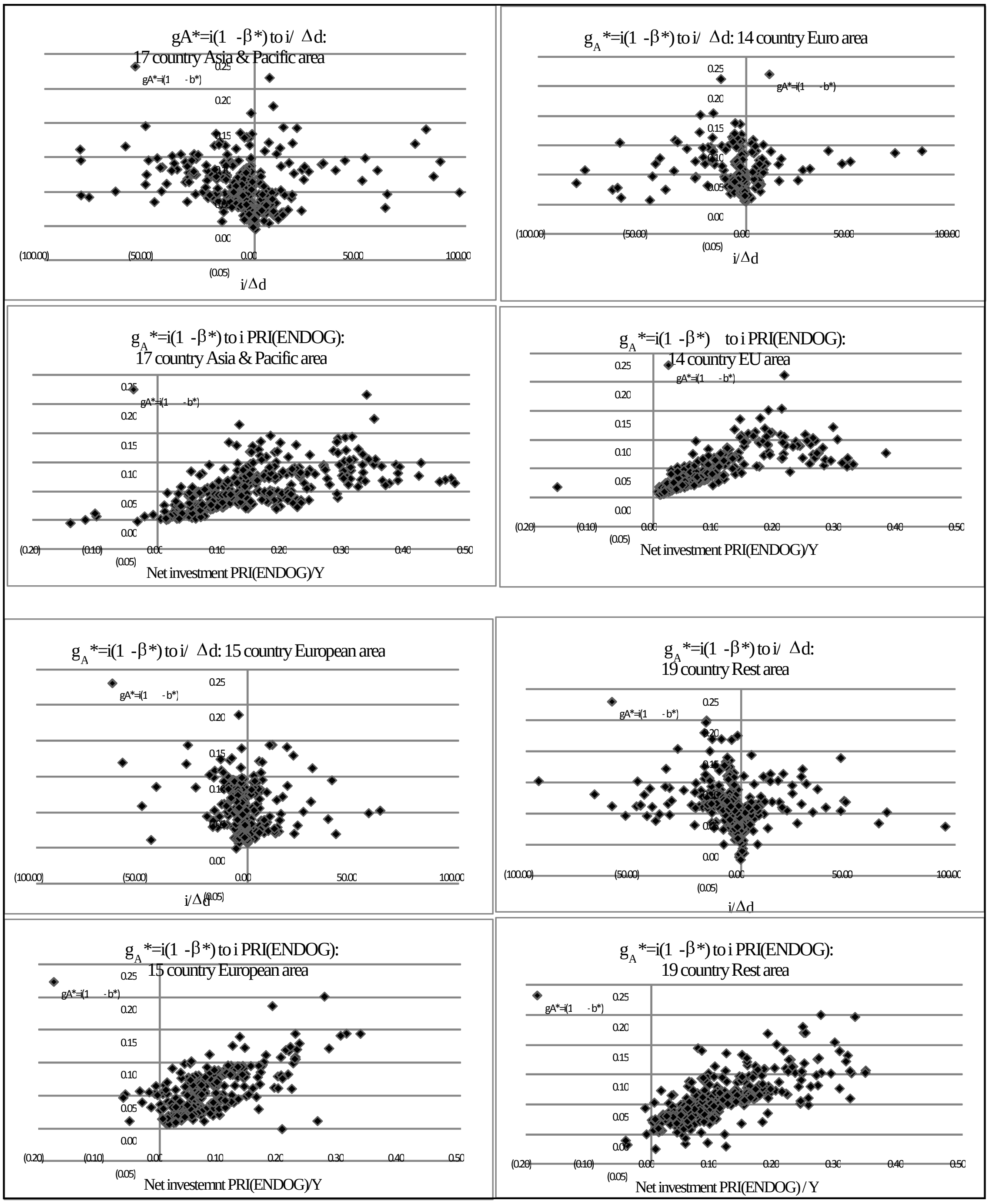
Denominators of endogenous ratios at the government sector are government output, Y_G, which is equal to endogenous taxes. $i_G/\Delta d$ is a sort of hybrid since $\frac{i_G}{\Delta d} = \frac{I_G}{Y_G} \cdot \frac{Y}{\Delta D}$ connects $i_G = I_G/Y_G$ with $g^*_{A(G)} = i_G \cdot \beta^*_G$.

Now, let the author explain **BOX 3-3** and **BOX 3-4** for panel data, starting with 'g^*_A to $i/\Delta d$' and '$i = I/Y$ to $i/\Delta d$' and setting up *four* 'Technology-Patterns.'

1. g^*_A to $i/\Delta d$: The total economy and the private sector seem to have similar results. On the x axis, $i/\Delta d$, is widely scattered but mostly below zero under deficit by country. Contrarily, the government sector contrasts the total economy and the private sector in that the closer to minus zero the $i/\Delta d$ the wider the range of g^*_A is. It implies; results of fiscal policy differ significantly by country and at the government sector. For example, the same amount of net investment results in high g^*_A at one country while it results in low g^*_A at the other country and, differently by year. This fact asserts the importance of dynamic balance between the government and private sectors.
2. $i = I/Y$ to $i/\Delta d$: Results of '$i = I/Y$ to $i/\Delta d$' wholly contrast results of 'g^*_A to $i/\Delta d$.' Results of '$i = I/Y$ to $i/\Delta d$' in the government sector completely differ from the total economy and the private sector: The government sector cannot raise net investment highly or net investment in the government sector must be enough low within a certain range so as to maintain a moderate range of the endogenous-equilibrium by country. Despite, '$i = I/Y$ to $i/\Delta d$' at the total economy and the private sector spreads much wider by country and by year. Most countries show deficit so that $i/\Delta d$ spreads at a wide minus range. The total economy and the private sector apparently show similar results. Suppose the '$i_{PRI/Y} = I_{PRI}/Y$ to the $i_{PRI}/\Delta d$' at the private sector by country. The private sector shows results much more severely than those at the total economy. This is a condensed fact. Unbalanced situations appear most delicately at the private sector by country.

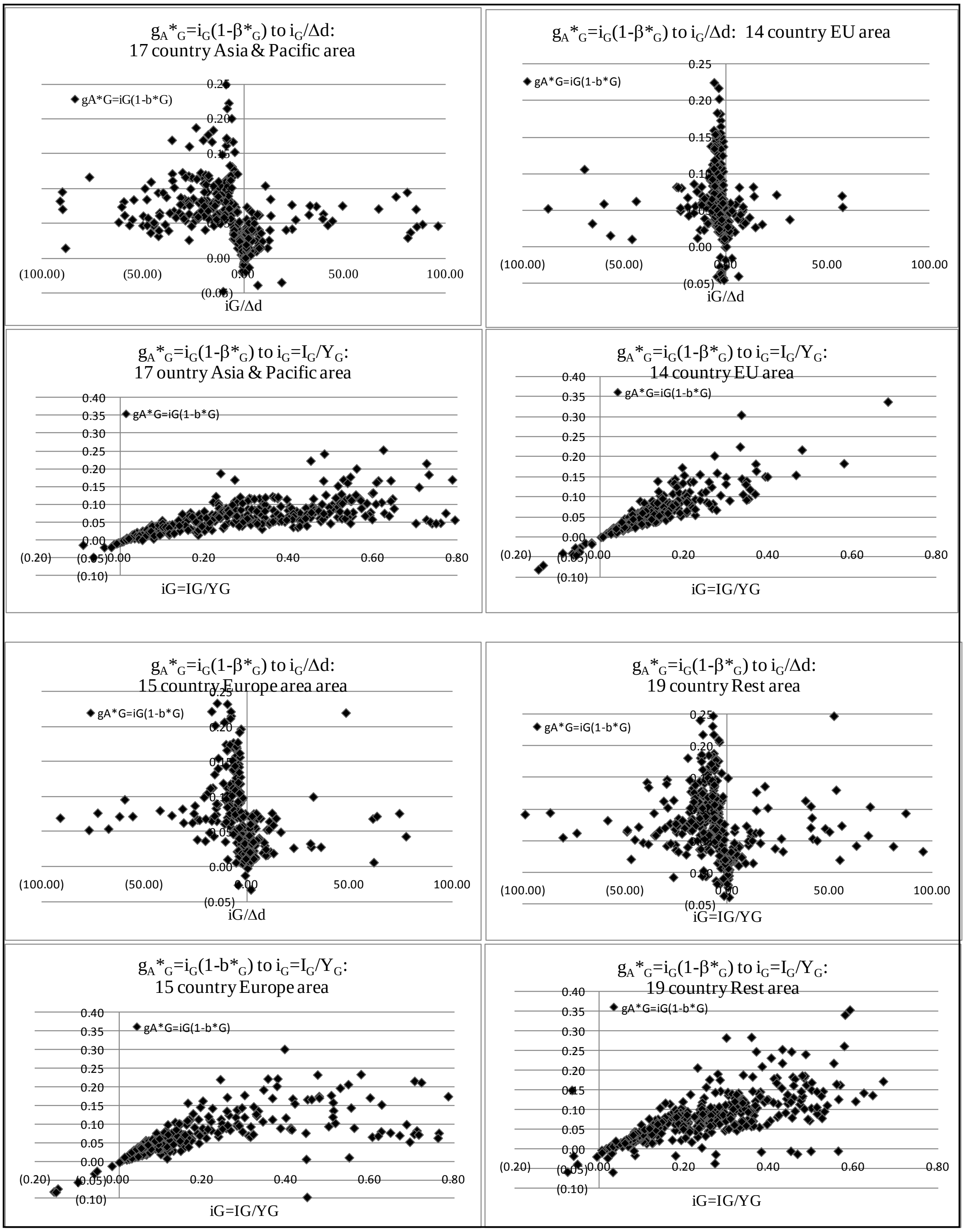
Next, let the author combine two ideas: the idea of 'g^*_A to $i/\Delta d$' with the idea of '$i = I/Y$ to $i/\Delta d$.' In this case, $i/\Delta d$ is common to the two ideas and the difference between g^*_A and $i = I/Y$ is seemingly vague, since $i = I/Y$ is independent of g^*_A. Let the author replace $i/\Delta d$ by g^*_A. Then, BOX 3-3 and BOX 3-4 are set up each for the total economy and the government sector, where g^*_A commonly stands at the y axis, stressing the work of $1-\beta^*$. The difference between g_A^* and $i = I/Y$ comes from the difference of net investment qualitative coefficient, $1-\beta^*$.

BOX 3-3 The rate of technological progress to the net investment/ deficit and also, to the private net investment/output; at the total economy average by area



Data source: KEWT 6.12-1, -2, -3, and -4, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

BOX 3-4 Government rate of technological progress to Government net investment/ deficit and also, to the G net investment to the G output; at the G sector average by area



Data source: KEWT 6.12-1, -2, -3, and -4, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

Nevertheless, apart from logic, compare the trend of g_A^* with the trend of $i = I/Y$ by country over years. The trend of g_A^* are invaluable and overlaps the trend of sustainable growth of an economy. Suppose that the net investment qualitative coefficient, $1-\beta^*$, is constant for the last twenty years. Then, the trend of g_A^* each overlap the trend of $i = I/Y$; there is no difference of the trend between g_A^* and $i = I/Y$ by country over years. It confirms that each situation by country and by year holds under the endogenous-equilibrium.

The literature starts with the situation under the price-equilibrium; using constant propensity to consume and/or constant propensity to invest over years by country and, apart from any rate of technological progress. BOX 3-3 contrarily presents the difference between g_A^* and $i/\Delta d$ by area. Most countries quickly recover a moderate range of the endogenous-equilibrium. It implies; most countries are rather stable in technological progress over years, except for some countries.

Let the author set up *four* Technology-Patterns and classify it by sustainable technology and net investment, by using 2007-2008 data.

<u>*Four* Technology-Patterns by country</u>

Technology-Pattern 1.	$g_A^*\ up$ and $i = I/Y\ down$:	Robust in sustainability; Germany, Japan, Korea.
Technology-Pattern 2.	$g_A^*\ flat$ and $i = I/Y\ flat$:	Stable in sustainability; Norway, Sweden, Brazil, China.
Technology-Pattern 3.	$g_A^*\ down$ and $i = I/Y\ up$:	Increasing risk to bubbles from sustainability; France, Greece, Spain, Iceland, Turkey, Russia.
Technology-Pattern 4.	$g_A^*\ down$ and $i = I/Y\ down$:	Weak in sustainability; Ireland, Italy, the UK, the US, Mexico.

There is no exception, from 2008 to 2010, all the countries stay at the above Technology-pattern 4. It implies; deficit-rescue to financial institutions or enterprises does not strengthen economic sustainability and remains the shift of income distribution. Moreover, huge deficit makes the 'real' cost of capital minus and, each government neutralizes deficit by the minus cost of capital (here 'real' as nominal rate less endogenous inflation rate; see Fisher, Irving. (1907, 87-116). This is related to the break-even point of deficit, as will be discussed in Chapter 4. All the countries suffer from the unbalance between the rate of technological progress and the ratio of net investment to output. Each shape and angle of sub-figures found at BOX 3-3 and BOX 3-4 differ significantly by area. The scale unit of g_A^* is set the same by sub-figures on the y axis. Results of fiscal policy by country are all condensed and, the differences lying between BOX 3-3 and BOX 3-4 are much more obvious by sub-figures, reflecting differences of fiscal policy. Author's interpretation is summarized as follows:

1. The real assets-side is not so much bad as the market is afraid of. Yet, once the ten year debt yield by country rises due to some symptoms, the real assets-side is influenced significantly.
2. Bubbles are foreseen at the real assets-side by year, as shown by Technology-pattern 3. When net investment rises, policy-makers must pay attention to the trend and take actions as soon as possible. Then, the market will be stabilized. Look at the trends of net investment after 2002. All the countries fall into Technology-pattern 3. It implies that the current situations in the world are unavoidable after 2008. Causes and results simultaneously occur always by country.
3. Net investment is a fundamental key for having a range of the endogenous-equilibrium dynamically balanced. Net investment effectively realizes maximum returns with minimum net investment and is delicate, following the rate of return hyperbola to net investment. This causes bubbles so that anyone cannot blame bubbles. Bubbles are foreseen and should be within the controllability of policy-makers or under a moderate equilibrium.
4. Finally, watch the trends of technological progress. A typical case is Japan after 2002. Japan is the worst country in that deficit by year has been accumulated without thinking of the next generations. The sustainability is the worst in that the growth rate of output will be close to zero forever, unless deficit reduces tremendously by year. One definite cause comes from group-oriented mind of people, some government officers, and enterprises that are indifferent of unborn descendants. Nevertheless, look at the zigzag up and down trends of g_A^* after 2002. It implies; the private sector endeavors to challenge for innovation through precise manufacturing and other industries, even under minus net investment at the private sector.

In short, any country has its hopeful future when the endogenous are utilized to policy-makers. Needless to say, leaders' philosophy and decision-making by country should not be selfish but think of others, under democratic system and even at any political system. This is an only way for human to universally survive. Matching econometrics has similarly proved the right direction.

3.5 Endogenous Policy Rules to Support the Golden Rule of the EMU

This section discusses three sorts of pattern classification using net investment to deficit/surplus, $i/\Delta d$. These patterns endogenously show the qualitative level of fiscal policy activities. Particularly the author is interested in setting up a new definition of the 'shock of $i/\Delta d$' or G-PRI Shock-Patterns. These classifications are: (1) G-PRI Fiscal-Stages, (2) G-PRI Policy Balances, and (3) G-PRI Shock-Patterns.

Ratio of Positive Net Investment to Deficit Required for the Reinforcement of the 3% Golden Rule

Let the author revisit the results of fiscal analysis by country and seek policy-oriented endogenous rules to reinforce the 3% golden rule of the EMU (for figures, see below soon). Balassone and Franco (207-229, 2000), for the golden rule, compares three types with the 'stylized version' of the EMU fiscal constitution. The stylized version is shown by $\Delta D/GDP \leq 0.03$, and $\Delta D/GDP \in (0.00, 0.01)$. This stylized version is consistent with author's $\Delta d = \Delta D/Y$, once the version is reinforced by policy-supporting rules. The three types are; i) Modigliani et al (1998), ii) the German model, and iii) the UK model. The three types each compare $\Delta D/GDP$ with gross or net investment to *GDP*, which corresponds with author's $i = I/Y$, in the case that uses net investment after deducting capital consumption. The stylized version seemingly treats 'deficit to *GDP'* and 'net investment to *GDP*,' similarly to those in the endogenous-equilibrium.

The above stylized version, however, definitely differs from author's $i/\Delta d$ as follows: (i) The price-equilibrium *versus* endogenous-equilibrium; (ii) Rival and non-rival together linearly *versus* rival and non-linear under the discrete Cobb-Douglas (C-D) production function; (iii) Actual data *versus* endogenous data; (iv) A closed steady economy (deficit alone) *versus* an open dynamic economy (consistent with the endogenous structure of the balance of payments and deficit); (v) No relationship between causes and effects, where causes are unknown, *versus* two-way simultaneous causes and results. The above three types each show an inequality (< or >). Author's $i/\Delta d$ replaces the inequality by $\Delta d + i$; $\Delta d + i = i - (-\Delta d)$, where minus deficit is shown by minus and surplus by plus.

Figures 1, 2, and **3,** for the total economy by country, are shown after the text, using time series (TS) results. **Figures 4, 5,** and **6**, for the government sector by country, are similarly shown for comparisons, primarily using government net investment, $i_G = I_G/Y_G$. The total economy is mostly expressed by the private sector. For example, in the case of net investment to output in equilibrium, $\mathrm{i} = I/Y$ is close to $i_{PRI} = I_{PRI}/Y$. If the government sector sacrifices the total economy, it definitely decreases private net investment, which is known as crowding out. If the government sector promotes the activities of the private sector, it increases private net investment. It is surprising that 81 countries show a variety of endogenous results, 1990-2010. It is difficult to find a similar trend by country among countries. Differences of national taste, preferences, culture, and history influence the propensity to consume and accordingly, saving and net investment, as shown by $(rho/r)(c)$. Differences by country essentially come from seven endogenous parameters: three; the ratio of net investment to output, the rate of change in population, and the relative share of capital, and four; the qualitative net investment coefficient, the relative share of capital, the capital-output ratio, and the speed year coefficient. Combinations of real, financial, market and the central bank polices follow seven endogenous parameters.

Chapter 3

Let the author focus on $i/\Delta d$ and $\Delta d + i$ and find fiscal policy rules in the endogenous-equilibrium. **Figures 1** to **3** each show $i/\Delta d$, $i_{PRI/Y} = I_{PRI}/Y$, and $g_A^* = i \cdot \beta^*$ by year, instead of using $i = I/Y$. **Figures 4** to **6** each show the government sector, using $i_G/\Delta d$, $i_G = I_G/Y_G$, and $g_{A(G)}^* = i_G \cdot \beta_G^*$ by year. Policy rules are empirically clarified, based on time series data, 1990-2010, by country, for 65=14+15+17+19 countries (for figures, omit 17+19 countries).

Fiscal policy rules are summed up here, comparing deficit and net investment. Broader rules are wholly summed up in Conclusions soon below.

Fiscal policy rules here are classified from deficit to surplus, while shifting from the worst to moderate and extreme equilibriums, as shown using *six* G-PRI Fiscal-Stages:

Six G-PRI Fiscal Stages

Fiscal-Stage 1	The worst, $i < \lvert\Delta d\rvert$.
Fiscal-Stage 2	$i = \lvert\Delta d\rvert$:, where $i/\Delta d = 1.0$ or $i/surplus = 1.0$.
Fiscal-Stage 3	Slightly better, $i > \lvert\Delta d\rvert$.
Fiscal-Stage 4	Moderate, $i \gg \lvert\Delta d\rvert$.
Fiscal-Stage 5	Slightly better, $i > surplus$.
Fiscal-Stage 6	Extreme or too much, $i > surplus$.

Fiscal-stage 4 is moderate and balanced in terms of controllability for sustainable economy. Too much is not controllable, as shown by Fiscal-stages 1, 2, 5, and 6. The endogenous structure of the balance of payments and deficit is deeply involved in the above six G-PRI Fiscal Stages. Further, the balance of payments differs from deficit in that the balance of payments has its plus and minus moderate range to output and that deficit=zero is the best since growth power is most high and sustainable. This is logical since net investment *I* is higher if *BOP* stays at a certain range of minus: $I = S - BOP$ due to $BOP = S - I$ or $i = s - bop$ due to $bop = s - i$.

Author's policy proposal by area is immediately connected with the above six G-PRI Fiscal Stages. For example, within Euro currency area, modest countries at Fiscal-Stages 2, 3, and 5, particularly Fiscal-stage 3, are eligible to help extreme countries at Fiscal-stages 1 and 6. This realizes sustainable area cooperatively. Money supply, for example, does not guarantee sustainability of Euro area, except for urgent help. Cooperative countries also get merits in that each country easily avoids bubbles, as the author stressed already above. In short, plus net investment by country is a necessary and sufficient condition to sustainability common to all the countries.

Next, let the author strictly and empirically inspect Figures 1 to 6. Note that the *EES* first inspects empirical results by aspect and chapter by chapter. Look at Figures 1 to 6. Why do many countries show their own endogenous results under the same policy-oriented logics and rules? The author answers this question from three viewpoints: (1) Summary of the rate of technological progress, g_A^*, and the ratio of net investment to deficit, $i/\Delta d$, (2) The Shape of the shock of $i/\Delta d$, and (3) The G-PRI Policy Balances, between government (G) and private (PRI) policy activities. (3) is most policy-oriented and, the author thoroughly discuss the balances between G and PRI at Chapters 12 and 13 later. (3) is preliminarily illustrated below using *three* G-PRI Policy Balances and *five* G-PRI Shock-Patterns.

(1) Summary of g_A^* and $i/\Delta d$

g_A^*: g_A^* differs by country and by sector (G and PRI) significantly. The level of g_A^* is judged by a fact that g_A^* is stable under a low levels of net investments, $i, i_G,$ and i_{PRI}. The rule of r_{MAX}^* and i_{MIN} is an ideal target of the endogenous system. This ideal is most severe and only realized under a minimum level of net investment by sector. Most policy-makers, however, stay at a high level of net investment comfortably: the higher net investment the more stable their positions and votes are. Some people welcome bubbles while other not welcome bubbles. Underlying cause comes from the spirit of people rather than statesmen. In this sense, $i/\Delta d$ is another expression of people's spirituality by country.

(2) The Shape of the shock of $i/\Delta d$

1. The Shape usually stands at minus. Sometimes, the shock turns to plus. It implies; after a sudden improvement/reduction of deficit, the level of extremely low level of deficit turns to extremely low level of surplus. Therefore, this occurrence is a good sign to strengthen the trend of g_A^*.
2. There are a few exceptional countries that there have been no shock of $i/\Delta d$. It implies; policy-making is not stubborn but strict so as to have g_A^* steady for many years.

(3) The G-PRI Policy Balances, between G and PRI policy activities

There are three sorts of G-PRI Balances, between G and PRI policy activities. The G-PRI Policy Balances implicitly include two balances of (i) the balance of payments and (ii) the deficit or surplus. The purpose of the *EES* is always directed towards dynamic balances existing between G and PRI plan-do-see policy executions. The author deepens the essence of the balances wholly at Chapters 12 and 13.

Chapter 3

Three G-PRI Policy Balances

Balance N: Negative. Most of 81 countries now suffer from this situation under the pressure of voting and cash scattering, far from long-sighted.
Balance C: Cooperative and compatible between two sectors; fortunately within a range of long-sighted.
Balance I: Ideal. When deficit=0, the balance is most welcome. This was proved by Samuelson (1942). Chapter 12 and 13 focus this proof theoretically and empirically.

Also, there are *five* G-PRI Shock-Patterns using two sign combination of $i/\Delta d$; (+·+), (−·−), (+·−), (−·+), and (no shock). The first sign indicates G and the second sign, PRI. Each country, 1990-2010, is classified soon below:

The G-PRI Shock-Patterns work most dynamically. The patterns show typical results executed by policy-makers by country. Dynamic efforts done by some policy-makers are intuitively beyond description, even apart from endogenous results. Figures 1 to 6 clarify that the 3% rule has worked as a good rule. The endogenous system clarifies that the 3% rule was given fortunately without theoretical proof. The market principles and the 3% rule become solid and are justified theoretically and empirically by the existence of the endogenous system. The seed was already sowed in 1942 by Samuelson (for the essence, jump to Chapters 12 and 13).

Five G-PRI Shock-Patterns by country

(+·+): Euro area average, Finland, Luxemburg; Iceland, Sweden, the UK, Bulgaria, Russia, Ukraine; Bangladesh, Canada, China, New Zealand, (Sri Lanka), Philippines, (Thailand); Chile, Colombia, Peru, Iran, (Kazakhstan), South Africa, Tanzania.
(−·−): Austria, Germany, Netherlands, Slovak, Slovenia; Denmark, Norway, Switzerland, Czech Republic, Hungary, Poland, Romania, Turkey; the US, Mexico, Australia, India, Indonesia, Singapore, Thailand, Vietnam; Argentina, Brazil, (Iran), Kazakhstan, Pakistan, Algeria, Morocco, Saudi Arabia, Nigeria.
(+·−): Belgium, Spain; (Japan).
(−·+): France, Ireland, Italy, Portugal; 15 Europe average, Latvia, Ukraine; 17 Asia & Pacific average, Sri Lanka, Korea; Paraguay, Kenya.
(No shock): Some countries have no shock but only for some periods, not for the last 21 years throughout.

3.6 Conclusions: Ten Endogenous Facts and Fiscal Policy Rules

The 3% to *GDP* rule was consented empirically twenty years ago. Nevertheless the 3% rule is influential like a constitution by country even today; without theoretical proof for i) net investment to output, ii) the 3% to output, and iii) the growth rate of output. One reason is that the 3% to *GDP* is a result that matches the theory inherent in the endogenous-equilibrium. The constitution will last when the golden rule is reinforced by 'plus net investment' or 'gross investment > depreciation' by country and by year, as proved endogenously and empirically in this chapter. Therefore, each country, with its people, is able to grow sustainably and in harmony of national taste, culture, and history, even under the current globalized world economies. Severe one-sided decrease in deficit without this reinforcement does not successfully make the 3% golden rule enjoyable.

The current financial world crisis will definitely be mitigated when policy-makers and leaders execute to shift actual data closer to the corresponding endogenous data. Read the following ten paragraphs for endogenous facts, while watching Figures 1 to 6 by country at the end. This chapter stresses a fact that even under the same common endogenous logics/rules, each country and its G and PRI sectors each express different endogenous results partly depending on different national taste, culture, and history. One is unable to examine this fact when individual utility function is vaguely used based on the micro level. This fact is consistent with another fact that specified real-assets characters by country are brightly harmonized with the market principles under the current globalization.

Ten facts endogenously found

1. The endogenous data by country have surprisingly digested close-to-disequilibrium and disequilibrium experiences. The current financial crisis is not so much grave compared with those disequilibrium experiences of many countries for the last 21 years. The close-to-disequilibrium is originally measured by the speed years for convergence by country and sector but, similarly and simultaneously by the ratio of net investment (after economic consumption) to output in equilibrium and more rigidly by the ratio of private net investment to output, as shown in this chapter.

2. Basically, an economy at the real assets and with the G and PRI sectors is dynamic and sustainable. The market and financial assets are too much sensitive to the current circumstances and future forecasting under the general static equilibrium. Policy-makers must be more relaxed, free from sticking to market reactions too much. This chapter is generous to sensitive market reactions as long as the endogenous system works. Market reactions are indispensable since decision-making is done by human who is by nature greedy for money.

3. The tie to connect the real assets and the financial assets is the neutrality of the financial assets to the real assets, as proved earlier. The endogenous fact of the neutrality is stably proved and strengthened by the current KEWT 6.12 data-sets, 1990-2010, by sector, for 81 countries, as shown in this chapter.

4. This chapter primarily compares data-sets of 14 Euro currency countries with those of 15 non-Euro countries in Europe, also paying attention to the characteristics of 65

countries for four areas. There are common endogenous logics/rules, whose results appear differently by country. The data-sets of 16 (=81−65) countries show insufficient levels of statistics so that the author will continue to observe the 16 country data for coming few years, watching IMF statistics data.

5. Each country has shown dynamic and balanced movements by year and has never repeated the same results for the last 21 years. Yet, the actual statistics data are always within a certain range of the corresponding endogenous data. This endogenous fact indicates that an economy -- by sector; the total economy, the government sector, and the private sector -- is able to recover by country.

6. The endogenous data simultaneously show causes and results. The causes are clarified by the seven endogenous parameters, where three parameters are constant by year: net investment to output, the rate of change in population, and government net investment to government output as the size of government. When policy-makers are able to control seven endogenous parameters, each country attains its sustainable and robust economy, no more repeating bubbles.

7. The key that directly controls fiscal policy is the ratio of net investment to deficit, $i/\Delta d$, which is based on the endogenous structure of the balance of payments and deficit in an open economy. This chapter presents *six* G-PRI Fiscal Stages; *three* G-PRI Balances; and *five* G-PRI Shock Patterns, each using $i/\Delta d$. Endogenous equation and its hyperbola are policy-oriented at the endogenous system and, are fitted for any social and accounting system. A condition to sustainable growth is that net investment must be above zero. The zero is immeasurable at any system and shown by the vertical asymptote and/or horizontal asymptote at the endogenous system. Instead of asymptotes, a close-to-zero point is measured, which appears as ‘a shock’ due to its large divisional magnitude (think of a case of division whose denominator is close-to-zero). When the point of close-to-zero slightly moves to a moderate point, for example, the optimum equilibrium of the rate of return appears. The optimum point implies that the maximum rate of return and accordingly, the maximum growth rates of output and per capita output realize, with the minimum net investment. In the case of the parabolic equation, a similar maximum or minimum is estimated yet, without specifying any quadrant at the plain, as shown in the literature. Almost all the countries have often realized high net investment periods but, this fact is endogenously incorrect. A definite endogenous fact is that growth and returns are maximized at the point of zero deficits, but this point is not measured so that a low/minimum plus net investment becomes a target of various fiscal policies. An extremely high level of net investment indicates a symptom of bubbles.

8. An economy is sustainable and robust when the government and private sectors are well balanced and moderate in equilibrium. This endogenous fact is that it is risky when policy-makers cannot control dynamic balances between government and private

sectors (i.e., G-PRI Policy Balances). This is partly because infrastructure by government is apt to be huge for several years and results in the sacrifice of the private sector. In this aspect, the private net investment must be observed wholly, as shown in Figs. 1 to 6 by country.

9. Bubbles often occur when net investment becomes rise up. However, the qualitative net investment coefficient, $1-\beta^{*}$, differs significantly by country and over years. Watch the trend of $1-\beta^{*}$. $1-\beta^{*}$ contains essential elements wholly at the endogenous system and reflects the results of policies by year, sector, and over years. The 'rival' capital and labor and 'non-rival' education, R & D, human capital, and environment, are wholly integrated. Sustainable growth and returns are primarily managed by β^{*} or $1-\beta^{*}$, and a plus low net investment is its direct partner and increases its environmental and energy-saving share over years in the last 21 years. Also, sustainable growth and returns are primarily controlled by the endogenous Phelps coefficient, $\alpha/(i \cdot \beta^{*})$: $r_0 = r^{*} = (\alpha/i \cdot \beta^{*})g_Y^{*}$. This is related to the cost of capital, as discussed in Chapter 5.

10. Typical actual results of an unbalanced close-to-disequilibrium economy are unstable unemployment and vicious inflation/deflation circles. These given results come from the unbalance between macro demand and supply, but nobody knows true causes that come from the real assets. The rate of return hyperbola has the horizontal asymptote and the hyperbolic curve. The rate of inflation or deflation is the differences between the rate of return and its horizontal asymptote. If this hyperbola reaches a moderate range of endogenous equilibrium, seven endogenous parameters are all controllable and thus, the rate of inflation is stably low under full-employment. When actual data approaches endogenous results, full-employment and a low rate of inflation are in reality.

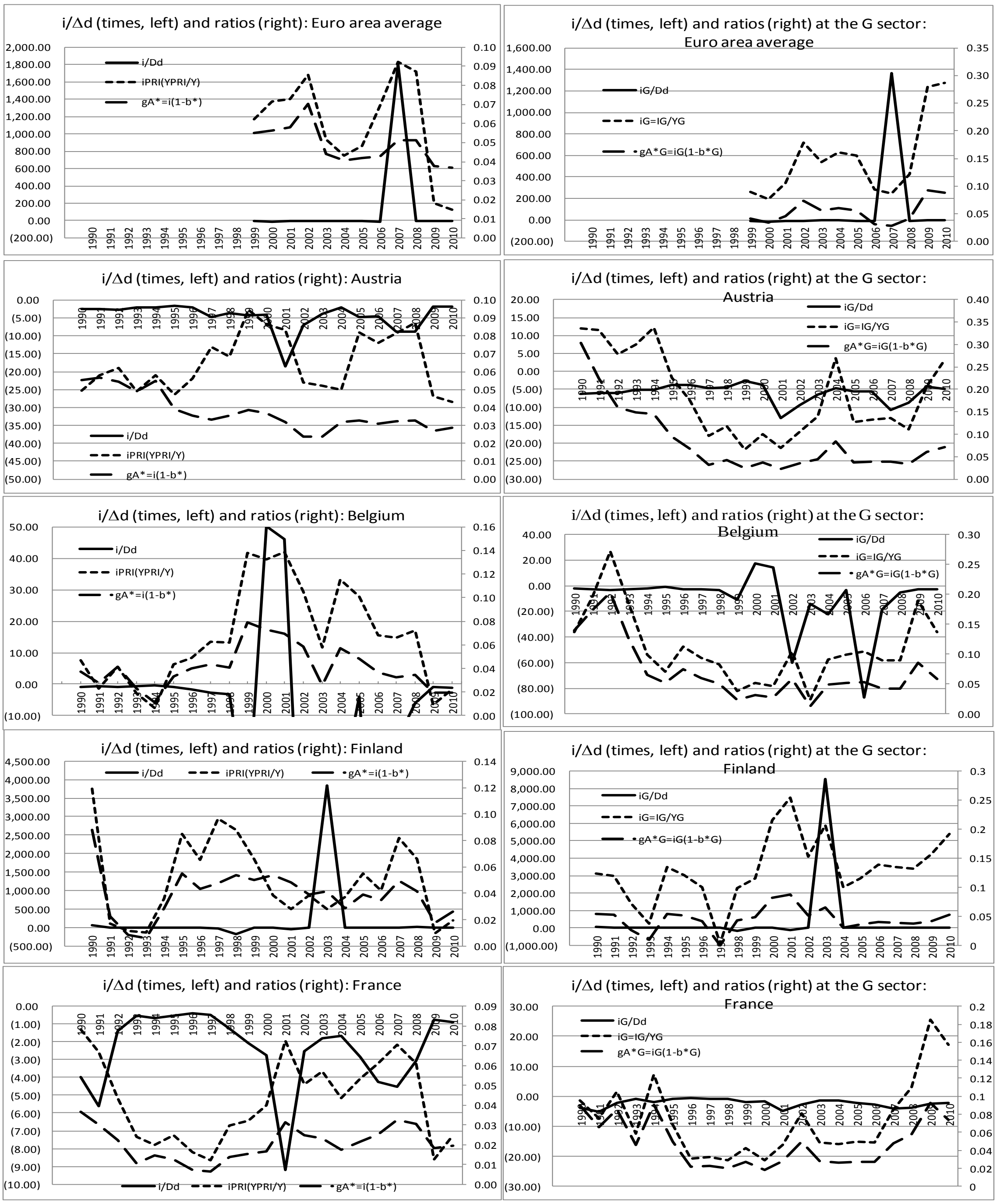
In short, 'the methodology used in the endogenous system produces tasty fruits through a universal level of decision-making and its execution.' This statement guarantees a hypothesis that democracy is in harmony with human economic life and society, supported by the neutrality of the financial assets to the real assets at the SNA. The author proves that independent and separated policies of the real/fiscal, financial/market, and central bank functions are integrated wholly and endogenously by country and all over the world. This is a sustainable way not only to recover the reliance on the markets and the market principles but also to construct a new way to realize harmonious fiscal, economic, environmental, and democratic society; to people, for people, and by people and citizens, with peace in mind and, without fighting.

Deficit should be reduced for a guarantee of an optimum/maximum level of the growth rate of per capita output and, this is only possible through consecutive technological progress coupled with a plus net investment by country. One key, $i/\Delta d$ or $i - \Delta d$ in equilibrium, where $i = I/Y$ is the ratio of net investment to output and, $\Delta d = \Delta D/Y$ is the ratio of deficit to output, is one proposal in this chapter while the literature is unable to subtract deficit from net investment in equilibrium. $i/\Delta d$ equals net investment divided by deficit after reduction by reduction and clarifies the current Fiscal-stage among six G-PRI Fiscal Stages, for a country to approach sustainable, modest, and balanced equilibrium between actual and endogenous data and between government and private sectors; as shown empirically using 65 country endogenous data, 1990-2010. *Four* Technology-Patterns clarify the priority between stable technological progress and fluctuating net investment over years. Policy-makers are able to watch whether or not the current Technology-pattern is controllable, stepping into *five* G-PRI Shock-Patterns of $i/\Delta d$ by sector. In short, the endogenous rate of technological progress, $g_A^* = i(1 - \beta^*)$, is a key to economic sustainability by country and is deeply involved in $i/\Delta d$ or $i - \Delta d$. This is an answer to the compatibility between increase in taxes and sustainable growth.

Conclusively, Chapter 3 is fully connected with Consumption-neutral (**Nature-aspect 2**) and Deficit-neutral and *RRR*=0 (**Nature-aspect 4**), and accordingly Politics-neutral (**Nature-aspect 5**). Consumption-neutral expresses a fact that preferences designed and measured as macro-utility are independent of technology. Empirics of the rate of technological progress $g_A^* = i(1 - \beta^*)$ and $i = I/Y$ are precisely analyzed in this chapter. And, this analysis is closely connected with net investments/deficit, $i/\Delta d$. Deficit-neutral and *RRR*=0 (the real rate of return=0) implies that if deficit is zero, the economy could enjoy Utopia situation by country, by sector, and by year and over years. This chapter numerically stepped into empirical analysis by sector (G and PRI).

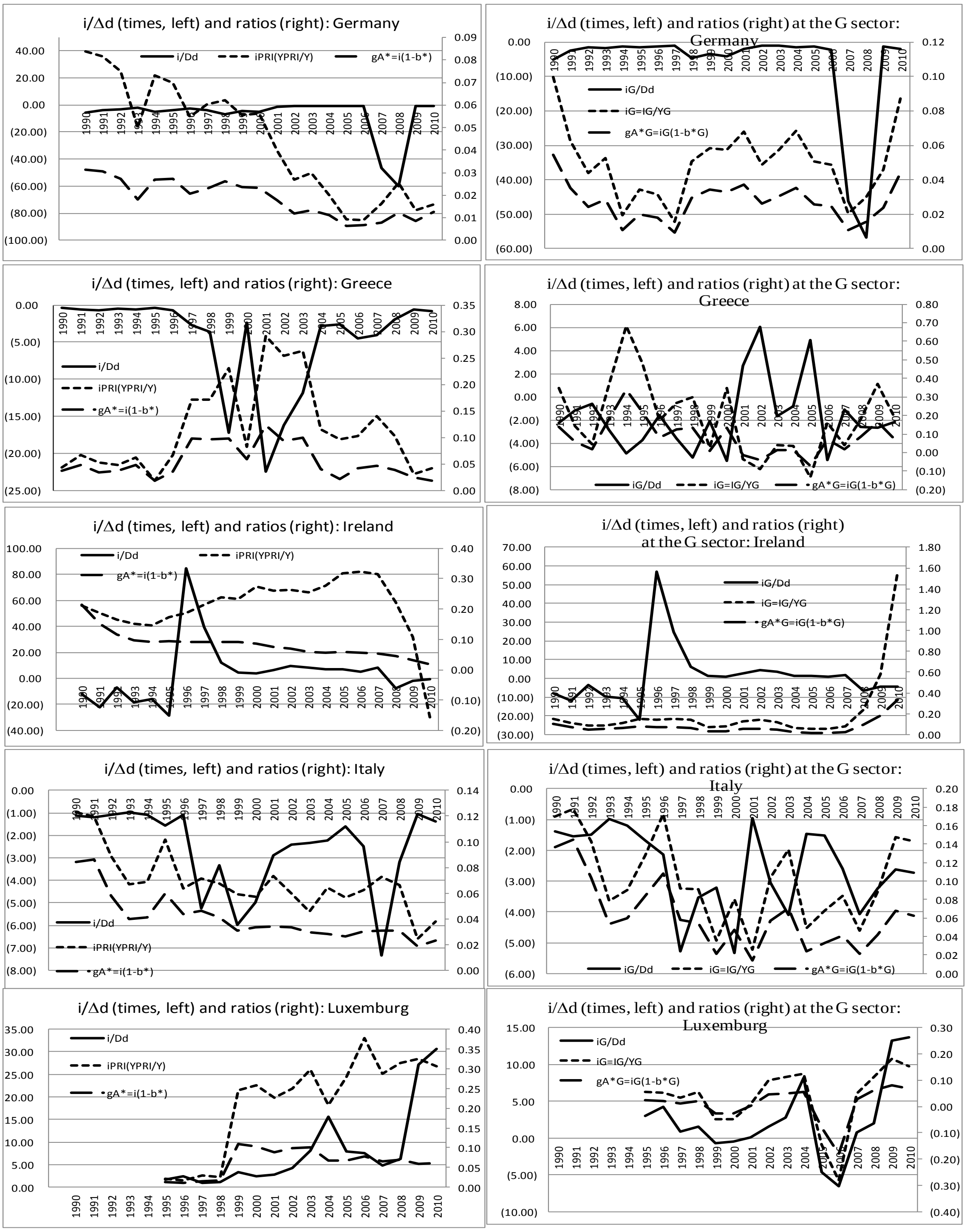
Therefore, this chapter, for the first time, could present a theoretical foundation to the 3% Golden Rule, empirically established under the market principles. The market principles are connected with demand and supply curves but cut absolute price levels vertically by consumers' and by producers' goods and services. These facts mean that it is impossible for one to prove the 3% Golden Rule.

It is true that the 3% Golden Rule was established empirically. Nevertheless, this Golden Rule reflects the truth to some extent. It implies that empirical analysis is close to theoretical analysis. This is because statistics data are always within a certain range of endogenous data, as proved everywhere in the *EES*.



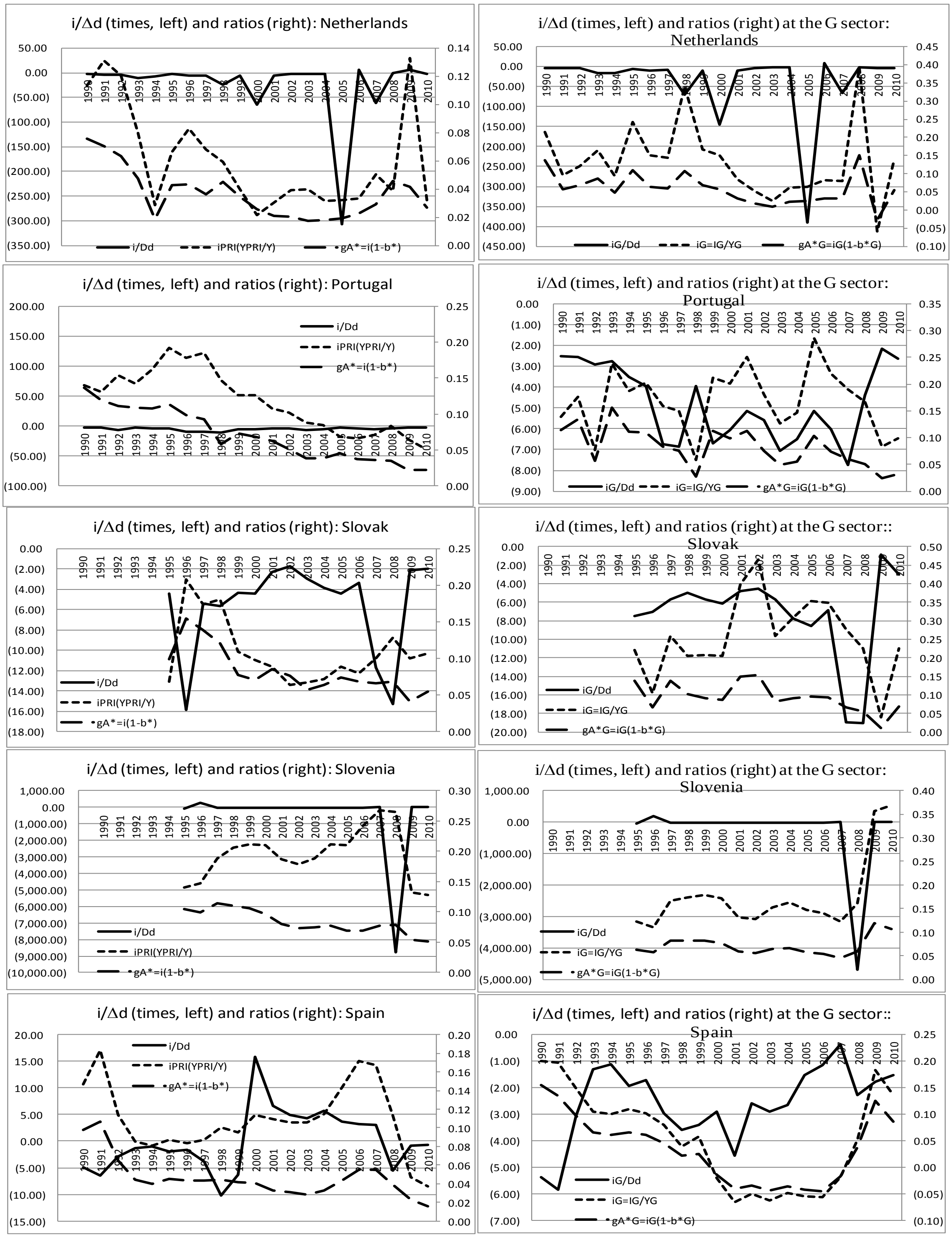
Data source: KEWT 6.12-2, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

Figure 1 Deficit, net investment, and the rate of technology, at the total economy and the G sector, 1990-2010: 14 country Euro area average; Austria; Belgium; Finland; France



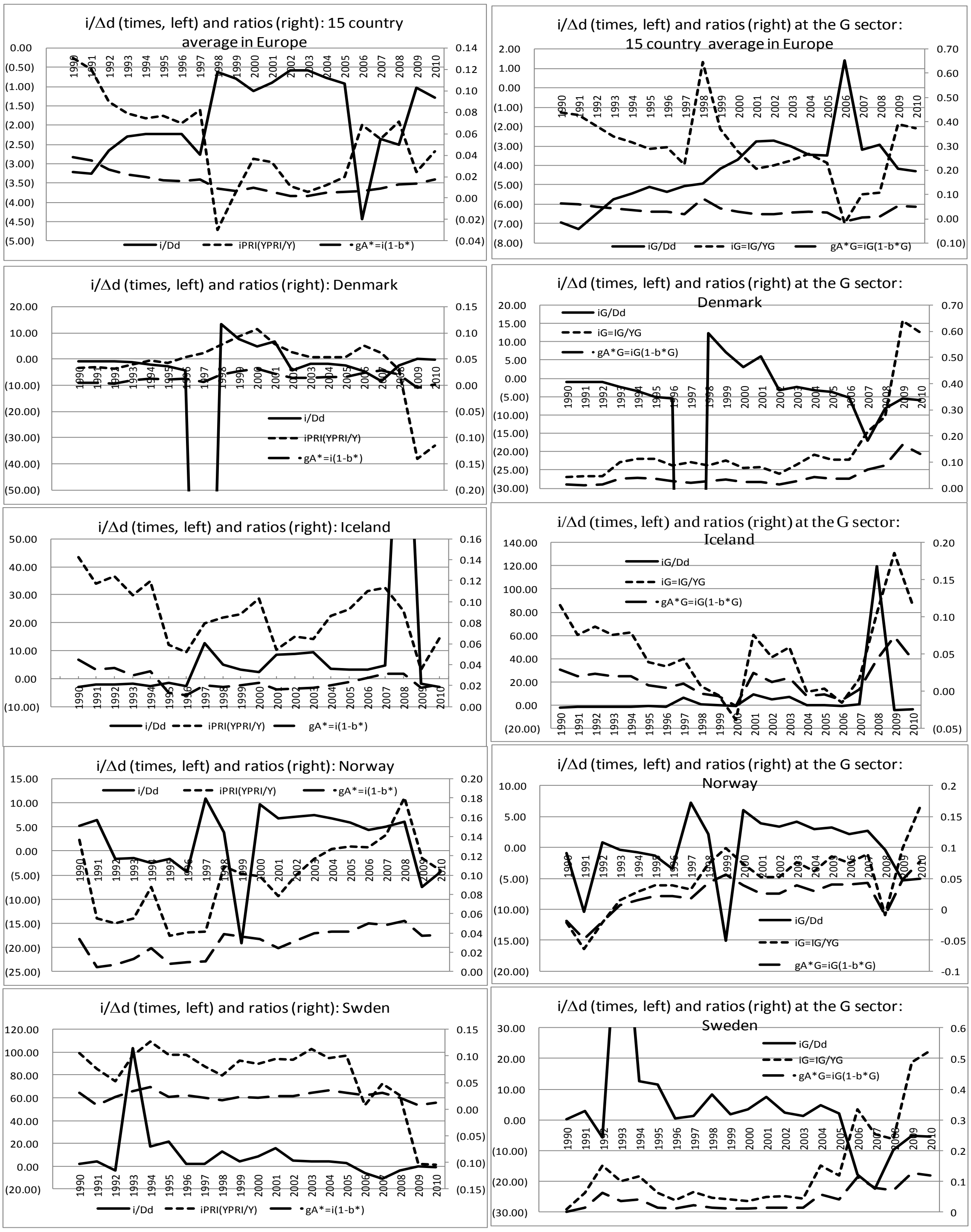
Data source: KEWT 6.12-2, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

Figure 2 Deficit, net investment, and the rate of technology, at the total economy and the G sector, 1990-2010; Germany; Greece; Ireland; Italy; Luxemburg



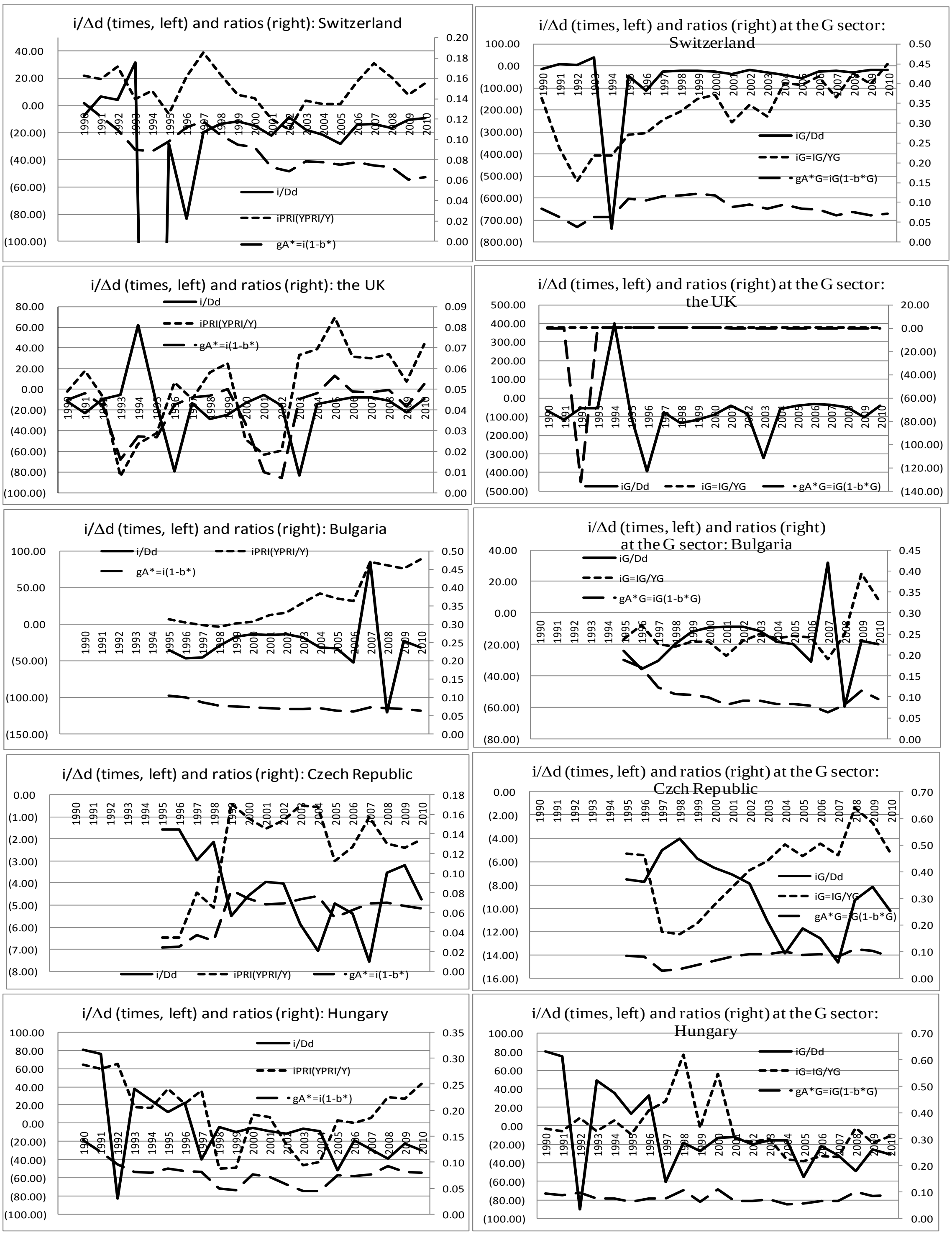
Data source: KEWT 6.12-2, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

Figure 3 Deficit, net investment, and the rate of technology, at the total economy and the G sector, 1990-2010: Netherlands; Portugal; Slovak; Slovenia; Spain



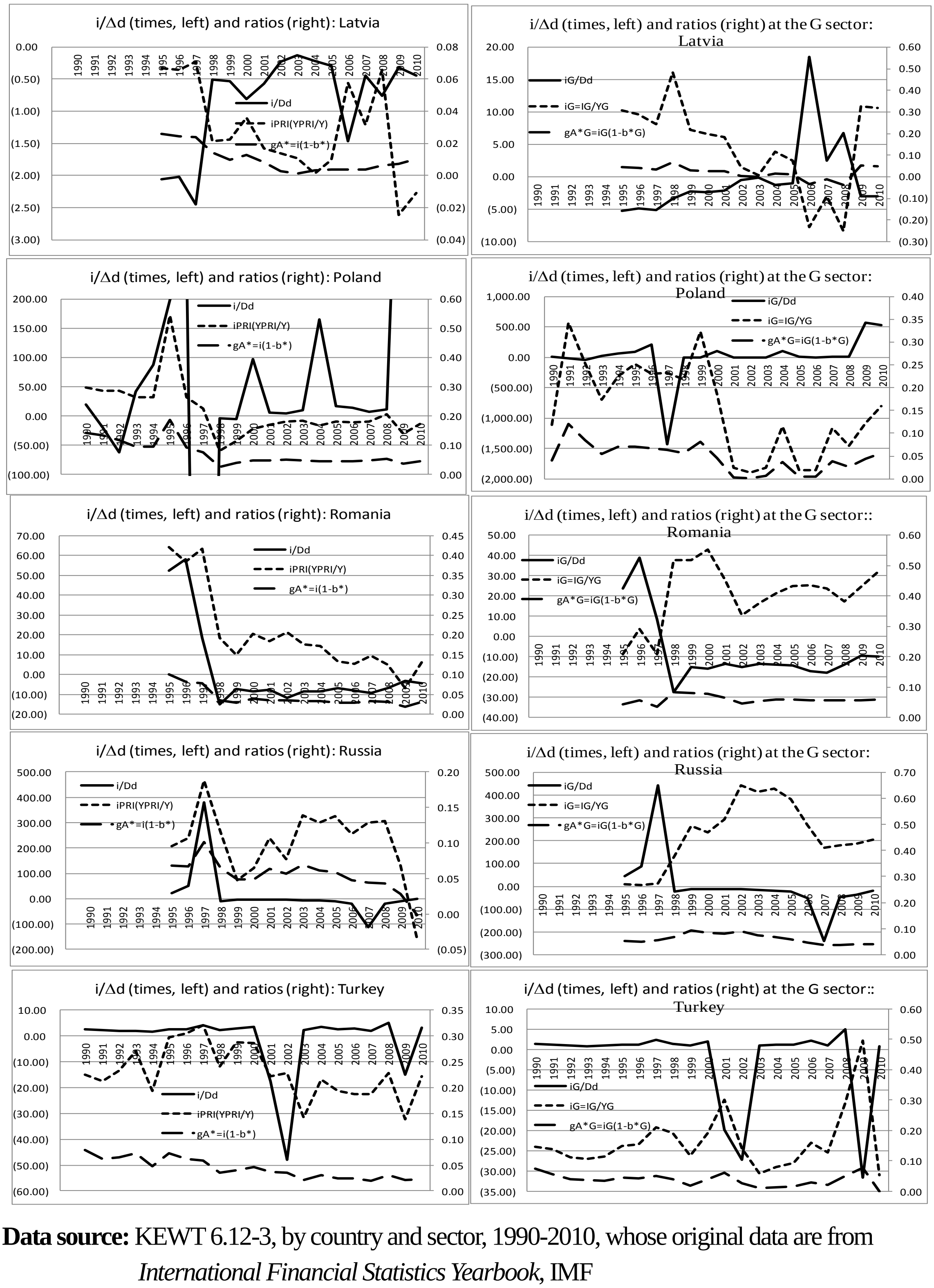
Data source: KEWT 6.12-3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

Figure 4 Deficit, net investment, and the rate of technology, at the total economy and the G sector, 1990-2010: 15 country average in Europe; Denmark; Iceland; Norway; Sweden



Data source: KEWT 6.12-3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

Figure 5 Deficit, net investment, and the rate of technology, at the total economy and the G sector, 1990-2010: Switzerland; the UK; Bulgaria; Czech Republic; Hungary



Data source: KEWT 6.12-3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

Figure 6 Deficit, net investment, and the rate of technology, at the total economy and the G sector, 1990-2010: Latvia; Poland; Romania; Russia; Turkey

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Chapter 4

Answer the Market 7% Problem at the Break-Even Point of Primary Balance: Endogenous Evidences with Fiscal Policy

4.1 Introduction: Background of the Market 7% Break-even Point Problem

This chapter discusses the primary balance of deficit and connects it with external data at the markets. A unique finding is BOX 4-1 in this chapter. Chapter 2 summarized the existence of the neutrality of the financial/market assets to the real assets. Therefore, this chapter is naturally related to that neutrality as a background. Chapter 3, the last chapter, examined empirical results of deficit and net investment and connected those results with the rate of technological progress. This chapter raises the rate of return at the endogenous system, to compare the rate of return with an external rate of interest at the markets. The relationship between capital and the rate of return will be treated at Chapter 6.

There are many important policy-oriented factors to determine the break-even point of primary balance to *GDP* in the government sector, as shown by the definition of the market 7% problem such that if deficit after reducing interest (primary balance) to *GDP* is beyond 7%, deficit might increase by year and forever. These factors have been analyzed by using several statistical data-sets[1] currently available. The author never denies statistical and specified efforts of data arrangements: without these efforts any new data-sets did not exist today. It is a strict fact that each data of estimated data-sets are all within a certain range of corresponding data at endogenous data-sets. One approaches indirectly and the other directly to theoretical values since endogenous data at a purely endogenous system are theoretically measured, with devices at the initialization setting and without indexing and tautology. Also it is a fact that the markets intuitively know everything trustworthily, but the market principles are vertically separated by labor, capital, and commodity, staying at the second best in the economic society for hundreds of years. The intuitive results are not always moderate and often short-sighted because the markets are operated by human whose character is inevitably profit-oriented, particularly with the modern globalization.

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1 For essential differences between author's KEWT database and the current databases, see Chapter 6. The author converts time functions in the literature to policy functions at KEWT. The author intends to compare the KEWT with those of http://correlatesofwar.org/ , http://www.euklems.net , and http://www.pwt.econ.upenn.edu/ , from viewpoint of a converted whole system. KEWT might be a converted final expression of Durlauf, S. N. and Kourtellos, A, Minkin, A. (2001) that uses the local Solow growth model and also vector index variables for initialization.

Elements related to the market 7% problem are: Minus interest rates, nominal and real rates of returns, the rates of inflation and deflation, liquidation of debts, the relationship between the rate of returns at the real assets and the market ten year debt yield. Under an assumption of the neutrality of the financial assets to the real assets in equilibrium, market elements may be replaced by real asset elements within the framework of a system for national accounts (the SNA, 1993, 2008). Today, however, market elements are only available in the markets under the price-equilibrium. The markets under the price-equilibrium determine market elements intuitively, and causes and effects are estimated using methodology of econometrics. A problem under the price-equilibrium is that there is no methodology to integrate various markets and measure a wholly consistent system by country. This is because the general equilibrium is static. For the proof of the above neutrality, the endogenous system is able to show a table of 10 year debt yield divided by the rate of return measured in the endogenous-equilibrium, as shown in **Table 1**. It is difficult to formulate market equations dynamically under the price-equilibrium and support the general equilibrium. As a result, it is difficult to solve the market 7% problem theoretically and empirically, unless such an endogenous system is introduced.

BOX 4-1 Market ÷ endogenous table: 10 year debt yield divided by the rate of return in equilibrium

	Market rate (10 year debt yield)									
Endoge. r*	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10
0.01	**1.000**	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000
0.02	0.500	**1.000**	1.500	2.000	2.500	3.000	3.500	4.000	4.500	5.000
0.03	0.333	0.667	**1.000**	1.333	1.667	2.000	2.333	2.667	3.000	3.333
0.04	0.250	0.500	0.750	**1.000**	1.250	1.500	1.750	2.000	2.250	2.500
0.05	0.200	0.400	0.600	0.800	**1.000**	1.200	1.400	1.600	1.800	2.000
0.06	0.167	0.333	0.500	0.667	0.833	**1.000**	1.167	1.333	1.500	1.667
0.07	0.143	0.286	0.429	0.571	0.714	0.857	**1.000**	1.143	1.286	1.429
0.08	0.125	0.250	0.375	0.500	0.625	0.750	0.875	**1.000**	1.125	1.250
0.09	0.111	0.222	0.333	0.444	0.556	0.667	0.778	0.889	**1.000**	1.111
0.10	0.100	0.200	0.300	0.400	0.500	0.600	0.700	0.800	0.900	**1.000**

Note: The above *diagonal* down to the right shows 1.000 and expresses a perfect neutrality of the financial/market assets to the real assets. The neutrality preferably requires a steady or constant value such as 0.8 or 1.2 even if it does not show 1.000. The rate of return at the endogenous system shows $r = r^* = r_0$, as discussed in Chapter 6.

This chapter intends to answer the market 7% problem theoretically and empirically, using each element available at KEWT data-sets the endogenous system measures. This is because initialization devices of KEWT data-sets enables the endogenous system to work consistently by country, sector, year, and over years, and without any given data at the starting year. The endogenous system is based on a discrete Cobb-Douglas production function, where continuous equations, log-growth, and differentials each have no meaning to data-setting. No article has established the discrete C-D production function hitherto. The discrete C-D production function endogenously measures the rate of technological progress, as the product of the ratio of net investment to output/income and the qualitative net investment coefficient, 1−*beta*, in equilibrium. Seven endogenous parameters are simultaneously measured; the ratio of net investment to output, the rate of change in population, the relative share of capital, the diminishing returns to capital coefficient, the capital-output ratio, the ratio of government net investment to government output, and the speed year coefficient, *lambda*, in equilibrium. The speed year equation for convergence at the transitional path includes all the seven endogenous parameters and directly measures the level of the endogenous-equilibrium. The speed years for convergence in the endogenous-equilibrium[2] differ from the speed year equation as shown by Barro and Sala-i-Martin, Xavier (1995) and Bart, van Ark (1996): Endogenously versus 'exogenously' using panel data, whose causes are not wholly clarified as a system.

The endogenous system simultaneously clarifies the cause and result relationship, measuring seven endogenous parameters for the real assets. This is partly because the system starts with the relationship between the balance of payments, deficit, and the difference between private saving and private net investment, free from deficit defined by cash flow-in and -out. Related to seven endogenous parameters, four structural ratios are specified for policy-makers: The qualitative net investment coefficient, the relative share of capital, *alpha*, the capital-output ratio, *Omega*, and the rate of return, *r*, which is the relative share of capital divided by the capital-output ratio. The rate of return equation is tightly connected with the growth rate of output equation, reorganizing Phelps' (1961, 65, 66) golden age to optimum consumption and golden rule to investment and formulating the endogenous coefficient between growth and returns by sector. This is because returns or profits are endogenously measured by sector.

Four structural ratios dynamically clarify simultaneous causes and results, with the speed years by country, sector, and year. Actual and estimated data in the literature definitely stay at a moderate range of endogenous data in equilibrium. When actual data are far from endogenous data, policy-makers are unable to control four structural ratios and face at close-to-disequilibrium or disequilibrium. In short, results of the speed years are another expression of the endogenous-equilibrium, sustainable growth and returns, and moderate balance between the government (G) and private (PRI) sectors, where the total economy is expressed as two sector weighted aggregation. A variety of symptoms to equilibrium are individualistic and each country never has the same results by year and over years. These results are wholly caused back by fiscal policy and reflect different

[2] The endogenous speed years for convergence by sector are $1/\lambda^*$, $1/\lambda^*_G$, and $1/\lambda^*_{PRI}$, where the speed year coefficient for the total economy is shown by $\lambda^* = (1-\alpha)n + (1-\delta_0)g_A^*$, the rate of change in population in equilibrium is $n_E = n$, and the rate of technological progress is $g_A^* = i(1-\beta^*)$ (for basic endogenous equations, see *Notations* at the beginning of the *EES*).

levels of philosophy and long-sighted leadership by country.

The upper limit of the market interest rate to debt by country is supposed to be 7%, according to the information at the markets. This chapter clarifies whether the market 7% problem is plausible or not, using the endogenous structure of primary balance by country. The market 7% problem is revealed by connecting the financial assets with the real assets at the SNA. United theory (the endogenous system) and practice (data-sets) by country answer the market 7% problem in reality and, safely under the neutrality of the financial/market assets to the real assets in equilibrium.[3]

The author respects the market principles, perceives a fact that financial market policies by policy-makers, leaders, and the central banks among countries are indispensable, and evaluates the importance such that they have tried to recover economic activities in the global world economies. Activities executed by leaders, however, remain symptomatic treatments and countermeasures. In fact, once or twice bubbles have been repeated, without solving essential problems and at the sacrifice of future generations. The story is expressed: Leaders or captains continue to sail in the universe sea, without having endogenous lighthouse or means. Goal is sustainable growth with full-employment and low inflation. Nevertheless, the financial/market assets do not clarify necessary conditions at the real assets. This chapter aims at clarifying real rules behind the break-even point of primary balance.

4.2 Reorganizing Exogenous Du Grauwe Equations to Answer the Market 7% Problem

The market 7% problem has been positively and negatively discussed at the markets and under the market principles. The market principles have been the second best since no other way has been found. In reality, the market 7% problem is involved in hidden relationships between the financial assets and the real assets. The financial assets and related markets have been integrated with the real assets, partially and not wholly at all. If the real assets are replaced by theoretical assets, the integration between the financial and real assets is realized. KEWT 6.12 data-sets are theoretically endogenous and hold at the endogenous-equilibrium. Market actual data and estimated data at the financial assets are now compared with corresponding endogenous data. For example, the ten year debt yield is compared with the rate of return in equilibrium by sector. The cost of capital, as

[3] Kamiryo, H. (2010) first proved the existence of the neutrality using KEWT 3.09 for 58 countries by sector; 1990-2007. The author here points out two weak points to the neutrality in the use of KEWT 3.09: (1) the conditions to the endogenous-equilibrium are not so much strict as KEWT 6.12, since the rate of unemployment was used as the last means to maintain equilibrium and (2) the data-sets do not include the severe financial crisis after 2007. The author proves a fact that the neutrality under full-employment was attacked by financial crisis shock, using KEWT 6.12 for 81 countries by sector, 1990-2010, in Chapter 5.

the rate of return less growth rate of dividends or output, is intuitively given in the financial market. The growth rates are estimated using econometrics, but it is not wholly endogenous. Theoretical or endogenous implies that every data are consistent with all the other data by country, year, and over years, in a whole system and this is the endogenous system.

To solve the market 7% problem, this Chapter compares the market interest rate on the x axis with the endogenous rate of return at the government sector on the y axis. The author represents the external rate of interest by the ten year debt yield, $r_{M(DEBT,10yrs)}$. The neutrality of the financial/market assets to the real assets is results of the endogenous system. It seems that one could easily get an answer to the break-even point of primary balance. But, it is difficult to answer this problem straightforward. This is because, technically, the denominator of the rate of return must not be *capital* but *debt*.

Paul De Grauwe's (225, 2005) equations are most useful to solve the market 7% problem. This is because market and estimated values/ratios are right now replaced by endogenous values/ratios, regardless of the existence of the neutrality of the financial assets to the real assets in equilibrium. Deficit is expressed as minus (or, surplus as plus) in the endogenous system. In Grauwe's equations, deficit is expressed as plus, where interest is added to deficit. Let the author confirm the ties between endogenous and exogenous equations.

<u>Ties lying between the endogenous system' equations and Grauwe's (225, 2005) equations</u>

1. Instead of *GDP*, endogenous income Y is used under the endogenous-equilibrium. Meade and Stone (1969) are now accurately able to measure *Y*=income= expenditures=output. Y is the sum of consumption and saving: *Y*=*C*+*S*. Net investment is saving less the balance of payments: $I = S - (S - I) = S - BOP$.
2. Instead of budget taxes, endogenous taxes are used, where endogenous taxes are equal to the endogenous sum of government consumption and saving and, government net investment is measured as government saving less deficit: $T_{AX} = Y_G = C_G + S_G$ and, $I_G = S_G - (S_G - I_G) = S_G - \Delta D$.
3. Grauwe's government spending is endogenously expressed as $C_G + I_G$. Grauwe's primary budget is surplus when $C_G + I_G - T_{AX} > 0$.
4. Instead of the growth rate of *GDP*, the endogenous growth rate of *Y* is measured directly from the endogenous rate of technological progress, where the endogenous Phelps coefficient, $\alpha/(i \cdot \beta^*)$ works between the rate of return and the growth rate of *Y*: $r_0 = r^* = (\alpha/i \cdot \beta^*) g_Y^*$.
5. The above values are each expressed as a corresponding ratio, i.e., dividing each value by output. For example, $bop = BOP/Y$, $\Delta d = \Delta D/Y$, $s = S/Y$, and $i = I/Y$. Further, in the endogenous-equilibrium, the rate of return by sector is measured using

each sector's output, capital, and seven parameters. For example, $i_G = I_G/Y_G$ and $i_{PRI} = I_{PRI}/Y_{PRI}$.

6. Turning to the market 7% problem, the market interest rate to debt should be compared with the endogenous rate of return to debt, $r_G^* = \Pi_G/K_G$. The $r_G^* = \Pi_G/K_G$ is the product of Δd_K and $\Pi_G/\Delta D$, where $\Delta d_K \equiv \Delta D/K_G$. This product is a key for formulating the break-even point of primary balance. $\Delta d_K \equiv \Delta D/K_G$, is directly connected with primary balance; $\Delta d_K = \frac{\Delta D}{Y} \cdot \frac{Y}{Y_G} \cdot \frac{Y_G}{K_G} = \Delta d/(t_{AX} \cdot \Omega_G^*)$, where deficit $\Delta d = \Delta D/Y$, the government capital-output ratio, $\Omega_{0(G)} = \Omega_G^* = K_G/Y_G$. Y_G/Y is endogenously equal to $t_{AX} = T_{AX}/Y$, as the size of government.
7. The primary balance is defined as a deficit after reducing interest paid. It is logical that the primary balance is expressed by the product of Δd_K and $1 - r_{M(DEBT,10yrs)}$, in the current year. This is because the market rate is usually higher than the endogenous one and, investors are able to foresee the risk of debt by country.

4.3 Preliminary Discussion on Primary Balance: Market vs. Endogenous

Before focusing on a few useful results and rules and interpreting the market 7% problem, this section empirically summarizes theoretical relationships between financial/market and endogenous ratios. Some of market-oriented results differ from endogenous results. Let the author explain the differences between market and endogenous results possibly using the case of the total economy as a weighted aggregation of an economy.

For market results

1. The relationship between the market interest rate to debt and the growth rate of *GDP* is not specified. Financial policy influences the market interest rate to debt, together with central bank policy, yet not using the real assets.
2. When deficits and debts increase, the financial market intuitively reflects a higher risk of bankruptcy. For example; Credit Default Swap (ODS) reflects the situation intuitively.

For endogenous results

3. The relationship between the rate of return and the growth rate of output is determined by the endogenous Phelps coefficient,[4] $r_0 = r^* = (\alpha/i \cdot \beta^*) g_Y^*$, as pointed out

[4] The difference between exogenous Phelps and endogenous Phelps is: Phelps, E. S. (145, 1966) distinguishes the golden age to maximize consumption with the golden rule to investment, while the

above. It implies that if the relative share of capital, *alpha*, equals the product of the quantitative net investment coefficient, *beta**, and the ratio of net investment to output, $i = I/Y$, then, $r^* = g_Y^*$ is realized in equilibrium. And thus, the cost f capital turns to an immeasurable zero.

4. When a deficit reaches zero, the endogenous rate of return and accordingly, the growth rate of output become a maximum, with a minimum net investment, under a constant *beta** assumption. Endogenous results of the total economy are exclusively equal to those of the private sector. This corresponds with an exogenous textbook case in the literature.
5. In the government sector, when deficits and debts increase, its rate of return turns to minus: the more minus the government saving the more minus the government rate of return in equilibrium and accordingly, the government share of capital. When government saving becomes minus (as in Japan, after 1991), the equilibrium condition becomes severe by year.
6. When the rate of technological progress stays at above zero, the growth rate of output remains above zero. This fact does not contradict the endogenous Phelps coefficient. A plus growth rate under a minus rate of return and a minus relative share of capital (i.e., $+= - \cdot -$) is traced back to a rule that $i = I/Y$ must be above zero by sector in the endogenous-equilibrium.

<u>For market and endogenous results</u>

7. The market rate cannot specify the rate of inflation or deflation, while endogenously, the rate of inflation or deflation[5] is involved in the hyperbola reduction of the rate of return equation. The endogenous rate of inflation/deflation is the horizontal asymptote less the rate of return in equilibrium, setting $i = I/Y$ on the *x* axis.

For simplicity, this chapter does not discuss the liquidation of debt, except for this paragraph. Reinhart, C. M. and Sbrancia, M. B. (NBER WP# 16893, 64p., 2011), based on Reinhart, C. M. (NEER WP#15815, 127p., 2010), empirically proves that national debts reduce not only by default but also by debt issue at an arbitrary interest rate, less than the market debt yield. Conclusively, the liquidation of debt remains one of symptomatic treatments and countermeasures. Default and financial institution-rescue shift money from government to enterprises, while liquidation of debt from enterprises to government. The author indicates that the liquidation of debt is measured by a minus cost of capital

endogenous Phelps in the endogenous system maximizes the rate of return with minimum net investment under a given consumption, $C = C_G + C_{PRI}$, where national taste/preferences is calculated as macro utility by country, using the relative discount rates of capital goods to consumer goods; $(rho/r)(C/Y)$, the propensity to consume $c = C/Y$, and $\frac{rho}{r} = 13.301c^2 - 22.608c + 10.566$.

[5] The rate of deflation is measured endogenously, apart from the viewpoint of macro demand and supply differences under the price-equilibrium and using the reduced hyperbola of the rate of return to the ratio of net investment to output by sector.

under deflation and that under such deflation, it is impossible for policy-makers to adjust the rate of inflation. According to the current European Central Bank (ECB) information, the current EU crisis realizes 53.5% reduction of debt at Greece rescue at the sacrifice of investors. These show a possibility that government, enterprises, and financial institutions are all able to realize a win-win relationship, without bubbles-repeating. The possibility is guaranteed by policy-makers' execution that realizes actual data closer to endogenous data by year.

Compulsive reduction of deficit is one policy. Plus net investment at a minimum level is another policy. Both policies aim at the same goal that guarantees sustainable growth and returns. However, if area countries all understand a minimum plus net investment by country and year, the rate of technological progress will recover steadily by country and, this is an essential real-oriented policy. Real-oriented policy may or may not become against a bold reduction of debt through default and against a steady liquidation of debt.

4.4 Rules and a Variety of Results by Country to Show up the Market 7% Problem, 1990-2010

This section first explains two tables that show the whole background spread in the real assets. The background is condensed by the neutrality of the financial assets to the real assets, endogenously including the exchange rate by country. Second, this section finds a few logics/rules derived from the results of empirical analyses, using (1) panel and cross section figures by area and (2) time series figures by country. The purpose to find a few logics is to confirm how the break-even point of primary balance differs definitely by country, although common logics prevail behind. Real-oriented policies are required for stabilizing economic society tossing with the market 7% problem.

First, **Tables 1, 2**, and **3** by weighted average area (see, before References) each show the neutrality of the financial assets to the real assets by using money supply, ten year debt yield, and the US exchange rate (hereunder, the neutrality). In detail, some countries are most neutrality-oriented over years while others are often fluctuating, depending on the whole policies by country over years. If the endogenous-equilibrium shows moderate, the neutrality is guaranteed strictly. When the endogenous-equilibrium falls into close-to-disequilibrium or disequilibrium, the neutrality is numerically fluctuating, sharply out of order. The more developed the economy, the more stable the economy is. The more developing the economy, the more unstable the economy often is. It is a prominent fact among 81 countries that Euro currency area realizes the neutrality much more steadily than other areas; other Europe area, Asian & Pacific, and Rest area (Latin America and Africa). The above figures prove that the Euro area average has partially enjoyed its integrated economic system although disorder attacked the neutrality after bubbles[6], similarly to other areas.

Second, **BOX 4-2** and **4-3** by area each show the panel of 46=17+14+15 countries (excluding 3 area averages) by the corresponding cross section figures. The LHS of each figure compares the market rate to debt, $r_{M(DEBT,10yrs)}$, on the x axis with the endogenous rate of return at the government sector, $r_G^* = \Pi_G/K_G$, on the y axis. The RHS of each figure compares government deficit/government capital, $\Delta d_K \equiv \Delta D/K_G$, with government returns to deficit, $\Pi_G/\Delta D$. The ΔD here shows 'primary balance' after reducing interest paid or after dividing deficit D by $\left(1 - r_{M(DEBT,10yrs)}\right)$. The difference between before and after reducing interest paid is just expressed by using $\left(1 - r_{M(DEBT,10yrs)}\right)$. The higher the 10 year debt yield the lower the primary balance is and, vice versa.

The denominator of Δd_K is government capital, K_G, instead of output, Y, so that $\Delta d_K \equiv \Delta D/K_G$ directly corresponds with the market 10 year debt yield. Exactly, the denominator of Δd_K turns from Y to K_G, by multiplying the product of the government capital-output ratio and the endogenous taxes/output. A problem is that the market debt yield is above zero by country. It implies that the hyperbola equations do not regularly work if this restriction is set.

BOX 4-2 by country remains at the 1st where a hyperbolic curve at the1st quadrant only slips down to the 4th quadrant. **BOX 4-3** by area average exactly shows two hyperbolic curves at the 1st and 3rd quadrants, without exception. It implies that the negatively higher the deficit the less net investment-oriented the economy is. This is in reality and empirically proved by country. It implies that under a minus net investment an economy cannot maintain sustainable growth. Many countries have incidentally taken this policy, facing at disequilibrium or close-to-disequilibrium. After bubbles, two choices, sustainable or further aggravating, economically separate robust countries with weak countries, with no exception among 81 countries. Net investment policy by sector is important much more than any others for steady maintenance of growth and returns by country. The break-even point[7] of primary balance in budgeting remains one of resultant phenomena by country. To confirm the above results, **BOX 4-4**, **4-5**, and **4-6** by country are shown. These figures each follow the same results as BOX 4-2 and 4-3.

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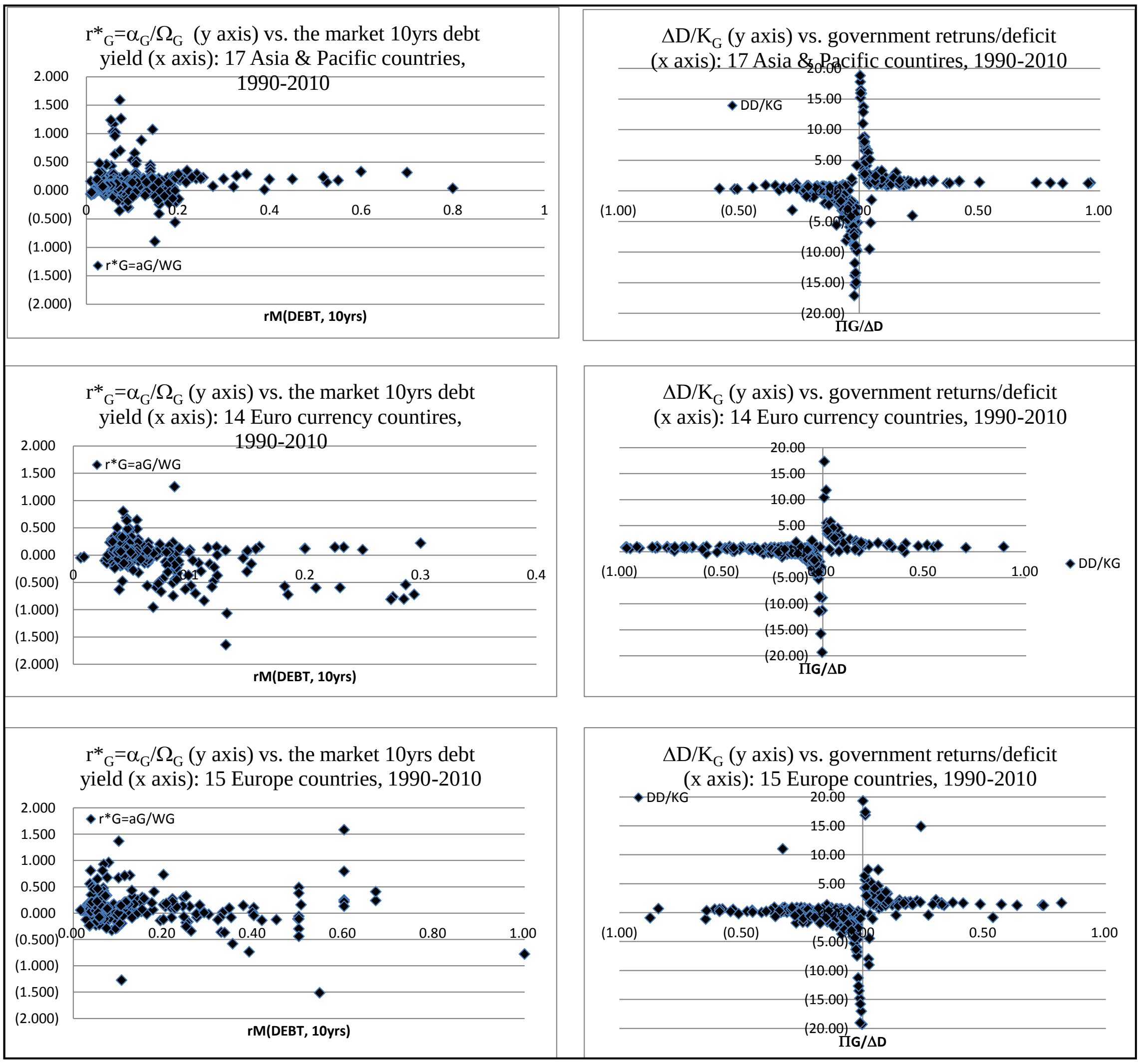
[6] Reinhart, C. M., and Rogoff, K. S. (346, 2011) uses 5-year moving average for domestic debt and default. KEWT does not need moving average by item and/or element since KEWT is thoroughly policy-oriented. For business cycle analysis, however, the author finds that 3-year moving average makes the trend moderate and smoothly shows net investment business cycle at the private sector, as shown in Chapter 14.

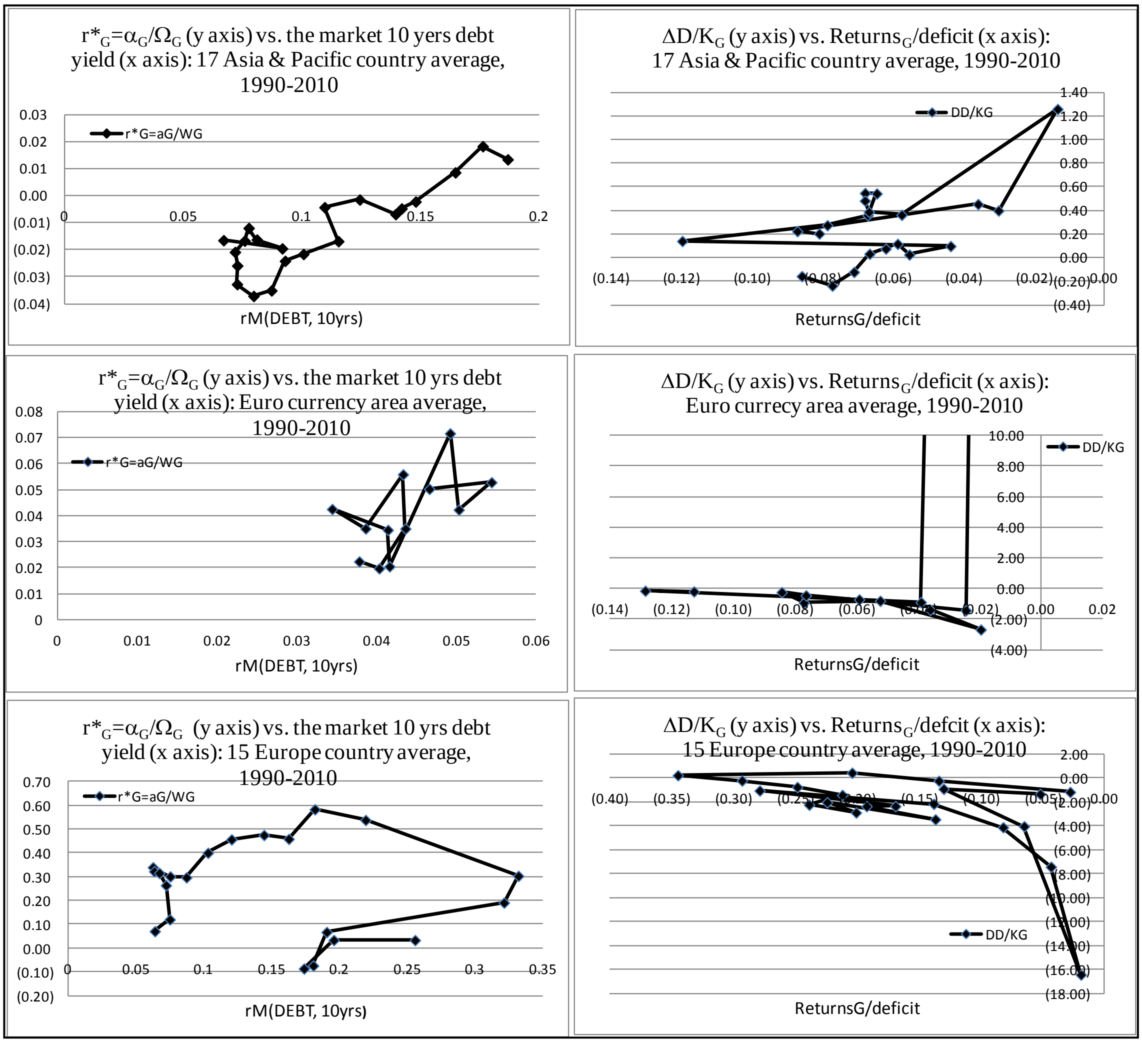
[7] For the author's hyperbolic break–even points wholly for flows and assets, see "Accounting" edited by Japan Accounting Association: 1967, 958-968; 318-330; 1968, 649-668; and 1969, 827-846; 963-990.

BOX 4-2 Market debt yield to the endogenous rate of return at the government sector (LHS) and the deficit/government capital stock to the government returns/deficit (RHS), panel by area



Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

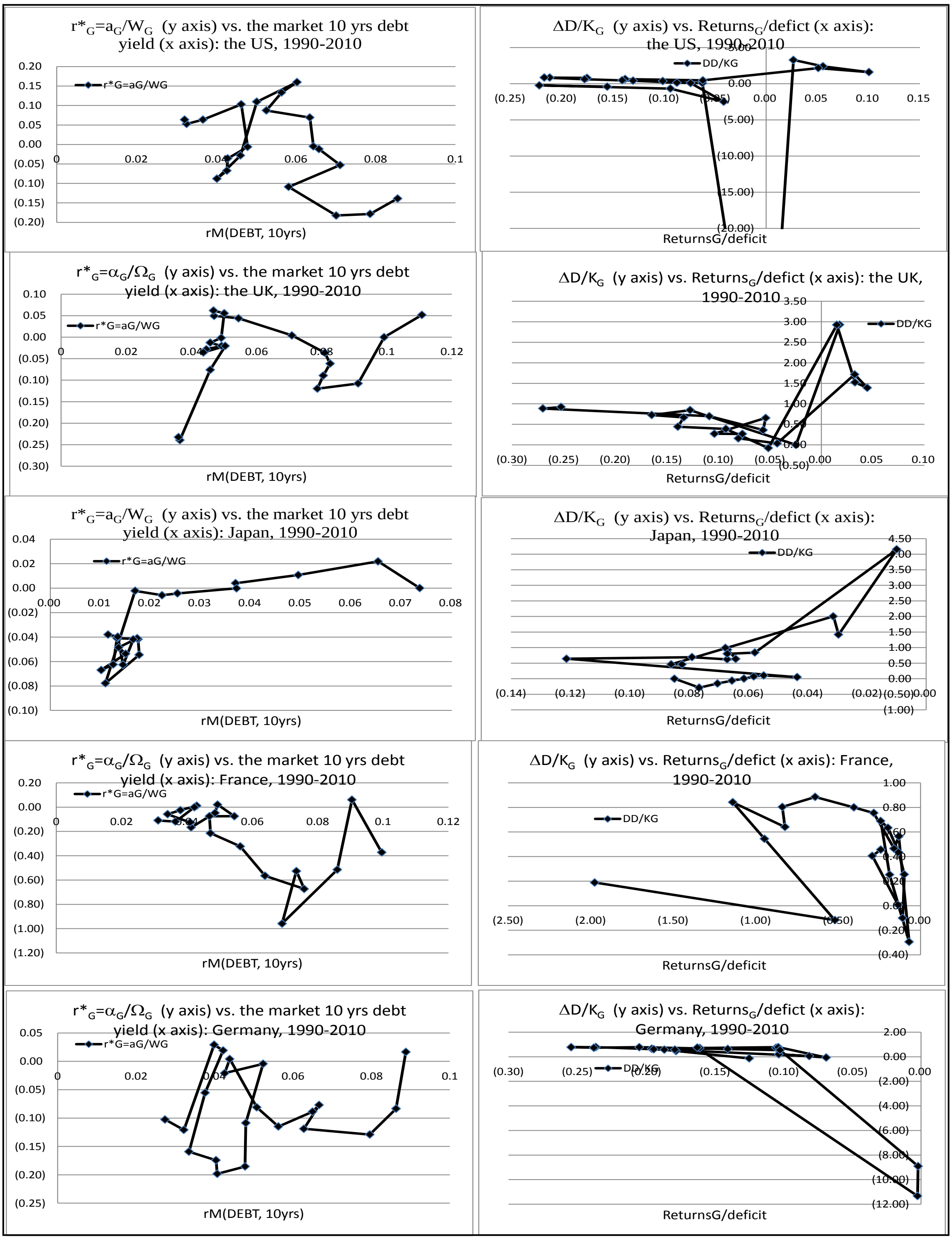
BOX 4-3 Market debt yield to the endogenous rate of return at the government sector (LHS) and the deficit/government capital stock to the government returns/deficit (RHS), average by area



Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

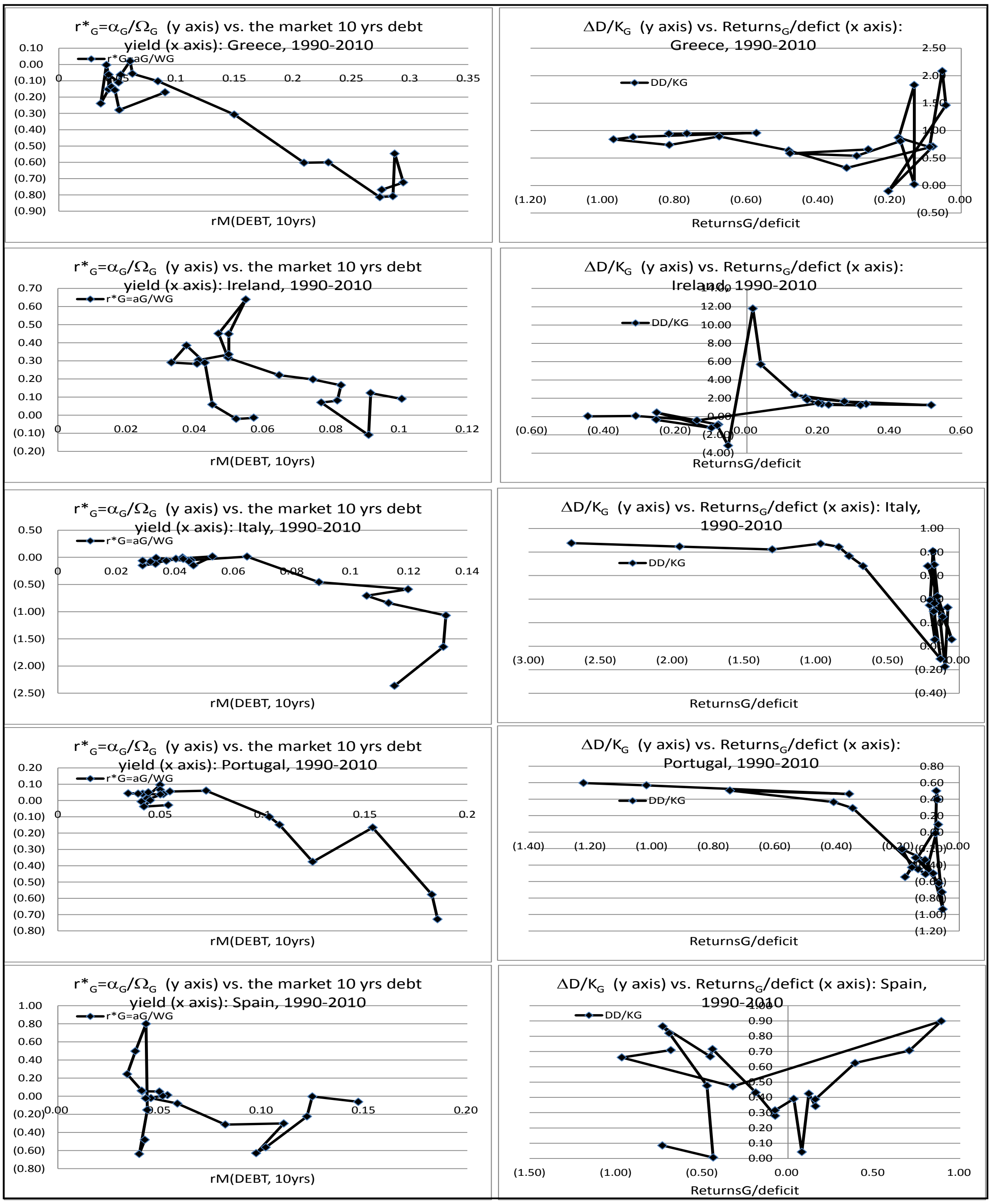
Note: Euro area is much more stable compared with the two other areas. The results within the government sector are much more fluctuating than those at the total economy and the private sector.

BOX 4-4 Market debt yield to the endogenous rate of return at the government sector (LHS) and the deficit/government capital stock to the government returns/deficit (RHS), by country (1)



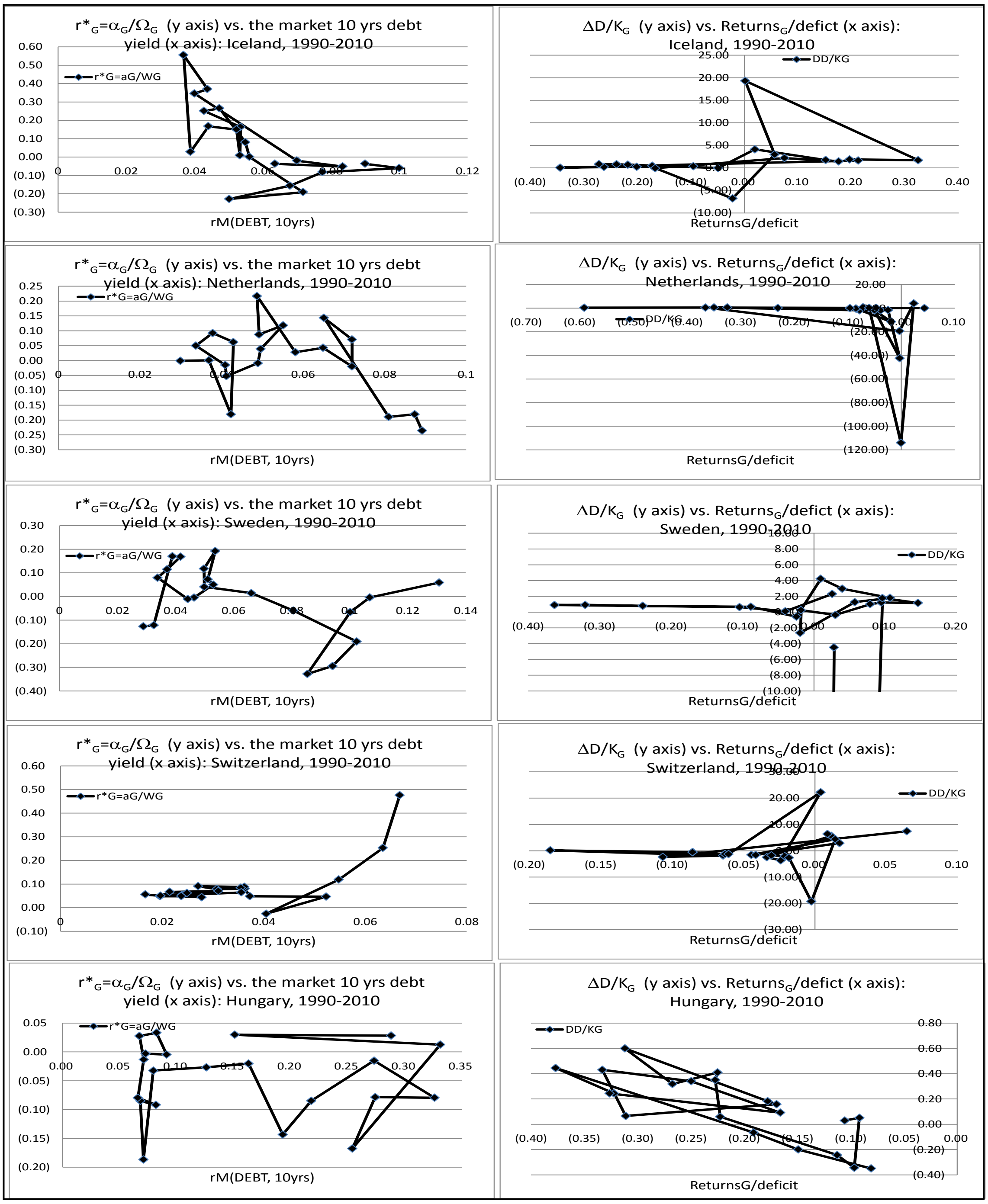
Data source: KEWT 6.12-1 by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

BOX 4-5 Market debt yield to the endogenous rate of return at the government sector (LHS) and the deficit/government capital stock to the government returns/deficit (RHS), by country (2)



Data source: KEWT 6.12-1 by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF

BOX 4-6 Market debt yield to the endogenous rate of return at the government sector (LHS) and the deficit/government capital stock to the government returns/deficit (RHS), by country (3)



Data source: KEWT 6.12-1 by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

First, on the LHS of each figure, the shape of time-series differs by country. Some countries spread widely while others narrowly. The market interest rate/yield does not basically show minus yet, the rate of return in the government sector in equilibrium spreads widely due to the change in deficit over years. The shape by country basically reflects its fiscal policy by year. The shape is also influenced by financial market policies by country. This is because fiscal policy and the financial/market policies are closely related and actual data are within a certain range of endogenous range by country.

For confirmation, let us look at time series figures by country. These figures are drawn using basic endogenous equations (for equations, see *Notations* at the beginning of the *EES*). The tendency of the market 10 year debt yield does not far from that of the rate of return at the government sector in equilibrium. It implies that the market shows the results sensitively to some extent, even though market results are intuitive. When policy-makers by country are unable to control four structural ratios (the qualitative net investment coefficient, the relative share of capital, the capital-output ratio, and the rate of return), the shape turns to abnormal. However, this sudden change does not indicate that the country will fall into default or bankrupted. Rather, by this sharp adjustment, the shape recovers soon later. Many countries have recovered with these sharp adjustments or shocks. The market warns ahead the current situation by country. The short-term market rates fluctuate sometimes sensitively, but this comes from money-oriented decision-making to react against risky conditions, although risky conditions are unknown except for endogenous data such as four structural ratios.

Second, on the RHS of each figure, the shape further differs by country. This is because net investment and its accumulation or capital stock are dynamically influenced by equilibrium conditions by country. Nevertheless, some common shape is observed when government returns are extremely minus: the higher negatively government returns the less net investment. This fact is not compulsive but due to policies by country and within the selfish balance between votes and democracy. The author indicates that this fact naturally comes from the logics/rules of the endogenous-equilibrium. When policy-makers are brave or selfish beyond a limit, the reaction backs to themselves. And, the results finally turn back to people. Policy-makers, leaders, and people know and accumulate the results through learning by doing. Developing countries are usually brave partly due to the fact that infrastructures are a necessary priority and the private sector gets its benefit by inducing foreign direct investment steadily. Some developed counties, however, invest in over-infrastructures and spend subdivides as minus taxes beyond each limit. The private sector, as a result, does not appropriately get benefits and fall into crowing out, as in Japan.

Fiscal, financial and market policies by year determines the balance of payments, deficit, and the difference between net saving and net investment in the private sector. There is mild plus and minus limits to the balance of payments by country while the real assets realize maximum returns solely under a minimum net investment and surplus=

deficit=0. Therefore, the shapes in figures by country have a variety of observations. The rules are common yet shapes differ.

The market 7% problem thus cannot be formulated by country. The goal of the market 7% problem is to seek for moderate equilibrium by country and by sector, realizing dynamic balances between actual and endogenous data and also moderate balances between government and private sectors. This chapter therefore advocates that the ratio of primary deficit after reducing interest paid cannot be generally specified or formulated.

4.5 Endogenous Conclusions

The author finds that a 7% deficit to *GDP* is empirically set with the market principles and it is not far from theoretical results. This chapter presents the necessary conditions underlying this issue. The financial/market assets show results not far from the results of the real assets. Then, why are bubbles repeated once or twice in a decade? This is not the responsibility of the financial/market assets and policy-makers. The reason is that there has not been any endogenous system to control all the parameters and variables by country, sector, and year, and over years or, in harmony with the space and time issue such that macro and micro physics and element chemistry today have conceived and partially proved. Endogenous data are most fitted for the proof of the space and time issue since money is homogenous magnitude, where a unique problem is greedy human decision-making. Equations of endogenous data are non-linear with each reduced hyperbola form. Linear econometrics is not applicable to endogenous equations. The current econometrics revives robustly by cooperating with endogenous data, where the initialization at a starting year has no given data and cut tautology.

Endogenous equations between deficits and debts by country solve the market 7% problem and reveal causes at the real assets. The answer to the market 7% problem indicates how to treat the equations between deficits and debts not to repeat bubbles and realize sustainable growth and returns by sector. The necessary conditions required for deficits and debts by country are determined by possible controllability using seven endogenous parameters derived from the discrete Cobb-Douglas production function (three items; the ratio of net investment to output, the rate of change in population, and the relative share of capital, and four items; the qualitative net investment coefficient, the relative share of capital, the capital-output ratio, and the speed year coefficient). And, four key structural ratios (the qualitative net investment coefficient, the relative share of capital, the capital-output ratio, and the rate of return) together express qualitative level of policy-control. More wholly, the necessary conditions required for deficits and debts must aim at dynamic balances between the government and private sectors, while setting actual data closer to endogenous data. Conclusively, Money-, Consumption-, *alpha*-, Deficit-, Politics-, and Spirituality-neutrals are all interrelated with no externalities.

Chapter 4

Roadmap to fiscal policy:

After empirical researches in Chapters 3 and 4 here, go to Chapters 12 and 13.

For readers' convenience: Contents of tables and figures hereunder

Table N1 Neutrality of the financial/market assets to the real assets in 17 country Asia & pacific weighted average area

Cell address	IF	IG	IH	IT	IU	JB	JD	JE	JF
Neutrality o	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
17 Asian countries						$gy^{**}=gy^*/gy^*_{(US)}$		$e^*_{(US)}=e_{(US)}+(r^*-r^*_{(US)})$	y
1990	0.1875	1.1903	3.888	0.1385	3.872	0.71	(0.0501)	1.313	1.0382
1991	0.1879	1.1706	3.936	0.1284	3.690	0.66	(0.0415)	1.299	1.0319
1992	0.1837	1.1549	4.494	0.1237	4.027	0.65	(0.0557)	1.155	1.0482
1993	0.1811	1.1552	5.186	0.1129	4.234	1.38	(0.0519)	1.068	1.0486
1994	0.1806	1.1633	5.987	0.1118	4.705	2.35	(0.0535)	1.176	1.0455
1995	0.1809	1.1659	6.089	0.1097	4.691	2.06	(0.0536)	1.261	1.0425
1996	0.1825	1.1840	6.471	0.0960	4.405	3.08	(0.0508)	1.202	1.0422
1997	0.1840	1.1925	5.770	0.0775	3.431	3.22	(0.0402)	1.062	1.0378
1998	0.1888	1.2755	8.166	0.0921	4.984	7.24	(0.0451)	1.122	1.0403
1999	0.1926	1.3325	10.344	0.0819	5.397	6.74	(0.0474)	0.957	1.0495
2000	0.1935	1.3242	9.986	0.0734	4.789	9.67	(0.0462)	0.884	1.0522
2001	0.1981	1.3802	12.303	0.0709	5.403	3.35	(0.0596)	0.822	1.0726
2002	0.2028	1.4376	13.886	0.0649	5.443	5.96	(0.0803)	0.968	1.0829
2003	0.2056	1.4598	13.546	0.0574	4.780	6.23	(0.0877)	1.175	1.0746
2004	0.2061	1.4473	12.341	0.0559	4.349	6.28	(0.0870)	1.275	1.0682
2005	0.2087	1.4619	12.938	0.0555	4.444	4.94	(0.0961)	1.084	1.0887
2006	0.2108	1.4605	12.382	0.0587	4.447	6.91	(0.0809)	1.236	1.0655
2007	0.2140	1.4549	11.130	0.0582	4.027	5.59	(0.0816)	1.390	1.0587
2008	0.2186	1.5023	12.888	0.0644	4.798	3.10	(0.0978)	1.294	1.0756
2009	0.2264	1.6173	16.543	0.0787	6.751	(0.00)	(0.1153)	1.325	1.0870
2010	0.2340	1.6089	14.797	0.0494	4.124	0.56	(0.1145)	1.222	1.0937
2011	0.2430	1.6582	16.431	0.0485	4.282	(1.04)	(0.1156)	1.178	1.0981
2012	0.2493	1.6897	17.036	0.0466	4.185	0.22	(0.1157)	1.178	1.0982

Data source: KEWT 8.14-1, by country and sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Note: *e* is the exchange (per US$, ac), *M* is mostly M2, *K* is endogenous capital, $r_{(DEBT)}$ is 10 year debt yield, and growth rates and rates of return are each endogenously measured simultaneously by year and over years, 1990-2012.

Table N2 Neutrality of the financial/market assets to the real assets at Euro currency total area (in *IFSY*) weighted average

Cell address	IF	IG	IH	IT	IU	JB	JD	JE	JF
Neutrality c	m_K=M/K	m=M/Y	m_Π=M/Π	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
E0. Euro Area using IMF data					$gy^{**}=gy^*/gy^*_{(US)}$		$e^*_{(US)}=e_{(US)}+(r^*-r^*_{(US)})$		y*
1990									
1991									
1992									
1993									
1994									
1995									
1996									
1997									
1998									
1999	0.9952	0.7519	7.943	(0.0787)	0.3719	0.80	0.0593	1.0547	0.9438
2000	0.9174	0.7415	7.802	(0.0632)	0.4627	0.90	0.0520	1.1267	0.9538
2001	0.8734	0.7612	8.124	(0.0572)	0.4679	0.57	0.0318	1.1665	0.9728
2002	0.7738	0.7319	4.934	(0.1076)	0.3137	0.24	0.0619	1.0155	0.9390
2003	0.7486	0.8078	8.714	(0.0443)	0.4842	0.37	(0.0170)	0.7748	1.0219
2004	0.7297	0.8256	8.825	(0.0413)	0.5007	0.43	(0.0210)	0.7132	1.0294
2005	0.7332	0.8727	9.373	(0.0438)	0.4398	0.47	(0.0340)	0.8137	1.0418
2006	0.7340	0.9080	9.558	(0.0382)	0.5027	0.53	(0.0212)	0.7381	1.0287
2007	0.7308	0.9386	8.712	(0.0406)	0.5162	0.32	(0.0170)	0.6623	1.0256
2008	0.7268	1.0048	10.420	(0.0261)	0.6251	0.24	(0.0450)	0.6735	1.0669
2009	0.7012	1.0507	11.176	(0.0224)	0.6423	(0.00)	(0.0662)	0.6280	1.1054
2010	0.6786	1.0445	11.211	(0.0227)	0.6245	0.06	(0.0698)	0.6786	1.1029
2011	0.6553	1.0390	11.241	(0.0152)	0.7393	0.06	(0.0720)	0.7009	1.1028
2012	0.6508	1.0740	11.584	(0.0257)	0.5429	0.07	(0.0742)	0.6837	1.1085

Data source: KEWT 8.14-2, by country and sector, 1990-2012; Euro area original data are from *International Financial Statistics Yearbook*, IMF.

Note: *e* is the exchange (per US$, ac), *M* is mostly M2, *K* is endogenous capital, $r_{(DEBT)}$ is 10 year debt yield, and growth rates and rates of return are each endogenously measured simultaneously by year and over years, 1990-2012.

Chapter 4

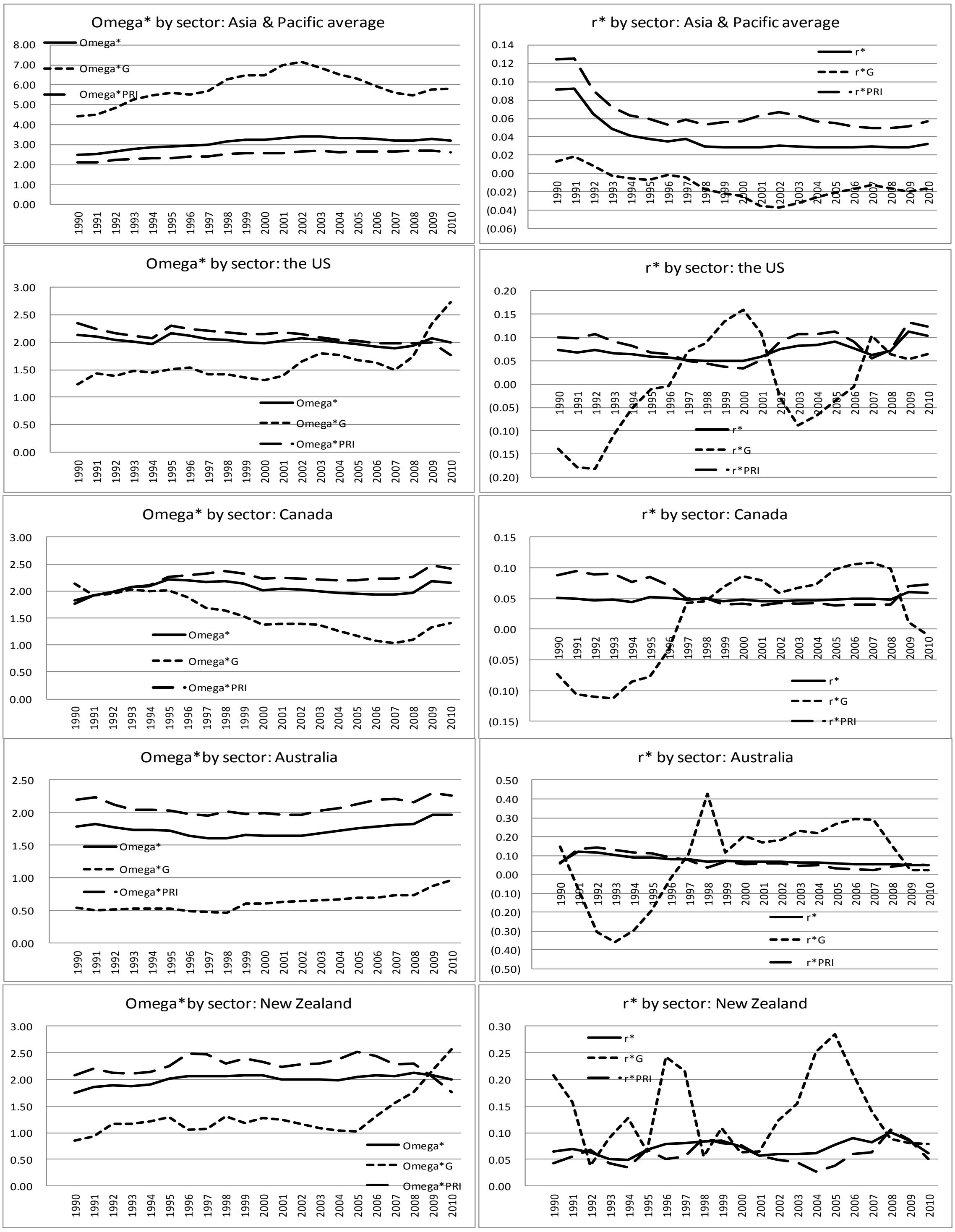
Table N3 Neutrality of the financial/market assets to the real assets in 15 countries, except for Euro area, Europe weighted average area

Cell addres	IF	IG	IH	IT	IU	JB	JD	JE	JF
Neutrality c	m_K=M/K	m=M/Y	m_Π=M/Π	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
15 Europe except for Euro Area					$gy^{**}=gy^*/gy^*_{(US)}$		$e^*_{(US)}=e_{(US)}+(r^*-r^*_{(US)})$		y*
1990	0.3634	0.6705	6.4580	0.1994	4.5439	47.84	(0.0421)	340.89	1.0001
1991	0.3898	0.6670	7.2144	0.1417	3.6223	74.01	(0.0352)	581.41	1.0001
1992	0.4019	0.6346	6.8685	0.1152	2.9689	(29.71)	(0.0381)	873.63	1.0000
1993	0.4434	0.6446	5.949	0.1060	2.4225	365.66	(0.0123)	1467	1.0000
1994	0.5775	0.7063	7.422	0.1126	2.4474	(209.08)	(0.0059)	3893	1.0000
1995	0.0572	0.0362	0.392	0.1753	2.2009	2.43	0.0627	17.5529	0.9964
1996	0.0613	0.0362	0.390	0.1750	2.1154	2.87	0.0780	19.6336	0.9960
1997	0.0732	0.0300	0.287	(0.0355)	0.8606	1.75	0.1826	23.5289	0.9922
1998	0.0708	0.0260	0.278	(0.0730)	0.7134	6.04	0.1865	25.1550	0.9926
1999	0.0703	0.0258	0.253	(0.1155)	0.5846	11.01	0.2119	28.8446	0.9927
2000	0.0669	0.0248	0.240	(0.1344)	0.5176	11.90	0.2130	32.2461	0.9934
2001	0.0578	0.0208	0.211	(0.1541)	0.4382	11.12	0.1986	33.2885	0.9940
2002	0.0554	0.0202	0.211	(0.1603)	0.3908	6.01	0.1682	27.5136	0.9939
2003	0.0554	0.0215	0.195	(0.1968)	0.3065	5.05	0.1808	25.0266	0.9928
2004	0.0522	0.0229	0.207	(0.1768)	0.2979	4.67	0.1482	21.9564	0.9933
2005	0.0684	0.0343	0.302	(0.1645)	0.2746	5.21	0.1146	24.7169	0.9954
2006	0.0642	0.0375	0.362	(0.1142)	0.3560	5.98	0.0832	23.1775	0.9964
2007	0.0636	0.0431	0.415	(0.0857)	0.4409	6.23	0.0776	20.7469	0.9963
2008	0.0617	0.0470	0.494	(0.0548)	0.5611	5.98	0.0409	26.4900	0.9985
2009	0.0562	0.0491	0.460	(0.0501)	0.5897	(2.55)	(0.0065)	26.6224	1.0002
2010	0.0576	0.0533	0.526	(0.0479)	0.5633	0.71	(0.0048)	27.4149	1.0002
2011	0.0578	0.0545	0.578	(0.0413)	0.5864	477.40	(0.0145)	28.0840	1.0005
2012	0.0562	0.0568	0.613	(0.0369)	0.5974	880.10	(0.0229)	28.3083	1.0008

Data source: KEWT 8.14-3, by country and sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

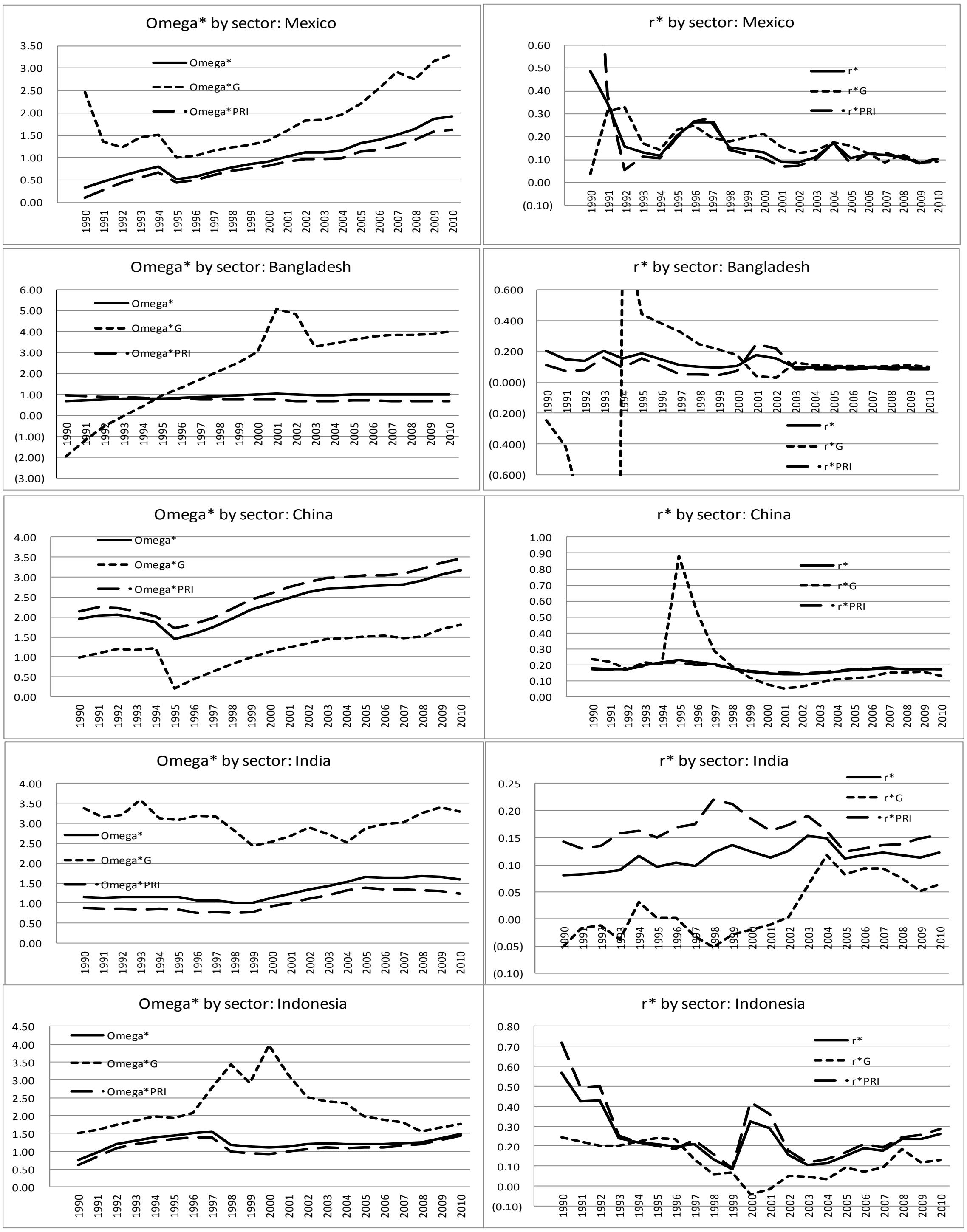
Notes: *e* is the exchange (per US$, ac), *M* is mostly M2, *K* is endogenous capital, $r_{(DEBT)}$ is 10 year debt yield, and growth rates and rates of return are each endogenously measured simultaneously by year and over years, 1990-2012.

For year 2012, some data are incomplete showing zero by cell.



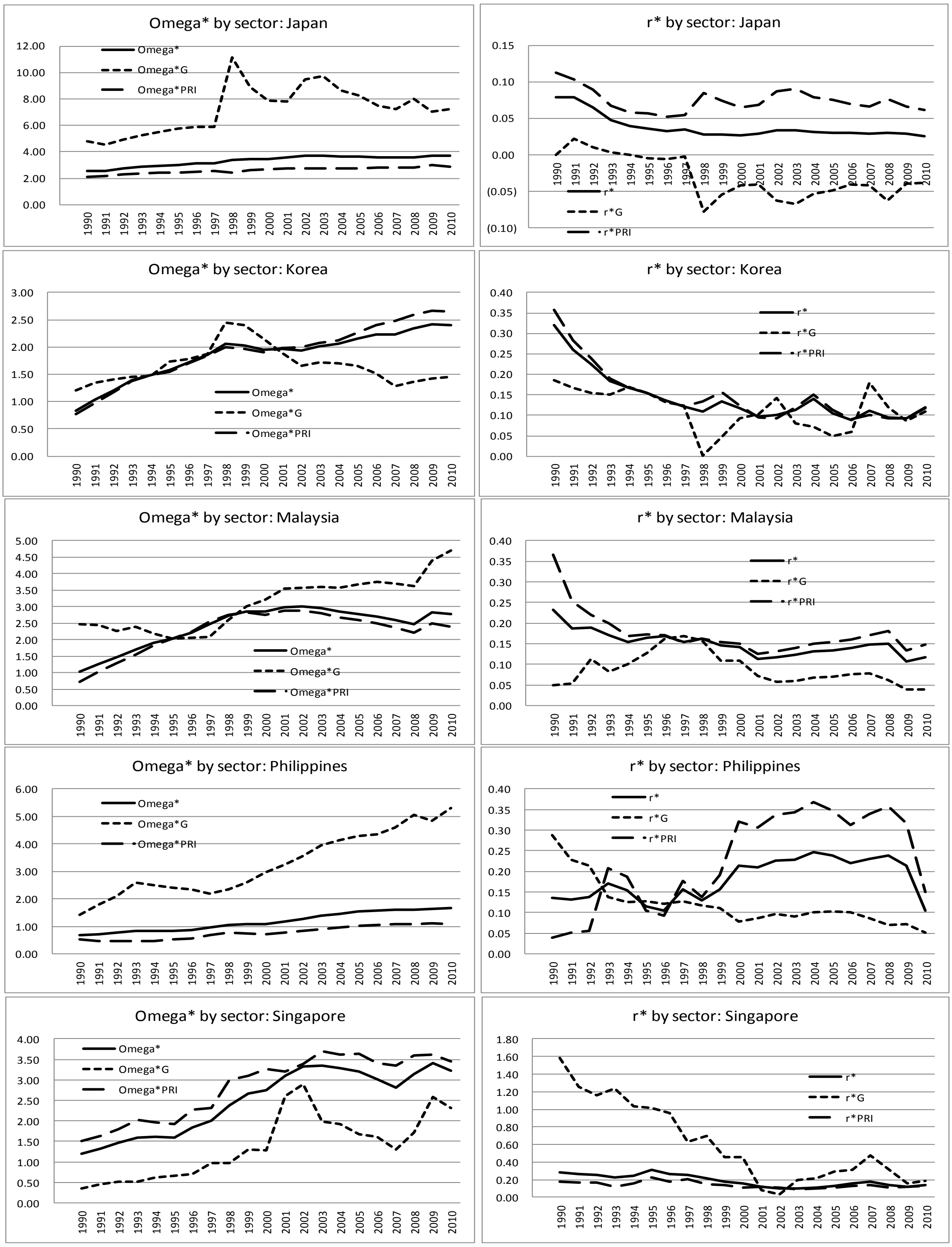
Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure O1 The capital-output ratio, Ω^*, and the rate of return, r^*, 1990-2010: 17 country area average; the US; Canada; Australia; New Zealand



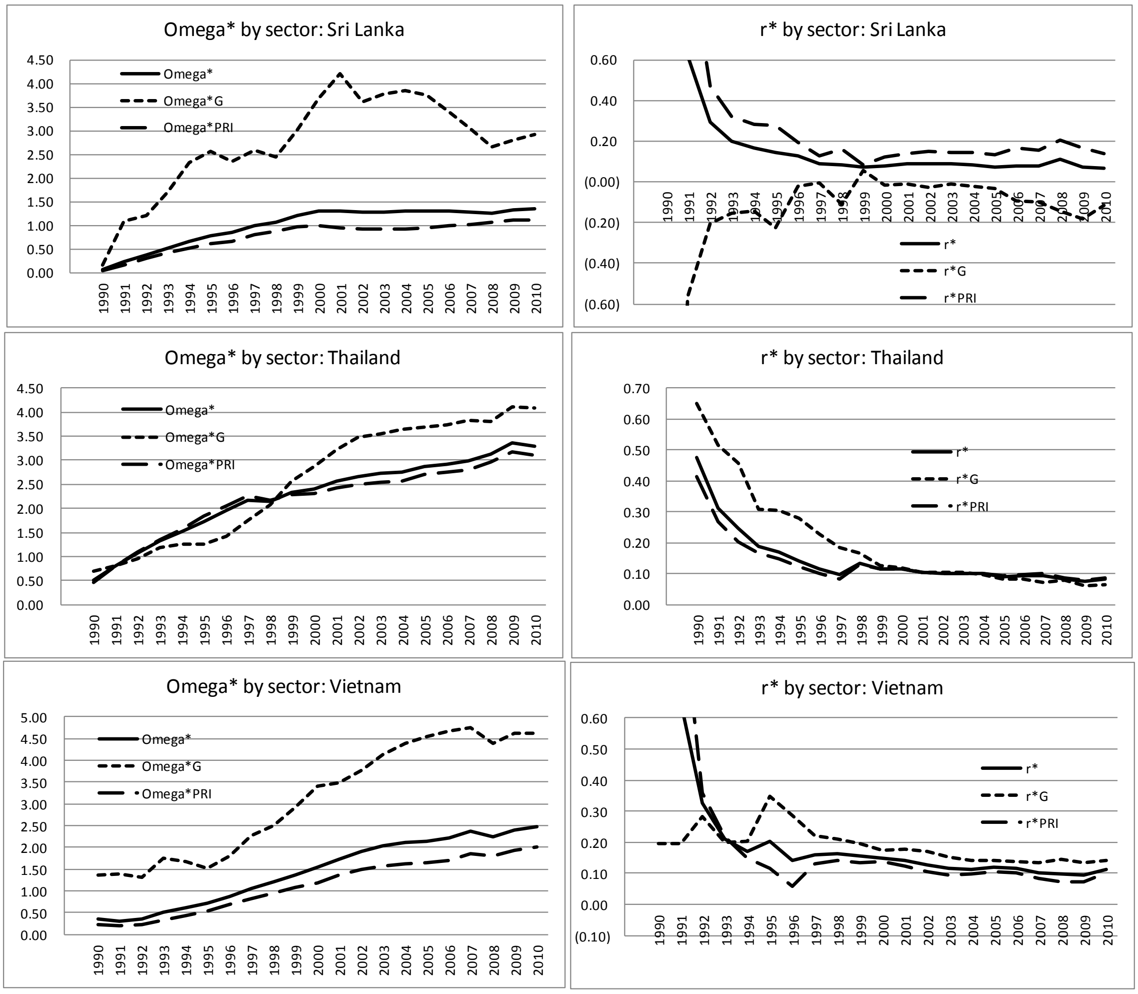
Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure O2 The capital-output ratio, Ω^*, and the rate of return, r^*, 1990-2010: Mexico; Bangladesh; China; India; Indonesia



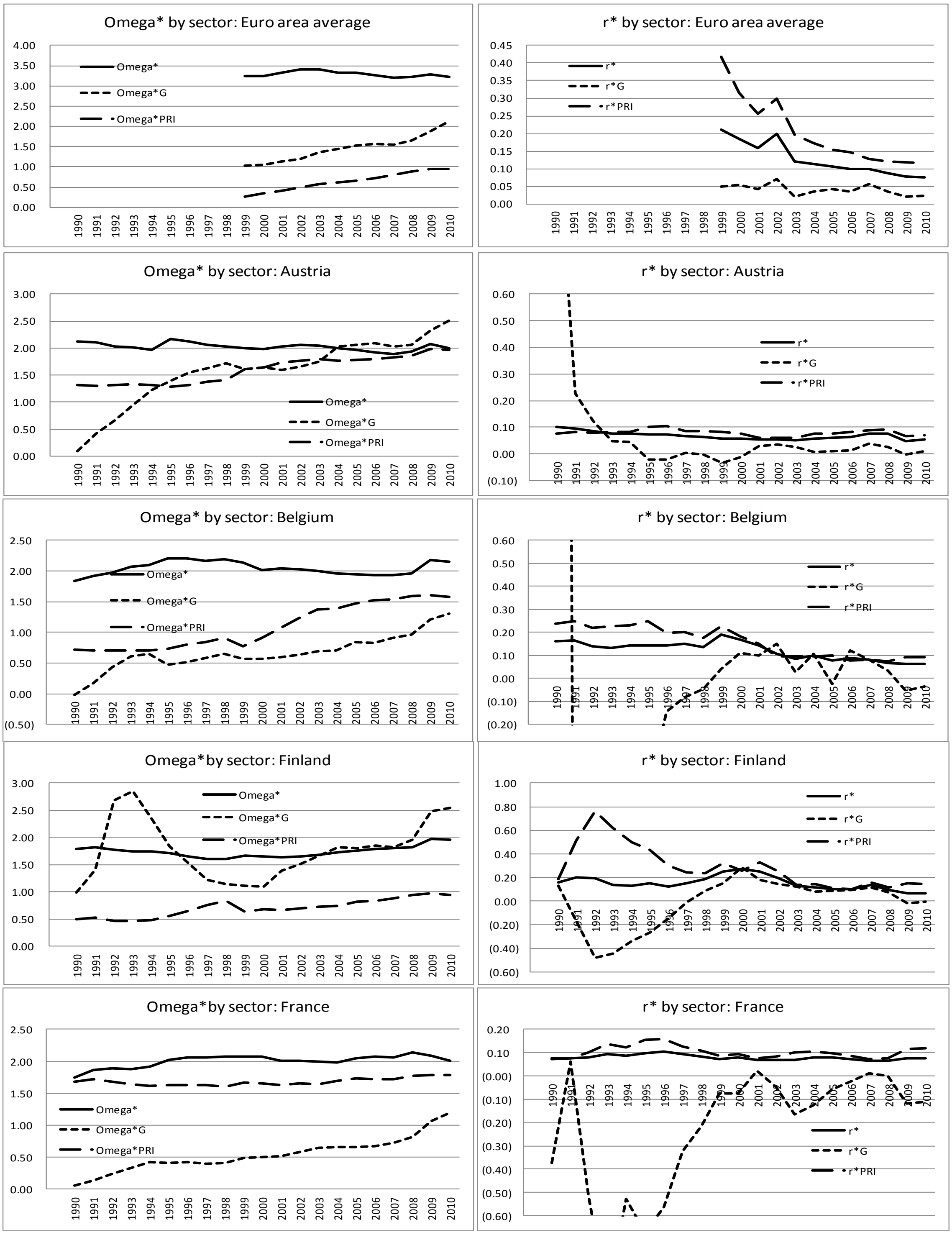
Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure O3 The capital-output ratio, Ω^*, and the rate of return, r^*, 1990-2010: Japan; Korea; Malaysia; Philippines; Singapore



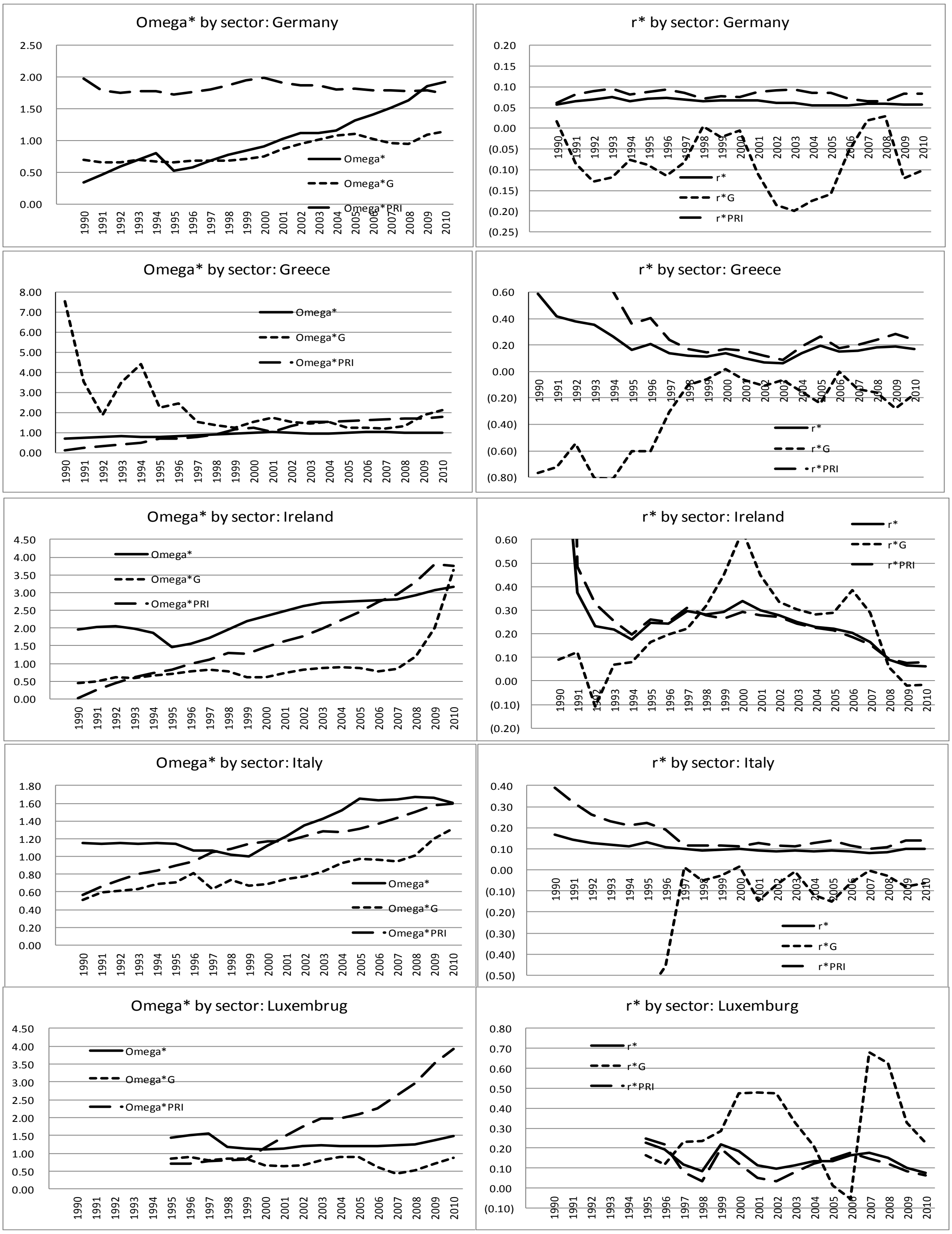
Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure O4 The capital-output ratio, Ω^*, and the rate of return, r^*, 1990-2010: Sri Lanka; Thailand; Vietnam



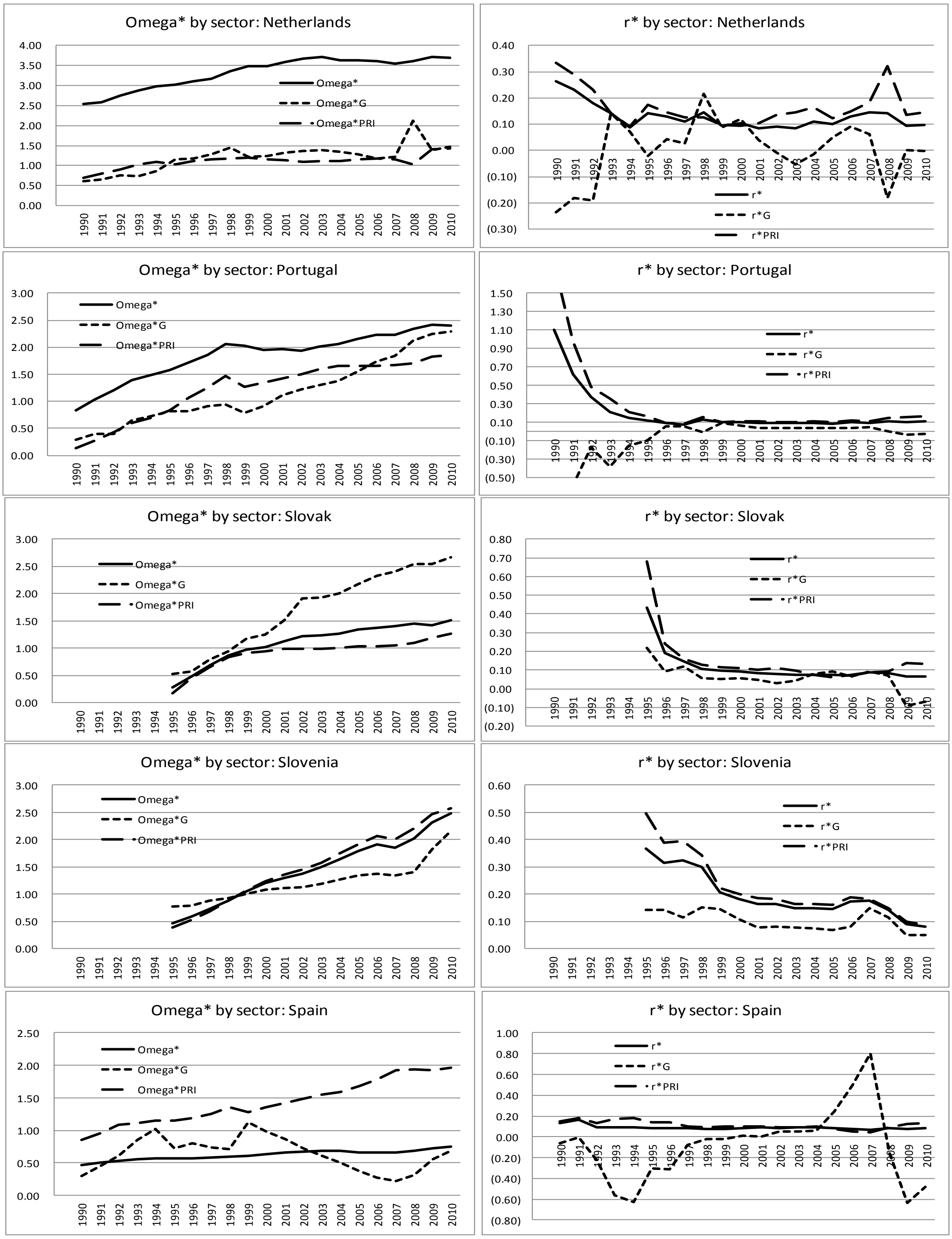
Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure O5 The capital-output ratio, Ω^*, and the rate of return, r^*, 1990-2010: Euro area average; Austria; Belgium; Finland; France



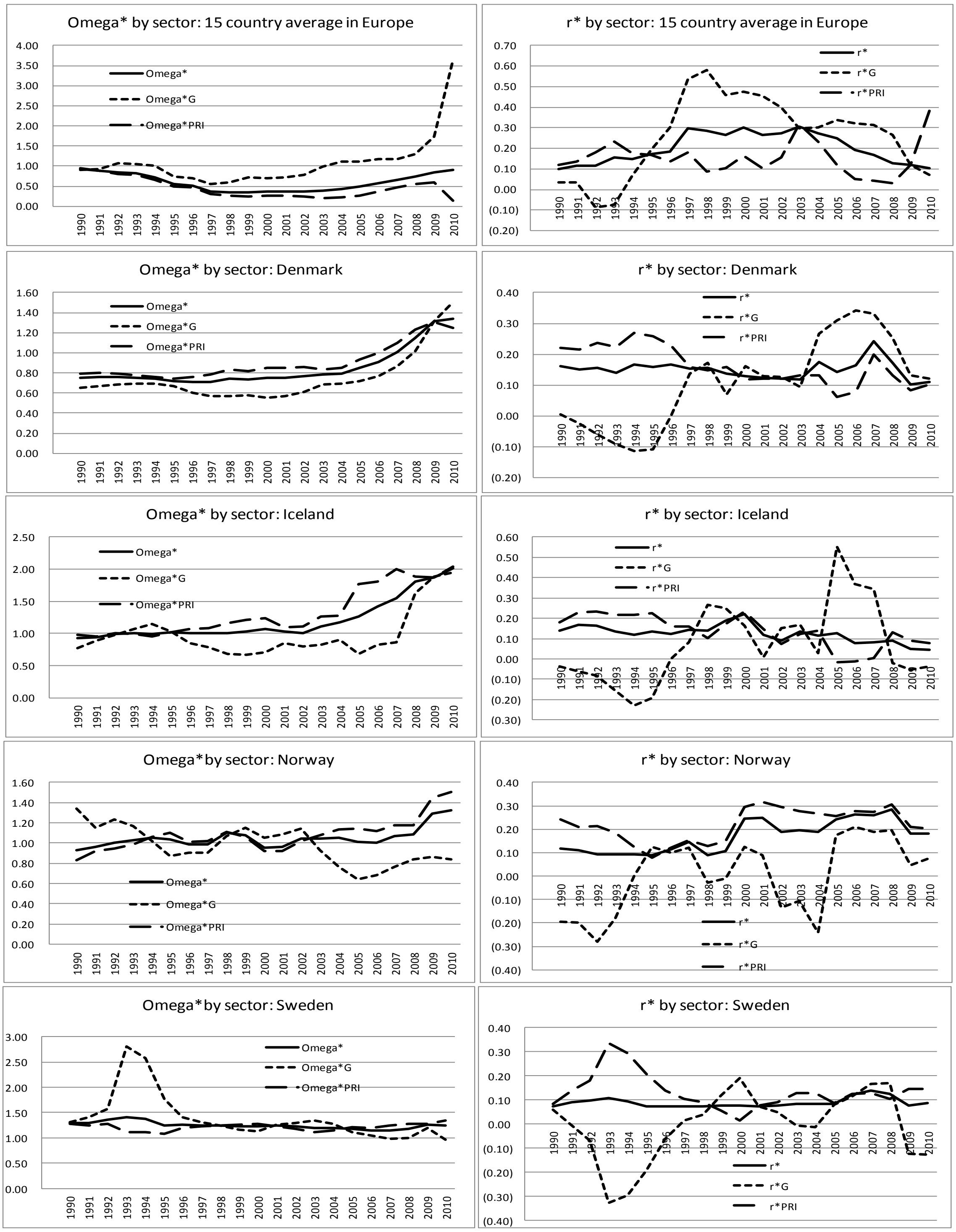
Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure O6 The capital-output ratio, Ω^*, and the rate of return, r^*, 1990-2010: Germany; Greece; Ireland; Italy; Luxemburg



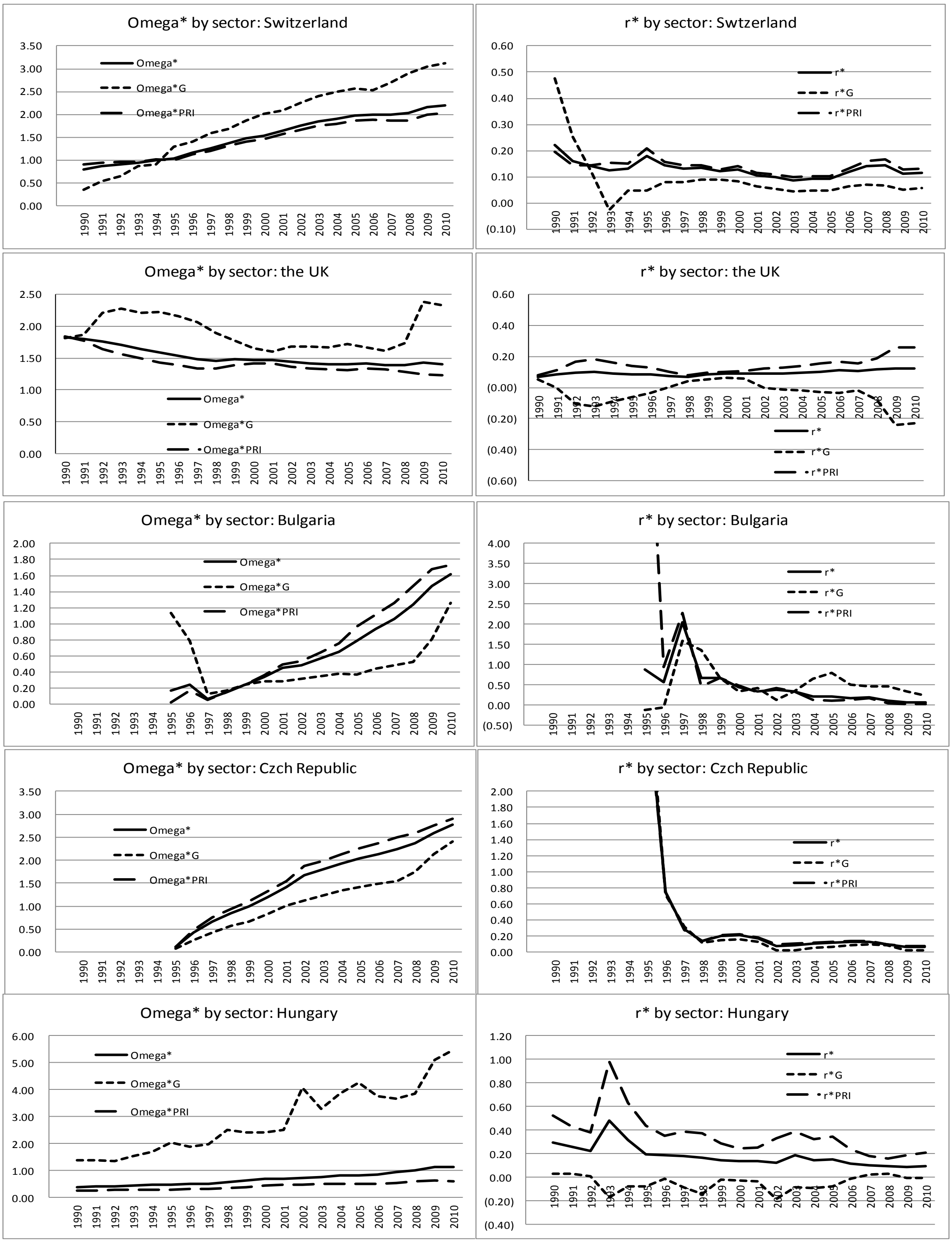
Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure O7 The capital-output ratio, Ω^*, and the rate of return, r^*, 1990-2010: Netherlands; Portugal; Slovak; Slovenia; Spain



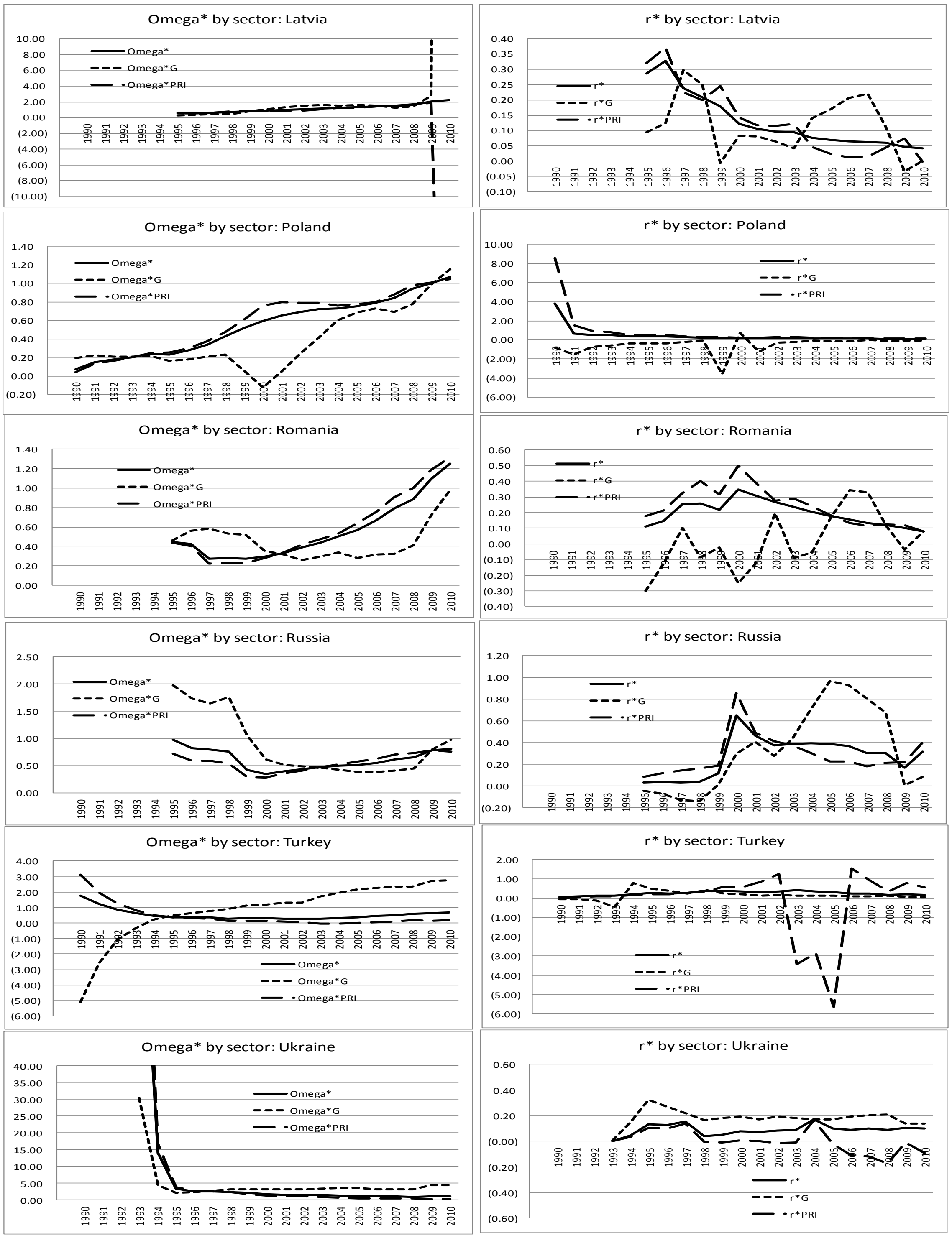
Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure O8 The capital-output ratio, Ω^*, and the rate of return, r^*, 1990-2010: 15 country average in Europe; Denmark; Iceland; Norway; Sweden



Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure O9 The capital-output ratio, Ω^*, and the rate of return, r^*, 1990-2010: Switzerland; the UK; Bulgaria; Czech Republic; Hungary



Data source: KEWT 6.12-1 to -3, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure O10 The capital-output ratio, Ω^*, and the rate of return, r^*, 1990-2010: Latvia; Poland; Romania; Russia; Turkey; Ukraine

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Chapter 5

How to Solve the Fiscal Problems In the Current Financial Crisis

5.1 Introduction: Why Separately vs. Endogenously towards Fiscal Policy?

This chapter moves to a whole sketch of fiscal policy, by measuring and interpreting the endogenous costs of capital by country and sector, and approaches how to solve fiscal problems. A related endogenous equation and its reduced hyperbola are used for this purpose, with the KEWT database. Statistics data and related databases are not fitted for essentially solving fiscal problems. This chapter begins with why the KEWT database is most directly policy-oriented, compared with the current databases. Each chapter after chapter 5 discusses a focused issue step by step, gradually towards a total version and, essentially answers unsolved economic problems at the macro level.

A system for national accounts (SNA, 1993) aims at records/recording and presents a base for statistics. The purpose of recording is right at the SNA. Statistics data are available, in addition to the SNA data recorded by country, at the current worldwide databases such that Penn World Table (PWT and EPWT), BEA, NBER, KOF, DDGG, EU KLEMS of the Conference Board, Real-Time, Time-Use, OECD, UN and UNU, IMF and the World Bank, and KEWT.[1]

Questions: Could the SNA and worldwide databases answer policy-problems to avoid symptomatic treatments to the financial crises and not to repeat bubbles and heavy burden of deficit? Are the database and the solution of economic policies really independent? These questions might be answered solely by setting up another system that aims at policy-

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[1] For detail, See Chapter 6; PWT 7.0 and, EPWT, v. 4.0: http://www.pwt.econ.upenn.edu
BEA: http://www.bea.gov; KOF: http://globlization.kof.ethz.ch; NBER: http://nber.org;
Time-Use: http://www.timeuse.org/information/links; OECD: http://OECD.com;
ddgg to 10 sectors: http://www.ggde.net/dseries/10-sector.html;
EU KLEMS: http://www.euklems.net/euk09i.shtml;
Real-Time: http://www.philadelphiafed.org/research-and-data/;
UN: http://unstats.un.org/unsd/snaama/selectionbasicFact.asp;
IMF: http://imf.org; World Bank: http://data.worldbank.org; KEWT 7.13: http://riee.tv

oriented sub-system. This is the author's viewpoint. For example, the use of the KEWT database, as expressed by the endogenous system and based on the real assets. The policy-oriented sub-system will cooperate with the SNA and reinforce the SNA. Leaders, policy-makers, and people urgently demand not mere analyses but essential solutions. And, worldwide databases, SNA statistics, economic policies, and the KEWT database reinforce each other--win and win! These expressions are the author's reply at the *EES*.

For solving the above problems, the following recognition may be effective as the first step. This recognition is to review the background of the literature, the SNA, and databases, without any preconception. The capitalism started with macro demand and supply by goods and by money. The market principles have been the second best since there has appeared no first-best historically. This recognition will be correct. The market principles are connected with individual utility function. This function aims at maximizing individual consumption. Thus maximum consumption has been a principal objective of econometrics since Samuelson, P. A. (97-120, 1941) clarified a framework of competitive statics and dynamics. Arrow, K. J. and Debreu, G. (265-290, 1954) published a decisive article for equilibrium. Since Klein, L. R. (1-12, 39-57, 1950), econometrics has spread as a great methodology. The equilibrium based on the market principles--the author calls it the price-equilibrium--has remained since economics started. In the last one decade, the methodology of econometrics has stepped into delicate relationships between deficit, votes, and democracy, as shown at some of academic conferences.

Nevertheless, why has bubbles been repeated after the 1950s? Three grounds are (1) a rough relationship between individual utility and maximized consumption via the capital-labor ratio and in the price-equilibrium, (2) the use of final consumption at households just after the redistribution of income caused by government spending and deficit before redistribution, and (3) the use of deficit as the difference between cash flow-in and –out, under an assumption that government does produce no return. Meade, J. E. (1960, 1962) and Meade, J. E. and Stone, J. R. N. (1969) advocated the income equality of income, expenditures, and output. Yet, this equality is not realized in statistics and databases since the SNA is records-oriented. Wages or compensation and profits or returns are charming objectives in econometrics.

Denote that α or $1-\alpha$ is the relative share of capital or labor,

$\Omega = \Omega^* = \Omega_0$ is the capital-output ratio, and $r = r^* = r_0$ is the rate of return in the endogenous-equilibrium. Then, $\alpha = \Omega \cdot r$ presents the best clue to an integrated set of policies that connect real-assets polices with financial, market, central, local/private banks, and other policies to environmental and human society. Nevertheless, statistics and databases, based on records, are unable to accurately measure $\alpha = \Omega \cdot r$.

The KEWT database has repeatedly proved the following fact, by comparing actual data with endogenous data: Estimated data and ratios derived using econometrics are always within a certain range of endogenous data and ratios in a moderate equilibrium. A moderate equilibrium is directly measured by seven endogenous parameters[2] and also indirectly by principal variables such as $\alpha = \Omega \cdot r$ and the growth rates of output and output per capita, g_Y^* and g_y^*. Therefore, econometrics, the current databases, and the KEWT database are colleagues to reinforce each other and thus, econometrics in reality will progress more peacefully for the world economies by country. This is because the rate of change in population in equilibrium equals the actual growth rate of population when the endogenous-equilibrium prevails and because causes of deflation under heavy deficit accumulation are clarified by seven endogenous parameters, with endogenous equations and the corresponding hyperbolic equations. For the rate of inflation or a minus inflation (=deflation), a hyperbola of the rate of return to the ratio of net investment to output in equilibrium, $r^*(i)$, measures an optimum range of equilibrium endogenously.

The current databases present either an internal rate of return in the discrete time using actual statistics, or Log growth in real-time in the continuous time. Neo- and New- Keynesians pursue the discrete case while Neoclassicists the continuous case. Both cannot be wholly united except for the endogenous system as long as the author has investigated after the 1950s. This is because a discrete Cobb-Douglas (C-D) production function does not hold without clarifying hidden seven endogenous parameters as formed in the endogenous system. A fact is that there is no evidence to prove the relationship between the rate of return, r^*, and the growth rate of output, g_Y^*, in the literature.

Phelps, E. S. (638-643, 1961) proves the existence of the golden rule at the golden age, but without evidences. The relationship between r^* and g_Y^* is a tie in reality. The tie is divided into two; the exogenous

[2] THREE: the ratio of net investment to output, the rate of change in population, and the relative share of capital, and FOUR: the qualitative net investment coefficient, the relative share of capital, the capital-output ratio, and the speed year coefficient.

Phelps coefficient and the author's endogenous Phelps coefficient, $\alpha/(i \cdot \beta^*)$; $r^* = (\alpha/i \cdot \beta^*)g_Y^*$, where β^* is the quantitative net investment coefficient, $i = I/Y$ is the ratio of net investment to output, and endogenous output, $Y = W + \Pi = C + S$, satisfies three equality of income, expenditures, and output, purely endogenously. 'Purely endogenous' holds only when externalities and assumptions completely disappear and only under scientific proofs of mathematicians at the endogenous system. A variety of denotations is used for 'endogenous growth' in the literature but, each definition remains partial. Net investment after capital consumption is involved in the balance of payments and deficit but, it should be purely endogenous in the open structure of the balance of payments,[3] $(S - I) = (S_G - I_G) + (S_{PRI} - I_{PRI})$ at the real assets.

The qualitative net investment coefficient, $1 - \beta^*$, is deeply involved in the rate of technological progress, $g_A^* = i(1 - \beta^*)$. $g_A^* = i(1 - \beta^*)$ holds endogenously while Solow's (1956) and Swan's (1956) exogenously. Upon measure of $g_A^* = i(1 - \beta^*)$, the marginal productivity of capital (MPK) equals the rate of return and the marginal productivity of labor (MPL) equals the wage rate and also, the marginal rate of substitution is measured as 1.0 by year. These values are confirmed using recursive programming by the same year. As a result, perfect competition is released from an assumption, which the literature does not realize commonly and universally by country. This shows a limit of individual utility equation at the micro level, indispensably.

Lastly, as a result, the neutrality of the financial assets to the real assets is complete at the endogenous system, as proved in KEWTs 3.09 to 6.12, each year (one at *Int Adv Econ Res* 16: 282-296; related cells of 65 countries and, the other at KEWT 6.12). This neutrality integrates not only the real and financial assets as the first policy category but also financial, monetary, central bank and private bank policies, and others, as the second policy category. Endogenous 'policies,' based on rival capital and labor at KEWT, work cooperatively with external strategies, based on non-rival education, R&D, learning by doing, and human capital. The core is the government sector that controls the total economy as a whole. The government sector is solely expressed just before the redistribution of income to households and enterprises at the private sector.

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[3] Why is the growth rate of output in equilibrium the highest at $S_G - I_G = 0$? The question is proved by using this equation. When $S_G - I_G = 0$ appears, the ratio of net investment to output, $i = I/Y$, locates at the top of a parabolic convex, since the higher the $i = I/Y$, the higher the rate of technological progress is, as shown by $g_A^* = i(1 - \beta^*)$ below.

Define government spending, $E_G = C_G + I_G$. Then, $T_{AX} - E_G = (S_G - I_G)$ endogenously holds; C_G is consumption and S_G is saving at the government sector. Thus, $T_{AX} = C_G + S_G$ holds, and therefore, $T_{AX} = Y_G$ holds endogenously. As a result, when deficit, ΔD is zero, $T_{AX} = C_G + I_G$ holds since $T_{AX} - \Delta D = C_G + I_G$. $T_{AX} = C_G + I_G$ is derived: The higher the size of government, Y_G/Y, the more the net investment.

Back to a hyperbola, $r^*(i)$; the higher the net investment the lower the rate of return in equilibrium is. These two implies that a goal of two category-integrated policies requires a direction towards a maximized rate of return with a minimized net investment, or the goal should realize an optimum range of the endogenous-equilibrium by using a lower rate of $i = I/Y$. The optimum range is realized by directly adjusting seven endogenous parameters. The speed years for convergence and principal variables express fundamental results; endogenous-shocks bring about close-to-disequilibrium or net investment approaching close to zero, each simultaneously by country. The author indicates that if endogenous results hardly exist, the second best market principles must work alone; with repeating bubbles and symptomatic treatments and, without sustainable growth.

5.2 Evidences to an Integrated Set of Policies: Using the Cost of Capital at KEWT

This chapter empirically presents two sets of evidences by country. For developed countries, the US, Australia, Japan, France, Germany, the UK, Canada, Italy; And, for developing countries, Spain, China, India, Brazil, Mexico, Russia, South Africa, each for 1990-2012. These two evidence sets are: (1) The cost of capital as the rate of return less the growth rate of output, $CC = C\ of\ C = r^* - g_Y^*$, using KEWT database by country; (2) The rate of return to net investment using a hyperbola, $r^*(i)$, with endogenous rate of inflation or deflation. (1) and (2) are interrelated endogenously. (1) measures the causes of inflation and deflation at the real-assets and (2) presents an optimum range of rate of return to net investment and clarifies the ground hidden behind financial, market, and central and local bank policies.

This section shows evidences of the cost of capital, where the nominal rate=the real rate + the rate of inflation or deflation, whose first setting was Fisher, I. (1907, 87-116). Evidences are shown by **Tables 1, 2, 3**, and **4**. Suppose that the rate of return at the G sector is minus due to heavy deficit by year. Then, even if the rate of return at the PRI sector is high, the rate of return at the total economy becomes extremely low. If the rate of return at the PRI sector is low due to crowding out, the rate of return at the total economy becomes much close to zero, as shown in Japan. For evidences of the above facts, Tables 1, 2, 3, and 4 each compare the cost of capital in the G sector with that in the PRI sector; accordingly, at the total economy as the weighted aggregate or average.

Let the author explain the logics behind the evidences shown in the four tables. The rate of return and the growth rate of output are connected with $\alpha/(i \cdot \beta^*)$ in $r^* = (\alpha/i \cdot \beta^*)g_Y^*$. Suppose $\alpha = i \cdot \beta^*$ is 1.0. Then, the cost of capital is zero, which is not realized. $\alpha < i \cdot \beta^*$ and $\alpha > i \cdot \beta^*$ are in reality. A hyperbola of $\beta^*(i)$ shows that the higher the $i = I/Y$ the more ineffective (or lower) endogenous technological progress is. The contents of technological progress must be selected severely between the G and PRI sectors and towards earth environmental cooperation. The hyperbola type of $\beta^*(i)$ is the same as that of $r^*(i)$ as explained at the next section; since the type is expressed by $y = \frac{cx+d}{ax}$, where b=0 and accordingly the vertical asymptote is zero, VA=0. The above fact indicates that net investment by country should be low and if it is high bubbles will be repeated. A sustainable technological progress is the goal of an integrated set of policies for real, fiscal, financial markets, and central and local banks, and others.

The $\alpha/(i \cdot \beta^*)$ is the endogenous Phelps coefficient and determines the level of the cost of capital. Besides, the rate of inflation or deflation is measured by the rate of return less the horizontal asymptote; $r^* - HA_{r^*(i)}$ (see soon below). Further, a sign to bubbles is expressed by the valuation ratio as the rate of return divided by the cost of capital, $v^* = r^*/(r^* - g_Y^*)$. When the valuation ratio is abnormal or shows a shock similarly to the speed years for convergence, the endogenous-equilibrium is uncontrollable by policy-makers. Many countries have the valuation ratio abnormal often in the last 23 years, 1990-2012, as shown each by the third row of Tables 1, 2, 3, and 4. Most of developed countries have shown a negative rate of inflation or deflation. This is traced back to deficits accumulated beyond government savings (see Note 3). And, a sign of bubbles is foreseen by the valuation ratio. If the valuation ratio begins to rapidly rise, financial and market symptomatic treatments are required not to repeat bubbles. Bubbles are a common source of declining fortune of a country. Symptomatic treatments should be used for oppressing bubbles. Symptomatic treatments aiming at economic recovery, however, are impossible since a low rate of return is a result of accumulated deficits and debts. Central bank's attitude aiming at against inflation follows the above logic and evidences.

5.3 Evidences to an Integrated Set of Policies: Using a Hyperbola, $\boldsymbol{r^*(i)}$

The endogenous system is geometrically strengthened by twelve hyperbolas reduced from corresponding endogenous equations in the endogenous-equilibrium.[4] The processes to form endogenous equations were wholly proved step by step, as summarized in a working paper (Feb, 2011). The $r^*(i)$ presents a method for controlling the rate of inflation and deflation, by moving the current level of $i = I/Y$. Seven endogenous parameters lead the endogenous-equilibrium to a balanced and moderate level. Deflation appears only when accumulated deficits or debts are extreme, as explained above.

The maximum utility theory is able to protect its thought by cooperating with $r^*(i)$. The concept of maximum and minimum in the literature is illustrated by the parabolic curve, convex and concave, only at the 1st quadrant but, evidences are not enough under the uses of prevailing Log growth and the real-time of Croushore, D., and Stark, T. (493-501, 2003). In the case of $r^*(i)$, a maximum rate of return and a minimum net investment are in reality at an optimum range of $r^*(i)$ at the 1st and 4th quadrants. Evidences show that the maximum rate of return is realized when deficit is zero. Accordingly, questions regarding 'deficit and growth' and 'increase in taxes and decrease in deficit' are accurately answered with the endogenous size of government of $T_{AX}/Y = (C_G + S_G)/Y$ (see Note 3).

Figures 2 and **3** each show $r^*(i)$ of 12 countries, corresponding with Tables 1, 2, 3, and 4. These figures were drawn helped with Tomoda

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[4] Twelve hyperbolas reduce to six forms by type. (1) $y = \frac{1}{ax+b}$: 1-1 $speed(i)$ and 1-3 $speed(n)$; (2) $y = \frac{cx+d}{ax}$: 2-1 $r^*(i)$. 6-1 $\beta^*(i)$; (3) $y = \frac{cx+d}{b}$: 2-3 $r^*(n)$; (4) $y = \frac{cx}{ax+b}$: 3-1 $\Omega^*(i)$. 4-1 $i(n)$. 4-3 $\Omega^*(\beta^*)$; (5) $y = \frac{d}{ax+b}$: 3-3 $\Omega^*(n)$; (6) $y = \frac{cx+d}{ax+b}$: 5-1 $\beta^*(n)$. 5-3 $\widetilde{\beta^*}(n)$, where. 6-3 $\alpha(i)$. 6-4 $\alpha(i)$. This chapter only uses (2) $y = \frac{cx+d}{ax}$, where VA=0 and HA≠0. $\widetilde{\beta^*} \equiv 1 - \beta^*$ and $\widetilde{\alpha^*} \equiv 1 - \alpha^*$ are not always needed for graphing. Also, see Figure 4 for the G sector.

Katsuhisa's 'specified' software to hyperbolas. Tomoda K. and his lifework have developed 'general' software, aiming at mathematical education at all high schools in Japan. The final form for any type of hyperbolas is shown by $\left(y-\frac{c}{a}\right)\left(x+\frac{b}{a}\right)=\frac{f}{a}$, where the horizontal asymptote (HA) is given by $\frac{c}{a}$, and the vertical asymptote (VA) is given by $\frac{-b}{a}$. Tomoda K., in his software, only uses a standard type of $y=\frac{cx+d}{ax+b}$ and sets 'hyperbolic_all.gps.' There are five types of $y=\frac{cx+d}{ax+b}$ in hyperbolas (see Note 4): If a=0, $y=\frac{cx+d}{b}$; if b=0, $y=\frac{cx+d}{ax}$; if c=0, $y=\frac{d}{ax+b}$; if d=0, $y=\frac{cx}{ax+b}$; and if c=d=0, $y=\frac{1}{ax+b}$.

Look at Figures 2 and 3. First of all, a hyperbola stays at the 1st and 4th quadrants, differently from parabolic convex or concave. At the current endogenous net investment, 2010, the rate of return in equilibrium shows minus at most developed countries. The rate of return never rides over the 3rd quadrant since a minus net investment implies a bankruptcy or default of a country (historically, see Reinhart Carmen. M., and Rogoff, Kenneth, S., 2011). When a hyperbola stays at the 1st and 4th quadrant, the rate of inflation or deflation is the same, regardless of whether the rate of return is plus or minus. This is the characteristic of $r^*(i)$. The same is true at $r_G^*(i_G)$ at the G sector.

Figure 4 shows $r_G^*(i_G)$, for comparison: The G sector fluctuates much more than the PRI sector and the total economy. Policy-makers in reality must compare $r_G^*(i_G)$ with $r_{PRI}^*(i_{PRI})$ at the PRI sector. Public/ government investment is often huge at the young economic stage while foreign direct investment must be steady at the PRI sector.

Technology-oriented $\beta^*(i)$ has the same characteristic as $r^*(i)$. $\beta^*(i)$, $\beta_G^*(i_G)$, and $\beta_{PRI}^*(i_{PRI})$ are most influentially related to dynamic balance between the G and PRI sectors in the long run. Upon technological progress, as a result, it is possible for policy-makers to adjust an integrated set of policies by country in the long run.

For severe evidences, back to Figures 2 and 3, to inspect surprising differences by country for twelve countries. These differences show a reporting by country. The horizontal asymptote of $HA_{r^*(i)}$ differs by country surprisingly. This fact not only shows the problem of $r^*(i)$ to inflation or deflation but also the results of an integrated set of policies and sustainable level of growth power by country. For $r^* - HA_{r^*(i)}$, as the endogenous rate of inflation or deflation, it is proved that the differences between $r^* - HA_{r^*(i)}$ and the consumers price index, *CPI*, and other external indicators are not so much in spite of the national taste, culture, and history. Then, why do the level of an integrate set of policies differ so much between countries? A reason is the differences of leadership, speed of decision-making, and the behaviors to votes and democracy, as scientifically estimated by the current econometric methodology.

The KEWT database accurately proves by country the neutrality of the financial assets to the real assets with evidences of endogenous values and ratios and external items such as the exchange rate, ten year debt yield, money supply, *CPI*, and others available at *IFSY*, IMF. Therefore, an integrated set of policies has bright future in reality when an integrated set of policies becomes alive.

5.4 Conclusions

Could the endogenous system and its KEWT database solve problems related to fiscal policy and repeating bubbles? A condition is required: The price-equilibrium is replaced by the endogenous-equilibrium. The price-equilibrium partially holds by market, but it is difficult to consistently measure the price level by year and over years. The endogenous-equilibrium contrarily holds wholly as a system by country and with seven endogenous parameters and all the variables by country, sector, and year and over years. The goal of the endogenous system is a balanced moderate equilibrium and its sustainable robust policies. And, policy-results are each by each measured at the KEWT database, with what is required urgently by country

This chapter focused two: the cost of capital and the hyperbola of the rate of return to net investment to output in equilibrium. An optimum range of this hyperbola is another expression of a balanced moderate equilibrium. An optimum range explains the ground of the endogenous cost of capital and clarifies the situation brought by fiscal policy. Fiscal policy has been a sister of financial and market policies but now, a core or mater of an integrated set of policies to the real and financial assets when the endogenous-system reinforces the current worldwide databases available today. The minus interest rate, the deflation rate, bubbles, and no growth and returns, all of these are results. Do not stick to results but remove true causes. Causes are finally expressed by seven endogenous parameters. These parameters must be within a range of moderation and be controllable by policy-makers. A truth: Execute and solved.

Conclusively, Chapter 5 confirms a fact that Money-neutral is tightly connected with Deficit-neutral with *RRR* (the real rate of return)=0. This chapter deepened its process step by step, using the cost of capital and fundamental variables. If deficit=0, the nominal growth rate of output=the rate of inflation/deflation=0. It implies that the cost of capital=0. Then, the valuation ratio=1.0 ($v^* = r^*/(r^* - g_Y^*)$). The endogenous Phelps coefficient, $\alpha/(i \cdot \beta^*)$, becomes independent of r^* and g_Y^*. It implies that policy-makers are more relaxed under no inflation/deflation and no assets-bubbles.

Acknowledgements

This chapter was first published by *the Forum for Economist International* (*FEI*), Amsterdam, June 2012. The author is grateful to Dr. Peter, van der Hoek, Organizer of this Forum, for his immediate welcome Permissions for its use to this chapter. Chapter 9 in the *EES* is also similar, whose original paper was published at *FEI*, Amsterdam, Sep 2011. Peter is brave and we recollect the discussions deepened at Amsterdam.

Chapter 5

For readers' convenience: contents of tables and figures hereunder

Table CC1 Endogenous inflation/deflation and the cost of capital by sector: the US, Australia, Japan, 1990-2012

Pacific	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
1. the US	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0338	0.0497	1.29	0.0385	(0.0375)	0.0791	0.0646	(0.0575)	0.1388
1991	0.0243	0.0518	1.35	0.0383	(0.0413)	0.0978	0.0563	(0.0696)	0.1328
1992	0.0241	0.0586	1.30	0.0452	(0.0463)	0.1105	0.0637	(0.0726)	0.1469
1993	0.0375	0.0326	1.67	0.0196	(0.0340)	0.0452	0.0420	(0.0612)	0.1048
1994	0.0422	0.0258	1.90	0.0136	(0.0204)	0.0298	0.0358	(0.0452)	0.0843
1995	0.0400	0.0179	2.96	0.0060	(0.0105)	0.0140	0.0195	(0.0289)	0.0484
1996	0.0398	0.0166	3.40	0.0049	(0.0093)	0.0102	0.0166	(0.0213)	0.0394
1997	0.0395	0.0148	4.82	0.0031	0.0018	0.0040	0.0113	0.0048	0.0162
1998	0.0395	0.0145	5.75	0.0025	0.0056	0.0013	0.0094	0.0186	0.0051
1999	0.0420	0.0136	6.52	0.0021	0.0113	(0.0001)	0.0085	0.0298	(0.0003)
2000	0.0443	0.0140	5.46	0.0026	0.0255	(0.0010)	0.0107	0.0495	(0.0052)
2001	0.0466	0.0174	2.65	0.0066	0.0122	0.0056	0.0242	0.0284	0.0234
2002	0.0502	0.0191	2.15	0.0089	(0.0022)	0.0194	0.0323	(0.0133)	0.0518
2003	0.0532	0.0196	2.00	0.0098	(0.0056)	0.0344	0.0364	(0.0421)	0.0728
2004	0.0538	0.0168	2.30	0.0073	(0.0163)	0.0166	0.0307	(0.0567)	0.0746
2005	0.0548	0.0156	2.50	0.0062	(0.0113)	0.0126	0.0282	(0.0399)	0.0617
2006	0.0542	0.0143	2.81	0.0051	(0.0087)	0.0094	0.0244	(0.0289)	0.0502
2007	0.0536	0.0166	2.22	0.0074	(0.0012)	0.0142	0.0316	(0.0077)	0.0489
2008	0.0564	0.0231	1.63	0.0141	(0.0023)	(1.1285)	0.0487	(0.0256)	0.0829
2009	0.0411	0.0449	1.25	0.0360	(0.0064)	(0.0277)	0.0690	(0.1050)	0.1763
2010	0.0486	0.0355	1.33	0.0268	(0.0056)	(0.0285)	0.0634	(0.0810)	0.1720
2011	0.0488	0.0383	1.29	0.0296	(0.0054)	(0.0289)	0.0673	(0.0719)	0.1971
2012	0.0322	0.0512	1.38	0.0371	(0.0082)	(0.0461)	0.0605	(0.0645)	0.2015

Pacific	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
3. Australi	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0359	0.0103	(2.26)	(0.0046)	0.0227	(0.0075)	(0.0204)	0.0401	(0.0401)
1991	0.0250	0.0108	(5.23)	(0.0021)	0.0080	(0.0031)	(0.0068)	0.0100	(0.0122)
1992	0.0252	0.0109	(8.82)	(0.0012)	(0.0227)	0.0017	(0.0041)	(0.0391)	0.0064
1993	0.0261	0.0087	(5.37)	(0.0016)	(0.0218)	0.0018	(0.0065)	(0.0563)	0.0081
1994	0.0273	0.0070	(2.24)	(0.0031)	(0.0170)	(0.0010)	(0.0153)	(0.0496)	(0.0057)
1995	0.0246	0.0110	(8.37)	(0.0013)	(0.0129)	0.0015	(0.0043)	(0.0375)	0.0051
1996	0.0257	0.0114	(14.71)	(0.0008)	(0.0030)	(0.0002)	(0.0025)	(0.0092)	(0.0007)
1997	0.0261	0.0112	(40.63)	(0.0003)	0.0052	(0.0017)	(0.0009)	0.0162	(0.0057)
1998	0.0317	0.0092	(4.39)	(0.0021)	0.0150	(0.0072)	(0.0093)	0.0693	(0.0315)
1999	0.0300	0.0087	(3.37)	54.9542	0.0009	(0.0037)	(0.0115)	0.0044	(0.0160)
2000	0.0300	0.0099	(5.59)	(0.0018)	0.0080	(0.0046)	(0.0071)	0.0326	(0.0184)
2001	0.0220	0.0178	(37.84)	(0.0005)	0.0132	(0.0046)	(0.0011)	0.0309	(0.0102)
2002	0.0306	0.0100	(7.85)	(0.0013)	0.0100	(0.0041)	(0.0052)	0.0373	(0.0172)
2003	0.0311	0.0097	(4.01)	(0.0024)	0.0107	(0.0061)	(0.0102)	0.0443	(0.0256)
2004	0.0314	0.0106	(3.59)	(0.0029)	0.0134	(0.0070)	(0.0117)	0.0484	(0.0286)
2005	0.0367	0.0128	(6.37)	(0.0020)	0.0145	(0.0070)	(0.0078)	0.0591	(0.0266)
2006	0.0339	0.0152	(8.33)	(0.0018)	0.0211	(0.0089)	(0.0059)	0.0722	(0.0281)
2007	0.0367	0.0162	(7.92)	(0.0020)	0.0199	(0.0090)	(0.0067)	0.0705	(0.0288)
2008	0.0480	0.0196	24.74	0.0008	0.0374	(0.0030)	0.0027	0.0558	(0.0119)
2009	0.0356	0.0175	(33.03)	(0.0005)	(0.0042)	0.0007	(0.0016)	(0.0145)	0.0020
2010	0.0443	0.0187	7.80	0.0024	(0.0065)	0.0065	0.0081	(0.0308)	0.0193
2011	0.0551	0.0193	4.64	0.0042	(0.0040)	0.0086	0.0160	(0.0235)	0.0280
2012	0.0499	0.0141	27.85	0.0005	(0.0032)	0.0024	0.0023	(0.0205)	0.0093

Asian	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
10. Japan	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0309	0.0036	24.18	0.0001	(0.0030)	0.0016	0.0014	(0.0225)	0.0175
1991	0.0312	0.0034	10.10	0.0003	(0.0021)	0.0019	0.0034	(0.0214)	0.0197
1992	0.0377	0.0036	2.99	0.0012	(0.0018)	0.0032	0.0138	(0.0208)	0.0364
1993	0.0326	0.0022	3.53	0.0006	(0.0013)	0.0019	0.0099	(0.0203)	0.0295
1994	0.0276	0.0018	4.68	0.0004	(0.0012)	0.0015	0.0063	(0.0198)	0.0233
1995	0.0271	0.0017	5.74	0.0003	(0.0012)	0.0012	0.0050	(0.0194)	0.0209
1996	0.0256	0.0016	7.60	0.0002	(0.0012)	0.0010	0.0036	(0.0188)	0.0181
1997	0.0290	0.0017	4.25	0.0004	(0.0010)	0.0011	0.0072	(0.0151)	0.0217
1998	0.0203	0.0015	6.23	0.0002	(0.0031)	0.0024	0.0035	(0.0454)	0.0347
1999	0.0151	0.0021	14.75	0.0001	(0.0047)	0.0023	0.0012	(0.0299)	0.0210
2000	0.0160	0.0018	16.78	0.0001	(0.0027)	0.0022	0.0011	(0.0304)	0.0209
2001	0.0125	0.0020	121.38	0.0000	(0.0044)	0.0017	0.0001	(0.0226)	0.0146
2002	0.0104	0.0024	11.93	0.0002	(0.0040)	0.0045	0.0011	(0.0279)	0.0192
2003	0.0105	0.0024	9.00	0.0003	(0.0024)	0.0105	0.0014	(0.0266)	0.0190
2004	0.0109	0.0023	6.59	0.0004	(0.0104)	0.0022	0.0020	(0.0216)	0.0174
2005	0.0105	0.0020	6.13	0.0003	(0.0036)	0.0020	0.0020	(0.0170)	0.0143
2006	0.0125	0.0000	4.75	0.0000	(0.0001)	0.0000	0.0026	(0.0127)	0.0124
2007	0.0120	0.0012	3.62	0.0003	(0.0011)	0.0008	0.0036	(0.0073)	0.0107
2008	0.0108	0.0007	5.42	0.0001	(0.0010)	0.0006	0.0021	(0.0140)	0.0123
2009	0.0104	0.0003	2.11	0.0001	(0.0003)	(0.0015)	0.0051	(0.0325)	0.0286
2010	0.0104	0.0001	2.33	0.0001	(0.0001)	(0.0022)	0.0045	(0.0294)	0.0262
2011	0.0116	(0.0003)	1.96	(0.0002)	0.0003	0.0050	0.0058	(0.0300)	0.0288
2012	0.0141	(0.0023)	1.51	(0.0015)	0.0014	0.0061	0.0078	(0.0313)	0.0335

Data source: KEWT 6.12-1, -2, -3, -4 and -5, by country and sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF

Table CC2 Endogenous inflation/deflation and the cost of capital by sector: France, Germany, the UK, 1990-2012

Euro	$HA_{r*(i)}$	r^*-$HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
4. France	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0517	0.0081	3.1333	0.0026	(0.0026)	0.0064	0.0191	(0.0261)	0.0408
1991	0.0515	0.0100	2.2966	0.0044	(0.0023)	0.0079	0.0268	(0.0149)	0.0475
1992	0.0520	0.0135	1.7132	0.0079	(0.0145)	0.0198	0.0382	(0.0738)	0.0941
1993	0.0525	0.0247	1.2457	0.0199	(0.0127)	0.1742	0.0620	(0.1016)	0.1466
1994	0.0550	0.0166	1.3535	0.0123	(0.0099)	0.0777	0.0529	(0.0967)	0.1337
1995	0.0642	0.0191	1.2633	0.0151	(0.0155)	0.0644	0.0659	(0.1177)	0.1699
1996	0.0545	0.0351	1.1397	0.0308	(0.0119)	(0.8949)	0.0786	(0.0891)	0.1780
1997	0.0491	0.0293	1.1398	0.0257	(0.0074)	(1.1363)	0.0688	(0.0564)	0.1459
1998	0.0582	0.0125	1.3014	0.0096	(0.0042)	0.0306	0.0543	(0.0384)	0.1126
1999	0.0651	0.0100	1.3766	0.0072	(0.0026)	0.0172	0.0545	(0.0276)	0.1030
2000	0.0731	0.0070	1.5759	0.0044	(0.0002)	0.0064	0.0508	(0.0015)	0.0818
2001	0.0612	0.0094	2.2607	0.0042	(0.0034)	0.0058	0.0312	(0.0108)	0.0557
2002	0.0556	0.0147	1.9263	0.0076	(0.0105)	0.0160	0.0365	(0.0445)	0.0804
2003	0.0496	0.0215	1.8742	0.0115	(0.0153)	0.0299	0.0380	(0.0591)	0.0906
2004	0.0478	0.0333	1.4248	0.0234	(0.0227)	0.0486	0.0569	(0.0554)	0.1182
2005	0.0599	0.0229	1.4601	0.0157	(0.0102)	0.0285	0.0567	(0.0345)	0.1061
2006	0.0593	0.0148	1.8177	0.0082	(0.0064)	0.0134	0.0408	(0.0237)	0.0751
2007	0.0583	0.0094	2.6457	0.0035	(0.0036)	0.0068	0.0256	(0.0232)	0.0511
2008	0.0580	0.0091	2.5233	0.0036	(0.0055)	0.0079	0.0266	(0.0388)	0.0603
2009	0.0620	0.0173	1.4592	0.0118	(0.0155)	0.0496	0.0544	(0.1199)	0.1473
2010	0.0624	0.0166	1.4811	0.0112	(0.0249)	0.0321	0.0534	(0.1241)	0.1486
2011	0.0510	0.0236	1.8690	0.0126	(0.0286)	0.0340	0.0399	(0.0886)	0.1085
2012	0.0476	0.0270	1.7123	0.0158	(0.0331)	0.0390	0.0436	(0.0847)	0.1119
Euro	$HA_{r*(i)}$	r^*-$HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
5. German	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0381	0.0105	5.6943	0.0018	(0.0027)	0.0030	0.0085	(0.0195)	0.0128
1991	0.0278	0.0066	(5.6596)	(0.0012)	(0.0068)	(0.0002)	(0.0061)	(0.0446)	(0.0008)
1992	0.0275	0.0065	(7.4385)	(0.0009)	(0.0094)	0.0004	(0.0046)	(0.0554)	0.0022
1993	0.0241	0.0075	(32.7856)	(0.0002)	(0.0094)	0.0017	(0.0010)	(0.0554)	0.0069
1994	0.0319	0.0026	(44.3751)	(0.0001)	(0.0020)	0.0002	(0.0008)	(0.0240)	0.0022
1995	0.0315	0.0029	(17.3839)	(0.0002)	(0.0027)	0.0002	(0.0020)	(0.0335)	0.0024
1996	0.0292	0.0031	61.4383	0.0001	(0.0037)	0.0007	0.0005	(0.0430)	0.0067
1997	0.0290	0.0032	100.0799	0.0000	(0.0026)	0.0004	0.0003	(0.0241)	0.0037
1998	0.0306	0.0023	(49.3372)	(0.0000)	(0.0002)	0.0000	(0.0007)	(0.0042)	0.0002
1999	0.0652	0.0028	6.0499	0.0005	(0.0004)	0.0007	0.0112	(0.0115)	0.0159
2000	0.0607	0.0023	(14.6271)	(0.0002)	(0.0002)	(0.0001)	(0.0043)	(0.0063)	(0.0041)
2001	0.0489	0.0103	6.7734	0.0015	(0.0127)	0.0050	0.0087	(0.0839)	0.0278
2002	0.0537	0.0038	2.9493	0.0013	(0.0074)	0.0032	0.0195	(0.1192)	0.0481
2003	0.0509	0.0019	2.7072	0.0007	(0.0043)	0.0019	0.0195	(0.1305)	0.0509
2004	0.0520	0.0017	1.7163	0.0010	(0.0036)	0.0021	0.0313	(0.1283)	0.0650
2005	0.0529	(0.0003)	1.6240	(0.0002)	0.0007	(0.0004)	0.0324	(0.1154)	0.0635
2006	0.0622	(0.0034)	1.5480	(0.0022)	0.0034	(0.0032)	0.0380	(0.0540)	0.0574
2007	0.0842	(0.0055)	1.5398	(0.0035)	(0.0013)	(0.0040)	0.0512	0.0183	0.0581
2008	0.0757	(0.0060)	1.6617	(0.0036)	(0.0010)	(0.0043)	0.0419	0.0124	0.0484
2009	0.0573	(0.0102)	1.3074	(0.0078)	0.0222	(0.0136)	0.0360	(0.0938)	0.0639
2010	0.0581	(0.0062)	1.4490	(0.0043)	0.0152	(0.0088)	0.0358	(0.1330)	0.0724
2011	0.0645	(0.0095)	1.5794	(0.0060)	0.0029	(0.0077)	0.0348	(0.0153)	0.0456
2012	0.0627	(0.0085)	1.4552	(0.0058)	(0.0012)	(0.0066)	0.0373	0.0068	0.0438
E U	$HA_{r*(i)}$	r^*-$HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
6. the UK	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.1201	0.0042	1.6058	0.0026	0.0029	0.0029	0.0774	0.0295	0.1141
1991	0.1372	0.0089	1.2459	0.0071	(0.0009)	0.0118	0.1172	(0.0134)	0.2023
1992	0.1507	0.0210	1.1209	0.0187	(0.0218)	0.0375	0.1532	(0.1401)	0.3409
1993	0.1515	0.0276	1.1123	0.0248	(0.0593)	0.0466	0.1610	(0.1936)	0.3818
1994	0.1355	0.0245	1.1278	0.0217	(0.0229)	0.0500	0.1419	(0.1527)	0.3236
1995	0.1217	0.0097	1.4004	0.0069	(0.0108)	0.0180	0.0939	(0.1503)	0.2421
1996	0.1221	0.0103	1.3668	0.0075	(0.0144)	0.0141	0.0968	(0.1068)	0.2155
1997	0.1079	0.0138	1.4265	0.0097	(0.0039)	0.0194	0.0853	(0.0411)	0.1569
1998	0.1128	0.0096	1.4001	0.0069	0.0045	0.0079	0.0874	0.0276	0.1219
1999	0.1217	0.0097	1.4673	0.0066	0.0112	0.0065	0.0896	0.0477	0.1127
2000	0.1297	0.0102	1.3988	0.0073	0.0129	0.0069	0.1000	0.0612	0.1192
2001	0.1314	0.0172	1.2934	0.0133	0.0134	0.0136	0.1149	0.0476	0.1446
2002	0.1348	0.0253	1.1908	0.0213	(0.0068)	0.0329	0.1345	(0.0420)	0.2099
2003	0.1331	0.0301	1.1704	0.0257	(0.0078)	0.0643	0.1394	(0.0756)	0.2352
2004	0.1342	0.0321	1.1786	0.0272	(0.0107)	0.0553	0.1411	(0.0762)	0.2405
2005	0.1408	0.0388	1.1538	0.0337	(0.0120)	0.0992	0.1557	(0.1030)	0.2803
2006	0.1374	0.0273	1.2613	0.0216	(0.0225)	0.0294	0.1306	(0.0626)	0.2196
2007	0.1246	0.0263	1.2918	0.0204	(0.0102)	0.0323	0.1168	(0.0520)	0.1933
2008	0.1163	0.0487	1.1426	0.0426	(0.0294)	0.0871	0.1444	(0.1218)	0.2661
2009	0.0563	0.1361	1.0478	0.1299	(0.1896)	0.3440	0.1836	(0.3394)	0.4246
2010	0.1122	0.0740	1.1014	0.0672	(0.0992)	0.1704	0.1690	(0.3011)	0.3877
2011	0.0317	0.1524	1.0905	0.1397	(0.2067)	0.3002	0.1688	(0.2506)	0.3620
2012	0.0958	0.1097	1.1164	0.0983	(0.0944)	0.1944	0.1841	(0.1851)	0.3562

Data source: KEWT 6.12-1, -2, -3, -4, and -5, by country and sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF

Table CC3 Endogenous inflation/deflation and the cost of capital by sector: China, India, Brazil, 1990-2012

Asia	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
7. China	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0933	0.0166	5.89	0.0028	0.0018	0.0030	0.0186	0.0134	0.0194
1991	0.0994	0.0159	5.58	0.0028	0.0013	0.0032	0.0207	0.0121	0.0222
1992	0.1140	0.0136	7.05	0.0019	0.0012	0.0020	0.0181	0.0102	0.0187
1993	0.1363	0.0126	11.79	0.0011	0.0028	0.0009	0.0126	0.0295	0.0104
1994	0.1615	0.0139	5.18	0.0027	0.0016	0.0028	0.0339	0.0189	0.0354
1995	0.1346	0.0134	4.78	0.0028	0.0010	0.0028	0.0309	0.0083	0.0325
1996	0.1278	0.0133	4.69	0.0028	0.0031	0.0028	0.0301	0.0309	0.0297
1997	0.1271	0.0145	3.28	0.0044	0.0008	0.0045	0.0432	0.0054	0.0464
1998	0.1172	0.0131	3.35	0.0039	(0.0025)	0.0042	0.0389	(0.0172)	0.0441
1999	0.1094	0.0095	4.25	0.0022	(0.0059)	0.0028	0.0280	(0.0531)	0.0360
2000	0.1042	0.0123	5.06	0.0024	(0.0115)	0.0034	0.0230	(0.0788)	0.0332
2001	0.1081	0.0085	5.34	0.0016	(0.0097)	0.0021	0.0218	(0.0759)	0.0304
2002	0.1123	0.0078	5.17	0.0015	(0.0063)	0.0020	0.0232	(0.0742)	0.0327
2003	0.1242	0.0071	5.54	0.0013	(0.0030)	0.0016	0.0237	(0.0446)	0.0302
2004	0.1388	0.0069	5.15	0.0013	(0.0005)	0.0014	0.0283	(0.0073)	0.0310
2005	0.1433	0.0073	3.75	0.0020	(0.0007)	0.0021	0.0402	(0.0105)	0.0441
2006	0.1488	0.0079	3.14	0.0025	0.0003	0.0025	0.0499	0.0036	0.0529
2007	0.1659	0.0080	2.88	0.0028	0.0074	0.0024	0.0604	0.0609	0.0573
2008	0.1672	0.0076	3.08	0.0025	0.0020	0.0024	0.0568	0.0293	0.0573
2009	0.1738	0.0065	4.16	0.0016	(0.0007)	0.0018	0.0433	(0.0211)	0.0500
2010	0.1697	0.0062	4.39	0.0014	(0.0003)	0.0015	0.0400	(0.0075)	0.0444
2011	0.1422	0.0246	5.60	0.0044	0.0003	0.0046	0.0298	0.0017	0.0318
2012	0.1419	0.0078	5.31	0.0015	(0.0011)	0.0016	0.0282	(0.0177)	0.0322

Asia	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
8. India	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0282	0.0175	(4.32)	(0.0041)	(0.0292)	0.0159	(0.0106)	(0.1594)	0.0301
1991	0.0305	0.0183	(10.31)	(0.0018)	(0.0229)	0.0129	(0.0047)	(0.1131)	0.0268
1992	0.0377	0.0168	(5.27)	(0.0032)	(0.0220)	0.0073	(0.0103)	(0.1102)	0.0204
1993	0.0387	0.0181	(9.97)	(0.0018)	(0.0264)	0.0169	(0.0057)	(0.1477)	0.0413
1994	0.0521	0.0189	(18.64)	(0.0010)	(0.0164)	0.0108	(0.0038)	(0.1077)	0.0314
1995	0.0597	0.0222	(20.93)	(0.0011)	(0.0175)	0.0094	(0.0039)	(0.0951)	0.0295
1996	0.0431	0.0290	(6.50)	(0.0045)	(0.0265)	0.0098	(0.0111)	(0.0953)	0.0210
1997	0.0489	0.0294	(9.57)	(0.0031)	(0.0332)	0.0055	(0.0082)	(0.0623)	0.0159
1998	0.0430	0.0232	(5.56)	(0.0042)	(0.0342)	0.0047	(0.0119)	(0.0774)	0.0143
1999	0.0508	0.0173	(7.03)	(0.0025)	(0.0339)	0.0041	(0.0097)	(0.0826)	0.0178
2000	0.0522	0.0178	(12.09)	(0.0015)	(0.0265)	0.0058	(0.0058)	(0.0905)	0.0235
2001	0.0522	0.0156	(15.27)	(0.0010)	(0.0203)	0.0063	(0.0044)	(0.0975)	0.0266
2002	0.0637	0.0165	45.16	0.0004	(0.0168)	0.0076	0.0018	(0.0974)	0.0348
2003	0.0761	0.0173	11.58	0.0015	(0.0094)	0.0065	0.0081	(0.0654)	0.0323
2004	0.1162	0.0187	5.75	0.0033	(0.0041)	0.0070	0.0235	(0.0403)	0.0446
2005	0.1101	0.0176	7.26	0.0024	(0.0040)	0.0057	0.0176	(0.0391)	0.0372
2006	0.1134	0.0167	9.12	0.0018	(0.0023)	0.0037	0.0143	(0.0213)	0.0267
2007	0.1142	0.0160	11.87	0.0013	(0.0031)	0.0033	0.0110	(0.0285)	0.0255
2008	0.1033	0.0150	25.85	0.0006	(0.0070)	0.0054	0.0046	(0.0787)	0.0360
2009	0.0988	0.0145	38.80	0.0004	(0.0085)	0.0061	0.0029	(0.0899)	0.0412
2010	0.1038	0.0151	13.53	0.0011	(0.0072)	0.0055	0.0088	(0.0655)	0.0407
2011	0.1047	0.0142	31.78	0.0004	(0.0065)	0.0038	0.0037	(0.0583)	0.0306
2012	0.1032	0.0000	32.01	0.0000	0.0000	0.0000	0.0032	(0.0510)	0.0265

W. Hemisph	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
3. Brazil	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0587	0.0112	(1.96)	(0.0057)	(0.0455)	0.0007	(0.0356)	(0.1717)	0.0051
1991	0.2083	0.0417	1.64	0.0254	(0.0471)	0.0525	0.1526	(0.3218)	0.3023
1992	0.1758	0.0392	1.66	0.0237	(0.0477)	0.0467	0.1297	(0.2688)	0.2537
1993	0.0312	0.0156	20.52	0.0008	(0.0481)	0.0220	0.0023	(0.1824)	0.0608
1994	0.0838	0.0181	4.74	0.0038	(0.0454)	0.0173	0.0215	(0.2330)	0.1004
1995	(0.0142)	0.0324	(1.73)	(0.0188)	(0.0901)	(0.0039)	(0.0106)	(0.0372)	(0.0024)
1996	0.0092	0.0124	(4.31)	(0.0029)	(0.0250)	0.0048	(0.0050)	(0.0478)	0.0082
1997	0.0110	0.0122	(3.41)	(0.0036)	(0.0330)	0.0076	(0.0068)	(0.0734)	0.0138
1998	0.0104	0.0136	(9.49)	(0.0014)	(0.0401)	0.0127	(0.0025)	(0.0799)	0.0215
1999	0.0133	0.0119	(3.90)	(0.0030)	(0.0357)	0.0023	(0.0065)	(0.0450)	0.0054
2000	0.0139	0.0157	(55.38)	(0.0003)	(0.0046)	0.0009	(0.0005)	(0.0081)	0.0018
2001	0.0115	0.0198	3.77	0.0053	(0.0147)	0.0124	0.0083	(0.0263)	0.0189
2002	0.0098	0.0226	2.53	0.0090	(0.0122)	0.0150	0.0128	(0.0168)	0.0219
2003	0.0133	0.0217	2.54	0.0085	(0.0551)	0.0240	0.0137	(0.0749)	0.0406
2004	0.0214	0.0172	3.64	0.0047	(0.0156)	0.0101	0.0106	(0.0316)	0.0233
2005	0.0223	0.0180	2.81	0.0064	(0.0277)	0.0181	0.0143	(0.0681)	0.0393
2006	0.0269	0.0160	3.02	0.0053	(0.0124)	0.0118	0.0142	(0.0379)	0.0301
2007	0.0330	0.0128	4.42	0.0029	(0.0024)	0.0049	0.0104	(0.0099)	0.0167
2008	0.0399	0.0100	15.13	0.0007	(0.0049)	0.0041	0.0033	(0.0378)	0.0168
2009	0.0397	0.0135	2.98	0.0045	(0.0072)	0.0105	0.0178	(0.0380)	0.0366
2010	0.0441	0.0102	7.93	0.0013	0.0019	0.0011	0.0068	0.0103	0.0057
2011	0.0326	0.0299	10.23	0.0029	(0.0056)	0.0067	0.0061	(0.0143)	0.0130
2012	(0.0559)	0.1833	1.17	0.1565	(0.0219)	0.2533	0.1088	(0.0205)	0.1530

Data source: KEWT 6.12-1, -2, -3, -4, and -5, by country and sector, 1990-2012, whose original data are *International Financial Statistics Yearbook*, IMF

Table CC4 Endogenous inflation/deflation and the cost of capital by sector: Mexico, Russia, South Africa, 1990-2012

Pacific	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
5. Mexico	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0544	0.0299	3.13	0.0095	(0.0196)	0.0187	0.0269	(0.0789)	0.0487
1991	0.0612	0.0349	2.33	0.0150	0.0411	0.0063	0.0413	0.1543	0.0161
1992	0.0835	0.0526	1.71	0.0307	0.1398	0.0181	0.0795	0.2211	0.0503
1993	0.0589	0.0220	184.49	0.0001	0.0147	(0.0041)	0.0004	0.0668	(0.0142)
1994	0.0621	0.0178	(21.32)	(0.0008)	0.0079	(0.0032)	(0.0037)	0.0413	(0.0138)
1995	0.0728	0.0166	21.05	0.0008	0.0038	(0.0007)	0.0042	0.0300	(0.0032)
1996	0.1105	0.0221	5.87	0.0038	0.0067	0.0027	0.0226	0.0487	0.0154
1997	0.1239	0.0186	6.21	0.0030	0.0008	0.0035	0.0229	0.0071	0.0259
1998	0.0815	0.0151	(8.37)	(0.0018)	(0.0007)	(0.0025)	(0.0115)	(0.0060)	(0.0148)
1999	0.0788	0.0150	(17.79)	(0.0008)	0.0002	(0.0020)	(0.0053)	0.0016	(0.0108)
2000	0.0753	0.0174	(11.23)	(0.0016)	0.0018	(0.0046)	(0.0083)	0.0158	(0.0206)
2001	0.0355	0.0467	(6.53)	(0.0071)	0.0023	(0.0135)	(0.0126)	0.0056	(0.0214)
2002	0.0637	0.0143	11.87	0.0012	(0.0016)	0.0023	0.0066	(0.0152)	0.0098
2003	0.0709	0.0124	(80.21)	(0.0002)	0.0008	(0.0012)	(0.0010)	0.0070	(0.0070)
2004	0.0774	0.0150	5.43	0.0028	0.0012	0.0024	0.0170	0.0132	0.0112
2005	0.0718	0.0118	(22.22)	(0.0005)	0.0017	(0.0034)	(0.0038)	0.0187	(0.0200)
2006	0.0844	0.0127	71.42	0.0002	(0.0007)	0.0001	0.0014	(0.0073)	0.0009
2007	0.0799	0.0124	(71.58)	(0.0002)	(0.0023)	0.0007	(0.0013)	(0.0182)	0.0054
2008	0.0718	0.0118	(12.79)	(0.0009)	(0.0004)	(0.0019)	(0.0065)	(0.0038)	(0.0116)
2009	0.0476	0.0106	(5.42)	(0.0020)	(0.0030)	(0.0017)	(0.0108)	(0.0216)	(0.0082)
2010	0.0485	0.0110	(6.96)	(0.0016)	(0.0042)	(0.0002)	(0.0086)	(0.0306)	(0.0011)
2011	0.0541	0.0113	(9.66)	(0.0012)	(0.0034)	(0.0001)	(0.0068)	(0.0264)	(0.0003)
2012	0.0526	0.0115	(11.18)	(0.0010)	(0.0030)	(0.0001)	(0.0057)	(0.0229)	(0.0004)
E. Europe	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
7. Russia	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1995	0.0508	(0.0010)	(1.1544)	0.0009	0.0026	0.0003	(0.0431)	(0.1726)	(0.0139)
1996	0.0542	(0.0007)	(1.4247)	0.0005	0.0037	(0.0007)	(0.0375)	(0.3538)	0.0423
1997	0.0356	(0.0029)	(0.8488)	0.0034	0.0206	(0.0028)	(0.0386)	(0.2881)	0.0294
1998	0.0344	(0.0024)	(264.11)	0.0000	0.0226	(0.0056)	(0.0001)	(0.2861)	0.0770
1999	0.1519	(0.0116)	1.3456	(0.0086)	0.0044	(0.0126)	0.1042	(0.0598)	0.1481
2000	0.6182	(0.0225)	1.1571	(0.0195)	(0.0204)	(0.0191)	0.5148	0.6026	0.4901
2001	0.4445	(0.0170)	1.3100	(0.0130)	(0.0240)	(0.0108)	0.3264	0.4739	0.2875
2002	0.3537	(0.0183)	1.3204	(0.0139)	(0.2321)	(0.0048)	0.2540	0.9458	0.1062
2003	0.3539	(0.0173)	1.3410	(0.0129)	(0.0219)	(0.0110)	0.2510	0.3986	0.2185
2004	0.3642	(0.0155)	1.3244	(0.0117)	(0.1335)	(0.0057)	0.2633	0.8643	0.1507
2005	0.3739	(0.0125)	1.2838	(0.0098)	(0.0258)	(0.0049)	0.2815	0.9867	0.1291
2006	0.3590	(0.0057)	1.3432	(0.0043)	(0.0201)	(0.0009)	0.2630	1.1630	0.0589
2007	0.3090	(0.0013)	1.5780	(0.0008)	(0.0085)	(0.0002)	0.1950	0.9240	0.0507
2008	0.3047	0.0005	1.6154	0.0003	0.0018	0.0001	0.1889	0.7452	0.0820
2009	0.1716	0.0002	1.5108	0.0001	(0.0003)	0.0002	0.1137	(0.2702)	0.1928
2010	0.2066	(0.0012)	1.6951	(0.0007)	(0.0001)	(0.0008)	0.1212	0.0124	0.1447
2011	0.2719	(0.0042)	1.6949	(0.0025)	(0.0363)	(0.0015)	0.1579	0.3294	0.1168
2012	0.2488	(0.0070)	1.8165	(0.0038)	(0.0114)	(0.0025)	0.1332	0.3109	0.0921
Africa	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
18. South	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0434	0.1628	1.8081	0.0900	(0.4649)	0.1770	0.1140	(0.4769)	0.2361
1991	0.1133	0.1085	1.3316	0.0815	(0.6254)	0.1345	0.1666	(0.6263)	0.3134
1992	0.1361	0.1031	1.2607	0.0818	(0.2922)	0.1919	0.1897	(0.8622)	0.4103
1993	0.1389	0.0693	1.4312	0.0484	(0.3357)	0.1092	0.1455	(0.8254)	0.3451
1994	0.1372	0.0576	1.5926	0.0362	(0.1579)	0.1105	0.1224	(0.7311)	0.3327
1995	0.1229	0.0444	2.3135	0.0192	(0.4142)	0.0414	0.0723	(0.5106)	0.1825
1996	0.1171	0.0427	2.0313	0.0210	(0.1126)	0.0461	0.0787	(0.3997)	0.1749
1997	0.1327	0.0269	1.7514	0.0154	(0.0774)	0.0244	0.0912	(0.2778)	0.1593
1998	0.1125	0.0305	2.0509	0.0149	(0.0320)	0.0240	0.0697	(0.1489)	0.1129
1999	0.1025	0.0311	1.9494	0.0160	(0.0352)	0.0217	0.0685	(0.1043)	0.1002
2000	0.1049	0.0248	1.9681	0.0126	(0.0145)	0.0192	0.0659	(0.0858)	0.0969
2001	0.0928	0.0327	2.0505	0.0160	(0.0298)	0.0190	0.0612	(0.0573)	0.0815
2002	0.0986	0.0258	2.0821	0.0124	(0.0382)	0.0143	0.0598	(0.0695)	0.0788
2003	0.0919	0.0292	2.2557	0.0130	(0.0547)	0.0212	0.0537	(0.1822)	0.0922
2004	0.0933	0.0216	3.0330	0.0071	(0.0231)	0.0113	0.0379	(0.1069)	0.0619
2005	0.0940	0.0241	2.5142	0.0096	0.0032	0.0089	0.0470	0.0061	0.0499
2006	0.0955	0.0208	3.0892	0.0067	0.0424	0.0043	0.0377	0.0795	0.0274
2007	0.0871	0.0149	15.582	0.0010	0.0592	(0.0034)	0.0065	0.2300	(0.0257)
2008	0.0795	0.0125	(12.03)	(0.0010)	0.0110	(0.0026)	(0.0076)	0.0747	(0.0196)
2009	0.0734	0.0160	4.3787	0.0037	(0.1285)	0.0117	0.0204	(0.3871)	0.0719
2010	0.0709	0.0134	5.6561	0.0024	(0.0213)	0.0056	0.0149	(0.1307)	0.0354
2011	0.0659	0.0353	18.387	0.0019	(0.2996)	0.0171	0.0055	(0.4245)	0.0547
2012	0.0718	0.0353	6.0692	0.0058	(0.3031)	0.0154	0.0176	(0.3412)	0.0534

Data source: KEWT 6.12-1, -2, -3, -4, and -5, by country and sector, 1990-2012, whose original data are *International Financial Statistics Yearbook*, IMF

Table CC5 Endogenous inflation/deflation and the cost of capital by sector: Canada, Italy, Spain, 1990-2012

Pacific	$HA_{r*(i)}$	r^*-$HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
2. Canada	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0219	0.0116	(3.41)	(0.0034)	(0.0539)	0.0030	(0.0098)	(0.1309)	0.0088
1991	0.0252	0.0138	7.34	0.0019	(0.0805)	0.0099	0.0053	(0.1577)	0.0299
1992	0.0251	0.0171	3.70	0.0046	(0.1067)	0.0148	0.0114	(0.1743)	0.0391
1993	0.0254	0.0151	3.93	0.0039	(0.0828)	0.0132	0.0103	(0.1682)	0.0370
1994	0.0226	0.0119	461.65	0.0000	(0.0658)	0.0066	0.0001	(0.1377)	0.0203
1995	0.0240	0.0091	89.27	0.0001	(0.0245)	0.0041	0.0004	(0.0943)	0.0149
1996	0.0223	0.0106	14.96	0.0007	(0.0120)	0.0030	0.0022	(0.0413)	0.0091
1997	0.0254	0.0081	(7.50)	(0.0011)	0.0082	(0.0026)	(0.0045)	0.0360	(0.0107)
1998	0.0250	0.0079	(6.75)	(0.0012)	0.0175	(0.0032)	(0.0049)	0.0527	(0.0142)
1999	0.0287	0.0086	(21.62)	(0.0004)	0.0301	(0.0031)	(0.0017)	0.0801	(0.0147)
2000	0.0384	0.0113	4.71	0.0024	0.0446	(0.0012)	0.0106	0.1159	(0.0057)
2001	0.0287	0.0126	5.81	0.0022	0.0092	0.0005	0.0071	0.0477	0.0015
2002	0.0280	0.0103	10.43	0.0010	0.0096	(0.0006)	0.0037	0.0406	(0.0020)
2003	0.0276	0.0110	10.37	0.0011	0.0091	(0.0006)	0.0037	0.0407	(0.0019)
2004	0.0297	0.0117	7.53	0.0016	0.0373	(0.0013)	0.0055	0.0676	(0.0050)
2005	0.0312	0.0120	8.87	0.0014	0.0319	(0.0023)	0.0049	0.0889	(0.0086)
2006	0.0294	0.0117	20.04	0.0006	0.0402	(0.0039)	0.0021	0.1040	(0.0142)
2007	0.0304	0.0116	(161.64)	(0.0001)	0.0298	(0.0035)	(0.0003)	0.0806	(0.0131)
2008	0.0305	0.0114	(86.52)	(0.0001)	0.0049	(0.0012)	(0.0005)	0.0264	(0.0041)
2009	0.0230	0.0111	(43.12)	(0.0003)	(0.0066)	0.0040	(0.0008)	(0.0454)	0.0089
2010	0.0237	0.0097	(6.15)	(0.0016)	(0.0088)	0.0027	(0.0054)	(0.0621)	0.0071
2011	0.0242	0.0086	(4.35)	(0.0020)	(0.0081)	0.0001	(0.0075)	(0.0435)	0.0003
2012	0.0363	0.0079	(3.50)	(0.0023)	(0.0035)	(0.0017)	(0.0126)	(0.0278)	(0.0087)

Euro	$HA_{r*(i)}$	r^*-$HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
8. Italy	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0743	0.0028	7.1624	0.0004	(0.0227)	0.0105	0.0108	(0.1341)	0.5291
1991	0.0945	(0.0204)	4.2508	(0.0048)	0.1452	(0.0611)	0.0174	(0.1304)	0.3773
1992	0.0695	0.0026	3.0988	0.0008	(0.0117)	0.0067	0.0233	(0.1135)	0.2889
1993	0.0631	0.0065	2.0582	0.0032	(0.0297)	0.0150	0.0338	(0.0961)	0.2517
1994	0.0642	0.0049	2.1487	0.0023	(0.0196)	0.0105	0.0321	(0.0940)	0.2200
1995	0.0812	0.0027	2.8415	0.0009	(0.0089)	0.0044	0.0295	(0.1000)	0.1977
1996	0.0692	0.0025	2.2440	0.0011	(0.0052)	0.0055	0.0319	(0.1047)	0.1870
1997	0.0788	(0.0090)	2.1757	(0.0042)	0.0042	(0.0088)	0.0321	(0.0174)	0.0886
1998	0.0666	(0.0019)	2.2837	(0.0008)	0.0016	(0.0020)	0.0284	(0.0311)	0.0897
1999	0.0685	(0.0004)	1.7135	(0.0002)	0.0003	(0.0003)	0.0397	(0.0355)	0.0517
2000	0.0724	(0.0015)	1.8357	(0.0008)	0.0004	(0.0013)	0.0386	(0.0307)	0.0518
2001	0.0600	0.0070	2.1120	0.0033	(0.0088)	0.0088	0.0317	(0.1515)	0.0682
2002	0.0539	0.0121	2.2990	0.0052	(0.0124)	0.0103	0.0287	(0.0874)	0.0524
2003	0.0593	0.0096	1.9582	0.0049	(0.0045)	0.0068	0.0352	(0.0328)	0.0489
2004	0.1521	(0.0855)	1.4783	(0.0578)	0.1467	(0.0933)	0.0450	(0.1010)	0.0748
2005	0.0074	0.0621	3.2198	0.0193	(0.1151)	0.0578	0.0216	(0.1606)	0.0606
2006	0.0551	0.0118	2.4636	0.0048	(0.0150)	0.0084	0.0271	(0.0771)	0.0490
2007	0.0517	0.0118	2.5006	0.0047	(0.0066)	0.0089	0.0254	(0.0493)	0.0426
2008	0.0548	0.0128	2.0550	0.0062	(0.0083)	0.0132	0.0329	(0.0710)	0.0581
2009	0.0614	0.0217	1.3411	0.0162	(0.0105)	0.0682	0.0619	(0.1166)	0.1097
2010	0.0662	0.0138	1.5362	0.0090	(0.0083)	0.0231	0.0521	(0.0948)	0.0934
2011	0.0575	0.0284	1.4256	0.0199	(0.0118)	0.0599	0.0602	(0.0851)	0.1020
2012	0.0465	0.0291	1.2663	0.0230	(0.0076)	0.1074	0.0597	(0.0606)	0.0958

Euro	$HA_{r*(i)}$	r^*-$HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
14. Spain	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0783	0.0029	(15.9885)	(0.0002)	(0.0034)	0.0013	(0.0051)	(0.0532)	0.0460
1991	0.1097	0.0028	11.3612	0.0002	(0.0026)	0.0012	0.0099	(0.0501)	0.0604
1992	0.0647	0.0022	10.8362	0.0002	(0.0045)	0.0017	0.0062	(0.0780)	0.0614
1993	0.0636	0.0040	2.7250	0.0015	(0.0179)	0.0058	0.0248	(0.1400)	0.1214
1994	0.0654	0.0050	2.2748	0.0022	(0.0262)	0.0078	0.0309	(0.1622)	0.1366
1995	0.0611	0.0046	3.5371	0.0013	(0.0124)	0.0050	0.0186	(0.1066)	0.0834
1996	0.0600	0.0044	3.1483	0.0014	(0.0136)	0.0051	0.0205	(0.1157)	0.0870
1997	0.0600	0.0036	3.2756	0.0011	(0.0052)	0.0025	0.0194	(0.0486)	0.0516
1998	0.0575	0.0037	3.9342	0.0009	(0.0042)	0.0015	0.0156	(0.0194)	0.0318
1999	0.0637	0.0047	3.1847	0.0015	(0.0059)	0.0022	0.0215	(0.0521)	0.0345
2000	0.0676	0.0073	2.8446	0.0026	0.0091	0.0017	0.0263	0.0664	0.0184
2001	0.0576	0.0205	2.3879	0.0086	0.0301	0.0052	0.0327	0.0971	0.0207
2002	0.0517	0.0243	2.5332	0.0096	0.0807	0.0042	0.0300	0.1094	0.0150
2003	0.0513	0.0289	2.2749	0.0127	0.0509	0.0074	0.0352	0.1131	0.0213
2004	0.0579	0.0279	2.4268	0.0115	0.0476	0.0061	0.0354	0.1267	0.0192
2005	0.0578	0.0200	4.6057	0.0043	0.1257	(0.0035)	0.0169	0.2039	(0.0155)
2006	0.0545	0.0137	(23.5026)	(0.0006)	0.1874	(0.0085)	(0.0029)	0.2847	(0.0484)
2007	0.0519	0.0133	(10.5470)	(0.0013)	0.2396	(0.0088)	(0.0062)	0.2925	(0.0495)
2008	0.0576	0.0183	3.4660	0.0053	(0.0305)	0.0083	0.0219	(0.0941)	0.0363
2009	0.0464	0.0252	1.8095	0.0139	(0.0597)	0.0505	0.0396	(0.3726)	0.1044
2010	0.0523	0.0303	1.4492	0.0209	(0.0704)	0.0523	0.0570	(0.3259)	0.1191
2011	0.0208	0.0626	1.3613	0.0460	(0.0648)	0.3191	0.0613	(0.3275)	0.1338
2012	0.0079	0.0695	1.2161	0.0571	(0.0268)	(0.0906)	0.0636	(0.3074)	0.1500

Data source: KEWT 6.12-1, -2, -3, -4, and -5, by country and sector, 1990-2012, whose original data are *International Financial Statistics Yearbook*, IMF

Chapter 5

Table H6 Hyperbola elements, a, b, c, d, and $i = I/Y$ at $y = (cx + d)/ax$ formed for the rate of return, $r^*(i)$: the US, Australia, Japan, France, Germany, the UK, 1990-2012

1. the US	a	b	c	d	i=I/Y	2. Australi	a	b	c	d	i=I/Y
1990	0.7149	0.00	0.0241	0.0015	0.0420	1990	0.6965	0.00	0.0250	0.0015	0.2127
1991	0.7496	0.00	0.0182	0.0016	0.0422	1991	0.7321	0.00	0.0183	0.0011	0.1385
1992	0.7493	0.00	0.0180	0.0017	0.0388	1992	0.7325	0.00	0.0185	0.0011	0.1321
1993	0.6950	0.00	0.0261	0.0014	0.0632	1993	0.7243	0.00	0.0189	0.0009	0.1381
1994	0.6739	0.00	0.0284	0.0013	0.0741	1994	0.7174	0.00	0.0196	0.0009	0.1695
1995	0.6648	0.00	0.0266	0.0011	0.0904	1995	0.7331	0.00	0.0180	0.0010	0.1287
1996	0.6627	0.00	0.0264	0.0010	0.0944	1996	0.7292	0.00	0.0187	0.0011	0.1265
1997	0.6592	0.00	0.0260	0.0010	0.1030	1997	0.7269	0.00	0.0190	0.0010	0.1222
1998	0.6600	0.00	0.0260	0.0010	0.1077	1998	0.7053	0.00	0.0224	0.0011	0.1621
1999	0.6527	0.00	0.0274	0.0010	0.1147	1999	0.7096	0.00	0.0213	0.0010	0.1634
2000	0.6500	0.00	0.0288	0.0011	0.1165	2000	0.7115	0.00	0.0213	0.0011	0.1508
2001	0.6541	0.00	0.0305	0.0011	0.0976	2001	0.7535	0.00	0.0166	0.0016	0.1224
2002	0.6513	0.00	0.0327	0.0011	0.0916	2002	0.7083	0.00	0.0217	0.0010	0.1447
2003	0.6466	0.00	0.0344	0.0011	0.0900	2003	0.7071	0.00	0.0220	0.0011	0.1623
2004	0.6412	0.00	0.0345	0.0011	0.0998	2004	0.7080	0.00	0.0223	0.0013	0.1699
2005	0.6374	0.00	0.0350	0.0011	0.1061	2005	0.6975	0.00	0.0256	0.0016	0.1800
2006	0.6370	0.00	0.0345	0.0010	0.1115	2006	0.7088	0.00	0.0240	0.0018	0.1705
2007	0.6419	0.00	0.0344	0.0010	0.0970	2007	0.7014	0.00	0.0257	0.0021	0.1829
2008	0.6459	0.00	0.0364	0.0011	0.0767	2008	0.6745	0.00	0.0324	0.0026	0.1974
2009	0.6923	0.00	0.0284	0.0013	0.0403	2009	0.7073	0.00	0.0252	0.0021	0.1731
2010	0.6713	0.00	0.0326	0.0012	0.0504	2010	0.6840	0.00	0.0303	0.0022	0.1732
2011	0.6712	0.00	0.0328	0.0012	0.0474	2011	0.6578	0.00	0.0362	0.0024	0.1862
2012	0.7200	0.00	0.0232	0.0019	0.0512	2012	0.6696	0.00	0.0334	0.0020	0.2079

3. Japan	a	b	c	d	i=I/Y	4. France	a	b	c	d	i=I/Y
1990	0.7005	0.00	0.0216	0.0006	0.2389	1990	91.6837	0.00	(0.5705)	0.0008	0.1387
1991	0.7012	0.00	0.0219	0.0005	0.2225	1991	95.1715	0.00	(0.6008)	0.0007	0.1245
1992	0.6632	0.00	0.0250	0.0005	0.1974	1992	97.9841	0.00	(0.6054)	0.0006	0.1066
1993	0.6935	0.00	0.0226	0.0003	0.1840	1993	98.3616	0.00	(0.5148)	0.0004	0.0780
1994	0.7211	0.00	0.0199	0.0002	0.1737	1994	102.6038	0.00	(0.4808)	0.0004	0.0865
1995	0.7240	0.00	0.0196	0.0002	0.1793	1995	108.2856	0.00	(0.4668)	0.0004	0.0908
1996	0.7318	0.00	0.0187	0.0002	0.1804	1996	110.4845	0.00	(0.5086)	0.0003	0.0754
1997	0.7113	0.00	0.0206	0.0002	0.1797	1997	114.1802	0.00	(0.4369)	0.0002	0.0692
1998	0.7594	0.00	0.0154	0.0002	0.1478	1998	118.9436	0.00	(0.3712)	0.0002	0.0815
1999	0.7907	0.00	0.0119	0.0002	0.1327	1999	18.6856	0.00	(0.0520)	0.0002	0.0766
2000	0.7855	0.00	0.0125	0.0002	0.1377	2000	19.6449	0.00	(0.0526)	0.0003	0.1056
2001	0.8084	0.00	0.0101	0.0002	0.1210	2001	20.2500	0.00	(0.1104)	0.0005	0.0868
2002	0.8233	0.00	0.0085	0.0002	0.1005	2002	20.7707	0.00	(0.1528)	0.0006	0.0847
2003	0.8224	0.00	0.0086	0.0002	0.0994	2003	21.0916	0.00	(0.2197)	0.0008	0.0786
2004	0.8186	0.00	0.0090	0.0002	0.0982	2004	21.7318	0.00	(0.2244)	0.0008	0.0784
2005	0.8221	0.00	0.0087	0.0002	0.0924	2005	22.4775	0.00	(0.1693)	0.0006	0.0848
2006	0.8092	0.00	0.0101	0.0000	0.0889	2006	23.3226	0.00	(0.1637)	0.0006	0.0910
2007	0.8117	0.00	0.0098	0.0001	0.0853	2007	24.3639	0.00	(0.1510)	0.0006	0.1040
2008	0.8203	0.00	0.0089	0.0000	0.0867	2008	24.7748	0.00	(0.1441)	0.0006	0.1029
2009	0.8233	0.00	0.0086	0.0000	0.0556	2009	23.6084	0.00	(0.1321)	0.0004	0.0686
2010	0.8236	0.00	0.0086	0.0000	0.0583	2010	24.0817	0.00	(0.1344)	0.0004	0.0708
2011	0.8147	0.00	0.0095	(0.0000)	0.0550	2011	24.7394	0.00	(0.2863)	0.0009	0.0868
2012	0.7989	0.00	0.0113	(0.0001)	0.0400	2012	24.9576	0.00	(0.2936)	0.0009	0.0785

5. German	a	b	c	d	i=I/Y	6. the UK	a	b	c	d	i=I/Y
1990	22.5838	0.00	(0.2186)	0.0014	0.1611	1990	7.4248	0.00	(0.0110)	0.0001	0.0858
1991	28.2292	0.00	(0.2469)	0.0012	0.1514	1991	7.5397	0.00	(0.0120)	0.0001	0.0517
1992	30.3474	0.00	(0.2490)	0.0010	0.1414	1992	7.6003	0.00	(0.0155)	0.0001	0.0317
1993	31.0755	0.00	(0.2612)	0.0009	0.1197	1993	7.9433	0.00	(0.0200)	0.0001	0.0301
1994	32.4785	0.00	(0.0970)	0.0004	0.1343	1994	8.6083	0.00	(0.0218)	0.0001	0.0301
1995	35.4005	0.00	(0.1202)	0.0004	0.1345	1995	9.6011	0.00	(0.0255)	0.0002	0.0656
1996	35.9664	0.00	(0.1202)	0.0004	0.1195	1996	10.1620	0.00	(0.0269)	0.0002	0.0621
1997	36.5329	0.00	(0.1269)	0.0004	0.1217	1997	11.0455	0.00	(0.0443)	0.0003	0.0625
1998	37.2681	0.00	(0.0951)	0.0003	0.1308	1998	11.6586	0.00	(0.0311)	0.0002	0.0615
1999	19.5465	0.00	(0.0485)	0.0003	0.1299	1999	12.1136	0.00	(0.0368)	0.0002	0.0743
2000	19.8111	0.00	(0.0532)	0.0004	0.1634	2000	12.5353	0.00	(0.0359)	0.0002	0.0713
2001	20.0821	0.00	(0.1903)	0.0011	0.1201	2001	12.8863	0.00	(0.0494)	0.0002	0.0592
2002	20.4198	0.00	(0.0537)	0.0002	0.0971	2002	13.3392	0.00	(0.0525)	0.0002	0.0437
2003	20.6608	0.00	(0.0256)	0.0001	0.0886	2003	14.0634	0.00	(0.0598)	0.0002	0.0396
2004	20.9482	0.00	(0.0152)	0.0000	0.0604	2004	14.7396	0.00	(0.0700)	0.0002	0.0415
2005	21.2892	0.00	0.0026	(0.0000)	0.0557	2005	15.0516	0.00	(0.0760)	0.0002	0.0387
2006	21.9754	0.00	0.0264	(0.0001)	0.0578	2006	16.1178	0.00	(0.0908)	0.0003	0.0571
2007	22.2286	0.00	0.0435	(0.0001)	0.0756	2007	17.2085	0.00	(0.1025)	0.0003	0.0572
2008	22.9927	0.00	0.0566	(0.0002)	0.0781	2008	17.1168	0.00	(0.1018)	0.0002	0.0325
2009	23.0733	0.00	0.0546	(0.0001)	0.0342	2009	15.8466	0.00	(0.0937)	0.0001	0.0111
2010	24.0730	0.00	0.0464	(0.0001)	0.0473	2010	16.7812	0.00	(0.1111)	0.0002	0.0256
2011	25.0241	0.00	0.0884	(0.0002)	0.0591	2011	17.3453	0.00	(0.2132)	0.0002	0.0169
2012	25.6228	0.00	0.0683	(0.0001)	0.0494	2012	17.0290	0.00	(0.1910)	0.0003	0.0290

Table H7 Hyperbola elements, a, b, c, d, and $i = I/Y$ at $\mathrm{y} = (\mathrm{cx} + \mathrm{d})/\mathrm{ax}$ formed for the rate of return, $r^*(i)$: China, India, Brazil, Mexico, Russia, South Africa, 1990-2012

7. China	a	b	c	d	i=I/Y	**8. India**	a	b	c	d	i=I/Y
1990	0.5794	0.0000	0.0541	0.0028	0.2951	**1990**	0.7145	0.00	0.0201	0.0018	0.1451
1991	0.5709	0.0000	0.0568	0.0027	0.2993	**1991**	0.7018	0.00	0.0214	0.0017	0.1316
1992	0.5524	0.0000	0.0630	0.0025	0.3306	**1992**	0.6740	0.00	0.0254	0.0018	0.1573
1993	0.5258	0.0000	0.0716	0.0025	0.3855	**1993**	0.6686	0.00	0.0259	0.0018	0.1458
1994	0.5012	0.0000	0.0810	0.0026	0.3665	**1994**	0.6365	0.00	0.0332	0.0020	0.1699
1995	0.5361	0.0000	0.0722	0.0021	0.2987	**1995**	0.6254	0.00	0.0374	0.0026	0.1892
1996	0.5440	0.0000	0.0695	0.0021	0.2848	**1996**	0.6668	0.00	0.0288	0.0033	0.1716
1997	0.5440	0.0000	0.0692	0.0020	0.2574	**1997**	0.6556	0.00	0.0320	0.0035	0.1816
1998	0.5551	0.0000	0.0651	0.0018	0.2517	**1998**	0.6559	0.00	0.0282	0.0025	0.1646
1999	0.5646	0.0000	0.0618	0.0014	0.2649	**1999**	0.6283	0.00	0.0319	0.0019	0.1708
2000	0.5711	0.0000	0.0595	0.0019	0.2755	**2000**	0.6318	0.00	0.0330	0.0019	0.1706
2001	0.5649	0.0000	0.0610	0.0014	0.2880	**2001**	0.6306	0.00	0.0329	0.0016	0.1674
2002	0.5566	0.0000	0.0625	0.0013	0.3012	**2002**	0.6192	0.00	0.0394	0.0019	0.1875
2003	0.5363	0.0000	0.0666	0.0013	0.3369	**2003**	0.6039	0.00	0.0460	0.0021	0.2054
2004	0.5135	0.0000	0.0713	0.0013	0.3620	**2004**	0.5573	0.00	0.0648	0.0028	0.2663
2005	0.5050	0.0000	0.0724	0.0013	0.3404	**2005**	0.5649	0.00	0.0622	0.0027	0.2699
2006	0.4962	0.0000	0.0738	0.0013	0.3260	**2006**	0.5613	0.00	0.0637	0.0027	0.2883
2007	0.4760	0.0000	0.0790	0.0013	0.3321	**2007**	0.5606	0.00	0.0640	0.0027	0.3020
2008	0.4727	0.0000	0.0790	0.0013	0.3475	**2008**	0.5745	0.00	0.0593	0.0026	0.2984
2009	0.4539	0.0000	0.0789	0.0012	0.4143	**2009**	0.5805	0.00	0.0573	0.0025	0.2949
2010	0.4551	0.0000	0.0772	0.0012	0.4203	**2010**	0.5738	0.00	0.0596	0.0025	0.2905
2011	0.4772	0.0000	0.0678	0.0050	0.4236	**2011**	0.5727	0.00	0.0600	0.0025	0.3092
2012	0.4870	0.0000	0.0691	0.0015	0.4052	**2012**	0.5729	0.00	0.0591	0.0000	0.3092

9. Brazil	a	b	c	d	i=I/Y	**10. Mexic**	a	b	c	d	i=I/Y
1990	0.0638	0.0000	0.0194	0.0037	0.2243	**1990**	0.6508	0.00	0.0354	0.0025	0.1302
1991	0.3291	0.0000	0.0120	0.0017	0.1087	**1991**	0.6300	0.00	0.0385	0.0024	0.1105
1992	0.3437	0.0000	0.0112	0.0015	0.1005	**1992**	0.5993	0.00	0.0501	0.0033	0.1047
1993	0.0741	0.0000	0.0154	0.0018	0.1232	**1993**	0.5973	0.00	0.0352	0.0020	0.1539
1994	0.1806	0.0000	0.0133	0.0020	0.1403	**1994**	0.5858	0.00	0.0364	0.0017	0.1651
1995	0.0338	0.0000	0.0558	0.0063	0.1294	**1995**	0.5533	0.00	0.0403	0.0015	0.1600
1996	0.0412	0.0000	0.0165	0.0019	0.1280	**1996**	0.5127	0.00	0.0567	0.0022	0.1915
1997	0.0451	0.0000	0.0171	0.0021	0.1367	**1997**	0.4998	0.00	0.0619	0.0020	0.2108
1998	0.0463	0.0000	0.0161	0.0018	0.1186	**1998**	0.5251	0.00	0.0428	0.0015	0.1940
1999	0.0496	0.0000	0.0161	0.0020	0.1381	**1999**	0.5281	0.00	0.0416	0.0014	0.1784
2000	0.0534	0.0000	0.0170	0.0019	0.1224	**2000**	0.5378	0.00	0.0405	0.0017	0.1800
2001	0.0583	0.0000	0.0149	0.0012	0.0853	**2001**	0.6843	0.00	0.0243	0.0046	0.1441
2002	0.0659	0.0000	0.0136	0.0009	0.0649	**2002**	0.5639	0.00	0.0359	0.0011	0.1381
2003	0.0749	0.0000	0.0129	0.0008	0.0649	**2003**	0.5459	0.00	0.0387	0.0011	0.1618
2004	0.0849	0.0000	0.0123	0.0010	0.0825	**2004**	0.5465	0.00	0.0423	0.0012	0.1436
2005	0.0932	0.0000	0.0112	0.0008	0.0725	**2005**	0.5583	0.00	0.0401	0.0012	0.1764
2006	0.1018	0.0000	0.0103	0.0008	0.0780	**2006**	0.5567	0.00	0.0470	0.0014	0.1982
2007	0.1133	0.0000	0.0096	0.0009	0.0944	**2007**	0.5697	0.00	0.0455	0.0014	0.2018
2008	0.1277	0.0000	0.0091	0.0011	0.1214	**2008**	0.5865	0.00	0.0421	0.0014	0.2034
2009	0.1346	0.0000	0.0084	0.0008	0.0893	**2009**	0.6324	0.00	0.0301	0.0011	0.1686
2010	0.1563	0.0000	0.0084	0.0010	0.1158	**2010**	0.6333	0.00	0.0307	0.0012	0.1674
2011	0.1670	0.0000	0.0248	0.0029	0.1102	**2011**	0.6267	0.00	0.0339	0.0013	0.1789
2012	0.1484	0.0000	0.0231	0.0005	0.0209	**2012**	0.6324	0.00	0.0333	0.0013	0.1757

11. Russia	a	b	c	d	i=I/Y	**12. S.Afric**	a	b	c	d	i=I/Y
	0.0000	0.0000	0.0000	0.0000	0.0000	**1990**	5.8848	0.00	(0.4126)	0.0041	0.0608
	0.0000	0.0000	0.0000	0.0000	0.0000	**1991**	6.8477	0.00	(0.1714)	0.0013	0.0507
	0.0000	0.0000	0.0000	0.0000	0.0000	**1992**	7.4993	0.00	(0.1487)	0.0010	0.0476
	0.0000	0.0000	0.0000	0.0000	0.0000	**1993**	8.5366	0.00	(0.1718)	0.0014	0.0668
	0.0000	0.0000	0.0000	0.0000	0.0000	**1994**	9.4626	0.00	(0.2011)	0.0017	0.0815
1995	8.2656	0.0000	0.0159	(0.0003)	0.1719	**1995**	10.5083	0.00	(0.2747)	0.0028	0.1146
1996	11.6435	0.0000	0.0157	(0.0002)	0.1595	**1996**	11.6131	0.00	(0.2595)	0.0021	0.1009
1997	13.9609	0.0000	0.0911	(0.0008)	0.1331	**1997**	12.7939	0.00	(0.1510)	0.0011	0.0937
1998	15.3240	0.0000	0.0358	(0.0001)	0.0590	**1998**	13.6257	0.00	(0.2209)	0.0016	0.1012
1999	27.6062	0.0000	0.0833	(0.0002)	0.0536	**1999**	14.7545	0.00	(0.2311)	0.0014	0.0909
2000	33.9653	0.0000	0.1102	(0.0003)	0.0968	**2000**	16.6005	0.00	(0.2108)	0.0011	0.0922
2001	44.4956	0.0000	0.1971	(0.0005)	0.1317	**2001**	17.9836	0.00	(0.3158)	0.0015	0.0902
2002	55.7356	0.0000	0.2696	(0.0005)	0.1125	**2002**	20.4222	0.00	(0.2888)	0.0012	0.0939
2003	68.2218	0.0000	0.3295	(0.0005)	0.1194	**2003**	21.5448	0.00	(0.3734)	0.0016	0.0986
2004	87.0805	0.0000	0.3640	(0.0005)	0.1181	**2004**	23.5946	0.00	(0.3727)	0.0017	0.1196
2005	109.8339	0.0000	0.3336	(0.0003)	0.1091	**2005**	25.9925	0.00	(0.4089)	0.0016	0.1105
2006	135.6091	0.0000	0.2203	(0.0002)	0.1235	**2006**	28.7737	0.00	(0.4475)	0.0018	0.1264
2007	167.5971	0.0000	0.0941	(0.0001)	0.1604	**2007**	32.6416	0.00	(0.5184)	0.0022	0.1618
2008	210.7391	0.0000	(0.0512)	0.0000	0.1681	**2008**	36.4535	0.00	(0.5717)	0.0024	0.1772
2009	214.3240	0.0000	(0.0163)	0.0000	0.0955	**2009**	37.8152	0.00	(0.5173)	0.0015	0.1250
2010	219.8866	0.0000	0.1205	(0.0001)	0.1309	**2010**	41.8239	0.00	(0.5128)	0.0014	0.1286
2011	240.1007	0.0000	0.3308	(0.0001)	0.1054	**2011**	45.0583	0.00	(1.7411)	0.0046	0.1421
2012	261.4440	0.0000	0.5562	(0.0003)	0.1367	**2012**	47.2124	0.00	(1.5981)	0.0039	0.1379

Chapter 5

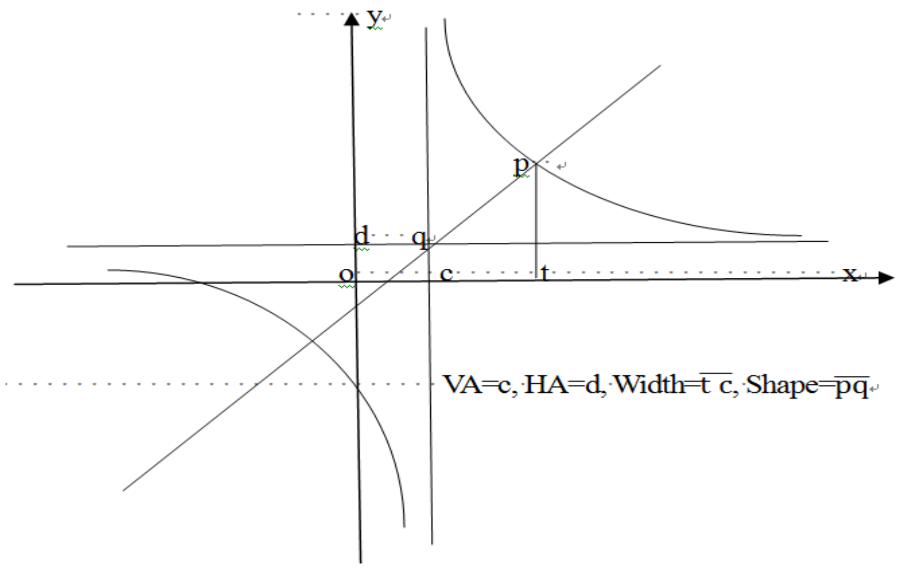
Table H8 Hyperbola elements, a, b, c, d, and $i = I/Y$ at $y = (cx + d)/ax$ formed for the rate of return, $r^*(i)$: Canada, Italy, Netherlands, Spain, Greece, Ireland, 1990-2012

13. Canad	a	b	c	d	i=I/Y	14. Italy	a	b	c	d	i=I/Y
1990	0.7494	0.0000	0.0164	0.0013	0.1456	**1990**	18.5052	0.0000	(0.0486)	0.0003	0.1380
1991	0.7408	0.0000	0.0187	0.0012	0.1141	**1991**	20.8642	0.0000	0.3469	(0.0022)	0.1373
1992	0.7450	0.0000	0.0187	0.0013	0.1039	**1992**	21.5305	0.0000	(0.0401)	0.0002	0.1056
1993	0.7421	0.0000	0.0188	0.0012	0.1027	**1993**	22.1215	0.0000	(0.0763)	0.0003	0.0769
1994	0.7477	0.0000	0.0169	0.0010	0.1169	**1994**	23.3404	0.0000	(0.0636)	0.0002	0.0804
1995	0.7358	0.0000	0.0176	0.0008	0.1127	**1995**	24.8612	0.0000	(0.0468)	0.0002	0.1197
1996	0.7461	0.0000	0.0166	0.0008	0.1050	**1996**	26.2461	0.0000	(0.0385)	0.0001	0.0894
1997	0.7289	0.0000	0.0185	0.0008	0.1319	**1997**	28.4064	0.0000	0.1452	(0.0004)	0.0909
1998	0.7306	0.0000	0.0183	0.0008	0.1328	**1998**	29.3425	0.0000	0.0323	(0.0001)	0.0861
1999	0.7191	0.0000	0.0207	0.0008	0.1350	**1999**	15.1943	0.0000	0.0027	(0.0000)	0.0670
2000	0.6943	0.0000	0.0267	0.0010	0.1304	**2000**	16.0325	0.0000	0.0113	(0.0001)	0.0765
2001	0.7247	0.0000	0.0208	0.0010	0.1131	**2001**	16.8692	0.0000	(0.0634)	0.0003	0.0798
2002	0.7229	0.0000	0.0203	0.0009	0.1165	**2002**	17.2166	0.0000	(0.1206)	0.0006	0.0829
2003	0.7249	0.0000	0.0200	0.0009	0.1159	**2003**	17.5502	0.0000	(0.0840)	0.0004	0.0774
2004	0.7186	0.0000	0.0214	0.0010	0.1179	**2004**	19.4675	0.0000	0.5352	(0.0022)	0.0787
2005	0.7141	0.0000	0.0223	0.0011	0.1249	**2005**	17.7407	0.0000	(0.8114)	0.0033	0.0803
2006	0.7192	0.0000	0.0211	0.0011	0.1271	**2006**	19.0591	0.0000	(0.1390)	0.0006	0.0931
2007	0.7155	0.0000	0.0217	0.0011	0.1367	**2007**	19.6264	0.0000	(0.1455)	0.0006	0.0906
2008	0.7155	0.0000	0.0218	0.0011	0.1381	**2008**	19.5325	0.0000	(0.1326)	0.0005	0.0842
2009	0.7461	0.0000	0.0171	0.0010	0.1211	**2009**	17.9932	0.0000	(0.0991)	0.0003	0.0518
2010	0.7396	0.0000	0.0176	0.0010	0.1351	**2010**	18.4760	0.0000	(0.0906)	0.0003	0.0713
2011	0.7348	0.0000	0.0178	0.0009	0.1405	**2011**	18.3955	0.0000	(0.1577)	0.0005	0.0610
2012	0.6983	0.0000	0.0254	0.0011	0.1995	**2012**	18.5463	0.0000	(0.1121)	0.0002	0.0383

15. Nether	a	b	c	d	i=I/Y	16. Spain	a	b	c	d	i=I/Y
1990	24.9123	0.0000	(0.1885)	0.0011	0.1626	**1990**	1035.1976	0.0000	(3.7691)	0.0006	0.1808
1991	26.4305	0.0000	(0.2376)	0.0012	0.1543	**1991**	1135.8642	0.0000	(3.5389)	0.0006	0.2168
1992	28.2185	0.0000	(0.2296)	0.0011	0.1471	**1992**	1202.0166	0.0000	(2.7965)	0.0003	0.1392
1993	28.9392	0.0000	(0.2304)	0.0009	0.1294	**1993**	1221.3912	0.0000	(3.4234)	0.0003	0.0996
1994	29.6351	0.0000	(0.1504)	0.0006	0.1420	**1994**	1256.5383	0.0000	(3.8402)	0.0003	0.0925
1995	29.9497	0.0000	(0.2160)	0.0009	0.1386	**1995**	1483.3090	0.0000	(5.4119)	0.0003	0.1060
1996	31.3435	0.0000	(0.2257)	0.0009	0.1423	**1996**	1561.1079	0.0000	(5.2116)	0.0003	0.1001
1997	32.6577	0.0000	(0.1873)	0.0007	0.1444	**1997**	1652.5265	0.0000	(4.5890)	0.0003	0.1020
1998	31.1981	0.0000	(0.2277)	0.0011	0.1716	**1998**	1710.6484	0.0000	(5.2408)	0.0003	0.1077
1999	18.2149	0.0000	(0.1110)	0.0007	0.1208	**1999**	10.9141	0.0000	(0.0358)	0.0003	0.1068
2000	19.3588	0.0000	(0.1155)	0.0006	0.0998	**2000**	11.4692	0.0000	(0.0553)	0.0005	0.1095
2001	20.9322	0.0000	(0.0417)	0.0002	0.1093	**2001**	11.8925	0.0000	(0.1441)	0.0011	0.0957
2002	22.0474	0.0000	(0.1299)	0.0005	0.0873	**2002**	12.4829	0.0000	(0.1880)	0.0014	0.0950
2003	22.7511	0.0000	(0.1326)	0.0004	0.0804	**2003**	12.8943	0.0000	(0.2140)	0.0015	0.0913
2004	22.9581	0.0000	(0.1306)	0.0003	0.0599	**2004**	13.5249	0.0000	(0.2310)	0.0017	0.1037
2005	23.2071	0.0000	(0.1494)	0.0005	0.0845	**2005**	14.7791	0.0000	(0.2482)	0.0020	0.1294
2006	24.2636	0.0000	(0.0920)	0.0003	0.0711	**2006**	16.2133	0.0000	(0.2554)	0.0022	0.1572
2007	24.9539	0.0000	(0.0959)	0.0003	0.0892	**2007**	17.1669	0.0000	(0.2774)	0.0023	0.1620
2008	25.7903	0.0000	(0.1027)	0.0005	0.1307	**2008**	16.8010	0.0000	(0.2341)	0.0016	0.1251
2009	26.6947	0.0000	(0.1044)	0.0004	0.1133	**2009**	16.2492	0.0000	(0.1870)	0.0008	0.0748
2010	27.0740	0.0000	(0.1034)	0.0003	0.0907	**2010**	15.6918	0.0000	(0.1479)	0.0006	0.0606
2011	26.7030	0.0000	(0.0833)	0.0002	0.0736	**2011**	15.7069	0.0000	(0.2598)	0.0007	0.0444
2012	26.9936	0.0000	(0.0670)	0.0002	0.0713	**2012**	15.6099	0.0000	(0.1876)	0.0003	0.0268

17. Greece	a	b	c	d	i=I/Y	18. Irelanc	a	b	c	d	i=I/Y
1990	1133.2880	0.0000	(8.3240)	0.0004	0.0523	**1990**	5.9559	0.0000	0.0174	(0.0007)	0.2387
1991	1408.4050	0.0000	(13.4990)	0.0006	0.0732	**1991**	6.2745	0.0000	(0.0366)	0.0012	0.2075
1992	1599.0548	0.0000	(11.6029)	0.0004	0.0559	**1992**	6.6389	0.0000	(0.0573)	0.0015	0.1799
1993	1779.4317	0.0000	(11.0493)	0.0004	0.0624	**1993**	6.9668	0.0000	(0.0197)	0.0005	0.1675
1994	2050.9714	0.0000	(10.7604)	0.0004	0.0845	**1994**	7.5501	0.0000	(0.0215)	0.0005	0.1674
1995	2366.1924	0.0000	(56.1226)	0.0011	0.0523	**1995**	8.0727	0.0000	(0.0964)	0.0022	0.2015
1996	2454.1193	0.0000	(19.9924)	0.0006	0.0778	**1996**	8.5206	0.0000	(0.0765)	0.0018	0.2124
1997	2770.2629	0.0000	(21.7635)	0.0013	0.1979	**1997**	8.6863	0.0000	(0.0795)	0.0020	0.2435
1998	2995.3013	0.0000	(16.8349)	0.0010	0.2099	**1998**	9.5159	0.0000	(0.1192)	0.0029	0.2685
1999	3131.8692	0.0000	(17.8834)	0.0011	0.2349	**1999**	14.4269	0.0000	(0.1835)	0.0027	0.2528
2000	3197.4386	0.0000	(23.7674)	0.0010	0.1515	**2000**	14.0999	0.0000	(0.2297)	0.0039	0.2960
2001	10.8220	0.0000	(0.0346)	0.0008	0.2858	**2001**	15.7893	0.0000	(0.3570)	0.0051	0.2845
2002	11.1563	0.0000	(0.0230)	0.0004	0.2462	**2002**	16.9658	0.0000	(0.3793)	0.0051	0.2881
2003	12.2961	0.0000	(0.0078)	0.0001	0.2699	**2003**	17.9792	0.0000	(0.3917)	0.0048	0.2741
2004	11.5385	0.0000	(0.0043)	0.0000	0.1197	**2004**	18.4919	0.0000	(0.4583)	0.0056	0.2857
2005	11.8015	0.0000	(0.0054)	0.0001	0.1132	**2005**	18.5072	0.0000	(0.4060)	0.0056	0.3304
2006	13.1576	0.0000	(0.0063)	0.0001	0.1532	**2006**	20.7196	0.0000	(0.4515)	0.0056	0.3366
2007	14.1142	0.0000	(0.0282)	0.0003	0.1875	**2007**	23.9540	0.0000	(0.4401)	0.0046	0.3317
2008	13.7032	0.0000	(0.0135)	0.0002	0.1715	**2008**	27.5098	0.0000	(0.4807)	0.0038	0.2778
2009	13.2264	0.0000	(0.0246)	0.0002	0.1122	**2009**	24.6632	0.0000	(0.4080)	0.0032	0.2320
2010	13.1525	0.0000	(0.0121)	0.0001	0.1050	**2010**	23.3427	0.0000	(0.3682)	0.0026	0.1940
2011	12.2262	0.0000	(0.0221)	0.0002	0.0898	**2011**	21.0665	0.0000	(0.3346)	0.0030	0.2247
2012	11.5247	0.0000	(0.0126)	0.0000	0.0243	**2012**	19.7121	0.0000	(0.2516)	0.0022	0.2040

When *f/a* is plus, the diagonal is upward to the right



When *F/A* is minus, the diagonal is downward to the right

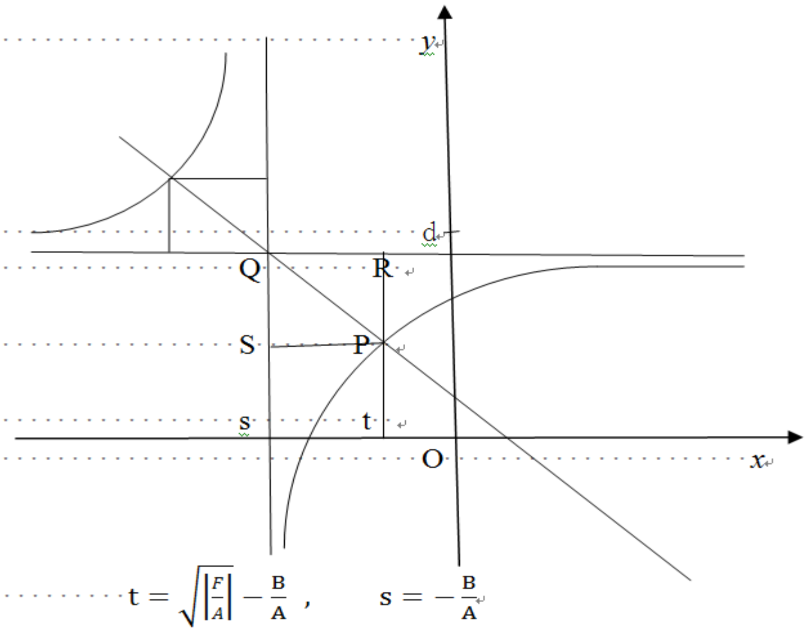
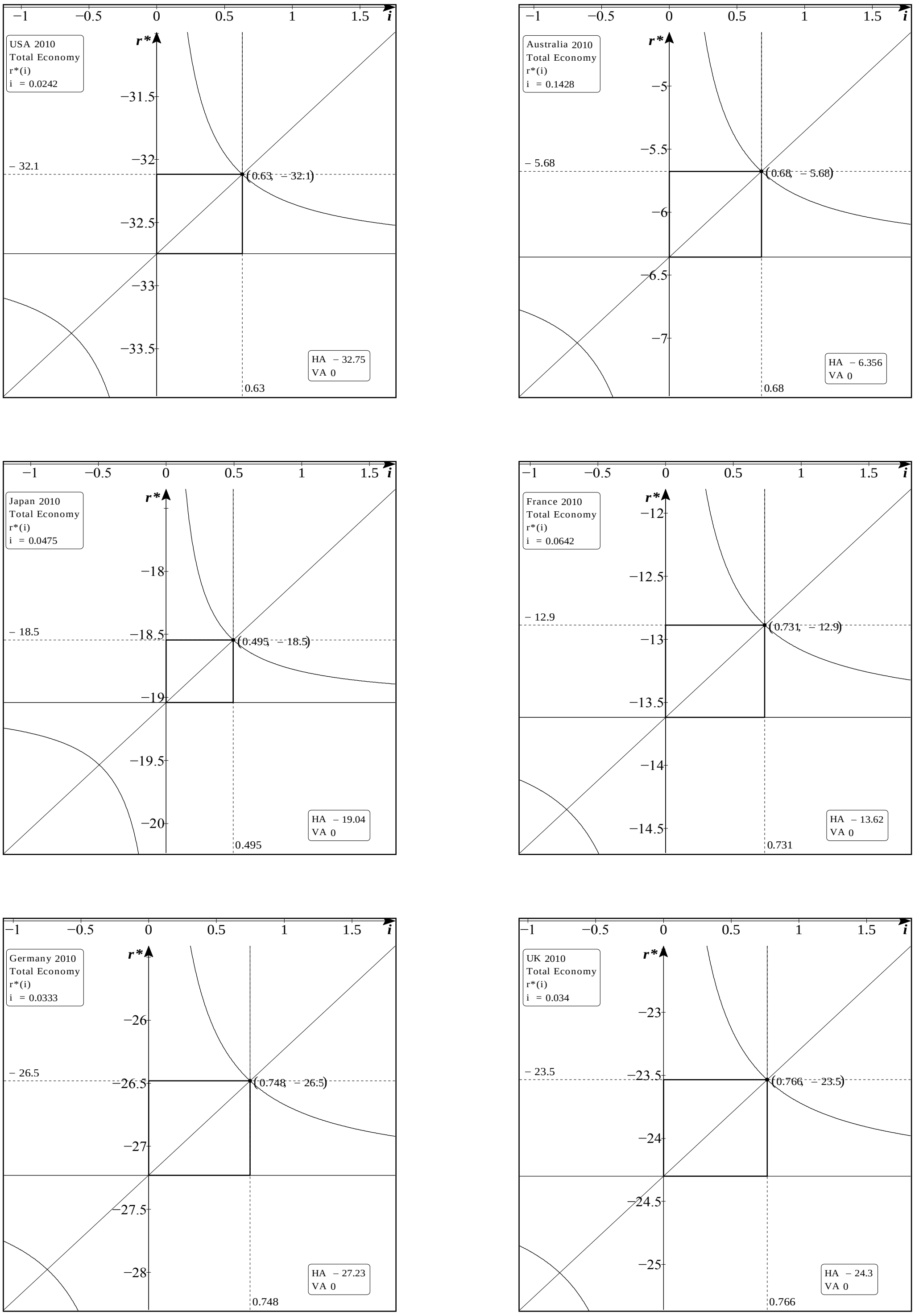
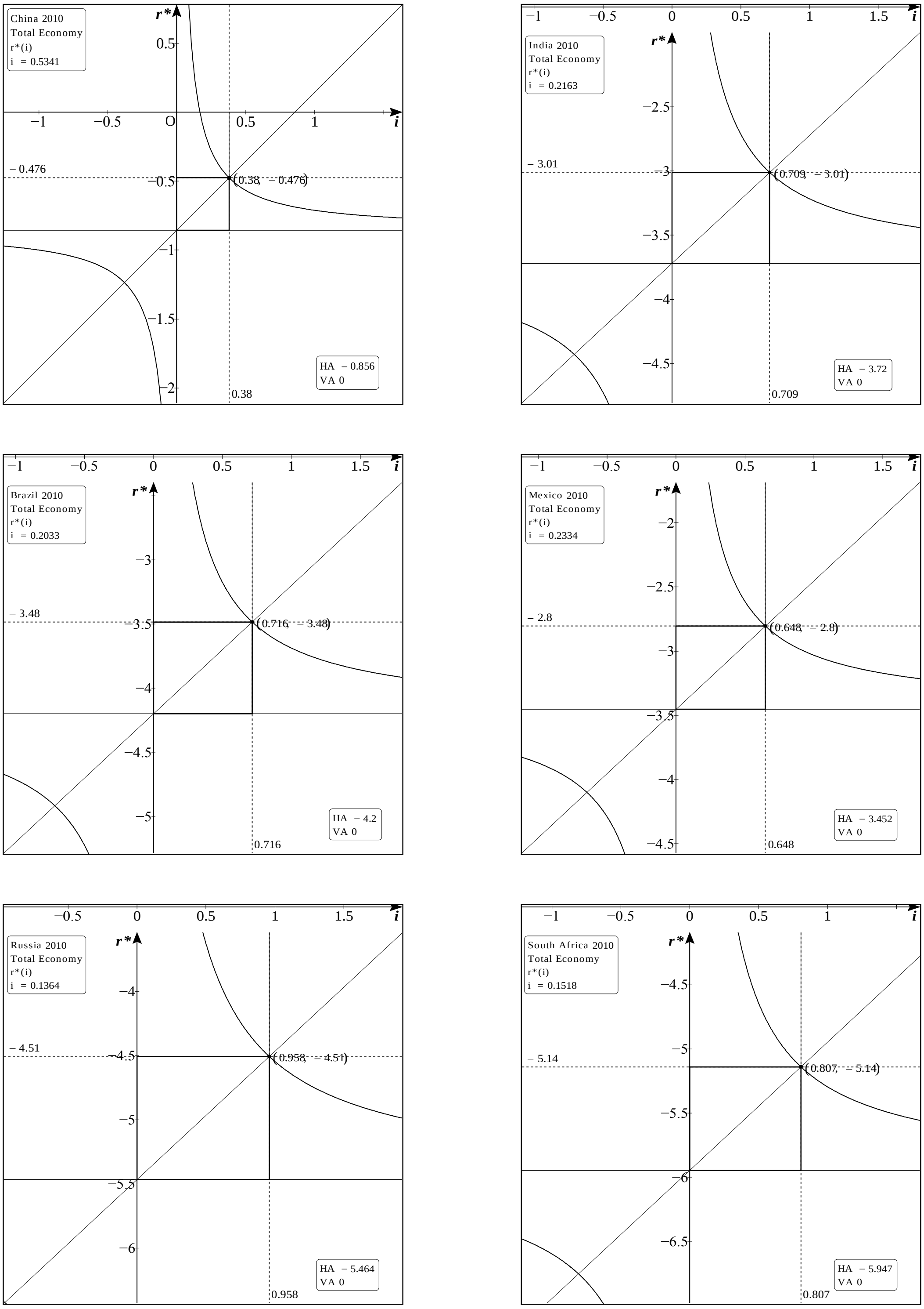


Figure H1 Relationship between the rectangular hyperbola and the rectangular equilateral triangle: *f/a*>0 versus *F/A*<0



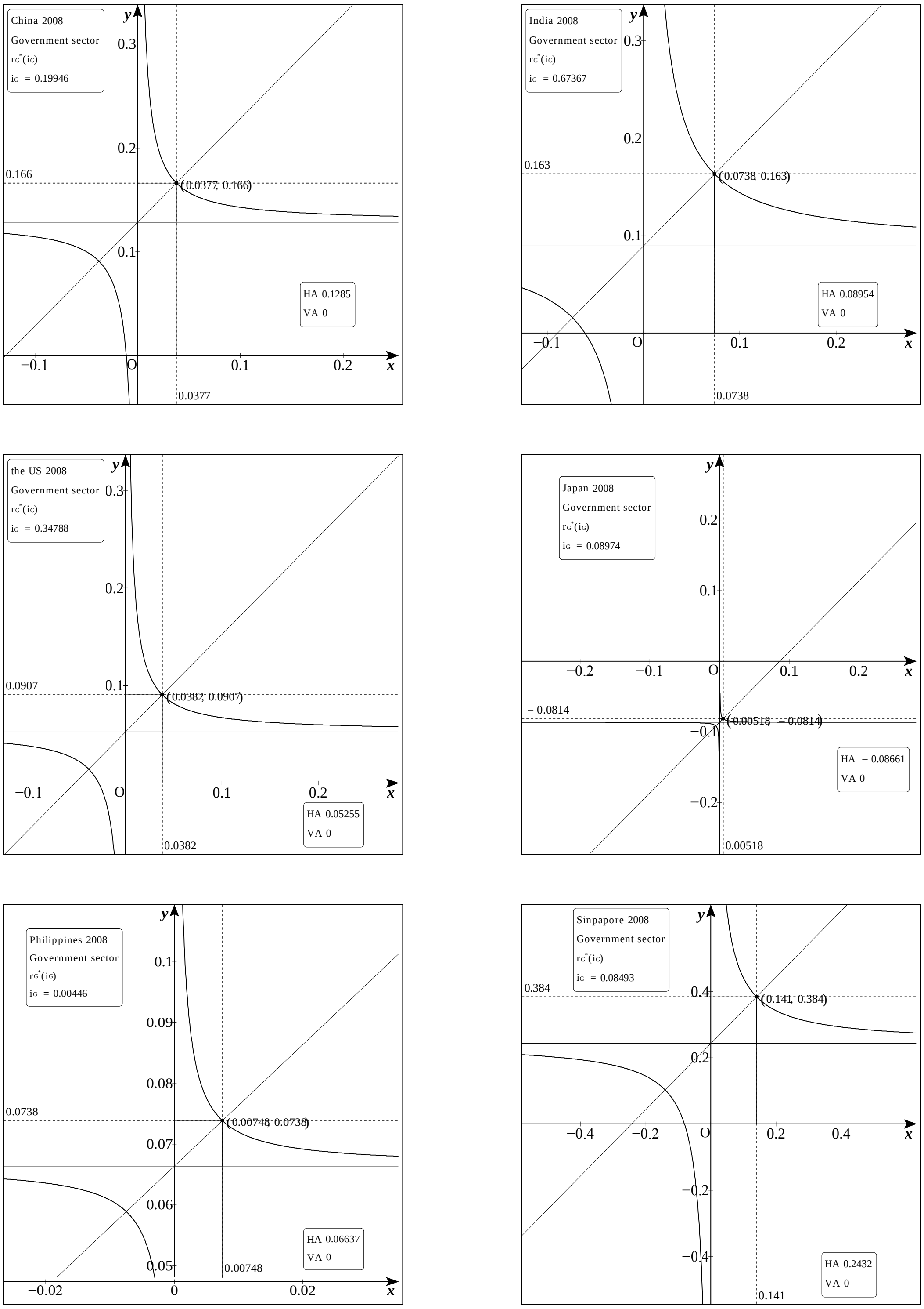
Data source: KEWT 6.12-1, -2, -3, and -4, by country and sector, 1990-2010, whose original data are from *IFSY*, IMF.

Figure H2 Hyperbola of the rate of return to net investment to output, $r^*(i)$: the US, Australia, Japan, France, Germany, the UK 2010



Data source: KEWT 6.12-1, -2, -3, and -4, by country and sector, 1990-2010, whose original data are from *International Financial Statistics Yearbook*, IMF. I am much obliged to Tomoda, K., for his software help.

Figure H3 Hyperbola of the rate of return to net investment to output, $r^*(i)$: China, India, Brazil, Mexico, Russia, South Africa, 2010



Data source: KEWT 4.10, by country and sector, 1990-2008, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure H4 Hyperbola of the rate of return to net investment to output at the G sector, $r_G^*(i_G)$: China, India, the US, Japan, the Philippines, Singapore, 2008

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Chapter 6

Capital Stock and Its Rate of Return, Japan *vs*. the US, 1960-2011, Purely Measured under *No* Assumption

6.1 Review of Representative Databases: With Capital Stock and the Rate of Return

This chapter presents a key to understanding the character common to the current representative databases. It is impossible for the current databases to measure capital stock endogenously. This is because the rate of technological progress, and accordingly, the rate of return and, the relative share of capital are only measured in the endogenous system. The author has used respectively databases of UN, IMF, OECD, Eurostat, and others after the 1980s. The author has failed to estimate the above three ratios, directly using the current databases. The experiences have stimulated the author to set up a homemade database, i.e., the KEWT database.

This chapter aims at calling after a blue bird, just like a child. The author already found a second blue bird at several articles written by Jorgenson and Griliches (1967) and Jorgenson (1963, 1966). The second bird's object was not the embodied and/or disembodied hypothesis but the confirmation of precise assumptions used at their models. Examining assumptions is essential to the comparison between the current various databases. This chapter explains why no assumption by using nine BOXES. This section preliminarily outlines the current databases.

EES is a whole naming to author's endogenous economic system and its Kamiryo Endogenous World Table (KEWT) database and further its recursive programming for the transitional path by year. Capital stock and its rate of return are simultaneously measured and consistently involved in EES as a whole system. Capital stock and its rate of return connect the current world databases with EES, through a common fact that statistics data are always within a narrow range of endogenous data in equilibrium.

First let the author outline the current representative databases. The author has paid a special attention to Penn World Table (PWT, and EPWT). The author recollects the past days, with Heston Alan and Ye Wang. The author was once shocked with a fact that PWT stopped publishing the capital-labor ratio after 1996. The author now understands and admires the brave decision-making. Economics and econometrics have marched together but a little differently, as suggested by Jorgenson and Griliches (1967). OECD national accounts data (http://OECD.com with market data explanation of Paul.Schreyer@OECD.org) publishes capital stock for corporate sector but not consecutively/periodically. The UN does not publish capital-related data (UN: http://unstats.un.org/unsd/snaama/selectionbasicFact.asp).

In the last decade, representative databases have been rapidly well-arranged, marching with the progress of econometrics: The representatives: NBER, http://nber.org; KOF, http://globlization.kof.ethz.ch ; EU KLEMS, http://www.euklems.net/euk09i.shtml ; Real-Time, http://www.philadelphiafed.org/research-and-data/; ddgg to 10 sectors, http://www.ggde.net/dseries/10-sector.html . Time-Use such as MTUS & AHTUS, where time-series preferences by country are available (see "Accounting for Household Production" by Landefeld, Steven, J., Fraumeni, Barbara, M., and Cindy, M., Vojtech (*Review of Income and Wealth*, June 2009); http://www.timeuse.org/information/links. And fundamentally, IMF and the World Bank, where the KEWT database introduces 25=10+15 original data from *International Financial Statistics Yearbook*, IMF, http://imf.org ; http://data.worldbank.org by aspect. This chapter does not explain each characteristic in detail. Instead, the next section discusses the essentials of capital and labor and relationship between stocks and flows. Nine BOXES outline the essentials overwhelmingly.

Capital stock is published as the data of a system for national accounts (SNA, 1993), by several countries consecutively. For example, the Bureau of Economic Analysis (BEA), Dept of Commerce, the US (http://www.bea.gov), had published capital stock so long until recently. Annual Report on National Accounts, Cabinet Office, Japan (http://www.esri.cao.go.jp/), has published capital stock based on real-assets over years. Swiss Federal Statistical Office, National Accounts information, publishes net non financial capital stock by industry (geometrical method). This database (http://www.bfs.admin.ch/bfs/portal/en/index/themen/04/0204/key/stock_cap.html) covers twelve Industries and total.

This chapter focuses on the comparison of capital stocks and the rates of return in Japan and the US. It was a great challenge for the BEA to publish the estimation of capital stock in its *Survey of Current Business*. The BEA, however, stopped publishing capital stock in 2007. Section 3 compares the enlarging differences lying between BEA capital stock, 1960-2007, and EES capital stock, 1960-2011.

The BEA, in 2007, turned to estimate 'profits' by year at enterprise level, instead of 'capital' stock. This fact suggests a useful viewpoint to EES. The BEA challenges for brave trial and error and cooperates with the framework of the SNA. The BEA publishes the following note and papers concerning profits/returns:

1. Lally, P. R; Note on the returns for domestic nonfinancial corporations in 1960-2005. *Survey of Current Business* May 2006: 6-10.

2. Lally, Smith, Hodge, and Corea; Returns for domestic nonfinancial business. *Survey of Current Business* May 2007: 6-10. Since then, updated contents are published consecutively by year, 2008, 2009, 2010, 2011, 2012; Lally, Hodge, and Corea; Hodge, Corea, Green, and Retus.

Chapter 6

The above note and papers show rates of return and shares of value added, before and after tax, at enterprise level, based on *GDP*. National disposable income is the sum of wages and returns after adjusting net primary income from abroad: $Y = W + \Pi = C + S$ or $Y = W_G + \Pi_G + W_{PRI} + \Pi_{PRI} = C_G + S_G + C_{PRI} + S_{PRI}$. The BEA uses flows instead of stocks, similarly to Jorgenson (1963). A problem remains at the government sector. When deficit is shown by cash flow -in and -out, the rate of return at the government sector is zero so that the total economy is not distinguished with the private sector.

These facts suggest that it is difficult for the SNA to publish capital stock based on the real-assets. The author's EES presents a robust database in the world today in that pure consistency brings about no assumption and no initialization, where data are not interrupted by estimated values of elasticity and differential. This robust database may last as long as 'purely endogenous with no assumption' is maintained. 'Purely endogenous' means that capital stock is measured completely within the author's policy-focused system and without using accounting method such as Perpetual Inventory Method (PIM) and/or financial market data such as the user cost of capital at the stock markets. Capital stock in the literature is estimated using econometrics-methodology solely at the private/corporate sector, where the total economy is another expression of the private sector. Capital stock estimated in the literature is based on a system of national accounts (SNA, 1993) that aims at records and accordingly, uses final income after redistribution of taxes and deficit by year.

Estimated results hold at the price-equilibrium involved in static 'general equilibrium' and under an assumption of perfect competition. Thus, there is no return or profit at the government sector. Or, there is no capital stock that is completely consistent with the rate of return by sector. Or, the rate of return and the growth rate of output each are the object of a dependent variable in econometrics. In short, theoretical consistency in the literature, to the author's understanding, holds with econometrics-methodology that applies a variety of parameters to each model and freely uses changing statistics and other various data.

There is no capital stock data by country and by sector that are consistent with all the other data by year and over years, except for KEWT 6.12 & 7.13 (http://riee.tv). KEWT 6.12 measures all the parameters and variables for 81 countries, 1990-2010 (i.e., for short periods) and 1960-2010 (i.e., for long periods), within its system. KEWT 6.12 & 7.13 each obtain 25 original data, 10 from real assets and 15 from financial/market assets, thanking for *International Financial Statistics Yearbook, IFSY,* IMF (http://imf.org ; http://data.worldbank.org , by aspect).

Penn World Table (PWT 6.1, after 5.6, 1950-1995) has bravely stopped the publication of the capital-labor ratio after 1996 for a few reasons, as the author discussed earlier (see *JES* 12 (Feb): 59-104). Today, Extended Penn World Table (EPWT) v.4.0 publishes 31 items for 166 countries, 1963-2009. This database is available with the current PWT 7.0. EPWT v.4.0 (http://www.pwt.econ.upenn.edu) shows 'nine' items related to capital stock, from item 11 to 19. For example, look at item 15; the capital-labor ratio in 2005 purchasing power parity. Readers soon realize that the capital-labor ratio is a base for estimating capital stock. The literature has used the capital-labor ratio as a base for the framework of each model, incidentally without interrupted by the capital-output ratio. This is natural from a fact that the individual utility function has historically connected maximized consumption per capita as a goal and that economic growth has been a means to the goal. Besides, markets are independently vertical by market, e.g., capital, labor, financial, stock, and many others; respectively tied up with its price level in the general equilibrium, theoretically proved by Arrow, K.J. and Debreu, G. (1954).

Among 31 items selected at the EPWT v.4.0, the rate of returns is not included. The author at once realizes that any item selected is not divided into sectors. The author stresses that the equality of national income, expenditures, and output is proved only when taxes and deficit are explicitly shown just before final income redistribution. Regardless of parameters or variables, the total economy is the sum of the government sector and the private sector, as an aggregate sum by year and over years. As a result, capital stock and its rate of return match in equilibrium and are purely consistent with all the other parameters and variables. Contrarily, there is no way in the literature to confirm the consistency among items by year and over years. The BEA, Washington, even though, bravely steps into how to estimate returns and household production within the framework of the SNA.

The author will revisit EU KLEMS for comparison, later before Conclusions.

6.2 Essentials of Capital Stock and Net Investment

This section presents the essentials of capital, stock and flow, in terms of measurability. Jorgenson (1963, 1966) and J & G (Jorgenson & Griliches, 1967) are compared with the essentials of EES. Six BOXES are used for explanations. Its manuscript was once presented at Second Poster Session, *International Association for Research in Income and Wealth Conference*, Boston, on Aug 9, 2012. First of all, the character of capital is compared with that of labor or population (see BOXES 6-1 and 6-2). Readers will broadly understand how EES differs from neo-classical models (for notations and equations, see Notations and Notes).

The author highly appreciates the figure of J & G (1967, p273) below (no number on this figure on page 273). This shows an inconsistency lying between stock and flow. Nevertheless it clarifies that flow is first even if stock is unknown. For this figure, the author got permission at the Permissions Department, Cambridge University Press.

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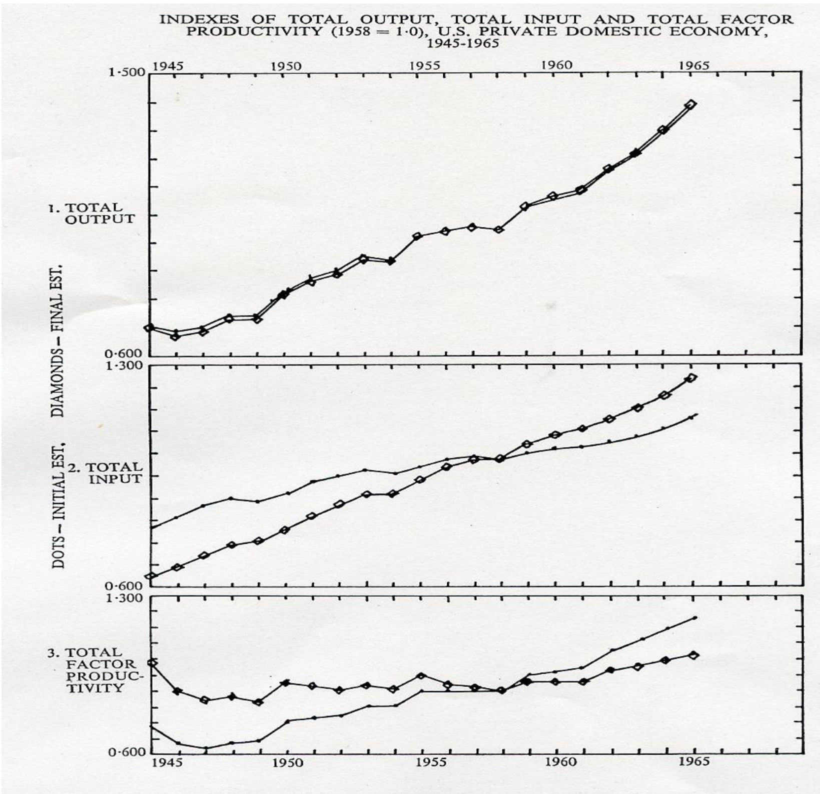
BOX 6-1 Basic concepts set between capital and labor: Jorgenson (1963, 1966) and J & G (1967)

1. Capital stock: The literature treats capital, quantitatively and homogeneous of degree one. Quality is separately shown using the price level or index under the price-equilibrium, where the rate of interest is a surrogate for the rate of return. Total factor productivity, *TFP*, and profits are shown respectively as an ex-post residual.
2. Labor/population: The literature similarly treats labor/population quantitatively. The quality of labor/population is somehow separated using human capital stock.
3. Capital flow: The literature separates capital flow or net investment from capital stock. Net investment is established without capital stock or independent of capital stock. Capital flow is as economically while capital stock is estimated as accounting-oriented.
4. Labor/population flow: The literature quantitatively counts the increase in labor/population. Labor flow corresponds with the increase in labor stock.
5. The literature has settled the rate of technological progress not pure-endogenously but exogenously.
6. Accordingly a residual ex-post growth rate of *TFP* (STOCK) is a surrogate for an external rate of technological progress (FLOW).

The proof of J & G (273, 1967) has been well accepted econometrically: Jorgenson and Griliches (273, 1967) shows overlapping error of output/input of *TFP*.



Note: Wiley permitted the author to use this figure, Sep10, 2012 (see Acknowledgements and Preface).

BOX 6-2 Basic concepts set between capital and labor: EES

1. Capital stock: Capital stock cannot separate its quality from quantity; not interrupted by the level of price. Capital stock changes consecutively but, its price level changes by second/minute. Capital stock is endogenously converted to returns and priced solely using the rate of return, $r = \Pi/K$.
2. Labor/population: Similarly to capital stock. Labor flow is converted to wages and priced solely using the wage rate, $w = W/L$.
3. Capital flow: It is a fact that capital stock and capital flow are, indispensably and consistently, united into one unity.
4. Population flow: Similarly to capital stock and capital flow.
5. EES purely measures an endogenous rate of technological progress (FLOW).
6. EES measures the growth rate of TFP (STOCK). At convergence* in the transitional path and under the endogenous-equilibrium, $g_A^* = i(1-\beta^*) = g_{TFP}^* = k^{*(1-\alpha)}/\Omega$ is measured. An endogenous turnpike equation exists for the transitional path.

Next, BOXES 6-3 and 6-4 clarify a base for 'no assumption.' The essence of assumptions is, to the author's understanding, 'indispensable,' due to no way but set assumptions.

BOX 6-3 *TFP*, *MRS* and elasticity of substitution, *sigma*, at J & G (1967) and Jorgenson (1963, 1966)

1. J & G (1967) empirically and econometrically proves that Solow's (1957) output/input productivity growth rate includes some double counts in input and output. Jorgenson proposes the use of capital flow (net investment) for an ex-post measurement of the growth rate of output to the input of total factor productivity, *TFP*.
2. J & G (1967) takes the assumption of the marginal rate of substitution, *MRS*, being equal to 1.000. This assumption may constitute a surrogate for an assumption of perfect competition.
3. Jorgenson (2, 1966) repeatedly stresses that the differences between econometrical results comes from not the differences of models but the differences of assumptions. The author is encouraged by his insight.
4. Why did J & G (1967) and Jorgenson (1963, 1966) not step into a core lying between capital stock and capital flow? A reason: Jorgenson remains the neo-classical framework and relies on individual utility function under the price-equilibrium to reinforce the market principle. An smooth expansion of micro to macro is difficult to attain at neo-classical framework, without a methodology to step into an endogenous paradigm enlarged from a partial micro to a whole macro.

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Scientific discovery requires equations. If a researcher could not formulate an equation, he/she has to set corresponding assumption(s) so that a discovery of an article holds scientifically. In short, a discovery has two alternatives, equations or assumptions. Marginal productivity theory (*MPT*) has historically occupied a centre of the literature; typically even today, i) total factor productivity (*TFP*), ii) marginal rate of substitution (*MRS*), iii) elasticity of substitution, *sigma*, and iv) no extra profits/returns for the one input change to the total output change. This chapter focuses the above i) to iii).

BOX 6-4 *TFP*, *MRS* and elasticity of substitution, *sigma*, at EES

1. From the viewpoint of a whole system, EES connects capital stock with capital flow/net investment. The growth rate of *TFP* shows not a flow growth but a stock growth. EES wholly and simultaneously measures the rate of technological progress (FLOW) and the growth rate of *TFP* (STOCK), by year.
2. EES proves a true meaning of the elasticity of substitution, *sigma*, with no assumption. The *sigma* holds with the marginal rate of substitution (MRS)=1.000 by country.
3. EES, as an empirical result of the above proof, withdraws two assumptions, MRS and *sigma*, and replaces each assumption by a corresponding endogenous equation. It definitely implies that perfect competition is also withdrawn from an assumption.
4. EES has withdrawn all the assumptions found in the literature and replaced these assumptions by the equations of *seven* endogenous parameters* in an open economy.
5. EES revolutionarily constructs a new paradigm of earth endogenous system (EES) under purely endogenous** and cyclical distinction. Cyclical holds with less net investment and a plus technological progress; never zero sum. The Earth has limited resources and green reinforce cyclical economy. EES is based on real-assets and the neutrality of financial/market assets to real-assets. EES is consistent with the market principle and never attracts bubbles.

Notes: * *Seven* parameters are: net investment to output 1) $i = I/Y$, and 2)$i_G = I_G/Y_G$ at the government sector, the rate of change in population ; 3) $n = (L_t - L_{t-1})/L_{t-1}$ and 4) $\alpha = \Pi/Y$, each fixed in the transitional path; the above, 5) β, and 6) δ_0; 7) the speed years, $1/\lambda_t = (1-\alpha)n + (1-\delta_t)g_{A_t}$, each change in the transitional path and each in equilibrium. The rate of technological progress $g_{A_t} = i(1-\beta_t)$ turns to $g_A^* = i(1-\beta^*)$ at convergence.

** *Purely endogenous* holds under no assumption: the process that each initial data turns to purely endogenous at KEWT database.

i) Temporal setting an initial value by item.

ii) Test the stability of the speed years by country.

iii) Test the stability of the speed years by sector (G and PRI).

iv) Watch dynamic balances between the two sectors, G and PRI; finally no change or close-to-no change appears. At this timing, moderation of the corresponding item reaches its extreme. This situation is called a moderate range of the endogenous-equilibrium.

Thirdly, BOXES 6-5 and 6-6 present the processes to withdraw assumptions, using MRS and *sigma*. BOX 6-5 indicates that the light is off on the way. BOX 6-6 presents the processes to the end; until three assumptions are completely withdrawn. Two assumptions, MRS and *sigma*, hold at neo-classical models. The current representative databases are available, summarized in section 6.1 and based on neo-classical and Keynesian. Suppose that the literature dares to use data-sets of EES or KEWT 7.13 in parallel with other available databases, then, the current circumstances change at once. This is because actual statistics data are always within a certain range of endogenous data of EES. A common base of databases is 'amounts and values', but not ratios. This is a precious scientific discovery of this chapter, which is commonly applicable to the current databases. This was proved by using the current databases (see the previous section). The KEWT database has tested the identity of *sigma* in various ways. KEWT 7.13 proves *sigma* empirically by country and for 81 countries, as done in this section.

BOX 6-5 Numerical synthesis of *MRS* and *sigma*: Jorgenson and neo-classical models

1. The marginal rate of substitution (*MRS*) and the elasticity of substitution (*sigma*) hold under the price-equilibrium. It is expressed using the Euler's theorem, based on individual utility, commonly to Robinson (1934) and Neo-classical.
2. The continuous Cobb-Douglas production function is united with neo-classical and the Euler's theorem. Partially endogenous at continuous time does not consistently spread over a whole system in the discrete time; continuous theory vs. discrete data.
3. No database publishes capital *K* consistently with all the other parameters and variables.

BOX 6-6 Numerical synthesis of MRS and *sigma*: EES

1. EES proves the neutrality of the financial/market assets to the real-assets.
2. The discrete Cobb-Douglas production function becomes familiar with the data related to accounting, financing, national accounts, and statistics. EES produces *seven* endogenous equations yet, these equations are non-linear and replaced by hyperbolas by ratio. *Seven* endogenous parameters are a core of the whole endogenous system.
3. *MRS* and *sigma* are melted in discrete time and synthesize a unity proof empirically. The method is manipulated so as to equal the ratio of the change in two factors to the change in the total output/income, using the real assets and with relative price, *p*=1.000.

1) ΔL remains given: $\Delta L^* = \Delta L$.

2) $MPL = w = (Y - \Pi)/L$ and $MPK = r = \Pi/K$. The *sigma* is involved in MRS. $MRS = (r/w)$ and $\Delta MRS = \Delta(r/w)$. $\Delta MRS = (r/w)_t - (r/w)_{t-1}$.

3) Simultaneously $\Omega = \Omega^* = \Omega_0$ and $r = r^* = r_0$ hold, based on the constancy of the capital-output ratio of Samuelson (1970) and under $\alpha = \Omega \cdot r$ as a connectors.

4. The relationship between discrete and continuous time finally matches.

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Note: EES measures Y=income=expenditures=output by country using the real assets in an open economy. Samuelson's (1970) constancy of the capital-output ratio completed by Sato's (1981) (see Notes).

6.3 Simultaneous Measurements of Capital and the Rate of Return using Japan and the US, 1960-2011

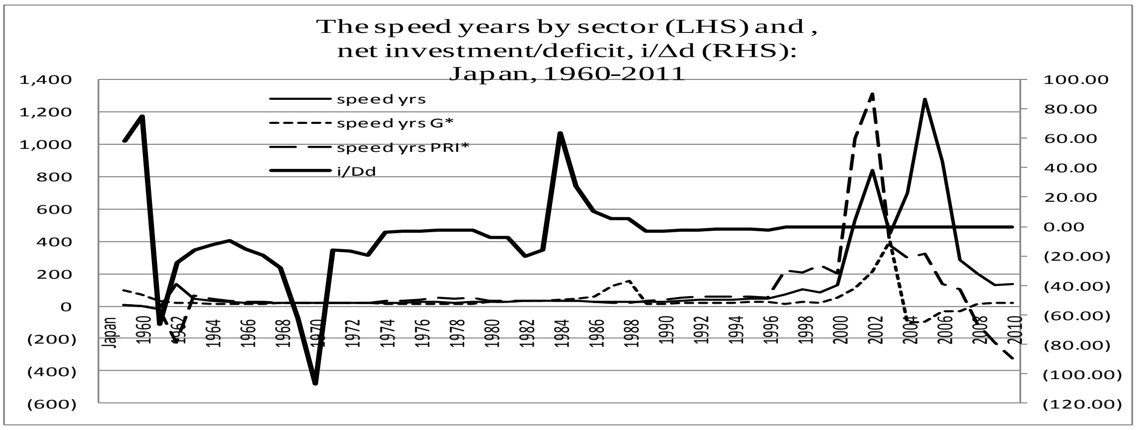
This section takes Japan and the US, 1960-2011, proves whole consistency for simultaneous measurements of capital and the rate of return, and expands 'amounts and values' to related ratios and compares actual/estimated data with endogenous data using KEWT 7.13 database. The two country comparison expresses the essentials of capital and labor, stocks and flows. Other chapters respectively express essentials of other aspects such as robustness of an economy, economic stages, national taste/preferences and culture, fiscal multipliers, business cycle, stop-macro inequality, and the relationship between the rate of change in population and the rate of technological progress. Some of these aspects overlap by nature. Fundamental background is common to respective aspect since endogenous equations exist behind and, under the endogenous-equilibrium and perfect competition. Note that Samuelson (1937, 1967) never contradicts EES.

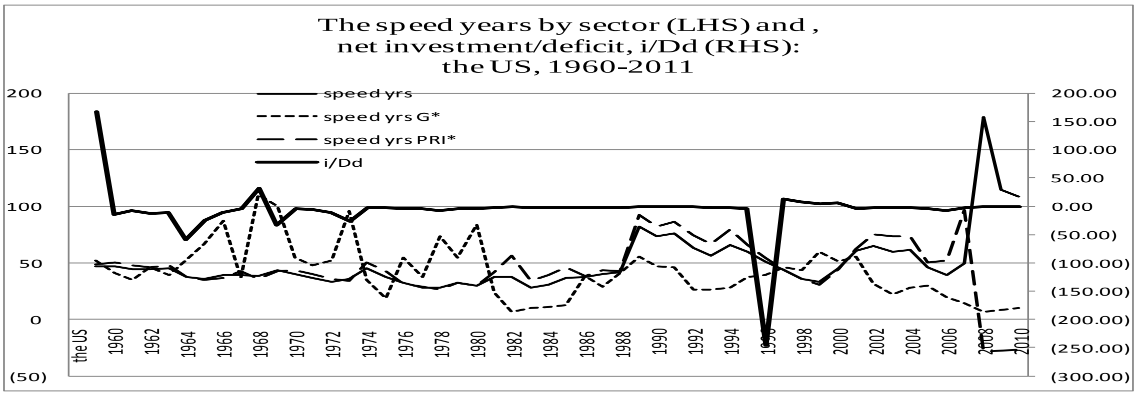
Core results are shown using BOXES 6-7, 6-8, and 6-9, with **Figures 1** to **12** at the end. The author tested (as definition of test), complete consistency between *Long* periods (1960-2011) and *Short* periods (1990-2011), by inserting *Short* into *Long* data by country.

Japan in BOX 6-7: The speed years by sector, as a direct measure of endogenous equilibrium, are like Sun rising and Setting or lifetime of a man or woman. After 2000, Japan' equilibrium is out of controllability and waiting for default, due to excessive deficits and debts, after sudden sacrifice of G and PRI (watch the trend of $i/\Delta d$).

The US in BOX 6-7: The speed years by sector are robust like a youth, except for 2008-2011. Excessive consumption guards endless debts. After 2008, moderate equilibrium collapses at sudden sacrifice of G and PRI (watch the trend of $i/\Delta d$).

BOX 6-7 The speed years by sector to support 'net investment/deficit,' 1960-2011: Japan vs. the US, using KEWT 7.13-6





The background is: When deficit is zero, the growth rate of output is most robust, universally by country. Samuelson (1942, 1975) proved this discovery theoretically (for proof, see Chapter 13). Hitherto the author's macro analyses have never proved that the higher the increases in *Y* and *K* the more robust an economy is. Most typically BOX 6-8 for output flow and capital stock shows this discovery at the real assets under perfect competition.

Japan in BOX 6-8: Output and capital, *Y* & *K* and, the corresponding Y^* & K^*, at convergence*, 1960-2011, surprisingly show the same Sun rising and Setting results of endogenous equilibrium as those at BOX 6-7. The difference between *K* (at a highly increasing level) and K^* (at a low moderate level) has been widen after the 1990s. The G saving turned negative in 1992 after badly exhausting the accumulated G savings. This fact tells us a true long story. Actual policies solely aggravate actual results. As a result, *Y* overlaps Y^*. $Y = Y^*$ is equal to such that there is no room for growth. The situation stands for constant returns to capital (CRC). Endogenously zero-growth expresses CRC under constant returns to scale (CRS). The results overwhelmingly come from a low consciousness of democracy; directing for selfishness and against next generations. Today people wait not for lip service but for essential real asset policies. A grass hopper waits for winter as in Aesop's Fables; time has come. Negative turns to Positive as shown by author's geometric hyperbola (an inverse number of an endogenous equation) and its philosophy.

The US in BOX 6-8: The above fact is the same but, quite differently in the case of the US. Contrarily, *K* overlaps K^*. $K = K^*$ is equal to such that there is much room for growth. This fact implies that maximum returns have realized with minimum net investment by year and over years. Nevertheless, it does not mean that the US economy continues to grow robustly in the future. This is because the US economy faces at sudden difficulties in 2008-2011. Both *K* and K^* suddenly and unbelievably fluctuate in 2008-2011. Endogenous equilibrium is out of controllability. Future results depend on the current actual policies so that future results are not foreseen at the current point of time.

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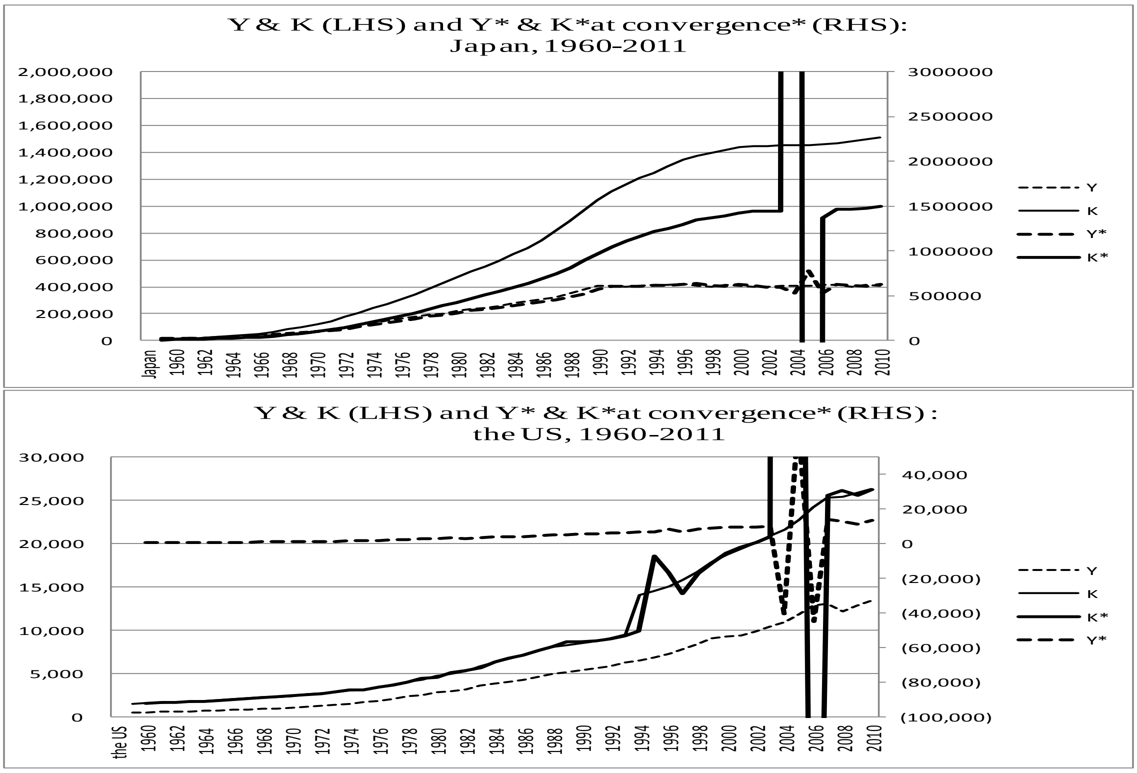
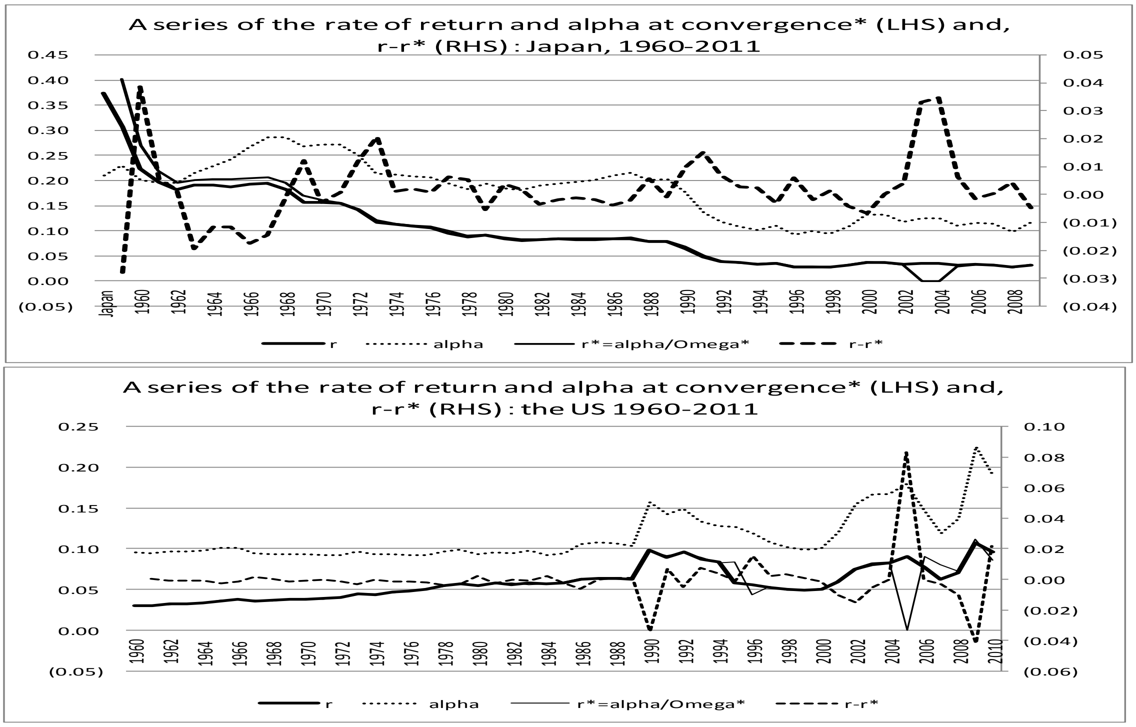
BOX 6-8 Y & K and Y^* & K^* at convergence*, 1960-2011, under $\alpha = \Omega^* \cdot r^*$: Japan vs. the US, using KEWT 7.13-6



BOX 6-9 The rate of return, r, r^*, and $r - r^*$, the current and at convergence*, and the relative share of capital, α: Japan vs. the US, 1960-2011, using KEWT 7.13-6



Japan in BOX 6-9: The rate of return decreases gradually. It implies that economic policies are against sustainable growth and returns. This cause is not the transition of economic stages but failures of real-assets policies at the macro level. The relative share of capital has decreased after government saving turned to minus in 1991. Further, $r - r^*$ has increased 'positively' after 2000. Japan has naturally fallen into disequilibrium due to irresponsible deficits over years.

The US in BOX 6-9: The rate of return increases gradually; proportionally to the relative share of capital. $r - r^*$ has fluctuated after the 1990s. If $r - r^*$ increases 'negatively,' this must be a better sign: The rate of return at convergence is higher than the current rate of return in equilibrium. This is not a better sign. Any country cannot run beyond its endogenous size of government (see Chapter 13).

The rate of return and the growth rate of output march together so that policy-makers could control each level, when deficit decreases less than a certain level of deficit, relative to *GDP* or *Y*. BOXES 6-7, 6-8, and 6-9 empirically reinforce a scientific discovery as first found by Samuelson (1942, 1975) (see Chapter 12).

6.4 Revisit Databases and EU KLEMS Database, Actual *vs.* Endogenous

6.4.1 Databases and econometrics: discrete time versus real-time

This section first summarizes a few defects pertinent to databases, with a problem of initialization. KEWT database before completion had similar problems but, solved these defects. Second, touches up-dated outline of the EU KLEMS.

First in Sub-section 6.4.1, the current databases commonly have the following character. The current databases each set initial values or ratios given. Each database commonly divides sectors by type of industries or firms since macro and micro are harmonious, based on individual utility function. Suppose that the initial data in databases are set arbitrary or given and adjusted. Then calibration works smoothly. There is no way but to adjust each initial data, unless databases are perfectly cyclical as a system or purely endogenous (see Note**, BOX 6-4). This is a fait or character of databases. When databases rely on the market data, data-setting becomes complicated. What test arrangement is most fitted for checking the relationship between macro and micro data, actual and market data, and industry and households? Staff to arrange for databases copes with the difficulties and it is beyond description. As a result, data analyses become more complicated.

To the extreme, suppose that the initial data of a database are consistent with each other by year and over years. This case must be best and it must be EU KLEMS. Each value of EU KLEMS changes by year, similarly to KEWT database. Each value never repeats the same even under a most moderate equilibrium. Question 1 from an economist: How does the economist or model researcher apply a database to macro and micro model analyses? Some model researchers have conquered the difficulty to find new methodologies by using econometrics, as Klein, L. R., Diewert, E. W., and Jorgenson, D. W. Question 2: Then, what are application-differences existing between databases in the literature and the purely endogenous KEWT database? Model researchers must formulate respective model and equations with assumptions when they take advantage of databases. Model researchers are able to freely apply their econometrics or methodologies to the KEWT database. A researcher compares and analyzes resultant differences between two databases. In the case of KEWT data-application, the researcher is released from assumptions required for scientific discovery; since the KEWT database need no assumption and, all the endogenous equations prevail globally and universally by country. The KEWT database is full of scientific discoveries. Researchers are able to find new scientific discoveries by using their econometrics, in parallel with actual data-application of a current database available in the literature. For resultant differences between the current database and the KEWT database, researchers are always able to set the endogenous data as stable foundation.

Next in Sub-section 6.4.1, the following three aspects are selected for the above questions:
(1) Real Cost Reduction (RCR) by Harberger, A. C. (1998).
(2) Real-Time by Croushore, D, and Stark, T. (2001, 2003) and Croushore, D. (2011).
(3) Factor Reversal Test (FRT) by Sato, K (1974) and Theil, H. (1974).

First the author reviews the discrete time results pursued by Harberger, A. C. (7, 8, 11, 15, 1998). Profiles of total factor productivity (TFP) growth among U. S. manufacturing branches are shown in his Figure 1 using four periods, 1970-75; 1975-80; 1980-85; and 1985-90, where ‘percentile’ is commonly used on the x axis for initial value added and on the y axis for Real Cost Reduction (RCR). His Figure 1 shows the initial setting every five years. Real Cost Reduction (RCR) corresponds with the actual change in TFP. His Figure 2 compares cumulative sum of RCR with cumulative rate of TFP growth. If the percentile of initial value added increases up to the right, it is called Sun-rising while if it decreases, it is called Sunset. The peak of RCR and TFP differs by initial setting year and by industry, between percentile=0 and =1.0 on the percentile of initial value added on the x axis. As a result, the frequency of average annual TFP growth rate differs significantly by TFP growth rate, spreading over plus and minus, as in Mexico, 1984-94 (see his Figure 6A). The author here pays attention to Appendix on methodology (29-30, ibid.), where the rate of return is calculated ex-post using standard average values. The author interprets his view such that RCR=0 means an equilibrium and that if RCR=0 is endogenously measured, RCR=0 is replaced by marginal productivity of capital (*MPK*)=the rate of return *r* and, marginal productivity of labor (*MPL*)=the wage rate *w*, where perfect competition holds, free from its assumption.

Second, let the author review 'a Real-Time set' at the continuous time pursued by Croushore, D, and Stark, T. (2001, 2003) and Croushore, D. (2011). This continuous case constitutes a starting point to EU KLEMS. The theoretical background was earlier designed by Samuelson, P. and Solow, R. M.(1956) and recently, by Durlauf, Kourtellos, and Minkin, A. (2001). The corresponding database is currently arranged by EU KLEMS Part I, Methodology, the Conference Board (as a consortium; 2007; for industry levels, see O'Mahony & Tummer, 2009). The above database in the continuous time is settled by a concept of real-time, using vintage, perpetual inventory method (PIM),[1] index numbers, and the initial data once 5 years. The Real-Time is far from simultaneous in the endogenous system or EES. The initial data may be a compromise between discrete and continuous.

Third, the author indicates that if the index numbers is empirically proved by the Factor Reversal Test (FRT), it might be wholly acceptable as a database for economic analyses designed by aspect. Sato, K. (1974) left a proof that ideal index numbers almost satisfy the FRT, exceptionally as one of three cases, according to Theil, H. (1974); since then, there has been no proof of the relationship between index numbers and the FRT.

Econometrics uses actual independent data, and derives equations by aspect while the endogenous system supplies a universal database composed of endogenous equations under no assumption. Once more, actual estimated data are always within a certain range of endogenous data so that it is easy for researchers to work with each other.

6.4.2 EU KLEMS database, actual versus endogenous: Comments on *International Productivity Monitor* 21, 2011

This sub-section compares EU KLEMS with the KEWT database. EU KLEMS is based on flow data by country and does not connect flows with stocks theoretically and empirically. The Database of EU KLEMS (i.e., O'Mahony, M., and Tummer, M. P., 2009, F374-F403) has developed with the consortium of world researchers (hereunder, EU KLEMS). EU KLEMS estimates investment and capital using vintages by industry, whose thought comes from Jorgenson (1963) and, Jorgenson and Griliches, Z. (1967); the rate of capital consumption is determined by vintages under Perpetual Inventory method (PIM). EU KLEMS also follows Schreyer, Paul (2004, 2007), whose thought is related to Diewert, E.W. (WP 01-24, 2001). EU KLEMS holds under constant returns to scale

[1] 1) Accounting depreciation in PIM differs from endogenous depreciation in that an endogenous rate of technological progress is simultaneously involved in capital stock and flow. For endogenous capital and its depreciation, see *Journal of Economic Sciences* 11 (Feb, 2), 23-84 and also 12 (Feb, 2), 59-104.

2) Meads, J. E. (1-9, 1960) raises three factors, capital, labor, and land. EES includes land in capital as stock. Endogenous rentals are flow and composed of endogenous returns and depreciation. When lands are owned by government, endogenous rentals are replaced by tax increase. Tax increase is another word of economic robustness as first proved by Samuelson (1942). Due to less burden of deficit, China has competed internationally.

(CRS); so that an internal rate of return is estimated as a residual by industry, with an assumption that extra returns are zero and the same within the industry.

Currently, *International Productivity Monitor* 21 (spring, 2011) using the EU KLEMS growth accounting raises a question why growth in Europe for 15 countries differs from the US. The growth accounting uses Log-growth in the continuous time and compares *GDP*, *GDP* per capita, and *GDP* per hour worked. EU KLEMS shows productivity measure by industry. Contrarily, the KEWT database introduces original 25 actual data (10 from the real assets and 15 from the financial assets and markets) by year from *IFSY*, IMF. Data and results simultaneously hold in the discrete time, consistently matching each other, and connected with *IFSY*, IMF.

It is true that databases become more global and universal and, still maintain each own characteristics. The current representative databases are connected with the KEWT database and its recursive programming, under a fact that actual statistics data are always within a certain range of endogenous data in the endogenous-equilibrium.

6.5 Conclusions

Capital stock and capital flow/net investment are most essentially involved in the real assets of national accounts. The current representative databases and capital flow in the literature are not integrated as a system. The author clarified the characters of these databases at Sections 6.4.1 and 6.4.2. Contrarily, the earth endogenous system (EES) connects theory with practice exactly. Simultaneous measurement of capital stock and the rate of return is one of cores at EES and its KEWT database, 7.13.

This chapter clarified the essentials of capital stock and net investment, by using BOXES 6-1 to 6-9 and comparing the literature with KEWT 7.13. These BOXES were first presented to Second Poster Session, *IARIW*, Aug 9, 2012, with its manuscript.

These essentials were cultivated upon a new fact that Jorgenson (1963, 1966) and Jorgenson and Griliches (1967) discovered double counting at output/input of total factor productivity, *TFP*, using actual data. At the KEWT database, the rate of technological progress (FLOW) and the growth rate of *TFP* (STOCK) endogenously march in parallel and cross at the convergence point of time. This fact is directly proved, using recursive programming for the transitional path. The KEWT database shows an *endogenous* turnpike in this respect (for detail, see Notes before Preface).

The author confirms that the *initial* data of 1960 at Long database, 1960-2011, and the *initial* data of 1990 at Short database, 1990-2011, each turn to *purely endogenous*, using KEWT 7.13. Essential differences at the real assets between Japan and the US are interesting to readers, as implied by BOXES 6-7, 6-8, and 6-9. The background of these essential differences is overwhelmingly shown by Figures 1 to 12, by aspect. These essential differences reflect the essence of real-assets causes and prove Samuelson's scientific discovery (1942; 1975 with Salant) (see Chapter 13).

Readers will understand why the author revisited the current databases, particularly EU KLEMS. The current databases are universal. Most important is how to settle assumptions by database, cooperatively with other databases: If assumptions become more common by database, databases are more useful to econometrics analyses. The author repeats: The current actual statistics data and representative databases always stay at a certain range of corresponding endogenous KEWT database.

Lastly the author referred to Landefeld, S. J., and Fraumeni, B. M. (2009) that calculated each output of non-market goods at households by applying 'Time Use' by country. The KEWT database simultaneously measures national taste and technological progress by country, sector and, year and over years, and distinguishes the macro whole level with the micro partial level. This is because the market rate of interest and an exogenous rate of technological progress are replaced by those endogenous rates.

Conclusively, Chapter 6 broadly compared various original researches and databases with the author's EES and its KEWT. The author's EES is free from record-oriented double-bookkeeping and endowed with its own essence by six nature-neutrals. Uniquely, macro-utility measure is independent of technology and makes it possible to measure capital flow and stock consistently over years in EES.

Roadmap: Towards robust Marginal productivity Theory (endogenous MPT)

Broadly and historically, Roadmap revisits the essence of marginal productivity theory (MPT) and glances at other chapters that discuss an endogenous MPT by aspect.

The MPT has harmonized Keynesians with Neo-classical. The MPT is characterized, based on perfect competition or imperfect oligopoly and duopoly. The MPT connects the individual utility for consumption, without and with the production function. The MPT integrates the literature with author's endogenous system and its KEWT 7.13, where the MPT is regenerated as an endogenous MPT under no assumption.

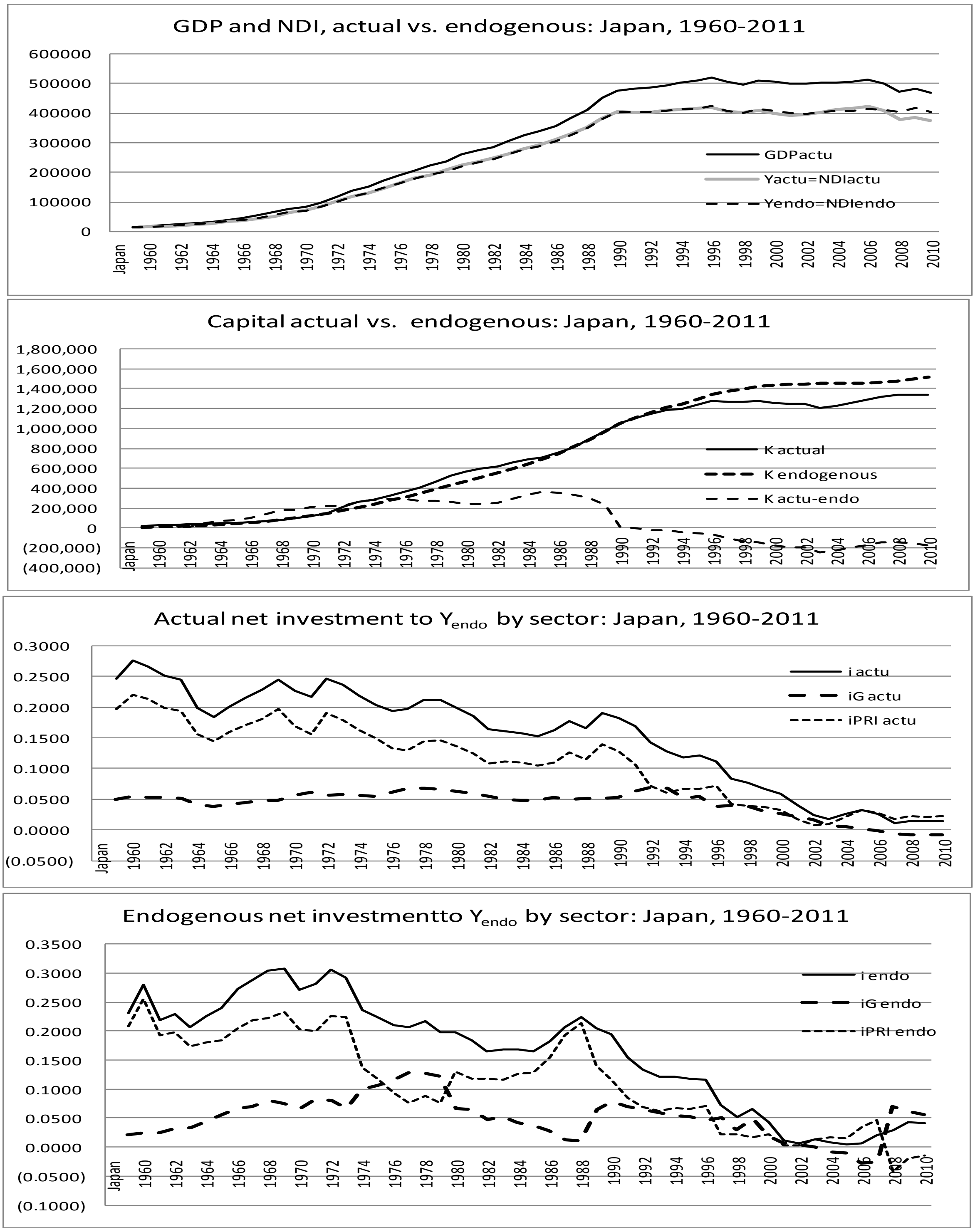
The MPT is always plus and that there exist no extra profits and returns under perfect competition. Marginal rate of substitution (MRS) at the macro level, is overwhelmingly connected with the elasticity of substitution, *sigma*=1.0000000.

MPT was discussed by Keynesians staticly; e.g., Kaldor (309-319, 1992), with assumptions of the steady state, the golden age, and perfect competition. As a result, Pasinetti's (318, ibid.) equation of the rate of profits, $\rho = g/s_c$, holds. A rescue is Kaldor's (1978) stylized facts, typically a constant capital-output ratio. Contrarily, neo-classical uses a continuous Cobb-Douglas or CES production functions, respectively with required assumptions. Neo-classical formulates various equations at the C-D production function, using an external interest rate and an exogenous rate of technological progress. As a result, neo-classical proves actual results by country over years.

Chapter 6

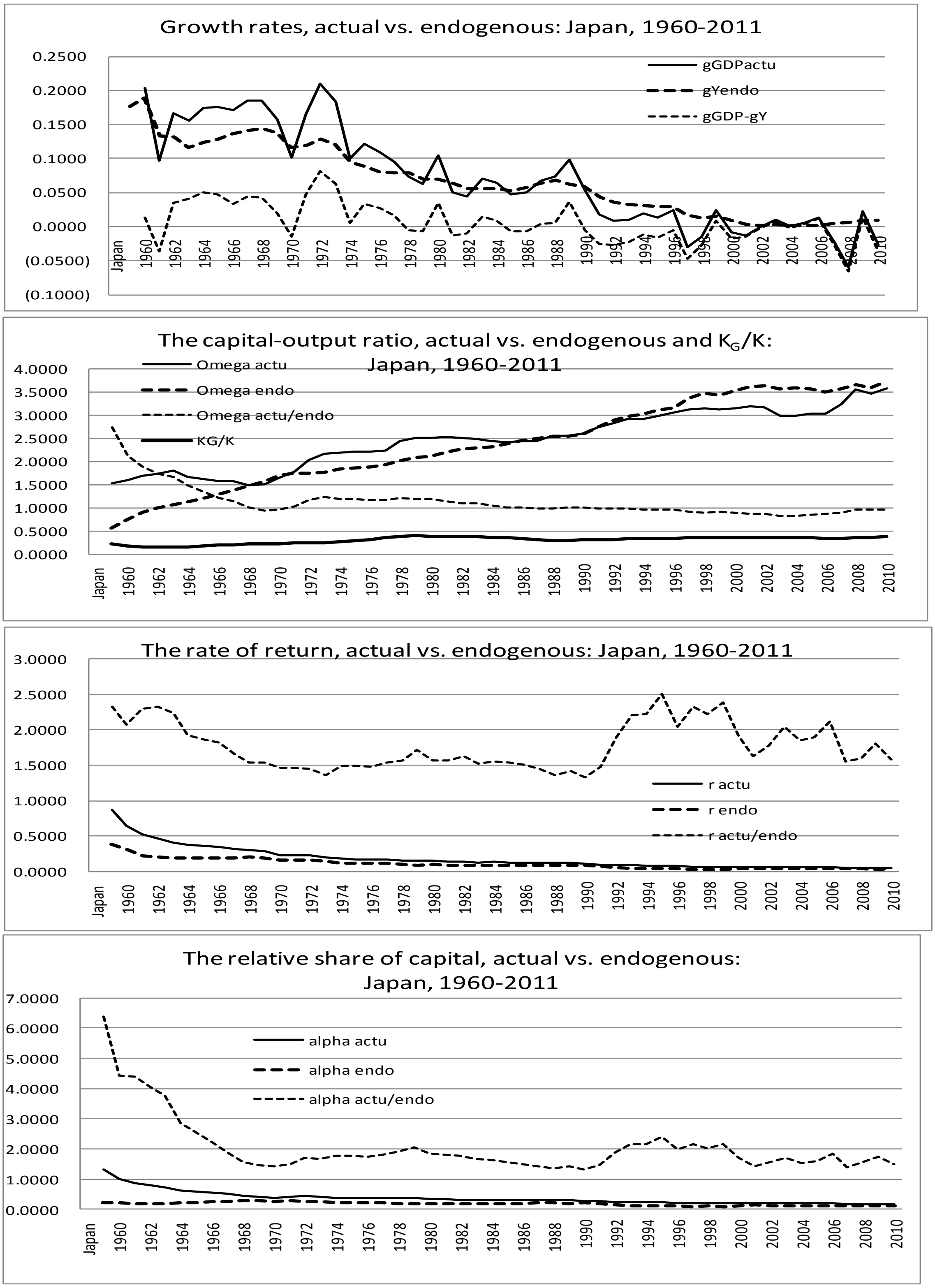
Contrarily the endogenous MPT recovers a whole of extension. The endogenous MPT starts with Samuelson's constancy of the capital-output ratio. The endogenous MPT proves $\Omega = \Omega^* = \Omega_0$ and $\mathrm{r} = \mathrm{r}^* = \mathrm{r}_0$, under CRS and, with diminishing returns to capital (no increasing) under constant returns to scale (CRS). Besides, endogenous ratios each solve problems by aspect. For example, the cost of capital, the speed years, two fiscal multipliers and the size of government are involved in the endogenous MPT (see C5, C7, C12, and C13, consecutively by chapter).

For readers' convenience: contents of figures hereunder



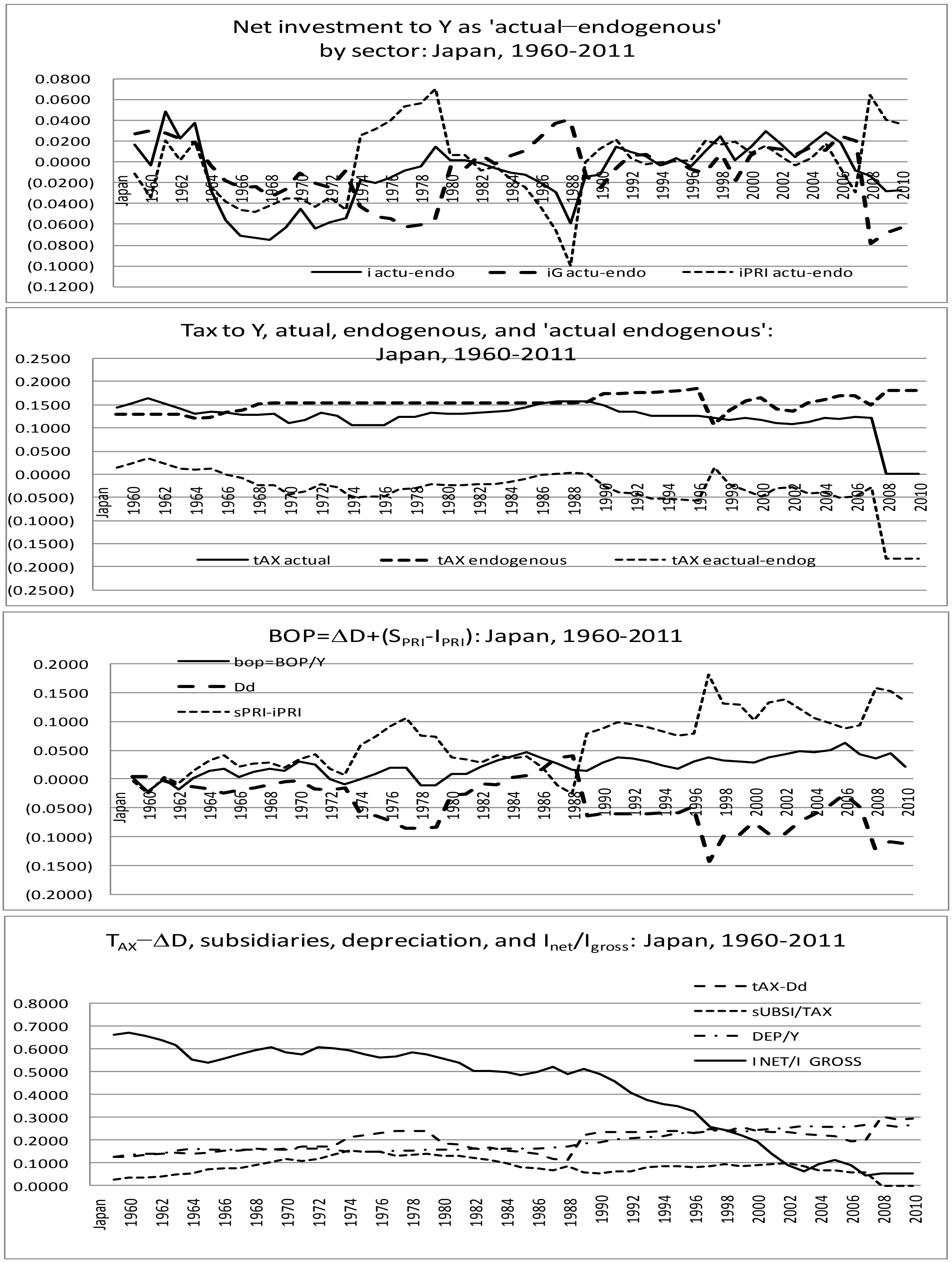
Data sources: KEWT 7.13-6 and related data-sets (the same hereunder)

Figure 1 Capital stock and output, actual and endogenous by sector: Japan, 1960-2011



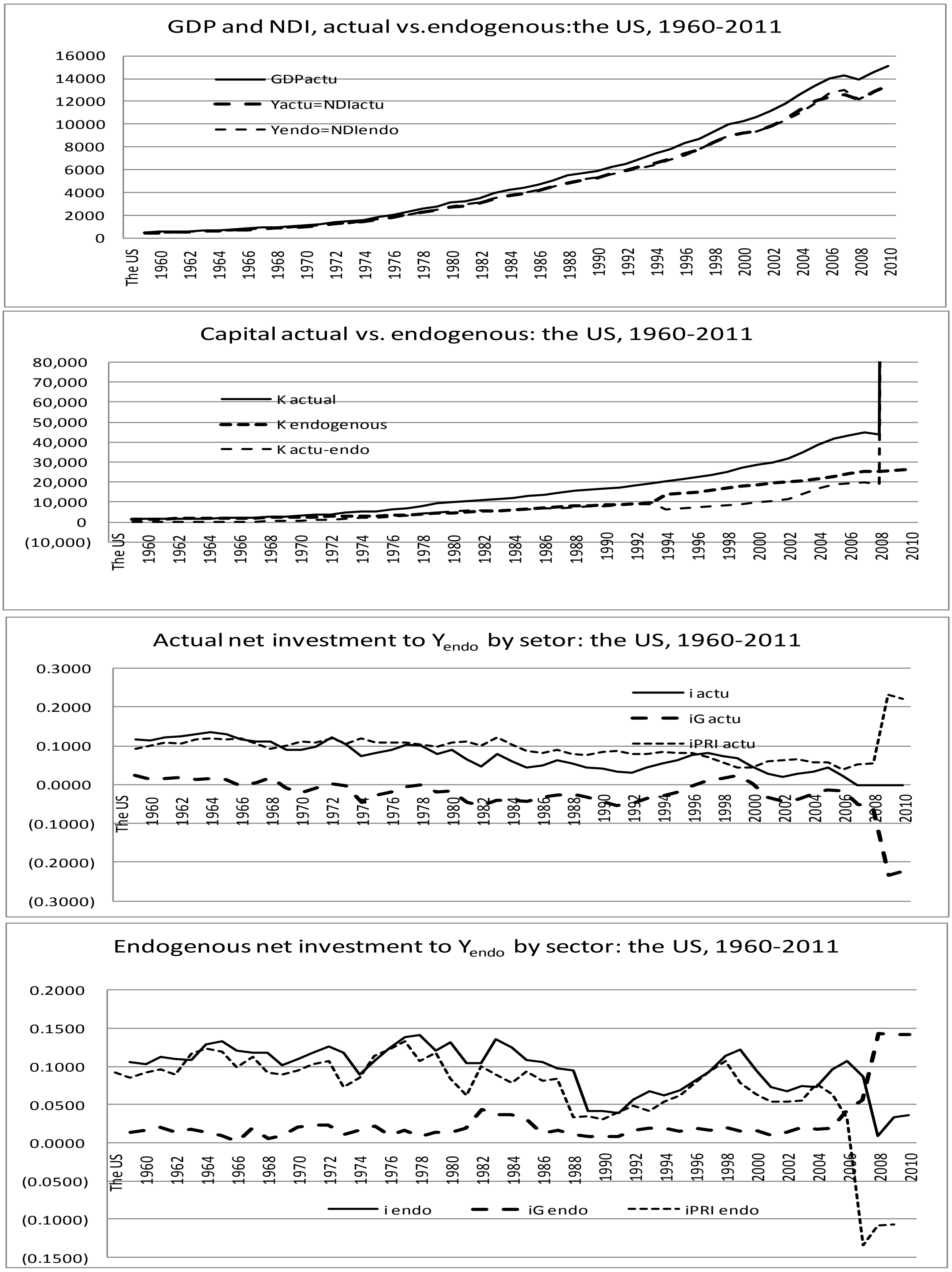
Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 2 Structural ratios, actual and endogenous: Japan, 1960-2011



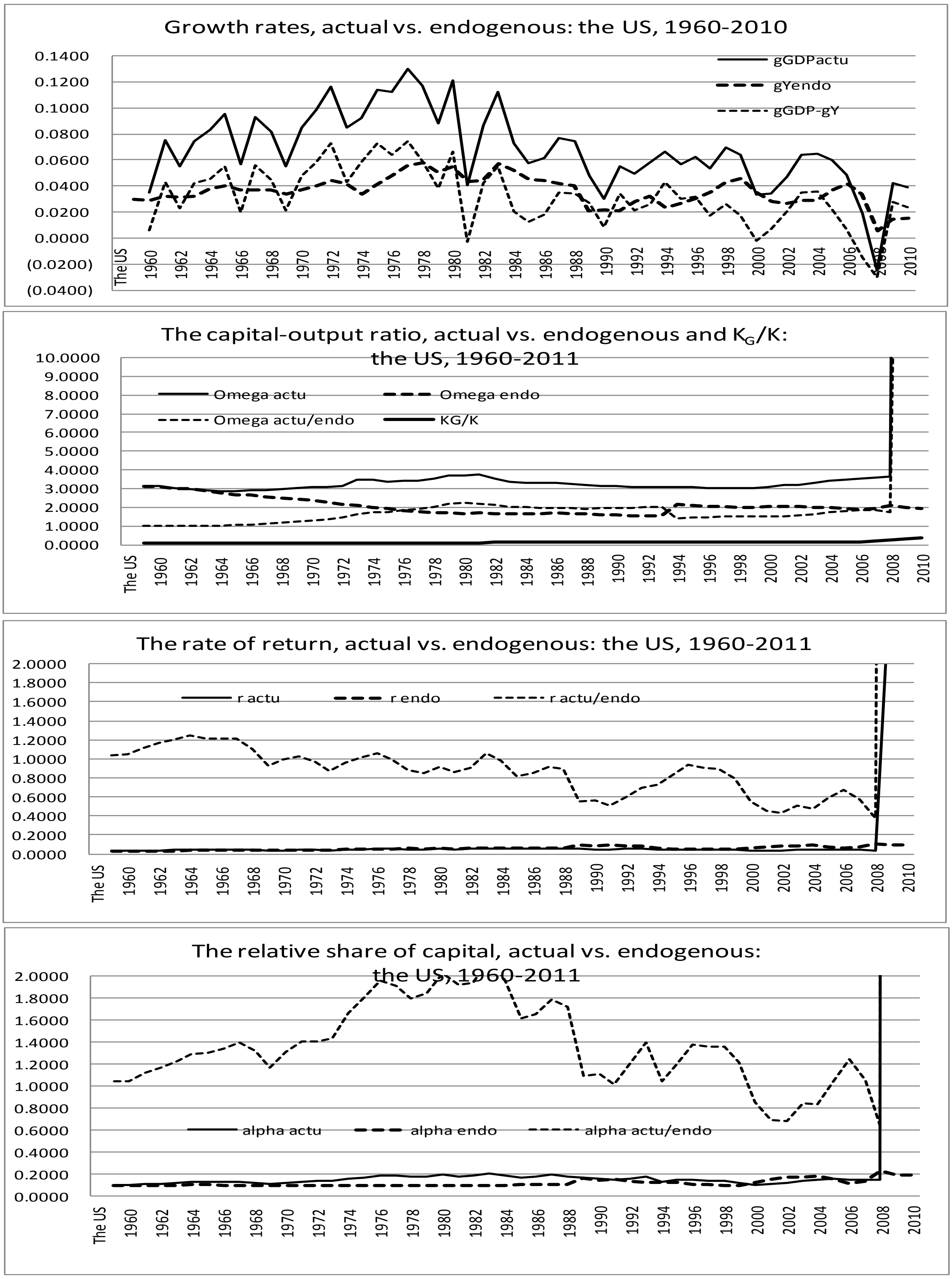
Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 3 Net investments by sector and the structure of the BOP, deficit, and taxes, actual and endogenous: Japan, 1960-2011



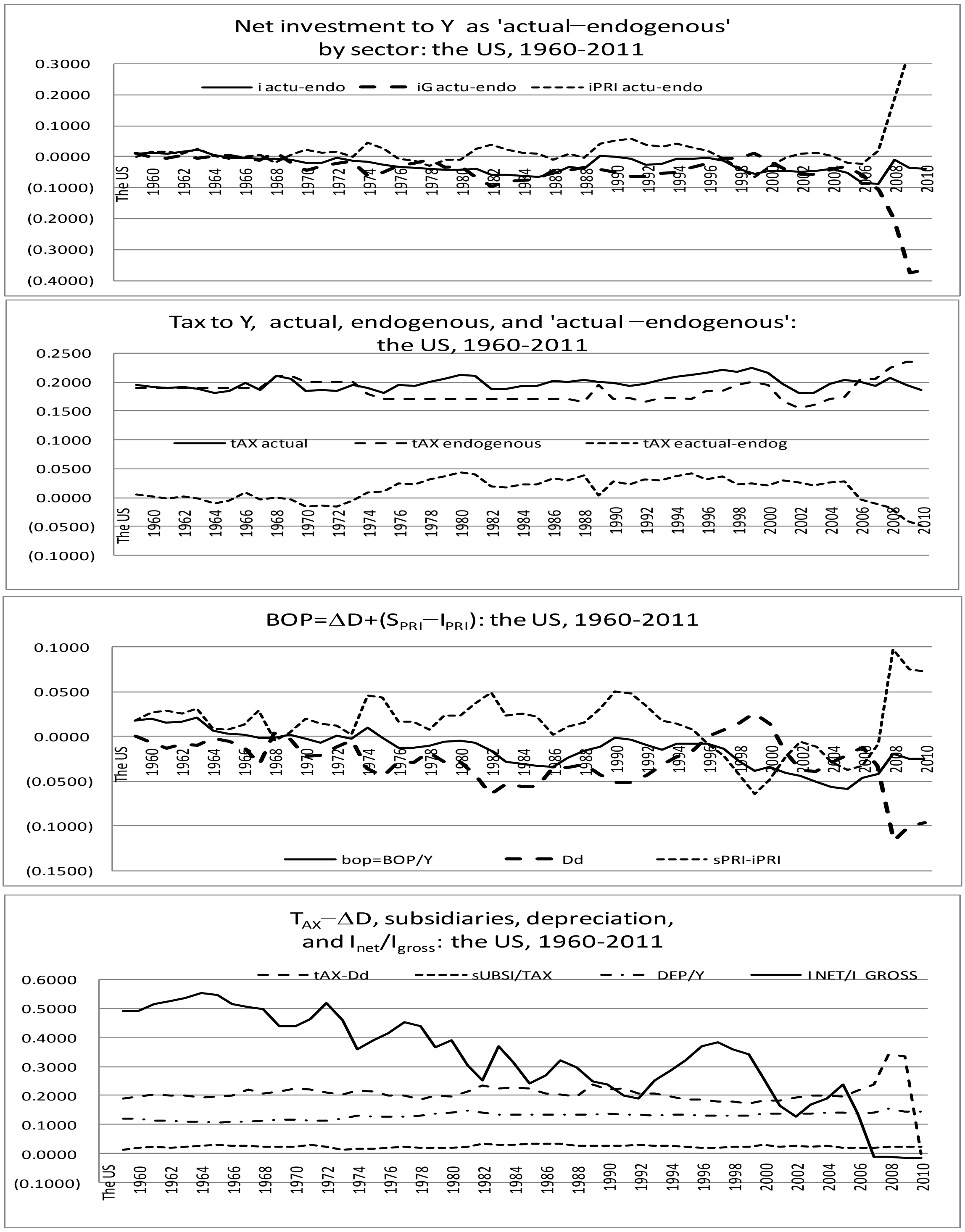
Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 4 Capital stock and output, actual and endogenous by sector: the US, 1960-2011



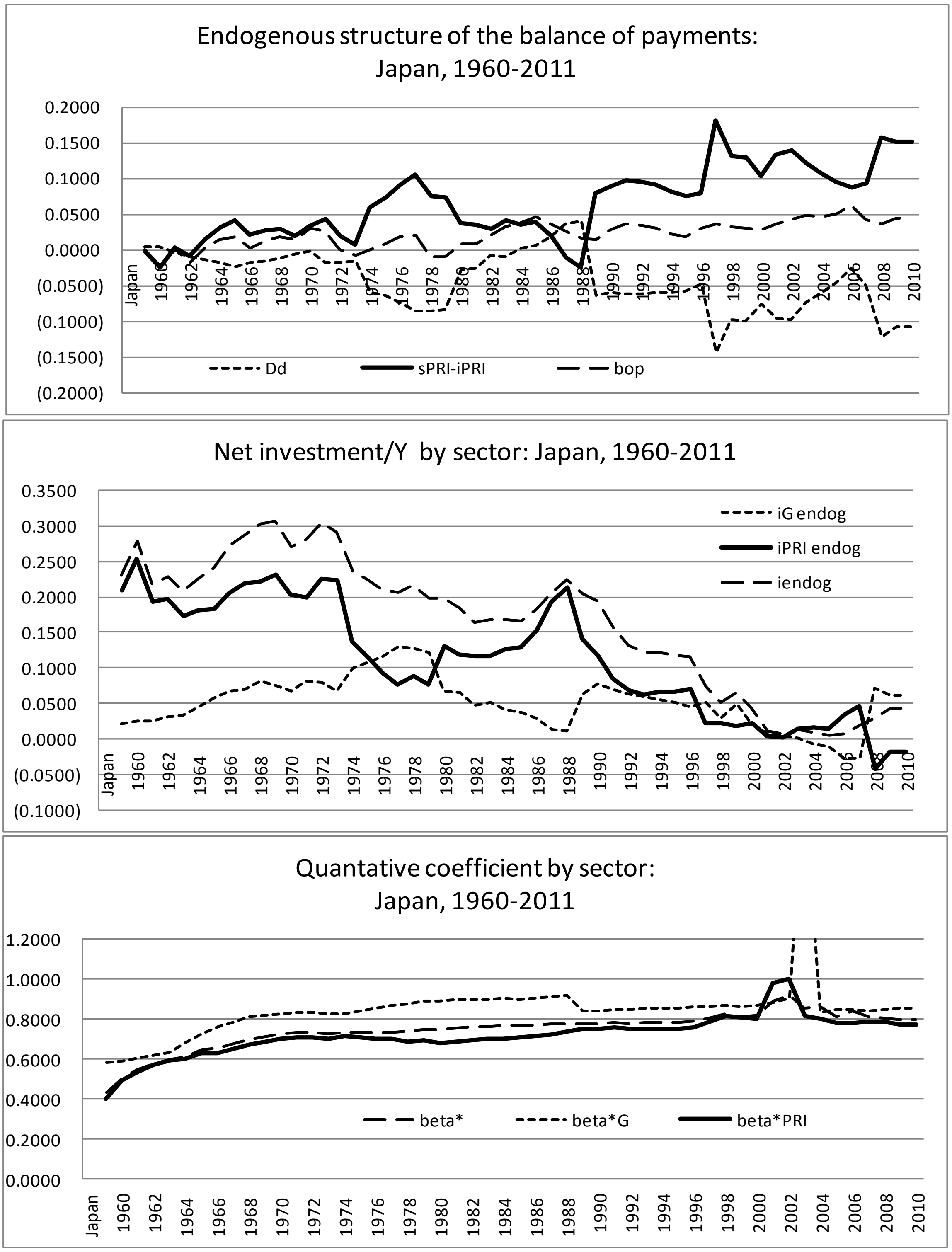
Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 5 Structural ratios, actual and endogenous: the US, 1960-2011



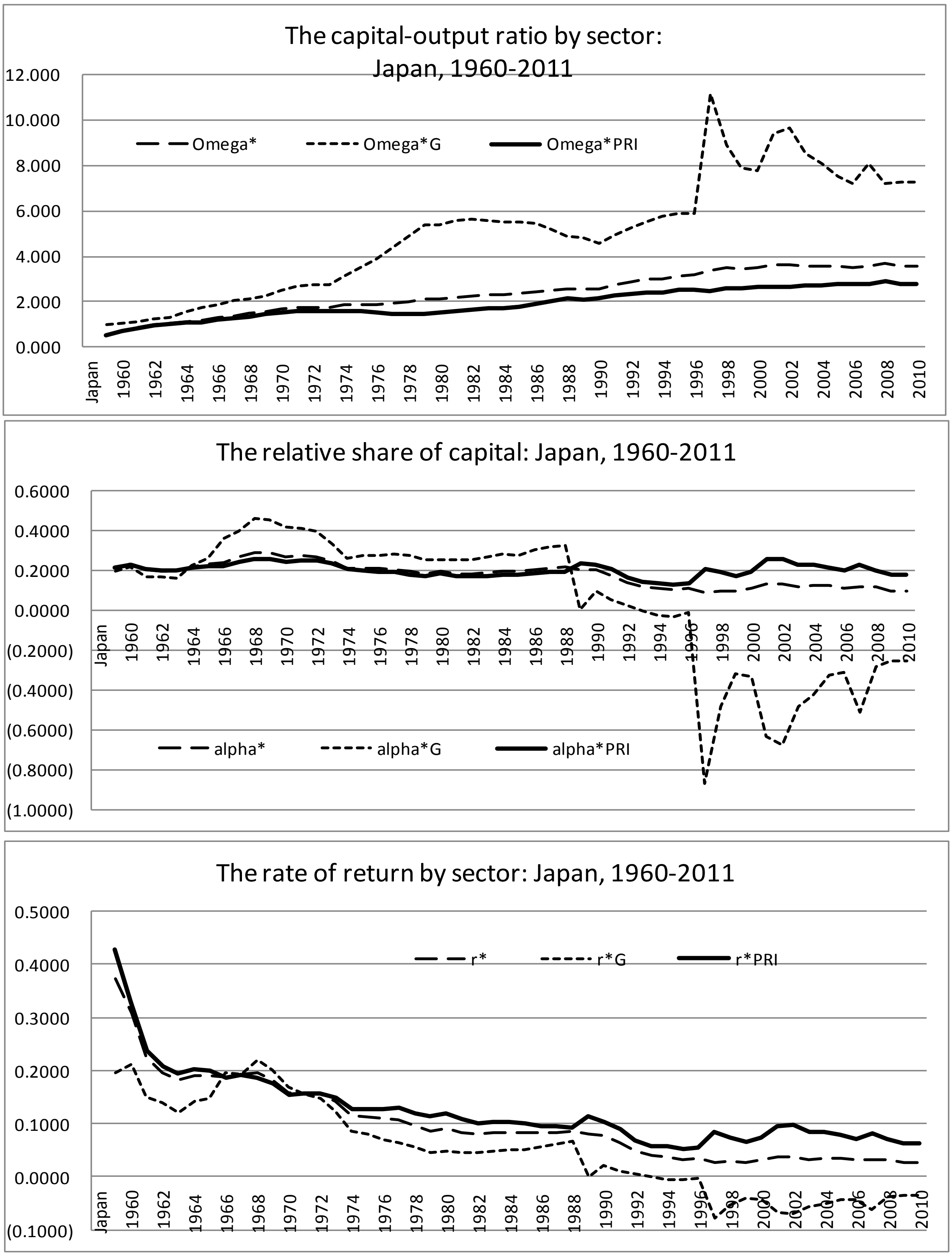
Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 6 Net investment by sector and the structure of the BOP, deficit, and taxes, actual and endogenous: the US, 1960-2011



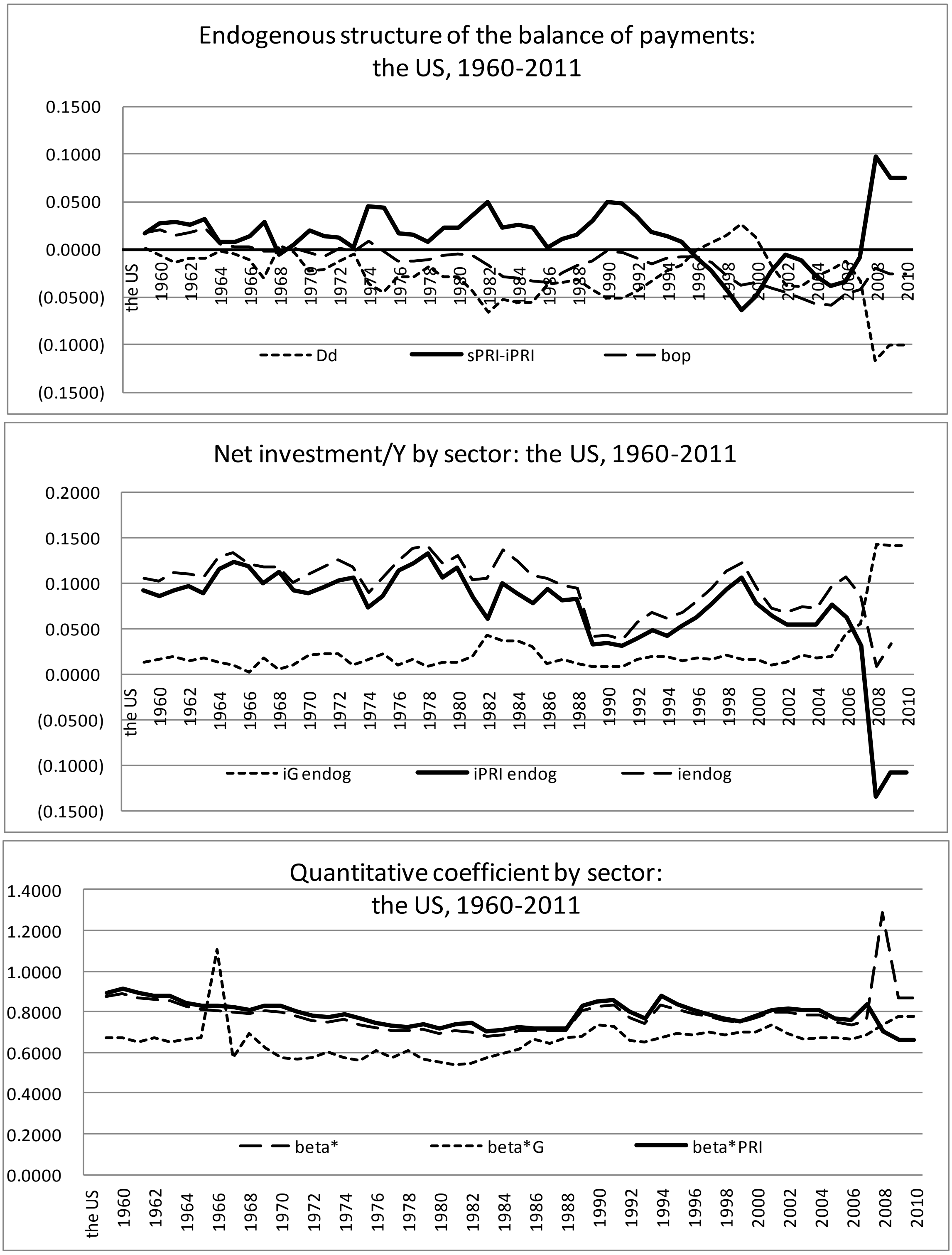
Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 7 Policy-oriented structural ahead-ratios, *bop*, $i = I/Y$, β^*, by sector, 1960-2011: Japan



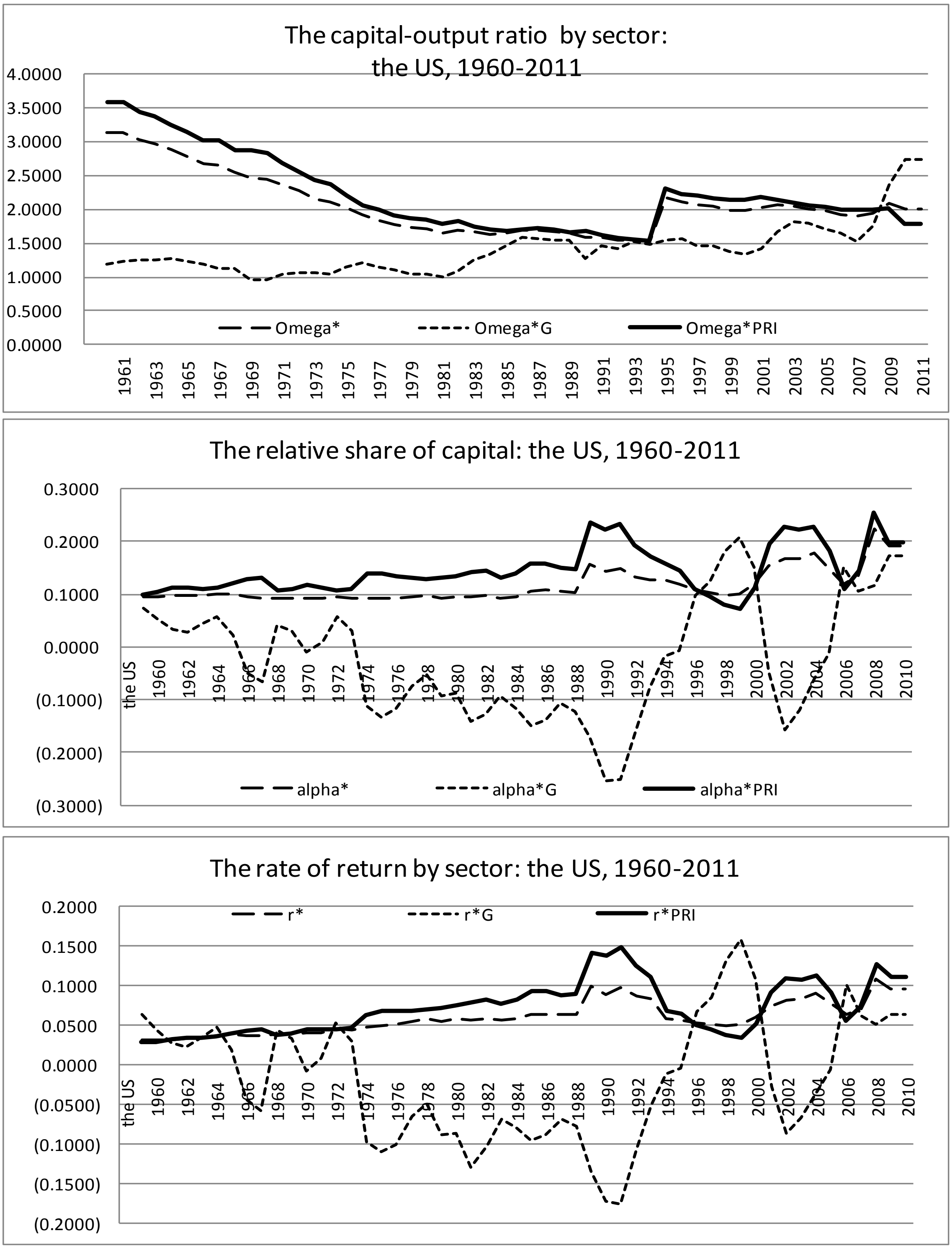
Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 8 Policy-oriented structural ratios, $\Omega = K/Y,\ \alpha = \Pi/Y,\ r = \Pi/K$, by sector, 1960-2011: Japan



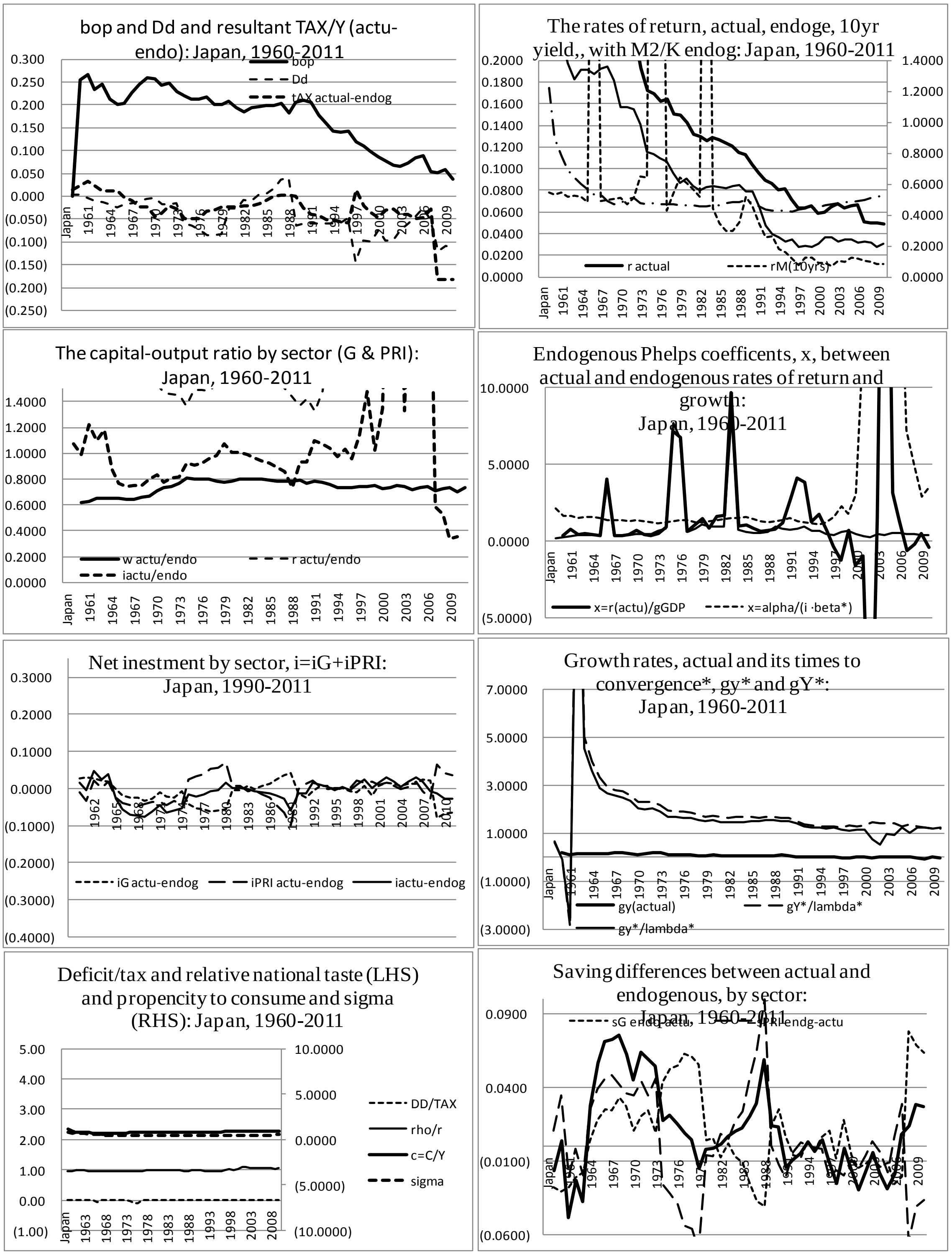
Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 9 Policy-oriented structural ahead-ratios, *bop*, $i = I/Y$, β^*, by sector, 1960-2011: the US



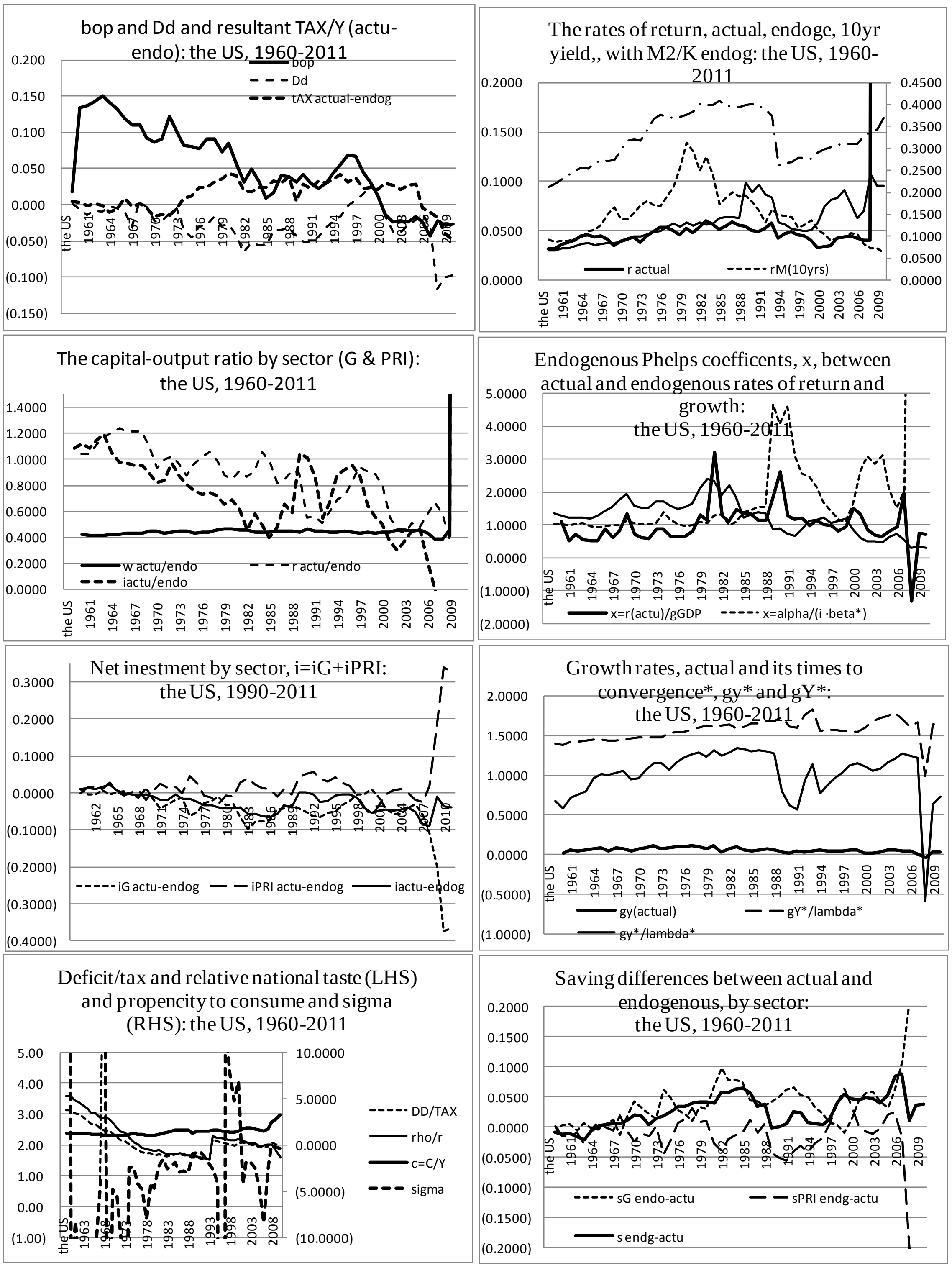
Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 10 Policy-oriented structural ratios, $\Omega = K/Y,\ \alpha = \Pi/Y,\ r = \Pi/K$, by sector, 1960-2011: the US



Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 11 Endogenous and actual/market ratios broadly supporting capital stock: Japan, 1960-2011



Data sources: KEWT 7.13-6, 1960-2011, by sector

Figure 12 Endogenous and actual actual/market ratios broadly supporting capital stock: the US, 1960-2011

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Chapter 7

Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

Background of ***the speed years***
With R. A. Musgrave's comment on Ryuzo Sato (1963)

Musgrave celebrates Sato's seventies birthday and talks on Sep 9, 2000. Let the author here allow to cite Musgrave's one phrase related to Sato's (16-23, 1963) first use of *the speed years*: 'At that time, neoclassical perfection had just triumphed over Keynesian rigidities and we were both concerned with how long it takes for the growth rate to respond to changes in policy.' Its background is interpreted: Neo-classical models conquered Keynesians' disequilibrium by proving complete substitution between capital and labor.

The author measures the level of equilibrium by country and sector using *the speed years* and replaces the literature's exogenous *speed years* by author's endogenous *speed years*. *The speed years* support the *EES*. Further, this Chapter reveals its structure.

7.1 Introduction

The purpose of this chapter is first to structurally clarify the dynamics of *the speed years* for convergence in equilibrium by country and, second to empirically show how to use simulations for *the speed years*. The author has theoretically explained *the speed years* for convergence in equilibrium by country (hereunder, *the speed years*) in related chapters, connecting *the speed years* with a few aspects. The level of endogenous-equilibrium is straight measured by *the speed years*. What conditions determine the differences of the endogenous-equilibrium? There are an optimum equilibrium, a modest equilibrium, a close-to-disequilibrium, and disequilibrium. An optimum equilibrium is a moderate equilibrium that satisfies the conditions of a maximized rate of return under a minimized net investment to output, and by sector. The author proves the optimum equilibrium empirically using hyperbola by country (see Chapters 5, 11, 15).

This chapter processes the cases not only at the total economy but also at two sectors, the government and private sectors, using twelve countries: the US, Japan, China, France, Germany, Greece, Ireland, Spain, Sweden, the UK, Turkey, and Singapore. These cases are, in the same way, extended to the two sectors, government and private, using endogenous data by sector.

The conditions for a moderate range of the endogenous-equilibrium are structurally determined by three items, the capital-output ratios, $\Omega^* = K/Y$, the quantitative net investment coefficient, β^*, and the diminishing returns to capital coefficient, δ_0. Three items constitute the structural combinations of the three items (hereunder, the structure of *the speed years*). This structure includes all the parameters to determine *the speed year* equations by sector, $1/\lambda^*$, $1/\lambda^*_G$, $1/\lambda^*_{PRI}$. *The speed years* of the total economy is shown by $\lambda^* = (1-\alpha)n + (1-\delta_0)g_A^*$. The capital-output ratio is a driver that manipulates and calibrates *the speed years* by carefully watching β^* and δ_0. A reason why the conditions leading to a moderate equilibrium is difficult comes from structural combinations of the three items.

For example, $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$ exists and $B^* = (1-\beta^*)/\beta^*$ is used for the denominator of δ_0. A good example: If β^*=0.5, then $1-\beta^*$ is 0.5 and as a result, $B^* = 1.0$ holds. This case is arithmetically a moment case. A bad example is the case of β^*=1.0; it results in $B^* = \text{impossible}$, and accordingly, *the speed years* fall into impossible. Actually, in this bad case, the rate of technological progress, $g_A^* = i(1-\beta^*)$, is zero and no growth is guaranteed. When a sign of #NUM! appears, policy-makers must discriminate each contents; whether a mere arithmetical result or a serious symptom closer to disequilibrium. A moment shock comes from purely arithmetic calculation. An aggravating shock comes from serious real-asset unbalances by year.

Chapter 8 will clarify the mechanics of the capital-output ratio thoroughly, after widely spreading the essence of *the speed years* for convergence in this chapter. This chapter is speed years-oriented and implicitly suggests what differences lying between *the endogenous speed years* and *the speed years* in the literature through the structural analysis of *the speed years*.

7.2 Background of Endogenous Equilibrium and *the Speed Years*

This section broadly summarizes a version of the structure of *the speed years* to sustainable robustness and economic stages by country. There are ‘economic indicators’ such as estimated by the World Bank, whose data are actually taken from *International Financial Statistics Yearbook*, IMF. Economic Indicators in the literature are statistics-oriented and, not endogenously related to real, fiscal, financial, and market policies. Policy-makers need to have theoretical data consistently with all other data by year. Statistics data are given exogenously and used independently under the market principles.

Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

For example, there exists an equation for *the speed years* for convergence in the literature yet, this equation is independent of empirical results. For empirical analysis, panel data in statistics are solely exogenously used. The results differ by data and, the causes at the real assets are not clarified at the same time. In the case of the endogenous system, *the speed years* for convergence are endogenously measured without using panel data in statistics. *The speed years* by country and by sector is inevitably related to the endogenous-equilibrium, where no panel data of certain countries by year are required for measurement, differently from *the speed years* in the literature.

The speed years in the endogenous-equilibrium are measured by the inverse number of an endogenous speed coefficient of $\lambda^* = (1-\alpha)n_E + (1-\delta_0)g_A^*$. The endogenous speed coefficient is measured differently using such nine parameters as are required for the endogenous system: $\alpha,\ \beta^*, \delta_0,\ \Omega,\ \lambda^*$, and $i, i_G, n_E, n_{E(G)}$. The endogenous speed coefficient, λ^*, does not include the ratio of net investment to output in equilibrium, $i = I/Y$, but the rate of change in population in equilibrium, n_E. The endogenous equilibrium is determined by adjusting $i = I/Y$ with the change in *the speed years* in equilibrium.

Policy-oriented core parameters are the relative share of capital, α, the capital-output ratio, Ω^*, and the rate of return, r^*,each in equilibrium and these three constitute $\alpha = \Omega^* \cdot r^*$. The inverse of the endogenous speed coefficient, $1/\lambda^*$, determines *the speed years* for convergence in equilibrium by country (i.e., *the speed years*). The three items of $\beta^*, \delta_0, \Omega$ constitute the structure of *the speed years*. This chapter focuses the structure of *the speed years* to answer related unsolved problems between causes and effects in the literature. Four items of $i, i_G, n_E, n_{E(G)}$ constitute independent variables by sector when endogenous equations are each reduced to hyperbolas. There are several related hyperbolas such as, $speed(i)$, $speed(n_E)$ $\Omega^*(i)$, $\Omega^*(n_E)$, $r^*(i)$, and $r^*(n_E)$. Note, $r^*(n_E)$ is reduces to linear, where gradient and intercept each are still expressed by some of nine endogenous parameters. Each hyperbola has its attributes such as the vertical asymptote (VA) and/or the horizontal asymptote (HA), the Width, the Shape, and the Curvature (for each definition and its equation, see Appendix at the end of the *EES*). These attributes in each hyperbola are all expressed using some of nine endogenous parameters. These attributes widely constitute the 'mechanics' in equilibrium using hyperbolas implicitly and explicitly.

Back to the structure of *the speed years,* the structure holds not at a closed but an open economy, and, by country and by sector. There is an assumption, behind of the structure of *the speed years*, that the actual balance of payments equals the endogenous balance of payments and that the actual budget deficit equals the endogenous budget deficit. This assumption is useful to guarantee an equation of $(S_{ENDOG} - S_{ACTUAL}) = -(I_{ENDOG} - I_{ACTUAL})$ as firm as a rock at the real assets. Suppose that endogenous net investment equals actual net investment. Then, the difference between the current situation and the endogenous situation disappears. Suppose that this equation holds within an optimum range of equilibrium, e.g., between 0.25Width and 0.5Width. Then, the current situation shows that policy-makers well acted to reach the optimum range. On the other hand, suppose that a country fell into disequilibrium. The difference between the current situation and the endogenous situation never disappears. The final manoeuvre is to decrease the rate of change in population in equilibrium, as intentionally shown at KEWT 5.11, 1990-2009. It implies that unemployment in equilibrium occurs. The length of the Width measured by $i = I/Y$ at the speed year hyperbola of $i = I/Y$ is in proportion to the robustness of sustainable economy: the longer the Width the more robust an economy is in equilibrium.

From the viewpoint of economic stages, the rate of return hyperbola of $i = I/Y$ controls the transition from developing to developed stage; $r^*(i)$. The lower the $i = I/Y$ the higher the rate of return in equilibrium is. $r^*(i)$ is simultaneously related to the above speed year hyperbola of $i = I/Y$; $speed(i)$. Nevertheless, developing countries want to maintain a high rate of output, where a high $i = I/Y$ is attractive, assuming that β^* or $\widetilde{\beta^*} = 1 - \beta^*$ is fixed. As a result, the developing country soon reaches a developed country, with an unexpected decline of robustness. This is because the capital-output ratio soon hits its upper limit, e.g., 2.0 to 2.5. It is possible for policy-makers to maintain sustainable robustness and economic stage to some extent, not to decreasing the growth rate of output too much. This is to promote technology and increase $\widetilde{\beta^*} = 1 - \beta^*$ by shifting quantitative to qualitative net investment through ecological and environmental R&D and education, with intentional reduction of $i = I/Y$ in equilibrium. This action leads to a minimized rate of return to a minimized net investment to output at an optimum point of $i = I/Y$.

Preferable combinations for the structure of *the speed years* are (1) $speed(i)$ and $speed(n_E)$, (2) $\Omega^*(i)$ and $\Omega^*(i)$, and (3) $r^*(i)$ and $r^*(n_E)$. It is interesting that $speed(i)$ and $speed(n_E)$ each have the VA and $r^*(i)$ has the HA, while $\Omega^*(i)$ and $\Omega^*(n_E)$ each have the VA and the HA For reverse calculation to serve policy-makers, $i(speed)$, $n_E(speed)$ $i(\Omega^*)$, $n_E(\Omega^*)$, $i(r^*)$, and $n_E(r^*)$ need to be formulated (for comparison, see Appendix of the *EES*).

In short, it is the mission of policy-makers to control sustainable robustness and economic stages in order to maintain a moderate growth rate of output in the long run by year. For this purpose, it is necessary for policy-makers to perceive the structure of *the speed years*, adjusting nine endogenous parameters by year. The characteristics of the structure of *the speed years* are clarified by establishing the framework of simulations.

7.3 Empirical Results and Implications by Country

This section discusses empirical results using KEWT 5.11 and summarizes implications by country. First, highlighted using BOX 7-1, 7-2, and 7-3 in the text each based on Tables S-1 to S-4 for simulations. Second, very shortly, Tables C1 and C2 for differences of economic stages; Tables A1 and A2 for the structure of *the speed years*; Tables E1 to E4 for endogenous elasticity values of parameters and variables each w.r.t. α and β^*; Tables F1 and F3 for frequencies to total numbers that falls into disequilibrium and close-to-disequilibrium. Third, very shortly, Figures P1 to P7, are presented widely for the mechanics in equilibrium.

First, **Tables S1** to **S4** show selected frameworks in simulation, with processes and results by aspect, and compare each other in detail. There are two manoeuvres for simulations; (i) what hyperbolas should be preferably combined and (ii), what endogenous parameters should be selected as basic poles of simulations. For (i) combinations, the author sets two combinations: Combination 1; $\Omega^*(i)$ and $r^*(i)$, and Combination 2; $speed(i)$ and $speed(n_E)$. Combination 1 determines economic stages based on the upper limit of the HA of $\Omega^*(i)$. The lower the difference between the HA of $\Omega^*(i)$ and the current capital-output ratio, the more risky a country becomes.

This is the stage risk. A high level of capital-output ratio inevitably decreases the growth rate of output. Combination 2 determines the relationship between equilibrium and unemployment, integrating optimum range of *the speed years* with the non-accelerating-inflation rate of unemployment (endogenous NAIRU). Combination 2 shows final results of policies by country. Combination 2, in other words, clarifies the entrance and exit of essential policies by country simultaneously, where the entrance is the level of endogenous equilibrium and the exit is full-employment with a low rate of inflation. The HA of $r^*(i)$ shows the endogenous rate of inflation. Therefore, the HA of $r^*(i)$ is a tie to connect Combination 1 with Combination 2.

For (ii) simulations, the author selects two parameters each as a basic pole of simulations: relative share, $1-\alpha$; and technology, $1-\beta^*$. When each pole is used, the author assumes that $i = I/Y$ and n_E are fixed in simulation. Relative share, $1-\alpha$, directly works for balancing sustainable robustness and economic stages while technology, $1-\beta^*$, works for promoting technological progress as a base for the dynamic balance between robustness and stages. The two poles, $1-\alpha$ and $1-\beta^*$, do not match always so that policy-makers must design their own directions and extents. Philosophy underlying determines the directions and extents of the dynamic balance. Suppose that these two poles each change the six hyperbolas towards the same good or bad direction. In this case, it is not needed for an operator to simulate two times of $1-\alpha$ and $1-\beta^*$. And, the relationship between philosophy and results is simply clarified.

However, in simulations, results examined by pole differ significantly. In particular, the increase in relative share, $1-\alpha$, results in a linear decrease of *the speed years*. On the contrary, the increase in technology, $1-\beta^*$, results in a convex curve of *the speed years* from upwards to downwards after reaching maximum point. As a result, optimum range of *the speed years* similarly changes, as measured by the vertical asymptote of the speed, $i_{VA(speed)}$, and the Width, $i_{Width(speed)}$. This implies that it is essential to maintain robustness by continuously improving technology. Also, when technology improves with a low $i = I/Y$, economic stage never becomes matured or developed in a hurry. For economic stages, the capital-output ratio hyperbola to $i = I/Y, \Omega^*(i)$, and its horizontal asymptote, ${\Omega^*}_{HA(i)}$, are the targets.

As a result, Combination 1, $\Omega^*(i)$ and $r^*(i)$, and Combination 2, $speed(i)$ and $speed(n_E)$, are simulated, each by using two poles, $1-\alpha$ and $1-\beta^*$separately. For Combination 1, the author examines the changes in the following items: Ω^*, $i_{VA(\Omega^*)}$, $\Omega^*_{HA(i)}$, r^*, $r^*_{HA(i)}$, g^*_Y, $\alpha/i\cdot\beta^*$ that shows the relationship between $r^*$and g^*_Y, $Curvature_{\Omega^*(i)}$, and $\Omega^*_{HA(i)}/r^*_{HA(i)}$. These items constitute a half part of the mechanics in equilibrium. For Combination 2, the author examines the changes in the following items: δ_0, $speed = 1/\lambda^*$, $i_{VA(speed)}$, $i_{Width(speed)}$, sum of $i_{VA(speed)} + i_{Width(speed)}$, $n_{VA(speed)}$, $n_{Width(speed)}$, $r^*_{HA(i)}$, and $\Omega^*_{HA(i)}/r^*_{HA(i)}$. These items also constitute a remaining part of the mechanics in equilibrium. The simulation results of the mechanics in equilibrium clarify the characteristics of related hyperbolas. The structure of *the speed years* of $\alpha = \Omega^* \cdot r^*$ seems to be rather complicated when the author explains simulation processes step by step. The simulation results by country show common characteristics among country and thus, are useful to policy-makers.

Let's illustrate the essence of each simulation. **BOXES 7-1, 7-2**, and **7-3** each highlight the results of simulations, using symbols drawn by trend.

BOX 7-1 Results of simulations 1-1, 1-2, 2-1, 2-2, 3-1, 3-2, 4-1, and 4-2 in equilibrium: by changing α & β^*, with changes in n and $i = I/Y$

	Movements between Cases 1 &2 and Cases 3 & 4									differs		differs	
equilibrium	i	n	α	Ω^*	β^*	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω^*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^*_{HA(i)}$	$i_{Width(r^*)}$	$\Omega^*_{HA(i)}/r^*_{H}$
Case 1-1			**rises**			↗	↘	↘	↗	↘	↑	↑	↓
Case 1-2					**rises**	↓	↑	↑	↓	↑	↓	↘	↑
Case 2-1		**rises**	**rises**			↗	↘	↘	↗	↘	↑	↑	↓
Case 2-2		**rises**			**rises**	↓	↑	↑	↓	↑	↓	↘	↑
equilibrium	i	n	α	Ω^*	β^*	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω^*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^*_{HA(i)}$	$i_{Width(r^*)}$	$\Omega^*_{HA(i)}/r^*_{H}$
Case 3-1	**falls**		**rises**			↗	↘	↘	↗	↘	↑	↑	↓
Case 3-2	**falls**				**rises**	↓	↑	↑	↓	↓	↓	↘	↑
Case 4-1	**rises**		**rises**			↗	↘	↘	↗	↘	↑	↗	↓
Case 4-2	**rises**				**rises**	↓	↑	↑	↓	↑	↓	↘	↑

	differs		differs	Movements between Cases 1 &2 and Cases 3 & 4				differs	differs	differs		differs	
equilibrium	**$delta_0$**	r^*	$r_{REAL}=r^*-r^*_{H}$	$\alpha/i\cdot\beta^*$	g_Y^*	g_A^*	$1/\lambda^*$	$\delta_0-\alpha$	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
Case 1-1	↑	↑	↑	↑	↗	→	↗	↘	↘	↗	↗	↘	↗
Case 1-2	↘	↓	↘	↘	↓	↓	◡↗	↘	↘	◡↗	◡↗	↘	→
Case 2-1	↗	↑	↑	↑	↗	→	↗	↓	↓	↘	↗	↘	↗
Case 2-2	↗	↓	↘	↘	↓	↓	◡↗	◡↗	◡↗	◠↘	◡↗	◡↗	→
equilibrium	**$delta_0$**	r^*	$r_{REAL}=r^*-r^*_{H}$	$\alpha/i\cdot\beta^*$	g_Y^*	g_A^*	$1/\lambda^*$	$\delta_0-\alpha$	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
Case 3-1	↗	↑	↑	↑	↗	→	↗	↘	↓	↘	↗	↗	↗
Case 3-2	↘	↓	↘	↘	↓	↓	◡↗	◡↗	◡↗	↓	◡↗	◡↗	→
Case 4-1	↗	↑	↗	↑	↗	→	↗	↘	◡↗	↗	↗	↘	↗
Case 4-2	↗	↓	↘	↘	↓	↓	◡↗	↘	◡↗	◠↘	◡↗	◡↗	→

BOX 7-2 Results of simulations for capital-output ratio and related ratios in equilibrium: by changing α & β^*, with changes in n and $i = I/Y$

	Movements between Cases 1 &2 and Cases 3 & 4									differs		differs	
equilibrium	i	n	α	Ω^*	β^*	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω^*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^*_{HA(i)}$	$i_{Width(r^*)}$	$\Omega^*_{HA(i)}/r^*_{H}$
Case 1-1			**rises**			↗	↘	↘	↗	↘	↑	↑	↓
Case 1-2					**rises**	↓	↑	↑	↓	↑	↓	↘	↑
Case 2-1		**rises**	**rises**			↗	↘	↘	↗	↘	↑	↑	↓
Case 2-2		**rises**			**rises**	↓	↑	↑	↓	↑	↓	↘	↑
equilibrium	i	n	α	Ω^*	β^*	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω^*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^*_{HA(i)}$	$i_{Width(r^*)}$	$\Omega^*_{HA(i)}/r^*_{H}$
Case 3-1	**falls**		**rises**			↗	↘	↘	↗	↘	↑	↑	↓
Case 3-2	**falls**				**rises**	↓	↑	↑	↓	↓	↓	↘	↑
Case 4-1	**rises**		**rises**			↗	↘	↘	↗	↘	↑	↗	↓
Case 4-2	**rises**				**rises**	↓	↑	↑	↓	↑	↓	↘	↑

BOX 7-3 Results of simulations for *the speed years* and related ratios in equilibrium: by changing α & β^*, with changes in n and $i = I/Y$

	differs		differs	Movements between Cases 1 &2 and Cases 3 & 4				differs	differs	differs		differs	
equilibrium	**$delta_0$**	r*	$r_{REAL}=r^*-r^*_H$	$\alpha/i{\cdot}\beta^*$	g_Y^*	g_A^*	$1/\lambda^*$	$\delta_0-\alpha$	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
Case 1-1	↑	↑	↑	↑	↗	→	↗	↘	↘	↗	↗	↘	↗
Case 1-2	↘	↓	↘	↘	↓	↓	∪↗	↘	↘	∪↗	∪↗	↘	→
Case 2-1	↗	↑	↑	↑	↗	→	↗	↓	↓	↘	↗	↘	↗
Case 2-2	↗	↓	↘	↘	↓	↓	∪↗	∪↗	∪↗	∩↘	∪↗	∪↗	→
equilibrium	**$delta_0$**	r*	$r_{REAL}=r^*-r^*_H$	$\alpha/i{\cdot}\beta^*$	g_Y^*	g_A^*	$1/\lambda^*$	$\delta_0-\alpha$	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
Case 3-1	↗	↑	↑	↑	↗	→	↗	↘	↓	↘	↗	↗	↗
Case 3-2	↘	↓	↘	↘	↓	↓	∪↗	∪↗	∪↗	↓	∪↗	∪↗	→
Case 4-1	↗	↑	↗	↑	↗	→	↗	↘	∪↗	↗	↗	↘	↗
Case 4-2	↗	↓	↘	↘	↓	↓	∪↗	↘	∪↗	∩↘	∪↗	∪↗	→

Notes:
In Case 1-1, rise; in Case 1-2, β^* rises.
In Case 2-1, α rises with a rise of *n*; and in Case 2-2, β^* rises with the same rise of *n*.
In Case 3-1, α rises; in Case 3-2, β^* rises, each with a fall of $i = I/Y$.
In Case 4-1, α rises and in Case 4-2, β^* rise, each with a rise of $i = I/Y$. Simulation of each case has nine levels, increasing and/or decreasing.

Next, **Tables C1** and **C2** show the differences of economic stages using the structure of *the speed years*, where economic stages are divided into five cases including extreme deficit case. **Tables A1** and **A2** each show results of the structure of *the speed years*, by country and by sub-area in Europe and Asia. **Tables E1** to **E4** show endogenous elasticity values of parameters and variables each w.r.t. α and β^*, in the discrete time, where the elasticity of substitution is 1.0, as proved (2009). **Tables F1** and **F2** show frequency to total numbers that falls into 'disequilibrium' and frequency to total numbers that falls into 'close-to-disequilibrium,' by country for the 1990-2008, where disequilibrium is measured by *the speed years*<0 and close-to-disequilibrium is measured by 0<*the speed years*<5. **Table F3** shows endogenous real rate of return and endogenous inflation/deflation rate for the NAIRU by country in 2008. This is another expression of disequilibrium since the adjustments by n_E is the last manoeuvre to equilibrium.

Finally, **Figures P1** to **P7** each show the mechanics in equilibrium for three Europe sub-areas in Europe. 'Mechanics' in these figures broadly means the characteristics shown by using some specific ratios in endogenous equations and related hyperbolas.

7.4 Conclusions

This chapter aims at clarifying a version of the structure of *the speed years* empirically using endogenous equations. One specific point in this chapter is the use of KEWT 5.11 data-sets. This is because KEWT 5.11 data-sets each leave an endogenous rate of unemployment as a final adjustment for maintaining a moderate range of endogenous equilibrium. The structure of *the speed years* locates at the centre of the endogenous-equilibrium and the endogenous system; made of two attributes, the capital-output ratio and the quantitative net investment coefficient, β^*. And, this chapter connects endogenous equations with corresponding hyperbolas. A hyperbola is a reduced form of an endogenous equation and reinforces the endogenous system by measuring vertical and/or horizontal asymptotes.

The policy-oriented core parameters, i.e., relative share of capital, the capita-output ratio, and the rate of return, or $\alpha = \Omega^* \cdot r^*$ are overlapped in the structure of *the speed years*. Related hyperbolas are a few times explained in other chapters from different viewpoints of sustainability so that readers may be relaxed in this chapter.

The other specific point of this chapter is the use of 'the origin' of each related hyperbola. The origin of a hyperbola is visibly shown at the centre of the four quadrants and determines accurate spots of parameters and variables. The optimum point of $i = I/Y$ of the rate of return hyperbola to $i = I/Y$ is, even though, difficult to find the maximum rate of return corresponding to the minimum $i = I/Y$ since this spot is not obtained by point but by a narrow range.

The author recalls a story of genius pianist, Tsujii Nobuyuki broadcasted on 19 May 2012 at TV Asahi. Tsujii won the highest pianist record in the world and today keeps "the youngest winner" by the age of twenty years, despite of blindness. A judge praised: He played piano with mind and spirit or his spirit played his piano.

The simulations based on related hyperbolas are visible and accordingly testable. Yet in a sense, it is important for an operator/policy-maker to work spiritually rather than to stick to mechanical method and its results. The parabolic maximization is replaced by an optimum range of the endogenous-equilibrium to satisfy the maximum rate of return under the minimum $i = I/Y$. The origin of a hyperbola overlaps one corner of the right rectangular that helps to draw hyperbolic curve. By imaging the rectangular, the optimum point by hyperbola will be confirmed, not intuitively but accurately. Two dimensional rectangular reinforces the hyperbola and, empirically determines the original point and a range of the maximum and minimum spots. The origin and the vertical and horizontal asymptotes constitute each body of the endogenous system and are related to hyperbolas. Not any corner of a rectangular but a whole of the rectangle determines the optimization by hyperbola. This image is similar to human body and further human mind and body (see Chapter 10).

Conclusively, Chapters 7, 8, and 9 each deepens direct measure of the speed years for convergence in the endogenous-equilibrium. The endogenous-equilibrium is the best surrogate for the price-equilibrium. The speed years harmoniously reinforces the market principles in the price-equilibrium. The endogenous-equilibrium is robustly connected with the capital-output ratio. When the capital-output ratio is constant by country, by sector (G and PRI), and year and over years, the endogenous-equilibrium is most modest and optimized. This fact is expressed by a constant capital-output ratio, $\Omega = \Omega^* = \Omega_0 = K/Y$ (**Axiom 1).** Remember Essence of Earth Endogenous System: Three Axioms and six Nature-Aspects at the beginning of the EES).

For readers' convenience: contents of Tables and Figures hereunder

Table S1 to S2: Simulations 1-1, 1-2, 2-1, and 2-2 in equilibrium: by changing α & β^*, with changes in $i = I/Y$, n, and δ_0

Table S3 to S4: Simulations 3-1, 3-2, 4-1, and 4-2 in equilibrium: by changing α & β^*, with changes in $i = I/Y$ and δ_0

Table C1: Case study of endogenous parameters and synergy structure of $\Omega^*(i)$ and $r^*(i)$ 2008

Table C2: Case study to δ_0, the speed of convergence, DRC, and variables 2008 (2)

Table A1: Endogenous parameters and synergy structure of $\Omega^*(i)$ and $r^*(i)$ by country and area 2008

Table A2: δ_0, the speed of convergence, DRC, and variables by country and area 2008 (2)

Table E1 to E4: The elasticity values of parameters and variables w.r.t. α and β^* in simulations

Table F1 to F3: Frequency by country and by sub-area to close-to-disequilibrium and disequilibrium: the Pacific and non-European area

Figure P1 to P2: Relative share of capital as the product of the rate of return and the capital-output ratio: developed versus developing countries in Europe

Figure P3 to P4: Endogenous rate of technological progress as the product of the ratio of qualitative investment to total investments and the ratio of net investment to output: developed versus developing countries in Europe

Figure P5 to P7: Mechanics in equilibrium; the 12 Euro currency countries; the 5 Non-Euro currency developed countries; the 11 developing countries in Europe

Table S1 Simulations 1-1, 1-2, 2-1, and 2-2 (1) in equilibrium: by changing α & β^{*}, with changes in n and $i = I/Y$

i	n	α	Ω^{*}	β^{*}	$i_{VA(\Omega)}$	$\Omega^{*}_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω^{*}	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^{*}_{HA(i)}$	$i_{Width(r^{*})}$	$\Omega^{*}_{HA(i)}/r^{*}_{H}$
Simu 1-1: changing *alpha*												
0.2	0.005	**0.05**	3.926	0.825	(0.0270)	4.456	0.3469	2.038	0.3199	0.0112	0.0174	397.17
0.2	0.005	**0.1**	3.743	0.825	(0.0256)	4.222	0.3287	2.151	0.3031	0.0237	0.0246	178.23
0.2	0.005	**0.15**	3.557	0.825	(0.0242)	3.987	0.3104	2.278	0.2862	0.0376	0.0302	105.99
0.2	0.005	**0.2**	3.369	0.825	(0.0227)	3.753	0.2921	2.420	0.2694	0.0533	0.0348	70.41
0.2	0.005	**0.25**	3.179	0.825	(0.0213)	3.518	0.2739	2.582	0.2526	0.0711	0.0389	49.51
0.2	0.005	**0.3**	2.986	0.825	(0.0199)	3.284	0.2556	2.766	0.2357	0.0914	0.0426	35.94
0.2	0.005	**0.35**	2.791	0.825	(0.0185)	3.049	0.2374	2.979	0.2189	0.1148	0.0461	26.56
0.2	0.005	**0.4**	2.593	0.825	(0.0171)	2.814	0.2191	3.227	0.2021	0.1421	0.0492	19.80
0.2	0.005	**0.45**	2.393	0.825	(0.0156)	2.580	0.2008	3.521	0.1852	0.1744	0.0522	14.79
Simu 1-2 changing *beta* *												
0.2	0.005	0.25	1.070	**0.6**	(0.0093)	1.119	0.1022	6.920	0.0929	0.2233	0.0456	5.01
0.2	0.005	0.25	1.316	**0.65**	(0.0107)	1.386	0.1216	5.817	0.1109	0.1804	0.0439	7.68
0.2	0.005	0.25	1.639	**0.7**	(0.0124)	1.741	0.1472	4.805	0.1347	0.1436	0.0423	12.13
0.2	0.005	0.25	2.083	**0.75**	(0.0149)	2.239	0.1828	3.868	0.1679	0.1117	0.0408	20.05
0.2	0.005	0.25	2.730	**0.8**	(0.0187)	2.985	0.2360	2.996	0.2173	0.0838	0.0395	35.64
0.2	0.005	0.25	3.761	**0.85**	(0.0249)	4.229	0.3243	2.180	0.2995	0.0591	0.0383	71.53
0.2	0.005	0.25	5.660	**0.9**	(0.0373)	6.716	0.5006	1.412	0.4633	0.0372	0.0373	180.44
0.2	0.005	0.25	10.326	**0.95**	(0.0746)	14.179	1.0287	0.687	0.9540	0.0176	0.0363	804.19
0.2	0.005	0.25	25.781	**0.99**	(0.3731)	73.881	5.2505	0.135	4.8773	0.0034	0.0355	21833
Simu 2-1: changing *alpha*												
0.2	**0.010**	**0.05**	3.495	0.825	(0.0537)	4.434	0.4882	1.448	0.4344	0.0113	0.0246	393.25
0.2	**0.010**	**0.1**	3.348	0.825	(0.0509)	4.201	0.4625	1.529	0.4116	0.0238	0.0348	176.47
0.2	**0.010**	**0.15**	3.198	0.825	(0.0481)	3.967	0.4368	1.619	0.3887	0.0378	0.0426	104.94
0.2	**0.010**	**0.2**	3.045	0.825	(0.0453)	3.734	0.4111	1.720	0.3658	0.0536	0.0492	69.72
0.2	**0.010**	**0.25**	2.888	0.825	(0.0424)	3.501	0.3854	1.835	0.3430	0.0714	0.0550	49.02
0.2	**0.010**	**0.3**	2.727	0.825	(0.0396)	3.267	0.3597	1.966	0.3201	0.0918	0.0603	35.58
0.2	**0.010**	**0.35**	2.563	0.825	(0.0368)	3.034	0.3340	2.117	0.2973	0.1154	0.0651	26.30
0.2	**0.010**	**0.4**	2.394	0.825	(0.0339)	2.801	0.3083	2.293	0.2744	0.1428	0.0696	19.61
0.2	**0.010**	**0.45**	2.222	0.825	(0.0311)	2.567	0.2826	2.502	0.2515	0.1753	0.0739	14.65
Simu 2-2 changing *beta* *												
0.2	**0.010**	0.25	1.019	**0.6**	(0.0186)	1.114	0.1438	4.917	0.1252	0.2244	0.0645	4.96
0.2	**0.010**	0.25	1.247	**0.65**	(0.0212)	1.379	0.1711	4.134	0.1498	0.1813	0.0620	7.61
0.2	**0.010**	0.25	1.542	**0.7**	(0.0248)	1.733	0.2071	3.414	0.1823	0.1443	0.0598	12.01
0.2	**0.010**	0.25	1.940	**0.75**	(0.0297)	2.228	0.2572	2.749	0.2275	0.1122	0.0577	19.85
0.2	**0.010**	0.25	2.505	**0.8**	(0.0371)	2.970	0.3321	2.129	0.2950	0.0842	0.0559	35.29
0.2	**0.010**	0.25	3.373	**0.85**	(0.0495)	4.208	0.4564	1.549	0.4069	0.0594	0.0542	70.83
0.2	**0.010**	0.25	4.874	**0.9**	(0.0743)	6.683	0.7045	1.004	0.6302	0.0374	0.0527	178.66
0.2	**0.010**	0.25	8.097	**0.95**	(0.1485)	14.109	1.4475	0.488	1.2990	0.0177	0.0513	796.25
0.2	**0.010**	0.25	15.599	**0.99**	(0.7426)	73.515	7.3885	0.096	6.6459	0.0034	0.0503	21618

Table S2 Simulations 1-1, 1-2, 2-1, and 2-2 (2) in equilibrium: by changing α & β^*, with changes in n and $i = I/Y$

$delta_0$	r^*	$r_{REAL} = r^* - r^*_H$	$\alpha/r\beta^*$	g_Y^*	g_A^*	$1/\lambda^*$	$\delta_0-\alpha$	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
Simu 1-1: changing *alpha*												
0.1180	0.0127	0.0015	0.3030	0.0420	0.0350	28.07	0.0680	1.3597	(0.0308)	0.0255	(0.0325)	0.0103
0.1488	0.0267	0.0030	0.6061	0.0441	0.0350	29.16	0.0488	0.4880	(0.0302)	0.0259	(0.0331)	0.0105
0.1816	0.0422	0.0045	0.9091	0.0464	0.0350	30.40	0.0316	0.2106	(0.0297)	0.0264	(0.0337)	0.0108
0.2166	0.0594	0.0061	1.2121	0.0490	0.0350	31.83	0.0166	0.0829	(0.0292)	0.0270	(0.0343)	0.0112
0.2541	0.0786	0.0076	1.5152	0.0519	0.0350	33.49	0.0041	0.0163	(0.0287)	0.0277	(0.0348)	0.0115
0.2944	0.1005	0.0091	1.8182	0.0553	0.0350	35.47	(0.0056)	(0.0186)	(0.0283)	0.0285	(0.0353)	0.0120
0.3380	0.1254	0.0106	2.1212	0.0591	0.0350	37.85	(0.0120)	(0.0342)	(0.0281)	0.0294	(0.0356)	0.0124
0.3854	0.1542	0.0121	2.4242	0.0636	0.0350	40.80	(0.0146)	(0.0364)	(0.0279)	0.0305	(0.0358)	0.0129
0.4373	0.1881	0.0136	2.7273	0.0690	0.0350	44.56	(0.0127)	(0.0282)	(0.0279)	0.0319	(0.0358)	0.0135
Simu 1-2 changing *beta**												
0.8342	0.2338	0.0104	2.0833	0.1122	0.0800	58.79	0.5842	2.3370	(0.0566)	0.0388	(0.0177)	0.0115
0.5567	0.1900	0.0096	1.9231	0.0988	0.0700	28.75	0.3067	1.2267	(0.0242)	0.0254	(0.0414)	0.0115
0.4166	0.1525	0.0089	1.7857	0.0854	0.0600	25.80	0.1666	0.6665	(0.0214)	0.0239	(0.0467)	0.0115
0.3319	0.1200	0.0083	1.6667	0.0720	0.0500	26.91	0.0819	0.3276	(0.0225)	0.0245	(0.0445)	0.0115
0.2755	0.0916	0.0078	1.5625	0.0586	0.0400	30.55	0.0255	0.1018	(0.0259)	0.0263	(0.0386)	0.0115
0.2363	0.0665	0.0074	1.4706	0.0452	0.0300	37.51	(0.0137)	(0.0548)	(0.0327)	0.0295	(0.0305)	0.0115
0.2111	0.0442	0.0069	1.3889	0.0318	0.0200	51.21	(0.0389)	(0.1558)	(0.0475)	0.0356	(0.0210)	0.0115
0.2071	0.0242	0.0066	1.3158	0.0184	0.0100	85.62	(0.0429)	(0.1716)	(0.0946)	0.0502	(0.0106)	0.0115
0.2928	0.0097	0.0063	1.2626	0.0077	0.0020	193.63	0.0428	0.1712	(0.5303)	0.1189	(0.0019)	0.0115
Simu 2-1: changing *alpha*												
0.1930	0.0143	0.0030	0.3030	0.0472	0.0350	26.49	0.1430	2.8600	(0.0673)	0.0266	(0.0297)	0.0103
0.2206	0.0299	0.0061	0.6061	0.0493	0.0350	27.57	0.1206	1.2064	(0.0660)	0.0271	(0.0303)	0.0105
0.2502	0.0469	0.0091	0.9091	0.0516	0.0350	28.78	0.1002	0.6679	(0.0648)	0.0276	(0.0309)	0.0108
0.2819	0.0657	0.0121	1.2121	0.0542	0.0350	30.18	0.0819	0.4095	(0.0637)	0.0282	(0.0314)	0.0112
0.3160	0.0866	0.0152	1.5152	0.0571	0.0350	31.81	0.0660	0.2641	(0.0627)	0.0289	(0.0319)	0.0115
0.3530	0.1100	0.0182	1.8182	0.0605	0.0350	33.73	0.0530	0.1765	(0.0618)	0.0297	(0.0324)	0.0120
0.3931	0.1366	0.0212	2.1212	0.0644	0.0350	36.05	0.0431	0.1231	(0.0612)	0.0307	(0.0327)	0.0124
0.4370	0.1671	0.0242	2.4242	0.0689	0.0350	38.90	0.0370	0.0924	(0.0609)	0.0319	(0.0328)	0.0129
0.4852	0.2026	0.0273	2.7273	0.0743	0.0350	42.52	0.0352	0.0783	(0.0611)	0.0333	(0.0328)	0.0135
Simu 2-2 changing *beta**												
0.9530	0.2453	0.0208	2.0833	0.1177	0.0800	88.79	0.7030	2.8119	(0.3987)	0.0729	(0.0050)	0.0115
0.6437	0.2005	0.0192	1.9231	0.1043	0.0700	30.82	0.3937	1.5747	(0.0601)	0.0283	(0.0333)	0.0115
0.4890	0.1621	0.0179	1.7857	0.0908	0.0600	26.20	0.2390	0.9559	(0.0489)	0.0255	(0.0409)	0.0115
0.3970	0.1289	0.0167	1.6667	0.0773	0.0500	26.56	0.1470	0.5878	(0.0497)	0.0258	(0.0402)	0.0115
0.3375	0.0998	0.0156	1.5625	0.0639	0.0400	29.41	0.0875	0.3501	(0.0566)	0.0275	(0.0353)	0.0115
0.2991	0.0741	0.0147	1.4706	0.0504	0.0300	35.05	0.0491	0.1963	(0.0713)	0.0308	(0.0280)	0.0115
0.2792	0.0513	0.0139	1.3889	0.0369	0.0200	45.63	0.0292	0.1166	(0.1040)	0.0372	(0.0192)	0.0115
0.2897	0.0309	0.0132	1.3158	0.0235	0.0100	68.48	0.0397	0.1588	(0.2112)	0.0531	(0.0095)	0.0115
0.4022	0.0160	0.0126	1.2626	0.0127	0.0020	115.00	0.1522	0.6086	(1.2545)	0.1293	(0.0016)	0.0115

Table S3 Simulations 3-1, 3-2, 4-1, and 4-2 (1) in equilibrium: by changing α & β^{*}, with changes in n and $i = I/Y$

i	n	α	Ω^{*}	β^{*}	$i_{VA(\Omega)}$	$\Omega^{*}_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^{*}_{HA(i)}$	$i_{Width(r^{*})}$	$\Omega^{*}_{HA(i)}/r^{*}_{H}$
Simu 3-1: changing *alpha*												
0.075	0.005	**0.05**	3.276	0.825	(0.0270)	4.456	0.3469	2.038	0.3199	0.0112	0.0174	397.17
0.075	0.005	**0.1**	3.148	0.825	(0.0256)	4.222	0.3287	2.151	0.3031	0.0237	0.0246	178.23
0.075	0.005	**0.15**	3.016	0.825	(0.0242)	3.987	0.3104	2.278	0.2862	0.0376	0.0302	105.99
0.075	0.005	**0.2**	2.879	0.825	(0.0227)	3.753	0.2921	2.420	0.2694	0.0533	0.0348	70.41
0.075	0.005	**0.25**	2.739	0.825	(0.0213)	3.518	0.2739	2.582	0.2526	0.0711	0.0389	49.51
0.075	0.005	**0.3**	2.595	0.825	(0.0199)	3.284	0.2556	2.766	0.2357	0.0914	0.0426	35.94
0.075	0.005	**0.35**	2.446	0.825	(0.0185)	3.049	0.2374	2.979	0.2189	0.1148	0.0461	26.56
0.075	0.005	**0.4**	2.293	0.825	(0.0171)	2.814	0.2191	3.227	0.2021	0.1421	0.0492	19.80
0.075	0.005	**0.45**	2.135	0.825	(0.0156)	2.580	0.2008	3.521	0.1852	0.1744	0.0522	14.79
Simu 3-2 changing *beta* *												
0.075	0.005	0.25	0.996	**0.6**	(0.0093)	1.119	0.1022	6.920	0.0929	0.2233	0.0456	5.01
0.075	0.005	0.25	1.213	**0.65**	(0.0107)	1.386	0.1216	5.817	0.1109	0.1804	0.0439	7.68
0.075	0.005	0.25	1.494	**0.7**	(0.0124)	1.741	0.1472	4.805	0.1347	0.1436	0.0423	12.13
0.075	0.005	0.25	1.867	**0.75**	(0.0149)	2.239	0.1828	3.868	0.1679	0.1117	0.0408	20.05
0.075	0.005	0.25	2.390	**0.8**	(0.0187)	2.985	0.2360	2.996	0.2173	0.0838	0.0395	35.64
0.075	0.005	0.25	3.176	**0.85**	(0.0249)	4.229	0.3243	2.180	0.2995	0.0591	0.0383	71.53
0.075	0.005	0.25	4.485	**0.9**	(0.0373)	6.716	0.5006	1.412	0.4633	0.0372	0.0373	180.44
0.075	0.005	0.25	7.107	**0.95**	(0.0746)	14.179	1.0287	0.687	0.9540	0.0176	0.0363	804.19
0.075	0.005	0.25	12.365	**0.99**	(0.3731)	73.881	5.2505	0.135	4.8773	0.0034	0.0355	21833
Simu 4-1: changing *alpha*												
0.4	0.005	**0.05**	4.174	0.825	(0.0270)	4.456	0.3469	2.038	0.3199	0.0112	0.0174	397.17
0.4	0.005	**0.1**	3.968	0.825	(0.0256)	4.222	0.3287	2.151	0.3031	0.0237	0.0246	178.23
0.4	0.005	**0.15**	3.760	0.825	(0.0242)	3.987	0.3104	2.278	0.2862	0.0376	0.0302	105.99
0.4	0.005	**0.2**	3.551	0.825	(0.0227)	3.753	0.2921	2.420	0.2694	0.0533	0.0348	70.41
0.4	0.005	**0.25**	3.340	0.825	(0.0213)	3.518	0.2739	2.582	0.2526	0.0711	0.0389	49.51
0.4	0.005	**0.3**	3.128	0.825	(0.0199)	3.284	0.2556	2.766	0.2357	0.0914	0.0426	35.94
0.4	0.005	**0.35**	2.914	0.825	(0.0185)	3.049	0.2374	2.979	0.2189	0.1148	0.0461	26.56
0.4	0.005	**0.4**	2.699	0.825	(0.0171)	2.814	0.2191	3.227	0.2021	0.1421	0.0492	19.80
0.4	0.005	**0.45**	2.483	0.825	(0.0156)	2.580	0.2008	3.521	0.1852	0.1744	0.0522	14.79
Simu 4-2 changing *beta* *												
0.4	0.005	0.25	1.094	**0.6**	(0.0093)	1.119	0.1022	6.920	0.0929	0.2233	0.0456	5.01
0.4	0.005	0.25	1.350	**0.65**	(0.0107)	1.386	0.1216	5.817	0.1109	0.1804	0.0439	7.68
0.4	0.005	0.25	1.689	**0.7**	(0.0124)	1.741	0.1472	4.805	0.1347	0.1436	0.0423	12.13
0.4	0.005	0.25	2.158	**0.75**	(0.0149)	2.239	0.1828	3.868	0.1679	0.1117	0.0408	20.05
0.4	0.005	0.25	2.852	**0.8**	(0.0187)	2.985	0.2360	2.996	0.2173	0.0838	0.0395	35.64
0.4	0.005	0.25	3.981	**0.85**	(0.0249)	4.229	0.3243	2.180	0.2995	0.0591	0.0383	71.53
0.4	0.005	0.25	6.143	**0.9**	(0.0373)	6.716	0.5006	1.412	0.4633	0.0372	0.0373	180.44
0.4	0.005	0.25	11.950	**0.95**	(0.0746)	14.179	1.0287	0.687	0.9540	0.0176	0.0363	804.19
0.4	0.005	0.25	38.224	**0.99**	(0.3731)	73.881	5.2505	0.135	4.8773	0.0034	0.0355	21833

Table S4 Simulations 3-1, 3-2, 4-1, and 4-2 (2) in equilibrium: by changing α & β^{*}, with changes in n and $i = I/Y$

$delta_0$	r*	$r_{REAL}=r^{*}-r^{*}_{H}$	$\alpha/i{\cdot}\beta^{*}$	g_Y^{*}	g_A^{*}	1/λ*	$\delta_0-\alpha$	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
Simu 3-1: changing *alpha*												
0.2346	0.0153	0.0040	0.8081	0.0189	0.0131	67.59	0.1846	3.6929	(0.0355)	0.0273	(0.0106)	0.0103
0.2605	0.0318	0.0081	1.6162	0.0197	0.0131	70.39	0.1605	1.6047	(0.0348)	0.0278	(0.0108)	0.0105
0.2881	0.0497	0.0121	2.4242	0.0205	0.0131	73.57	0.1381	0.9210	(0.0341)	0.0283	(0.0110)	0.0108
0.3179	0.0695	0.0162	3.2323	0.0215	0.0131	77.21	0.1179	0.5897	(0.0335)	0.0289	(0.0112)	0.0112
0.3501	0.0913	0.0202	4.0404	0.0226	0.0131	81.43	0.1001	0.4004	(0.0330)	0.0297	(0.0114)	0.0115
0.3850	0.1156	0.0242	4.8485	0.0238	0.0131	86.42	0.0850	0.2834	(0.0325)	0.0305	(0.0115)	0.0120
0.4231	0.1431	0.0283	5.6566	0.0253	0.0131	92.40	0.0731	0.2088	(0.0322)	0.0315	(0.0116)	0.0124
0.4648	0.1744	0.0323	6.4646	0.0270	0.0131	99.76	0.0648	0.1620	(0.0320)	0.0327	(0.0117)	0.0129
0.5109	0.2108	0.0364	7.2727	0.0290	0.0131	109.06	0.0609	0.1353	(0.0321)	0.0342	(0.0117)	0.0135
Simu 3-2 changing *beta**												
1.0109	0.2511	0.0278	5.5556	0.0452	0.0300	292.24	0.7609	3.0437	0.8572	#NUM!	0.0004	0.0115
0.6875	0.2060	0.0256	5.1282	0.0402	0.0263	83.66	0.4375	1.7499	(0.0343)	0.0302	(0.0109)	0.0115
0.5265	0.1674	0.0238	4.7619	0.0352	0.0225	69.43	0.2765	1.1060	(0.0264)	0.0265	(0.0142)	0.0115
0.4316	0.1339	0.0222	4.4444	0.0301	0.0188	69.41	0.1816	0.7264	(0.0264)	0.0265	(0.0142)	0.0115
0.3714	0.1046	0.0208	4.1667	0.0251	0.0150	75.88	0.1214	0.4854	(0.0298)	0.0282	(0.0126)	0.0115
0.3339	0.0787	0.0196	3.9216	0.0201	0.0113	88.94	0.0839	0.3354	(0.0375)	0.0316	(0.0100)	0.0115
0.3170	0.0557	0.0185	3.7037	0.0151	0.0075	112.71	0.0670	0.2679	(0.0549)	0.0383	(0.0068)	0.0115
0.3340	0.0352	0.0175	3.5088	0.0100	0.0038	160.06	0.0840	0.3358	(0.1126)	0.0548	(0.0033)	0.0115
0.4527	0.0202	0.0168	3.3670	0.0060	0.0008	240.36	0.2027	0.8109	(0.6852)	0.1352	(0.0005)	0.0115
Simu 4-1: changing *alpha*												
0.0784	0.0120	0.0008	0.1515	0.0791	0.0700	14.44	0.0284	0.5687	(0.0295)	0.0249	(0.0679)	0.0103
0.1112	0.0252	0.0015	0.3030	0.0832	0.0700	14.99	0.0112	0.1115	(0.0289)	0.0254	(0.0691)	0.0105
0.1459	0.0399	0.0023	0.4545	0.0878	0.0700	15.62	(0.0041)	(0.0276)	(0.0284)	0.0259	(0.0703)	0.0108
0.1828	0.0563	0.0030	0.6061	0.0929	0.0700	16.34	(0.0172)	(0.0861)	(0.0280)	0.0264	(0.0715)	0.0112
0.2222	0.0748	0.0038	0.7576	0.0988	0.0700	17.18	(0.0278)	(0.1110)	(0.0276)	0.0271	(0.0726)	0.0115
0.2646	0.0959	0.0045	0.9091	0.1055	0.0700	18.19	(0.0354)	(0.1182)	(0.0272)	0.0279	(0.0735)	0.0120
0.3102	0.1201	0.0053	1.0606	0.1132	0.0700	19.40	(0.0398)	(0.1138)	(0.0269)	0.0288	(0.0743)	0.0124
0.3596	0.1482	0.0061	1.2121	0.1223	0.0700	20.91	(0.0404)	(0.1010)	(0.0268)	0.0299	(0.0747)	0.0129
0.4135	0.1812	0.0068	1.3636	0.1329	0.0700	22.83	(0.0365)	(0.0811)	(0.0268)	0.0312	(0.0746)	0.0135
Simu 4-2 changing *beta**												
0.7787	0.2285	0.0052	1.0417	0.2194	0.1600	25.53	0.5287	2.1147	(0.0424)	0.0336	(0.0472)	0.0115
0.5153	0.1852	0.0048	0.9615	0.1926	0.1400	13.96	0.2653	1.0611	(0.0221)	0.0243	(0.0905)	0.0115
0.3816	0.1480	0.0045	0.8929	0.1658	0.1200	12.83	0.1316	0.5262	(0.0202)	0.0232	(0.0990)	0.0115
0.2997	0.1158	0.0042	0.8333	0.1390	0.1000	13.55	0.0497	0.1990	(0.0214)	0.0239	(0.0934)	0.0115
0.2440	0.0877	0.0039	0.7813	0.1122	0.0800	15.57	(0.0060)	(0.0240)	(0.0248)	0.0257	(0.0806)	0.0115
0.2035	0.0628	0.0037	0.7353	0.0854	0.0600	19.40	(0.0465)	(0.1860)	(0.0314)	0.0289	(0.0637)	0.0115
0.1738	0.0407	0.0035	0.6944	0.0586	0.0400	27.18	(0.0762)	(0.3048)	(0.0454)	0.0348	(0.0441)	0.0115
0.1575	0.0209	0.0033	0.6579	0.0318	0.0200	48.54	(0.0925)	(0.3700)	(0.0890)	0.0487	(0.0225)	0.0115
0.2071	0.0065	0.0032	0.6313	0.0104	0.0040	144.48	(0.0429)	(0.1716)	(0.4729)	0.1123	(0.0042)	0.0115

Table C1 Economic stage case study of endogenous parameters and synergy structure of $\Omega^*(i)$ and $r^*(i)$ 2008

equilibrium	i	n	α	Ω^*	β^*	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^*_{HA(i)}$	$i_{Width(r^*)}$	$\Omega^*_{HA(i)}/r^*_{HA}$
Case 1	0.1	(0.0050)	0.275	4.3382	0.825	0.0208	3.4350	0.2674	2.6442	0.2882	0.0801	0.0408	42.91
developed	0.1	(0.0025)	0.275	3.8234	0.825	0.0104	3.4264	0.1886	3.7489	0.1990	0.0803	0.0289	42.69
good tech.	0.1	0.0000	0.275	3.4179	0.825	0.0000	3.4179	0.0000	#DIV/0!	0.0000	0.0805	0.0000	42.48
	0.1	0.0025	0.275	3.0901	0.825	(0.0103)	3.4093	0.1877	3.7677	0.1773	0.0807	0.0289	42.27
	0.1	0.0050	0.275	2.8197	0.825	(0.0206)	3.4009	0.2648	2.6708	0.2441	0.0809	0.0408	42.06
	0.1	0.0075	0.275	2.5928	0.825	(0.0308)	3.3924	0.3235	2.1861	0.2926	0.0811	0.0500	41.85
	0.1	0.0100	0.275	2.3997	0.825	(0.0410)	3.3840	0.3726	1.8979	0.3315	0.0813	0.0577	41.64
	0.1	0.0125	0.275	2.2334	0.825	(0.0511)	3.3757	0.4155	1.7018	0.3644	0.0815	0.0645	41.44
	0.1	0.0150	0.275	2.0886	0.825	(0.0612)	3.3673	0.4541	1.5573	0.3928	0.0817	0.0707	41.23
Case 2	0.3	(0.0050)	0.375	2.2692	0.775	0.0140	2.1636	0.1738	4.0689	0.1877	0.1733	0.0492	12.48
developing	0.3	(0.0025)	0.375	2.2094	0.775	0.0070	2.1582	0.1226	5.7687	0.1295	0.1738	0.0348	12.42
good tech.	0.3	0.0000	0.375	2.1528	0.775	0.0000	2.1528	0.0000	#DIV/0!	0.0000	0.1742	0.0000	12.36
	0.3	0.0025	0.375	2.0989	0.775	(0.0069)	2.1474	0.1220	5.7976	0.1150	0.1746	0.0348	12.30
	0.3	0.0050	0.375	2.0477	0.775	(0.0138)	2.1421	0.1721	4.1098	0.1582	0.1751	0.0492	12.24
	0.3	0.0075	0.375	1.9990	0.775	(0.0207)	2.1368	0.2102	3.3640	0.1895	0.1755	0.0602	12.18
	0.3	0.0100	0.375	1.9525	0.775	(0.0275)	2.1315	0.2421	2.9205	0.2146	0.1759	0.0696	12.12
	0.3	0.0125	0.375	1.9081	0.775	(0.0343)	2.1262	0.2700	2.6186	0.2357	0.1764	0.0778	12.06
	0.3	0.0150	0.375	1.8657	0.775	(0.0411)	2.1210	0.2951	2.3964	0.2540	0.1768	0.0852	12.00
Case 3	0.05	(0.0050)	0.15	11.2451	0.85	0.0285	4.8409	0.3713	1.9045	0.3998	0.0310	0.0297	156.23
developing	0.05	(0.0025)	0.15	6.7445	0.85	0.0142	4.8287	0.2619	2.7002	0.2761	0.0311	0.0210	155.44
unstable	0.05	0.0000	0.15	4.8167	0.85	0.0000	4.8167	0.0000	#DIV/0!	0.0000	0.0311	0.0000	154.67
	0.05	0.0025	0.15	3.7459	0.85	(0.0141)	4.8047	0.2606	2.7137	0.2464	0.0312	0.0210	153.90
	0.05	0.0050	0.15	3.0647	0.85	(0.0282)	4.7927	0.3676	1.9237	0.3394	0.0313	0.0297	153.13
	0.05	0.0075	0.15	2.5931	0.85	(0.0422)	4.7808	0.4491	1.5746	0.4069	0.0314	0.0364	152.37
	0.05	0.0100	0.15	2.2473	0.85	(0.0561)	4.7690	0.5173	1.3670	0.4612	0.0315	0.0420	151.62
	0.05	0.0125	0.15	1.9828	0.85	(0.0700)	4.7572	0.5769	1.2257	0.5069	0.0315	0.0470	150.87
	0.05	0.0150	0.15	1.7741	0.85	(0.0837)	4.7455	0.6304	1.1217	0.5467	0.0316	0.0514	150.13
Case 4	0.05	(0.0050)	0.2	(137.67)	0.925	0.0536	9.9162	0.7291	0.9699	0.7827	0.0202	0.0329	491.66
Huge deficit	0.05	(0.0025)	0.2	21.26	0.925	0.0267	9.8914	0.5142	1.3751	0.5410	0.0202	0.0232	489.20
	0.05	0.0000	0.2	9.8667	0.925	0.0000	9.8667	0.0000	#DIV/0!	0.0000	0.0203	0.0000	486.76
	0.05	0.0025	0.2	6.4243	0.925	(0.0266)	9.8421	0.5117	1.3820	0.4851	0.0203	0.0232	484.33
	0.05	0.0050	0.2	4.7627	0.925	(0.0531)	9.8176	0.7218	0.9796	0.6687	0.0204	0.0329	481.92
	0.05	0.0075	0.2	3.7840	0.925	(0.0794)	9.7932	0.8818	0.8019	0.8024	0.0204	0.0403	479.54
	0.05	0.0100	0.2	3.1389	0.925	(0.1056)	9.7690	1.0157	0.6962	0.9101	0.0205	0.0465	477.16
	0.05	0.0125	0.2	2.6818	0.925	(0.1317)	9.7449	1.1328	0.6242	1.0011	0.0205	0.0520	474.81
	0.05	0.0150	0.2	2.3408	0.925	(0.1576)	9.7209	1.2379	0.5712	1.0802	0.0206	0.0569	472.47
Case 5	0.2	(0.0050)	0.3	2.6287	0.775	0.0156	2.4232	0.1946	3.6329	0.2103	0.1238	0.0440	19.57
balanced	0.2	(0.0025)	0.3	2.5152	0.775	0.0078	2.4172	0.1373	5.1506	0.1451	0.1241	0.0311	19.48
growth and	0.2	0.0000	0.3	2.4111	0.775	0.0000	2.4111	0.0000	#DIV/0!	0.0000	0.1244	0.0000	19.38
inequality	0.2	0.0025	0.3	2.3153	0.775	(0.0078)	2.4051	0.1366	5.1765	0.1288	0.1247	0.0311	19.28
	0.2	0.0050	0.3	2.2268	0.775	(0.0155)	2.3991	0.1927	3.6694	0.1772	0.1250	0.0440	19.19
	0.2	0.0075	0.3	2.1448	0.775	(0.0232)	2.3932	0.2354	3.0035	0.2123	0.1254	0.0539	19.09
	0.2	0.0100	0.3	2.0686	0.775	(0.0308)	2.3872	0.2712	2.6076	0.2404	0.1257	0.0622	19.00
	0.2	0.0125	0.3	1.9977	0.775	(0.0384)	2.3813	0.3024	2.3381	0.2640	0.1260	0.0696	18.90
	0.2	0.0150	0.3	1.9315	0.775	(0.0460)	2.3755	0.3305	2.1396	0.2845	0.1263	0.0762	18.81
equilibrium	i	n	α	Ω^*	β^*	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^*_{HA(i)}$	$i_{Width(r^*)}$	$\Omega^*_{HA(i)}/r^*_{HA}$

Note: Shadowed cells each show abnormal results due to close-to-disequilibrium or disequilibrium, far from a moderate range of endogenous equilibrium.

Table C2 Economic stage case study to δ_0, the speed of convergence, DRC, and variables 2008 (2)

equilibrium	$delta_0$	r*	$r_{REAL}=r^*-r^*_F$	$\alpha/\tilde{r}\beta^*$	g_Y^*	g_A^*	1/λ*	$\delta_0-\alpha$	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
Case 1	0.0536	0.0634	(0.0167)	3.3333	0.0190	0.0175	77.30	(0.2214)	(0.8050)	0.0219	0.0246	(0.0228)	0.0117
developed	0.1351	0.0719	(0.0083)	3.3333	0.0216	0.0175	75.05	(0.1399)	(0.5088)	0.0120	0.0257	(0.0209)	0.0117
good tech.	0.2074	0.0805	0.0000	3.3333	0.0241	0.0175	72.09	(0.0676)	(0.2458)	0.0000	0.0269	(0.0191)	0.0117
	0.2724	0.0890	0.0083	3.3333	0.0267	0.0175	68.75	(0.0026)	(0.0094)	(0.0142)	0.0280	(0.0176)	0.0117
	0.3315	0.0975	0.0167	3.3333	0.0293	0.0175	65.26	0.0565	0.2053	(0.0310)	0.0292	(0.0161)	0.0117
	0.3856	0.1061	0.0250	3.3333	0.0318	0.0175	61.77	0.1106	0.4021	(0.0506)	0.0305	(0.0148)	0.0117
	0.4355	0.1146	0.0333	3.3333	0.0344	0.0175	58.38	0.1605	0.5836	(0.0734)	0.0318	(0.0136)	0.0117
	0.4818	0.1231	0.0417	3.3333	0.0369	0.0175	55.15	0.2068	0.7520	(0.0999)	0.0332	(0.0125)	0.0117
	0.5250	0.1317	0.0500	3.3333	0.0395	0.0175	52.12	0.2500	0.9092	(0.1308)	0.0347	(0.0115)	0.0117
Case 2	0.3374	0.1653	(0.0081)	1.6129	0.1025	0.0675	24.04	(0.0376)	(0.1001)	0.0210	0.0259	(0.0716)	0.0126
developing	0.3590	0.1697	(0.0040)	1.6129	0.1052	0.0675	23.98	(0.0160)	(0.0426)	0.0108	0.0263	(0.0692)	0.0126
good tech.	0.3800	0.1742	0.0000	1.6129	0.1080	0.0675	23.90	0.0050	0.0134	0.0000	0.0268	(0.0670)	0.0126
	0.4005	0.1787	0.0040	1.6129	0.1108	0.0675	23.79	0.0255	0.0680	(0.0116)	0.0272	(0.0647)	0.0126
	0.4205	0.1831	0.0081	1.6129	0.1135	0.0675	23.67	0.0455	0.1213	(0.0240)	0.0277	(0.0626)	0.0126
	0.4400	0.1876	0.0121	1.6129	0.1163	0.0675	23.54	0.0650	0.1732	(0.0372)	0.0282	(0.0605)	0.0126
	0.4590	0.1921	0.0161	1.6129	0.1191	0.0675	23.38	0.0840	0.2240	(0.0513)	0.0287	(0.0584)	0.0126
	0.4776	0.1965	0.0202	1.6129	0.1219	0.0675	23.22	0.1026	0.2736	(0.0665)	0.0292	(0.0564)	0.0126
	0.4958	0.2010	0.0242	1.6129	0.1246	0.0675	23.04	0.1208	0.3220	(0.0826)	0.0297	(0.0545)	0.0126
Case 3	(0.3951)	0.0133	(0.0176)	3.5294	0.0038	0.0075	160.95	(0.5451)	(3.6340)	0.0203	0.0219	(0.0123)	0.0108
developing	(0.1004)	0.0222	(0.0088)	3.5294	0.0063	0.0075	163.19	(0.2504)	(1.6692)	0.0129	0.0246	(0.0097)	0.0108
unstable	0.0937	0.0311	0.0000	3.5294	0.0088	0.0075	147.12	(0.0563)	(0.3754)	0.0000	0.0271	(0.0080)	0.0108
	0.2386	0.0400	0.0088	3.5294	0.0113	0.0075	127.63	0.0886	0.5909	(0.0186)	0.0296	(0.0067)	0.0108
	0.3543	0.0489	0.0176	3.5294	0.0139	0.0075	109.98	0.2043	1.3623	(0.0439)	0.0321	(0.0057)	0.0108
	0.4507	0.0578	0.0265	3.5294	0.0164	0.0075	95.28	0.3007	2.0045	(0.0774)	0.0348	(0.0048)	0.0108
	0.5332	0.0667	0.0353	3.5294	0.0189	0.0075	83.33	0.3832	2.5546	(0.1214)	0.0378	(0.0041)	0.0108
	0.6054	0.0756	0.0441	3.5294	0.0214	0.0075	73.61	0.4554	3.0358	(0.1795)	0.0411	(0.0035)	0.0108
	0.6695	0.0846	0.0529	3.5294	0.0240	0.0075	65.67	0.5195	3.4633	(0.2572)	0.0449	(0.0029)	0.0108
Case 4	#NUM!	(0.0015)	(0.0216)	4.3243	(0.0003)	0.0038	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0112
Huge defici	(0.2167)	0.0094	(0.0108)	4.3243	0.0022	0.0038	390.24	(0.4167)	(2.0834)	0.0219	0.0331	(0.0057)	0.0112
	0.0888	0.0203	0.0000	4.3243	0.0047	0.0038	292.66	(0.1112)	(0.5559)	0.0000	0.0383	(0.0043)	0.0112
	0.2596	0.0311	0.0108	4.3243	0.0072	0.00375	209.36	0.0596	0.2980	(0.0360)	0.0424	(0.0035)	0.0112
	0.3787	0.0420	0.0216	4.3243	0.0097	0.00375	157.98	0.1787	0.8937	(0.0858)	0.0463	(0.0029)	0.0112
	0.4703	0.0529	0.0324	4.3243	0.0122	0.00375	125.21	0.2703	1.3515	(0.1510)	0.0502	(0.0025)	0.0112
	0.5447	0.0637	0.0432	4.3243	0.0147	0.00375	103.01	0.3447	1.7234	(0.2343)	0.0541	(0.0021)	0.0112
	0.6073	0.0746	0.0541	4.3243	0.0172	0.00375	87.17	0.4073	2.0367	(0.3396)	0.0583	(0.0018)	0.0112
	0.6615	0.0854	0.0649	4.3243	0.0198	0.00375	75.36	0.4615	2.3073	(0.4726)	0.0628	(0.0016)	0.0112
Case 5	0.2185	0.1141	(0.0097)	1.9355	0.0590	0.0450	31.58	(0.0815)	(0.2716)	0.0199	0.0238	(0.0502)	0.0120
balanced	0.2542	0.1193	(0.0048)	1.9355	0.0616	0.0450	31.44	(0.0458)	(0.1526)	0.0104	0.0244	(0.0479)	0.0120
growth and	0.2884	0.1244	0.0000	1.9355	0.0643	0.0450	31.23	(0.0116)	(0.0387)	0.0000	0.0250	(0.0457)	0.0120
inequality	0.3212	0.1296	0.0048	1.9355	0.0669	0.045	30.96	0.0212	0.0706	(0.0115)	0.0256	(0.0436)	0.0120
	0.3527	0.1347	0.0097	1.9355	0.0696	0.045	30.65	0.0527	0.1757	(0.0240)	0.0262	(0.0416)	0.0120
	0.3830	0.1399	0.0145	1.9355	0.0723	0.045	30.29	0.0830	0.2768	(0.0378)	0.0268	(0.0397)	0.0120
	0.4123	0.1450	0.0194	1.9355	0.0749	0.045	29.90	0.1123	0.3742	(0.0529)	0.0275	(0.0378)	0.0120
	0.4405	0.1502	0.0242	1.9355	0.0776	0.045	29.47	0.1405	0.4683	(0.0695)	0.0282	(0.0360)	0.0120
	0.4677	0.1553	0.0290	1.9355	0.0803	0.045	29.03	0.1677	0.5591	(0.0877)	0.0289	(0.0342)	0.0120
equilibrium	$delta_0$	r*	$r_{REAL}=r^*-r^*_F$	$\alpha/\tilde{r}\beta^*$	g_Y^*	g_A^*	1/λ*	$\delta_0-\alpha$	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$

Table A1 Endogenous parameters and synergy structure of $\Omega^{*}(i)$ and $r^{*}(i)$ by country and area 2008

equilibrium	i	n	α	Ω*	β*	$i_{VA(\Omega)}$	$\Omega^{*}_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^{*}_{HA(i)}$	$i_{Width(r^{*})}$	$\Omega^{*}_{HA(i)}/r^{*}_{HA}$
17 pacific on	0.1998	0.01098	0.2595	2.2267	0.7742	(0.0356)	2.5110	0.2990	2.3649	0.2634	0.1034	0.0607	24.29
the U S	0.0826	0.00972	0.1415	1.9034	0.7604	(0.0345)	2.6979	0.3050	2.3182	0.2705	0.0524	0.0425	51.45
Canada	0.1168	0.00941	0.0956	1.9623	0.7361	(0.0319)	2.4991	0.2825	2.5027	0.2506	0.0382	0.0349	65.37
Australia	0.1553	0.01055	0.0924	1.9246	0.7234	(0.0343)	2.3493	0.2837	2.4922	0.2495	0.0393	0.0367	59.74
New Zealand	0.0795	0.00955	0.1018	2.0910	0.7765	(0.0380)	3.0908	0.3427	2.0633	0.3047	0.0329	0.0354	93.83
Mexico	0.2335	0.00995	0.1973	1.4306	0.6646	(0.0236)	1.5752	0.1928	3.6681	0.1692	0.1252	0.0544	12.58
China	0.3657	0.00509	0.4602	2.3978	0.8231	(0.0155)	2.4992	0.1966	3.5967	0.1811	0.1841	0.0534	13.57
India	0.3762	0.01437	0.4843	1.9679	0.8101	(0.0385)	2.1692	0.2889	2.4473	0.2504	0.2233	0.0927	9.72
Indonesia	0.2646	0.01193	0.2827	1.2181	0.6523	(0.0243)	1.3301	0.1799	3.9315	0.1555	0.2125	0.0719	6.26
Japan	0.0149	(0.00086)	0.1220	3.7570	0.7692	0.0033	2.9285	0.0981	7.2068	0.1014	0.0417	0.0117	70.28
Korea	0.2232	0.00396	0.2304	2.3473	0.7641	(0.0129)	2.4827	0.1788	3.9554	0.1659	0.0928	0.0346	26.76
Malaysia	0.1912	0.01656	0.3788	2.4713	0.8442	(0.0649)	3.3108	0.4637	1.5249	0.3988	0.1144	0.0862	28.94
Philippines	0.0831	0.01837	0.1708	1.4579	0.7571	(0.0616)	2.5377	0.3953	1.7887	0.3337	0.0673	0.0644	37.71
Singapore	0.2838	0.02895	0.4112	3.1437	0.8954	(0.1584)	4.8979	0.8808	0.8028	0.7224	0.0839	0.1153	58.34
Thailand	0.3274	0.00612	0.4645	3.1010	0.8620	(0.0236)	3.3245	0.2802	2.5240	0.2565	0.1397	0.0574	23.79
Vietnam	0.4370	0.01357	0.2398	2.3391	0.7748	(0.0452)	2.5811	0.3416	2.0701	0.2964	0.0929	0.0648	27.78
Sri Lanka	0.2104	0.00914	0.0996	1.2448	0.6051	(0.0206)	1.3670	0.1680	4.2095	0.1473	0.0728	0.0388	18.77
Brazil	0.2062	0.00973	0.1605	1.5549	0.6771	(0.0251)	1.7438	0.2090	3.3826	0.1840	0.0920	0.0480	18.95
equilibrium	i	n	α	Ω*	β*	$i_{VA(\Omega)}$	$\Omega^{*}_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^{*}_{HA(i)}$	$i_{Width(r^{*})}$	$\Omega^{*}_{HA(i)}/r^{*}_{HA}$
13EMU on a	0.1464	0.00416	0.1276	1.6295	0.6683	(0.0109)	1.7508	0.1381	5.1191	0.1272	0.0729	0.0282	24.03
Austria	0.1284	0.00361	0.1439	2.0015	0.7180	(0.0109)	2.1717	0.1540	4.5918	0.1431	0.0662	0.0269	32.78
Belgium	0.1024	0.00570	0.0929	1.1066	0.5786	(0.0122)	1.2383	0.1229	5.7539	0.1107	0.0750	0.0302	16.51
Finland	0.1082	0.00379	0.1092	1.2347	0.5999	(0.0084)	1.3306	0.1057	6.6877	0.0973	0.0821	0.0263	16.22
France	0.1107	0.00535	0.0964	1.4526	0.6446	(0.0135)	1.6301	0.1485	4.7625	0.1350	0.0591	0.0283	27.58
Germany	0.0423	(0.00097)	0.1006	1.4886	0.6103	0.0022	1.4097	0.0562	12.5714	0.0585	0.0714	0.0127	19.76
Greece	0.1307	0.00270	0.2271	1.3739	0.6508	(0.0060)	1.4366	0.0925	7.6415	0.0866	0.1581	0.0307	9.09
Ireland	0.2722	0.01835	0.2584	2.8219	0.8339	(0.0804)	3.6557	0.5423	1.3040	0.4618	0.0707	0.0754	51.73
Italy	0.0838	0.00489	0.1173	1.3805	0.6425	(0.0120)	1.5784	0.1377	5.1352	0.1257	0.0743	0.0299	21.24
Luxemburg	0.0768	0.01028	0.2986	1.0046	0.6463	(0.0202)	1.2686	0.1600	4.4188	0.1398	0.2354	0.0689	5.39
Netherlands	0.0966	0.00425	0.1712	1.2219	0.6186	(0.0092)	1.3383	0.1110	6.3722	0.1018	0.1279	0.0343	10.46
Portugal	0.1117	0.00376	0.2014	1.7977	0.7118	(0.0104)	1.9648	0.1428	4.9521	0.1324	0.1025	0.0326	19.16
Slovenia	0.3028	(0.05600)	0.3091	0.9633	0.4913	0.0806	0.7070	0.2387	2.9627	0.3192	0.4372	0.1877	1.62
Spain	0.1434	0.00999	0.1078	1.5513	0.6764	(0.0273)	1.8463	0.2244	3.1516	0.1971	0.0584	0.0399	31.63
equilibrium	i	n	α	Ω*	β*	$i_{VA(\Omega)}$	$\Omega^{*}_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^{*}_{HA(i)}$	$i_{Width(r^{*})}$	$\Omega^{*}_{HA(i)}/r^{*}_{HA}$
16 Europe or	0.1752	0.00176	0.0956	0.7464	0.4567	(0.0029)	0.7588	0.0471	15.0212	0.0442	0.1260	0.0192	6.02
Bulgaria	0.3459	(0.00654)	0.1007	1.3657	0.5911	0.0145	1.3085	0.1377	5.1357	0.1522	0.0770	0.0334	17.00
Czech Rep.	0.2479	0.00487	0.2361	2.4235	0.7726	(0.0163)	2.5827	0.2050	3.4490	0.1887	0.0914	0.0386	28.25
Denmark	0.1638	0.00183	0.2037	1.2053	0.6080	(0.0037)	1.2327	0.0677	10.4418	0.0640	0.1652	0.0248	7.46
Hungary	0.0742	(0.00340)	0.0970	0.9789	0.4977	0.0061	0.8979	0.0742	9.5279	0.0803	0.1080	0.0257	8.31
Iceland	0.4585	0.05263	0.1430	1.7393	0.7448	(0.1679)	2.3763	0.6317	1.1194	0.4638	0.0602	0.1005	39.50
Latvia	0.2952	(0.00441)	0.0963	1.5695	0.6250	0.0107	1.5128	0.1270	5.5675	0.1377	0.0637	0.0261	23.77
Norway	0.1385	0.01059	0.3278	1.0477	0.6428	(0.0197)	1.1969	0.1537	4.6018	0.1339	0.2739	0.0735	4.37
Poland	0.1270	(0.00079)	0.0966	0.9044	0.4973	0.0014	0.8943	0.0356	19.8779	0.0370	0.1080	0.0124	8.28
Romania	0.2489	(0.00420)	0.0280	0.8972	0.4710	0.0077	0.8693	0.0820	8.6191	0.0898	0.0322	0.0158	27.00
Russia	0.1711	(0.00387)	0.0927	0.6447	0.4059	0.0059	0.6223	0.0608	11.6298	0.0667	0.1490	0.0297	4.18
Slovak	0.1814	0.00070	0.1175	1.4623	0.6259	(0.0017)	1.4757	0.0495	14.2858	0.0478	0.0796	0.0115	18.53
Sweden	0.0672	0.00546	0.1491	1.1675	0.6196	(0.0121)	1.3784	0.1294	5.4653	0.1172	0.1081	0.0362	12.75
Switzerland	0.1163	0.00399	0.2700	2.0696	0.7585	(0.0120)	2.2837	0.1657	4.2667	0.1537	0.1182	0.0377	19.31
Turkey	0.1245	0.01247	0.1073	0.5911	0.4368	(0.0195)	0.6838	0.1155	6.1210	0.0960	0.1569	0.0553	4.36
the U K	0.0295	0.00542	0.1734	1.3869	0.7228	(0.0161)	2.1431	0.1856	3.8105	0.1695	0.0809	0.0361	26.48

Data source: KEWT 4.10 of 59 countries by sector, 1990-2008, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Table A2 δ_0, the speed of convergence, DRC, and variables by country and area 2008 (2)

equilibrium	$delta_0$	r*	$r_{REAL}=r^*-r^*_F$	$\alpha/i\cdot\beta^*$	g_Y^*	g_A^*	1/λ*	δ_0-α	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
17 pacific c	0.3503	0.1166	0.0132	1.6775	0.0695	0.0451	26.70	0.0907	0.3496	(0.0554)	0.0261	(0.0396)	0.0116
the U S	0.4426	0.0743	0.0219	2.2520	0.0330	0.0198	51.60	0.3011	2.1282	(0.0625)	0.0274	(0.0129)	0.0108
Canada	0.3428	0.0487	0.0105	1.1117	0.0438	0.0308	34.77	0.2472	2.5875	(0.0491)	0.0240	(0.0224)	0.0105
Australia	0.3191	0.0480	0.0087	0.8224	0.0584	0.0429	25.76	0.2267	2.4540	(0.0509)	0.0230	(0.0322)	0.0105
New Zeala	0.4077	0.0487	0.0158	1.6500	0.0295	0.0178	52.37	0.3059	3.0041	(0.0648)	0.0275	(0.0117)	0.0106
Mexico	0.4765	0.1379	0.0127	1.2715	0.1085	0.0783	20.42	0.2792	1.4151	(0.0455)	0.0239	(0.0511)	0.0112
China	0.4312	0.1919	0.0078	1.5290	0.1255	0.0647	25.29	(0.0290)	(0.0630)	(0.0273)	0.0315	(0.0682)	0.0136
India	0.5334	0.2461	0.0228	1.5890	0.1549	0.0714	24.55	0.0491	0.1014	(0.0837)	0.0336	(0.0646)	0.0139
Indonesia	0.6865	0.2321	0.0195	1.6377	0.1417	0.0920	26.74	0.4038	1.4285	(0.0785)	0.0303	(0.0402)	0.0118
Japan	(0.0996)	0.0325	(0.0092)	10.6419	0.0031	0.0034	330.56	(0.2216)	(1.8158)	0.0030	0.0199	(0.0043)	0.0107
Korea	0.2739	0.0981	0.0054	1.3511	0.0726	0.0526	24.23	0.0435	0.1890	(0.0178)	0.0242	(0.0497)	0.0114
Malaysia	0.4646	0.1533	0.0389	2.3470	0.0653	0.0298	38.11	0.0857	0.2263	(0.1233)	0.0346	(0.0257)	0.0127
Philippines	0.6684	0.1171	0.0498	2.7128	0.0432	0.0202	45.59	0.4976	2.9139	(0.1891)	0.0352	(0.0081)	0.0110
Singapore	0.4665	0.1308	0.0468	1.6179	0.0808	0.0297	30.41	0.0553	0.1346	(0.3055)	0.0423	(0.0269)	0.0130
Thailand	0.3823	0.1498	0.0101	1.6458	0.0910	0.0452	32.06	(0.0823)	(0.1771)	(0.0385)	0.0342	(0.0521)	0.0137
Vietnam	0.3124	0.1025	0.0096	0.7082	0.1448	0.0984	12.82	0.0726	0.3027	(0.0666)	0.0254	(0.0890)	0.0115
Sri Lanka	0.4866	0.0800	0.0071	0.7821	0.1023	0.0831	19.65	0.3870	3.8869	(0.0406)	0.0222	(0.0474)	0.0105
Brazil	0.4041	0.1032	0.0112	1.1491	0.0898	0.0666	20.90	0.2436	1.5181	(0.0425)	0.0228	(0.0473)	0.0109
equilibrium	$delta_0$	r*	$r_{REAL}=r^*-r^*_F$	$\alpha/i\cdot\beta^*$	g_Y^*	g_A^*	1/λ*	δ_0-α	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
13EMU on	0.3032	0.0783	0.0054	1.3038	0.0601	0.0486	26.69	0.1756	1.3765	(0.0157)	0.0208	(0.0388)	0.0107
Austria	0.2574	0.0719	0.0056	1.5602	0.0461	0.0362	33.35	0.1136	0.7893	(0.0148)	0.0219	(0.0314)	0.0108
Belgium	0.6805	0.0839	0.0089	1.5673	0.0535	0.0432	52.75	0.5876	6.3279	(0.0384)	0.0273	(0.0152)	0.0105
Finland	0.4795	0.0884	0.0064	1.6826	0.0526	0.0433	38.61	0.3703	3.3916	(0.0162)	0.0219	(0.0253)	0.0106
France	0.3728	0.0663	0.0072	1.3507	0.0491	0.0393	33.89	0.2765	2.8692	(0.0217)	0.0212	(0.0273)	0.0105
Germany	0.1128	0.0676	(0.0038)	3.8935	0.0174	0.0165	72.65	0.0122	0.1212	0.0025	0.0170	(0.0163)	0.0105
Greece	0.4898	0.1653	0.0072	2.6701	0.0619	0.0456	39.41	0.2626	1.1562	(0.0117)	0.0237	(0.0301)	0.0114
Ireland	0.3570	0.0916	0.0209	1.1381	0.0804	0.0452	23.43	0.0986	0.3817	(0.1274)	0.0306	(0.0392)	0.0116
Italy	0.4498	0.0850	0.0107	2.1788	0.0390	0.0300	48.08	0.3325	2.8346	(0.0219)	0.0225	(0.0187)	0.0106
Luxemburg	0.9925	0.2972	0.0619	6.0175	0.0494	0.0272	134.83	0.6939	2.3238	(2.7067)	0.1937	(0.0003)	0.0119
Netherland	0.5854	0.1401	0.0122	2.8649	0.0489	0.0369	53.18	0.4142	2.4195	(0.0223)	0.0251	(0.0184)	0.0110
Portugal	0.3512	0.1120	0.0095	2.5340	0.0442	0.0322	41.87	0.1498	0.7437	(0.0161)	0.0231	(0.0262)	0.0112
Slovenia	(0.0763)	0.3208	(0.1164)	2.0778	0.1544	0.1540	7.87	(0.3854)	(1.2468)	0.0707	0.0135	(0.2399)	0.0120
Spain	0.4043	0.0695	0.0111	1.1109	0.0625	0.0464	27.35	0.2965	2.7516	(0.0462)	0.0228	(0.0310)	0.0106
equilibrium	$delta_0$	r*	$r_{REAL}=r^*-r^*_F$	$\alpha/i\cdot\beta^*$	g_Y^*	g_A^*	1/λ*	δ_0-α	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
16 Europe	(0.6832)	0.1281	0.0021	1.1948	0.1072	0.0952	6.18	(0.7788)	(8.1481)	(0.0017)	0.0105	(0.1771)	0.0105
Bulgaria	0.1541	0.0737	(0.0032)	0.4925	0.1497	0.1414	8.79	0.0534	0.5304	0.0170	0.0170	(0.1330)	0.0105
Czech Rep.	0.2762	0.0974	0.0060	1.2329	0.0790	0.0564	22.46	0.0401	0.1697	(0.0226)	0.0246	(0.0534)	0.0114
Denmark	0.5744	0.1690	0.0038	2.0447	0.0826	0.0642	34.73	0.3707	1.8205	(0.0088)	0.0245	(0.0343)	0.0112
Hungary	(1.3553)	0.0991	(0.0089)	2.6274	0.0377	0.0372	11.81	(1.4523)	(14.9759)	0.0026	0.0092	(0.0971)	0.0105
Iceland	0.4833	0.0822	0.0220	0.4186	0.1963	0.1170	9.47	0.3403	2.3801	(0.3421)	0.0275	(0.0706)	0.0108
Latvia	0.1175	0.0614	(0.0023)	0.5220	0.1175	0.1107	10.67	0.0213	0.2208	0.0120	0.0174	(0.1081)	0.0105
Norway	0.9207	0.3129	0.0390	3.6832	0.0849	0.0495	90.56	0.5929	1.8088	(0.2514)	0.0594	(0.0058)	0.0122
Poland	(8.2042)	0.1068	(0.0012)	1.5294	0.0698	0.0639	1.70	(8.3008)	(85.9353)	0.0002	0.0046	(0.6505)	0.0105
Romania	0.0640	0.0312	(0.0010)	0.2387	0.1307	0.1316	8.39	0.0361	1.2885	0.0082	0.0142	(0.1268)	0.0101
Russia	(0.1524)	0.1438	(0.0052)	1.3346	0.1077	0.1017	8.80	(0.2451)	(2.6440)	0.0051	0.0121	(0.1291)	0.0105
Slovak	0.2618	0.0803	0.0007	1.0347	0.0777	0.0679	19.72	0.1443	1.2285	(0.0023)	0.0190	(0.0568)	0.0106
Sweden	0.6826	0.1277	0.0195	3.5801	0.0357	0.0256	78.38	0.5335	3.5795	(0.0385)	0.0288	(0.0095)	0.0108
Switzerland	0.3645	0.1305	0.0122	3.0613	0.0426	0.0281	48.16	0.0945	0.3498	(0.0190)	0.0255	(0.0244)	0.0117
Turkey	(1.0682)	0.1815	0.0246	1.9735	0.0920	0.0701	6.41	(1.1755)	(10.9577)	(0.0096)	0.0093	(0.1624)	0.0106
the U K	0.6587	0.1251	0.0441	8.1440	0.0154	0.0082	137.60	0.4852	2.7978	(0.0473)	0.0325	(0.0034)	0.0110

Data source: KEWT 4.10 of 59 countries by sector, 1990-2008, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Table E1 Elasticity values of parameters and variables w.r.t. α and β^{*} in simulations (1)

i	n	α	Ω*	b*	$i_{VA(\Omega)}$	$\Omega^{*}_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω*	$i_{VA(\Omega)}+i_{Wid(}$	$r^{*}_{HA(i)}$	$i_{Width(r^{*})}$	$\Omega^{*}_{HA(i)}/r^{*}_{H}$
Simu 1-1: changing alpha					**To alpha:**		**Elasticity at the discrete time=(2-1)/((1+2)/2)**					
0.2	0.005	**0.05**	3.926	0.825								
0.2	0.005	**0.1**	3.743	0.825	(0.081)	(0.081)	(0.081)	0.081	(0.081)	1.071	0.515	(1.141)
0.2	0.005	**0.15**	3.557	0.825	(0.143)	(0.143)	(0.143)	0.143	(0.143)	1.136	0.505	(1.271)
0.2	0.005	**0.2**	3.369	0.825	(0.212)	(0.212)	(0.212)	0.212	(0.212)	1.207	0.503	(1.412)
0.2	0.005	**0.25**	3.179	0.825	(0.290)	(0.290)	(0.290)	0.290	(0.290)	1.286	0.502	(1.569)
0.2	0.005	**0.3**	2.986	0.825	(0.379)	(0.379)	(0.379)	0.379	(0.379)	1.375	0.501	(1.747)
0.2	0.005	**0.35**	2.791	0.825	(0.481)	(0.481)	(0.481)	0.481	(0.481)	1.477	0.501	(1.951)
0.2	0.005	**0.4**	2.593	0.825	(0.600)	(0.600)	(0.600)	0.600	(0.600)	1.596	0.501	(2.186)
0.2	0.005	**0.45**	2.393	0.825	(0.739)	(0.739)	(0.739)	0.739	(0.739)	1.735	0.500	(2.463)
Simu 1-2 changing beta*					**To beta*:**		**Elasticity at the discrete time=(2-1)/((1+2)/2)**					
0.2	0.005	0.25	1.070	**0.6**								
0.2	0.005	0.25	1.316	**0.65**	1.667	1.596	0.814	(1.000)	(1.023)	(1.202)	0.188	(10.515)
0.2	0.005	0.25	1.639	**0.7**	2.077	1.477	0.839	(1.000)	(1.018)	(1.171)	0.163	(12.112)
0.2	0.005	0.25	2.083	**0.75**	2.636	1.375	0.864	(1.000)	(1.014)	(1.141)	0.138	(14.273)
0.2	0.005	0.25	2.730	**0.8**	3.444	1.286	0.889	(1.000)	(1.011)	(1.113)	0.113	(17.355)
0.2	0.005	0.25	3.761	**0.85**	4.714	1.207	0.914	(1.000)	(1.008)	(1.085)	0.088	(22.097)
0.2	0.005	0.25	5.660	**0.9**	7.000	1.136	0.940	(1.000)	(1.005)	(1.058)	0.063	(30.249)
0.2	0.005	0.25	10.326	**0.95**	12.333	1.071	0.967	(1.000)	(1.003)	(1.031)	0.038	(46.869)
0.2	0.005	0.25	25.781	**0.99**	32.333	1.017	0.992	(1.000)	(1.001)	(1.008)	0.015	(90.099)
Simu 2-1: changing alpha					**To alpha:**		**Elasticity at the discrete time=(2-1)/((1+2)/2)**					
0.2	**0.010**	**0.05**	3.495	0.825								
0.2	**0.010**	**0.1**	3.348	0.825	(0.081)	(0.081)	(0.081)	0.081	(0.081)	1.071	0.515	(1.141)
0.2	**0.010**	**0.15**	3.198	0.825	(0.143)	(0.143)	(0.143)	0.143	(0.143)	1.136	0.505	(1.271)
0.2	**0.010**	**0.2**	3.045	0.825	(0.212)	(0.212)	(0.212)	0.212	(0.212)	1.207	0.503	(1.412)
0.2	**0.010**	**0.25**	2.888	0.825	(0.290)	(0.290)	(0.290)	0.290	(0.290)	1.286	0.502	(1.569)
0.2	**0.010**	**0.3**	2.727	0.825	(0.379)	(0.379)	(0.379)	0.379	(0.379)	1.375	0.501	(1.747)
0.2	**0.010**	**0.35**	2.563	0.825	(0.481)	(0.481)	(0.481)	0.481	(0.481)	1.477	0.501	(1.951)
0.2	**0.010**	**0.4**	2.394	0.825	(0.600)	(0.600)	(0.600)	0.600	(0.600)	1.596	0.501	(2.186)
0.2	**0.010**	**0.45**	2.222	0.825	(0.739)	(0.739)	(0.739)	0.739	(0.739)	1.735	0.500	(2.463)
Simu 2-2 changing beta*					**To beta*:**		**Elasticity at the discrete time=(2-1)/((1+2)/2)**					
0.2	**0.010**	0.25	1.019	**0.6**								
0.2	**0.010**	0.25	1.247	**0.65**	1.667	2.660	2.164	(2.164)	2.236	(2.660)	(0.500)	5.260
0.2	**0.010**	0.25	1.542	**0.7**	2.077	3.068	2.573	(2.573)	2.642	(3.068)	(0.500)	6.058
0.2	**0.010**	0.25	1.940	**0.75**	2.636	3.625	3.132	(3.132)	3.197	(3.625)	(0.500)	7.138
0.2	**0.010**	0.25	2.505	**0.8**	3.444	4.429	3.938	(3.938)	4.001	(4.429)	(0.500)	8.680
0.2	**0.010**	0.25	3.373	**0.85**	4.714	5.690	5.203	(5.203)	5.263	(5.690)	(0.500)	11.051
0.2	**0.010**	0.25	4.874	**0.9**	7.000	7.955	7.479	(7.479)	7.536	(7.955)	(0.500)	15.128
0.2	**0.010**	0.25	8.097	**0.95**	12.333	13.214	12.776	(12.776)	12.827	(13.214)	(0.500)	23.439
0.2	**0.010**	0.25	15.599	**0.99**	32.333	32.881	32.609	(32.609)	32.640	(32.881)	(0.500)	45.054

Note: Elasticity values are only used for simulations. Within the endogenous system, all the parameters and variables are purely measured and with no help of elasticity value setting.

Table E2 Elasticity values of parameters and variables w.r.t. α and β^{*} in simulations (2)

$delta_0$	r*	$r_{REAL}=r^{*}-r^{*}_{F}$	$\alpha/i{\cdot}\beta^{*}$	g_Y^{*}	g_A^{*}	$1/\lambda^{*}$	$\delta_0-\alpha$	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
To alpha:	**Simu 1-1: changing alpha**					**Elasticity at the discrete time=(2-1)/((1+2)/2)**						
0.347	1.063	1.000	1.000	0.072	0.000	0.057	(0.493)	(1.415)	(0.028)	0.027	0.028	0.041
0.496	1.121	1.000	1.000	0.127	0.000	0.104	(1.071)	(1.986)	(0.045)	0.049	0.045	0.071
0.615	1.185	1.000	1.000	0.190	0.000	0.161	(2.180)	(3.045)	(0.059)	0.076	0.059	0.106
0.717	1.257	1.000	1.000	0.262	0.000	0.229	(5.448)	(6.042)	(0.070)	0.110	0.070	0.145
0.809	1.340	1.000	1.000	0.344	0.000	0.315	70.494	166.488	(0.074)	0.153	0.074	0.190
0.896	1.436	1.000	1.000	0.439	0.000	0.423	4.731	3.838	(0.067)	0.207	0.067	0.241
0.983	1.547	1.000	1.000	0.551	0.000	0.562	1.464	0.467	(0.043)	0.279	0.043	0.300
1.072	1.679	1.000	1.000	0.683	0.000	0.748	(1.171)	(2.163)	0.010	0.375	(0.010)	0.370
To beta*:	**Simu 1-2 changing beta***					**Elasticity at the discrete time=(2-1)/((1+2)/2)**						
(4.989)	(2.581)	(1.000)	(1.000)	(1.588)	(1.667)	(8.578)	(7.789)	(7.789)	(10.031)	(5.235)	10.031	0.000
(3.885)	(2.956)	(1.000)	(1.000)	(1.964)	(2.077)	(1.458)	(7.990)	(7.990)	(1.623)	(0.812)	1.623	0.000
(3.282)	(3.459)	(1.000)	(1.000)	(2.469)	(2.636)	0.611	(9.884)	(9.884)	0.678	0.339	(0.678)	0.000
(2.882)	(4.167)	(1.000)	(1.000)	(3.181)	(3.444)	1.962	(16.303)	(16.303)	2.198	1.100	(2.198)	0.000
(2.524)	(5.240)	(1.000)	(1.000)	(4.260)	(4.714)	3.373	(109.857)	(109.857)	3.861	1.937	(3.861)	0.000
(1.976)	(7.056)	(1.000)	(1.000)	(6.091)	(7.000)	5.404	16.791	16.791	6.452	3.254	(6.452)	0.000
(0.351)	(10.799)	(1.000)	(1.000)	(9.876)	(12.333)	9.307	1.792	1.792	12.251	6.303	(12.251)	0.000
8.316	(20.760)	(1.000)	(1.000)	(19.936)	(32.333)	18.759	########	########	33.816	19.697	(33.816)	0.000
To alpha:	**Simu 2-1: changing alpha**					**Elasticity at the discrete time=(2-1)/((1+2)/2)**						
0.200	1.057	1.000	1.000	0.064	0.000	0.059	(0.254)	(1.220)	(0.029)	0.026	0.029	0.041
0.314	1.109	1.000	1.000	0.115	0.000	0.108	(0.463)	(1.436)	(0.046)	0.048	0.046	0.071
0.417	1.168	1.000	1.000	0.172	0.000	0.166	(0.703)	(1.679)	(0.061)	0.076	0.061	0.106
0.514	1.235	1.000	1.000	0.238	0.000	0.236	(0.965)	(1.942)	(0.071)	0.110	0.071	0.145
0.607	1.311	1.000	1.000	0.315	0.000	0.323	(1.209)	(2.187)	(0.074)	0.153	0.074	0.190
0.699	1.401	1.000	1.000	0.404	0.000	0.431	(1.335)	(2.317)	(0.065)	0.208	0.065	0.241
0.793	1.507	1.000	1.000	0.510	0.000	0.571	(1.149)	(2.138)	(0.038)	0.281	0.038	0.300
0.890	1.632	1.000	1.000	0.636	0.000	0.756	(0.408)	(1.406)	0.022	0.381	(0.022)	0.370
To beta*:	**Simu 2-2 changing beta***					**Elasticity at the discrete time=(2-1)/((1+2)/2)**						
(4.843)	(2.510)	(1.000)	(1.000)	(1.517)	(1.667)	(12.116)	(7.051)	(7.051)	(18.446)	(11.013)	18.446	0.000
(3.687)	(2.857)	(1.000)	(1.000)	(1.864)	(2.077)	(2.187)	(6.602)	(6.602)	(2.776)	(1.392)	2.776	0.000
(3.012)	(3.314)	(1.000)	(1.000)	(2.323)	(2.636)	0.195	(6.915)	(6.915)	0.243	0.121	(0.243)	0.000
(2.508)	(3.944)	(1.000)	(1.000)	(2.957)	(3.444)	1.581	(7.856)	(7.856)	1.999	1.001	(1.999)	0.000
(1.993)	(4.872)	(1.000)	(1.000)	(3.889)	(4.714)	2.888	(9.287)	(9.287)	3.799	1.906	(3.799)	0.000
(1.206)	(6.369)	(1.000)	(1.000)	(5.397)	(7.000)	4.587	(8.912)	(8.912)	6.528	3.293	(6.528)	0.000
0.685	(9.194)	(1.000)	(1.000)	(8.249)	(12.333)	7.410	5.661	5.661	12.575	6.480	(12.575)	0.000
7.883	(15.356)	(1.000)	(1.000)	(14.450)	(32.333)	12.297	28.429	28.429	34.524	20.280	(34.524)	0.000

Table E3 Elasticity values of parameters and variables w.r.t. α and β^* in simulations (3)

i	n	α	Ω*	b*	$i_{VA(\Omega)}$	$\Omega^*_{HA(i)}$	$i_{Width(\Omega)}$	Curvat.(Ω*	$i_{VA(\Omega)}+i_{Wid(\Omega}$	$r^*_{HA(i)}$	$i_{Width(r^*)}$	$\Omega^*_{HA(i)}/r^*_{HA}$
Simu 3-1: changing alpha					To alpha:		Elasticity at the discrete time=(2-1)/((1+2)/2)					
0.075	0.005	0.05	3.276	0.825								
0.075	0.005	0.1	3.148	0.825	(0.081)	(0.081)	(0.081)	0.081	(0.081)	1.071	0.515	(1.141)
0.075	0.005	0.15	3.016	0.825	(0.143)	(0.143)	(0.143)	0.143	(0.143)	1.136	0.505	(1.271)
0.075	0.005	0.2	2.879	0.825	(0.212)	(0.212)	(0.212)	0.212	(0.212)	1.207	0.503	(1.412)
0.075	0.005	0.25	2.739	0.825	(0.290)	(0.290)	(0.290)	0.290	(0.290)	1.286	0.502	(1.569)
0.075	0.005	0.3	2.595	0.825	(0.379)	(0.379)	(0.379)	0.379	(0.379)	1.375	0.501	(1.747)
0.075	0.005	0.35	2.446	0.825	(0.481)	(0.481)	(0.481)	0.481	(0.481)	1.477	0.501	(1.951)
0.075	0.005	0.4	2.293	0.825	(0.600)	(0.600)	(0.600)	0.600	(0.600)	1.596	0.501	(2.186)
0.075	0.005	0.45	2.135	0.825	(0.739)	(0.739)	(0.739)	0.739	(0.739)	1.735	0.500	(2.463)
Simu 3-2 changing beta*					To beta*:		Elasticity at the discrete time=(2-1)/((1+2)/2)					
0.075	0.005	0.25	0.996	0.6								
0.075	0.005	0.25	1.213	0.65	1.667	2.660	2.164	(2.164)	2.213	(2.660)	(0.500)	5.260
0.075	0.005	0.25	1.494	0.7	2.077	3.068	2.573	(2.573)	2.620	(3.068)	(0.500)	6.058
0.075	0.005	0.25	1.867	0.75	2.636	3.625	3.132	(3.132)	3.176	(3.625)	(0.500)	7.138
0.075	0.005	0.25	2.390	0.8	3.444	4.429	3.938	(3.938)	3.981	(4.429)	(0.500)	8.680
0.075	0.005	0.25	3.176	0.85	4.714	5.690	5.203	(5.203)	5.244	(5.690)	(0.500)	11.051
0.075	0.005	0.25	4.485	0.9	7.000	7.955	7.479	(7.479)	7.518	(7.955)	(0.500)	15.128
0.075	0.005	0.25	7.107	0.95	12.333	13.214	12.776	(12.776)	12.811	(13.214)	(0.500)	23.439
0.075	0.005	0.25	12.365	0.99	32.333	32.881	32.609	(32.609)	32.630	(32.881)	(0.500)	45.054
Simu 4-1: changing alpha					To alpha:		Elasticity at the discrete time=(2-1)/((1+2)/2)					
0.4	0.005	0.05	4.174	0.825								
0.4	0.005	0.1	3.968	0.825	(0.081)	(0.081)	(0.081)	0.081	(0.081)	1.071	0.515	(1.141)
0.4	0.005	0.15	3.760	0.825	(0.143)	(0.143)	(0.143)	0.143	(0.143)	1.136	0.505	(1.271)
0.4	0.005	0.2	3.551	0.825	(0.212)	(0.212)	(0.212)	0.212	(0.212)	1.207	0.503	(1.412)
0.4	0.005	0.25	3.340	0.825	(0.290)	(0.290)	(0.290)	0.290	(0.290)	1.286	0.502	(1.569)
0.4	0.005	0.3	3.128	0.825	(0.379)	(0.379)	(0.379)	0.379	(0.379)	1.375	0.501	(1.747)
0.4	0.005	0.35	2.914	0.825	(0.481)	(0.481)	(0.481)	0.481	(0.481)	1.477	0.501	(1.951)
0.4	0.005	0.4	2.699	0.825	(0.600)	(0.600)	(0.600)	0.600	(0.600)	1.596	0.501	(2.186)
0.4	0.005	0.45	2.483	0.825	(0.739)	(0.739)	(0.739)	0.739	(0.739)	1.735	0.500	(2.463)
Simu 4-2 changing beta*					To beta*:		Elasticity at the discrete time=(2-1)/((1+2)/2)					
0.4	0.005	0.25	1.094	0.6								
0.4	0.005	0.25	1.350	0.65	1.667	2.660	2.164	(2.164)	2.213	(2.660)	(0.500)	5.260
0.4	0.005	0.25	1.689	0.7	2.077	3.068	2.573	(2.573)	2.620	(3.068)	(0.500)	6.058
0.4	0.005	0.25	2.158	0.75	2.636	3.625	3.132	(3.132)	3.176	(3.625)	(0.500)	7.138
0.4	0.005	0.25	2.852	0.8	3.444	4.429	3.938	(3.938)	3.981	(4.429)	(0.500)	8.680
0.4	0.005	0.25	3.981	0.85	4.714	5.690	5.203	(5.203)	5.244	(5.690)	(0.500)	11.051
0.4	0.005	0.25	6.143	0.9	7.000	7.955	7.479	(7.479)	7.518	(7.955)	(0.500)	15.128
0.4	0.005	0.25	11.950	0.95	12.333	13.214	12.776	(12.776)	12.811	(13.214)	(0.500)	23.439
0.4	0.005	0.25	38.224	0.99	32.333	32.881	32.609	(32.609)	32.630	(32.881)	(0.500)	45.054

Table E4 Elasticity values of parameters and variables w.r.t. α and β^* in simulations (4)

$delta_0$	r*	$r_{REAL}=r^*-r^*_F$	$\alpha/i\beta^*$	g_Y^*	g_A^*	$1/\lambda^*$	$\delta_0-\alpha$	$(\delta_0-\alpha)/\alpha$	$i_{VA(speed)}$	$i_{Width(speed)}$	$n_{VA(speed)}$	$n_{Width(speed)}$
To alpha:	**Simu 3-1: changing alpha**					**Elasticity at the discrete time=(2-1)/((1+2)/2)**						
0.156	1.053	1.000	1.000	0.060	0.000	0.061	(0.210)	(1.183)	(0.030)	0.026	0.030	0.041
0.252	1.103	1.000	1.000	0.107	0.000	0.110	(0.374)	(1.353)	(0.048)	0.048	0.048	0.071
0.344	1.158	1.000	1.000	0.162	0.000	0.169	(0.553)	(1.535)	(0.063)	0.075	0.063	0.106
0.433	1.221	1.000	1.000	0.224	0.000	0.240	(0.736)	(1.720)	(0.073)	0.109	0.073	0.145
0.522	1.294	1.000	1.000	0.298	0.000	0.327	(0.897)	(1.883)	(0.076)	0.152	0.076	0.190
0.612	1.380	1.000	1.000	0.383	0.000	0.435	(0.982)	(1.970)	(0.066)	0.208	0.066	0.241
0.705	1.482	1.000	1.000	0.485	0.000	0.574	(0.899)	(1.891)	(0.037)	0.282	0.037	0.300
0.803	1.604	1.000	1.000	0.607	0.000	0.757	(0.530)	(1.527)	0.026	0.383	(0.026)	0.370
To beta*:	**Simu 3-2 changing beta***					**Elasticity at the discrete time=(2-1)/((1+2)/2)**						
(4.761)	(2.466)	(1.000)	(1.000)	(1.471)	(1.667)	(13.872)	(6.748)	(6.748)	(27.083)	#NUM!	27.083	0.000
(3.580)	(2.794)	(1.000)	(1.000)	(1.801)	(2.077)	(2.510)	(6.087)	(6.087)	(3.508)	(1.761)	3.508	0.000
(2.873)	(3.224)	(1.000)	(1.000)	(2.232)	(2.636)	(0.004)	(6.008)	(6.008)	(0.005)	(0.003)	0.005	0.000
(2.326)	(3.810)	(1.000)	(1.000)	(2.821)	(3.444)	1.380	(6.164)	(6.164)	1.895	0.948	(1.895)	0.000
(1.755)	(4.655)	(1.000)	(1.000)	(3.671)	(4.714)	2.615	(6.031)	(6.031)	3.774	1.893	(3.774)	0.000
(0.908)	(5.983)	(1.000)	(1.000)	(5.007)	(7.000)	4.126	(3.916)	(3.916)	6.579	3.319	(6.579)	0.000
0.965	(8.369)	(1.000)	(1.000)	(7.415)	(12.333)	6.423	4.163	4.163	12.746	6.574	(12.746)	0.000
7.321	(13.095)	(1.000)	(1.000)	(12.163)	(32.333)	9.726	20.091	20.091	34.809	20.520	(34.809)	0.000
To alpha:	**Simu 4-1: changing alpha**					**Elasticity at the discrete time=(2-1)/((1+2)/2)**						
0.518	1.067	1.000	1.000	0.076	0.000	0.056	(1.310)	(2.016)	(0.027)	0.027	0.027	0.041
0.675	1.128	1.000	1.000	0.134	0.000	0.102	(10.913)	(8.293)	(0.043)	0.050	0.043	0.071
0.787	1.195	1.000	1.000	0.200	0.000	0.158	4.283	3.598	(0.057)	0.077	0.057	0.106
0.877	1.271	1.000	1.000	0.275	0.000	0.227	2.111	1.141	(0.068)	0.111	0.068	0.145
0.956	1.357	1.000	1.000	0.361	0.000	0.312	1.337	0.341	(0.072)	0.154	0.072	0.190
1.032	1.456	1.000	1.000	0.459	0.000	0.420	0.759	(0.242)	(0.066)	0.208	0.066	0.241
1.107	1.571	1.000	1.000	0.575	0.000	0.560	0.107	(0.893)	(0.043)	0.279	0.043	0.300
1.186	1.706	1.000	1.000	0.710	0.000	0.747	(0.865)	(1.859)	0.008	0.374	(0.008)	0.370
To beta*:	**Simu 4-2 changing beta***					**Elasticity at the discrete time=(2-1)/((1+2)/2)**						
(5.089)	(2.619)	(1.000)	(1.000)	(1.626)	(1.667)	(7.323)	(8.294)	(8.294)	(7.855)	(4.030)	7.855	0.000
(4.026)	(3.011)	(1.000)	(1.000)	(2.019)	(2.077)	(1.146)	(9.098)	(9.098)	(1.207)	(0.604)	1.207	0.000
(3.482)	(3.539)	(1.000)	(1.000)	(2.550)	(2.636)	0.800	(13.086)	(13.086)	0.842	0.421	(0.842)	0.000
(3.178)	(4.293)	(1.000)	(1.000)	(3.307)	(3.444)	2.144	(39.503)	(39.503)	2.267	1.135	(2.267)	0.000
(2.986)	(5.453)	(1.000)	(1.000)	(4.476)	(4.714)	3.617	25.457	25.457	3.868	1.941	(3.868)	0.000
(2.757)	(7.474)	(1.000)	(1.000)	(6.514)	(7.000)	5.841	8.476	8.476	6.382	3.218	(6.382)	0.000
(1.820)	(11.874)	(1.000)	(1.000)	(10.969)	(12.333)	10.442	3.574	3.574	12.011	6.173	(12.011)	0.000
6.599	(25.398)	(1.000)	(1.000)	(24.664)	(32.333)	24.105	(17.769)	(17.769)	33.134	19.150	(33.134)	0.000

Table F1 Frequency by country and by sub-area to close-to-disequilibrium and disequilibrium: the Pacific and non-European area, using KEWT 4.10 data-sets (1)

Frequency	close-to-disequilibirum (0 to 5 years of speed)				disequiliibrum (minus or more than 1000 yeas)				Numbers
Pacific countries	sum	Total econc	G sector	PRI sector	sum	Total econc	G sector	PRI sector	(times)
1. the US	0	0	0	0	0	0	0	0	19
2. Canada	1	0	0	1	0	0	0	0	19
3. Australia	0	0	0	0	0	0	0	0	19
4. New Zealand	0	0	0	0	0	0	0	0	19
5. Mexico	0	0	0	0	2	0	0	2	19
6. China	13	4	5	4	0	0	0	0	19
7. India	5	2	3	0	0	0	0	0	19
8. Indonesia	4	2	0	2	0	0	0	0	19
9. Japan	0	0	0	0	1	0	0	1	19
10. Korea	1	0	1	0	0	0	0	0	19
11. Malaysia	1	0	0	1	0	0	0	0	19
12. Philippines	9	3	0	6	0	0	0	0	19
13. Singapore	3	0	3	0	0	0	0	0	19
14. Thailand	3	1	0	2	0	0	0	0	19
15. Vietnam	5	3	0	2	0	0	0	0	18
16. Sri Lanka	12	4	6	2	1	0	1	0	18
17. *Brazil*	13	4	5	4	3	0	3	0	19
total	70	23	23	24	7	0	4	3	321
Frequency (rate)	0.2181	0.0717	0.0717	0.0748	0.0218	0.0000	0.0125	0.0093	1.0000
total (excl.Brazil)	57	19	18	20	4	0	1	3	302
Freq.excl.Brazil (	0.1887	0.0629	0.0596	0.0662	0.0132	0.0000	0.0033	0.0099	1.0000

Frequency	close-to-disequilibirum (0 to 5 years of speed)				disequiliibrum (minus or more than 1000 yeas)				Numbers
Other countries	sum	Total econc	G sector	PRI sector	sum	Total econc	G sector	PRI sector	(times)
Latin America, 5									
16. Argentina	4	2	0	2	0	0	0	0	19
17. Brazil	13	4	5	4	3	0	3	0	19
18. Chile	8	3	2	3	0	0	0	0	19
19. Colombia	5	3	1	1	3	0	3	0	18
20. Peru	11	3	5	3	0	0	0	0	19
Middle East, 5									
21. Iran	11	4	4	3	2	2	0	0	18
22. Kazakhstan	1	0	0	1	0	0	0	0	13
23. Kuwait	1	0	0	1	8	0	6	2	18
24. Pakistan	8	1	4	3	2	1	1	0	19
25. Saudi Arabia	2	0	2	0	0	0	0	0	19
Africa, 5									
26. Egypt	5	1	2	2	1	1	0	0	18
27. Kenya	10	3	2	5	0	0	0	0	17
28. Nigeria	11	3	7	1	0	0	0	0	14
29. South Africa	8	2	2	4	0	0	0	0	19
30. Tanzania	7	3	1	3	0	0	0	0	16
total	105	32	37	36	19	4	13	2	265
Frequency (rate)	0.3962	0.1208	0.1396	0.1358	0.0717	0.0151	0.0491	0.0075	1.0000

Table F2 Frequency by country and by sub-area to close-to-disequilibrium and disequilibrium: the Euro and others in Europe, using KEWT 4.10 data-sets (2)

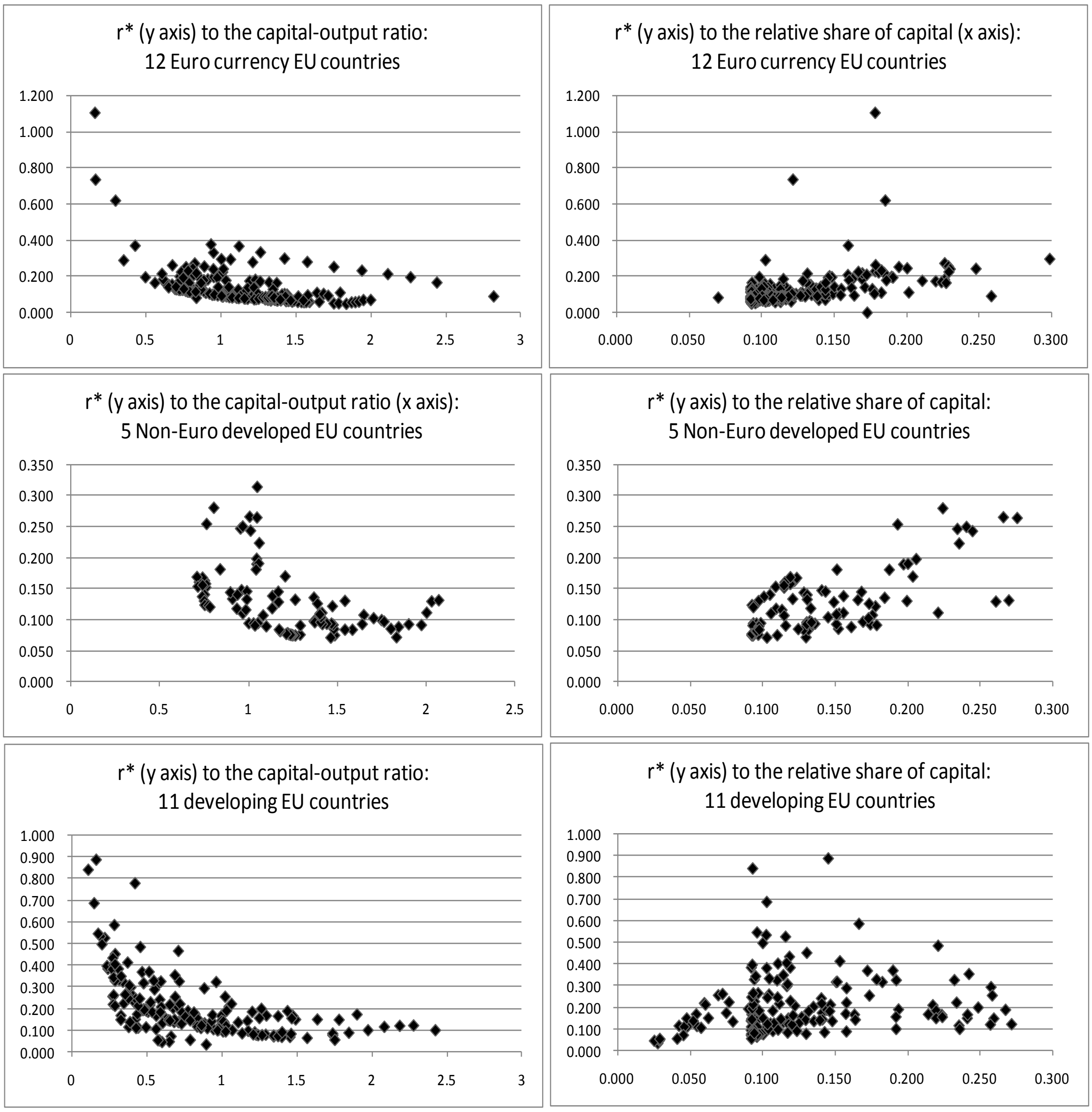
Frequency	close-to-disequilibirum (0 to 5 years of speed)				disequiliibrum (minus or more than 1000 yeas)				Numbers
countries	sum	Total econc	G sector	PRI sector	sum	Total econc	G sector	PRI sector	(times)
12 Euro sub-are	62	17	24	21	11	1	6	4	223
E1. Austria	3	0	3	0	0	0	0	0	19
E2. Belgium	5	2	2	1	1	0	0	1	19
E3. Finland	8	5	0	3	0	0	0	0	19
E4. France	0	0	0	0	0	0	0	0	19
E5. Germany	0	0	0	0	1	0	1	0	19
E6. Greece 299	17	2	7	8	1	0	1	0	19
E7. Ireland	9	2	5	2	0	0	0	0	19
E8. Italy	2	1	0	1	0	0	0	0	19
E9. Luxemburg	2	1	1	0	5	1	2	2	14
E10. Netherlands	6	3	2	1	0	0	0	0	19
E11. Portugal	5	0	2	3	0	0	0	0	19
E12. Spain	5	1	2	2	3	0	2	1	19
Frequency (rate)	0.2780	0.0762	0.1076	0.0942	0.0493	0.0045	0.0269	0.0179	1.0000
Frequency	close-to-disequilibirum (0 to 5 years of speed)				disequiliibrum (minus or more than 1000 yeas)				Numbers
Non Euro sub-ar	sum	Total econc	G sector	PRI sector	sum	Total econc	G sector	PRI sector	(times)
5 Developed sub	12	3	5	4	2	1	0	1	95
1.Denmark	4	1	2	1	0	0	0	0	19
2. Sweden	2	0	0	2	0	0	0	0	19
3. the U K	1	0	0	1	1	0	0	1	19
4. Norway	2	0	2	0	1	1	0	0	19
5. Switzerland	3	2	1	0	0	0	0	0	19
Frequency (rate)	0.1263	0.0316	0.0526	0.0421	0.0211	0.0105	0.0000	0.0105	1.0000
11 Developing s	60	12	29	19	13	3	5	5	174
1. Bulgaria	4	1	1	2	4	1	2	1	14
2. Czech Republi	8	4	1	3	0	0	0	0	14
3. Hungary	8	1	5	2	0	0	0	0	19
4. Iceland	3	0	3	0	2	0	0	2	19
5. Latvia	2	0	1	1	2	1	1	0	14
6. Poland	3	1	0	2	0	0	0	0	19
7. Romania	5	0	2	3	2	0	2	0	14
8. Russia	0	0	0	0	0	0	0	0	14
9. Slovak	4	1	1	2	3	1	0	2	14
10E. *Slovenia*	8	2	4	2	0	0	0	0	14
11. Turkey	15	2	11	2	0	0	0	0	19
Frequency (rate)	0.3448	0.0690	0.1667	0.1092	0.0747	0.0172	0.0287	0.0287	1.0000
16 Non Euro sub	72	15	34	23	15	4	5	6	269
Frequency (rate)	0.2677	0.0558	0.1264	0.0855	0.0558	0.0149	0.0186	0.0223	1.0000

Table F3 Endogenous real rate of return and endogenous inflation/deflation rate for the NAIRU by country 2008

	For the inflanflation rate		For the real rate of return		For endogenous unemployment		
equilibrium	r*	$r^*_{HA(i)}$	$r^*/r^*_{HA(i)}$	$r^*-r^*_{HA(i)}$	n_E	n	n_E-n
17 pacific on ave	0.1166	0.1034	1.1277	0.0132	0.01095	0.01095	0.00000
the U S	0.0743	0.0524	1.4174	0.0219	0.00972	0.0097	0.00000
Canada	0.0487	0.0382	1.2736	0.0105	0.00941	0.0094	0.00000
Australia	0.0480	0.0393	1.2207	0.0087	0.01055	0.0106	0.00000
New Zealand	0.0487	0.0329	1.4782	0.0158	0.00955	0.0095	0.00000
Mexico	0.1379	0.1252	1.1011	0.0127	0.00995	0.0100	0.00000
China	0.1919	0.1841	1.0423	0.0078	0.00509	0.0051	0.00000
India	0.2461	0.2233	1.1023	0.0228	0.01437	0.0144	0.00000
Indonesia	0.2321	0.2125	1.0919	0.0195	0.01193	0.0119	0.00000
Japan	0.0325	0.0417	0.7795	(0.0092)	(0.00086)	(0.0009)	0.00000
Korea	0.0981	0.0928	1.0577	0.0054	0.00396	0.0040	0.00000
Malaysia	0.1533	0.1144	1.3397	0.0389	0.01656	0.0166	0.00000
Philippines	0.1171	0.0673	1.7407	0.0498	0.01837	0.0184	0.00000
Singapore	0.1308	0.0839	1.5580	0.0468	0.02895	0.0290	0.00000
Thailand	0.1498	0.1397	1.0721	0.0101	0.00612	0.0061	0.00000
Vietnam	0.1025	0.0929	1.1034	0.0096	0.01357	0.0136	0.00000
Sri Lanka	0.0800	0.0728	1.0981	0.0071	0.00914	0.0091	0.00000
Brazil	0.1032	0.0920	1.1215	0.0112	0.00973	0.0097	0.00000
	For the inflation rate		For the real rate of return		For endogenous unemployment		
equilibrium	r*	$r^*_{HA(i)}$	$r^*/r^*_{HA(i)}$	$r^*-r^*_{HA(i)}$	n_E	n	n_E-n
13EMU on ave.	0.0783	0.0729	1.0744	0.0054	0.00121	0.00560	(0.00440)
Austria	0.0719	0.0662	1.0850	0.0056	0.00361	0.0036	0.00000
Belgium	0.0839	0.0750	1.1191	0.0089	0.00570	0.0057	0.00000
Finland	0.0884	0.0821	1.0777	0.0064	0.00379	0.0038	0.00000
France	0.0663	0.0591	1.1222	0.0072	0.00535	0.0053	0.00000
Germany	0.0676	0.0714	0.9470	(0.0038)	(0.00097)	(0.0010)	0.00000
Greece	0.1653	0.1581	1.0456	0.0072	0.00270	0.0027	0.00000
Ireland	0.0916	0.0707	1.2955	0.0209	0.01835	0.0183	0.00000
Italy	0.0850	0.0743	1.1434	0.0107	0.00489	0.0049	0.00000
Luxemburg	0.2972	0.2354	1.2629	0.0619	0.01028	0.0103	0.00000
Netherlands	0.1401	0.1279	1.0952	0.0122	0.00425	0.0043	0.00000
Portugal	0.1120	0.1025	1.0929	0.0095	0.00376	0.0038	0.00000
Slovenia	0.3208	0.4372	0.7339	(0.1164)	(0.05600)	0.0011	(0.05714)
Spain	0.0695	0.0584	1.1901	0.0111	0.00999	0.0100	0.00000
	For the inflation rate		For the real rate of return		For endogenous unemployment		
equilibrium	r*	$r^*_{HA(i)}$	$r^*/r^*_{HA(i)}$	$r^*-r^*_{HA(i)}$	n_E	n	n_E-n
16 Europe on ave	0.1281	0.1260	1.0167	0.0021	0.00467	0.00476	(0.00009)
Bulgaria	0.0737	0.0770	0.9581	(0.0032)	(0.00654)	(0.0065)	0.00000
Czech Rep.	0.0974	0.0914	1.0657	0.0060	0.00487	0.0049	0.00000
Denmark	0.1690	0.1652	1.0227	0.0038	0.00183	0.0018	0.00000
Hungary	0.0991	0.1080	0.9173	(0.0089)	(0.00340)	(0.0020)	(0.00141)
Iceland	0.0822	0.0602	1.3662	0.0220	0.05263	0.0526	0.00000
Latvia	0.0614	0.0637	0.9639	(0.0023)	(0.00441)	(0.0044)	0.00000
Norway	0.3129	0.2739	1.1425	0.0390	0.01059	0.0106	0.00000
Poland	0.1068	0.1080	0.9889	(0.0012)	(0.00079)	(0.0008)	0.00000
Romania	0.0312	0.0322	0.9689	(0.0010)	(0.00420)	(0.0042)	0.00000
Russia	0.1438	0.1490	0.9653	(0.0052)	(0.00387)	(0.0039)	0.00000
Slovak	0.0803	0.0796	1.0092	0.0007	0.00070	0.0007	0.00000
Sweden	0.1277	0.1081	1.1807	0.0195	0.00546	0.0055	0.00000
Switzerland	0.1305	0.1182	1.1034	0.0122	0.00399	0.0040	0.00000
Turkey	0.1815	0.1569	1.1568	0.0246	0.01247	0.0125	0.00000
the U K	0.1251	0.0809	1.5453	0.0441	0.00542	0.0054	0.00000

Data source: KEWT 4.10 of 59 countries by sector, 1990-2008, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

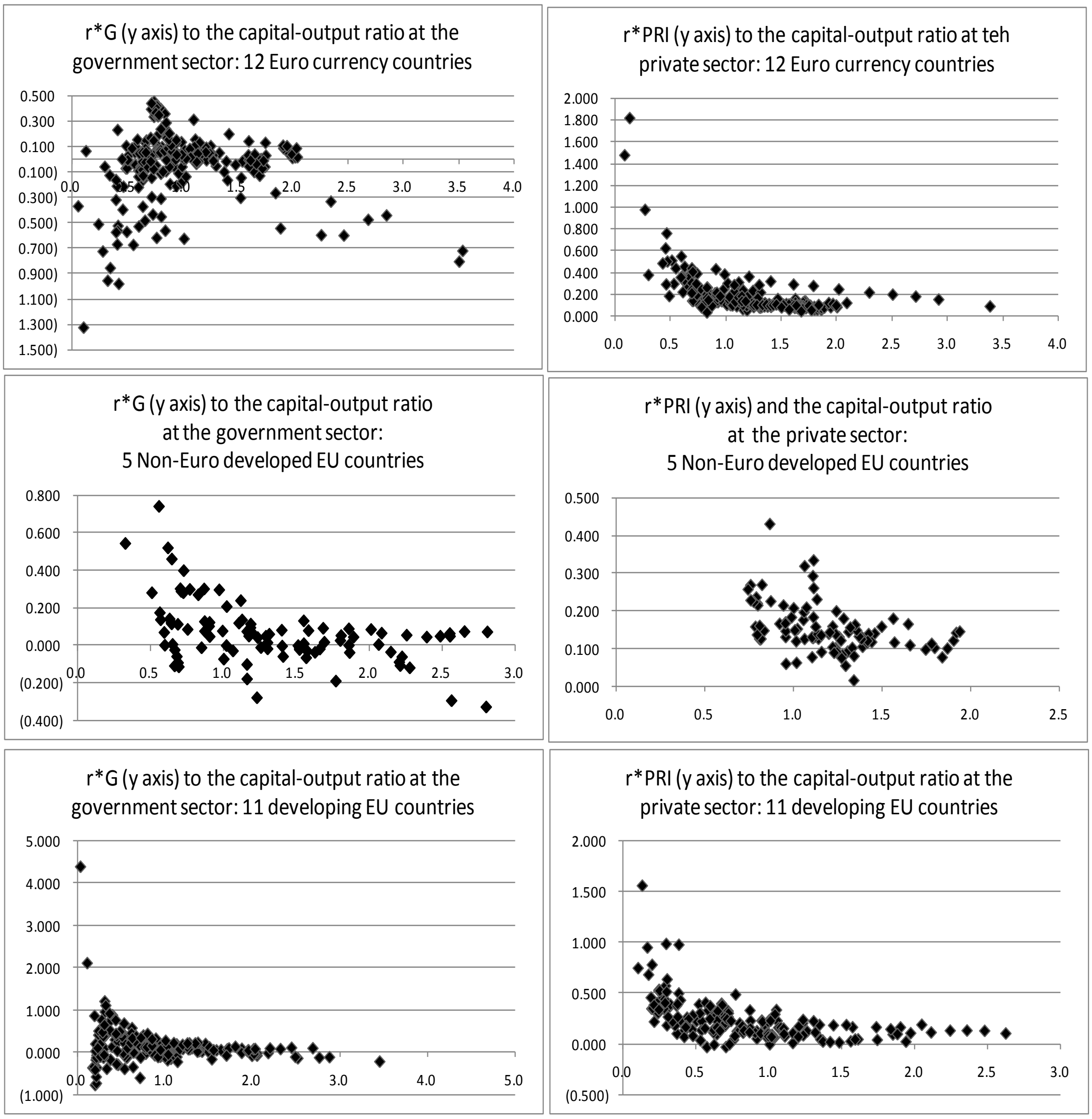
Note to Table F3: Shadowed cells show unstable results, partly due to a minus rate of change in population in equilibrium. Seventeen Pacific area countries 2008 do not show this instability except for Japan. A minus value of $n_E - n$ shows unemployment even in equilibrium.



Data source: 13 Euro currency Sub-Area, 15 Non-Euro Sub-Area, and 31 other country Area outside Europe, using KEWT 4.10 by sector, 1990-2008, whose ten original data come from *International Financial Statistics Yearbook*, IMF (hereafter, the same).

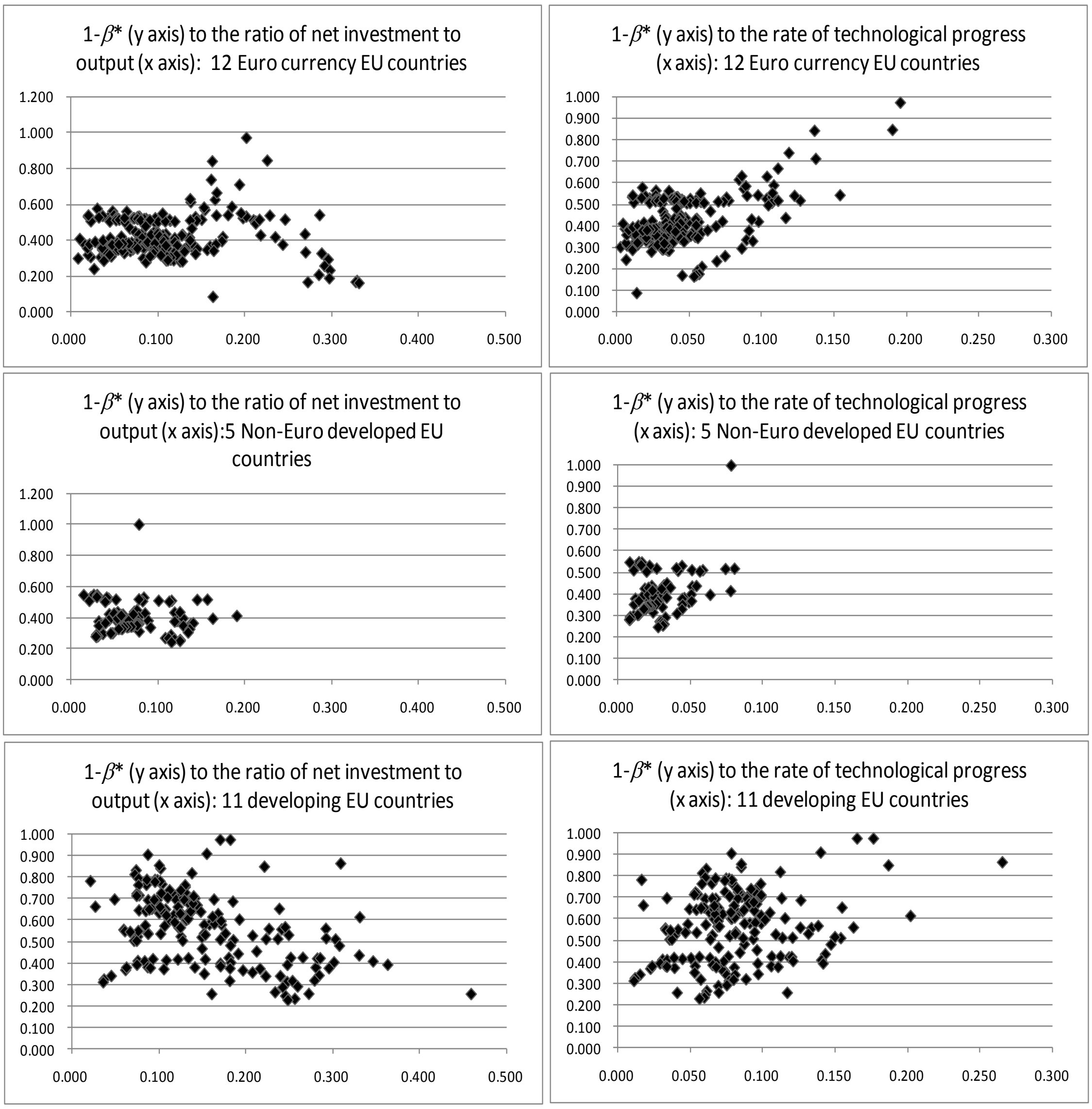
Note: Policy-oriented core parameters are united by $\alpha = r^* \cdot \Omega^*$, and by sector.

Figure P1 Relative share of capital as the product of the rate of return and the capital-output ratio: developed versus developing countries in Europe



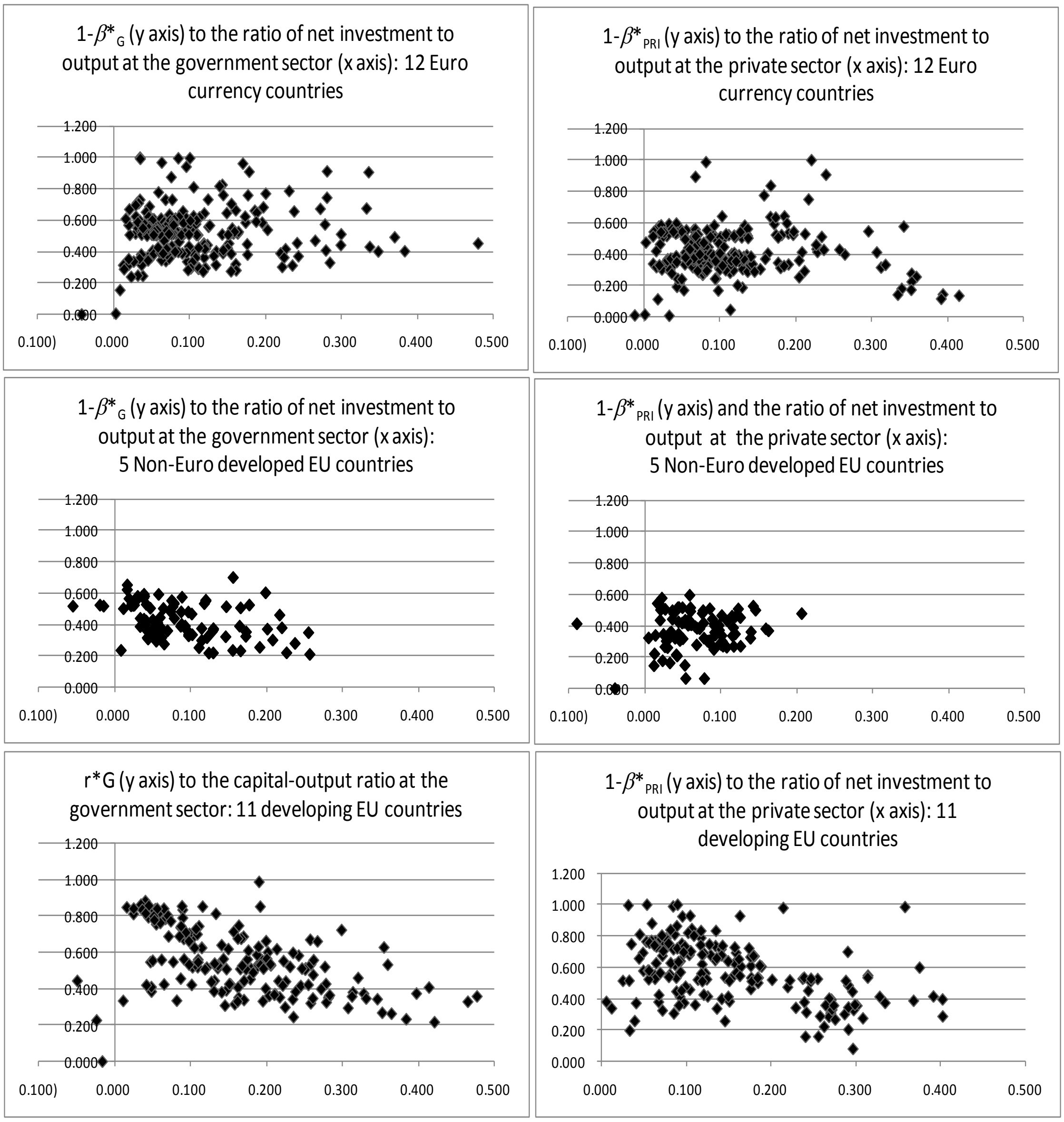
Note: The purpose of these figures is to compare developing with developed countries in Europe. Five developed countries that do not use Euro currency are: Denmark, Norway, Sweden, Switzerland, the UK. Eleven developing countries in Europe are Bulgaria, Czech Rep., Hungary, Iceland, Latvia, Poland, Romania, Russia, Slovak, Slovenia, and Turkey, where a few countries still fall into disequilibrium a few times in 1990-2008. When 'deficit' is available by year, the author is able to increase the number of countries in Europe.

Figure P2 Relative share of capital, by sector, as the product of the rate of return and the capital-output ratio: developed versus developing countries in Europe



Note: Extreme values happen when an economy gets into disequilibrium once ten years or so.

Figure P3 Endogenous rate of technological progress as the product of the ratio of qualitative investment to total investments and the ratio of net investment to output: developed versus developing countries in Europe



Note: The government sector is closely related to the private sector, although there are differences between two sectors.

Figure P4 Endogenous rate of technological progress, by sector, as the product of the ratio of qualitative investment to total investments and the ratio of net investment to output: developed versus developing countries in Europe

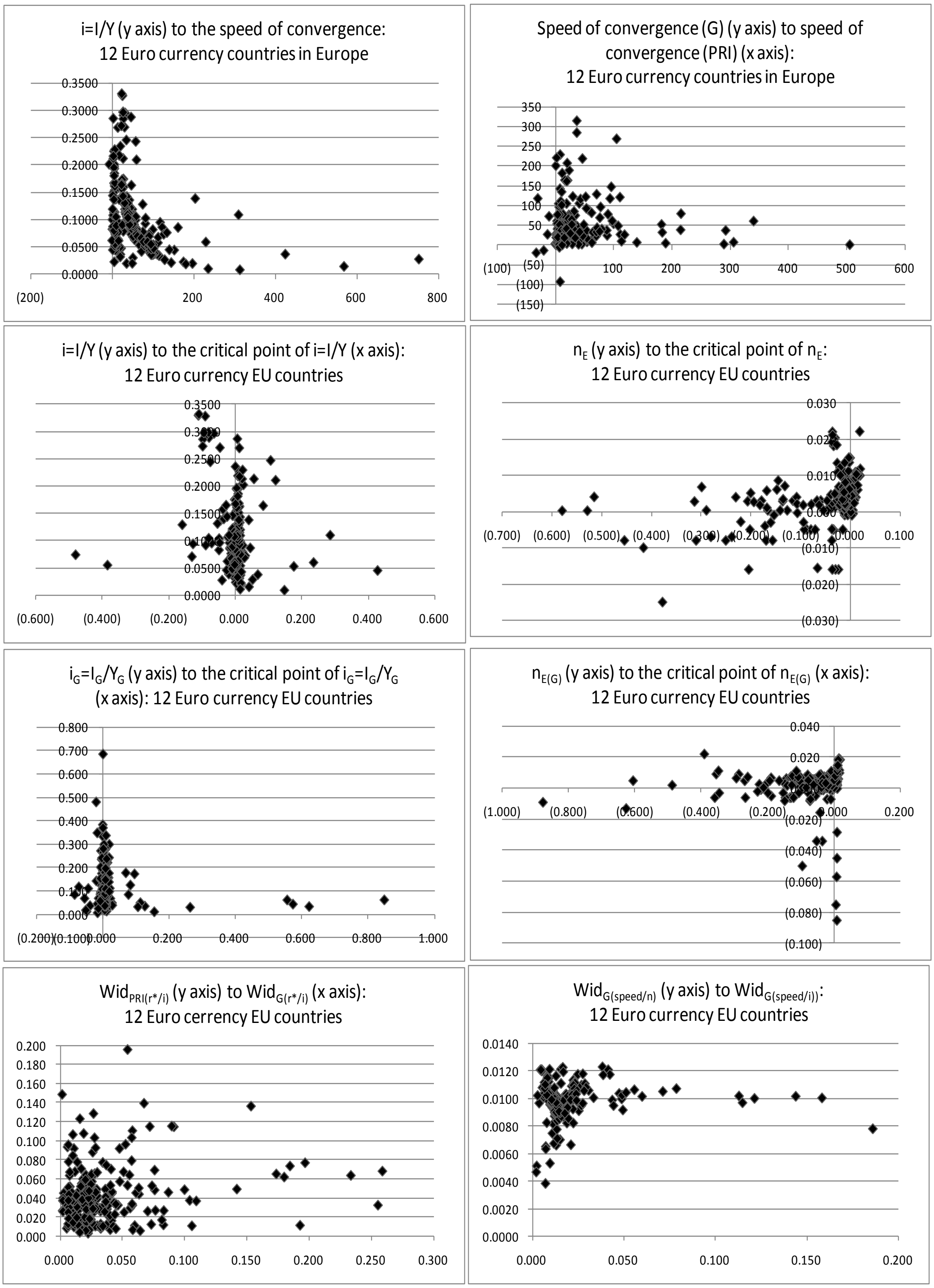


Figure P5 Mechanics in equilibrium: the 12 Euro currency countries

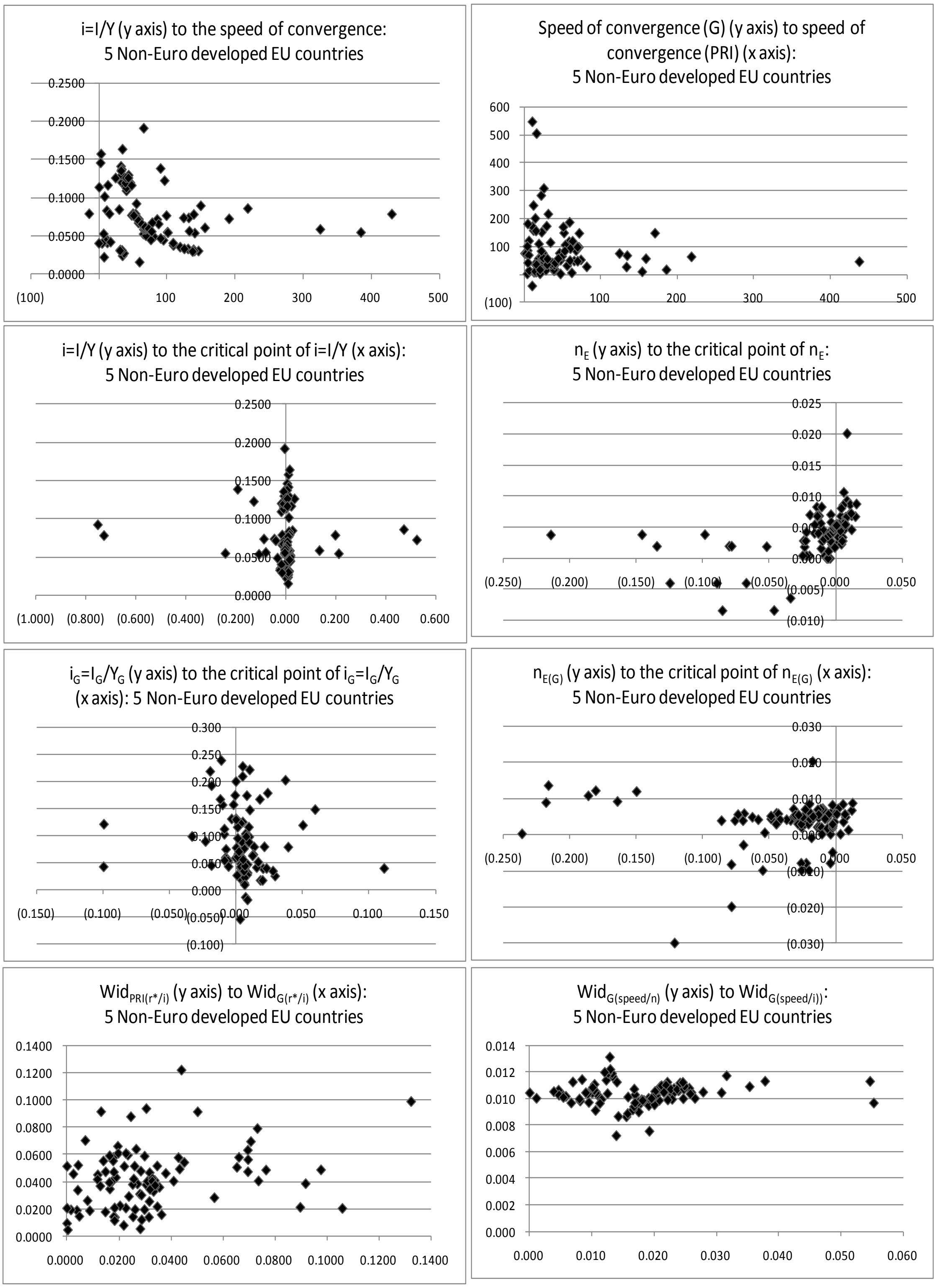


Figure P6 Mechanics in equilibrium: the 5 Non-Euro currency developed countries

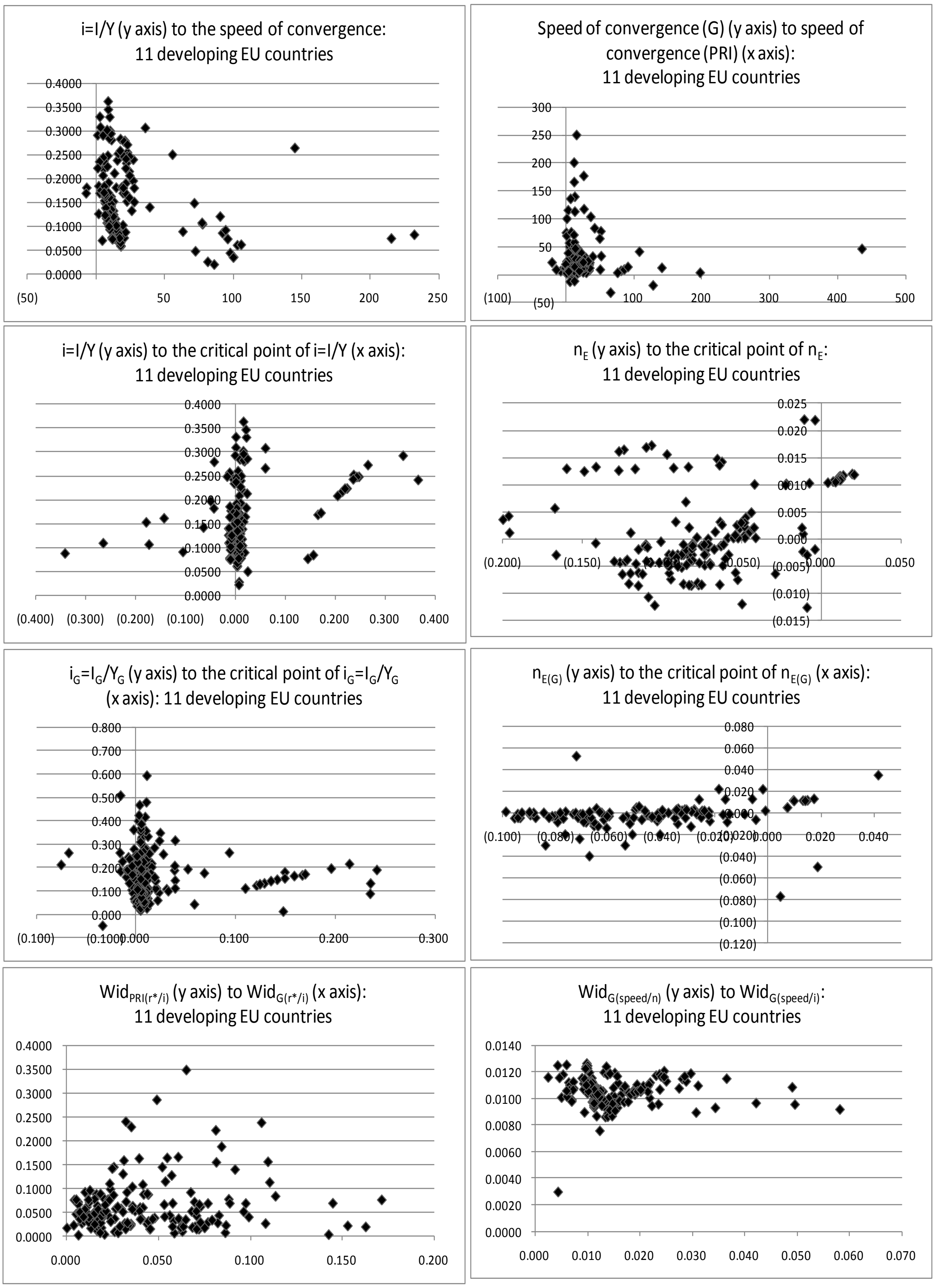


Figure P7 Mechanics in equilibrium: the 11 developing countries in Europe

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Chapter 8

Two Disequilibrium Risks of δ_0 and the Speed Years, Essential to Seven Endogenous Parameters

8.1 Essence of Seven Endogenous Parameters in Equilibrium

This chapter reveals the essence of seven endogenous parameters and simulates two risks (δ_0 and $1/\lambda^*$, soon below) against sufficient and necessary conditions lying at the endogenous-equilibrium. The Graphic Dynamics (GD) is a tool and constitutes a highlight in this Chapter. Seven endogenous parameters are the following: The ratio of net investment to output, $i = I/Y$; The rate of change in population, $n_E = n$; The relative share of capital, $\alpha = \Pi/Y$; the capital-output ratio, $\Omega = K/Y$; The diminishing returns to capital (DRC) coefficient, δ_0; and *the speed years* as the inverse of the convergence coefficient, $1/\lambda^*$. Seven endogenous parameters are consistent with the discrete Cobb-Douglas production function under constant returns to scale and cooperatively work for maintaining endogenous equilibrium, by country, sector, and year and, over years. Seven endogenous parameters are each shown by equations. The author formulates seven equations with each theoretical proof separately in the *EES*. For simplicity this chapter does not repeat theoretical proofs of seven endogenous equations.

Two risks against stable equilibrium are selected from seven endogenous parameters: i) the diminishing returns to capital (DRC) coefficient, δ_0, and 2) *the speed years* $1/\lambda^*$ as the inverse of the convergence coefficient, λ^*. These two risks are a quick litmus paper to test a qualitative level of equilibrium. And, these two risks are tightly related to the capital-output ratio and the technology coefficient. These four endogenous parameters are tied up with the character of capital stock and flow. Capital is a rival and composed of qualitative and quantitative. Capital flow is net investment and qualitatively measured. The capital-output ratio, $\Omega = K/Y$, sensitively influences the level of equilibrium while the capital-labor ratio, $k = K/L$, does not. The technology coefficient, β^*, determines the qualitative level of capital flow or net investment. The level of β^* has its effective range lying from above zero to below one; $0 < \beta^* < 1.0$.

At economic stages, the capital-output ratio starts with a low level, e.g., 0.4 to 0.6 and then, gradually gets into a higher level, e.g., 0.9, 1.5, and 2.0. If the capital-output ratio rises rapidly, as seen in some developing countries in Asia, the level of β^* becomes above 1.0 shortly. It implies that the endogenous-equilibrium is broken. This is a basic idea and a fact behind two risks lying among seven endogenous parameters. The fact is also shown by the hyperbola of the capital-output ratio to β^*; $\Omega(\beta^*)$. Chapter 7 explained *the speed years* using hyperbolas of $speed(i)$ and $speed(n)$. To sum up,

$\Omega(\beta^*)$ or $\beta^*(\Omega)$ shows a negative diagonal, similarly to the hyperbolas to the rate of change in population and reinforces seven endogenous parameters. This chapter skips the explanation (for whole version of hyperbolas, see Appendix of the *EES*).

As a result, this chapter shows Graphic Dynamics designed for two disequilibrium risks, using endogenous parameters, δ_0 and *the speed years*, each to the capital-output ratio. Figure 1 to Figure 9 cover 36 countries, 2010, where each figure compares Graphic Dynamics of the government sector with that of the private sector. Readers understand how deeply the government sector is involved in the total economy. It is beyond description. In another word, the government sector determines qualitative levels of capital stock and endogenous equilibrium. Net investment is fully qualitative and does not include any level of quantitative net investment. This is discussed in Chapter 14 with business cycle.

Graphic Dynamics in this chapter shows results of simulations. The author also simulates some aspects, for example, population and growth. These simulations are distinguished with the results of recursive programming (see Chapter 16). Graphic dynamics is non-linear and impossible to be treated in econometrics. Econometrics has improved steadily and surprisingly for the last 60 or more years at Keynesian and neo-classical schools. This chapter does not touch econometrics since each character completely differs. For the differences between the endogenous system and econometrics, the author will compare the results of endogenous data with statistics actual data in the following few chapters by aspect.

8.2 The Graphic Dynamics to Examine Two Risks to Disequilibrium

Two risks of δ_0 and *the speed years* result in disequilibrium. The author first classifies two risks into two different cases: One is numerically mismatching combination. The other is an uncontrollable case, extremely out of a right road. Mismatching case happens when the ratio of qualitative technology coefficient divided by quantitative technology coefficient, $B^* = (1-\beta^*)/\beta^*$ is incalculable:

1) $\beta^* = 0.5$ or $B^* = 1.0$.
2) $\beta^* = 0.8$ or $B^* = 0.25$ under the capital-output ratio is 4.0 or its inverse is 0.25.
3) $\beta^* = 1.0$ or $B^* = 0$. This comes from numerical character of δ_0. $\delta_0 = 1 + \frac{LN(\Omega)}{LN(B^*)}$ or

   $\delta_0 = 1 - \frac{LN(1/\Omega)}{LN(B^*)}$. If $\beta^* > 1.0$, mismatching combination turns to the other case of no controllable disequilibrium.

The other case always expresses disequilibrium. The endogenous system does not approve a condition of $\beta^* > 1.0$. Or, when quantitative capital is more than qualitative capital, capital does not exist in the Cobb-Douglas production function. Nevertheless, interesting to say, the relationship between β_0 and the capital-output ratio is dynamic and changeable quickly. Some countries have experienced $\beta^* < 1.0$ even if the capital-output ratio is exceptionally high, e.g., $\Omega = 6.0 \ or \ 8.0$ under $\Omega \gg 1.0$. This is a high technology case, as shown by Singapore. Other countries have experienced $\beta^* < 1.0$ while $\Omega = 0.6 \ or \ 0.8$. These occurrences were intuitively anticipated by Schumpeter, an older teacher of Samuelson. Expansion is not a right road and, extension must be a right road if extension includes continuous qualitative improvement in economic sustainability.

BOX 8-1 Numerical relationship among the capital-output ratio, $\Omega = K/Y$, β^*, and δ_0

Ω	0.4000	0.5000	0.6852	0.8000	**1.0000**	1.2000	2.0000	10.0000	**11.0000**
LN(Ω)	(0.9163)	(0.6931)	(0.3781)	(0.2231)	0.0000	0.1823	0.6931	2.3026	2.3979
$r^*=\alpha/\Omega$	0.5000	0.4000	0.2919	0.2500	0.2000	0.1667	0.1000	0.0200	0.0182
beta*	0.3616	0.4171	**0.5000**	0.5417	**0.6017**	0.6496	0.7726	1.0000	1.0067
B^*	1.7655	1.3977	**1.0001**	0.8460	0.6621	0.5395	0.2943	0.0000	(0.0067)
$LN(B^*)$	0.5684	0.3348	0.0001	(0.1673)	(0.4124)	(0.6172)	(1.2233)	(36.7368)	**#NUM!**
$LN(\Omega)/LN(B^*$	(1.6119)	(2.0702)	**(3869.66)**	1.3341	**0.0000**	(0.2954)	(0.5666)	(0.0627)	**#NUM!**
$delta_0$	**(0.612)**	**(1.070)**	**(3868.66)**	2.3341	**1.0000**	0.7046	0.4334	0.9373	**#NUM!**

Let the author explain the above **BOX 8-1**. This BOX shows a high-technology oriented country or an economy (the private sector). Leaders' eyes are far ahead and towards next generations. Mismatching case exists when the capital-output ratio shows 0.6852 and results in δ_0=3868.66. No controllable case is shown by $\delta_0 < 0$ and, $\delta_0 = \#NUM!$, where equilibrium falls into disequilibrium. In particular, $\delta_0 = \#NUM!$ shows the worst. This worst occurs at $\Omega = 11.00$ in the above BOX. For example, the highest capital-output ratio is 8.9803 among 86 countries in the world for 23 years, 1990-2012. This is the case of the government sector of Japan, 1990-2012, due to increasing deficit by year and over years. It implies that how the private sector of Japan, 1990-2012, has been strong in technology, while leaders, companies, and people are too instant votes-oriented (notorious 'baramaki') and neglect next generations. The above BOX, for simplicity, excludes *the speed years*. The author discusses *the speed years* empirically in the next section. This is because *the speed years* are determined by two risks and remain results of two risks. *The speed years* include the rate of technological progress that shows qualitative net investment, as discussed in Chapter 7.

Graphic dynamics presents behavioral analysis or behavioral science. This is because decision-making is deeply involved in two risks against disequilibrium. Apparently, graphic dynamics belongs to the products or the real assets-product in the endogenous system. However, deficit by year is determined by leaders and policy-makers. The philosophy of leaders are high and quality-oriented, the results and the above real assets-product become technology-oriented. Deficit belongs not to the financial assets but to the real assets in the endogenous system. Therefore, graphic dynamics clarifies the level of unbalance between the government and private sectors. Of course, developing countries, first of all, need infra-structure to be acceptable by companies in the world. Yet, any country should not drive out of the right road by year and over years. Drivers are the leaders and policy-makers by country. The next section shows empirically drivers' decision-making and the real assets-product or graphic dynamics by sector.

8.3 The Graphic Dynamics (GD) to Avoid Instable Equilibrium

This section is composed of two sub-sections: 1) Processes to connect δ_0 with *the speed years* and the outline of Graphic Dynamics (GD); 2) Empirical results of the GD and summing up of whole economic policies. This section is unique in the *EES* and also a highlight of this chapter. This section presents Graphic Dynamics (GD), 2010, by sector, for 36 countries, selected among 81 countries. The 36 countries are used in other chapters by aspect.

8.3.1 Process to *the speed years* from δ_0 and the outline of the Graphic Dynamics (GD)

The diminishing returns to capital (DRC) coefficient, δ_0, was measured in the previous section, using the ratio of net investment to output/income, $i = I/Y$, the relative share of capital, $\alpha = \Pi/Y$, the rate of change in population, $n_E = n$, and the capital-output ratio, $\Omega = K/Y$. $\Omega = K/Y$ is a key ratio for two risks of $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$ and *the speed years*, $1/\lambda^*$, where the speed coefficient $\lambda^* = (1-\alpha)n + (1-\delta_0)g_A^*$, and the rate of technological progress $g_A^* = i(1-\beta^*)$ each hold by year and by sector. Therefore, the tie between δ_0 and *the speed years* is the qualitative net investment coefficient, $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$, and accordingly, $B^* = \frac{1-\beta^*}{\beta^*}$. Once $B^* = \frac{1-\beta^*}{\beta^*}$ is determined following the level of $\Omega = K/Y$, *the speed years* are simultaneously determined. **Tables 1, 2,** and **3** are results of the above process; the total economy (T), the government sector (G), and the private sector (PRI). For simplicity, other chapters do not show these tables by sector.

The Graphic Dynamics (GD) presents a dynamic level of two risks, $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$ and *the speed years*, $1/((1-\alpha)n + (1-\delta_0)g_A^*)$, along with $\Omega = K/Y$ and β^*.

The GD is based on the capital-output ratio, $\Omega = \Omega^* = \Omega_0$ and $\Omega^* = \frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)(1+n)+n(1-\alpha)}$.

The GD adopts and proves the consistency of $\Omega = \Omega^* = \Omega_0$ with $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$.

As a result, the GD conclusively clarifies dynamic balances between the G sector and the PRI sector, preserving national taste, preferences, culture, and history and cooperatively trading with all the other countries in an open economy.

The relationship between the capital-output ratio and β^* remains unchanged throughout all the GDs, by country, and by sector, as readers well recognize this fact. It is traced back to the essential character of the hyperbola of β^* to Ω, $\beta^*(\Omega)$ or reversely, $\Omega(\beta^*)$ (for explanations of hyperbolas, see Appendix). For confirmation, the author added two figures for twelve countries, 2010, at the end (see **Figures 10** and **11**). Despite, why does the author add the qualitative net investment coefficient β^* to the GD? This is because if the transition of δ_0 is not far from the transition of β^*, the situation is stable and robust. To be easier for observing, β^* and δ_0 have the same scale on the LHS of each graph. *The speed years* are widely scattered; from 2 to 200 years by country and by sector. For *the speed years*, the author has to set a different scale on the RHS each graph. When *the speed years* are relatively short and stable, the situation is well balanced. This is discussed empirically, from the viewpoint of policy sum up, in the next sub-section.

8.3.2 Empirical results of the GD and summing up of whole economic policies

Let the author first empirically watch each Graphic Dynamics (GD) by sector and distinguish stable with instable facts and then, sum up behavioral wisdom accumulated by whole economic policies among countries. For understandable explanations, the author does not use equations and also, symbols except for δ_0 and β^* (see BOX 8-1 above).

Fact-findings of the GD, towards more stable in the endogenous-equilibrium, are the following (see each data and results of **Tables 2** to **4** and **Figures 1** to **9**, for 36 countries).

1. Generally, up to the right trends are each normal. Down to the right trends each are apt to be abnormal.

   Roughly, 90 % or more countries among 36 countries have experienced up to the right trends. But, not always; sometimes suddenly changing. It may be inconsistent decision-making partly due to unstable changes of politics, political power, and dispersive voting. Further, leaders cannot perceive risky ‘down to the right trends’ since there is no method developed in researches except for the GD.

2. The wider the effective range of the capital-output ratio, the more normal the situation is. The narrower the effective range of the capital-output ratio, the more abnormal the situation is.

It is important for policy-makers to know how the effective range is apparently changeable like weather. Policy-makers must be alert at these changes consecutively. Also, it implies that policy mix is difficult to treat since combination of seven endogenous parameters are interrelated each other organically and delicately like human body. Organically is replaced by towards dynamic balances or moderation. Then, policy-makers are relaxed and enjoy executing policies towards moderation.

3. The smaller the differences between the G sector and the PRI sector, the more balanced the situation is.

   Differences between the G sector and the PRI sector differ surprisingly by country. These differences reflect circumstances of each political situation and national taste and culture preserved by country. Political situation immediately spreads economic situation the GD expresses. The above ‘organic’ is replaced by the balances between the G sector and the PRI sector. Economic policies are free in a sense since organic balances between the G and PRI sectors are free.

4. When one of two sectors, G and PRI, is abnormal, policy-makers must pursue its causes and results and amend its abnormality. Otherwise, the situation falls into definite disequilibrium. The symptom measured by *the speed years* is extremely high (more than 70 to 80 yrs) or low (less than 2.0 to 3.0 yrs).

   Abnormal is related to another expression of ‘execute nothing’ or ‘do not execute anything within a few years later,’ as shown in Japan after the 1990s. Also, execute immediately has two ways in terms of redistribution: (1) for next generations far ahead, 30 to 50 yrs ahead and (2) more older people or younger people within the current generation, more selfishly. Typical case of (1) is Singapore and immediate case of (1) will be China. The author shows Singapore and China, comparing with each other concretely using some ratios as follows:

<u>Singapore and China:</u>

Singapore is most typical among 81 countries in that the capital-output ratio increases along with technological progress and breaks a common upper limit of the capital-output ratio. China is also unique in that all the economic policies are immediately and done by year and over years boldly without hesitation, contrarily to Japan. Dear to say, China is still much more quantity-oriented while Singapore is thoroughly quality-oriented since a common upper limit of the capital-output ratio has been meaningless. China, for sustainability, is now urged to be eco-oriented rapidly turning from money to earth, nature, and people.

More concretely, Singapore has taken unique strategies such that by regulation the temperature of inside room must be less than 15^{0}C, lest the next generation will be born with cleverer brains and such that cities and everywhere be cleaned with education so that private enterprises, by their burden, must accept public clean service of employees who break the clean rule. Thus, Singapore has changed from the dirtiest to the cleanest area in the world surprisingly. The strong leadership made it possible to clean up Singapore.

China has no privately-owned land by following its social system. For example, China government takes yearly rental from people for 60 yrs and from enterprises for 40 yrs. Budgetary burden is much less than that of many privately-owned land countries. As a result, the G and PRI sectors are well balanced but, profits-oriented and quantity-oriented too much hitherto.

Stable versus instable countries:

Unbalances between the G and PRI sectors drive countries to instability from stability. Extremely unbalanced countries have a possibility to fall into instability. Japan (PRI), the US (PRI), South Africa (PRI), Denmark (PRI), Greece (PRI), Iceland (PRI), Ireland (PRI), Spain (PRI), and Poland (PRI). These countries have spent government money extremely after 2007 to save financial institutions. Deficit is a result. Increase in deficit definitely reduces growth in the private sector. Policy-makers do not like to use the phase of Crowded-out but, the above GD exactly expresses crowded-out. A problem is how to recover sustainable growth. A future risk possibility depends on how to cut government expenditure with maintaining a minimum level of net investment. As earlier suggested by Samuelson (575-605, 1942) and W. S. Salant (308-314, 1942), tax increase and investment minimum spending are simultaneously required (for fiscal multiplier, see Chapters 12 and 13).

5. This chapter does not refer to actual/statistics versus endogenous data yet, the unbalances between the G and PRI sectors are another expression of the above unbalances between statistics and endogenous data (for comparisons of statistics and endogenous data, see other chapters related to several points).

Sum up behavioral policies behind the Graphic Dynamics (GD)

1. Any country has its own shape in detail, precisely, widely and universally. Yet, the GD roughly has a common and moderate shape. This situation is called stable one. Stable situation is based on BOX 8-1 explained above in this chapter.
2. The GD expresses the past, the current and even future of a country and its sectors, G and PRI, at a glance. The GD reflects causes and effects/results simultaneously. This is because policies are all determined by leaders and policy-makers, by year, sector, and over years.
3. Leaders and policy-makers have each characteristic by country and are influenced by national characteristics such as taste, culture, history, and more broadly civilization of the East and West. The endogenous system all absorbs these differences by country and globally.
4. Two extremes exist in social sciences related to human-life history, the positive and the

negative. Two extremes are indispensable. Two extremes exist and hold not only in human sciences but also in natural sciences, physics and chemistry, macro and micro. Nevertheless, two extremes have its own natural point of moderation and this moderation is an eternal goal. The author states 'moderation in reality' just like 'in reality' of Samuelson (1962). The author further steps into Moderation beyond Space and Time (see Chapter 10). Moderation is essentially dynamic and, suddenly changes and matches a new situation.

5. Leaders and policy-makers, regardless of whether or not the spiritual level of ideas and philosophy stand at high or low. Rather, 'high or low' is not an appropriate phase but only shows a passing experiment and experience. Human has progressed back and forth gradually, taking time and from fighting and wars to cooperation and peace towards moderation. The goal is coming nearer when human decision-making becomes close to moderation, since moderation makes everything relaxed and happy.
6. The GD suggests how risky it is not to decide the current promptly and at once. Theory and practice are one. The tie is whole economic policies. Theory exists only when practices and experiments are repeated continuously without any delay. Any system becomes slow when it becomes older. The GD checks necessary and sufficient conditions for endogenous equilibrium, related to seven endogenous parameters, and starting with the above BOX 8-1.

8.4 Conclusions

World society has gradually turned to human (decision-makers) from money (object-oriented), particularly after entering the 21st Century. People have begun to know people live with Earth and nature. Wisdom tells us that we need prediction rather than forecasting and that we must know maximum and worst risk. A system of national accounts has its own role to recording as statistics. The endogenous system has its role to policy-making by country, sector, and year, and over years.

In the field of econometrics, Vilfredo, F. Pareto's (1848-1923) law and optimum are based on the magnitudes of vectors. Houthakker, H. S. (27-31, 1955-56), extending from firm to industry, proves that the Pareto distribution is consistent with the Cobb-Douglas production function using a simple linear approach and suggests that the approach is not fitted for non-linear. Besides, non-linear is difficult to estimate, forecast, and predict, even using econometrics. In short, Pareto's optimum completely differs from the endogenous system and graphic dynamics in this chapter. Econometrics is one and, graphic dynamics the other. The endogenous system and graphic dynamics do not forecast and predict but measure all the parameters and variables. Leaders and policy-makers need to look for and realize optimum range of two risks of δ_0 and *the speed years*, and accordingly, graphic dynamics; continuously, behaviorally, and simultaneously with changes in environments and circumstances. Conclusively, nature-aspects are implicitly and deeply involved in δ_0, responding with the markets.

Empirically, each country has tried every effort to maintain equilibrium under the price-equilibrium. This reality is beyond description, although leaders' philosophy and intention differs by country, with national taste, preferences, culture, and civilization. Processes to realize and maintain equilibrium are shown by graphic dynamics in Figures 1 to 9, for 36 countries, 2010. These figures consistently correspond with hyperbola graphs and other simulation graphs.

This chapter concentrated on the essence of seven endogenous parameters and revealed graphic dynamics. Other chapters do not repeat the essence of seven endogenous parameters. This chapter empirically appeals the importance of balanced government and private sector.

For readers' convenience: contents of Tables and Figures hereunder

Table EP1 Seven endogenous parameters for 36 countries, 2012: the total economy

Total	i=I/Y	n	α	Ω	β^*	B*	δ_0	g_A^*	$1/\lambda^*$
1. the US	0.1171	0.00579	0.0992	6.7789	0.9224	0.084	0.2269	0.0091	**81.69**
2. Japan	0.0400	(0.00079)	0.1058	8.9803	0.8934	0.119	0.1799	0.0043	**357.47**
3. Australia	0.2079	0.01363	0.1751	2.7338	0.8117	0.232	0.3117	0.0392	**26.18**
4. France	0.0785	0.01123	0.1057	1.7464	0.7478	0.337	0.4870	0.0198	**49.49**
5. Germany	0.0494	(0.00265)	0.1014	1.8697	0.6422	0.557	(0.0700)	0.0177	**60.52**
6. the UK	0.0290	0.01144	0.2028	0.9741	0.7245	0.380	1.0271	0.0080	**112.32**
7. China	0.4052	0.00636	0.4170	2.7845	0.8353	0.197	0.3693	0.0667	**21.84**
8. India	0.3092	0.00000	0.2409	2.3344	0.7546	0.325	0.2453	0.0759	**17.46**
9. Brazil	0.0209	0.02672	0.1877	1.4735	1.3081	(0.236)	0.7319	(0.0064)	**50.06**
10. Mexico	0.1757	0.01248	0.1153	1.7990	0.7149	0.399	0.3611	0.0501	**23.23**
11. Russia	0.1367	(0.00188)	0.2643	0.8759	0.5375	0.860	1.8809	0.0632	**17.52**
12. S.Africa	0.1421	(0.01924)	0.0924	1.1295	0.4808	1.080	2.5836	0.0738	**(7.45)**

Total	i=I/Y	n	α	Ω	β^*	B*	δ_0	g_A^*	$1/\lambda^*$
1. Denmark	0.0365	0.00358	0.0953	1.9103	0.7396	0.352	0.3799	0.0095	**109.52**
2. Finland	0.0959	0.00371	0.0974	1.8703	0.6988	0.431	0.2560	0.0289	**40.26**
3. Netherlan	0.0713	0.00240	0.1529	2.0741	0.7307	0.369	0.2692	0.0192	**62.28**
4. Norway	0.9501	0.01012	0.2714	3.5171	0.8362	0.196	0.2286	0.1556	**7.85**
5. Sweden	0.0618	0.01386	0.1209	1.5548	0.7667	0.304	0.6291	0.0144	**57.03**
6. Canada	0.1995	0.01015	0.1236	2.7953	0.7968	0.255	0.2478	0.0405	**25.40**
7. Greece	0.0243	0.00117	0.2555	2.9506	0.8273	0.209	0.3093	0.0042	**265.07**
8. Iceland	0.2109	0.01227	0.0924	2.6276	0.7845	0.275	0.2522	0.0455	**22.16**
9. Ireland	0.2040	0.01104	0.3800	4.3035	0.9043	0.106	0.3502	0.0195	**51.21**
10. Italy	0.0383	0.00611	0.1423	1.8843	0.7823	0.278	0.5047	0.0083	**106.72**
11. Portugal	0.0280	0.00046	0.1706	2.5892	0.7678	0.302	0.2047	0.0065	**180.16**
12. Spain	0.0268	0.01234	0.1439	1.8603	0.9556	0.046	0.7977	0.0012	**92.53**

Total	i=I/Y	n	α	Ω	β^*	B*	δ_0	g_A^*	$1/\lambda^*$
1. Indonesi	0.3446	0.01255	0.3311	1.7536	0.7438	0.344	0.4731	0.0883	**18.21**
2. Korea	0.1708	0.00554	0.2201	3.0206	0.8157	0.226	0.2569	0.0315	**36.09**
3. Malaysi	0.4381	0.01669	0.2696	2.7604	0.8152	0.227	0.3158	0.0810	**14.80**
4. Philippin	(0.0452)	0.01746	0.1184	0.2799	0.1625	5.153	0.2235	(0.0379)	**71.30**
5. Singapor	0.2055	0.02119	0.3959	2.7001	0.8703	0.149	0.4783	0.0266	**37.45**
6. Thailand	0.2661	0.00315	0.2117	3.6110	0.8289	0.206	0.1863	0.0455	**25.30**
7. Banglad	0.1193	0.01204	0.0927	0.9804	0.5696	0.756	1.0706	0.0514	**137.03**
8. Pakistan	(0.0271)	0.01697	0.3194	0.3593	0.2030	3.926	0.2514	(0.0216)	**216.02**
9. Saudi Ara	0.1662	0.00000	0.2799	2.0211	0.7373	0.356	0.3181	0.0437	**33.59**
10. Sri Lan	0.2510	0.00812	0.1039	1.5179	0.6488	0.541	0.3201	0.0882	**14.88**
11. Czech R	0.2069	0.00000	0.1677	3.3194	0.7995	0.251	0.1327	0.0415	**27.80**
12. Poland	0.1171	0.00000	0.0924	1.3482	0.5976	0.673	0.2450	0.0471	**28.11**

Data source: KEWT 8.14 of 86 countries by sector, 1990-2012, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Table EP2 Seven endogenous parameters for 36 countries, 2012: the government sector

GGG	$i_G=I_G/Y_G$	n_G	α_G	$\Omega_G=K_G/Y_G$	β^*_G	B^*_G	δ_{G0}	$g_A{}^*_G$	$1/\lambda^*_G$
1. the US	0.6242	0.0141	0.2321	4.9333	0.8818	0.134	0.2057	0.0738	**14.40**
2. Japan	0.3603	(0.0008)	(0.2811)	19.7656	0.9365	0.068	(0.1091)	0.0229	**41.01**
3. Australi	0.3124	0.0136	0.1944	2.8563	0.8095	0.235	0.2744	0.0595	**18.46**
4. France	0.0943	0.0112	(0.1069)	1.4851	0.6507	0.537	0.3643	0.0330	**29.96**
5. Germany	0.0382	(0.0026)	0.0315	1.4701	0.5616	0.781	(0.5560)	0.0167	**42.62**
6. the UK	0.0489	0.0114	(0.2553)	1.0050	0.5775	0.732	0.9841	0.0206	**68.08**
7. China	0.2288	0.0064	0.1218	1.5155	0.6500	0.538	0.3283	0.0801	**16.84**
8. India	0.5307	0.0000	0.2355	4.1837	0.8455	0.183	0.1580	0.0820	**14.48**
9. Brazil	0.0350	0.0267	0.0066	1.4655	1.0469	(0.045)	0.8769	(0.0016)	**37.96**
10. Mexic	0.3848	0.0125	0.2451	3.4351	0.8415	0.188	0.2609	0.0610	**18.35**
11. Russia	0.0083	(0.0019)	0.1165	0.3124	0.2088	3.790	0.1269	0.0066	**243.97**
12. S.Afric	0.0194	0.0295	(0.1421)	0.4614	0.7885	0.268	1.5877	0.0041	**32.00**

GGG	$i_G=I_G/Y_G$	n_G	α_G	$\Omega_G=K_G/Y_G$	β^*_G	B^*_G	δ_{G0}	$g_A{}^*_G$	$1/\lambda^*_G$
1. Denmark	0.0327	0.0036	(0.1071)	1.4164	0.6301	0.587	0.3463	0.0121	**84.14**
2. Finland	0.0453	0.0037	(0.0329)	1.9116	0.7048	0.419	0.2556	0.0134	**72.53**
3. Netherla	0.0674	0.0024	(0.0655)	2.0995	0.6890	0.451	0.0677	0.0209	**45.28**
4. Norway	0.0614	0.0101	0.0964	1.2568	0.6704	0.492	0.6781	0.0202	**63.86**
5. Sweden	0.0436	0.0139	0.0571	1.1932	0.7280	0.374	0.8205	0.0119	**65.80**
6. Canada	0.2198	0.0101	0.1029	1.9605	0.7165	0.396	0.2738	0.0623	**18.40**
7. Greece	0.2825	0.0012	(0.9954)	5.2650	0.7314	0.367	(0.6583)	0.0759	**7.80**
8. Iceland	0.1521	0.0123	(0.0239)	1.6012	0.6629	0.509	0.3038	0.0513	**20.72**
9. Ireland	0.2832	0.0110	(0.2200)	4.6975	0.8330	0.200	0.0375	0.0473	**16.96**
10. Italy	0.1324	0.0061	(0.0224)	1.8443	0.6750	0.482	0.1625	0.0430	**23.64**
11. Portuga	0.0599	0.0005	(0.1682)	3.6039	0.7621	0.312	(0.1012)	0.0143	**61.57**
12. Spain	0.4097	0.0123	(0.2867)	1.7305	0.5986	0.671	(0.3719)	0.1644	**4.14**

GGG	$i_G=I_G/Y_G$	n_G	α_G	$\Omega_G=K_G/Y_G$	β^*_G	B^*_G	δ_{G0}	$g_A{}^*_G$	$1/\lambda^*_G$
1. Indones	0.3920	0.0126	0.2406	2.1309	0.7574	0.320	0.3356	0.0951	**13.75**
2. Korea	0.0369	0.0055	0.1432	1.4148	0.7040	0.420	0.5995	0.0109	**109.64**
3. Malaysi	0.3410	0.0167	0.0896	4.7086	0.8770	0.140	0.2114	0.0419	**20.72**
4. Philippi	0.0444	0.0175	(0.1767)	1.4205	0.8019	0.247	0.7490	0.0088	**43.94**
5. Singapo	0.0827	0.0212	0.5012	1.7766	0.8826	0.133	0.7151	0.0097	**74.98**
6. Thailan	0.1712	0.0032	0.1712	4.2006	0.8484	0.179	0.1664	0.0260	**41.23**
7. Banglad	0.3085	0.0120	0.3085	3.3217	0.8515	0.174	0.3126	0.0458	**25.12**
8. Pakistan	0.2764	0.0170	(1.6449)	5.0523	0.7656	0.306	(0.3686)	0.0648	**7.49**
9. Saudi Ar	0.2831	0.0000	0.0446	2.7658	0.7433	0.345	0.0429	0.0727	**14.37**
10. Sri Lar	0.5249	0.0081	(0.1514)	3.1040	0.7439	0.344	(0.0620)	0.1344	**6.57**
11. Czech I	0.2945	0.0000	0.0606	3.1131	0.7682	0.302	0.0522	0.0683	**15.45**
12. Poland	0.2193	0.0000	(0.0936)	1.6326	0.5989	0.670	(0.2233)	0.0880	**9.29**

Data source: KEWT 8.14 of 86 countries by sector, 1990-2012, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Table EP3 Seven endogenous parameters for 36 countries, 2012: the private sector

PRI	$i_{PR}=I_{PR}/Y_{PR}$	n_{PRI}	α_{PRI}	$\Omega_P=K_P/Y_P$	β^*_{PRI}	B^*_{PRI}	δ_{0PRI}	$g^*_{A\ PRI}$	λ^*_{PRI}
1. the US	(0.1248)	0.01412	0.1368	0.9779	0.4831	1.070	0.6690	(0.0645)	**109.16**
2. Japan	(0.0312)	(0.00079)	0.1919	6.5807	0.9087	0.101	0.1799	(0.0029)	**336.33**
3. Australi	0.1767	0.01363	0.1693	2.6972	0.8154	0.226	0.3322	0.0326	**30.21**
4. France	0.0733	0.01123	0.1766	1.8334	0.7789	0.284	0.5186	0.0162	**58.67**
5. Germany	0.0527	(0.00265)	0.1218	1.9864	0.6622	0.510	(0.0199)	0.0178	**63.23**
6. the UK	0.0241	0.01144	0.3173	0.9664	0.7778	0.286	1.0272	0.0053	**130.48**
7. China	0.4426	0.00636	0.4796	3.0537	0.8615	0.161	0.3894	0.0613	**24.55**
8. India	0.2638	0.00000	0.2419	1.9556	0.7207	0.388	0.2923	0.0737	**19.17**
9. Brazil	0.0161	0.02672	0.2497	1.4762	1.4804	(0.325)	0.6539	(0.0077)	**57.56**
10. Mexic	0.1329	0.01248	0.0887	1.4639	0.6716	0.489	0.4674	0.0436	**28.89**
11. Russia	0.1818	(0.00188)	0.3162	1.0739	0.6062	0.650	0.8347	0.0716	**94.81**
12. S.Afric	0.1709	0.02948	0.1707	1.0953	0.6563	0.524	0.8592	0.0588	**30.57**
PRI	$i_{PR}=I_{PR}/Y_{PR}$	n_{PRI}	α_{PRI}	$\Omega_P=K_P/Y_P$	β^*_{PRI}	B^*_{PRI}	δ_{0PRI}	$g^*_{A\ PRI}$	λ^*_{PRI}
1. Denmark	0.0380	0.00358	0.1780	2.1120	0.7762	0.288	0.3989	0.0085	**124.13**
2. Finland	0.1146	0.00371	0.1456	1.8550	0.7043	0.420	0.2882	0.0339	**36.64**
3. Netherla	0.0674	0.0024	(0.0655)	2.0995	0.6890	0.451	0.0677	0.0209	**45.28**
4. Norway	1.2705	0.01012	0.3346	4.3321	0.8726	0.146	0.2379	0.1619	**7.68**
5. Sweden	0.0704	0.01386	0.1510	1.7249	0.7841	0.275	0.5774	0.0152	**54.98**
6. Canada	0.1927	0.01015	0.1305	3.0735	0.8166	0.225	0.2483	0.0353	**28.26**
7. Greece	(0.0044)	0.00117	0.3945	2.6934	0.6843	0.461	(0.2811)	(0.0014)	**945.84**
8. Iceland	0.2338	0.01227	0.1377	3.0268	0.8152	0.227	0.2539	0.0432	**23.36**
9. Ireland	0.1889	0.01104	0.4943	4.2284	0.9203	0.087	0.4108	0.0150	**69.22**
10. Italy	0.0098	0.00611	0.1921	1.8964	1.0538	(0.051)	0.7849	(0.0005)	**207.20**
11. Portuga	0.0200	0.00046	0.2553	2.3355	0.7714	0.296	0.3025	0.0046	**282.99**
12. Spain	(0.0631)	0.01234	0.2449	1.8908	0.6124	0.633	(0.3925)	(0.0244)	**40.47**
PRI	$i_{PR}=I_{PR}/Y_{PR}$	n_{PRI}	α_{PRI}	$\Omega_P=K_P/Y_P$	β^*_{PRI}	B^*_{PRI}	δ_{0PRI}	$g^*_{A\ PRI}$	λ^*_{PRI}
1. Indones	0.3376	0.01255	0.3446	1.6973	0.7413	0.349	0.4976	0.0873	**19.20**
2. Korea	0.2064	0.00554	0.2406	3.4475	0.8369	0.195	0.2433	0.0337	**33.70**
3. Malaysi	0.4573	0.01669	0.3051	2.3754	0.7959	0.256	0.3643	0.0933	**14.10**
4. Philippi	(0.0550)	0.01746	0.1504	0.1560	0.1157	7.644	0.0866	(0.0486)	**33.81**
5. Singapo	0.2401	0.02119	0.3662	2.9606	0.8720	0.147	0.4343	0.0307	**32.45**
6. Thailan	0.2872	0.00315	0.2207	3.4798	0.8245	0.213	0.1939	0.0504	**23.20**
7. Banglad	0.1006	0.01204	0.0714	0.7489	0.4987	1.005	(54.6692)	0.0504	**0.35**
8. Pakistan	(0.0381)	0.01697	0.3906	0.1891	0.1759	4.686	(0.0784)	(0.0314)	**42.47**
9. Saudi Ar	0.1185	0.00000	0.3759	1.7169	0.7334	0.363	0.4659	0.0316	**59.29**
10. Sri Lan	0.2101	0.00812	0.1420	1.2809	0.6206	0.611	0.4968	0.0797	**21.24**
11. Czech I	0.1761	0.00000	0.2053	3.3920	0.8102	0.234	0.1584	0.0334	**35.55**
12. Poland	0.0931	0.00000	0.1360	1.2814	0.5973	0.674	0.3709	0.0375	**42.39**

Data source: KEWT 8.14 of 86 countries by sector, 1990-2012, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Chapter 8

Table R4 Two risks, δ_0 and *the speed years* based on the capital-output ratio: stable vs. instable

Total economy	Omega						Test of caluculation	3.0000	Stable case in the endogenous-equilibirum			
	0.4000	0.5000	0.6000	0.8000	1.2000	1.5000	2.0000	3.0000	4.0000	5.0000	6.0000	1.0000
LN(Ω)	(0.9163)	(0.6931)	(0.5108)	(0.2231)	0.1823	0.4055	0.6931	1.0986	1.3863	1.6094	1.7918	0.0000
$r^*=\alpha/\Omega$	0.5000	0.4000	0.3333	0.2500	0.1667	0.1333	0.1000	0.0667	0.0500	0.0400	0.0333	0.2000
beta*	0.3616	0.4171	0.4646	0.5417	0.6496	0.7058	0.7726	0.8535	0.9006	0.9315	0.9533	0.6017
B^*	1.7655	1.3977	1.1525	0.8460	0.5395	0.4169	0.2943	0.1716	0.1103	0.0736	0.0490	0.6621
LN(B^*)	0.5684	0.3348	0.1419	(0.1673)	(0.6172)	(0.8750)	(1.2233)	(1.7623)	(2.2041)	(2.6096)	(3.0151)	(0.4124)
LN(Ω)/LN(B^*	(1.6119)	(2.0702)	(3.5993)	1.3341	(0.2954)	(0.4634)	(0.5666)	(0.6234)	(0.6289)	(0.6167)	(0.5943)	0.0000
delta$_0$	**(0.612)**	**(1.070)**	**(2.60)**	2.3341	0.7046	0.5366	0.4334	0.3766	0.3711	0.3833	0.4057	1.0000
i=I/Y	**0.075**		alpha	**0.2000**		n	**0.0075**					
g_A^*	0.0479	0.0437	0.0402	0.0344	0.0263	0.0221	0.0171	0.0110	0.0075	0.0051	0.0035	0.0299
1−delta$_0$	1.6119	2.0702	3.5993	(1.3341)	0.2954	0.4634	0.5666	0.6234	0.6289	0.6167	0.5943	0.0000
(1−delta$_0$)g	0.0772	0.0905	0.1445	(0.0459)	0.0078	0.0102	0.0097	0.0068	0.0047	0.0032	0.0021	0.0000
(1-α)n	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060
lambda*	0.0832	0.0965	0.1505	(0.0399)	0.0138	0.0162	0.0157	0.0128	0.0107	0.0092	0.0081	0.0060
Speed years	12.02	10.36	6.64	(25.09)	72.65	61.63	63.85	77.82	93.56	109.06	123.71	166.67

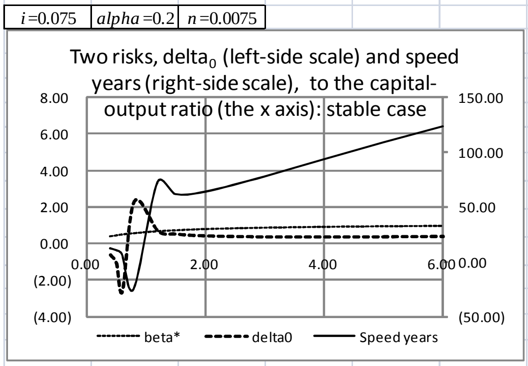
Fact findings

(1) Numerically, most risky point of equilibirum is *beta**=0.5 and *beta**>1.0 since capital is always plus.

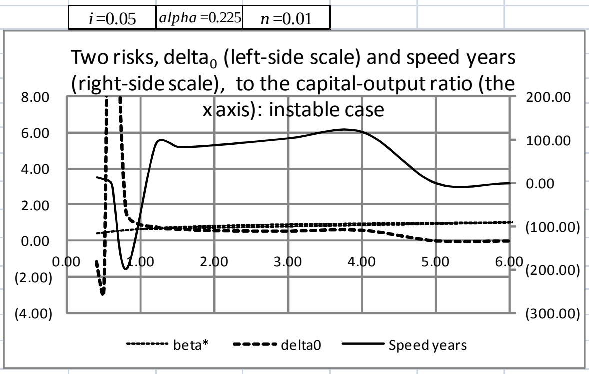
(2) If the inverse number of the capital-output ratio happens to be equal to B^*, the situation suddenly falls into disequilibrum.

(3) If the capital-output ratio becomes beyond a certain high level, the situation turns to disequilibirum, regardless of the level of B^*.

i=0.075 | *alpha*=0.2 | *n*=0.0075

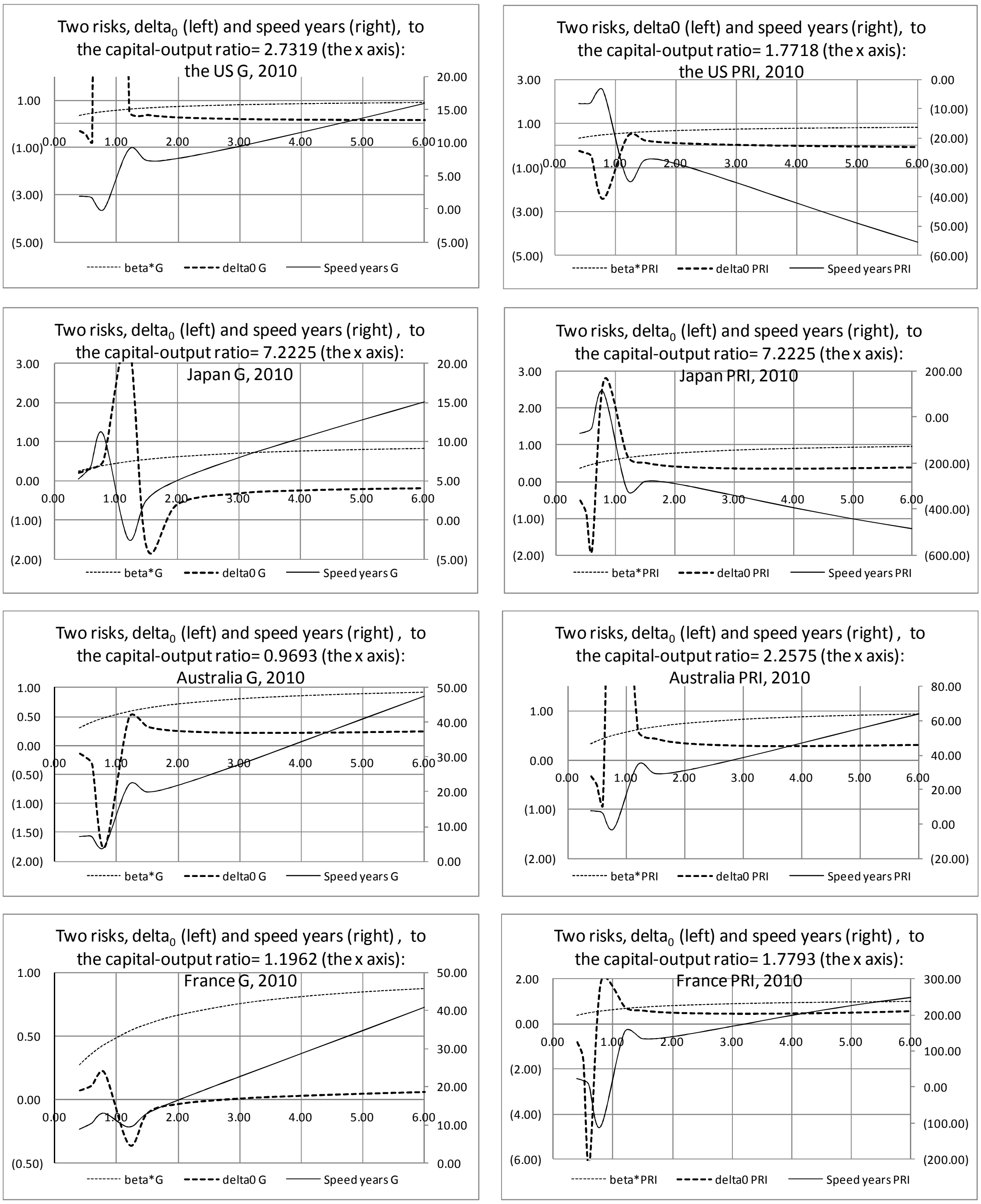


i=0.05 | *alpha*=0.225 | *n*=0.01



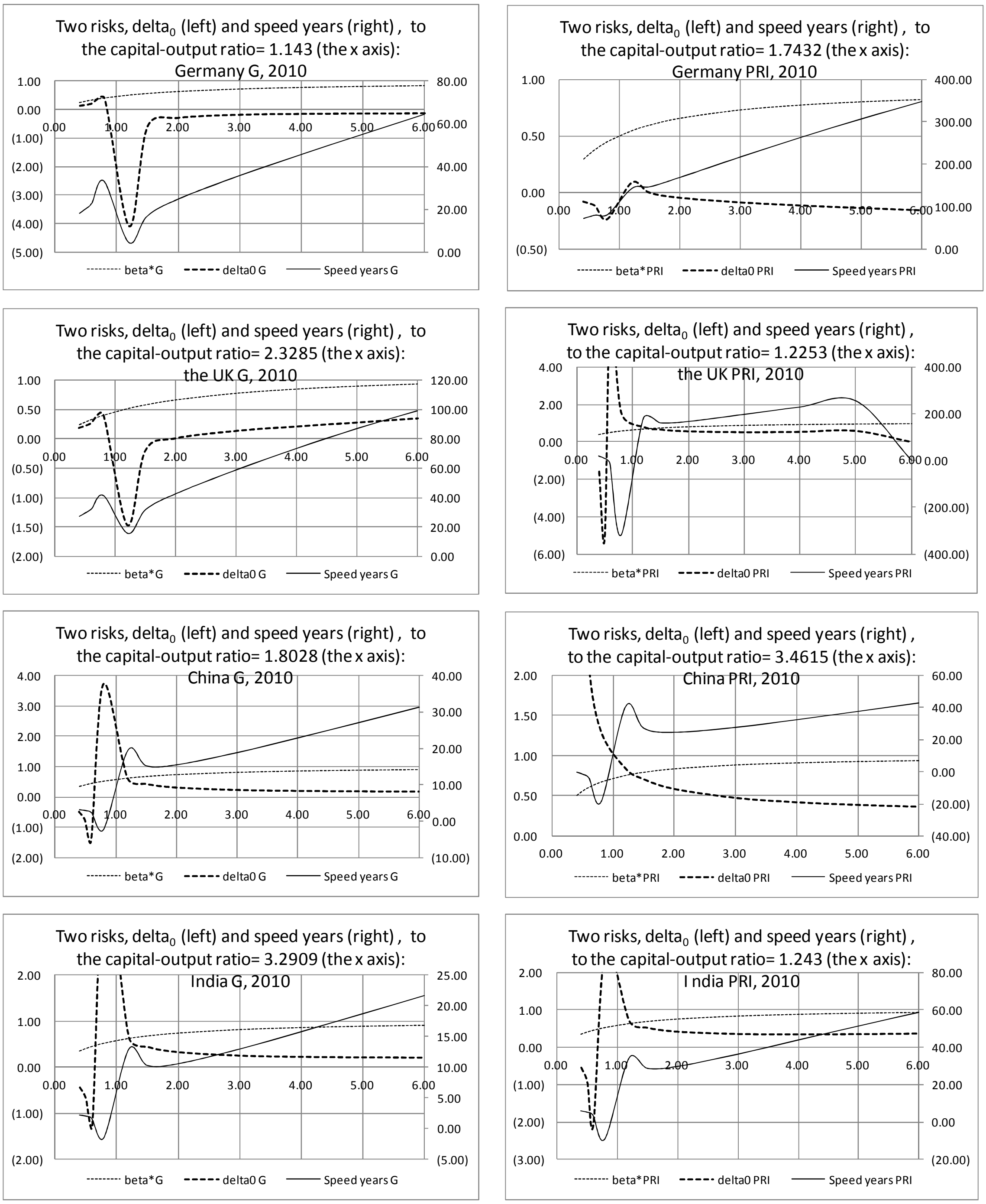
	Omega						Test of caluculation	3.0000	Instable case in the endogenous-equilibrium			
	0.4000	0.5000	0.6000	0.8000	1.2000	1.5000	2.0000	3.0000	4.0000	5.0000	6.0000	1.0000
LN(Ω)	(0.9163)	(0.6931)	(0.5108)	(0.2231)	0.1823	0.4055	0.6931	1.0986	1.3863	1.6094	1.7918	0.0000
$r^*=\alpha/\Omega$	0.5625	0.4500	0.3750	0.2813	0.1875	0.1500	0.1125	0.0750	0.0563	0.0450	0.0375	0.2250
beta*	0.3953	0.4551	0.5062	0.5888	0.7036	0.7631	0.8336	0.9185	0.9678	1.0000	1.0227	0.6527
B^*	1.5300	1.1974	0.9757	0.6985	0.4213	0.3104	0.1996	0.0887	0.0333	0.0000	(0.0222)	0.5322
LN(B^*)	0.4253	0.1802	(0.0246)	(0.3588)	(0.8644)	(1.1698)	(1.6116)	(2.4225)	(3.4033)	#NUM!	#NUM!	(0.6308)
LN(Ω)/LN(B^*	(2.1545)	(3.8471)	20.7475	0.6219	(0.2109)	(0.3466)	(0.4301)	(0.4535)	(0.4073)	#NUM!	#NUM!	0.0000
delta$_0$	**(1.154)**	**(2.847)**	**21.75**	1.6219	0.7891	0.6534	0.5699	0.5465	0.5927	#NUM!	#NUM!	1.0000
i=I/Y	**0.050**		alpha	**0.2250**		n	**0.01**					
g_A^*	0.0302	0.0272	0.0247	0.0206	0.0148	0.0118	0.0083	0.0041	0.0016	0.0000	(0.0011)	0.0174
1−delta$_0$	2.1545	3.8471	(20.7475)	(0.6219)	0.2109	0.3466	0.4301	0.4535	0.4073	#NUM!	#NUM!	0.0000
(1−delta$_0$)g	0.0651	0.1048	(0.5123)	(0.0128)	0.0031	0.0041	0.0036	0.0018	0.0007	#NUM!	#NUM!	0.0000
(1-α)n	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
lambda*	0.0729	0.1126	(0.5046)	(0.0050)	0.0109	0.0119	0.0113	0.0096	0.0084	#NUM!	#NUM!	0.0078
Speed years	13.72	8.88	(1.98)	(198.52)	91.94	84.35	88.28	104.20	118.97	#NUM!	#NUM!	129.03

Note: The figure on the LHS shows a stable combination of δ_0 and *the speed years*. The figure on the RHS shows an instable combination of δ_0 and *the speed years*. When the level of the capital-output ratio stays at 0.5 or so, any economy is difficult to control the level of equilibrium expressed by *the speed years*. When the level of the capital-output ratio increases more than 3.0 or 4.0 partly due to extreme deficit, the economy also suffers from a high speed years.



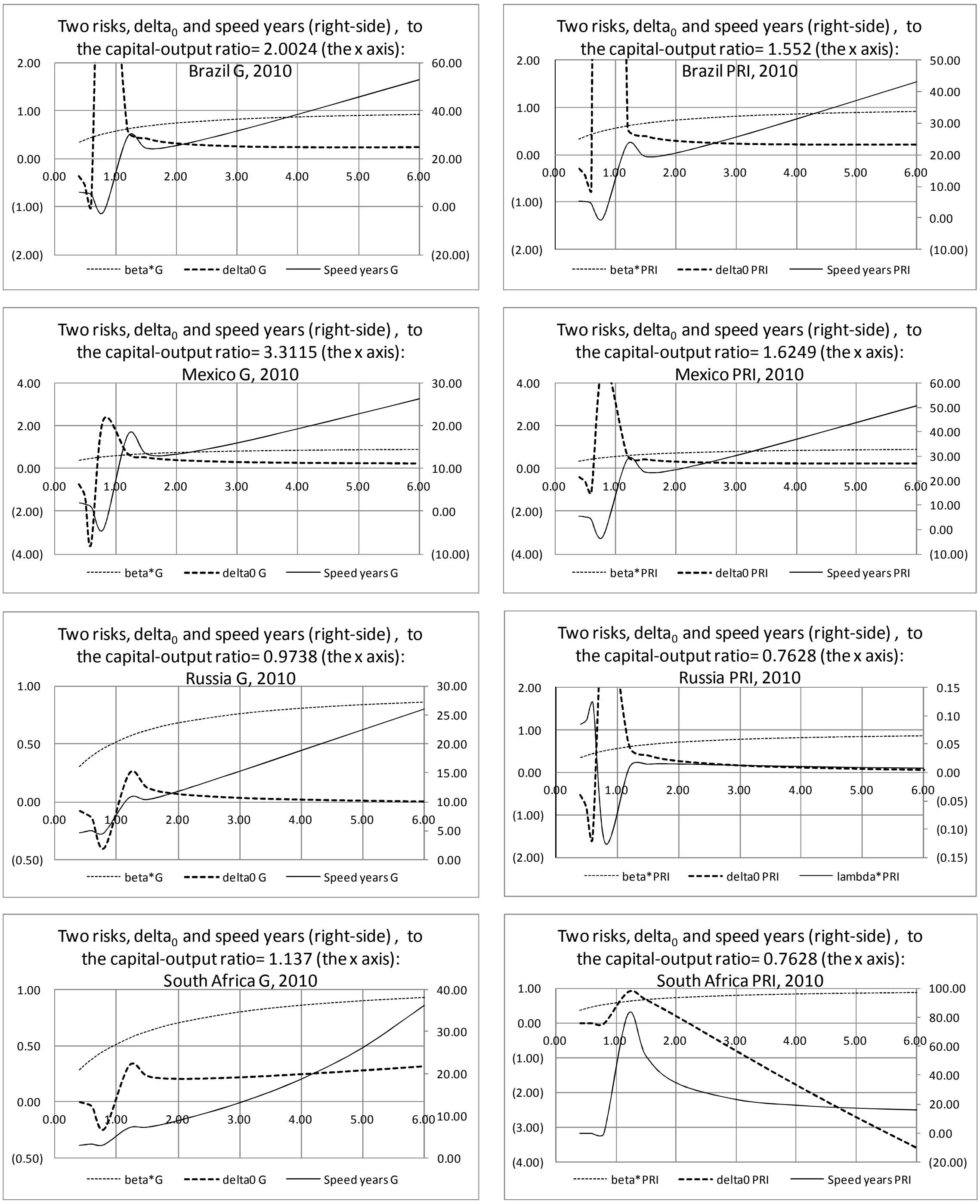
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R1 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: the US, Japan, Australia, and France



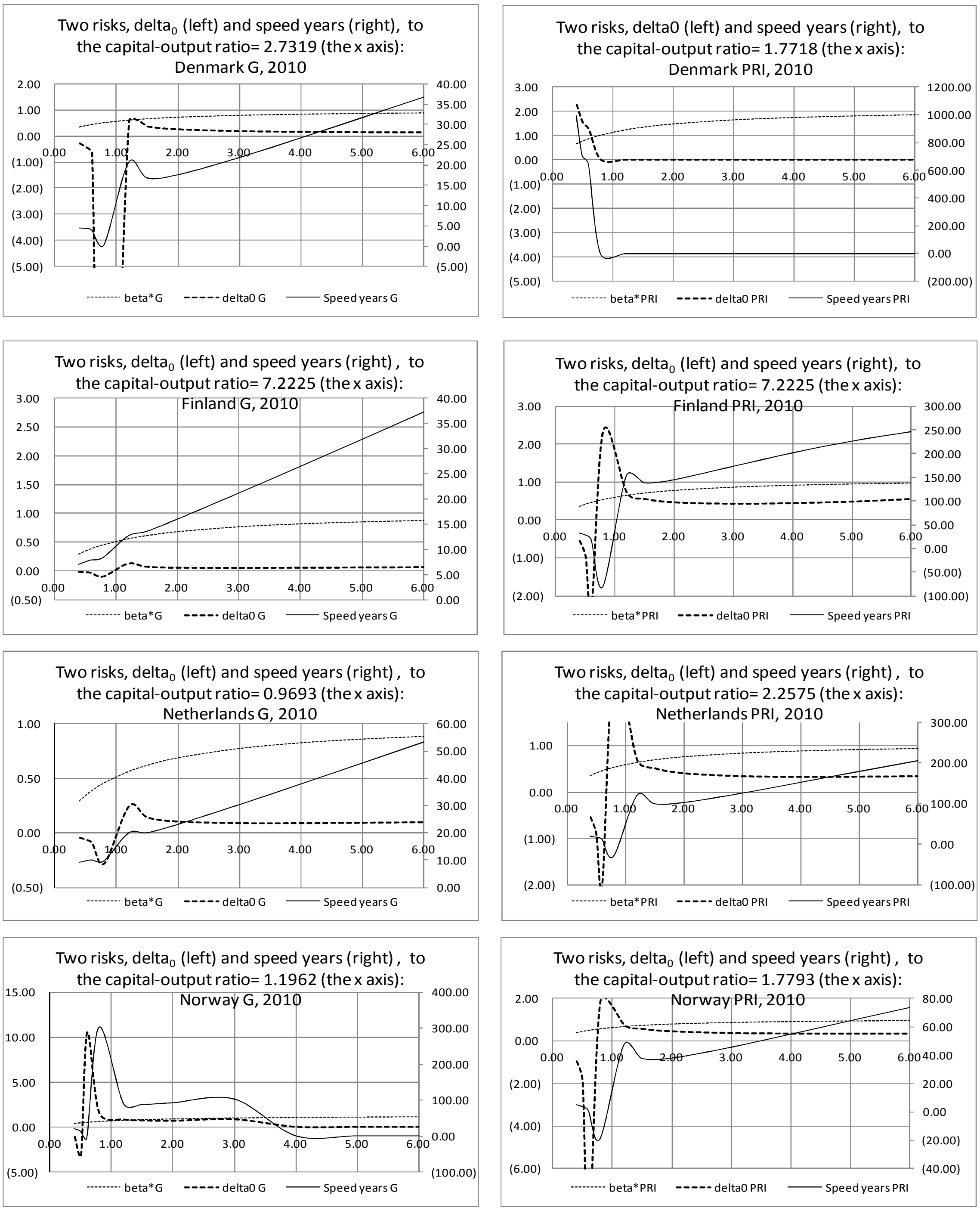
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R2 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Germany, the UK, China, and India



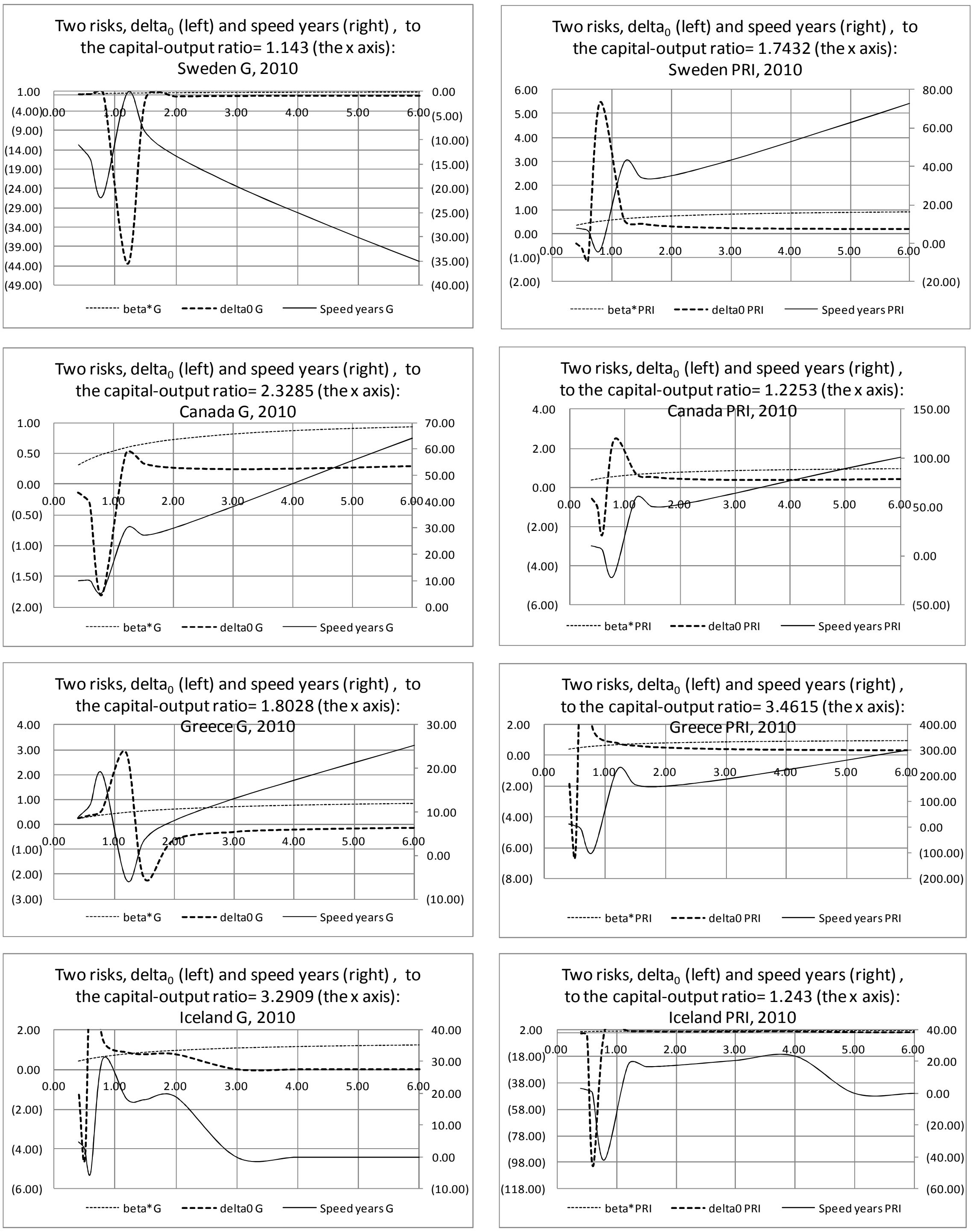
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R3 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Brazil, Mexico, Russia, and South Africa



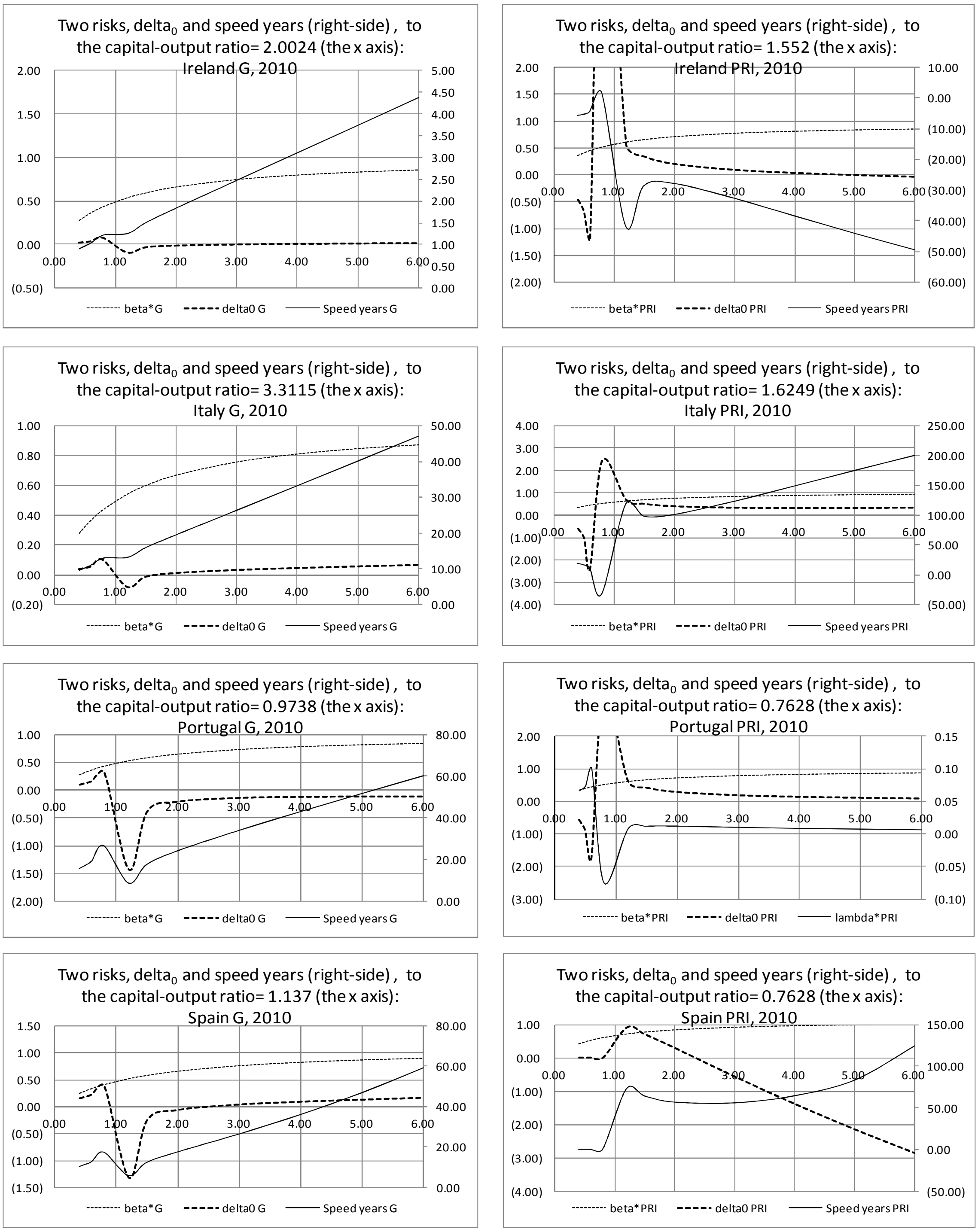
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R4 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Denmark, Finland, Netherlands, and Norway



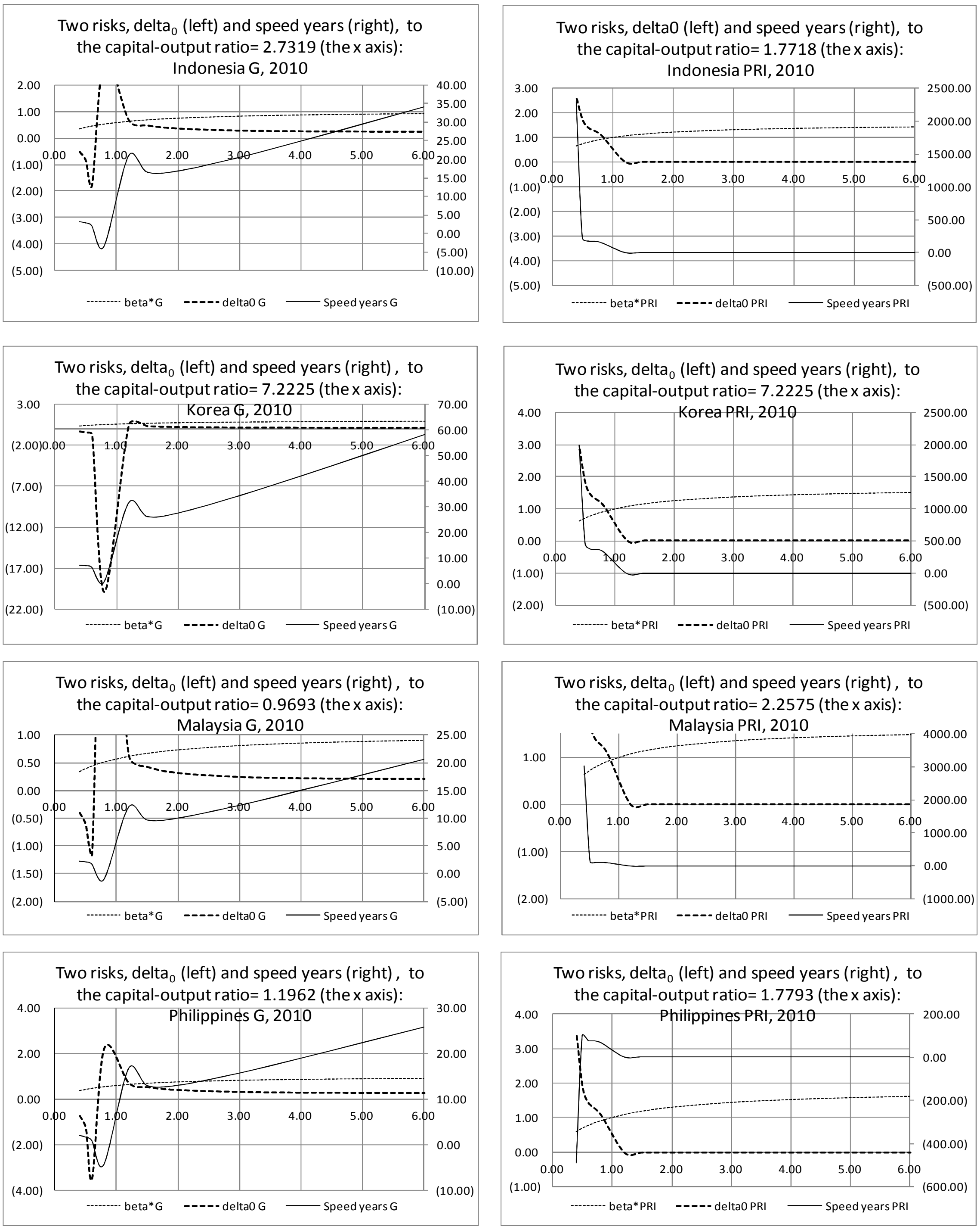
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R5 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Sweden, Canada, Greece, and Iceland



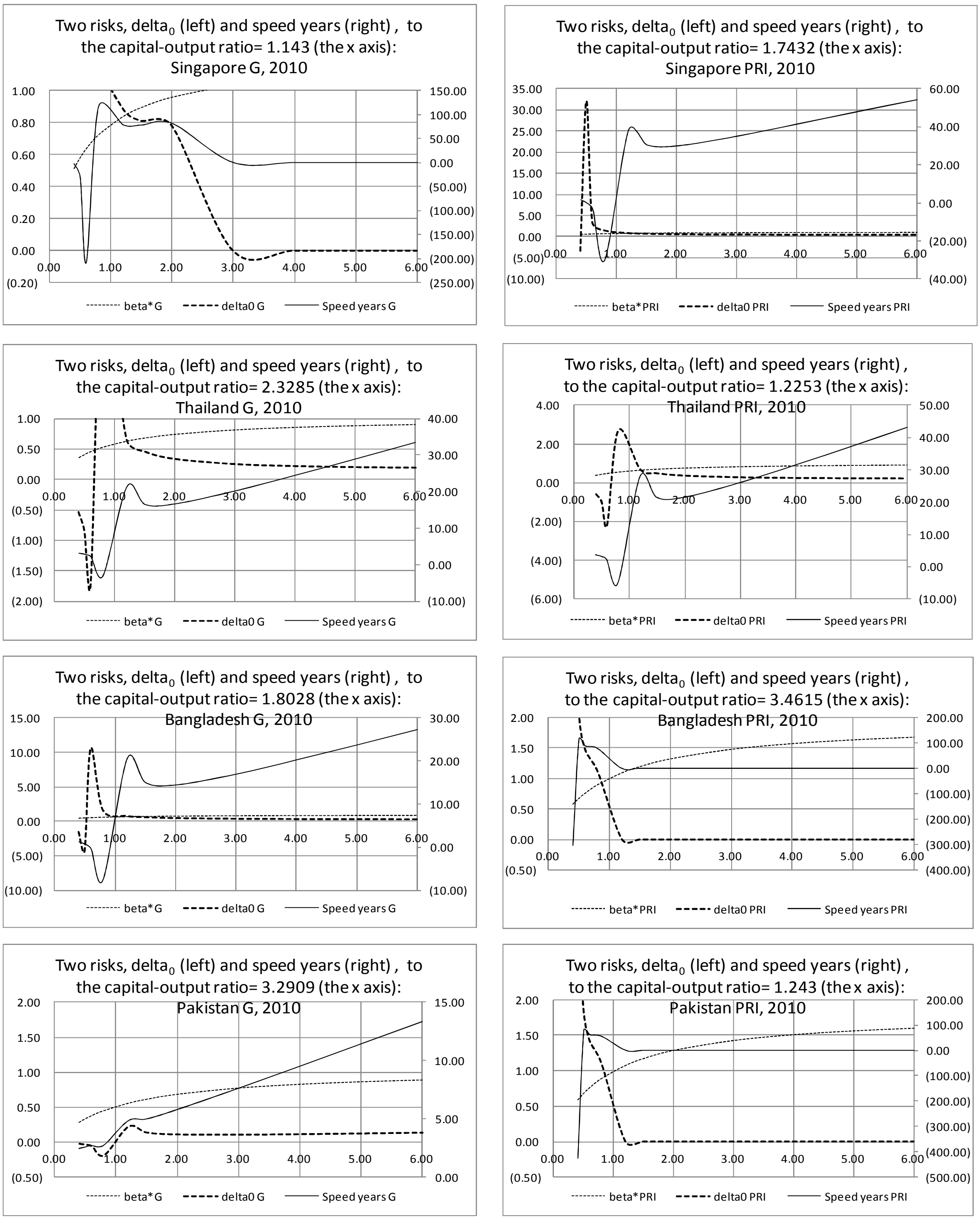
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R6 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Ireland, Italy, Portugal, and Spain



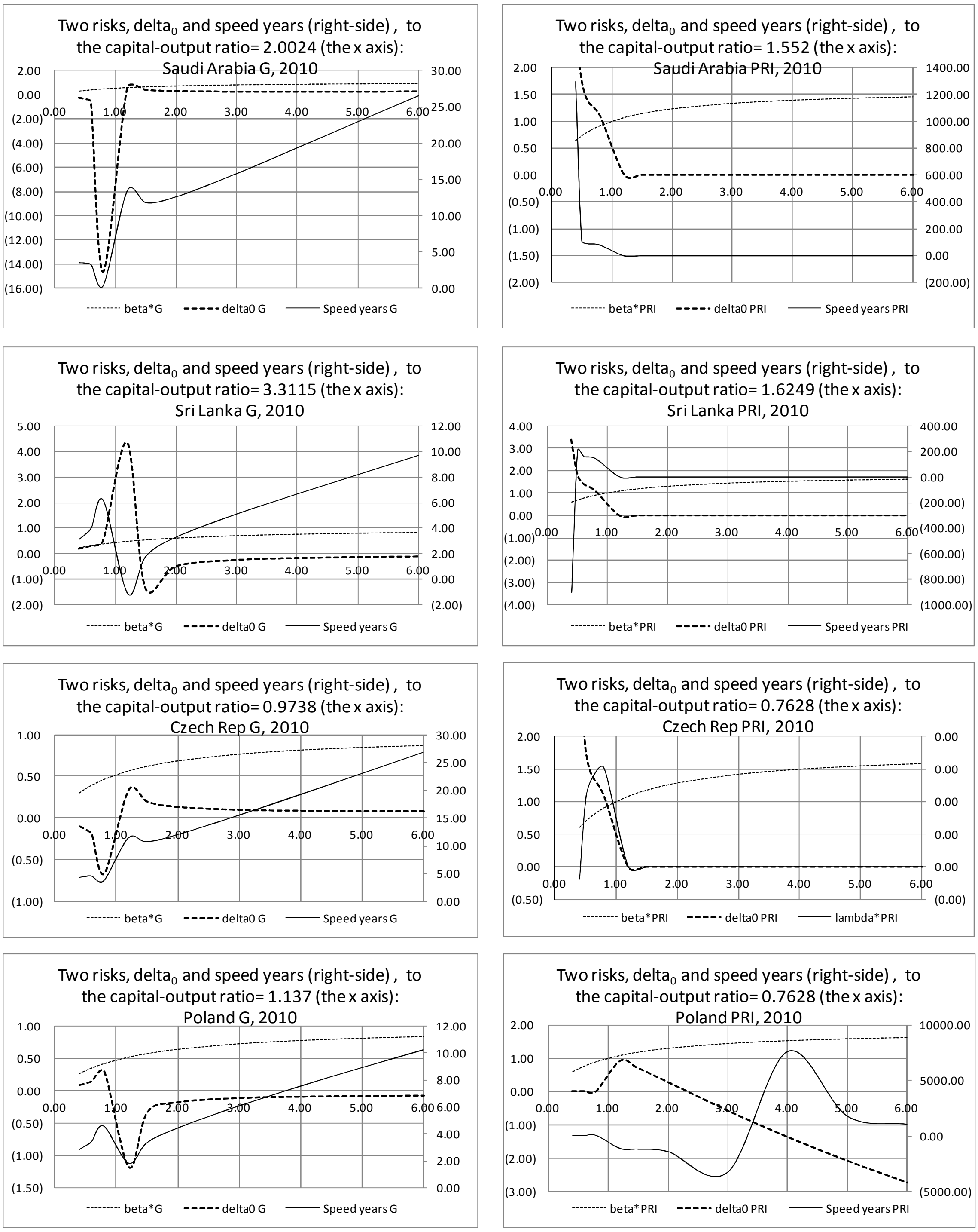
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R7 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Indonesia, Korea, Malaysia, and Philippines



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R8 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Singapore, Thailand, Bangladesh, and Pakistan



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and fifteen original data for the financial assets each come from *International Financial Statistics Yearbook*, IMF.

Figure R9 Two risks, δ_0 and *the speed years*, sensitive to the capital-output ratio as a base: Saudi Arabia, Sri Lanka, Czech Rep, and Poland

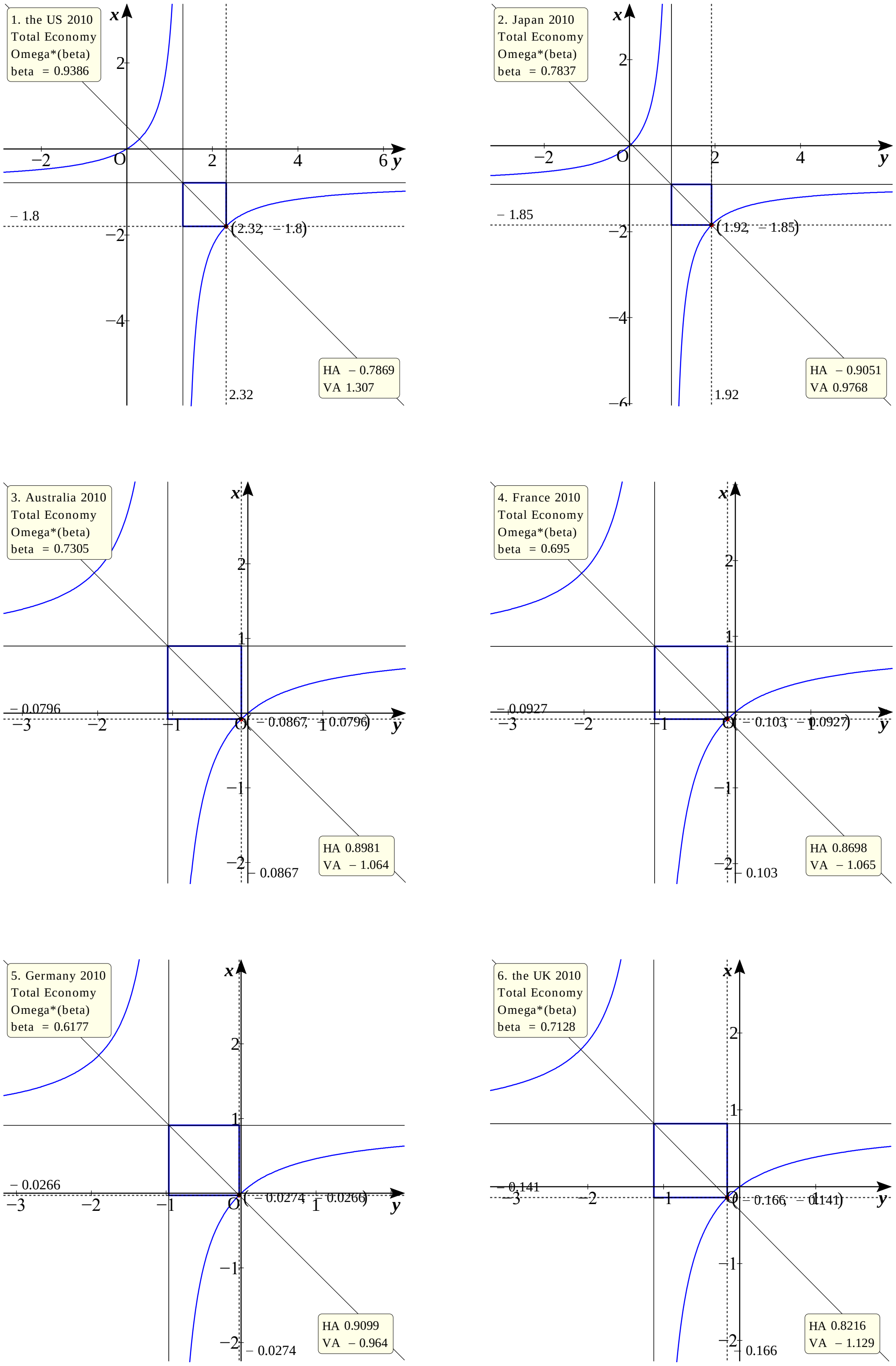


Figure H10 $\Omega(\beta^*)$ by country 2010: the US, Japan, Australia, France, Germany, the UK

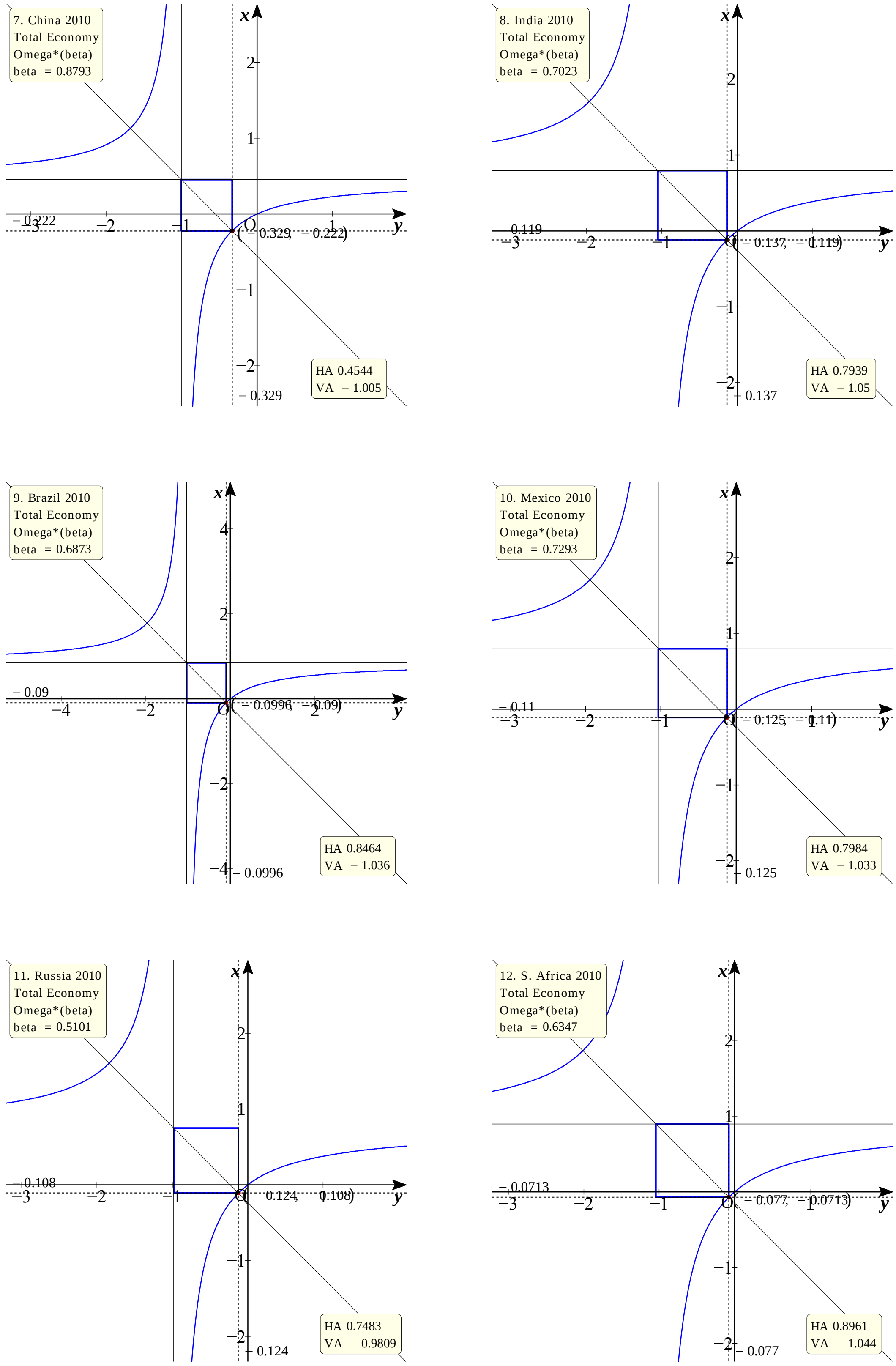


Figure H11 Hyperbola of $\Omega(\beta^*)$: China, India, Brazil, Mexico, Russia, South Africa, 2010

Chapter 9

Empirical Proof of the Flexibility of the Wage Rate and the Rate of Return in Endogenous Equilibrium

9.1 Introduction with Questions again and again

The author has had several serious questions. The author has been motivated by these questions. Why do the world economies repeat bubbles once or twice within one decade? What are true causes of budgetary deficit? The author protests superficial answers to these questions, saying 'Oh no, your answers remain some parts of whole results or lead to short-sighted countermeasures.' True causes may be clarified in such a way of 'Scientific Revolutions,' as advocated by Thomas S. Kuhn (1962, 1996). This Chapter compares the flexibility of the wage rate and the rate of return with marginal productivities of labor and capital and, emphasizes true results to correct varying answers. One aspect here is the characteristics of the wage rate and the rate of return measured by endogenous and actual data of the real assets in national accounts. This Chapter concisely presents examples of actual data vs. endogenous data for the above flexibility.

Backgrounds of various aspects spread over the following questions:

- Do you think that policies conquer bubbles?
- Do you think that policies conquer high inflation or continuous deflation (as in Japan)?
- Do you think that policies conquer unemployment?
- Do you think that policies conquer deflation?
- Do you think that the causes of economic results have been clarified already?
- Do you distinguish countermeasures with essential solutions?
- Do you distinguish policies with strategies to support policies?
- Does ample money supply present a true clue to solve the above causes?
- Does one-sided tax reduction present a true clue to solve the above causes?
- Does huge deficit present a true clue to solve the above causes?
- Does huge tariffs and subsidies present a true clue to solve the above causes?
- What is the cause of 'one-sided tax reduction'?
- What is the cause of 'huge deficit and cash flow out'?
- What is the cause of 'ample money supply'?
- What is the cause of 'bubbles and high inflation'?
- What is the cause of 'low growth and deflation'?

This chapter starts with a definition of the endogenous-equilibrium. This definition is essential for understanding Author's endogenous organic system. The endogenous-equilibrium is guaranteed by the marginal productivities of labor and capital, $MPL = \partial Y/\partial L = w$ and $MPK = \partial Y/\partial K = r^*$. The two equality equations were proved by

Robinson, J. (1934) by applying the Euler's Theorem to the linear homogeneous production function (under the constant returns to scale). Author's KEWT database by country and year in the endogenous-equilibrium measures $MPL = w$ and $MPK = r^*$, deleting the assumptions set in the literature.

Simultaneous measurement of $MPL = w$ and $MPK = r^*$ makes it possible for researchers to test the characteristics of the wage rate w and the rate of return r^*; flexible or inflexible by year in the endogenous organic system. If w and r^* are really flexible by year, the state realizes an endogenous equilibrium. What does this mean? It means that economic policies are able to control an economy in the real assets and without being interrupted by short-sighted funds in the markets. More fundamentally, it means that perfect competition exists in economies and extra returns are zero. Assumption of perfect competition is deleted if the flexibility of w and r^* prevails. Why is the assumption of perfect competition in the literature so important?[1] This is discussed in the methodology below.

Certainly, the price-equilibrium has been assumed for the last three centuries by economists. The price-equilibrium holds actually and always in economies. The balance between macro demand and supply has been simultaneously recovered by the price-equilibrium. This is true. A problem is: this assumption hides true causes of results. For example, deficit immediately recovers the unbalance between macro demand and supply but, without specifying its causes and solving these causes. Someone, for example, claims that for recovering disequilibrium, tax and expenditure reduction with ample money supply have saved crises. But, these executions remain counterparts and aggravate the unbalance in the long run since true causes are not taken away.

Two problems exist even today: (1) The price-equilibrium does not clarify the process recovering from disequilibrium. (2) There exists Samuelson's (1998) dictum lying between the macro and micro levels, as discussed by Jung, J. and Shiller, R. J. (221-228, 2004) using the stock market. Someone says that the price-equilibrium is measured using computer science power. But, how does this measurement by country catch the changes in economic policies by country and by year in the dramatically changing global world?

Lucas's critique (1976), in fact, has not been solved in terms of causes and results in a strict sense, when actual statistics data are only used for econometrics. Moreover, there are various causes behind the price-equilibrium and, even a genius cannot clarify fundamental causes since the whole numerical system is alive like a human body and

[1] Samuelson, P. A. (1957) showed a dissection of Marxian economic models, where a definite defect was traced back to imperfect competition. This is a reply to historical marginal productivity theory (endogenous MPT).

cannot be divided into separable factor parts. Causes ceaselessly change by year and over years.

9.2 Methodology with Some Aspects

For methodology, the endogenous-equilibrium is a surrogate for the price-equilibrium yet, clarifies fundamental causes by measuring the following seven endogenous parameters: (1) Four: The ratio of net investment to output, $i = I/Y$, the rate of change in population in equilibrium, n_E, and the relative share of capital, $\alpha = \Pi/Y$. These four ratios are each fixed at the KEWT database and its transitional path by year. Note that $i_G = I_G/Y_G$ in the government sector is additionally required for the endogenous-equilibrium. (2) Three: The quantitative/qualitative net investment coefficient, β^* or $1 - \beta^*$, the capital-output ratio, $\Omega = K/Y$, and the diminishing returns to capital (DRC) coefficient, $\delta_0 = 1 + LN(\Omega^*)/LN(B^*)$. These three ratios each change at the KEWT database and its transitional path by year. As a result, the rate of return, $r^* = \alpha/\Omega$, is measured at once, where the growth rate of output, g_Y^*, is connected with the rate of return, $r^* = (\alpha/i \cdot \beta^*)g_Y^*$.

Returning back to $MPL = w$ and $MPK = r^*$, the marginal rate of substitution (MRS) is defined as the rate of return to the wage rate (r/w) in equilibrium, where just for abbreviation (r/w) is used instead of (r^*/w). The elasticity of substitution is defined by $\sigma = -\frac{\Delta k/k}{\Delta MRS/MRS} = -\frac{(\Delta K/L)/(K/L)}{\Delta(r/w)/(r/w)}$. For the process to formulate these equations and related researches, see earlier *PRSCE* 41 (Sep, 1): 277-350 and also *PRSCE* 50 (Feb, 2): 389-428. Note that these papers are not yet based on the endogenous system in the strictest sense today 2014.

When *sigma* as a result is flexible over years, it means that the economy is robust and the level of endogenous equilibrium is sustainable. If *sigma*, as a result, is inflexible over years, the economy is inflexible or loses sustainable robustness, falling into disequilibrium. How can the flexibility of *w* and *r* be recovered? Is it the answer to improve seven endogenous parameters? Then, how do seven endogenous parameters improve? These parameters are determined by the cause and effect relationships in the endogenous organic system. Note, however, that the recovery from inflexibility does not guarantee a robust sustainability of an economy. The flexibility remains one of sufficient conditions to support endogenous equilibrium. Both $MPL = w$ and $MPK = r^*$ are necessary conditions for endogenous equilibrium as clarified by the definition of the endogenous-equilibrium. The endogenous organic system under perfect completion measures and proves that at an optimum point of equilibrium the ratio of net investment to output is minimized, by using endogenous speed years by country and by sector. This implies that the least net investment produces the maximum returns in the endogenous organic system. The endogenous system does not follow maximum principle as shown by using parabolic equations in the literature but minimum net investment and maximum returns are guaranteed by using hyperbolas.

To the author's understanding, the rate of technological progress has never been measured at 'purely endogenous' in the literature, regardless of the differences between neo-classical and Keynesian. The author here interprets a rigid neo-classical methodology by Meade, J. E. (1962). Robinson, J. (1961) calls her model 'equilibrium growth.' Meade (ibid; for notations, see p.184-85), formulates two sectors for capital and consumer goods, and uses each saved share of profits, wages, and rents to national income; the rate of profits and the rate of interest; the rate of technical progress; and other values and their respective growth rate. Meade (107, ibid.) shows a parabolic curve of the growth rate of output, whose horizontal axis is output=national income, *Y*. The cross point of *Y* and the curve is shown by the capital-output ratio K/Y × the growth rate of *MPK* ÷ the elasticity of the rate of profit to capital. Meade distinguishes *MPK* with the rate of profit and, *MPL* with the wage rate, based on the real assets. If Meade could formulate his rate of technical progress endogenously, and if corresponding data had been available at that time, Meade would have been almost successful in integrating his whole model more endogenously. Meade, instead of using endogenous equations, assumed a number of elasticity values.

Author's endogenous system, on the other hand, always confirms *MPK*=*r* and *MPL*=*w*, as indicated above. Furthermore, the endogenous system measures the endogenous rate of inflation/deflation, with the endogenous rate of full-employment in equilibrium and, the endogenous rates of un-employment and over-employment in disequilibrium. Priority order of economic policies would be endogenous equilibrium, employment with low inflation, *MPL*=*w* and *MPK*=*r* and then, the flexibility of *w* and *r*. Mundell, R. A. published his "A Theory of Optimum Currency Areas" in 1961. From the point of the exchange rate, factor mobility within an area and outside of the area is most important; for example, within the EU and outside of the EU. The author is keen on the relationship between the flexibility of *w* and *r* and the mobility of factors, *K* and *L*. A complete mobility of factors shows a final stage of developed countries. Mobility cannot be far from the flexibility of *w* and *r*. Accordingly, the level of mobility is indirectly measured by the level of flexibility of *w* and *r*, as shown in this chapter. There has been no accurate measurement for the mobility by country hitherto.

Here first the author must express a viewpoint on Samuelson's (1970) constancy of the capital-output ratio at the KEWT database and its transitional path. The endogenous system maintains one presumption that the current/initial capital-output ratio is equal to the capital-output ratio at convergence in the transitional path, i.e. $\Omega = \Omega^* = \Omega_0$. This presumption produces another presumption of $r = r^* = r_0$ under a fixed relative share of capital/returns. $\Omega = \Omega^* = \Omega_0$ and $r = r^* = r_0$ are necessitated to avoid tautology.

Chapter 9

A question: Is the consistency common to recursive programming and the KEWT database? To answer this question, the author revisited the endogenous model starting with *JES* 7 (Feb, 1): 51-80, 2004. For the measurement of *MPL*=*w* and *MPK*=*r*, it is essential to simultaneously obtain the rate of return with capital stock by year, as pursued by Robinson, J. (1959): She argued that neither the rate of return under assumption of a given capital K nor capital K under assumption of a given rate of return r are justified. When *r* and *K* are simultaneously measured, endogenous equilibrium holds and its level is measured endogenously using the speed years, $1/\lambda^*$, $\lambda^* = (1-\alpha)n + (1-\delta_0)g_A^*$.

Next, policy-makers need to compare endogenous data with actual and market data by year. Otherwise, useful and prompt policy-decisions cannot be executed. How can the market rate, for example, the ten year debt yield be compared with the current rate of return in equilibrium? Assume that the current rate of return equals the rate of return at convergence: $r = r^* = r_0$. Ten year debt yield, $r_{M(DEBT)} = r_{M(10yrs)}$, is then compatible with $r = r^* = r_0$ in equilibrium. If the situation is under disequilibrium, $r_{M(DEBT)}$ = $r_{M(10yrs)}$ will rise up, but $r = r^* = r_0$ falling into 'out of measurement.' This is because the rate of return is close to the vertical asymptote in the hyperbola. The KEWT database and its recursive programming by year are always consistent (see Chapter 16).

9.3 Preparatory Processes towards the Tests of Flexibility

This section first raises the items selected for the tests of the wage rate and the rate of return and second, adds interpretations to some of fundamental items, since some data are not well available for low developing countries despite of the efforts of IMF.

First, selected items are the following. These items basically show the true cause and effect relationship towards each country's sustainable robustness in the endogenous-equilibrium.

1. Minimum items (I): i) $bop = BOP/Y$ is the balance of payments divided by endogenous national income *Y*. ii) $\Delta d = \Delta D/Y$ is budgetary deficit divided by *Y*. iii) $tax = Y_G/Y = T_{AX}/Y$ determines the size of government using endogenous taxes measured in the endogenous system. iv) $i_{FDI} = I_{FDI}/Y$ is the ratio of foreign direct investment to *Y* and shows private sector's investment abroad. The original data '79abd' at *IFSY*, IMF, is *FDI* as *stock* in International Investment Position (i.e., in the financial assets). The stock is converted to *flow* using *FDI* $\times$ r^*_{PRI} $\div$ *Y*, where the rate of return at the private sector $r^*_{PRI} = \Pi_{PRI}/K_{PRI}$. A robust developed country steadily increases $i_{FDI} = I_{FDI}/Y$ over years. The author needs to comment on the relationship between the flexibility of *w* and *r* in equilibrium and the mobility of factors, *K* and *L*. The author here points out that actual capital stock

K_{actual} is difficult to estimate by country, as proved by *JES* 12 (Feb, 2): 59-104, and that actual labor or population mobility needs specific statistics.

2. Minimum items (II): Endogenous net investment to Y, $i = I/Y$, is an engine for technology and growth. The comparison of actual and endogenous net investment, v) $i_{actu} = I_{actu}/Y_{actu}$ and vi) $i_{endo} = I_{endo}/Y_{endo}$, are most important and shows the level of sustainable robustness of an economy: vii) $i_{actu-endo} = i_{actu} - i_{endo}$ and viii) i_{actu}/i_{endo}.
3. Preferable item: $g_{w\ actu/endo} = g_{w\ actu}/g_{w\ endo}$ is the growth rate of the wage index, as shown by 65ey or 65eyc in *IFSY*, IMF. This item is more explained soon below.
4. Minimum items (III): ix) The actual ratio of r to w, $(r/w)_{actu}$, x) the endogenous ratio of r to w, $(r/w)_{endo}$, and xi) $(r/w)_{actu/endo} = (r/w)_{actu}/(r/w)_{endo}$. Author's (r/w) corresponds with the marginal rate of substitution (*MRS*) in the literature.

The total number of the above minimum items is eleven and the preferable item is one. Many developing countries will prepare for the wage index gradually in the future.

The above items basically imply that the more moderate the balance of payments and deficit, the more robust the base of an economy in equilibrium is. $bop = BOP/Y$ has a moderate plus and minus ranges for robustness but, the more close to $\Delta d = 0$ of an economy the broader flexible policies the economy could select.

Second, there are three levels of data accuracy for the tests of the wage rate and the rate of return as follows:

1. No actual data of the wage index (65ey or 65eyc in *IFSY*, IMF), as seen at KEWT 5.11-4 for 19 countries (Western Hemisphere, Near East, and Africa).
2. Actual data of the wage index (65ey or 65eyc in *IFSY*, IMF) are available, as seen at KEWT 5.11-1, 2, and 3 for 46=14+15+17 countries (Pacific and Asia, the EU, and Europe).
3. Additional data of actual wages and returns, using the SNA data by country, as seen at KEWT 5.11-6 for the US and Japan, 1960-2009, where actual wages produce the actual wage rate and, actual returns produce the actual rate of return.

When actual wages and returns are available at *IFSY*, IMF, in the future, then, the tests become perfect. The author here confirms that even without the above actual data 3., the wage rate is roughly tested though it is not perfect. For this confirmation, the author first tested the relationship between the wage rate and the rate of change in wages by using the US and Japan. The rate of change in wages is obtained directly by using the wage index. In fact, the wage rate has been significantly stable in the US and Japan, and the rate of change in wages has been sharply fluctuated. However, the author finds, the fluctuation of the rate of change in wages almost evenly has spread above and below the wage rate. This implies that the wage index can be a surrogate for 'actual wages' unable to obtain at *IFSY*, IMF statistics.

Likewise, when 'actual returns' are not available at IMF data, how can policy-makers find the actual rate of return? There is no way to find the actual rate of return. However, the author confirms that the trend of the actual rate of return has been close to that of the endogenous rate of return while the market rate for the short term has fluctuated sometimes sharply for the last two decades, as shown by the US and Japan. This implies that the endogenous rate of return exists as a base for the actual rate of return even if the actual rate of return is unknown.

For reinforcement, the author endogenously measures the elasticity of substitution, *sigma*, by using the ratio of the rate of return to the wage rate, (r/w), in equilibrium: $\sigma = \frac{-\Delta k/k}{\Delta(r/w)/(r/w)}$. $\Delta(r/w) = \Delta r/\Delta w$ is called the marginal rate of substitution (MRS) in the literature. The *sigma* is accurately and always shows 1.00 in the case of recursive programming when the denominator is calculated using the two period average:

$$\sigma = \frac{-\Delta k/\left(\frac{k_0+k_1}{2}\right)}{\Delta(r/w)/\left(\frac{r_0+r_1}{2}/\frac{w_0+w_1}{2}\right)}.$$

The *sigma* at the KEWT database, however, has been vividly fluctuated for the last two decades, as shown by the US and Japan. And, any country has the *sigma* in equilibrium at the KEWT database. For tests, the *sigma* is able to be more than a surrogate for the wage index.

9.4 Concluding remarks: Test results and Implications of the Flexibility of w & r^*

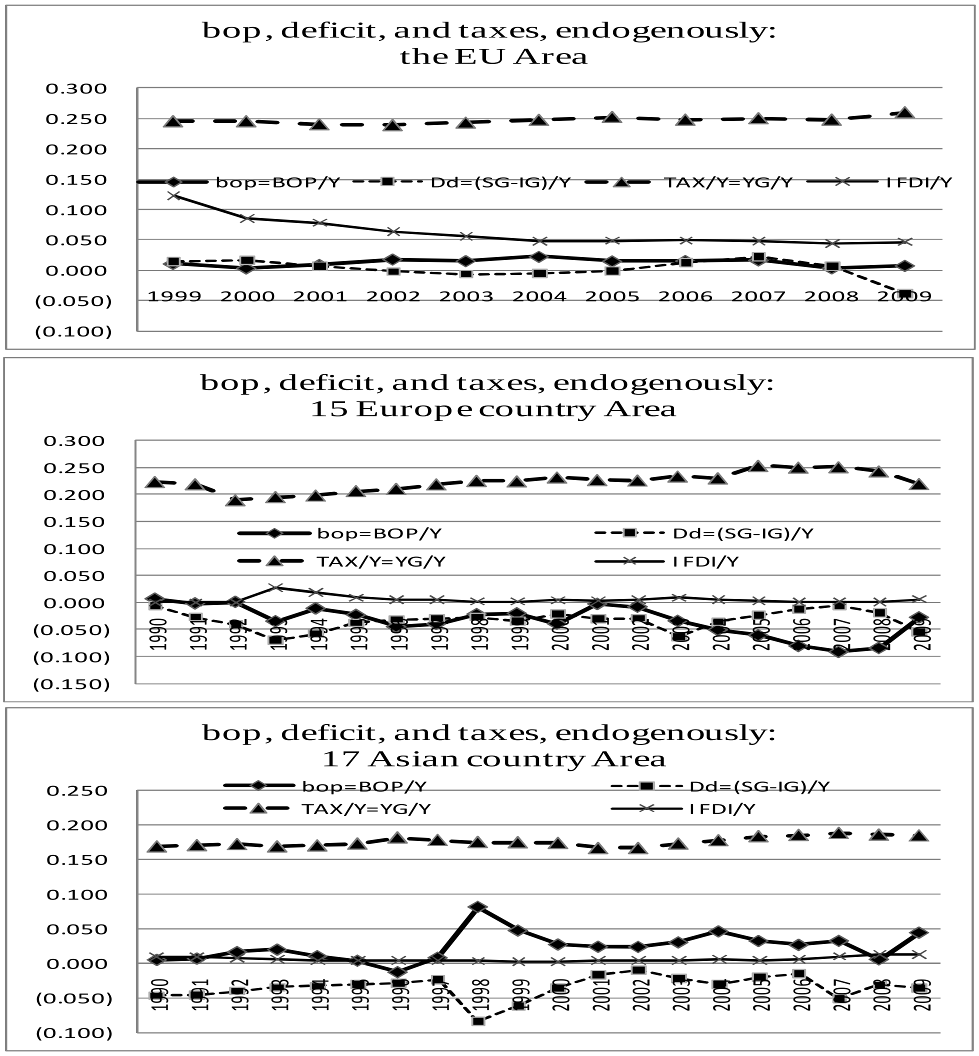
The author preserves seven sub-files in KEWT 5.11 for 65 countries, 1990-2009, in addition to KEWT 6.12, 1990-2010. The original data come from IMF actual statistics. **BOXEX 9-1** and **9-2** each show results overwhelmingly.

The author briefly explains endogenous results each by each with related figures, and conveys good and bad policy implications. Remind of a fact that results have causes based on the real assets under the neutrality of the financial/market assets. Geographic philosophy is moderation, as shown by a hyperbola. Moderation is tested not only by seven endogenous parameters but also by variables.

1. 65 countries have maintained moderate range of endogenous equilibrium, except for 2008 and 2009 suffering from bubbles and financial crisis. Recent deficits have been

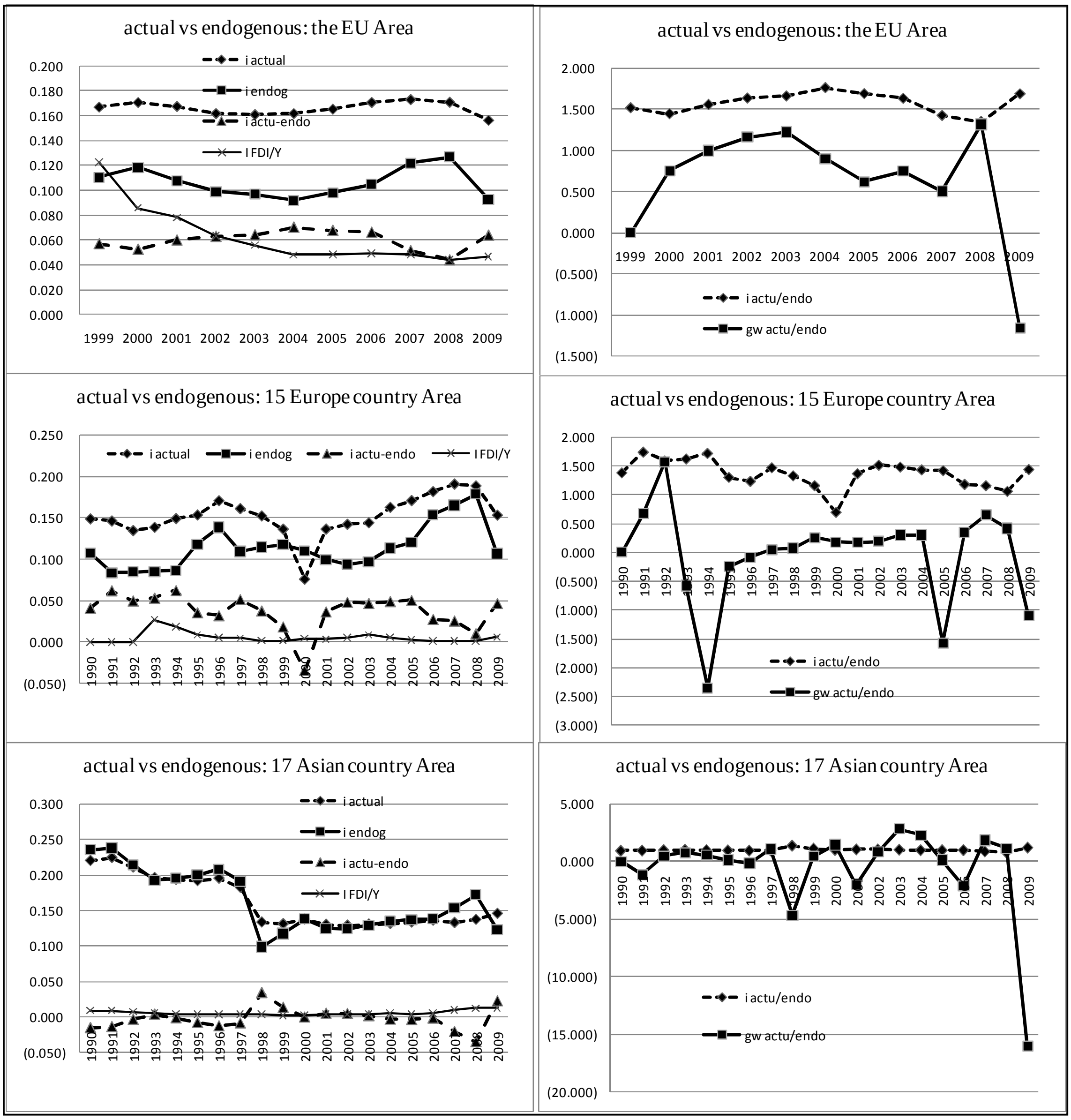
used for the recovery of financial institutions in many countries yet, some Asian countries are free from these urgent countermeasures. Surprisingly, each country has its own different economic policies and shows different results in the real assets. The real assets are more moderate than policy-makers have in mind today. Yet, some countries have been weak in maintaining endogenous equilibrium for the last two decades, showing inflexibility of the wage and the rate of return is several times under disequilibrium.

BOX 9-1 Ratios of BOP to Y, deficit to Y, tax to Y, and FDI to Y for the EU Area, 15- country Europe Area and 17- country Asian Area



Data source: KEWT 5.11-1, -2, -3 by area and by sector, 1990-2009, whose original data are from *International Financial Statistics Yearbook*, IMF

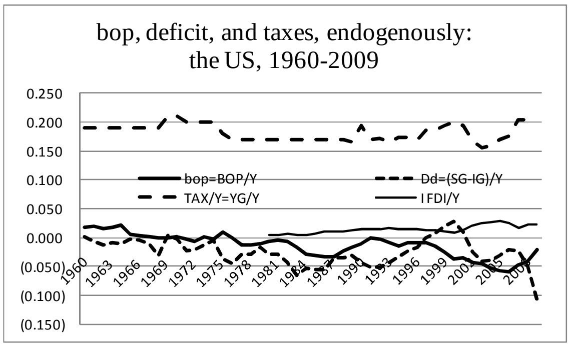
BOX 9-2 Actual versus endogenous for net investment and wage rate flexibility: by Area using weighted averages

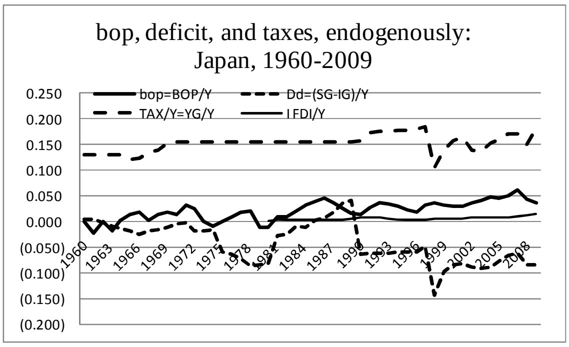


Data source: KEWT 5.11-1, -2, -3 by area and by sector, 1990-2009, whose original data are from *International Financial Statistics Yearbook*, IMF.

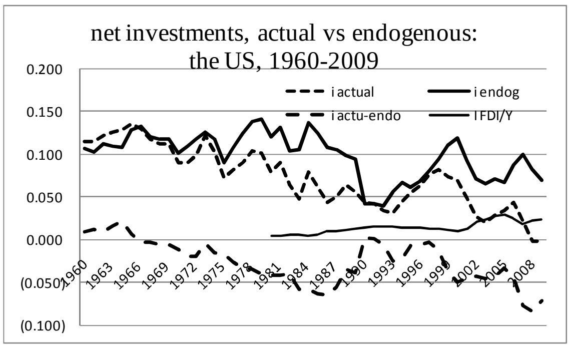
2. The balance of payments and deficit structure differ by country. Roughly, there are four patterns as shown by $bop = \Delta d + (s_{PRI} - i_{PRI})$: (1) +, +, + or −, −, −; (2) +, −, +; (3) −, −, +; and (4) +, −, + or +, −, −, where (1) is almost falling into disequilibrium and (4) is close to disequilibrium. Like an organic body, most countries stay at (2) or (3) in equilibrium. The PRI sector must be robust. Unfortunately, Japan is close to disequilibrium at (4), where $i_{PRI} = I_{PRI}/Y_{PRI}$ is close to zero, compared with other countries due to abnormal deficits over years. Under any situation by country, the

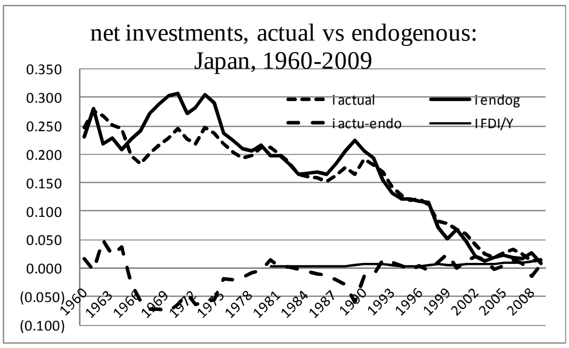
endogenous taxes to output, shown by Y_G/Y, determines a fundamental base for equilibrium as the size of government. This item ranges from 0.10 to 0.40 depending on each national culture and preferences with technology. When policy-makers violate this rule, the results are not preferable, unstable or fluctuating in endogenous equilibrium. This is related to speed years by country and by sector.





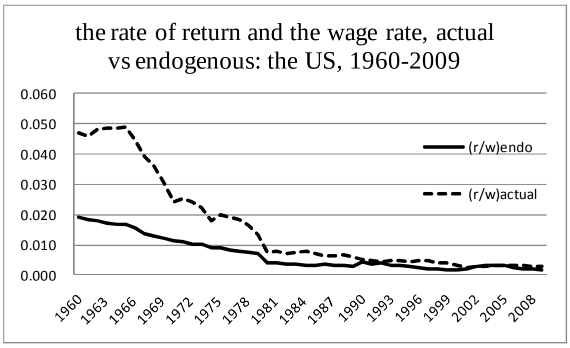
3. The good or bad symptom is most fluently shown by the trend of $i = I/Y$. A robust country has a high level of $i_{actu} = I_{actu}/Y_{actu}$ and shows $i_{actu} = I_{actu}/Y_{actu} > i_{endo} = I_{endo}/Y_{endo}$. On the contrary, developed countries suffering huge deficits have a low level of $i_{actu} = I_{actu}/Y_{actu}$ and shows $i_{actu} = I_{actu}/Y_{actu} < i_{endo} = I_{endo}/Y_{endo}$. When $i_{endo} = I_{endo}/Y_{endo}$ is close to zero, as shown in Japan, growth power is almost absorbed by the government sector. No one can increase $i = I/Y$ due to this fact. This is a coolheaded hypothesis proved in the endogenous system. Many developed countries know this fact intuitively and now try to reduce deficit or oppress deficit.

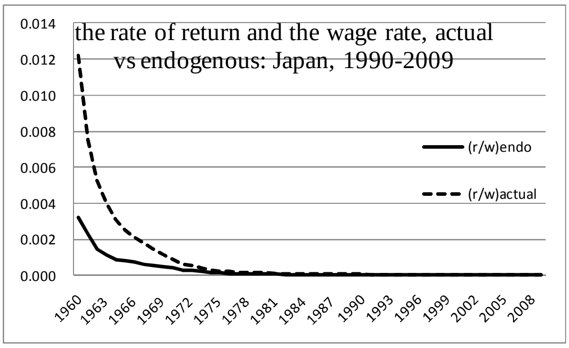




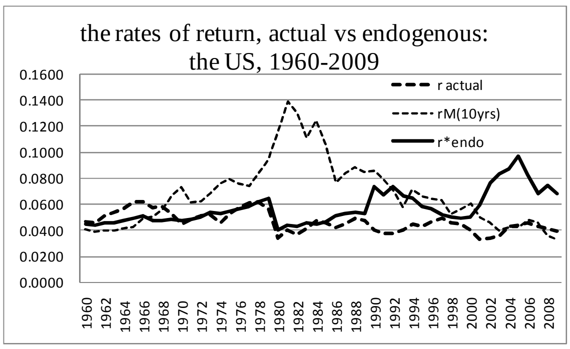
4. The good or bad symptom is accurately shown by the trend of $(r/w)_{actu}$, $(r/w)_{endo}$, and $(r/w)_{actu/endo}$. Policy-makers must watch and accept this trend as an integrated signal. This signal accurately reflects the qualitative (think of next generations) level of democracy or physical-oriented philosophy of people by country. This is justified by the fact that poor/developing countries have much more obstacles than those of developed countries and yet endeavor to cope with numerical obstacles

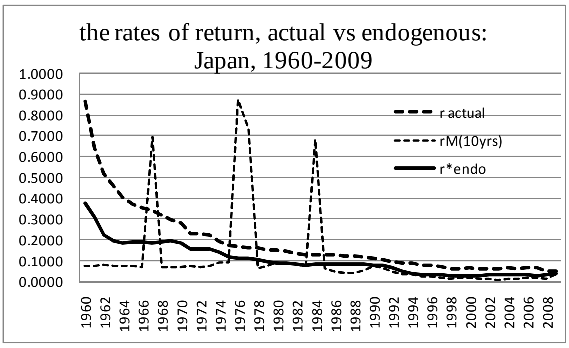
endowed with the qualitative net investment coefficient, *beta**, the capital-output ratio, Ω, and *delta*$_0$, in equilibrium.[2] $(r/w)_{actu}$, $(r/w)_{endo}$, and $(r/w)_{actu/endo}$ are measured as one of minimum items at any country regardless of the statistics accuracy levels at poor/developing countries at *IFSY*, IMF. To the author's understanding, some countries such as China, Singapore, and Malaysia have intuitively controlled $(r/w)_{actu}$ and $(r/w)_{endo}$, by prompt decisive actions by year.





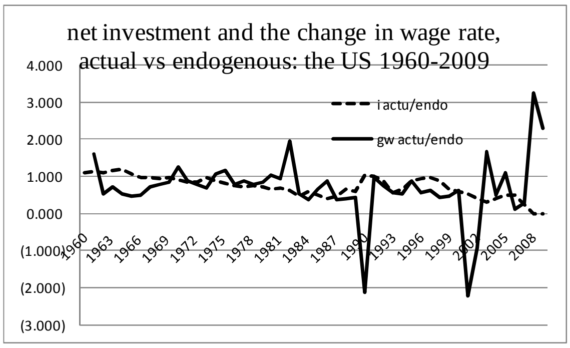
5. The market principles vividly exist in the long run; for example, ten year national debt yield, $r_{M(DEBT)} = r_{M(10yrs)}$, cannot be controlled arbitrarily. Yet, the market rate fluctuates when the real assets suddenly lose their essential robustness in equilibrium. Short-term speculative funds aim at such timing once or twice every decade. If endogenous never be broken, such funds cannot be alive. Such funds, in a sense, has their existence, assuming that financial institutions' balance between capital and its endogenous valuation value of the real assets remains unchanged soon after bubbles and deficit is not used for that balance.

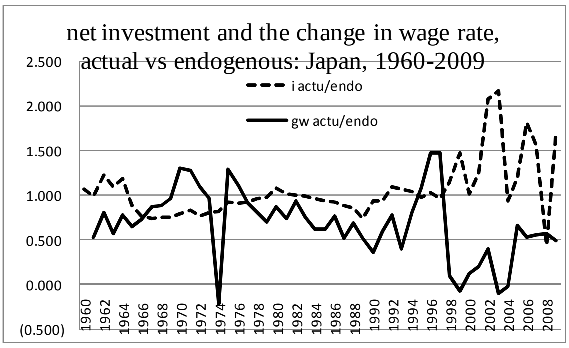




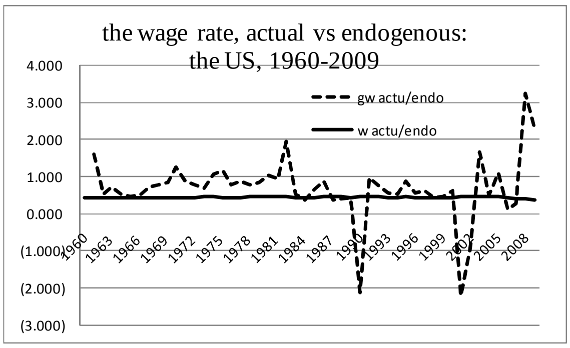
2 This is shown by using the essence of the economic stage. At an early stage of developing, *beta** is less than 0.5 and also the capital-output ratio is below 1.0. In this case, *delta*$_0$ has a few additional difficulties strongly influenced by endogenous equations. This was discussed at the *WEAI* Conference, San Diego on 1st of July, 2011, using 16 poor/developing countries.

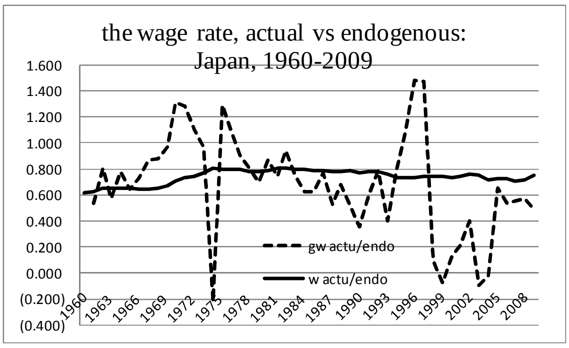
6. The wage rates, actual and endogenous, are essentially flexible. This is a wonderful finding and constitutes a trustworthy hypothesis among countries. Let the author compare actual with endogenous in the wage rate. This is shown by using $g_{w\ actu/endo}$, obtained from the actual wage index. And, $g_{w\ actu/endo}$ is tightly related to the relative net investment level, $i_{actu/endo}$. If $i_{actu/endo}$ passes a difficult period(s), $g_{w\ actu/endo}$ works as an adjustor in the endogenous system.



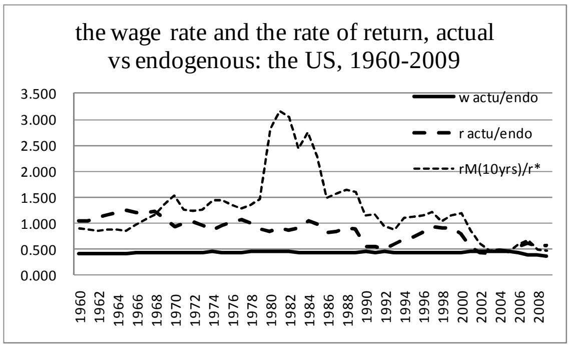


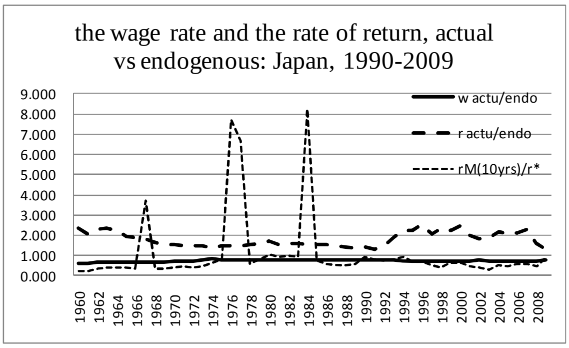
7. When the actual wages are available at each country's national accounts, it is possible to compare $g_{w\ actu/endo}$ with the relative wage rate, $w_{actu/endo}$. Its $g_{w\ actu/endo}$ fluctuates by year to support the endogenous system but $w_{actu/endo}$ is stable over decade. This fact shows that the actual wage rate and the endogenous wage rate go together or, the actual wage rate follows the endogenous wage rate. Even $g_{w\ actu/endo}$ follows $w_{actu/endo}$, as the central base. These imply that wages are flexible by nature.



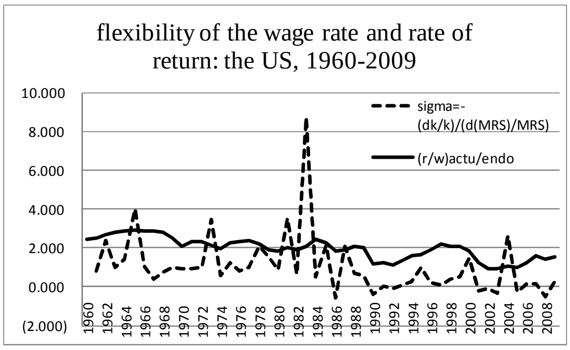


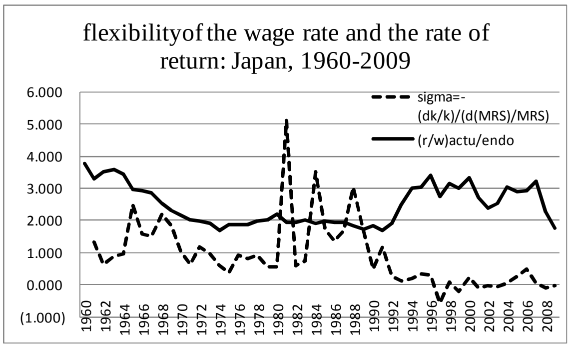
8. As a result, by taking into consideration the actual and endogenous rates of return, the relationship between wages and returns are clarified. It is true that the market rate even in the long term exaggerates its evaluation in disequilibrium period(s). In peaceful periods, both $w_{actu/endo}$ and $r_{actu/endo}$ are surprisingly stable.





9. As a conclusion, the flexibility of the wage rate and the rate of return are shown, using the elasticity of substitution, *sigma*. The author would like to point out: the EU member countries had been stable for two decades before 2008 as exposed by member countries.

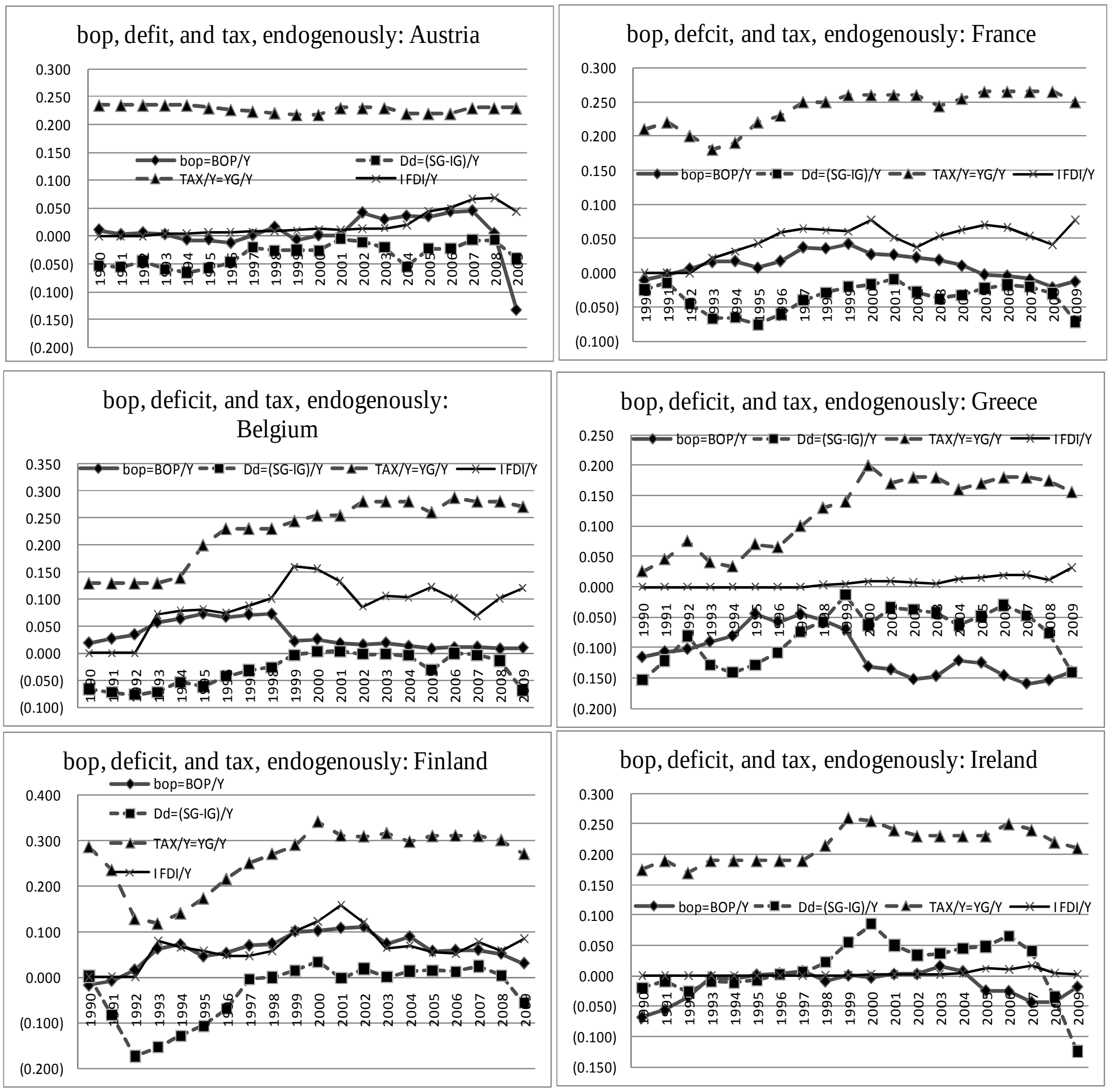




The author does not refer to the exchange rate in this chapter; the exchange rate leads to another problem as discussed by Mundell, R. (1961b). This problem was discussed at *Forum for Economists International*, Amsterdam, 24-25 Sep, 2011, using KEWT 5.11-2 and -3 (see chapter 5).

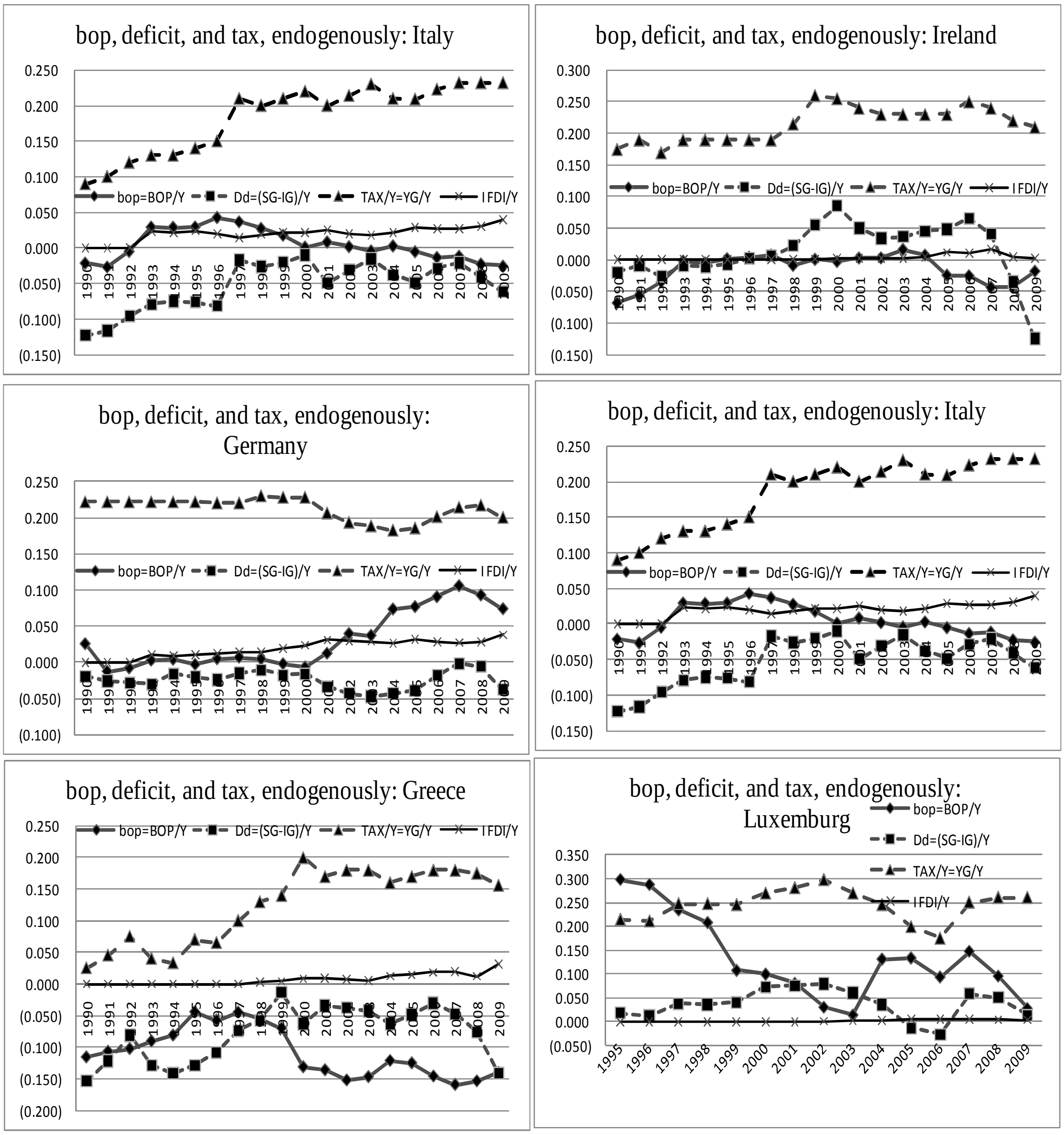
Acknowledgements: I am grateful to, and welcome Permissions by Peter, van der Hoek, organizer of FEI, Amsterdam, similarly to Chapter 5. Peter is sincere and he is my teacher of study, behavior, and spirit.

<u>For readers' convenience: contents of Tables and Figures hereunder</u>



Data source: KEWT 5.11-2 by sector, 1990-2009, whose original data are from *International Financial Statistics Yearbook*, IMF

Figure AE1 Actual versus endogenous for net investment and wage rate flexibility: by country in 14-country EU Area (1)



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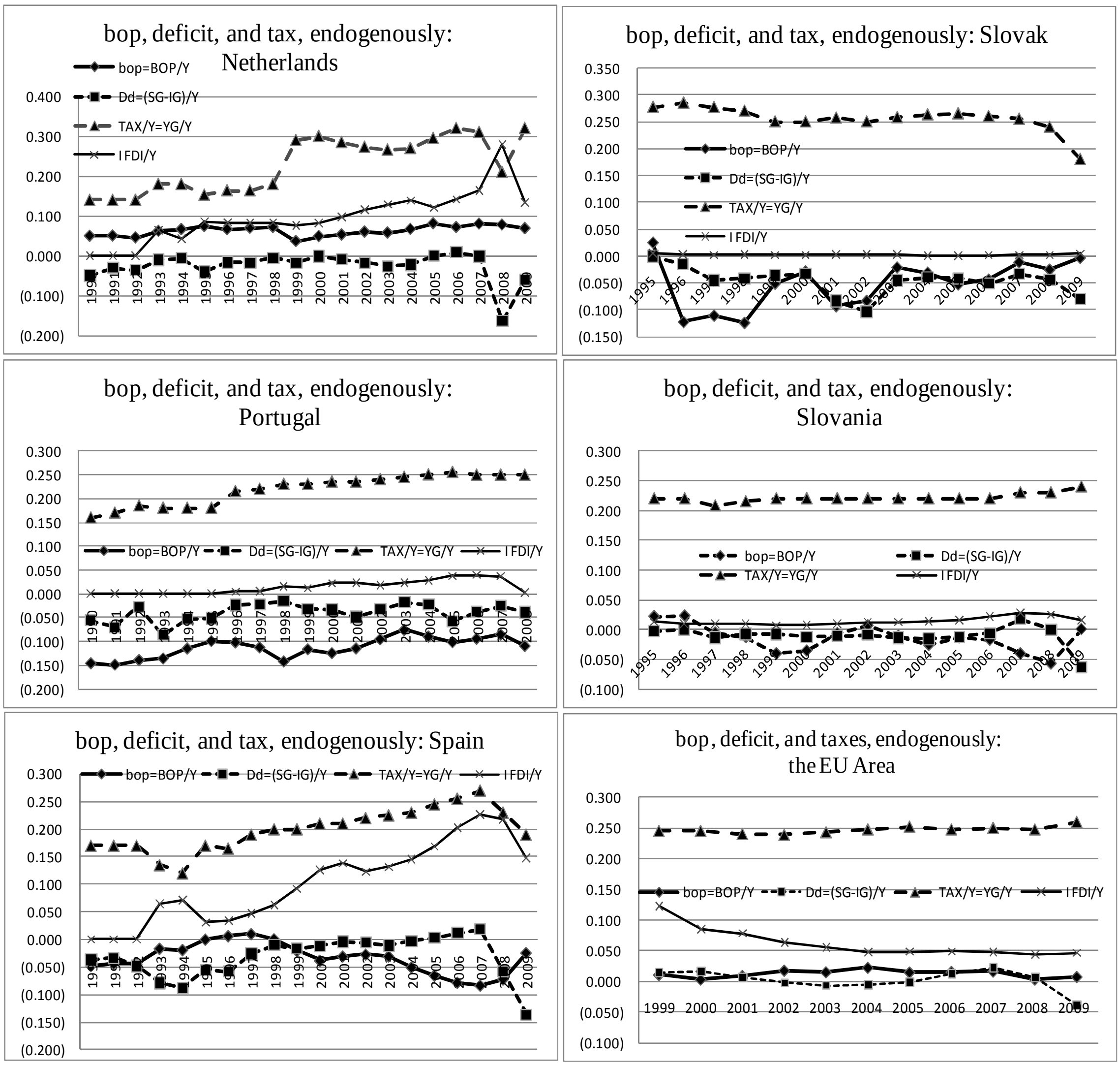

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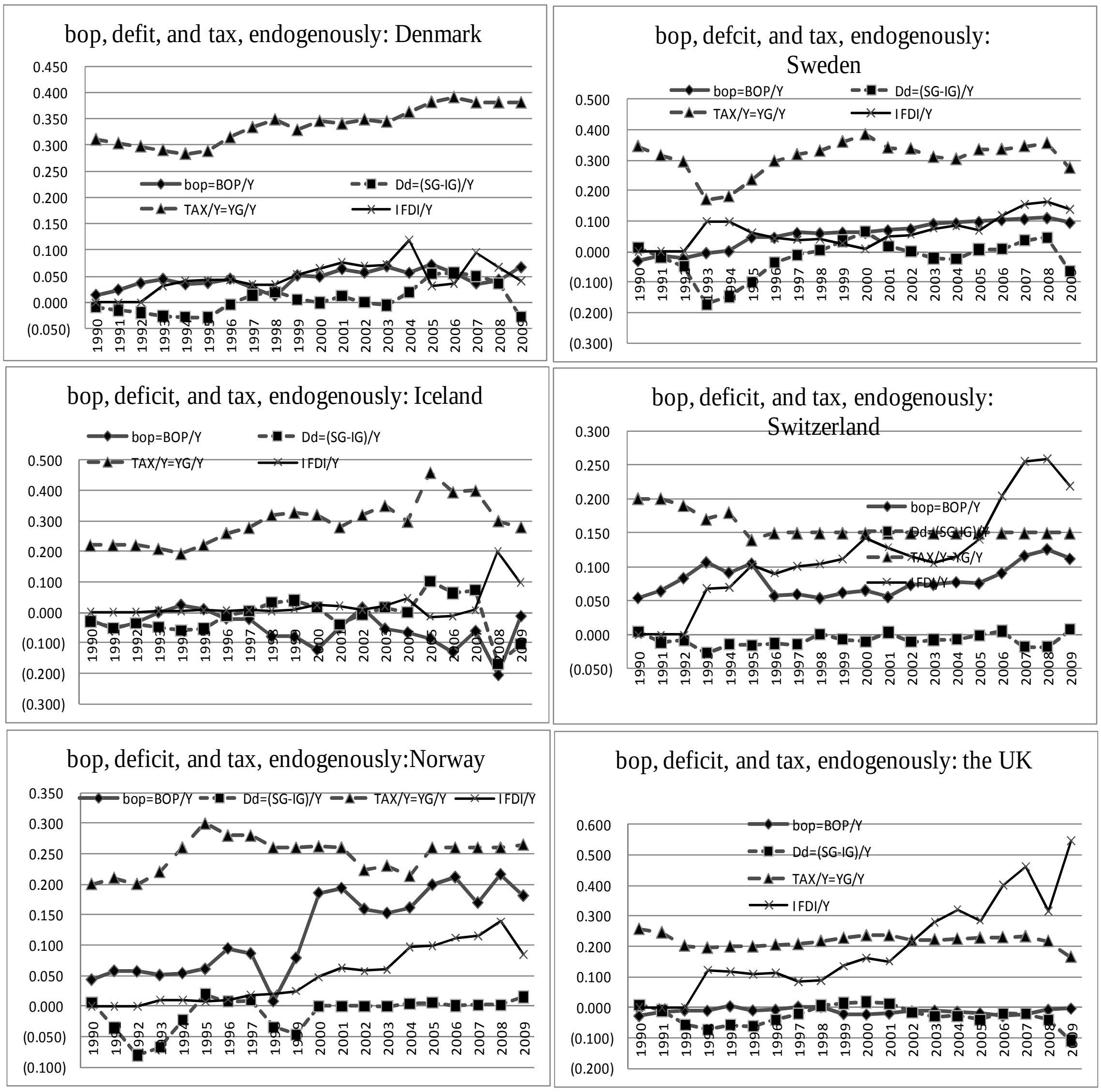

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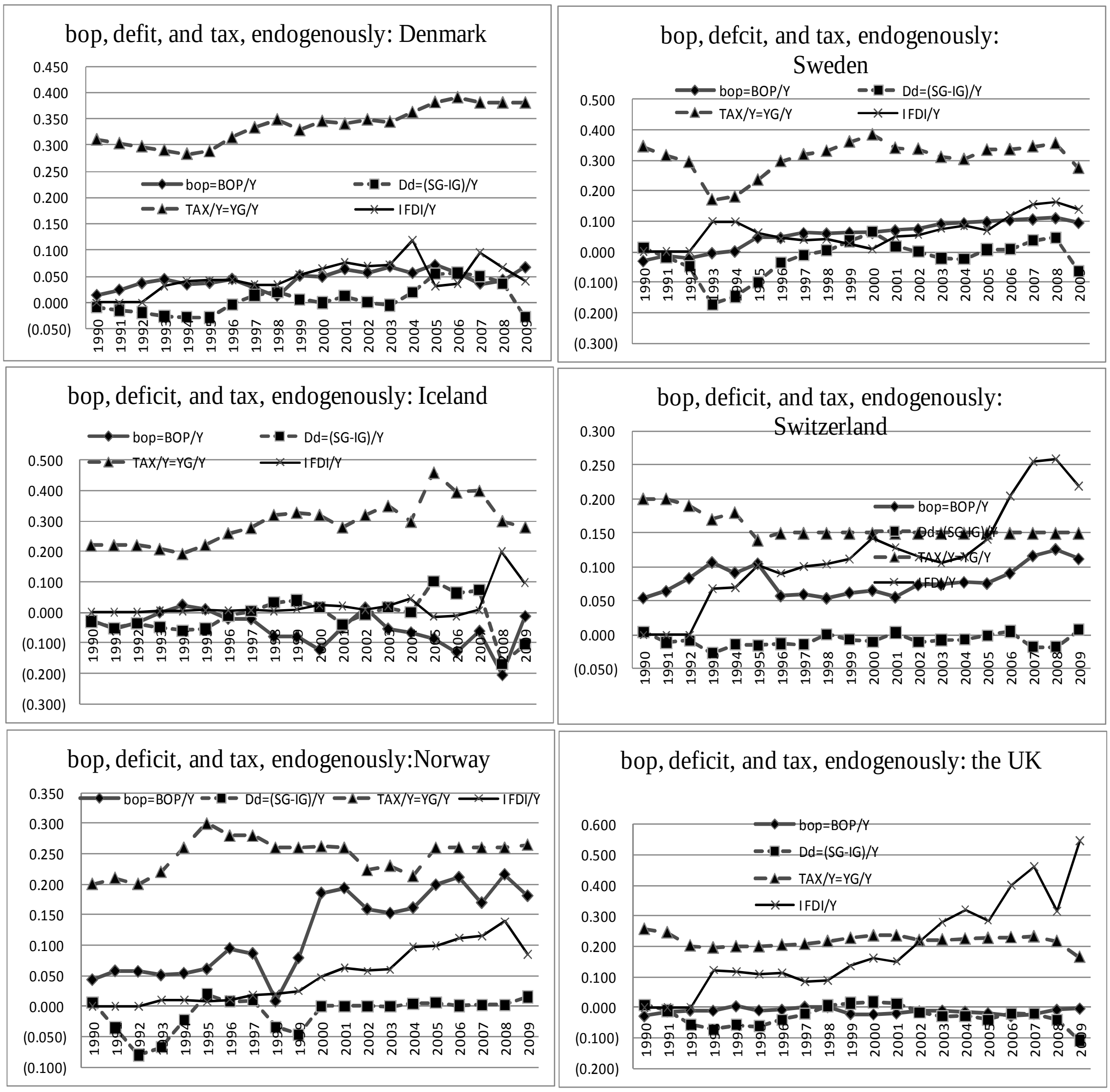

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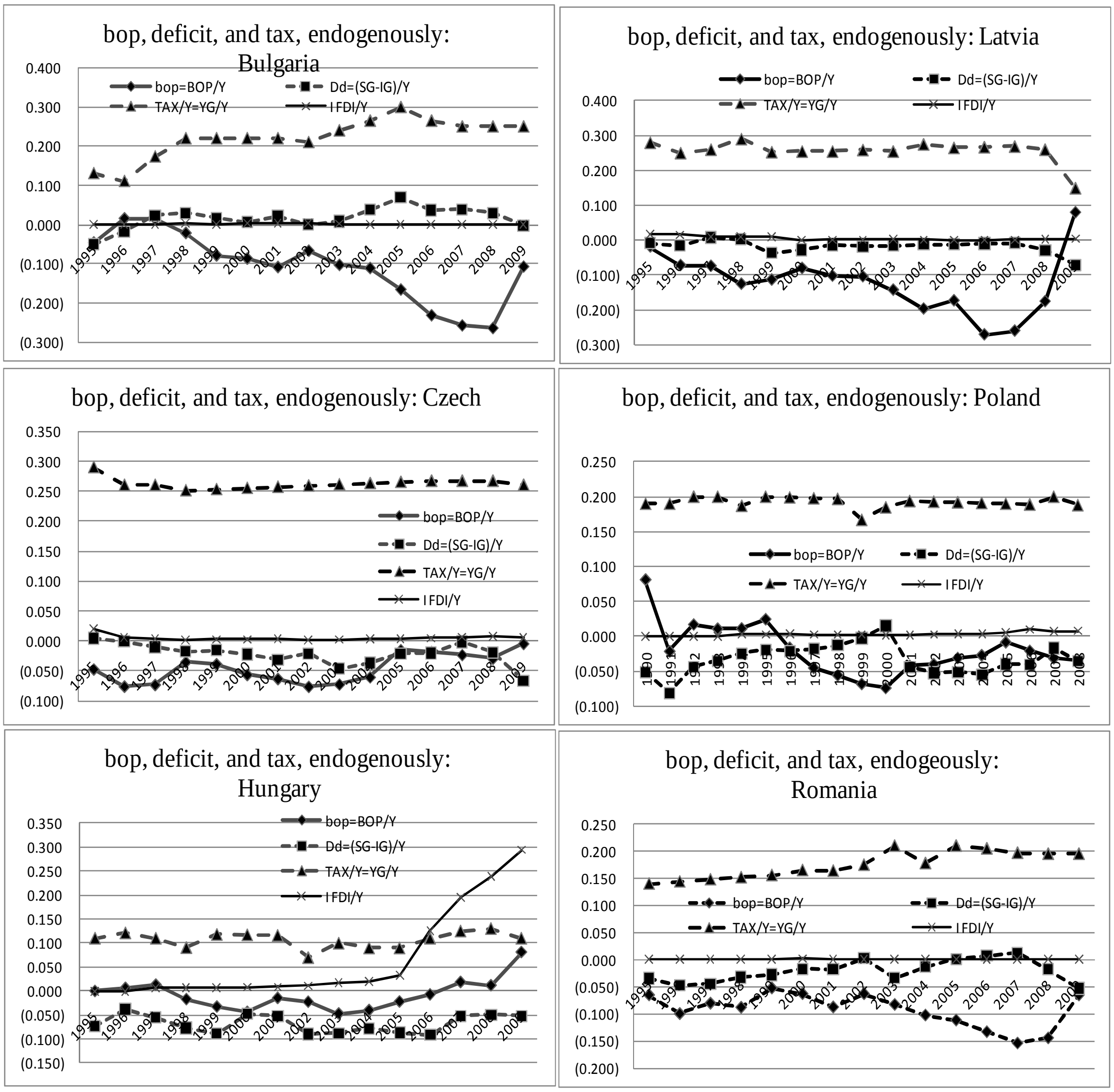

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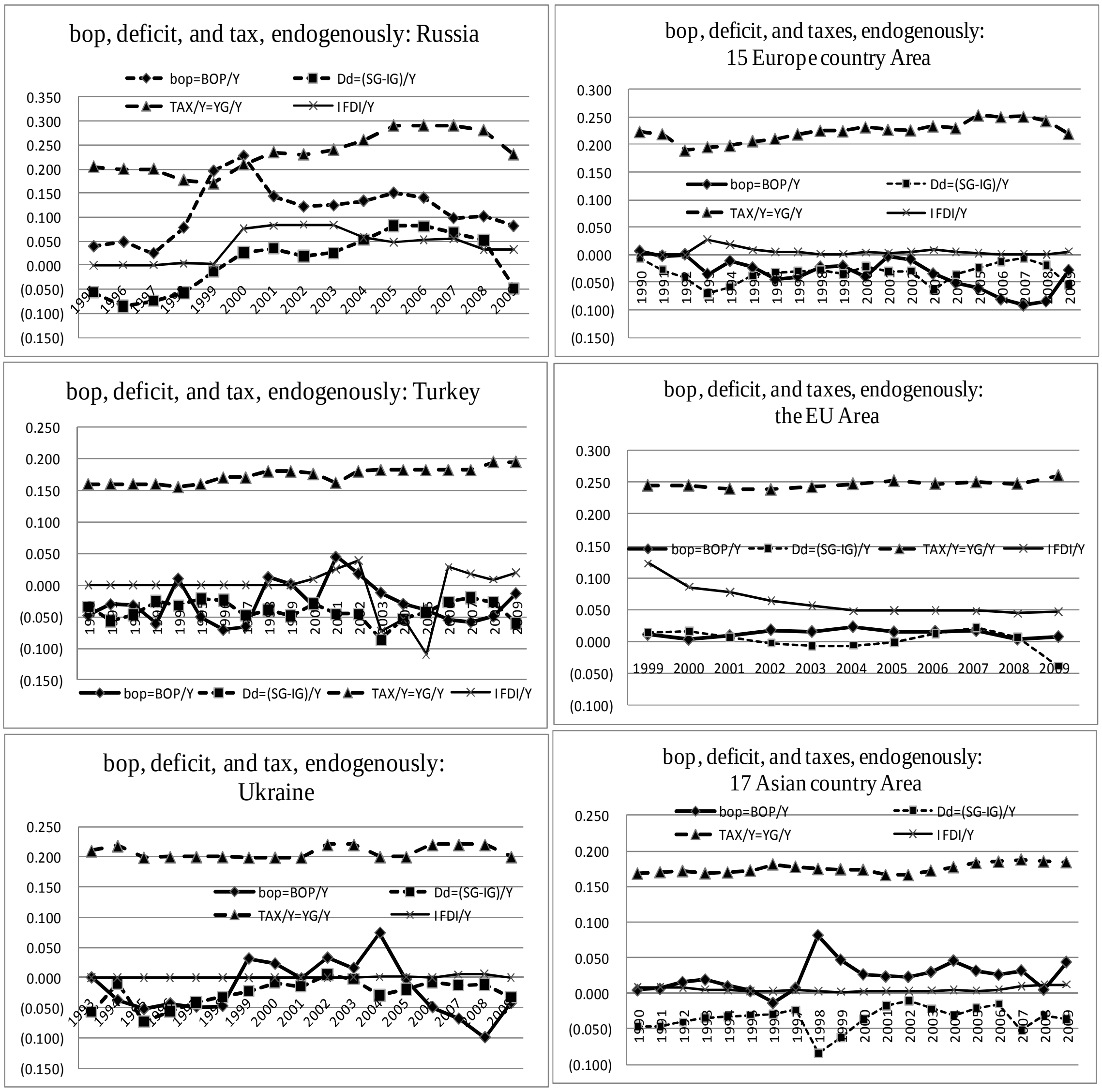

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Figure AE7 Actual versus endogenous for net investment and wage rate flexibility: by country in 15-country Europe Area (4)

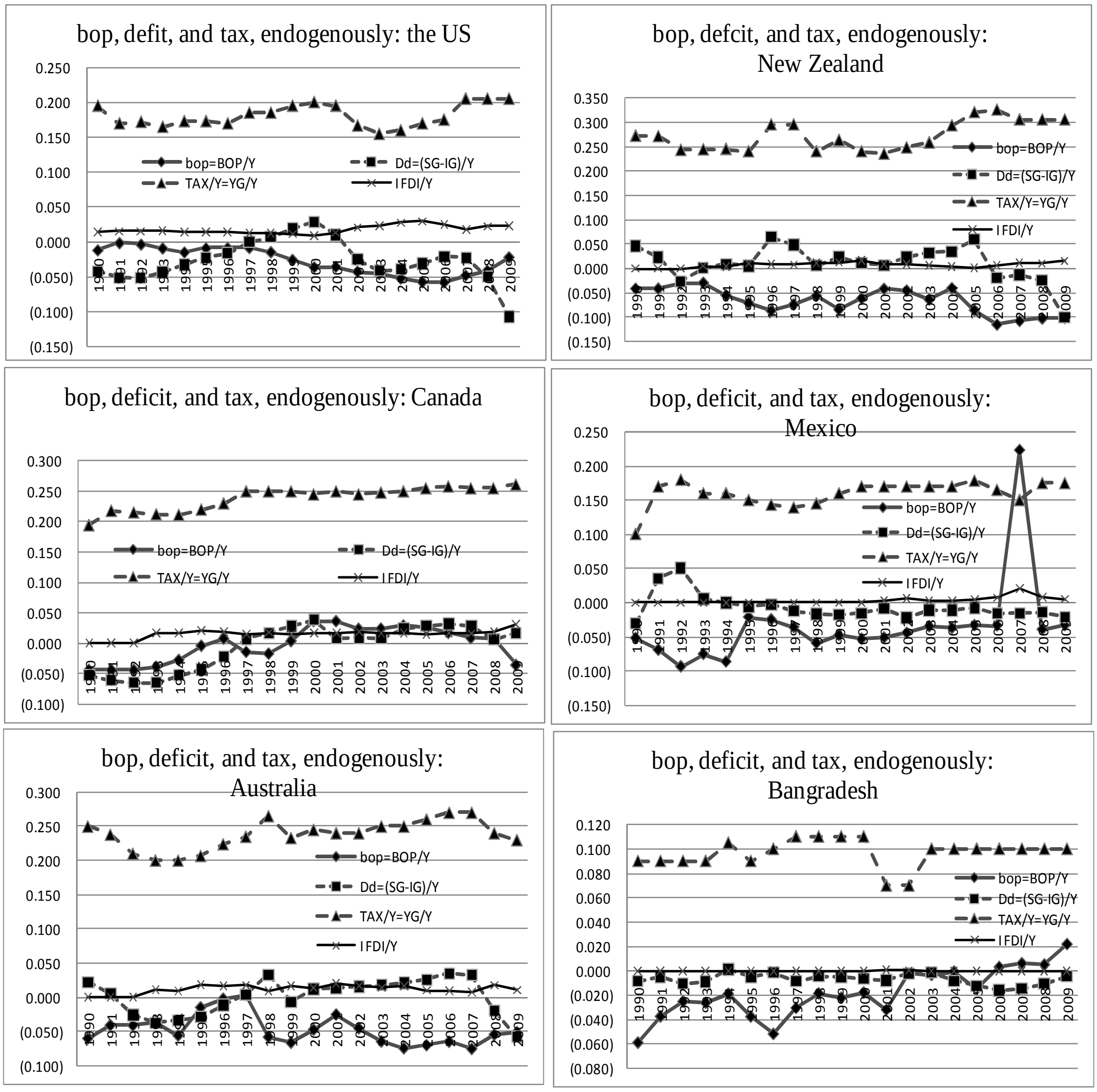

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Figure AE8 Actual versus endogenous for net investment and wage rate flexibility: by country in 17-country Pacific and Asia Area (1)

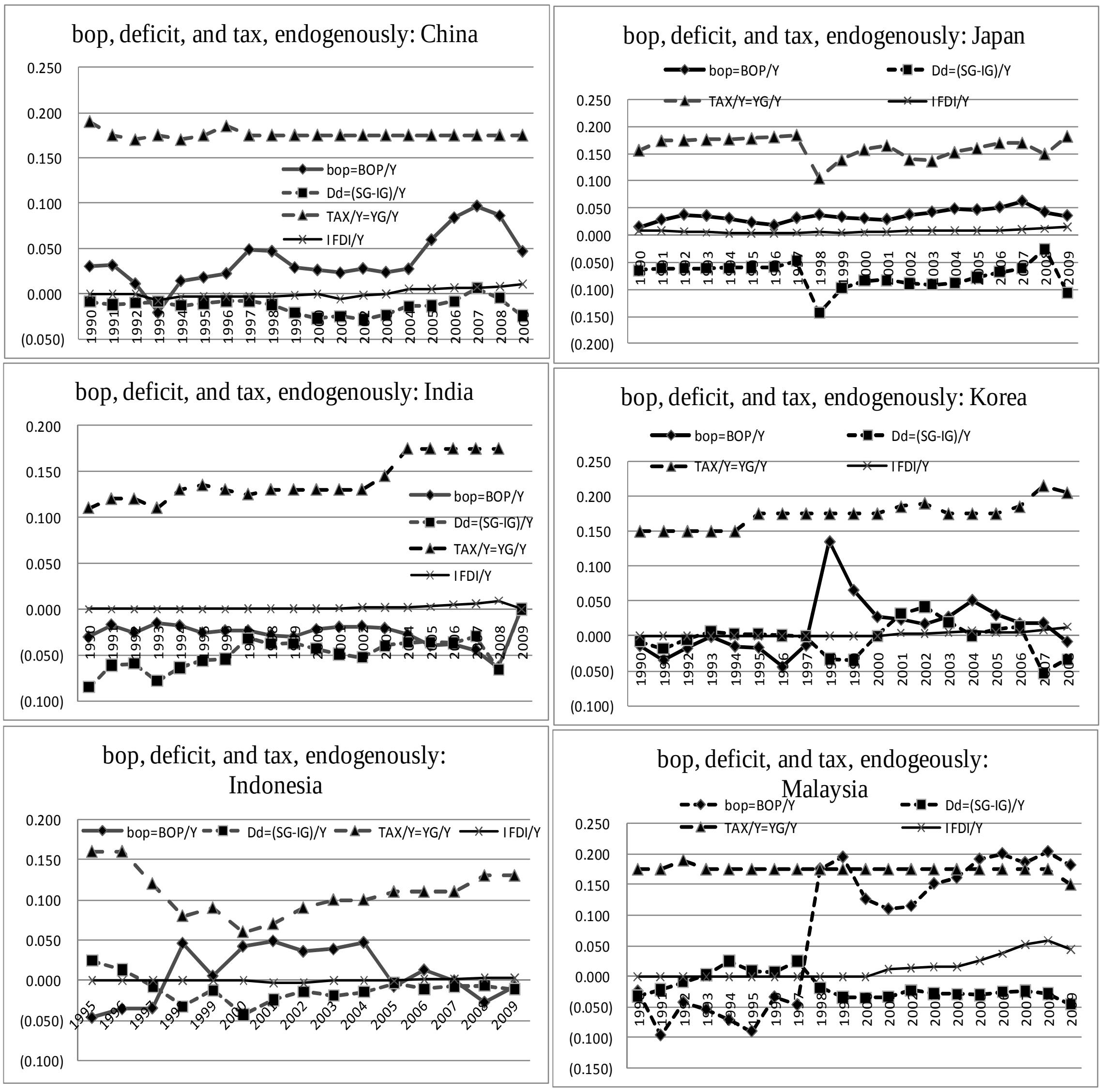

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Figure AE9 Actual versus endogenous for net investment and wage rate flexibility: by country in 17-country Pacific and Asia Area (2)

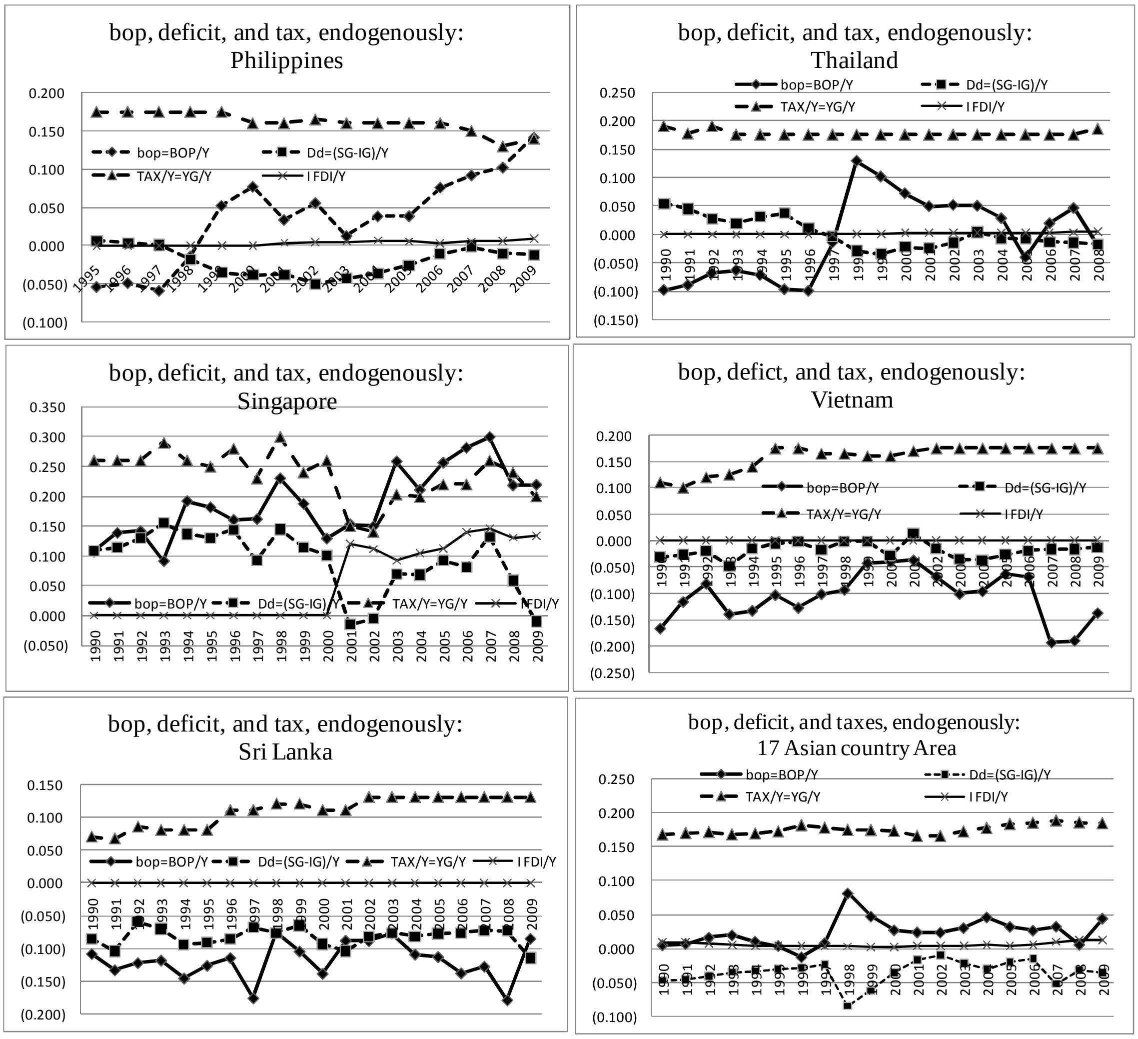

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Figure AE10 Actual versus endogenous for net investment and wage rate flexibility: by country in 17-country Pacific and Asia Area (3)

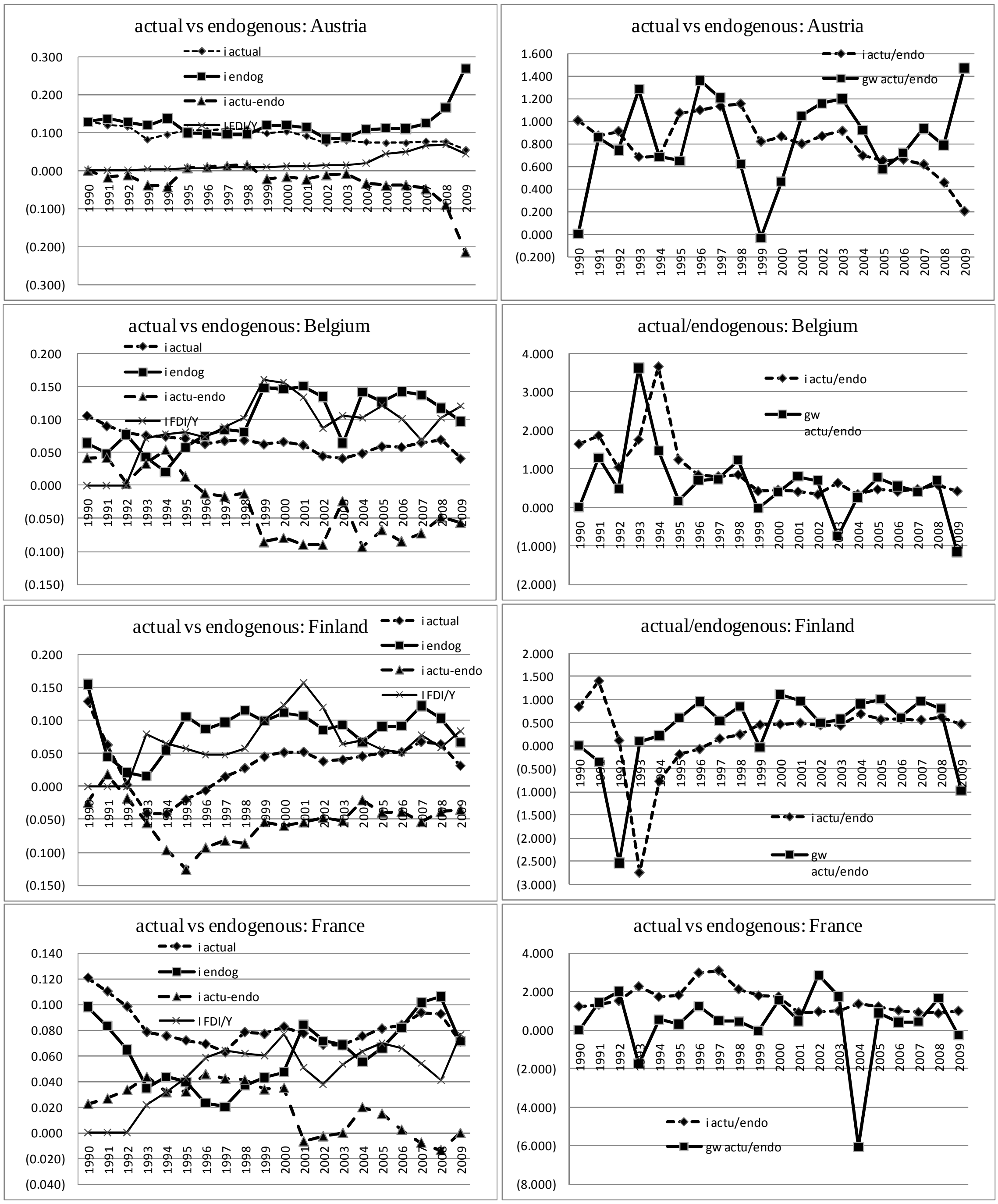

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Figure F1 Actual versus endogenous for net investment and wage rate flexibility: by country in 14-country EU Area (1)

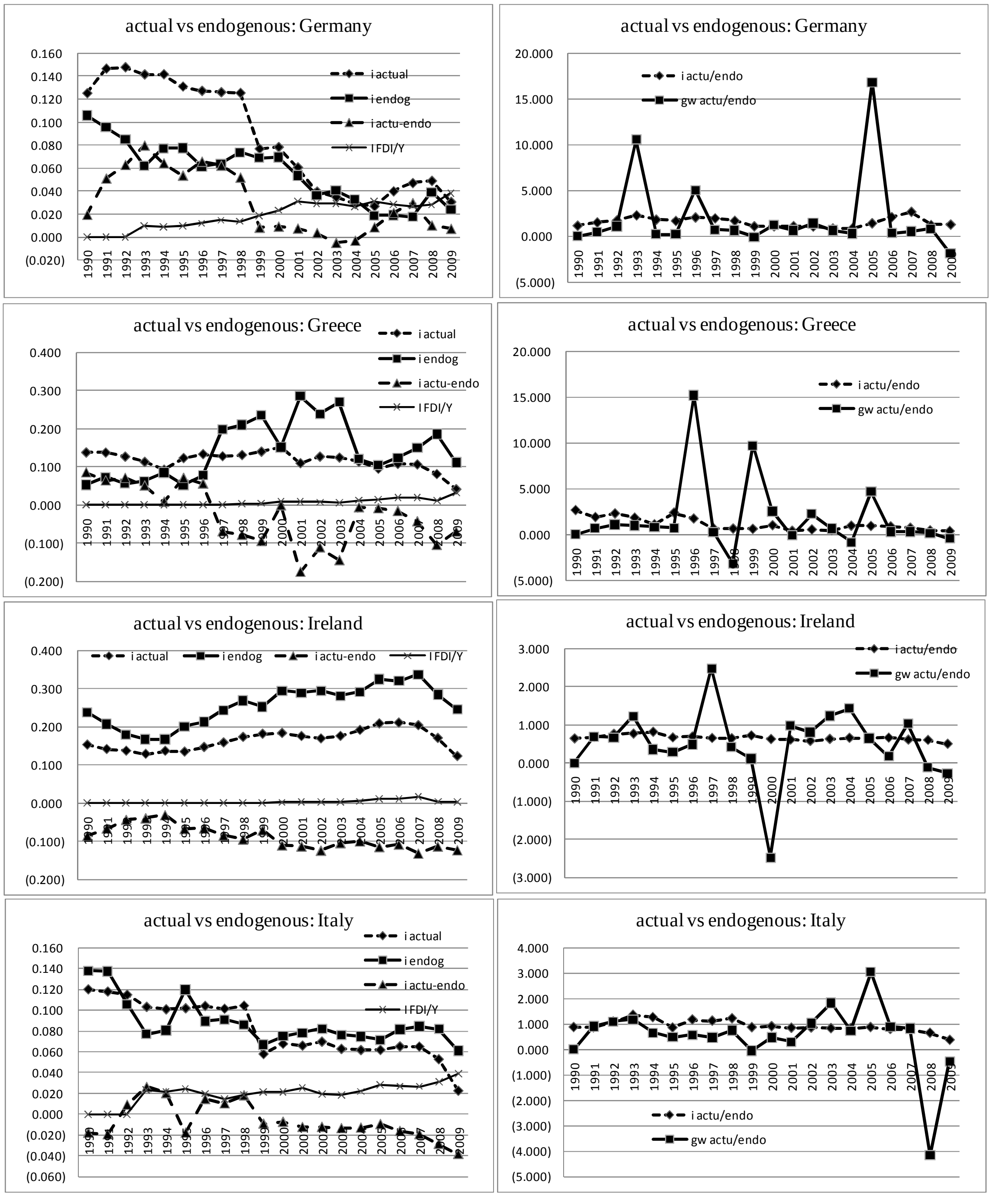

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Figure F2 Actual versus endogenous for net investment and wage rate flexibility: by country in 14-country EU Area (2)

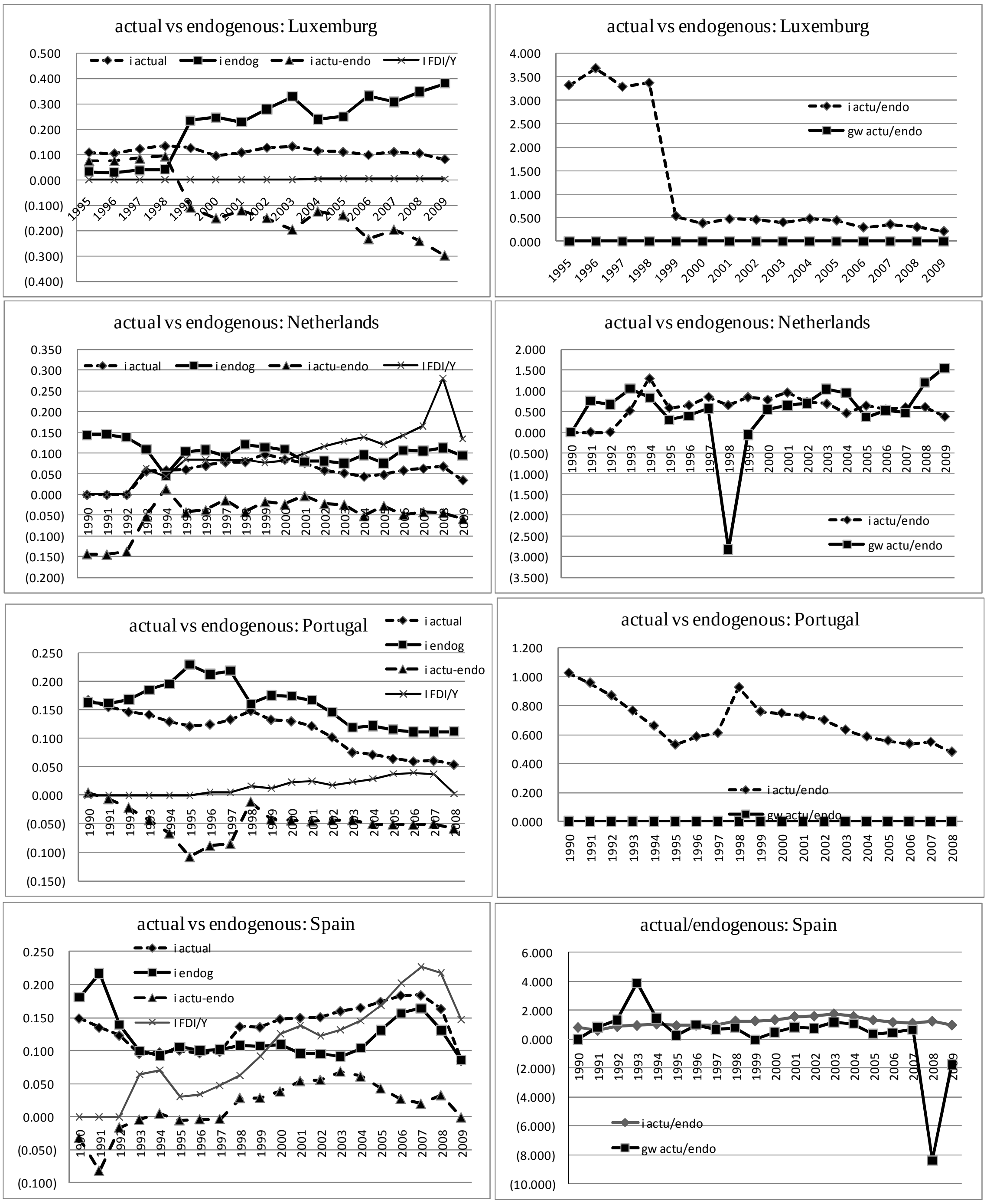

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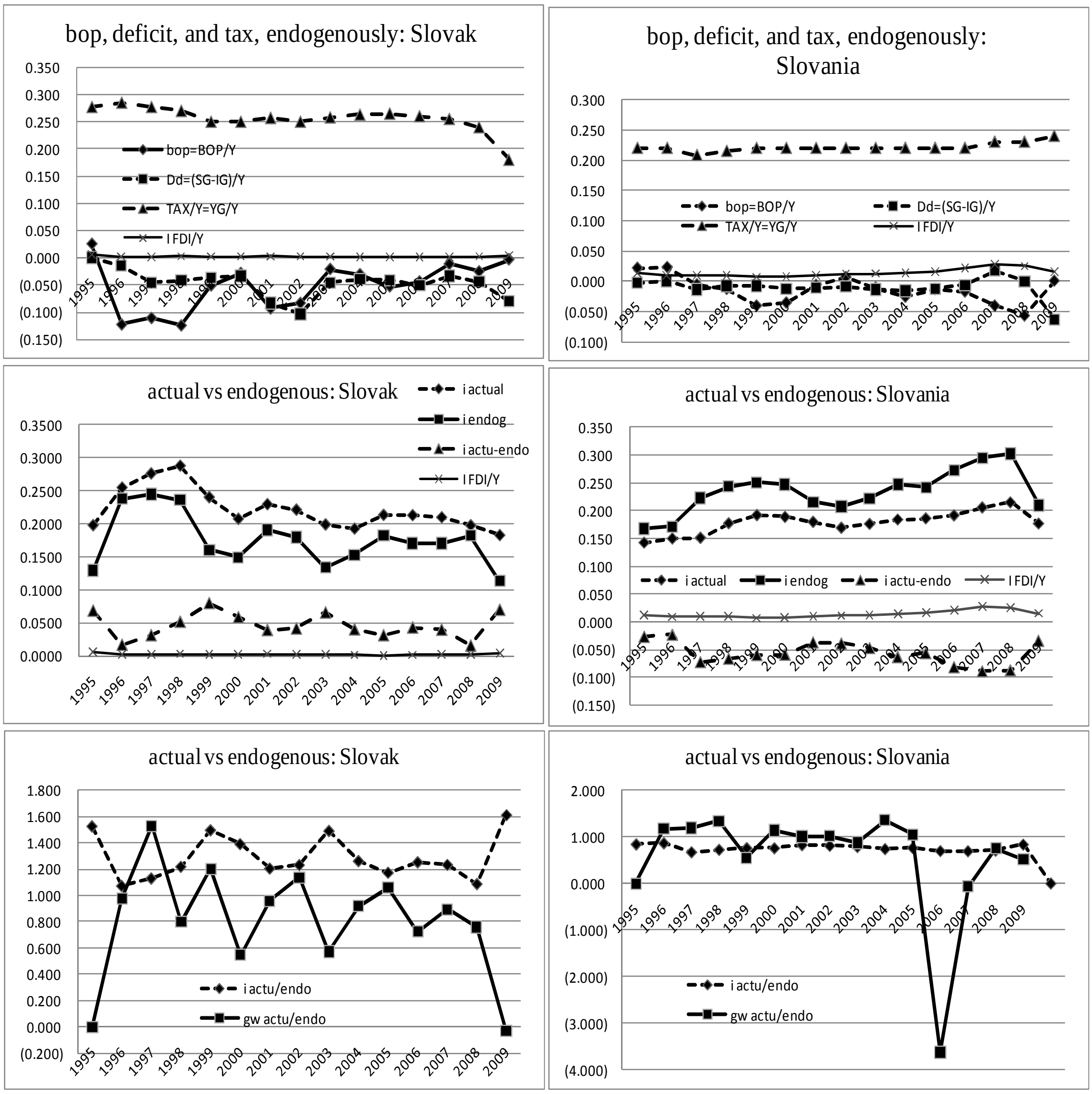
Figure F3 Actual versus endogenous for net investment and wage rate flexibility: by country in 14-country EU Area (3)



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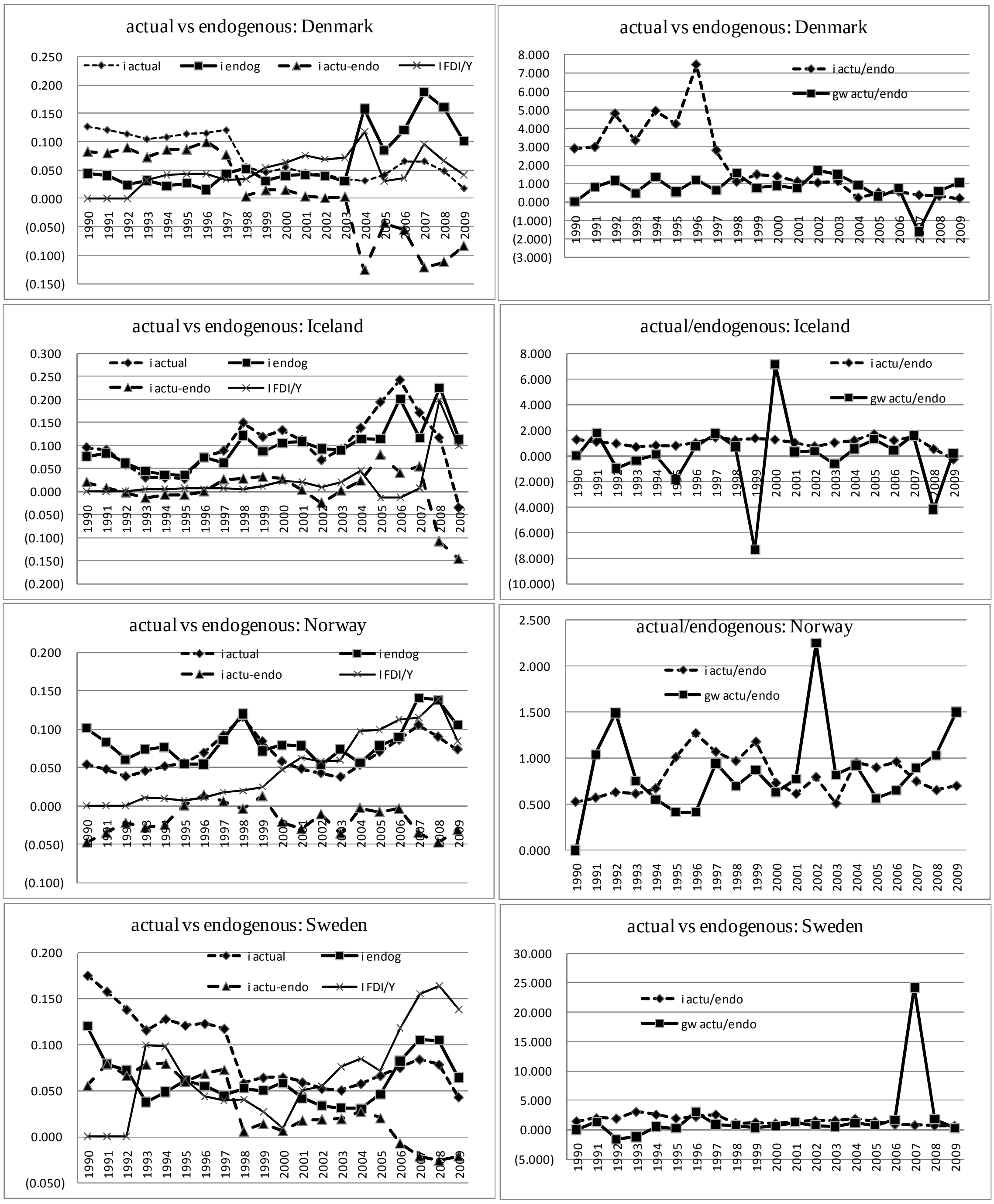

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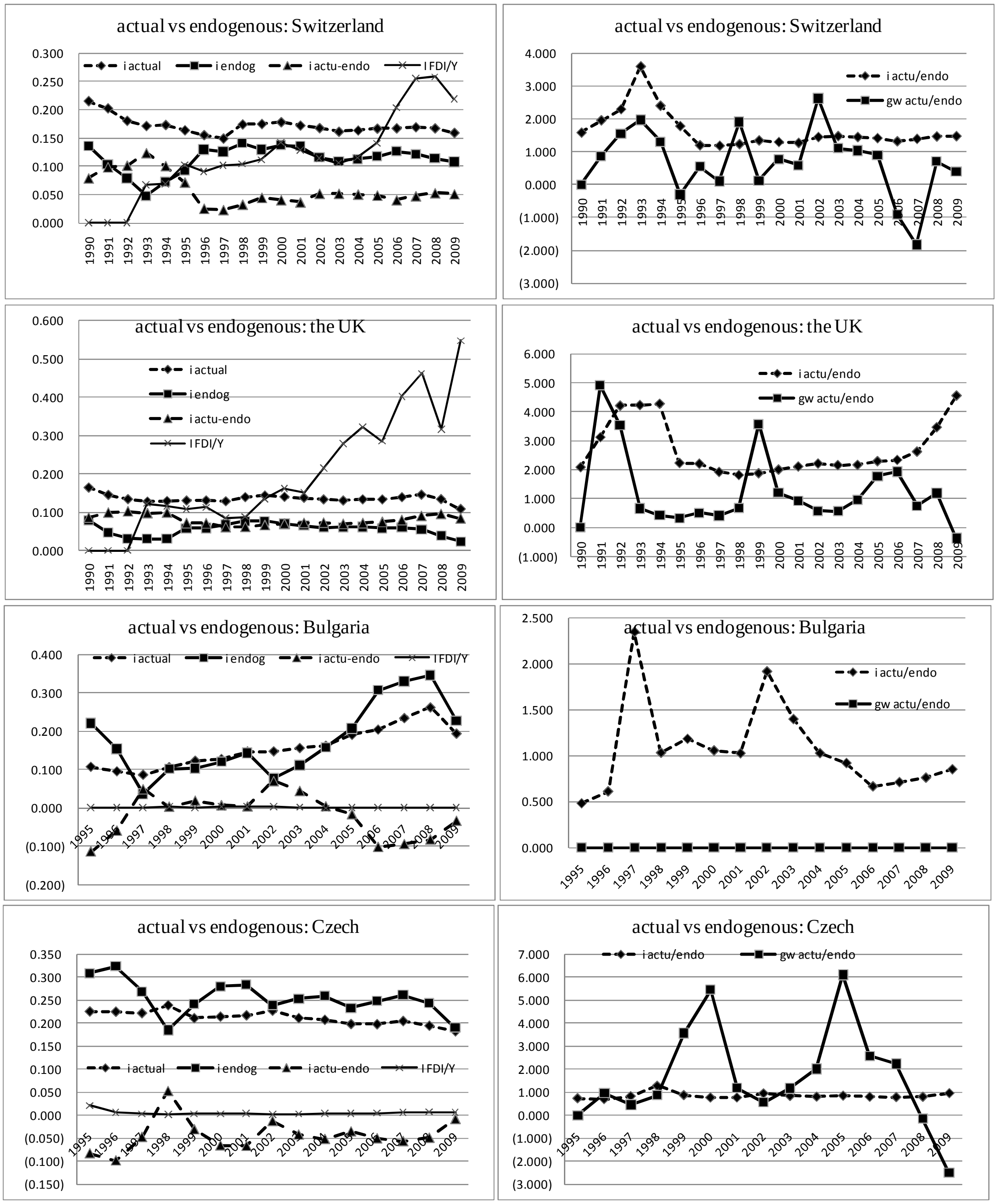

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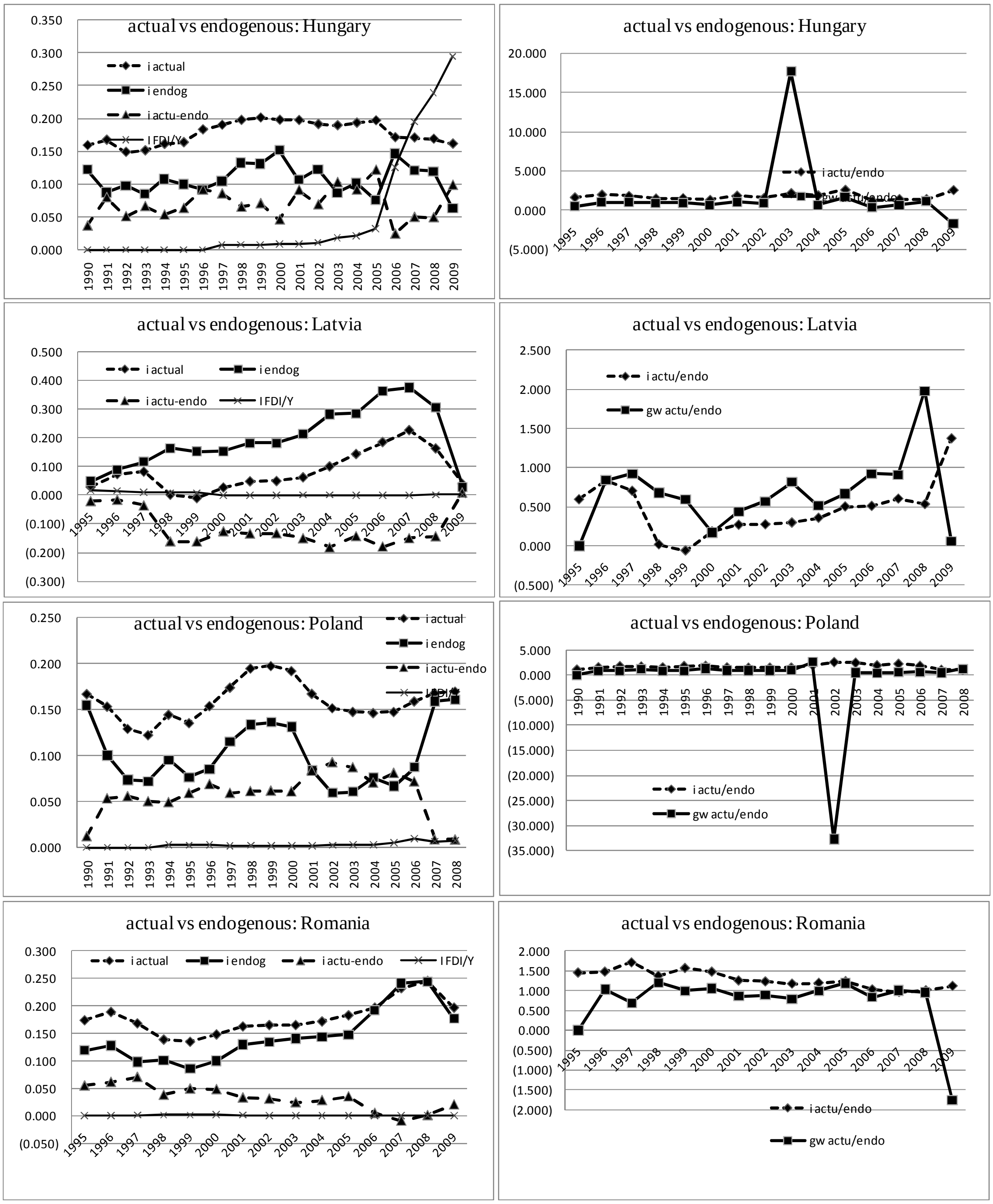

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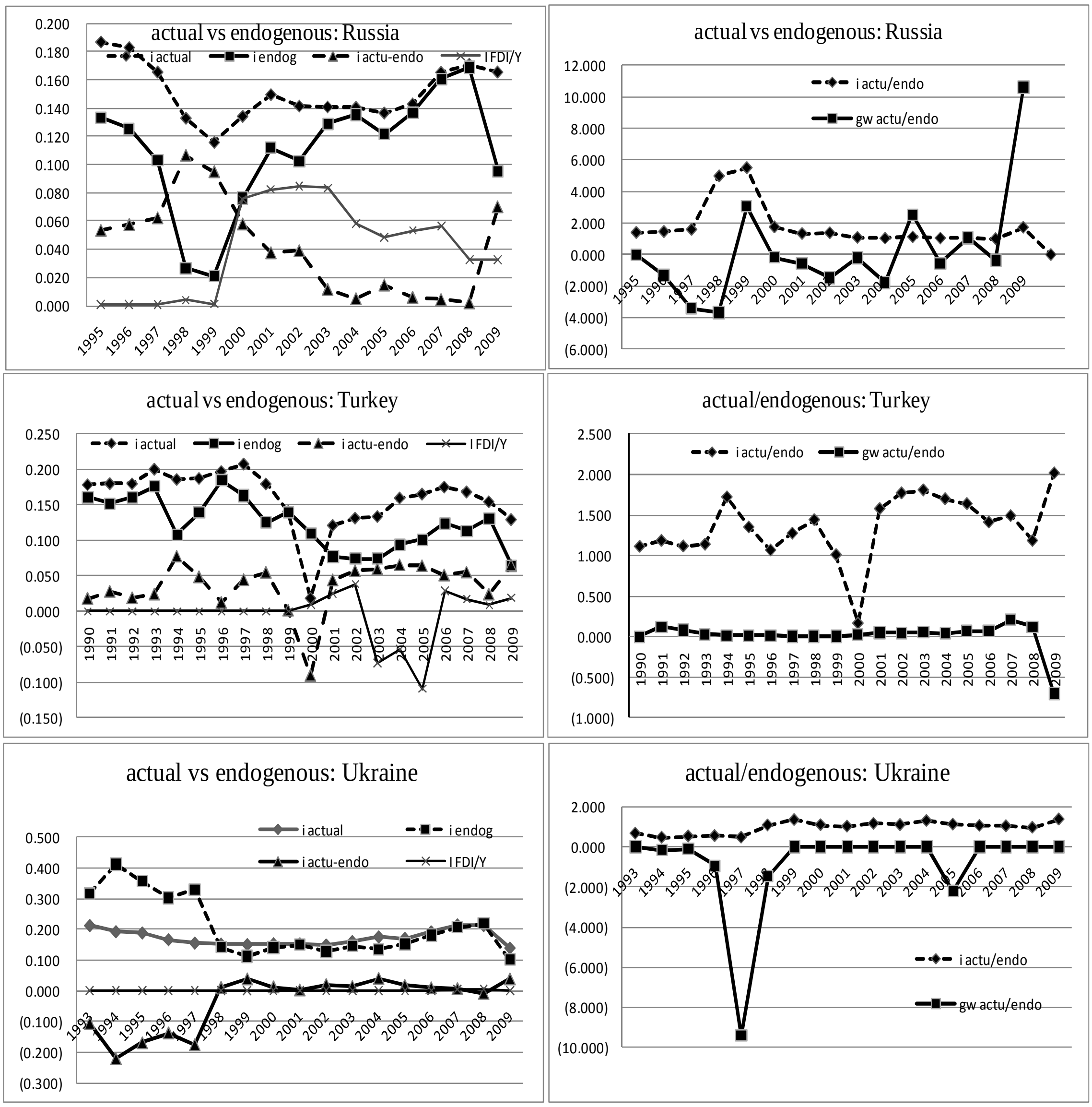

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Figure F8 Actual versus endogenous for net investment and wage rate flexibility: by country in 15-country Europe Area (4)

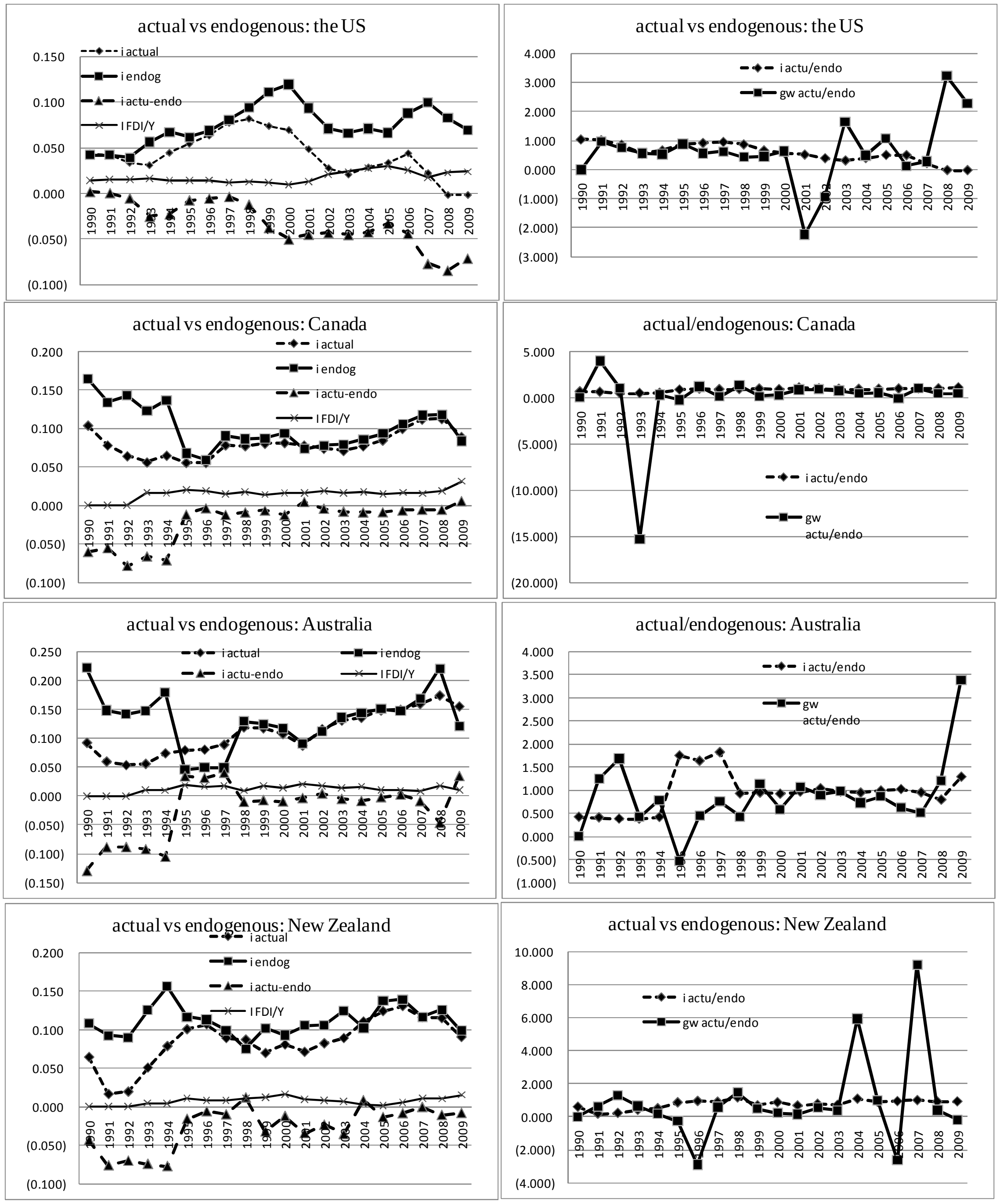

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Figure F9 Actual versus endogenous for net investment and wage rate flexibility: by country in 17-country Pacific and Asia Area (1)

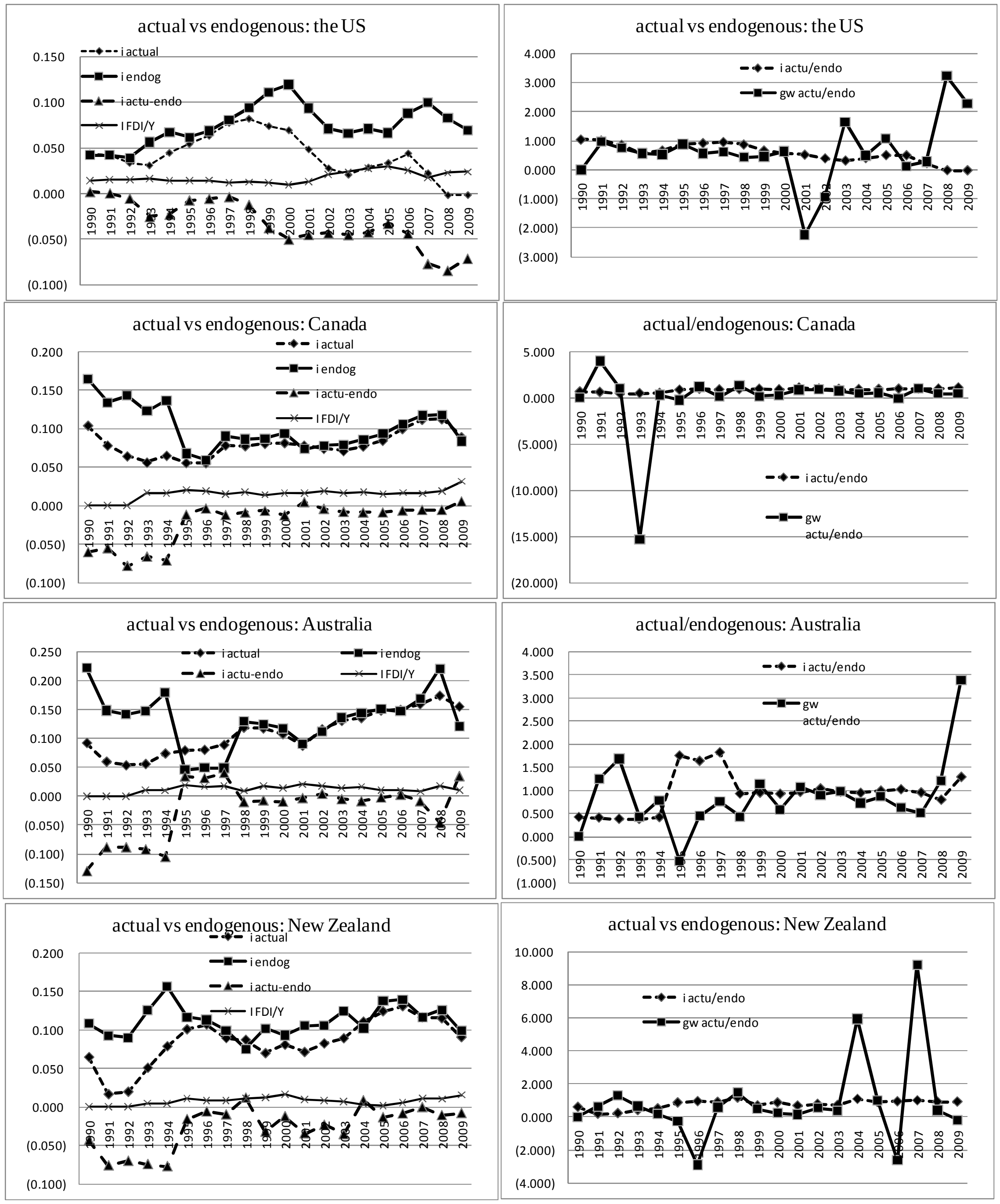

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Figure F10 Actual versus endogenous for net investment and wage rate flexibility: by country in 17-country Pacific and Asia Area (2)

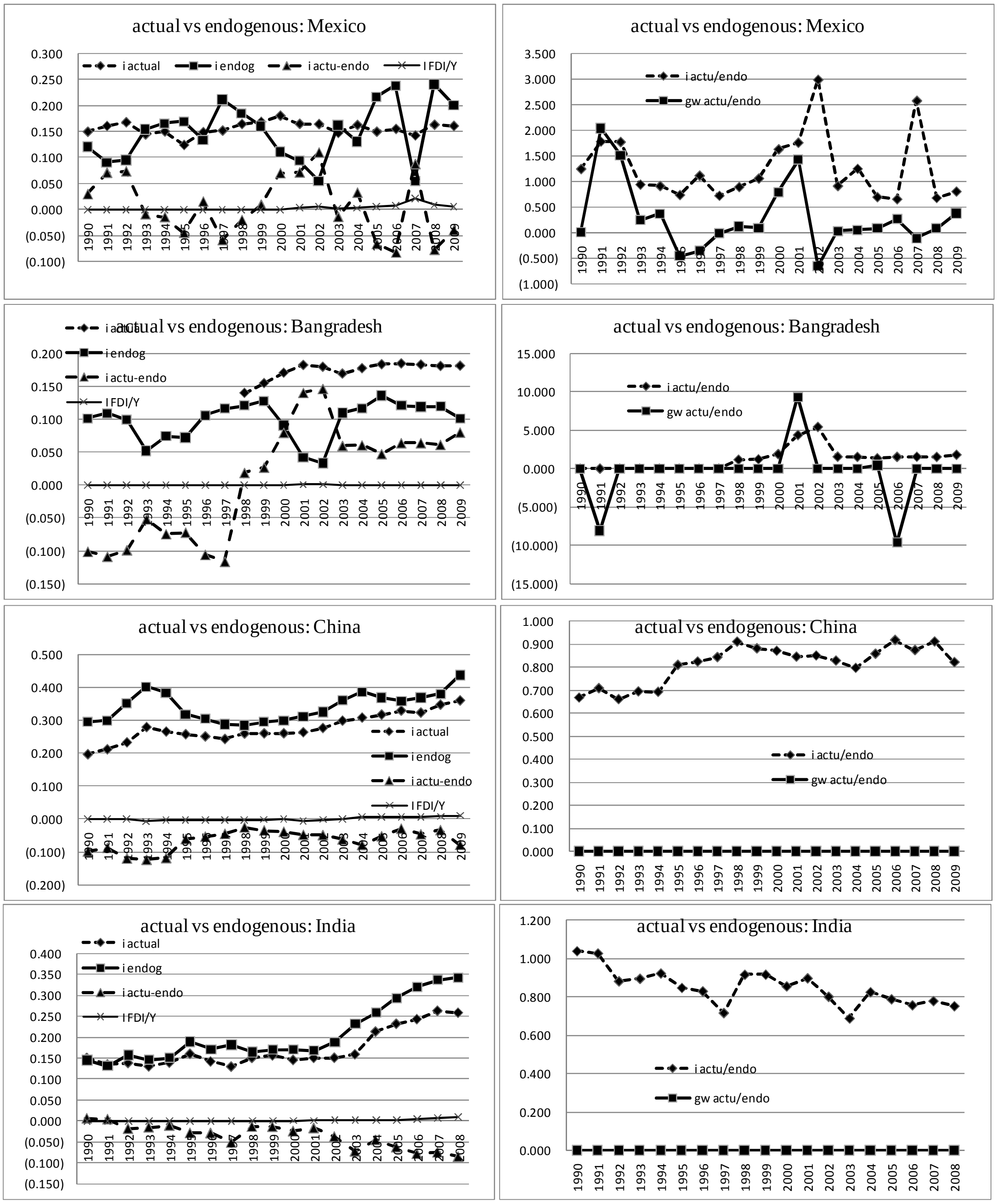

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Figure F11 Actual versus endogenous for net investment and wage rate flexibility: by country in 17-country Pacific and Asia Area (3)

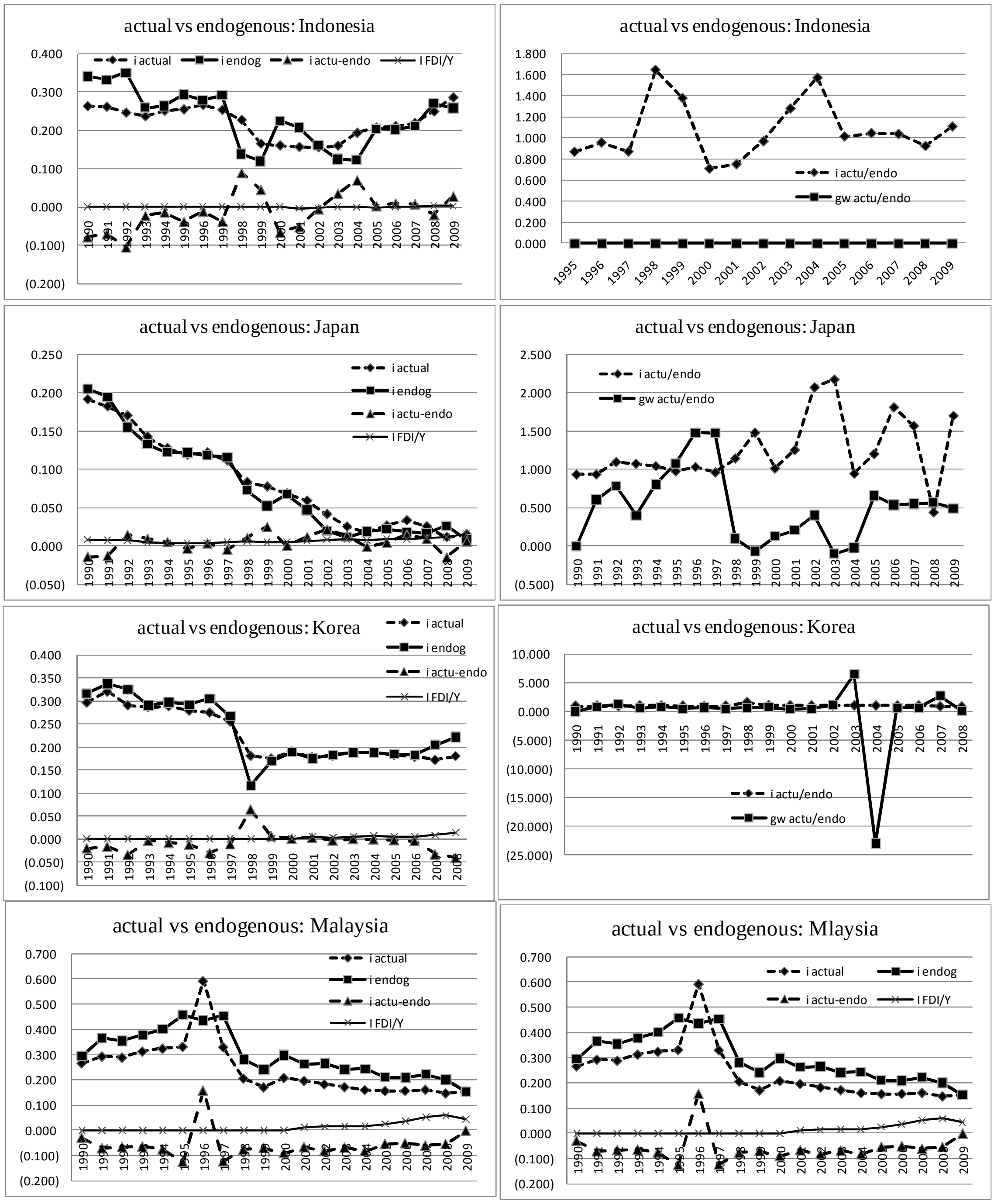

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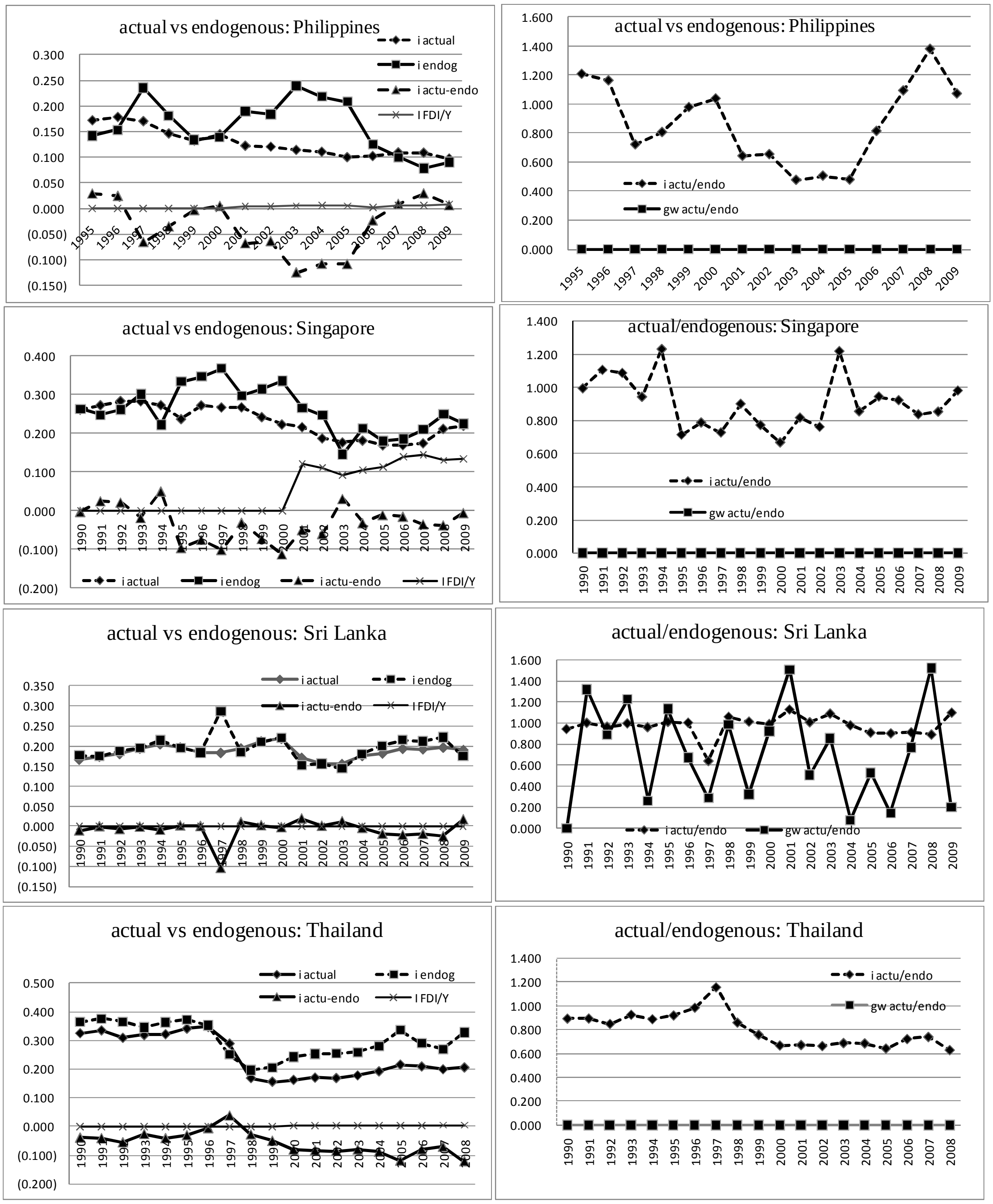
Figure F12 Actual versus endogenous for net investment and wage rate flexibility: by country in 17-country Pacific and Asia Area (4)



Data source: KEWT 5.11-1 by sector, 1990-2009, whose original data are from *International Financial Statistics Yearbook*, IMF.

Figure F13 Actual versus endogenous for net investment and wage rate flexibility: by country in 17-country Pacific and Asia Area (5)

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Chapter 10

Essence of the Endogenous System and Its Geometrical Philosophy

Signpost to Chapter 10

Geometrical philosophy involved in this Chapter is connected with the basic framework of Chapter 1 (see BOX 1-3 Cross-Roads Scientific Discovery (C-RSD) Diagram: positioning of natural, social, and behavioral sciences on a two dimensional topology). Methodology, topology, and endogenous equations in the *EES* are empirically integrated with hyperbolas, reinforced by geometrical philosophy. Geometrical philosophy is another expression of hyperbolas and hyperbolas are each reduced forms of endogenous equations. Endogenous equations have no assumption. The endogenous system stays at a range of scientific discoveries, as stressed in Chapter 1. The author follows Samuelson's (1937, 1940, 1942, 1975) scientific discoveries, with author's empirical proofs to 81 countries today.

This Chapter mitigates the above *fixed* spirituality a little bit and still remains within a range of scientific discovery. The author is grateful to Gerard 't Hooft's advice, Dept. of Physics of Utrecht University, on 26 Sept 2011 (see Appendix A at the end of this Chapter). Hyperbolas in the *EES* stay in two dimensions. Nevertheless, hyperbolas are implicitly connected with space and time. In this respect, I am much obliged to Shizuko Ishida's philosophical intuitions and scientific feel-familiar proofs since 1998. Natural science and social science have common dimensions spiritually and physically. Yet the author treats behavior science and behavior economics more severely than the current stream admits, because behavior science has spread its ranges beyond the current limit of a fixed spirituality.

According to *International Herald Tribune* on 5 July 2012, "Physicists herald a key to mystery of the universe: Discovery is 'consistent' with elusive Higgs boson, which helps explain mass." The abstract follows: "The discovery of what looks like a Higgs boson particle signals what is probably the beginning of the end for one of the longest, most expensive searches in the history of science." Natural sciences are connected with social sciences when people are modest and respect nature or absolute existence in the universe. Behavioral science starts with decision-making and policy-making yet, how could endless avarice of human mind be controlled? Natural science and scientists may dislike the use of results derived from natural science. Natural science and mathematics are solemnly conscious of a fact that a part of researches is even consistent with the whole science.

In a word, behavioral sciences produce different results. Results are related to the spiritual level of policy-makers and people. Therefore the author has asserted that the endogenous system only presents a receptacle of methodology. Leaders and policy-makers decide the qualitative level of results, particularly under the market principles and the price-equilibrium. Nevertheless the author is optimistic to the near future of global economies. Mankind knows and proves that there exists absolute existence in the universe, partly since natural science has opened the door to the universe step by step. And partly world economies in reality are much more tied up with business and life of each other than the last century. The author likes to use 'in reality' as used by Samuelson. This is because science holds historically when scientists execute, experiment, and accumulate experiences and wisdom. Neglect of leaning by doing is no more scientific.

This chapter steps into philosophical, ideal, and spiritual zone behind the endogenous system. Other chapters follow scientific discoveries and proofs as similarly to strict mathematical proofs in the literature. This chapter is responsible for a bridge set between scientific proofs and the absolute zone proofs. Two separate zones, physical and spiritual, do not contradict essentially. It is intuitively natural since absolute or nature commands both zones. Intuitions are right and each researcher usually has his/her deep confidence in intuitions yet, scientific proofs must delete intuitions. It is true that the current sciences begin to overcome the gap between two zones, yet the *EES* follows most strict proofs of mathematicians. Historically, see Appendices B, C, and D at the end of this chapter and conclusively, see **Axiom 3** in <u>Essence of Earth Endogenous System</u>.

Philosophy of Kant Immanuel (1724-1804) does not contradict religion. The 21st Century will get over philosophy and religion more broadly and be relaxed. Intuitions often support scientific proofs behind but no one shows intuitions explicitly. The endogenous equations start with seven endogenous parameters hidden in a discrete Cobb-Doulas production function. Continuous among Neo-classicists and discrete among Keynesians are compatible at scientific proofs. If the author could not discover a discrete Cobb-Douglas production function there is no Higgs boson and no reality. The discrete Cobb-Douglas is a bridge in reality between continuous and discrete schools.

Discrete and continuous cannot be integrated statistically. 'If a Keynesian earlier discovered one of complete (with no assumptions) discrete Cobb-Douglas production functions, author's endogenous system has not been born today.' Why is this statement true? Actually, the AK or Ak model of Keynesians is a specified reduced form of author's discrete production function. Unfortunately the AK or Ak model holds under some assumptions and accordingly, is incomplete. The author is grateful to discreteness of the endogenous system and perfectness of the Excel system.

Preliminary explanations are as follows: The endogenous system is composed of the endogenous theory and its practical data-sets, where theory and practice are a unity.

The data-sets are so called Kamiryo Endogenous World Table (KEWT). KEWT is renewed by year, accumulating the data by country. KEWT 6.12 and 7.13 each remain unchanged. Original data come from *International Financial Statistics Yearbook*, IMF. KEWT 6.12 sets the rate of unemployment as the last means for adjusting the moderate level of the endogenous-equilibrium. KEWT 7.13 settles all the data under no unemployment; the actual growth rate of population always equals the rate of change in population. Ultimately, see six nature-aspects in Essence of Earth Endogenous System.

The philosophy behind is geometrically explained by applying the Positive and Negative principle to each of hyperbolas. The author cites, in this chapter, ‘t Hooft’s (2000) conception of the holographic principle and listens to his advice that the author should be free from his principle. This chapter wholly reviews the author’s own theory and practice based on geographical philosophy that matches the Positive and Negative principle inheriting for the last thousands of years in China. The author, even though, confesses that the Positive and Negative principle and the holographic principle have a common root and foundation to some extent. When human spirit becomes close to the Nature, both natural and social sciences will overlap, free from the current separation of natural and social sciences.

The above paragraph shows the author’s final stance to the endogenous model and system. For memories, the author explains the background of the above paragraph. The author decided to take the above notion when I happened to meet Gerard ‘t Hooft on 26 Sept 2011. Before that, the author had had a little different notion. This is because the author had believed that natural and social sciences have common phenomena since both sciences have a root from the Nature. The author has observed a fact that the results measured at the endogenous system in equilibrium overlap those found in quantum physics from the viewpoint of two-dimension hyperbola and one-dimension ‘space and time.’ When human decision-making does not stand for human cooperation but for selfish fighting, as seen in the real world, social sciences and economics/econometrics are distinguished from quantum physics and element chemistry. This is his notion. Then social sciences differ from natural sciences. The vertical asymptote of a hyperbola, nevertheless, implies that the plus and minus seem to exist each at the extreme but, simultaneously are integrated as one or one as three (plus, zero, and minus). The real world reflects or transcripts the above differences everywhere and any time, even though space and time are invisible.

The current situation in this world seems to be close to the polarity of selfish mind, far from original human mind. If it is so, it shows the Negative polarity, far from moderation or the golden mean in philosophy. It implies that human mind soon turns to the Positive or cooperative mind closest to the Nature, as shown geometrically by hyperbola. This is a reason why the author leaves this chapter for a record.

Lastly, the author adds the spirit of the endogenous system to this signpost. Theory and practice march together with simultaneous causes and effects. Actual statistics data are always within a range of endogenous data, whose ties are endogenous economic policies based on the real assets at the SNA (1993). The literature has progressed cooperatively along with statistics road, as shown by *System of National Accounts 1993, Eurostat, IMF, OECD, UN,* and *World Bank*, 693p, Luxembourg/New York/ Paris/Washington DC. The literature convinces us how important policy-methodology is and suggests what actual data should be first added to the current data-sets of KEWT 6.12 and 7.13; thankfulness for ceaseless IMF's efforts towards the spirit of Keynes (1944). The current econometrics is ready for absorbing a new wave of endogenous road.

10.1 Six Features of the Endogenous System

The first feature of the endogenous system is 'organic' such that each set of data of all possible parameters and variables are wholly consistent with each other, organically without any assumption and towards dynamically balanced 'moderation,' as shown in monism, the Oriental philosophy, or the positive and negative principle. This is because each variable is endogenously measured starting with the measurement of seven endogenous parameters, together with the simultaneous measure of endogenous capital and its rate of return at the endogenous-equilibrium. This leads to such that each variable is a part yet a part of the whole.

The second feature of the endogenous system is expressed by 24 hyperbolas under two-dimensions. The hyperbola has three cases; vertical and horizontal asymptotes are; i) both, zero, ii) both, not zero and, iii) either vertical or horizontal asymptote is zero. Each equation is partial yet a part of the whole, reflecting the above first feature. The hyperbola does not directly have space or time. In the literature, space and time each constitute three- and four-dimensional. Two dimensions of a hyperbola, however, express a whole consistency by country, sector, and year and, over years. This fact implies that the whole consistency takes in space and time as one-dimensional, as Einstein discovered.

The third feature of the endogenous system is policy-oriented. Seven endogenous parameters wholly determine real asset policies (for detail, see Chapter 8 that reveals the essence of seven endogenous parameters). These policies constitute primary 'causes.' A given balance of payments and a deficit, government and private consumption, and population are given values in a sense yet these are converted to endogenous from actual. The results of causes are shown by other data simultaneously by year, without any assumption. This means that the whole data reflect the changes in policies such as revealed by Lucas, R. (19-46, 1976). It implies that mind is first as causes and body follows as results but, both simultaneously appear. Indeed, seven endogenous parameters wholly control policies and changes in policies by year and over years and, so as to turn out to be a well-balanced.

The fourth feature of the endogenous system is that actual statistics data do not go away from endogenous data beyond a certain limit, as long as actual data remain at the endogenous-equilibrium. Actual data are selected from *International Financial Statistics Yearbook*, IMF, and, several datasets such as the balance of payments, deficit, government and private consumption, and population remain given or actual before being endogenous. Endogenous taxes are measured as a size of government and compared with actual taxes when actual taxes are available in national accounts by country. Endogenous data are dynamic and balanced in equilibrium and, each datum is 'numerical energy.' National culture/preferences are preserved by country and, the same results never happen over years by country. As a result, a concept of forecasting is not fitted for the endogenous system and its data-sets.

The fifth feature of the endogenous system is that endogenous data are divided into two sectors, government and private. The division differs from national accounts classification and each component. The fifth feature is deeply related to the above four features. A system for national accounts (SNA) is supreme record-oriented and indispensable as an actual system. Policy-makers, however, need endogenous data that transform the SNA by dividing the total economy into government and private sectors and using just before final income distribution.

The sixth feature of the endogenous system is the neutrality of the financial/market assets to the real assets. The KEWT data-sets have yearly proved the neutrality of the financial assets to the real assets, using money supply M2, ten year national debt yield, and the exchange rate, each by country and by year.[1]

The above six features have been gradually found and steadily realized for the last ten years, along with the improvements in the numerical expressions of data-sets, particularly towards the optimum range of the endogenous-equilibrium. At the same time, the author has tackled how to justify the unique existence of the above six features in the endogenous system.

The endogenous system has followed and absorbed all the performances and gifts preserved in the literature. In particular, the author has confirmed the stand points of methodologies in the literature, using Paul Samuelson's articles in his life time. It is a fact that Keynesians have not used the continuous Cobb-Douglas production function while

[1] The literature under the price-equilibrium has to positively take advantage of financial/monetary policies to support real assets. The endogenous-equilibrium endogenously uses real asset policies (host) and financial/monetary policies remain supplemental (guest). When financial structure analysis such as Rezavi, Gibran's (#135, July 3, 2011) uses endogenous data in parallel, the results must be much more consistent over years.

neo-classicists have pursued this function. The author had kept in mind a 'discrete' Cobb-Douglas production function soon after the author was nominated for the Brooks Prize Award to Master thesis, MIT, June 1974. The author began to challenge for a unique discrete Cobb-Douglas production function when the author became a candidate for PhD at the University of Auckland, New Zealand, Nov 1995. The author's PhD Nov 2003, nevertheless, completed a unique recursive programming for the transitional path, without using endogenous equations. The author proved that non-linear was solely solved by recursive programming. The author could not complete a full set of endogenous equations with limited time, i.e., within eight years, although three of seven endogenous parameters were insufficiently settled. Samuelson (90-93, 1956) and Samuelson and Solow (537-562, 1968) proved that linear was solved mathematically, related to Euler-Lagrange, Lagrange-Hamilton, maximizing and minimizing, based on matrix, and without relying on recursive programming. It was Feb 2004 when the author formulated equations for *beta**, the capital-output ratio, relative share, the growth rate of population, and the ratio of net investment to output in equilibrium, but still having a few hidden parameters such as *delta* and *lambda* unsolved.

Seven endogenous parameters and each equation were revealed in the discrete Cobb-Douglas production function. These parameters determine real-based policies and all the results by year. The author presented KEWT 1.07 in 2007, using nine countries, 1960-2005, simultaneously measuring endogenous capital stock and its rate of return in equilibrium. The current KEWT is 8.14 in Jan 2014, for 86 countries, 1990-2012. During these years, the author has experimentally accumulated methods to measure the endogenous-equilibrium by country and sector. These methods progressed to a universe measurement of the speed years for convergence in equilibrium (hereunder, the speed years). The price-equilibrium is immeasurable and does not present real-based causes. The endogenous-equilibrium is a surrogate for the price-equilibrium. The author now dedicates the current KEWT 8.14 to Dr. Paul; if KEWT 8.14 were available when he was living, his performances were endogenously proved step by step. The above story clearly shows that the endogenous system owes its existence to the literature, without shifting the current paradigm such as Kuhn's (1962, 1970) to a revolutionary paradigm.

10.2 Contact with the Holographic Principle in Physics

The above story, however, remains description and does not justify the existence of the endogenous system. The endogenous system needs a universal theory. What conditions does the universal theory need? There are three conditions[2] for theory to be universal: (1) People of the world consent the theory; (2) The theory is common to the world; (3) No change eternally. No one justifies the existence of the endogenous system

2 Miyako Udatsu (2008) "Introduction of the Positive and Negative Principles," p. 7.

without the above three universal conditions prevailing in the world.

10.2.1 Contact with the holographic principle in physics

Is there a universal theory to satisfy the above three conditions in the literature? The author asserts that holographic memories in quantum physics are a universal theory. Dennis Gabor summarizes "Holography, 1948-1971"[3] in IEEE Xplore. And, Gerard 't Hooft[4] (June 2000) summarizes "The Holographic Principle: Opening Lecture," (see http://www.phys.uu.nl/˜thooft/). The holographic principle requires a 'two-dimension function' in the vicinity of the black hole, where this concept is difficult to prove, except for observations and experiments. The endogenous system data, however, are most congenial with holographic principle, from the viewpoint of dimensionality.

For important reasons, the author here cites the following five statements (Italic is the author's) in Lisa Randall (2005), famous for best explanations without using any equation. (1) Randall (ibid., 418, Chap. 22) states that there is only a single brane—the Gravity brane as an infinite *fifth* dimension. (2) Randall (ibid., 434, Chap. 23) states that 'We'll see that not only could space appear to be *four*-dimensional when there are truly *five* dimensions, but we might be living in an isolated pocket with *four*-dimensional gravity inside a *five*-dimensional universe.' (3) Randall (ibid., 451-452, Chap. 24) states that 'T-duality applies when a dimension is rolled up into a *circle*' and that 'mirror symmetry says that *six* dimension can be curled up into two very different Calabi-Yau manifolds, yet the resulting *four*-dimensional long-distance theory can be the same.' (4) Randall (ibid., 21-28) explains *holography* under the title of 'Three from Two, referring to 't Hooft on page 232. (5) Randall (ibid., 173-174, Chap. 7) explains, most suggestively to the endogenous system, 'The Friedman-Kendall-Taylor deep inelastic scattering experiment,' Nobel for physics, 1990. Their physics experiment differs from macroeconomics yet, the author has all the evidences at the KEWT data-sets that thousand elasticity experiments by value/ratio scatter and, never repeat over years by country. The author indicates that physics and macroeconomics have a common feature in terms of dimensional phenomena. A decisive reason is a condition that national accounts are expressed using money/currency all over the world.

Now, the holographic principle stated by 't Hooft (ibid., 13), to the author's understanding, is summarized as follows: The holographic principle appears in the relationship between the black hole and the dimensionality of space and time. This principle expresses 'one-dimensional reduction' in quantum gravity. Suppose that four-

3 Gabor, Dennis, "Holography, 1948-1971," see Proceedings of the IEEE; Vol. 60 (6): 655-668, June 1972; for previous papers, see References at the end.

4 For the original literature, the following Note 26 is added: "G. 't Hooft, "Dimensional Reduction in Quantum Gravity," Essay dedicated to Abdus Salam, Utrecht preprint THU-93/26 (gr-qc/9310026); id., "Black holes and the dimensionality of space-time," in Proceedings of the Symposium "*The Oskar Klein Centenary*," 19-21 Sept. 1994, Stockholm, Sweden. Ed. U. Lindström, World Scientific 1995, p. 122.

dimensional exists here. Then, three-dimensional, instead of four-dimensional, expresses the whole picture of four-dimensional, as originated by Gabor (1972). As a result, a related discovery is derived; a particle includes information of the whole, though the whole may not be clear at the particle level. It implies that a part is inherently connected with the whole. Further, this connection leads to a discovery that quantum information may have the past and future information. Takeo Oku[5] (62, Feb 2009; in Japanese) indicates that these conceptual discoveries still remain concepts. Are these concepts proved practically? The author advocates that any concept is proved only when the concept overlaps its practice or action; practice is essential to proof and justification. In section 2 hereunder, the author continues to put in order the above concepts in the case of four-dimensional. And in section 3, the author will list up the evidences for the unity between theory and practice that prevails over the endogenous system.

10.2.2 Contact with the relationship between the physical zone and the spiritual zone

For the relationship between these two zones, the endogenous system absorbs the idea of Iyonoishi (20-33, 51-53, "Words of Life," Feb, 2010; in Japanese). Iyonoishi universally integrated the whole relationship between spiritual and physical zones by using curved geometry and element-chemistry. Iyonoishi proves the whole relationship theoretically and empirically using visible materials found in daily life. The spiritual zone is composed of five-dimensions; two-dimensions for the plane (the x and y axes), one-dimension for height, one-dimension for space and time (due to one dimension reduction law), and most importantly the 5^{th} one-dimension for 'spiral' rotation. The physical zone is a shadow of the spiritual zone of five dimensions. The physical zone, however, requires the 6^{th} one-dimension for vibrations (peculiar swing or idle). Both zones are connected with an axle. The spiritual zone spirally rotates first to the right and the physical zone spirally rotates adversely to the left, yet both zones towards the same course. The 'zero point' exists infinitely everywhere at the boundaries of the two zones.

The physical zone is the object of social sciences, where dialectic is used for proof. Iyonoishi's conception absorbs the spiritual zones yet, her conception is proved at the physical zone alone, based on a universe philosophy.

10.2.3 Iyonoishi's zero point as a boundary versus holographic principle's black hole

Now the author clarifies essential differences of concepts between Iyonoishi (Ishida Shizuko) and 't Hooft, and focuses on her zero point versus his black hole. First of all, 't Hooft (ibid., 13) indicates that the particle states require *a two-dimensional function* in the vicinity of a black hole. The two-dimensional function is really a marvelous concept, yet

5 Takeo Oku (Feb 2009) "Is success rule proved scientifically?," p. 60-62 and 66-76 (in Japanese). He does not use holography but use hologram. The author puts 'holographic' in the endogenous system. Dennis Gabor uses 'holography' and 't Hooft, 'holographic photograph' although each stresses the same differently.

this function stays solely at the physical zone, differently from Iyonoishi. Iyonoishi has the zero point as infinitely small boundary lying between the spiritual and physical zone, with one-dimensional space-time.

Each characteristic essentially differs at four conceptual aspects as follows: (1) Iyonoishi sets the zero point at the boundary of the two zones, where the spiritual five-dimension zone turns to the physical six-dimension zone, realized through one-dimensional, swing or idle. His holographic principle stays at the physical zone and sets the black hole. (2) Iyonoishi's zero point exists everywhere at the boundary of these two zones. The black hole of the holographic principle does not refer to the spiritual zone, naturally due to a limit of scientific discoveries in the literature. (3) Iyonoishi's space-time implies that space and time constitute one-dimension inseparably and, Iyonoishi proved it at the physical zone by using familiar goods such as 'Japanese Sudare/bamboo blind' and banana's rind. The holographic principle has its three-dimensional (the plane and the space) at the physical zone, but time enters into the physical zone (consistently with the holographic principle); the space-time is resultantly visible within the physical/scientific zone. (4) Iyonoishi's (312-314, 2012) 'zero point' is immeasurable but infinitely 'close-to-zero' is measurable. Three phenomena (two zones and the zero point) remain the same. The black hole is a physical but immeasurable hole, definitely larger than her zero point. The black hole, in a sense, is an unknown surrogate for her zero point at the physical zone.

Dialectic shifting to Iyonoishi from 't Hooft: 't Hooft (ibid., 13) does not clarify that the black hole connects five-dimensional at the spiritual zone with six-dimensional at the physical zone, while Iyonoishi clarifies the existence of these two zones: the spiritual five-dimension zone and the physical six-dimension zone, with an additional one-dimension, 'swing or idle,' required at the physical zone. The scientists have to stay at the physical zone since the dialectic must be naturally proved in the physical zone. Then, the black hole may exist at the boundary of the two zones set between space and time (i.e., between three- and four-dimensions). This concept has been commonly accepted in scientific approaches.

Contrarily Iyonoishi (20-33, 51-53, ibid.) historically clarifies the zero point-existence at the boundary of the two zones and, anywhere at the physical zone similarly to the current scientific discoveries. This zero point is not countable or immeasurable but distinguished with the black hole conceivable at the physical zone. And, the existence of one-dimension, swing or idle, is indispensable for the shift of the spiritual zone to the physical zone, always jumping over the zero point. The 5^{th}-dimension of spiral rotation respectively at the two zones everywhere expresses the form of the ellipse (for the differences between cycle and ellipse, see Appendix at the end of the *EES*). The author's two-dimensional 'hyperbolic' enjoys the circle (instead of the ellipse) and avoids the relationship/difference between the 5^{th}-dimensions and the 6^{th}-dimensions. [6]

10.2.4 Geometrically further, touching upon sociology and economics

Are sociology and economics able to geometrically absorb Iyonoishi's conception staying at the physical zone? One typical affirmative object is the endogenous system that wholly wraps the holographic principle in Iyonoishi's universe conception. In this respect, it is historically difficult to have an affirmative reply derived from sociology and economics.

The endogenous system uses the plane as two-dimensions, the x and y axes. The author proposes, in the case of macroeconomics, that dialectic holds comfortably at the physical zone when the above hybrid is taken into account. Macroeconomics data or currency data are surprisingly fitted for the proof of holography at the physical zone any more than other sciences and fields. Dialectic shows the logic to grasp the motion and momentum not partially but wholly.[7] The motion and momentum are expressed by accounts, numerical/currency information, energy, light, ray, and universe. It is much easier for macroeconomics to approach the above dialectic or logic than other fields such as sociology[8] and ecological/agricultural technology. Two unique reasons are: (1) Macroeconomics is expressed by national currency accounts at the physical zone. (2) Hyperbola has a secret understanding with the above dialectic. It is more difficult for other fields to measure causes and results numerically.

Nevertheless, there is only one field in economics that takes 'hyperbola' concept into consideration. This is Drazen Prelec (1989) and its revival (2004, 511-532), whose title is 'Decreasing Impatience: A Criterion for Non-stationary Time Preference and "Hyperbolic" Discounting.' Recent papers for hyperbolic discounting are Tarek Coury and Chetan Dave (2010). The discounting rates in these papers are shown by hyperbolic instead of horizontal by year in models or over years on the transitional path. On the contrary, the endogenous system (2005, 2006, 2009) uses the relative discounting rate of consumer goods to capital goods as a surrogate for aggregate individual utility and in relation to the system (see section 3 below). This relative discounting rate is estimated empirically and strictly as a function to distinguish national culture and preferences by country, yet geographically related to all the hyperbolas that support the whole endogenous system.

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6 A reply letter from Iyonoishi to the author, soon after our conference, Osaka, on 16 June 2012, reconfirms that 1) ray has no mass and, electron moves vertically with no mass; 2) neutron moves horizontally; but 3) when neutron makes electron to move together, mass generates with spiral movement. The mass is called Psi as the 23^{rd} Greek word or Ki in Japan.

7 Haruhisa Ogawa, "Baien Miura's space and nature philosophy." (1989; Baien's 200 year's anniversary publication). Baien (1723-1789) was called Orient Aristotelian.

8 The author investigated the space and time or the space-time using Web of Science (available after 1970) at the Library of HSU. The author found 22 title for sociology and 59 for economics, where there was no article to inseparably and numerically treat the concept of the space-time.

Geometrically, the spiritual and the physical zone constitute one unity and are perfect, where the Pythagoras right rectangle is shown by $x^n + y^n = z^n$, with the golden ratio; 3, 4, 5, each at both zones and due to the 5th dimensional, with spiral rotation. The hyperbola in the endogenous system is shown by $x^2 + y^2 = z^2$; not by 3, 4, 5 (i.e., the golden ratio) but by 1, 1, $\sqrt{2}$ (i.e., the silver size that is 'similar' as shown by A3, A4 and A5 paper sizes). For a diagram, see BOX N-2, Notations, after Preface. The right triangle and accordingly, the inherent circle are related to a hyperbola at two-dimensions. Space and time are simultaneously involved in the hyperbola, due to the two applications of the holographic principle and Iyonoishi's one-dimensional space-time over Einstein's discovery. And, these two applications are justified by the evidences of the endogenous equation and its hyperbola in the endogenous system. The decisive condition to the evidence is the unity of theory and practice. The endogenous system is universally qualified with that condition of the unity of theory and practice, equipped by the 24 hyperbola.

Geometrically, the hyperbola has the diagonal and the circle that touches the cross point of the diagonal and the hyperbola curve, where the hypotenuse of the right rectangle is the distance between the above cross point and the origin, when vertical and horizontal asymptotes are each zero. The circle seemingly differs from the ellipse of Iyonoishi, yet both are the same, as confirmed above.

10.2.5 'Theory and Realism' and monism *vs.* dualism

Let the author first feedback the conceptual differences lying between theory and practice. This section is divided into two parts: (1) Samuelson's 'Theory and Realism' still unsolved and (2) monism versus dualism existed with mankind history. There must be common human aspects behind. Samuelson (1963, 1964, 1965) discussed 'Theory and Realism' repeatedly with several commentators in *American Economic Review*, conferring to economics, mathematics, and physics/atoms (see References at the end). It was fifty years ago and then, quantum physics progressed much so far. Yet, regardless of the stage of developments in sciences, 'Theory and Realism' have remained unsolved, the author stresses. 'Theory and Realism' come from the relationship between methodology, assumptions, propositions, theory, empirical data, consequences, and practice. As a result, there were two opposite discussions by Friz Machlup and Paul Samuelson. 'Theory and Realism' have been essentially inevitable not only in economics but also in other sciences. How are the above opposite debates mitigated towards solution at any science? Are opposite debates inevitable, without shifting the physical zone to the spiritual zone or Nature and Universe? There yet exists a solution at the physical zone if assumptions are deleted and if theory and practice are united into one as the methodology. One typical example is the endogenous system by country at macroeconomics, where no assumption exists and the endogenous system (theory) and its data-sets such as KEWT 6.12 and 7.13 (practice) are united by year and over years. The zero point surprisingly overlaps the origin of two-dimensions at the endogenous system. Mind (decision-making) and body (practice) are invisibly tied up with the two zones even if the spiritual zone is neglected.

Second, let the author summarize monism (united mind and body) versus dualism (separated mind and body) or the difference between the Orient monism and the Western dualism, referring to Thomas Kuhn. Thomas Kuhn's (1st Ed., 1962; 3rd Ed., 1996) 'Scientific Revolution' stresses the importance of his 'paradigm shift'. The author agrees on the opinion that historically there been revolutionary shifts of old paradigms in areas such as astronomy after Newtonians, physics, and element-chemistry. But, the author opposes an application of his paradigm shift to the endogenous system. And, the existence of the unity of both zones appeals to human sensitivity as a fact. For example, according to Kuhn (ibid., p.171), 'We are all deeply accustomed to seeing science as the one enterprise that draws constantly nearer to some goal set by nature in advance.' The author, instead, advocates that new discovery and inventions become complete and modest if human integrates mind and body completely even when we live in the physical zone.

This is a monism, apart from duality lying between mind and body. The monism implies that nature prevails everywhere regardless whether or not the two zones exist. Nature integrates mind and body completely when humans understand nature completely. The author advocates the essence of the monism. The monism is most easy to approach the zero point through the unity of mind and body and essentially directs the dynamic balance towards Oriental moderation. Balanced and moderate are key words in the monism. Note that duality today naturally aims at the dynamic balances.

In the fields of social sciences such as sociology, management, and economics, it may be necessary for humans to modestly respect nature, seemingly more than other natural sciences. But, remember that human treats and studies all the sciences. Social sciences in particular treat the relationship between human mind and body at the physical zone, where it is possible for human not to step into the spiritual zone. Apart from human choice, the zero point exists everywhere in the physical zone. A typical case is the endogenous system that uses the hyperbola. The zero point always connects the physical zone with the spiritual zone or decisions with results. The zero point ever related to the origin of the plane. The author advocates: hyperbola expresses philosophical moderation.

10.2.6 Geometrical inevitability from parabola to hyperbola

One will find two different geometrical illustrations using the endogenous system: Parabola and hyperbola have similar attributes mathematically. Is the similarity true? This is the purpose of this section. What is the difference between the parabola and hyperbola in the physical zone? Parabola's origin is able to express the zero point commonly to the physical and spiritual zones. The parabola, however, stays in the 1st quadrant. The maximum or minimum of the parabola seldom corresponds with the origin of two-dimensions. Therefore, the maximum or minimum of the parabola seldom has connection with the zero point and the spiritual zone. Or, the parabola no doubt treats the 1st quadrant apart from the origin when the parabola calculates maximum or minimum using actual data for economics and econometrics.

On the other hand, the hyperbola is complicated since it is always connected with the zero point that overlaps its origin when the vertical and/or horizontal zones are equal to zero. It is impossible to measure the zero point in the spiritual and physical zones. The hyperbola of the endogenous system is expressed by the plane as two-dimensions of the physical zone. Even the cross-point of the vertical and horizontal asymptotes differs from the origin, the origin is primarily tied up with the zero point (not the cross point). The closer to the origin the more difficult to measure the hyperbola values of both the x and y axes. When the vertical and horizontal asymptotes are not zero, the cross point of the hyperbola differs from the origin of the plane. The cross point and the origin must be carefully interpreted for the endogenous system (see section 10.4 later).

Suppose that the hyperbola has its optimum equilibrium range. This range must stay at an appropriate value of the x axis; not to too low and not to too high. This range is primarily measured by the speed years (the y axis) to the net investment to output (x axis) and also to the rate of change in population (x axis) both in equilibrium. The preferable optimum range is coherent in momentum; more strictly than consistently. In a sense, the maximum or minimum of the parabola is replaced by the optimum range of the hyperbola. A great merit of the hyperbola is the connection of the zero point. Since space and time constitute one-dimension, two-dimensions (the x and y axes) embrace space and time at the same time, regardless of whether the zone point is physical or spiritual.

In short, when the endogenous system is based not on the duality of the two zones but on the monism, the mind/decision-making (causes) and the body/practice (results) are integrated simultaneously in this world. Then, the shift of parabola to hyperbola is endogenously inevitable.

10.3 Some Evidences Reflecting the Holographic Principle in the Endogenous System

The author finds five evidences below each as a fact at KEWT database. Five evidences in turn partially justify the existence of the holographic principle itself:

1. The holographic- and policy-oriented causes and results: The balance of payments and deficit, government and private consumption, and population are tentatively given causes before measuring seven endogenous parameters. Then endogenous net investment by sector and also endogenous taxes are measured by country, simultaneously with seven endogenous parameters, the rate of technological progress, and capital (stock) and its rate of return by year and, over years.

2. Simultaneously, all the other parameters and all the variables such as the growth rates of 'output' and 'per capita output' are measured consistently as a whole, where output equals income, as Meade and Stone (1969) pursued. Note that the growth rate of output equals the product of the rate of return and the author's 'endogenous Phelps coefficient' measured by some of seven endogenous parameters. Of course, the growth rate of per capita output is more close to the rate of technological progress and occupies a center of fundamental variables, with the capital-labor ratio (for recursive programming, see Chapter 16).

3. The relative share of capital equals the product of the capital-output ratio and the rate of return: $\alpha = \Omega^* \cdot r^*$. The three elements in $\alpha = \Omega^* \cdot r^*$ each formulate a hyperbola. For $\alpha = \Omega^* \cdot r^*$, the author sets one indispensable presumption. The endogenous system has no assumption, other than this presumption. This presumption is such that the initial/current capital-output ratio equals the capital-output ratio at the convergence point of time in the transitional path. As a result, the initial/current rate of return becomes equal to the rate of return at the convergence point of time on the transitional path. The presumption is required for stopping tautology. Under this presumption, the endogenous system and the recursive programming each are completely consistent by year and over years. The unity of theory and practice at the endogenous system is guaranteed when all the assumption are replaced by equations each by each, except for this presumption.

4. Let the author explain the characteristics of the above three hyperbolas in detail. First, for the capital-output ratio: The literature in general uses the capital-labor ratio when it is estimated, but independently with the capital-output ratio. The capital-output ratio and its hyperbola constitute a primary core of parameters and are directly related to the ranges of the endogenous-equilibrium measured by the speed years, technological progress, and the economic stages by country and sector. The capital-output ratio is inherently related to all the seven endogenous parameters. If the ratio of capital-output ratio is controllable, the endogenous-equilibrium is stably maintained and, the transition of the economic stages, from poor and young-developing to stable-developing and developed, is smoothened. The horizontal asymptote of the capital-output ratio shows an upper limit of economic stage, influenced by each country's national taste, culture, and preferences.

Second, for the rate of return: Its hyperbola is a supplemental core at the endogenous system and explains endogenously the change from inflation to deflation. The endogenous inflation stays in the 1st quadrant, where nominal rate>real rate holds. When a plus rate of return goes to an extreme due to excessive deficit, the quadrant rotates from the 1st to the 4th, by 270 degree counterclockwise, where a minus rate of return appears with a rate of deflation. In the 4th quadrant, nominal rate=real rate+(−inflation rate) holds, resulting in real rate>nominal rate. However, the growth rate of output, whose main element is the rate of technological progress, must be always plus in the endogenous system. This is because the net investment must be positive. If net investment approaches depreciation, the growth rate shrinks closer to zero (until just before zero) in the 4th quadrant. The endogenous Phelps coefficient is the endogenous returns divided by endogenous quantitative net investment, where net investment is the sum of quantitative and qualitative net investments. This implies that the cost of capital as the rate of return less the growth rate of output must be closer to zero, where the difference between the rate of return and the cost of capital is tiny, as seen in Japan data-sets. Now, when the above deflation goes to the extreme, the deflation turns to serious inflation, suddenly returning to the 1st from the 4th quadrant. These phenomena are explained using the characteristics of the hyperbola.

Third, for the relative share of capital: This relative share is responsible for stop-macro inequality, apart from social policies to poor individuals. To balance growth and stop-inequality, the relative share of capital hyperbola must stay within a certain range measured by the horizontal asymptote. Dynamic balances lying between/among parameters and variables are essential to sustainability.

Dynamic balances differ from efficiency and conveniences. The space-time as one dimensional concept in physics is involved in the above three hyperbolas. The space-time prevails everywhere at the endogenous system. For example, the 'endogenous' multipliers based on Samuelson's (1939a, 1939b) are consistently measured by taking into several years before and after a specified year.

5. The methodology of the endogenous system has no assumption, as stated above. National taste/culture is macro-based by country and differs from the aggregation of individuals' utility that is difficult to estimate at the macro level. The same combination of all the parameters and variables never happens by year and over years at the KEWT database. The literature sets a theory and examines it using actual statistical data, which are independent of the theory. In this case, various correlation analyses such as the Granger causal test based on Granger (1969) and the Sims-Test based on Sims (1972, 1980) are indispensable to the verification of the theory, since theory and data are separated. On the other hand, in the case of the endogenous system, it is meaningless to calculate endogenous correlations between and among parameters and variables. There is no need to calculate the correlation coefficients if the endogenous system only uses endogenous data. The endogenous system, nevertheless, sets endogenous=actual for such data as the balance of payments, deficit, and government and private consumptions. These settings are required for first connecting actual with endogenous and second guaranteeing 'policy-oriented.' As a result, 'endogenous saving less actual saving=actual net investment less endogenous net investment' becomes a useful key for real-assets policy makers.

10.4 Common Symptoms Lying Between the Literature and the Endogenous System

The author finds some symptoms in the literature common to the features of the endogenous system. The author takes and interprets three articles, collating each with the endogenous system: The first is Reinhart and Rogoff (May 2011), with respect to mitigated differences between actual and endogenous data in the long-term. The second is Modigliani (Dec 1961), with respect to delicate limitations of 'continuous' modeling formulated after starting with illustrations of discrete national accounts-data. The third is Robert Hall (April 2011), with respect to his long experiences and insights towards unseen causes based on actual data phenomena.

10.4.1 Carmen M. Reinhart and Kenneth S. Rogoff, "The Forgotten History of Domestic Debt," *The Economic Journal* 121 (May, 2011): 319-350

As a preparatory data to Reinhart and Rogoff (2011), the author paid much attention to Carmen M. Reinhart, "This Time is Different Chartbook: Country Histories on Debt, Deficit, and Financial Crisis," Working Paper 15815, *NBER*, March 2010. Then, the author interprets the above Reinhart and Rogoff (2011). Preparatory, Chartbook (2010) distinguishes highlight events using five colors: (1) Years in default or restructuring external debt (pale shading); (2) Years in default or restructuring domestic debt (dark shading); (3) Near default, as defined in test (bright shading); (4) First year of banking crisis; (5) Hyperinflation, annual inflation>500% (medium shading), broadly between 1800-2009, depending on each event. Highlight events are composed of three defaults and two financial extremes, banking crisis and hyperinflation. The data-sets of KEWT 1.07 to 7.13, are measured between 1960-2011 and 1990-2011, respectively. There are much period- differences between the above preliminary Chartbook and the figures/charts in the KEWT base. Yet, the comparisons between the two data sources suggest common phenomena despite of the differences existing between 'actual' data and 'endogenous' data. The author interprets common phenomena as follows:

1. The above WP 15815 precisely shows some of the three defaults with two financial extremes for seventy countries; poor, young-developing, developing, and developed. These events are the results of the real asset changes as the causes, where actual causes and actual results are illustrated.
2. In the long-term, the actual data and the endogenous data are not separated beyond a certain limit by item of national accounts. When the price-equilibrium or the endogenous-equilibrium as a surrogate for the price-equilibrium is moderately maintained, there occurs no default and the neutrality of the financial/market assets to the real assets holds without bubbles and hyperinflation.
3. Banking crisis and hyperinflation are results of default. These occur only when the price-equilibrium or the endogenous-equilibrium becomes unbalanced or gets into

close-to-disequilibrium or disequilibrium. It is a fact that many countries have fallen into default historically in the long run. Is there any feature difference between the price-equilibrium and the endogenous-equilibrium? Yes, the price-equilibrium does not measure its causes while the endogenous-equilibrium wholly measures the causes to close-to-disequilibrium and disequilibrium. Further, it apparently seems that the processes changing from the price-equilibrium to price-disequilibrium are shown by unskillful manipulation of financial policies related to money supply, official interest rate, and other direct means. But, financial manipulation remains supplement to the real assets and cannot essentially solve disequilibrium.

Turning to Reinhart and Rogoff (2011), this article uses actual data, 1810-2010 and 1900-2010, based on WP 15815. The conclusions (ibid., 337-339) indicate that historical data to some extent show the results similarly to the endogenous system, although the results remain vague, without room for the cause-result analysis.

The author interprets the above results such that partials are related to the whole, as shown in physics and such that the difference between actual and endogenous data reduces considerably when 'the period covered' becomes long enough. This implies that actual data for the long-term becomes a surrogate for the endogenous data. Actual data for the long-term have points of contact with the data-sets of the endogenous system. The author compares actual data with endogenous data at KEWT 6.12 and 7.13 and has proved: When the difference rises up beyond a certain level, the room for selectable polices becomes narrower and finally gets into disequilibrium. The author admits that Reinhart and Rogoff presented a challenge for the limit of actual data. Reinhart and Rogoff (ibid., 338-339) states, 'Without a long dated historical data set, how can one meaningfully think about what debt levels are associated with elevated risk of default and financial crisis?.... But, as our historical data set on domestic debt underscores with surprising forces, nothing could be further from the truth.' The author, of course, highly evaluates and respects ceaseless efforts of international organizations against default by country. A problem is that people of default countries do not easily understand essential defects caused by deficit and debt. The endogenous system is able to solve this problem since all the variables are measured, simultaneously with policy-changes by year.

10.4.2 Franco Modigliani, "Long-run Implications of Alternative Fiscal Policies and the Burden of the National Debt," *The Economic Journal* 71 (Dec, 1961): 730-755

Differential and elasticity methods give power to modeling. The relationship between continuous and discrete, however, conveys everlasting questions. Keeping in mind the endogenous system, first, suppose that the continuous C-D production function, consistently over years, holds using consecutive actual data. The necessary conditions for this continuous function are: (1) time interval of the data is close-to-zero, and (2) total differential equals partial differential for complete consistency. These conditions are not realizable since given data are discrete in statistics. Next, suppose that the discrete C-D production function, consistently over years, holds using discrete actual data. The necessary conditions for this discrete function are: (1) the rate of technological progress is measured endogenously, (2) without any assumption, and (3) the equality of income= expenditures=output holds as a base for national accounts. These conditions are realizable since actual data in statistics are discrete. Essentially, a function of $y(x)$ itself stands in the reverse and against the above conditions. Nevertheless, the literature mostly formulates continuous models, starting the sketch in discrete cases and expanding models in various continuous ways under linear. A typical case is the above Modigliani (1961).

The market modeling derived by Modigliani (1961), nevertheless, is close to endogenous modeling at the endogenous system, both starting from the balance of payments and debt. Modigliani's model assumes that taxes are constant while the endogenous system measures endogenous taxes (instead of constant). Modigliani's model uses the market interest rate to justify the assumption that the marginal productivity of capital equals the rate of return in the market equilibrium, while the endogenous system measures a fact that the marginal productivity of capital equals the rate of return in the endogenous-equilibrium (released from assumption). Besides, his model (ibid., 755) sets up two concepts of (1) full-employment saving and (2) capital formation consistently with feasible monetary policy. The endogenous system, instead, full-employment is the last condition to guarantee the endogenous-equilibrium, where once saving and net investment are endogenously measured, full-employment holds, usually satisfying a condition of actual population growth rate = endogenous population growth rate, and the endogenous-equilibrium stays in a moderate range.

Conclusively, Modigliani's model, instead of using endogenous data, relies on the work of the financial market. His approach is consistent with the endogenous system that the neutrality of the financial/market assets to the real assets is tested and justified by using the KEWT data-sets. His rule to 'government deficit,' however, shows a severe condition that the balance of payments must be positive in the price-equilibrium. His conclusion differs from endogenous results that the balance of payments should be kept between plus 3% and minus 3% when an economy maintains stable growth over years. His conclusion sacrifices the balance of payment for the increase in deficit, which lowers sustainable growth in the long run. His model is one of the best approaches under the price-equilibrium without directly using 'actual capital' while the endogenous system is based on the endogenous-equilibrium with the use of 'endogenous capital' by sector. Note that his model starts with discrete calculations as shown in his Table I, but for logic his model has to step into differentials to formulate variables while the endogenous system measures all the variables endogenously in the discrete time by year. The endogenous system measures so to speak his Table I, by using the whole data-sets by country, sector, and year.

10.4.3 Robert E. Hall, "The Long Slump," *American Economic Review* 101 (April, 2011): 431-469

The issues of Robert E. Hall (2011, 467) do not contradict those of the endogenous system. For both, Samuelson's "neo-classical synthesis" is vividly alive in macro-economics. Why does Hall have critical mind rather commonly to the endogenous system? This is because Hall's article is based not on the financial assets but on the real assets, where monetary policy is short-sighted as shown in the last paragraph of page 467. The author proves the existence of the neutrality of the financial assets to the real assets in the long-term (see, *IAER*, 2010). The author indicates that the above neutrality was figured out by the positive theory as advocated by Milton Friedman (1977). Even if monetary policy is well managed, Paul Krugman's (1998) proposal will immediately settle the situation, but never fundamentally.

In particular, Hall's last statement on unemployment and inflation matches one phenomenon derived by the endogenous system. Hall (ibid., 468) states:

> The analysis and calculations in this article assume that the gradual price adjustment described by the Phillips curve does not occur. Inflation remains at the same rate. If inflation declines and turns into growing deflation, the slump will worsen, as the real interest rate rises. So far in the current slump, notwithstanding episodes of grave concern, no slide into deflation has occurred.

The endogenous system measures the causes and results as stated in the above statement. Why does 'the Great Slump that began after the end of 2007' show a symptom against the Phillips curve [9]? The author, in the endogenous system, converted the non-accelerating-inflation rate of unemployment (NAIRU) to the 'endogenous' NAIRU. Both NAIRUs each have a common key word of 'the vertical line' defined as the natural or endogenous rate of unemployment. The vertical line is indifferent of the rate of inflation. The difference between the NAIRU and the endogenous NAIRU is that the NAIRU uses actual unemployment and an external rate of inflation, while the endogenous NAIRU measures both endogenously. The difference between actual and endogenous data exist yet, actual data stay within a certain range of endogenous data in a moderate equilibrium, as the author stressed repeatedly.

The author interprets 'the Great Slump that began after the end of 2007' as follows: The vertical line defined as the 'endogenous' rate of unemployment overlaps the y axis, where the endogenous full employment is independent of the 'endogenous' rate of inflation. This means that full-employment always holds under any rate of return at a moderate endogenous-equilibrium and that the condition of this equilibrium does not necessitate unemployment as the last condition to a moderate equilibrium. However,

[9] For the Phillips curve, see Paul De Grauwe, "*Economics of Monetary Union*," (34-53), where several figures are shown by developed country, 1970-2000.

when the condition to obtain the endogenous-equilibrium requires unemployment as the last condition, unemployment occurs but rarely in equilibrium. Actual data reflect these circumstances.

On the other hand, the higher the endogenous growth rate of output the higher the endogenous rate of endogenous inflation as the horizontal asymptote is. When the dynamic balances between all the parameters and variables were broken, far from moderation, both the growth rate of output and the rate of return shrink to close-to-zero in the endogenous-equilibrium. ‘The nominal rate of return>the real rate of return’ still holds, as the case of the current US. When the circumstance conversely falls into close-to-disequilibrium or disequilibrium, ‘the nominal rate of return<the real rate of return’ appears, which rises the real rate. When the government saving shows an extreme minus by year and over years, the whole economy deflates, as the case of Japan. Actual data reflect these circumstances and the market catches these circumstances. Hall’s ‘actual unemployment at a level of inflation’ is examined by seven endogenous parameters.

10.5 Concluding Remarks

This chapter shows the essence of endogenous system as one unity of theory and practice at macroeconomics. The endogenous system has six fundamental features as summarized first in section 1. Numerical/currency information at the endogenous system partially reflects the finding of the holographic principle, which has remained as conception. Behind the holographic principle, Iyonoishi’s universe conception exists. Iyonoishi’s conception was summarized in section 2, compared with ‘t Hooft’s holographic principle. The author indicates that if human becomes more modest and obeys to nature, social sciences and economics approach more to natural sciences. The reason is that the positive and negative principle exists with mankind history for thousands of years. This fact is expressed most geometrically by the author’s hyperbolas. The principle embodies the vertical asymptote of the hyperbola, as discussed in section 4, in comparison hyperbola with parabola and, optimum with versus. Geometrically and philosophically, one will understand the implications of KEWT database as a unity of theory and practice, and will confirm the existence of numerical evidences.

For suggestive evidences in the literature, the author selects three favorable articles by Carmen M. Reinhart and Kenneth S. Rogoff (2011), Franco Modigliani (1961), and Robert E. Hall (2011). These three articles appeal some points of contact set between actual and endogenous data. Even actual results clarify the results close to the endogenous system, though actual data never clarify the cause-result analysis.

For the cause-result analysis: Policy-makers by country now i) keep in mind the endogenous-equilibrium directed towards dynamic moderate balances among data by country, ii) control seven endogenous policy-oriented parameters, iii) enjoy sustainable technological progress, iv) take advantage of its own national history, culture, and preferences, and v) need no sequential calibration and no initialization problem. There is no magic but lasting fact. The endogenous-equilibrium is endowed with holographic-oriented causes and results. Direct causes are seven policy-oriented endogenous parameters. Results are all the other parameters and all the variables. The author has indicated that accounting, financing, management, and economies constitute one unity, not to be partial and not to be divided by field. The author finds that Dual Motive Theory (DMT) led by Gerald Cory (1974[10]) has the same root as the Orient philosophy; e.g., dynamic balance changes of Ego (demand) and Empathy (supply) based on the positive and negative principle. DMT strengthens the base of behavioral economics, whose accumulation for strategies and tactics will support endogenous policies at universe macroeconomics.

For system difference: The 'mixed' economy has been discussed first by Samuelson (1964; 1970, 1973, 1980, in his long seller, 'Economics'; *Challenge*, 1988). Farrant, Andrew, and McPhail, Edward (2009) historically summarized the logic of mixed economy, comparing Hayek with Samuelson. Certainly, the logic is related to controllability of an economic system. The endogenous system, aiming at balanced moderation between sectors (government and private), guarantees the controllability, with higher spiritual humanity leadership by country; not by any particular system but by relaxed sensitivity, and beyond over static classification of democratic vs. dictatorial.

Forecast is replaced by the results determined by the changes in seven policy-oriented endogenous parameters. Yet, in the future, the author expects to have new forecasting developed by cooperative use of actual and endogenous data if a few more original data are added to actual statistics. Note that the SNA statistics is a unique actual statistic records and this is a great historical fact.

The author presents thankfulness to the efforts of the IMF members that have improved actual data for almost all the countries more accurately by year and over years. Without the *International Financial Statistics Yearbook* (*IFSY*), IMF, the author could not consecutively have set the KEWT, 1.07 to 8.14, up to date. For more pertinent fiscal policy-making and the reduction of the differences between actual and endogenous data, the author hopes that the *IFSY* would include actual data such as total taxes and subsidies, government and private net investment (similarly to consumption of 96f.c and 91f.c), foreign direct investment in and out, and most importantly, 'wages/compensation.' By joint cooperation of actual and endogenous, the difference between the endogenous-equilibrium and the price-equilibrium will numerically vanish, and peaceful cooperative world economies will be at hands as Keynes expected earlier in 1944.

[10] We enjoyed discussions with DMT group at Session # 266, WEAI, San Diego, on July 3, 2011, with Gerald Cory and Liz Li, thanking for sympathetic synchronized time to listening to "Dual Motive Theory and the Economics of Social Networking," by Liz Q. Li and Yan-Gene Chan, with eighteen citations on page 18.

Appendix A Before and after advice given from Dr. Gerard 't Hooft on 26 Sept 2011

Before the discussion at Dept. of Physics of Utrecht University: The holographic principle is applicable to macroeconomics. A reason is that currency magnitude of national accounts data may be most fitted for the holographic principle.

After the discussion: The holographic principle should not be applied to macroeconomics. A reason is that a part of the whole is consistent with the whole, where the whole of quantum physics differs from the whole of macroeconomics. Partially the principle is applied to the endogenous system but not wholly since natural sciences differ from social sciences. The author still believes that the holographic principle is applicable to macroeconomics; not by 'holographic principle' but by 'the principle,' deleting the word of 'holographic.' But, this use does not follow his advice. The wholly is more important than partially. The endogenous system is worthy of practical use only if it is applied to economics wholly and systematically and under moderation.

Gerard believes that social sciences are involved in human's mind and body. Assume that mind and body are integrated into one and completely close to nature or controllable. Then, both sciences are the same, he may say. However, this does not hold in the human world. He stresses that human cheats each other to get money. If human always thinks of others, then human spirit becomes close to the Nature spirit, where human respects nature modestly. It is insolent for human to conquest the Nature or challenge for the Nature.

The author accepted his thoughtful advice. The author defines 'the endogenous model and its system' as a whole unity of theory and practice, and stops applying his *holographic* principle to macroeconomics after 26 Oct 2011. The theory is composed of the 'discrete' Cobb-Douglas production function by country, year, and sector (government and private sectors). The practice is composed of Kamiryo Endogenous World Table (KEWT) 6.12 and 7.13, by sector, where endogenous data-sets and corresponding recursive programming by fiscal year are measured consistently or endogenously. The endogenous system is unique in that the *discrete* Cobb-Douglas production function was strictly established as the first appearance in the literature and that the endogenous system or KEWT database is applied commonly to countries, starting with original actual statistics data at *International Financial Statistics Yearbook*, IMF.

The *foundation* of the endogenous system is 'purely endogenous,' where all the data are endogenously measured using endogenous equations by year and over years without later correction. And, the endogenous system is geometrically strengthened by corresponding two-dimensional hyperbolas each as a reduced form of endogenous equation. Actual data and endogenous data march together. Actual data fall into a certain range of endogenous data when the endogenous-equilibrium is moderate by country and by sector, as a measurable surrogate for the price-equilibrium prevailing in the literature. When national leaders make policy-decisions (causes) to approach endogenous data as targets, hopeful results are realized by year, directly clarifying causes-results relationships. For example, full-employment turns to a normal fact from an unrealizable dream, with a low inflation by country and under a moderate endogenous equilibrium. Policies taken at the endogenous system are based on the real-assets and start with the structure of the balance of payments, $(S - I) = (S_G - I_G) + (S_{PRI} - I_{PRI})$, where $(S - I)$ is the balance of payments, $(S_G - I_G)$ is deficit, and $(S_{PRI} - I_{PRI})$ is the remainder at the private sector. Money and financial-assets policies are neutral to the real-assets policies.

The discrete Cobb-Douglas production function does not hold without discovering *seven* endogenous parameters that expresses changes in policies by year, where capital and labor are rival items. And, endogenous policies absorb 'strategies and tactics' supported by non-rival items such as human capital, education, R&D, and learning by doing. The endogenous system simultaneously measures all the parameters and variables, starting with capital and its rate of return and with national taste and culture measured by macro-utility by country.

The characteristics of the endogenous model and system are: i) Endogenous data do not repeat the same results, similarly to actual statistics data by year and over years. ii) A part is the part of the whole; part and whole are always consistent each other as long as within the endogenous system. 3) Geometrically, two-dimensional hyperbolas are commonly consistent with space (any country and sector) and time (by year and over years). One-dimensional reduction law holds similarly to a principle at quantum physics.

At the same time, the author reconfirms that mind and body are inseparably one in this world or that philosophy, decision-making, and results, are inseparably one. The Orient philosophy expresses itself the positive and negative, cosmic dual forces, yin and yang, or sun and moon. The higher the philosophy the more hopeful the endogenous data results are.

It seems that the endogenous model and system completely differ from the literature. The fact differs. The base of the endogenous model has succeeded the accumulation of Keynesian and neoclassical models and, erases all the assumptions (typically nine assumptions of Meade, J. E., 1962). Assumptions are required for scientific discoveries when equations are not formulated. Indispensable is national accounts consensus that wages are attributed to households so that no returns are expected at the government sector. Accordingly deficit has to be the difference between cash flow-in and -out at the government sector. Or, the rate of return is totally attributed to the private sector. There exists no methodology behind to measure capital simultaneously with the rate of return. Most regrettably, the rate of technological progress has been given externally in the continuous Cobb-Douglas production function. To cope with these difficulties, the endogenous system first of all measures the rate of technological progress endogenously. When the rate of technological progress is endogenously measured, the exogenous golden rule proposed by Phelps, E. (61, 1960) turns to an endogenous golden rule between the rate of return and the growth rate of output, with the measurement of capital and its rate of return by sector.

What is the aim of the endogenous model and system? The aim is the moderate and robust maintenance of the endogenous-equilibrium. This is measured by the speed years by country and by sector. The speed years are one divided by the speed coefficient as a growth rate in equilibrium, $(1-\alpha)(1-\delta_0)g_A^*$. The rate of technological progress is $g_A^* = i(1-\beta^*)$, δ_0 is diminishing returns to capital coefficient, i is I/Y, and β^* is qualitative net investment coefficient. Seven endogenous parameters are involved in the speed years and determine all the parameters and variables. An economy is robust when the situation is dynamically and modestly balanced.

Appendix B Five to six dimensional at the real world: From Pythagoras, Gauss to Fermat, Wiles and Iyonoishi (2012)

1. Iyonoishi (xxvii-xviii, 2012)[11] proves, for the first time in history, a common mechanism that nine problems unsolved at the current physics are wholly solved by only one equation prevailing in Supersymmetric Grand Unified Theory and, this equation is $x^n + y^n = z^n$ $(n \geqq 3)$.

$x^n + y^n = z^n$ has been the same as that of Pierre de Fermat's (1601-1665) Grand Theorem and also that of Pythagoras (572-492 B. C.) theorem. Iyonoishi indicates that $x^n + y^n = z^n$ is an equation that has mass by the breakthrough of natural symmetry and changes to mol-amount of substance.

$x^n + y^n = z^n$ is an equation that produces pentagram form from the breakthrough of natural symmetry. $x^n + y^n = z^n$ is an equation that produces a balanced feel beauty ratio i.e., the golden ratio of $1{:}1.1618$ and shows the law of beauty (goodness, truth, and beauty) hidden in all things formation. Iyonoishi earlier finds: $x^n + y^n = z^n$ is an equation required for the beginning of human body DNA. This fact was shown by 'Kanon (body's ideal ratio)' drawn by Leonard da Vinci (1452-1519). Iyonoishi exclusively finds that its mathematical geometry is another expression of elementary particle.

Pierre de Fermat's Grand Theorem (1601-1665) had not been proved for 350 years. In 1994 Andrew John Wiles (1953-) discovered a proof of Fermat's Grand Theorem equation that except for *n*=2, there is no (rational) integer *n* to satisfy $x^n + y^n = z^n$.

Iyonoishi interprets Wiles' (1994) chance to proof as follows: Wiles could prove Fermat's equation when he realized that all the elliptic curves were composed of modular forms, whose final path was given by 'Taniyama, Shimura, and Iwasawa forecast.'

According to Iyonoishi (though Kamiryo is responsible for translation[12]), compiled module format stays at the upper half of complex plane (whose x axis is 'real axis,' and y axis is 'imaginary axis') and is characterized by non-Euclidean geometry. Non-Euclidean geometry is shown by $\mathrm{Rij} - 1/2\mathrm{gijR} = \mathrm{KTij}$. The LHS of non-Euclid geometry shows bent space and time and, the

[11] Iyonoishi (2012). *Solve the Universe by Japanese Language*: with an Article, 'To Solve Neutrino's Puzzle Why Neutrino is Faster Than Rays (in Japanese). Tokyo: KonnichinoWadaisha. xxvii, 355p.

[12] The author confirmed related terminologies using http://en.wikipedia.org/wiki.

RHS mass and energy; space and time is warped by mass. Originally Carl Friedrich Gauss (1777-1855) hit this module format. Gauss discovered that natural number was composed of three triangles, which was equal to Iyonoishi's mass root form. Finally Wiles proves Grand Theorem by using exponent 5. This '5' is the same as $n = 5$ at $3^2 + 4^2 = 5^2$, which Direchlet Peter Gastav Lejeune (1805-1859) proved. Iyonoishi stresses that this '5' is the origin that produces 'warped' five dimensional universes (i.e., to six dimensional). Therefore five produces six dimensional in the real world).

2. Iyonoishi proves, for the first time in history, 'Higgs Boson' by expressing its substance using her own spiral-movement equation that shifts from five dimensional in spirituality to six dimensional in reality based on currently existing Gauss's Plane. It implies that Higgs Boson is a boson that shapes geometrical super symmetric particle, plus and minus in this real world.

On 5 Aug 2012, the European Organization for Nuclear Research (CERN) discovered a new particle that seemed to be Higgs Boson, it was reported by newspapers. Contrarily, another report says that it was not discovered dated in the same August. Currently common consensus in the literature is that Higgs Boson is difficult to catch or trace back since it disappears at a moment when it appeared. Kamiryo confirmed her proof by a reply letter to Kamiryo dated 15 Sep 2012.

3. Iyonoishi (i-xxvii, with 18 figures, 2012) theoretically proves, for the first time in history, the mechanism that μ neutrino is faster than the speed of light, by using imaginary numbers. She states that without imaginary numbers natural science no more expresses any explanatory fact and its proof. And, she proves, using 18 figures, that by using imaginary numbers the above mechanism does not contradict Einstein's theory at all.

4. Further Kamiryo' endogenous system itself expresses an empirical or numerical proof of Iyonoishi's great discovery (beyond scientific discovery) that the real world simultaneously expresses every phenomenon at the spiritual world (see Iyonoishi (Figure 17 at 17, 2012). As a result, the golden ratio of 3, 4, 5 does not contradict the silver ratio of 1, 1, $\sqrt{2}$ at the Pythagoras equation. The 1, 1, $\sqrt{2}$ lying behind Kamiryo' hyperbola becomes closer to Japanese culture/civilization. The irrational number of $\sqrt{2}$ characterizes a unique character of hyperbola.

Appendix C Why does Kamiryo remain circle and hyperbola plane in the endogenous system ?

1. When spiral-parametric equation in physics is expressed at x-y plane, rotation does not appear but circle appears. Add time axis to plane then, three dimensional appears with the shape of spring and circle disappears, where the values of length and area differ from those at plane. The author takes advantage of this spiral-parametric equation and dares to remain at x-y plane. The endogenous system formulates endogenous equations instead of parametric equations. Thus all the parameters and variables are precisely and simultaneously measured. Yet, hyperbola is connected with spiral-parametric equation, through a way of cos (t) and sin (t).

2. Circle exists at plane and does not exist at any higher planes. KEWT database stays at plane and consistently follows circle as a base for Kamiryo's right-hyperbola to reinforce all the

endogenous equations. Circle is directly related to Hicks' (65-82, 170-181; 1950) use of 'sin' that expresses business cycle (see Chapter 14). Circle is also related to the exponential, e^x, along with real and imaginary numbers when its complex plane exchanges equations.

3. Plane in the real world implicitly includes space and time, from two dimensions to four dimensions. This is because the real world simultaneously expresses every phenomenon at the spiritual five dimensional zone, as discovered and, theoretically and empirically, proved by Iyonoishi (2012; since 1998). The author explains its outline only here at Chapter 10. The author stays at 'Cross-Roads Scientific Discovery Diagram' fixed by certain level of spirituality, as stressed in Chapter 1, and follows Samuelson's (1970) and, endogenously proves Sato's (1981) discoveries on the Lie Theory (see Notes at the beginning of the *EES*).

4. Topology at plane remains explanations by researchers in the literature. Topology at the endogenous system is always measured precisely by county, sector, year, and over years. This is because all the endogenous equations are respectively reduced to hyperbola. This result is due to the circle existing behind each hyperbola. For example, an econometrics model uses CES production function whose values of elasticity is fixed, instead of using author's discrete Cobb-Douglas production function under constant returns to scale. The endogenous system does not need supposed elasticity values, since these values are endogenously measured.

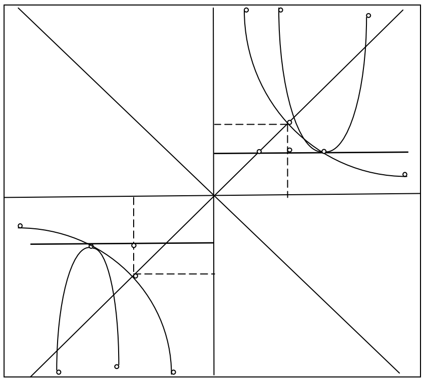
5. Topology in the literature shows not circle but ellipse. The literature is based on the price-equilibrium and aims at maximum profits/returns. This is expressed by using parabola. The topology in the endogenous system measures a maximum rate of return to a minimum ratio of net investment to output. The origin is not required for parabola: anywhere parabola exists. The origin is required for parabola: anywhere hyperbola exists but with its origin of a fixed plane. Parabola is symmetric at the maximum or minimum point, regardless of the origin. The hyperbola has a hidden circle. The curve of hyperbola is symmetric at a crossing point of the circle and hyperbola on the 45^0 diagonal. Hyperbola empirically proves **Axiom 1** for a constant capital-output ratio (see Essence of Earth Endogenous System).

6. Minkowsky, Hermann (1918 and many…) shifted space and time to four dimensions from two dimension plane and, showed a line. The line exists at plane and also his four dimensions. The line holds anywhere simultaneously and with no contradiction, from the viewpoint of Iyonoishi's discoveries in Physics and element chemistry (see above 3). The author agrees to Iyonoishi's conclusive reply by letter dated on 15 Sep 2012. Social science eventually follows discoveries at natural science. And, this is a correct road which is everlasting.

7. Kamiryo's first proof in topology: Overlapping of the Golden ratio to the silver ratio

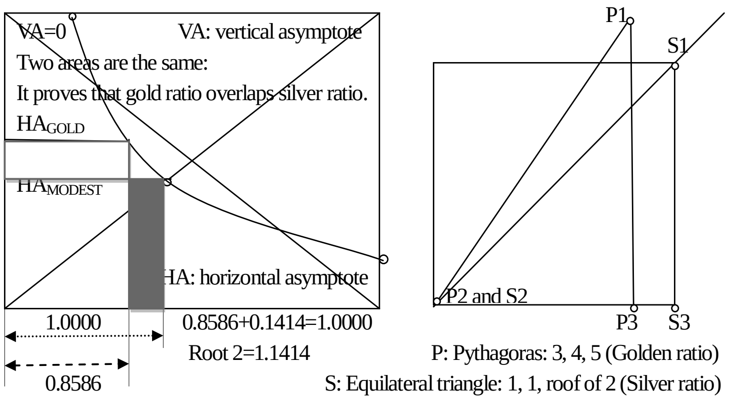
The following figures clarify the first proof. This was presented to CMI after the author(s full paper (Royal roads to Utopia economy, wholly under the endogenous-equilibrium=the price-equilibrium) to Royal Economic Society Conference, Manchester, 7-9 April, 2014.

Chapter 10



Samuelson's Parabola maximized is united with profits maximized with net investment minimized in 2D Plane Hyperbola (2DPH)

Fig. P1 Two-Dimension Plane Hyperbola (2DPH) reinforces Parabola-maximized profits principle

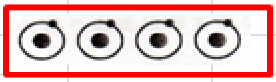
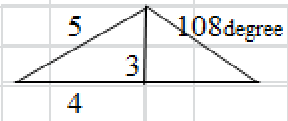
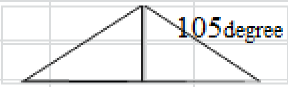
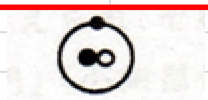
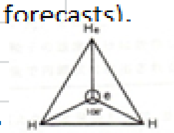
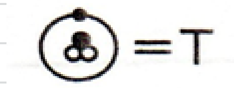


Note: The author cites Fig. 4 in a paper sent to Clay Mathematics Institute (CMI), Cambridge. This is because Fig. 4 proves the equality between the silver ratio area and the golden ratio area in two-dimension plain hyperbola (2DPH). The title of the paper to CMI is 'Proofs: Riemann Hypothesis with Yang-Mills,' by Shizuko Ishida and Hideyuki Kamiryo, dated on 23 Aug 2013. Explanation of Fig. 4: Start with the silver ratio, whose length is 1.0000. Then length of the golden ratio must be 1.0000−0.1414=0.8586. As a result, each area is the same, and also each increased area.

Fig. P2 First proofs in plane topology: The Golden ratio equal to the Silver ratio

The above two figures imply that Pythagorean triangle and equilateral right triangle are closely related or Greece culture and western civilization are tightly related in this world or the six-dimension world. The Silver ratio has been brought up as agricultural civilization for at least two thousand years in Japan Inlands, separately from Europe and other continents. The Golden ratio has been the center of Western and Near East civilizations since the dawn of history. World civilizations are united by nature. This notion is proved by using topology now here. We are harmonious as mankind and close to the Nature. The fact is that philosophy is produced by hyperbola and its spirituality. We are working in Utopia, not ideal but in reality.

Appendix D Shizuko Ishida's beyond six-dimension mathematics

	Nine red-color frames show **established theorems** Three boxes without red frame show **Ishida's new hypotheses**		
①	4 units of nuclear reacton, before reaction of rays of the sun	 one unit of **P** (proton) and one unit of **e** (proton emission).	**H** – hydrogenate = proton = **P** **p + e**
②	4 units of hydrogen atom, produced after nuclear reaction.	2 units of neutrino, 2 units of proton emission  Higgs boson (Ishida forecasts).	neutrino (ν) proton emission (e)
③	after reaction, hydrogen atom is emanated. Neutrino has a role for frame of original form. After this role, frame is off.	 It is implied, Electron neutrino is is transformed. (**Ishida** forecasts).	 **H**, 2 units of deuteriumheavy hydrogen **e**, 1 unit of patron emission **D** = heavy water deutrium oxide
	neutrol is produced. → patron emission is produced.		
④	Ultimately, 1 unit of **He** (helium) is produced 4 units of **He** produces regular tetrahedron. (Methane is produced,	**He** is compsed of 1 unit of atomic nucleus and 2 units of neutrino, and patron emission. (**Ishida** forecasts). forecasted). 	**He** forms tritium bonding. (**Ishida** forecasts). 
	Atom of carbon and oxygen is produced by helium rneuclear fusion reaction.		

Note: The data source: Figure 17 (Inspective illustration: Ishida versus established theories for sunbeam hydrogen atomic nuclear fusion) on page 19 of Ishida (13 Oct 2012). Kamiryo is responsible for English translation of her original Japanese. Figure 17 clarifies her new discoveries beyond other scientists. Red marked frameworks are already published in the world while no red marked boxes belong to her new discoveries. Ishida and Kamiryo presented two co-authors' paper to Clay Math Institute on 14 Sep 2013, whose reply was dated on 2 Oct 2013. Kamiryo decided to follow CMI's advice and present a related paper to one of math journals later.

Chapter 10

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Chapter 11

Stage Processes from Young-Developing to Robust-Developing by Country in the Endogenous-Equilibrium

Signpost to Chapter 11

There are theory, practice, and history, in any science. This chapter sums up KEWT data-sets empirically from the viewpoint of economic stages and growth. The economic stages, however, are transparent historically and philosophically. Since Adam Smith (1776), almost two centuries and a half have passed. Except for the last half century, scholars and economists had studied and solved economic growth problems, without national accounts calculation system. Economic theories, nevertheless, had progress strongly step by step, like weeds, without fertilizer or tests for theories. In the meantime, leaders and people had experienced the Industrial Revolution for the first time in human history. It is surprising for scholars to create economic theories decade after decade, even in the times of no statistical-data.

Kuznets, S. (1941, 1952, 1966, 1971) had continuously researched economic stage and growth by country. In the 1960s, the data-sets were rough compared with the latest data after the 2000s. Scholars and economists even today consent that Schumpeter, J. A. (1912, 1938, 1954) is the Father of modern economics for technological progress. Economic theories including Schumpeter's, however, are all demand and supply price-oriented even up to date. The author here loudly indicates that this price-oriented stream had brought about wars after wars. What is its foundation? In earlier days of Smith and Ricardo, it was thought that an economy or nation converged to the steady state and finally creased growth. To avoid no growth, an open economy was needed and divided into two: security first and free trade first. To maintain growth and drive the steady state away, technological progress is a universal means. Nevertheless, human behavior wants more money endlessly and is inclined to control other countries with power, under a big wave for colonialism, and repeats wars to solve problems, within and between nations.

The author pays attention to heterogeneous culture and history by area, as well recognized by Kuznets. This philosophy needs two paradigm rotations of theories and methodologies. Needless to say, the first rotates from the price-equilibrium to the endogenous-equilibrium; the second rotates from homogeneous to heterogeneous. All problems are solves endogenously cooperatively and peacefully. Historical review and revisit of the literature clearly prove these rotations are true, without unemployment and with a low inflation. And, these rotations co-exist with the current modern economics. Now, macroeconomics[1] independently is Mother as Chapter 1 clarified the base.

This chapter does not step into the above history. Instead, in conclusions at the end, the author refers to several articles related to technological progress policy in Singapore, China, and Mexico, after briefly reviewing 'competiveness report.'

11.1 Introduction

The current stream in developing countries quantitatively makes them hurry up in order not to be behind other countries. The author feels this atmosphere in G7, G20, and other conferences, 2012. It is of course natural that we need growth for full-employment even under tight budgetary control. The author, however, proves that for this reason each country must choose the best second path that guarantees sustainable growth as a short cut and in reality. This chapter takes advantage of six organic aspects and empirically clarifies facts and methods to the correct path policy-makers all look for with feverish eyes, as we run after Blue Birds.

This chapter examines and summarizes different transition processes from young-developing to robust-developing and, further to developed stages, by country. African countries are not included in this chapter because KEWT series have not enough data-sets by country for African area, in particular, deficit by year and over years. This chapter also does not concretely step into developed stage countries. The developed stage is separately discussed in other chapters as recognizably by those titles of fiscal policy or fiscal multiplier and the size of government. This chapter, in Conclusions, refers to the current variety of articles, compares, and comments each methodology. What elements guarantee stable growth by country? This is the purpose of this chapter.

There are two problems for the characteristics of the economic stages: 1) the characteristic *common* to a country at an economic stage and 2) the characteristic *peculiar* to each stage. The common characteristic is the endogenous structure of the balance of payments and deficit. Firstly, the endogenous structure of the balance of payments differs from the structure of the balance of payments in the literature since the literature treats it from the viewpoint of the financial assets-side while the author's from the real-assets side. Conclusively, if the endogenous structure overruns a moderate range of the endogenous-

[1] Macroeconomics is most fitted for pursuing true results as a unit of causes and effects since Smith (1776). The private sector is most fitted for pursuing business cycle since Schumpeter (1928). Jorgenson, D. W., and Griliches, Z. (1967) rotates one paradigm from stock to flow as capital investment for technological progress (for simultaneous measure of flow and stock of capital, see Chapter 6). This rotation needs one more rotation of the consistency between flow and stock (see, Chapter 16). Macroeconomics endlessly continue to grow, generation after generation in the endogenous system. Right now, leaders and policy-makers are able to focus on green/eco economics. Green/eco buries holes to fall into, since world resources are limited and we endogenously attain maximum returns under minimum net investment, as shown by hyperbola and its graph (see, Chapters 7 and 15).

equilibrium or becomes extremely unbalanced, any country cannot maintain a sustainable rate of technological progress. Secondly, the peculiar characteristic varies by economic stage. This chapter treats sixteen cases of the transition processes at the young-developing stage beginning in 1990. Some countries grew steadily and got into the next stage while others moved back and forth for the last twenty years. There may be peculiar reasons, partly due to strong personality of national taste/preferences, culture, and history by country.

My questions are: Why do some young-developing countries conquer their difficulties and get into the next stage while others stay at the same stage up and down for many years? Do young-developing countries have their own peculiar difficulties at each economic stage, compared with developed countries? Behind these questions, there exists human philosophy. The higher the wave rays the more calm an economy is. The earth is the place where we human and people live together peacefully with other living animals and vegetation. Strong personality by country may or may not fight against high wave rays of human itself.

The original actual statistics data are obtained from *International Financial Statistics Yearbook*, IMF. The author selects sixteen young-developing countries in Asia, Latin America, and Near East; Turkey, Ukraine, Kazakhstan, Pakistan, Bangladesh, Indonesia, Philippines, Sri Lanka, Vietnam, Mexico, Argentina, Bolivia, Chile, Columbia, Paraguay, and Peru.

Before starting, the author wholly sketches the endogenous model and system in this section. This sketch is also necessary for setting up two methods to observe and examine the above different characteristics. Two methods are *six* organic aspects and *five* pattern-settings. The background of the two methods will be gradually clarified by sketching the endogenous model and system.

The endogenous system connects theory with its practice and integrates into a system as one simultaneous unity. The endogenous model starts with Solow's (1956) model but, definitely replaces exogenous by endogenous and endogenously measures the rate of technological progress. The endogenous model always holds in the endogenous-equilibrium. The rate of technological progress and all others are each expressed by two ways: (1) at convergence in the transitional path and (2) at the data-sets by year as the unity of theory and practice, where (1) and (2) are consistent by year and over years. The rate of technological progress, the growth rates of capital, the rate of return endogenously, and other parameters and variables are all simultaneously measured using a 'discrete' Cobb-Douglas production function that involves *seven* endogenous parameters.

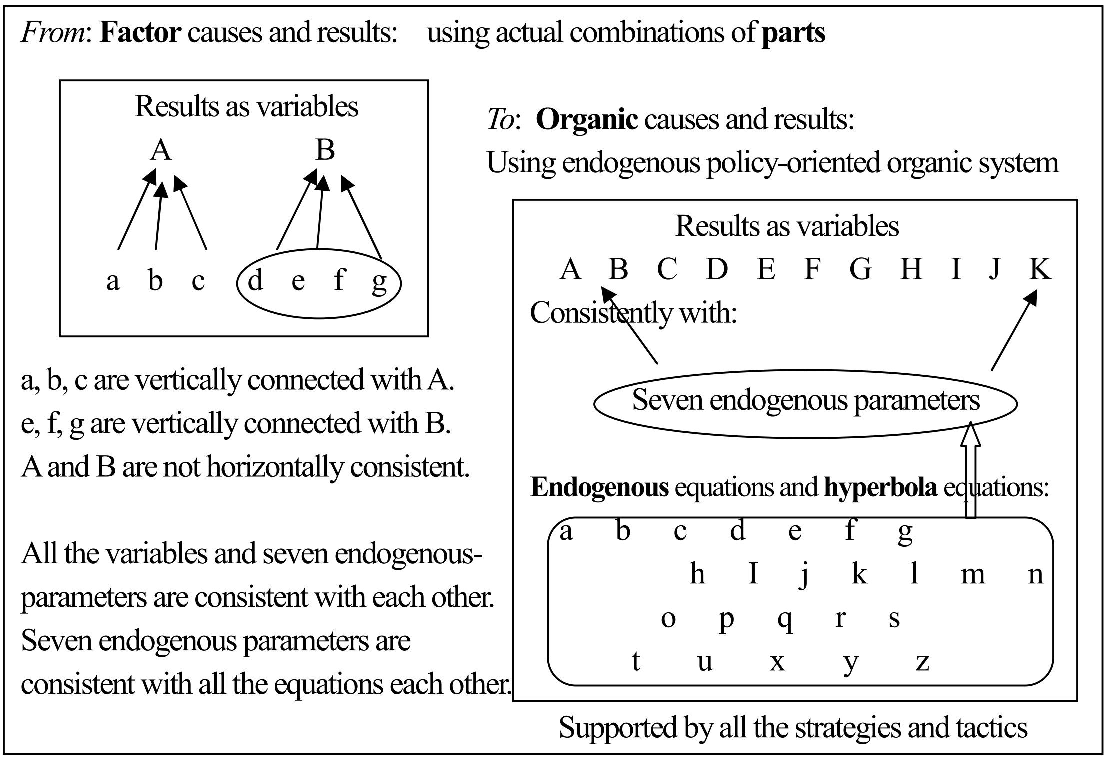
The literature, without exception, distinguishes a model with its actual data used for the model: 'Estimated parameter' is distinguished with 'calculated variable,' under the use of actual 'panel' data. 'Forecasting' shows a result of variables after independent variables were inserted into the model. 'Ad hoc' is never general and means 'once for all' or 'for specific purpose or situation at hand.' Independent variables constitute causes and dependent variables constitute results under various functions. Each model is separated so that an integration of all possible models is impossible, in particular when optional actual data are used independently of the model.

The endogenous system, contrarily, reverses the above concepts and definitions completely. This system does not distinguish estimate with measure since the system measures all the data after converting actual data to endogenous data. Measurement is most strict to the extreme and, differs from the concepts of estimate, calculate, and forecast. Endogenous data change, by item, year, country, and sector; never repeating again over years, just like ad hoc. Endogenous data, nevertheless, always consistently with each other, just like or similarly to the cases of actual data in this world. Forecast may be expressed as a case when actual data are replaced by forecasted data. Due to one theory and practice unity, causes and results at endogenous data simultaneously occur by year. Policy-oriented causes are only expressed by seven endogenous parameters and accordingly eight policy determinants by year. Results are all endogenously expressed by parameters and variables by year. Strategies and tactics are all absorbed into seven endogenous policy-oriented parameters.

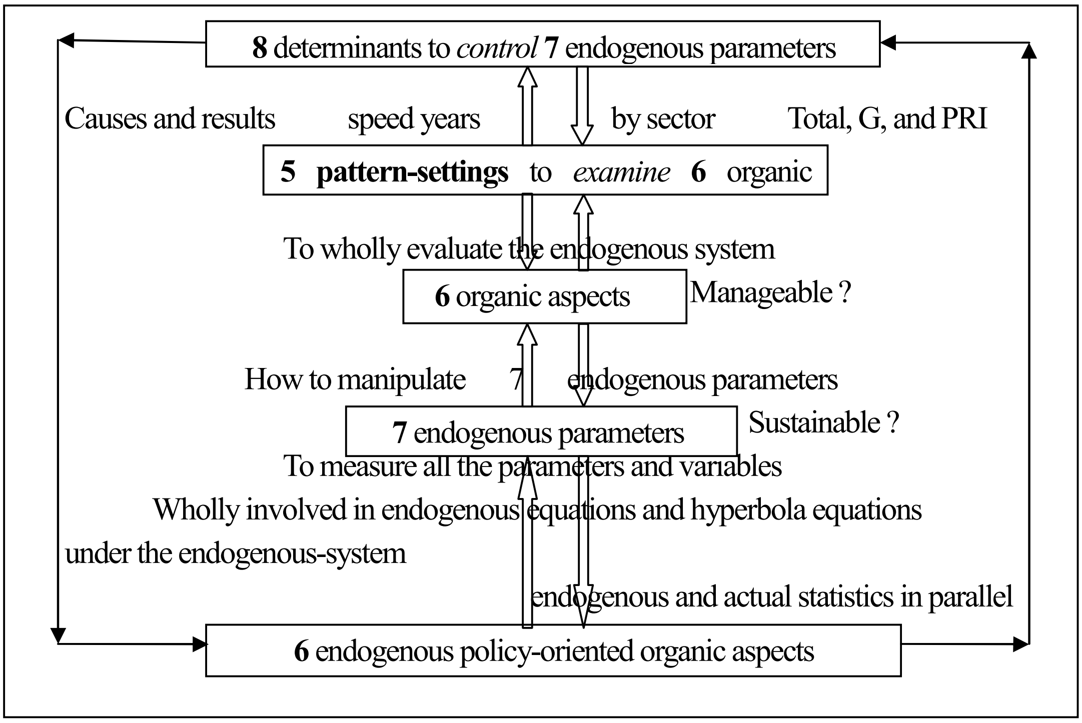
Let the author now connect the endogenous model and system with six organic aspects and five pattern-settings: The endogenous policy-oriented organic system (hereafter, the endogenous system) is based on the 'discrete' Cobb-Douglas production function in the endogenous-equilibrium, where seven endogenous parameters are first measured using endogenous equations and corresponding hyperbolic equations. The endogenous-equilibrium is measured by endogenous speed years by country and sector. The financial and market assets are supplemental and indirectly involved in the real assets of the endogenous system, due to the neutrality of the financial and market assets to the real endogenous assets by year. The endogenous system is wholly and broadly examined by *six* organic aspects by country. If the levels of six organic aspects are all well balanced, a country as an economic organ maintains robust sustainable equilibrium. Six organic aspects, however, are difficult to take out one by one.

In order to solve this problem in six organic aspects, the author introduces two new devices; (1) 'eight policy determinants' to *control* seven endogenous parameters and (2) 'five pattern-settings' to *examine* six organic aspects. A series of BOXES are shown. Eight policy determinants are overlapped with seven endogenous parameters and six organic aspects and, most fitted for five pattern-settings, free from sticky explanations of endogenous and hyperbolic equations, as shown in **BOX 11-1**.

BOX 11-1 A shift of paradigm of causes and results: vertical versus wholly



BOX 11-2 Endogenous parameters, organic aspects, and pattern-settings in the endogenous system



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BOX 11-1 shows the background of the endogenous-system from the viewpoint of causes and results and clarifying the differences between vertical and whole. Data use statistics but no external. Data are all converted to endogenous as a whole system, starting with simultaneous measurements of capital and the rate of return.

BOX 11-2 is designed for evaluating stage processes by country and shows up *five* pattern-settings that take advantage of basic endogenous ratios.[2] Pattern-settings are mostly based on *six* organic aspects (for *six* organic aspects in detail, see Notations at the beginning of the *EES*). Background of *five* pattern-settings is endogenously related to all of i) seven endogenous parameters, ii) eight policy determinants, and iii) six organic aspects.

The items related to *five* pattern-settings are the following.

i) *Seven* endogenous parameters are: the relative share of capital α; the growth rate of population n; the ratio of net investment to output $i = I/Y$; the qualitative net investment coefficient β^*; the diminishing returns to capital (DRC) coefficient δ_0; the capital-output ratio Ω; and, the ratio of government net investment to government output $i_G = I_G/Y_G$.

ii) *Eight* policy determinants: (1) the balance of payments and debt, (2) endogenous taxes, (3) marginal rate of substitution, (4) marginal productivities of labor and capital, (5) the elasticity of substitution, (6) the relative share of capital, (7) the speed years for convergence, and (8) the capital-output ratio.

iii) *Six* organic aspects: for simplicity, *eight* policy determinants are used as a surrogate.

The items *five* pattern-settings directly treat are: (1) the balance of payments and deficit, (2) the relative share of capital, (3) possibility of full-employment, (4) the real cost of capital, and (5) the endogenous valuation ratio.

Sixteen countries have each its own policies and policy-changes by year. The results

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[2] Basic endogenous equations in the endogenous model/system:

1. The capital-output ratio, $\Omega = K/Y$: $\Omega^* = \frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)(1+n)+n(1-\alpha)}$.

2. The qualitative coefficients, *beta**: $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$.

3. The coefficient of diminishing returns, *delta*$_0$: $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$ and $B^* = (1-\beta^*)/\beta^*$.

4. The level of technology (as stock): $A = TFP = k^{1-\alpha}/\Omega$.

5. The relative price level, p: p=1 always holds using $p \cdot Y = w \cdot L + r \cdot K$ in the transitional path and the data-sets.

6. The relative share of capital, $\alpha = \Pi/Y$: $(1-\alpha) = \frac{c}{(rho/r)}$, $\frac{K}{L} = \frac{(\alpha/(1-\alpha)}{(r/w)}$, and $k = \frac{w \cdot \Omega}{1-r \cdot \Omega}$.

7. $\sigma = 1.0 = \frac{\Delta k/k}{\left(\Delta\left(\frac{r}{w}\right)\right)/\frac{r}{w}}$ holds in the transitional path.

examined by *five* pattern-settings considerably differ by country. Each country maintains endogenous equilibrium by reducing inevitable unbalances between seven endogenous parameters. Seven endogenous parameters measures the level of endogenous equilibrium but, differently. This is because each country has its own national taste/ preferences, culture, and technology, even in the global economies. Diversification and Globalization do not endogenously contradict and cooperate with each other. Some countries still cannot get rid of difficulties; such as Pakistan, staying at the same economic stage. A country cannot always grow fast and needs its own vision far ahead, partly due to the possibility of excessive unbalances in seven endogenous parameters. Extreme unbalances of the total economy are further aggravated by the unbalances between the government and private sectors. Unbalanced relationships between the government and private sectors are a key for conquering and controlling difficulties at any economic stage.

11.2 How to Classify Six Organic Aspects to Conquer Difficulties at an Economic Stage

There are six organic aspects for any country to conquer difficulties by economic stage (poor, young-developing, developing, and developed). A young-developing country cannot easily get into a stable developing stage. Why does this occur? It implies that six organic aspects are too burden at young-developing stages. The characteristics at the beginning are low *GDP* per capita, low education, and considerably less jobs, with insufficient infrastructures.

In the endogenous system by country, the policies and policy-changes are all absorbed into seven endogenous parameters that digest rival factors, labor and capital. Strategies and tactics all absorb non-rival factors such as education, R & D, and learning by doing and are wholly filtered into policies and policy-changes measured by seven endogenous parameters. Then, how to control endogenous parameters? Seven endogenous parameters (results) are controlled by changing eight policy determinants (causes). Endogenous 'causes and results' circulate at the real assets and, the cause-determinants are eight policy determinants. For example, the rate of unemployment and some level of inflation are results of the real assets in equilibrium. Infrastructures are expressed by seven endogenous parameters using flow and stock of capital in equilibrium by sector (the total economy, and the government and private sectors).

Endogenous equilibrium is a surrogate of the price-equilibrium that balances macro demand and supply and, measured by the speed years for convergence in the transitional path by country and year. The price-equilibrium has fostered the literature for the last three Centuries. Nevertheless, it has two critical defects: (1) it is not always measured consistently within a whole system of an economy and (2) it cannot consistently measure cases of disequilibrium. In other words, the price-equilibrium is measured only after settling disequilibrium, where disequilibrium recovers simultaneously (with government cash flow-out by deficit). Disequilibrium does not actually. Even national bankruptcy holds at a close-to-disequilibrium and, before hitting actual disequilibrium. For example, countries had fallen into bankruptcies, as IMF tried to help recovering Argentina, Malaysia, and Korea.

Eight policy determinants are explained using equations step by step as follows: (1) The balance of payments and deficit each to endogenous income Y, $bop = BOP/Y$ and $\Delta d = \Delta D/Y$; (2) endogenous taxes that determine the size of government, $tax = Y_G/Y = T_{AX}/Y$; (3) the marginal rate of substitution, *MRS=r/w*, where '*r*' is the rate of return and '*w*' is the wage rate each in equilibrium; (4) the marginal productivity of labor, *MPL=w*, and the marginal productivity of capital, *MPK=r*, under the relative price level *p*=1.0; (5) so called *sigma*[3] as an endogenous surrogate for the wage index in statistics; (6) the (endogenous) relative share of capital $\alpha = \Pi/Y$, where Π is endogenous returns.

Then, (7) the speed years for convergence, $1/\lambda^*$, $\lambda^* = (1-\alpha)n + (1-\delta_0)g_A^*$, where $n = n_E$ is the rate of change in population in equilibrium; δ_0 [4] is the diminishing returns to capital (DRC) coefficient; $g_A^* = i(1-\beta^*)$ is the rate of technological progress; $i = I/Y$ is the ratio of net investment to output/income; and $1-\beta^*$ is the qualitative net investment coefficient. All of these are not assumed but measured in equilibrium consistently over years in the endogenous system; and finally (8) the capital-output ratio, $\Omega = \Omega_0 = \Omega^*$, where the above δ_0 and β^* are involved. As a result, seven endogenous parameters are measured and controlled in equilibrium.

At the above (8), the literature does not use the capital-output ratio, $\Omega = K/Y$, but the capital-labor ratio, $k = K/L$. The author here stresses two fundamental reasons why the literature does not use the capital-output ratio in the Cobb-Douglas production function. Two fundamental reasons: (1) Capital and the rate of return must be measured, at the same time as Robinson, Joan (1959) claimed, and by sector and, (2) returns by sector are difficult to measure in the case of a system of national accounts (SNA). Statistics today, including IMF, OECD, and Penn World Table (PWT 6.2), do not measure and publish neither capital stock nor the capital-labor ratio. Japan Government Office, the Bureau of Economic Analysis of Dept. of Commerce, the US, and several other countries publish capital at national accounts statistics. However, capital is estimated externally either using the perpetual inventory method at the total economy or the cost of capital market data at the corporate sector.

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[3] The *sigma* is similar to the literature and defined as $\sigma = \frac{-\Delta k/k}{\Delta(r/w)/(r/w)}$. In the author's discrete Cobb-Douglas production function, it is calculated as $\sigma = \frac{-\Delta k/\left(\frac{k_0+k_1}{2}\right)}{\Delta(r/w)/\left(\frac{r_0+r_1}{2}/\frac{w_0+w_1}{2}\right)}$. The *sigma* fluctuates at the data-sets by sector and by year and shows that the flexibility is guaranteed. In the corresponding recursive programming, *sigma*=1.00 is proved by year at the transitional path.

[4] $\delta_0 = 1 + LN(\Omega^*)/LN((1-\beta^*)/\beta^*)$, where $\Omega_0 = \Omega^*$ is the capital-output ratio. The speed years terminates at convergence in the transitional path.

Capital and the rate of return are only measured with all the other parameters and variables at the same time. The processes to measure parameters and variables endogenously are involved in eight policy determinants. Endogenously, capital K is measured by flow and stock relationship of net investment after reducing capital consumption. The rate of return r is measured, starting with actual *GDP* and national disposable income (*NDI*) and using $tax = Y_G/Y = T_{AX}/Y$ and $i_G = I_G/Y_G$ stated above; with *MRS*=*r/w*,[5] Ω, $r = \alpha/\Omega$, and $w = r/(r/w)$.

A country at any economic stage requires fulfilling six organic aspects. Causes and results do not hold independently each by each but, wholly and simultaneously at six organic aspects. As a result, any country enjoys maintaining endogenous equilibrium sustainably over years. A defect of six organic aspects exists not theoretically but by empirically. Six organic aspects should not uniformly classify young-developing countries and satisfy with arranging alphabetically these countries. These arrangements are a starting point and require whole implications through six organic aspects, with eight policy determinants.

11.3 Secret of Success to Solve Problems at Young-developing Countries

This section, for simplicity, uses eight policy determinants possibly as a surrogate for the classifications of countries based on six organic aspects. How can a young-developing country successfully enter into a robust developing stage without staying back and forth at the young-developing stage? Policy-makers' patient struggling at the young-developing stage may be similar to that at the developed stage. First of all, the balance of payments, *BOP*, and deficit ΔD stir up the situation. Policy-makers' aim is to maintain moderate endogenous equilibrium but, a moderate balance of payments and a deficit may be a prerequisite to some extent. Under equilibrium, there is no difference lying between the price-equilibrium and endogenous equilibrium. The author stresses that a moderate level of the balance of payments and deficit is a result at an endogenous equilibrium. Policy-makers' philosophy and perception of national taste and technology finally influence the level of *bop* and Δd. If philosophy and perception by country are widened to the earth preservation in the long run, the corresponding organic aspects may be robust and conquer various difficulties by strong leadership. Young-developing stage countries must quickly prepare for sudden risks ahead, with much room for balanced organic aspects.

[5] The marginal rate of substitution *MRS*=*r/w* is obtained by using (1) national taste, $\frac{rho}{r} = 13.301c^2 - 22.608c + 10.566$, where the propensity to consume $c = C/Y$, (2) $\alpha = 1 - \frac{c}{rho/r}$, and (3) $(r/w) = \frac{\alpha/(1-\alpha)}{K/L}$.

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What policy determinant is most sensitive to endogenous equilibrium at young-developing stage? This is the ratio of net investment to output/income. First, if a young-developing country could stably get net investment for many years, the country is able to proceed to the next stage. Nevertheless, the actual world differs. A reason is that a high level of net investments over years causes an unbalanced net investment between the government (G) private (PRI) sectors. What causes net investment unbalanced between government and private? Government investment may be actually processed at the PRI sector yet, pros group-oriented opinion becomes much stronger than corns, often apart from right judgments and sacrificing the PRI sector.

The author advocates here that if policy-makers knew the size of government endogenously, the results differ and, the country makes the most of resources and taste/ preferences with the corresponding technology. An economy grows gradually just like a baby as an organ with its reserve power. Sustainable economy needs to be balanced by year. Many countries today, after 1997-98 financial crises, have tried to guard against outside short money, with increased savings. This is learning-by-doing, though against free mobility of capital as a stream.

What result must policy-makers accept when the size of government is beyond its limit? The country must lose its reserve power and the speed years will be unstably longer. A typical case is Japan's speed years, 2007 and 2009 under increasing deficits: The speed years were 313.12 at the total economy, 68.09 at the G sector, and −17.07 at the PRI sector in 2007 while 495.24, 5.04, and −101.19 in 2009 respectively. The total economy still maintains equilibrium in 2009 but, the G and PRI sectors are already out of equilibrium. Huge deficit by year is one of results. It implies that Japan lost its reserve power due to the increase in deficits and debts over years. A young-developing country cannot raise actual taxes so that the difference between actual and endogenous taxes must be smaller than that of developing and developed countries. The young-developing country cannot eat too much.

Under these circumstances, young-developing countries have often suffered from high inflation. The rate of inflation is usually watched by Consumers Price Index (*CPI*). The literature assumes that the rate of inflation is externally given. Six organic aspects, differently from a common sense, have the rate of inflation endogenously measured. This clarifies that higher inflation is inevitable when an economy grows at a higher rate. If a young-developing country suffers from high inflation under a low growth, it means that policy-makers cannot find a sustainable combination of policies and endogenous parameters or that the corresponding six organic aspects become more wholly unbalanced. This is true even if deficit is not a burden so much. Policy-makers look for real-assets causes and pursue balanced aspects by year, improving a combination of seven endogenous parameters. Principal causes are traced back to the abnormal values of DRC coefficient $\delta_0(\Omega, \beta^*)$ and the current capital-output ratio Ω_0.

The capital-output ratio spreads itself into six organic aspects along with the transition of the economic stage. At a young-developing stage country, the capital-output ratio is considerably low; e.g., less than 0.5 and/or less than 1.0. If δ_0 and β^* are unbalanced with such low levels of the capital-output ratio, the combination of seven endogenous parameters are unbalanced. To improve seven endogenous parameters, policy-makers need to control eight policy determinants and widely execute fulfilling strategies and tactics by year. Along with the improvement in seven endogenous parameters, the speed years will enter a moderate range of equilibrium.

For strategies, a young-developing country consecutively executes higher education in the long run and increase employment. As a result of higher education with think of others, the quality of jobs will be higher gradually by year. Earlier economists such as Adam Smith started with full employment and today, the rate of unemployment is inevitable in the literature, as shown by huge researches related the non-accelerating-inflation rate of unemployment (NAIRU). The author stresses that the 'endogenous' NAIRU is involved in six organic aspects, where a low unemployment with a low inflation is within hands. It is true that when seven endogenous parameters are well controlled using policy determinants, full employment and low inflation are attained, as shown empirically using the data-sets of 65 countries at KEWT 5.11 by sector.

The relationship between the rate of return and the rate of u-, full-, and over-employment is theoretically proved by using the rate of return hyperbola equation, $r(n, \alpha, i, \beta^*)$. The upper limit of endogenous inflation is shown by its horizontal asymptote (HA) and full employment is shown as a case that the actual growth rate of population equals the endogenous rate of change in population in equilibrium, $n = n_E$. The upper limit of the capital-output ratio distresses developed countries and is shown by the horizontal asymptote (HA) of $\Omega(n, \alpha, i, \beta^*)$.

Finally, the author summarizes this section by stressing the use of an equation of $\alpha = \Omega \cdot r$. This is a core of seven endogenous equations and respective hyperbola equations. This equation influences commonly to all of economic stages and most severely to the young-developing stage. Young-developing stage countries each have a low relative share of capital α, which demands a soft balance between the capital-output ratio Ω and the rate of return r. Some developing countries show a high level of α, but Ω and r are not backed to steadily guard the low α. For a balanced maintenance of $\alpha = \Omega \cdot r$, $\Omega(n, \alpha, i, \beta^*)$ need to cooperate with $r(n, \alpha, i, \beta^*)$ (for each equation, see Appendix). A bad interruption is bubbles of flow (uncontrollable inflation) or stock (irresponsible asset bubble). Six organic aspects fuse eight policy determinants, the upper limit of inflation, and the endogenous valuation ratio, $v^* = V^*/K$. Seven endogenous parameters must have a room for reserve power to control each other: not to grow too high but to be balanced.

11.4 Five Pattern-settings to Examine Balanced Levels by Country

This section is a highlight of this chapter. The author selects sixteen countries: Turkey, Ukraine, Kazakhstan, Pakistan, Bangladesh, Indonesia, Philippines, Sri Lanka, Vietnam, Mexico, Argentina, Bolivia, Chile, Columbia, Paraguay, and Peru. The author does not include African and Near East countries, partly due to widely-ranged qualitative differences of data disclosed at *International Financial Statistics Yearbook*, IMF. It is true that peaceful world economies are guaranteed by stop-inequality. Stop-inequality has two aspects: macro and micro, where endogenous policies absorb all the strategies and tactics, through seven endogenous parameters. If seven endogenous parameters are controllable, stop-inequality spreads over causes and results. Six organic aspects are endowed with stop-inequality. The speed years are endowed with endogenous equilibrium. In the long run, there is no contradiction between the speed years and stop-inequality yet, in the short run there is some contradiction. This is because excessive policy to stop-inequality decreases steady growth for the future. This kind of contradiction is also adapted to a case of excessive deficit. Contradiction is mitigated by balanced pattern-settings.

BOX 11-3 Characteristics of younger-stage of 16 countries, 2009

2009	The capital-output ratio			
alpha	0 to 0.99	1.0 to 1.49	1.5 to 1.99	2.0 to 2.5
0 to 0.099	Bangladesh	Sri Lanka		
0.10 to 0.149	Turkey	Ukraine	Mexico	
	Pakistan	Peru		
	Paraguay			
0.15 to 0.249			Bolivia	Vietnam
			Chile	
			Columbia	
0.25 to 0.4		Kazakhstan		
		Indonesia		
		Philippines		
		Argentina		

2009	$(S_{PRI}-I_{PRI})/Y$ as BOP less deficit				
bop=BOP/Y	-0.05 to -0.099	0 to -0.049	0 to 0.049	0.05 to 0.099	above 0.10
-0.05 to -0.099	Paraguay		Pakistan		Kazakhstan
			Sri Lanka		
0 to -0.049		Turkey	Indonesia		
		Ukraine	Mexico		
0 to 0.049			Bangladesh		
0.05 to 0.099				Bolivia	Argentina
				Chile	
				Columbia	
				Peru	
above 0.10					Philippines
					Vietnam

2009	Endogenous Phelps coefficient, x=alpha/(i·beta*)			
r	0 to 0.99	1.0 to 1.99	2.0 to 2.99	above 3.0
0 to 0.099	Sri Lanka	Bangladesh		
	Vietnam	Mexico		
		Chile		
0.10 to 0.149		Columbia	Ukraine	
		Paraguay		
		Peru		
0.15 to 0.249		Kazakhstan	Pakistan	Turkey
		Indonesia	Argentina	Philippines
0.25 to 0.4				Bolivia

2009	Diminishing returns to capital coefficient, $delta_0$				
Speed years	below -0.5	0 to -0.49	0 to 0.399	0.4 to 0.699	above 0.7
0 to 4.99	Bolivia				
5.0 to 9.99	Pakistan				
10 to 19.9		Turkey	Vietnam		
20 to 29.9		Sri Lanka	Ukraine	Kazakhstan	
			Chile	Indonesia	
			Mexico	Columbia	
above 30				Argentina	Bangladesh
				Peru	Philippines
					Paraguay

Data source: KEWT 5.11-5 by sector, 1990-2009, whose original data are from *International Financial Statistics Yearbook*, IMF. KEWT 5.11-5 Data-source of Tables A2-3 and A3-3 is each the same.

This section examines and evaluates results of each country by using five pattern-settings. Five pattern-settings are: (1) The balance of payments and deficit; (2) The relative share of capital; (3) The relationship between the growth rate of population and the rate of change in population in equilibrium; (4) The real cost of capital; and (5) The valuation ratio as a whole evaluator of seven endogenous parameters and eight policy determinants. Each country has conquered its own unbalanced situations by year. Therefore, each of five pattern-settings differently reveals unbalanced determinants. Five pattern-settings are conclusively shown by using BOX 11-3, 11-4, and 11-5. The author explains each of a series of BOXES step by step after **BOX 11-3**.

The author examine sixteen countries, using the 1st pattern-setting to $bop = \Delta d + (S_{PRI} - I_{PRI})$, where $\text{bop} = BOP/Y$ is the balance of payments to output/income Y, $\Delta d = \Delta D/Y$ is deficit to Y, and $(S_{PRI} - I_{PRI})$ is the difference between saving and net investment at the private (PRI) sector. The data-sets of KEWT 5.11, 1990-2009 by sector is used for this pattern-setting. The above pattern-setting examines twenty year tendency of *bop*, *Δd*, and $(S_{PRI} - I_{PRI})$, by giving 'plus and minus signs' to three of *bop*, *Δd*, and $(S_{PRI} - I_{PRI})$, just like +, +, + or +, −, +. For this pattern-setting, the author simultaneously takes into consideration the smoothness of the speed years. Note that Pattern, +, +, +, is not always sustainable, partly due to the decrease in domestic net investment. There are *four* patterns and each corresponding countries are as follows:

1. Pattern Balanced: +, −, +, or −,+,+ balanced and robust.
2. Pattern Temporal: +, +, +, or, +,+, −, or −, −, +, with strong individuality.
3. Pattern Difficult: +, −, −, or −, −, −, sometimes close-to-disequilibrium.
4. Pattern the Lowermost: −, −, −, often falling into disequilibrium.

Pattern Balanced: Argentina, Colombia, Paraguay, and Peru.
Pattern Temporal: Bangladesh, Indonesia, Philippines, Sri Lanka, Vietnam, Bolivia, and Chile.
Pattern Difficult: Turkey, Ukraine, Kazakhstan, and Mexico.
Pattern the Lowermost: Pakistan.

Let the author similarly examine sixteen countries, using the 2nd pattern-setting to different levels of the relative share of capital at $\alpha = \Omega \cdot r$, and following the data-sets of KEWT 5.11, 1990-2009 by sector. Each of sixteen countries has its own characteristics in six organic aspects. The above pattern-setting examines sixteen countries by twenty year transition of unbalanced growth and stop-inequality. For this pattern-setting, the author simultaneously takes into consideration the sign of DRC coefficient, δ_0, for the last ten years. There are *four* patterns originally defined and corresponding countries are as follows:

1. Pattern Smooth: $0.15 < \alpha < 0.25$, balanced and smooth.
2. Pattern Irregular: $0.05 < \alpha < 0.125$ or $0.30 < \alpha < 0.50$, with strong individuality.
3. Pattern Difficult: α unstable and fluctuating, sometimes close-to-disequilibrium.
4. Pattern the Lowermost: α most unbalanced, often falling into disequilibrium.

Pattern Smooth: Bangladesh, Indonesia, Philippines, Sri Lanka, Vietnam, Chile, Colombia, Paraguay, and Peru.
Pattern Irregular: Ukraine, Mexico, and Argentina.
Pattern Difficult: Turkey, Kazakhstan, and Bolivia.
Pattern the Lowermost: Pakistan.

The above results are interpreted wholly: Young-developing stage countries have each national taste/preferences even in the global economies in the world today. Each country has different policies for the last twenty years yet, for the last ten years, many countries have adjusted their policies much more than expected, particularly at Asian and Latin American countries. Most countries show minus balance of payments yet, this minus is within a range and contributes to each country's growth in the long run. Each country has its own strategy for coping with a minus balance of payments and also a minus deficit within some ranges. What does urge each country to have its own policy? This is endogenous equilibrium. Each country does not actually measure endogenous equilibrium but, each country manipulates policies towards equilibrium. As a result, a moderate range of endogenous equilibrium is maintained but, its approach differs by country. No country takes same policies or strategies. This fact is proved by confirming various variables and endogenous parameters—not only through the review of seven endogenous parameters but also through hundred related parameters. A certain level of growth is not obtained by the guidelines in the textbooks. This is an implication of the above two pattern classifications.

In general, most countries are divided into two patterns; low versus high relative share of capital. Then, does a country with a low relative share of capital sacrifice stop-inequality? Or, does a country with a high relative share of capital a country sacrifice stop-inequality? The author denies both. Each country executes each preferable policy or has to do so under people's votes and elections. Then, why must a country take a policy of high relative share of capital despite a fact that the higher the relative share of capital the more distribution to capital is anticipated? The interpretation is: a young organic economy must be balanced as much as possible but, factors and resources have more restrictions so that unbalanced conditions result in a high relative share of capital. Each country's people historically know the responsibility for each own rights and duties, after long failures and experiences. When each country survives with less help from others, the world economies become more stable and peaceful. Each country becomes 'think of others' and cooperates with each other. This is a good point of globalization. Globalization cooperates with national taste/preferences and culture. In fact, each country never have has the same pattern. It is difficult for policy-makers to examine and confine each country into a certain pattern.

Let the author examine sixteen countries, using the 3rd pattern-setting to different levels of the unemployment at the total economy by $n_E - n$, similarly to the above two pattern-settings. Theoretically, there is no unemployment in equilibrium at any economic stage. And this fact encourages policy-makers to approach full-employment. There are *three* patterns defined, by year during 1990-2009, and each corresponding countries are as follows:

1. Pattern Robust: $n_E - n = 0$ by year, balanced and smooth.
2. Pattern Usual: $n_E - n \neq 0$, a few times in earlier 1990s and 2009, sometimes close-to-disequilibrium.
3. Pattern Difficult: $n_E - n \neq 0$, repeatedly, often falling into disequilibrium.

Pattern Robust: None.

Pattern Difficult: Turkey, Ukraine, Bangladesh, Indonesia, Sri Lanka, Vietnam, Mexico, Argentina, Chile, Colombia, Paraguay, and Peru.

Pattern Difficult: Kazakhstan, Pakistan, Philippines, and Bolivia.

All the countries enjoy full-employment in equilibrium, except for the above four countries. Unemployment occurs only in 2009 and/or one or two times during the 1990-93. Even the above four countries enjoy full-employment except for Pakistan. Pakistan must find balanced six organic aspects so that national taste and culture could accept without resistance, with steady education and FDI.

Let the author examine sixteen countries, using the 4th pattern-setting to plus/minus different levels of the real cost of capital (=the rate of return less the growth rate) by sector using $CC^*_{REAL(G)}$ and $CC^*_{REAL(PRI)}$. For this pattern-setting, the author takes 'a plus real cost of capital at the total economy.' The author does not deny the market rate in the long-term and proves that ten year debt yield at the market is equal to the rate of return in equilibrium by country. Plus signed high cost of capital is preferable to minus signed one. Because: (1) If the rate of return is higher than the growth rate of output, net investment is encouraged. (2) If deficit rise up beyond a certain range the cost of capital turns to minus first at the G sector. The *four* Patterns are as follows:

1. Pattern Smooth: plus $CC^*_{REAL(G)}$ and $CC^*_{REAL(PRI)}$, balanced and smooth.
2. Pattern Private-oriented: minus $CC^*_{REAL(G)}$ but plus $CC^*_{REAL(PRI)}$, with strong individuality.
3. Pattern Government-oriented: minus $CC^*_{REAL(G)}$ and $CC^*_{REAL(PRI)}$, sometimes close-to-disequilibrium.
4. Pattern the Lowermost: negatively fluctuating $CC^*_{REAL(G)}$ and $CC^*_{REAL(PRI)}$, often falling into disequilibrium.

Pattern Smooth: Bolivia, Chile, Colombia, Paraguay, and Peru (though each, after 2000).
Pattern Private-oriented: Turkey, Pakistan, Bangladesh, Indonesia, Philippines, Mexico, and Argentina,
Pattern Government-oriented: Ukraine, Kazakhstan, Sri Lanka, and Vietnam.
Pattern the Lowermost: None.

Pattern Smooth is occupied by Latin American countries.

Pattern Private-oriented is occupied by Asian countries. Each case has its own series of histories and experiments in the past. Private-oriented implies that government helps develop the private sector and it has its identity. Government-oriented implies that government must lead an economy when it is young. This is justified by the fact that without leading infrastructure the economy cannot grow under the world competitions. Government-oriented, however, often falls into a minus cost of capital due to minus government rate of return, with less technology-oriented compared with private-oriented. This direction is allowed when domestic saving is high as shown in most Asian countries after 1997-98 crises. Note that the private sector actually runs even under government-orientation. Government-oriented is endogenously related to the size of government. Therefore, government-oriented never lasts as a sustainable policy. Both private-and government-oriented must be flexible so as to shift to private-oriented when an economy gets into a developed stage. The author raises a serious fact in this respect: group-oriented political powers would not accept this right timely shift at the transit of economic stages, as democratic Japan has experienced for the last twenty years.

Let the author finally examine sixteen countries, using the 5th pattern-setting to the valuation ratio, $v^* = V^*/K$. The valuation ratio is endogenous and indicates all the policies should prevent from bubbles ahead. Exogenous inflation shown by *CPI* follows later than bubbles. Bubbles interrupt a steady growth and stop-inequality path, as many countries have experienced. There are *four* patterns defined and each corresponding countries are as follows:

1. Pattern Smooth: $1.0 < v^* < 2.75$ (except for early 1990s), balanced and smooth.
2. Pattern Avoid: $v^* < 1.0$ or $v^* > 4.0$, with steady change in policies.
3. Pattern Policy-Warning: $\text{minus } v^*$ included, towards urgent change in policies.
4. Pattern the Lowermost: $\text{no value of } v^*$, revolutionary revival required.

Pattern Smooth: Turkey, Kazakhstan, Indonesia, Philippines, Argentina (after2002), Bolivia, Paraguay, and Peru.
Pattern Avoid: Pakistan, Bangladesh, and Mexico.
Pattern Policy-Warning: Ukraine, Sri Lanka, Vietnam, Chile, and Colombia.
Pattern the Lowermost: None.

The above countries have known how to guard against instant-oriented funds. The mobility of capital among countries is endogenously guaranteed under a moderate equilibrium. Recall that bubbles earn huge profits at the sacrifice of financial institutions, which must be finally rescued by deficit by country.

BOX 11-4 Characteristics of younger-stage of 16 countries, 1990

1990	The capital-output ratio			
alpha	0 to 0.99	1.0 to 1.49	1.5 to 1.99	2.0 to 2.5
0 to 0.099	Kazakhstan		Turkey	
	Phili., Peru			
0.10 to 0.149	Pakistan	Mexico		
	Bangladesh			
	Sri Lanka			
	Argentina			
	Bolivia, Colum.			
0.15 to 0.249	Chile			
	Paraguay			
0.25 to 0.4	Indonesia			Ukraine
	Vietnam			

1990	$(S_{PRI}-I_{PRI})/Y$ as BOP less deficit				
bop=BOP/Y	-0.05 to -0.099	0 to -0.049	0 to 0.049	0.05 to 0.099	above 0.10
-0.05 to -0.099	Bangladesh	Kazakhstan			
	Vietnam	Philippines			
		Sri Lanka			
		Mexico			
0 to -0.049	Paraguay	Turkey	Pakistan	Peru	
		Indonesia	Bolivia		
		Chile			
0 to 0.049			Argentina	Ukraine	
			Columbia		
0.05 to 0.099					
above 0.10					

1990	Endogenous Phelps coefficient, $x=alpha/(i\cdot beta^*)$			
r	0 to 0.99	1.0 to 1.99	2.0 to 2.99	above 3.0
0 to 0.099	Turkey	Ukraine		
0.10 to 0.149		Kazakhstan	Argentina	
		Philippines		
0.15 to 0.249			Mexico	Pakistan
				Bangladesh
0.25 to 0.4		Chile	Indonesia	Sri Lanka
				Vietnam
				Bolivia, Colum.
				Paraguay, Peru

1990	Diminishing returns to capital coefficient, $delta_0$				
Speed years	below -0.5	0 to -0.49	0 to 0.399	0.4 to 0.699	above 0.7
0 to 4.99	Chile				
5.0 to 9.99	Argentina				
	Columbia	Indonesia			
		Philippines, Sri Lanka			
		Paraguay, Peru			
10 to 19.9			Kazakhstan		
			Vietnam		
20 to 29.9			Bangladesh	Turkey	
above 30		Pakistan	Ukraine	Mexico	Bolivia

BOX 11-5 Characteristics of younger-stage of 16 countries, 2000

2000	The capital-output ratio			
alpha	0 to 0.99	1.0 to 1.49	1.5 to 1.99	2.0 to 2.5
0 to 0.099				
0.10 to 0.149	Turkey	Bangladesh	Ukraine	
	Kazakhstan	Sri Lanka	Argentina	
	Pakistan	Chile		
	Mexico	Columbia		
	Bolivia	Paraguay		
	Peru			
0.15 to 0.249		Philippines	Vietnam	
0.25 to 0.4		Indonesia		

2000	$(S_{PRI}-I_{PRI})/Y$ as BOP less deficit				
bop=BOP/Y	-0.05 to -0.099	0 to -0.049	0 to 0.049	0.05 to 0.099	above 0.10
-0.05 to -0.099	Bolivia	Sri Lanka			
	Paraguay	Mexico			
0 to -0.049		Turkey	Pakistan		
		Bangladesh	Columbia		
		Vietnam	Peru		
		Argentina			
		Chile			
0 to 0.049			Ukraine	Indonesia	
0.05 to 0.099				Kazakhstan	Philippines
above 0.10					

2000	Endogenous Phelps coefficient, $x=alpha/(i\cdot beta^*)$			
r	0 to 0.99	1.0 to 1.99	2.0 to 2.99	above 3.0
0 to 0.099	Sri Lanka	Ukraine		
	Argentina	Chile		
0.10 to 0.149		Bangladesh	Pakistan	
		Vietnam	Paraguay	
		Mexico	Peru	
		Columbia		
0.15 to 0.249			Philippines	Kazakhstan
				Bolivia
0.25 to 0.4			Indonesia	Turkey

2000	Diminishing returns to capital coefficient, $delta_0$				
Speed years	below -0.5	0 to -0.49	0 to 0.399	0.4 to 0.699	above 0.7
0 to 4.99					
5.0 to 9.99	Pakistan	Turkey			
	Bolivia				
10 to 19.9			Sri Lanka	Vietnam	
20 to 29.9		Ukraine	Kazakhstan		
			Argentina		
above 30				Chile	Bangladesh
					Indonesia
					Philippines
					Mexico, Columbia
					Paraguay, Peru

Notes for BOX 11-3, 11-4, and 11-5:

1. For the last twenty years, each country has taken a different transition, where some countries have taken a more stable path than others.
2. Some countries start with a new step to accept the SNA, where rapid irregular trends disappear within a few years but these results are interesting to know how some ratios are settled at the first step. For example, the capital-output ratio is extremely low and the rate of return is extremely high under different level of the relative share of capital, each in endogenous-equilibrium.
3. Two countries, Ukraine and Kazakhstan, start with 1993 and 1995. These data are exceptionally shown in 1990 data of Figure 2. When data are exceptionally out of each table, these data are input at the corner of top left or bottom right.
4. Policy-makers by country have its own philosophy and decisions to harmonize national taste/preferences with corresponding technological progress. Yet, some of real-assets policies may be wrong, resulting in back and forth trends. Most importantly, actual data should be closer to endogenous data by sector; a stable or fluctuating level of net investment over years determines the differences by country.

Data source: KEWT 5.11-5 by sector, 1990-2009, whose original data are from *International Financial Statistics Yearbook*, IMF. Figures 3, 4, and 5 are based on the same KEWT 5.11-5.
For each set of data by item, see tables by country and area (weighted averaged) in Appendix at the end.

Five pattern-settings by aspect were as explained above, with three sets of figures. The author finds that Pakistan has encountered most difficult times during the last twenty years. Why do Pakistan policy-makers not find moderate combinations of real-assets policies for equilibrium? The author comments on the case of Pakistan by reviewing each of seven endogenous parameters. Apparently, each value of seven endogenous parameters are not so much exceptional except for the DRC coefficient, δ_0. Pakistan's δ_0 has shown a minus value by year continuously. Years of a plus value of δ_0 are exceptionally 1990, 1999, 2002, and 2008, yet these values are 1.5926, 1.3866, 1.5175, and 1.1940, each abnormally high. What are the causes of abnormal levels of δ_0? Two reasons are: (1) The qualitative net investment coefficient is less than 0.5, which implies that $B^* = (1-\beta^*)/\beta^*$ is above 1.0. (2) The capital-output ratio is less than 1.0.

For these two reasons, the value of δ_0 has been abnormal. Nevertheless, Pakistan's G sector is normal, where low $B^* = (1-\beta^*)/\beta^*$ is low and the capital-output ratio is high, resulting in normal δ_0 by year. Then, what does this mean? A serious problem stays at the PRI sector. The balance of the G sector and the PRI sector is extreme abnormal. Pakistan policy-makers lost their way how to recover the abnormality at the PRI sector. It is apparently possible for policy-makers to operate the G sector. But, actually this operation is far beyond a limit of the G sector in the case of Pakistan. The G sector and the PRI sector are closely related and cannot overrun a certain level of unbalance between the two sectors. And further, fundamental causes are traced back to minus high levels of the balance of payments and deficit. In this respect, Pakistan's case teaches us a warning against the unbalance between the two sectors. A young organic economy teaches us this fact.

In short, peculiar characteristics of the transition processes to robust-developing are policy-oriented in the endogenous-equilibrium and expressed by dynamic balances between government and private sector. This fact is naturally connected with common characteristics. It implies that it is difficult for young-developing stage countries to clearly distinguish *common* with *peculiar* characteristics.

11.5 Reinhart and Rogoff (2009), Lall (2001), Kuruvilla et al. (2002), and Castillo, A. et al. (2005): Common *vs.* Peculiar Characteristics

This section reviews a few impressive articles to seek the characteristics at young-developing countries common to developed countries. The author understands that common is a concept for long periods while peculiar short and long periods. Author's five pattern-settings are applied to 21 years, 1990-2010, as short periods. Carmen M. Reinhart and Kenneth S. Rogoff (249-273, 2009) devises long periods, 1900-2005/2008, 1800-2008 or 1820-2000, with resultant analyses. Reinhart and Rogoff (ibid.; hereunder R & R) surprisingly presents one of most reliable data to us. The researches by R & R are based on four relationships between banking crisis, currency crashes, default, and inflation (BCDI). As a result, R & R develops a composite index called the BCDI Index. This Index is commonly applicable to many countries, developed and developing. The four items of R & R, no doubt, constitute author's 'characteristics common to developed countries and developing countries.' The four items correspond with author's five pattern-settings in this chapter. Five pattern-settings do not step into indexes while the four items of R & R develops the BCDI Index among countries based on country and area data.

The author reviews and introduces three points in R & R (263,ibid.). First is Figure 16.7 of R & R (263, ibid.). The x axis shows time after of t, t+1, t+2, t+3,…, t+9, t+10, t+11, at global stock markets during global crisis. The y axis shows Composite Real Stock Price Index (End of Period), where Index (t) 2007=100. 11936 is exceptionally high and long. Others are significantly lower and shorter. Second is Figure 16.8 of R & R (264, ibid.). The x axis shows time after of t, t+1, t+2, t+3,…, t+9, t+10, t+11, at Real per capita GDP during global financial crisis and, the y axis shows GDP Index, where WEO 2009, Index 2008=100. Figure 16.8 compares Emerging economies, WEO (World Economic Outlook); Advanced economies, WEO; Western Europe; Latin America; and Australia, Canada, New Zealand, United States. GDP recovers promptly and shortly in the case of two WEOs while other three cases sharply fall and then recover gradually. Except for the case of WEO at Figure 16.8, three cases correspond with author's speed years in equilibrium. Supposing that author's neutrality of the financial/

market assets to the real assets holds, Figure 16.7 is plausibly replaced by real-assets recovery.

Third is Figure 16.12 of R & R (271, ibid.). Figure 16.12 shows The sequencing of crises: A prototype. Figure 16.12 is related to i) Diaz-Alejandro; ii) Kaminsky and Reinhart "twin crises;' iii) Capital controls introduced or increased round this time; and iv) Reinhart and Rogoff (2008c) — no clear sequence of domestic versus external default. I), ii), ii), and iv) are shadowed in Figure 16.12. Figure 16.12 leads to the BCDI Index. Author's comment is the following: From the viewpoint of financial/market-assets, the prototype is the best in the literature. The prototype exactly corresponds with author's processes to recover equilibrium from close-to-disequilibrium or disequilibrium. Under the endogenous-equilibrium, the processes are numerically measured directly by seven endogenous parameters or understandably by *five* pattern-settings developed in this chapter. Underlying situations are similar to the prototype. This is because the price-equilibrium directly shows the results although the processes are not clarified. The price-equilibrium and the endogenous-equilibrium are the same and completely overlap. The price-equilibrium only shows results while the endogenous-equilibrium clarifies the processes numerically. In particular, R & R is most close to the endogenous-equilibrium. This is because deficits and debts are a base for the cyclical prototype of R & R. Deficits and debts are a key for connecting the financial/market assets with the real assets. And, deficits and debts are characteristics common to advanced/developed and developing countries. In fact, almost all the countries, according to R & R, have experiences of default and bankruptcy by country after 1800.

Economic stage theories have advanced, one step forwards and half step backwards, after industrial revolution, generation after generation and, from selfish to altruistic. Economic methodologies have freely widened, from micro to macro and, from policies to strategies.

Second, turning to peculiar characteristics, the author briefly reviews Lall, S. (2001). Look at 'competitiveness indices and developing countries' by Lall (ibid.): Tables 1 to 4 in Lall (1502, 1516, 1517, 1518, ibid.) compares two indexes, IMD (2000) and WEF (2000), with such data as categories of variable, R &D, and royalties ranking. Index and ranking differs with its own criterion for competitiveness by country. To solve this problem universally, the author presented an essential ratio analysis at Chapter 8. This chapter, instead of indices, tried to express competitiveness using *five* pattern-settings based on six organic aspects.

Third, the author picks up Singapore assessed by Kuruvilla, S., Erickson, CL., and Hwang, A. (2002). Kuruvilla et al. (1461-1476, ibid.) investigates a strategy such as skill development system for competiveness. Strategies must be Blue Birds chosen freely yet, without numerical integration or aggregation of data as a whole system. Skills development is evaluated as results. The endogenous system contrarily needs strategies to support and reinforce polices. The endogenous system reflects and measures the results of skills development. In this respect, Kuruvilla et al. (ibid.) is a good work needed for endogenous policies. A problem is how to absorb 'skills development' into endogenous policies synthesized as a whole system.

Fourth, the author pays attention to Castillo, A., Magana, A., Pujadas, A., Martinez, L., and Godinez, Z. (2005). Castillo, A. et al. (630-643, ibid.) investigates 'rural people with ecosystems' experimented at a region in Mexico. The experiment presents a typical case of universal policy and strategy. Past three century history of agriculture and industries suggests that this experiment does not end but is deepened nearer to nature, from chemical fertilizer to natural circling fertilizer and, from eroded to fermented soil, body, and society; nearer to nature. Endogenously, the direction expressed by Castillo, A. et al. (ibid.) is indispensable. Because, the qualitative net investment coefficient measures and realizes that direction most numerically.

Castillo, A. et al. (ibid.) was expected to be *peculiar* but ultimately resulted in the *common* characteristics.

11.6 Conclusions

Why did some young-developing countries conquer their difficulties and get into the next stage while others stayed at the same stage up and down for many years? Do young-developing stage countries have strong personality of national taste/preferences, culture, and history than developed stage countries? No, strong personality is not the reason why some countries cannot get into the next-stage. *Five* pattern-settings (BOXES 3 to 5, with 32 Tables by country), prove that true causes are unbalanced activities between government and private sectors. It is difficult for young-developing countries to flexibly adjust various priorities of short- and long-term polices, compared with the case of robust-developing countries. This fact identifies a *peculiar* characteristic of young-developing countries. The young-developing stage needs a consecutive high level of net investment over years. Distribution of net investment between public infrastructure and enterprises is delicate. Economic circumstances change quickly and sharply. Net investment and its distribution between government and private sectors need to be long-sighted. Unbalanced periods are indispensable at young-developing countries. Financial support is required consecutively and stably. When real-assets policies do not match financial-assets policies, the speed years are instable and fall into close-to-disequilibrium. Most of young countries, 1990-2010, have severely experienced close-to-disequilibrium.

On the other hand, *common* characteristics of young-developing stage countries are based on the endogenous structure of the balance of payments. Here the author does not repeat deficits and debts to control the balance of payments (see R & R above). If a country is instable in endogenously maintaining the balance of payments, its economy becomes instable and cannot get into the next stage. A true fact for the balance of payments is not a high plus level but a stable plus or minus level to some extent. A flexible range of the balance of payments makes the rate of technological progress stable. A high plus level of the balance of payments damages sustainable growth in the long run.

Nevertheless, young-developing stage countries often and sharply fall into a fluctuating level of the balance of payments and result in up and down changes in net investment. The fluctuating level of the balance of payments ultimately comes from unbalanced net investment activities between government and private sector. Sharp changes in net investment are *peculiar* to the young-developing stage; these results constitute characteristics of the young-developing stage. When a country could ride over *peculiar* characteristics, the country gets into robust-developing country.

Once a young-developing country falls into economic difficulties, the tide changes at once and adversely; the market reaction is severe more than at the robust-developing country. Net investment is stabilized by dynamic policies, fast and flexible, but it is difficult for the young-developing countries to execute fast and flexible policies to the real assets. Conclusively, *peculiar* and *common* characteristics are tightly related in the case of the young-developing stage.

When the world economies are stuck after bubbles, waste deficits, and weaken sustainable growth in the long run, enterprise managers cry out money supply much more. Any country cannot fasten international money within the country, once the country turns to the worse and loses its attractiveness to investors. Or, excessive money returns back to central banks. Therefore, ample helicopter money supply in the world remains psychological effect. We need improvement in the real-assets through seven endogenous parameters. We need assessment of five pattern-settings to examine effective policies by country. Then the neutrality of the financial assets to the real assets is strengthened and, the market becomes calm. It implies that an economy cannot survive alone and selfishly. We need cooperation, not fighting but for others. Safely we return back to human original thought and philosophy.

Finally Lewis, Arthur, W. (139-191, 1954; 1978; 1-10, 1984) has, historically and socially, investigated actual environmental causes and results among many countries for so many decades. His experienced viewpoint of trades and prices between two countries is supreme. Analyses in this chapter needs to broadly interpret author's neutrality of the financial/market assets to the real assets and, to review pattern settings and mobility of capital and labor, from his everlasting viewpoint at commodity and industry bases.

Conclusively, Chapter 11 arrives at **Axiom 1** of a constant capital-output ratio, $\Omega = \Omega^* = \Omega_0 = K/Y$. **Axiom 1** (see, Essence of Earth Endogenous System) stands for six nature-aspects under endogenous equilibrium. Chapters 11, 12, and 13 spread wholly from focusing. And, money-neutral is always responsible for six nature-aspects.

For readers' convenience: contents of tables and figures hereunder

Using two page tables for 16 countries: From Tables C1-1 and C1-2 at Turkey to Tables C16-1 and C16-2 at Peru, by country, 1990-2012.

Turkey, Ukraine, Kazakhstan, Pakistan, Bangladesh, Indonesia, Philippines, Sri Lanka, Vietnam, Mexico, Argentina, Bolivia, Chile, Columbia, Paraguay, and Peru.

Table C1-1 **Turkey:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
8. Turkey	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.1429	(0.0157)	3.5371	(0.0044)	0.0037	(0.0217)	0.0359	(0.0379)	0.1473
1991	0.1296	0.0302	3.6480	0.0083	(0.0129)	0.0563	0.0438	(0.0996)	0.2272
1992	0.1707	0.0324	3.0531	0.0106	(0.0121)	0.0424	0.0665	(0.0935)	0.2394
1993	0.1801	0.0257	3.6418	0.0070	(0.0047)	0.0161	0.0565	(0.0378)	0.1291
1994	0.2293	0.0439	1.6469	0.0267	(0.0030)	0.0666	0.1659	(0.0394)	0.2789
1995	0.2461	0.0347	1.9018	0.0183	0.0022	0.0292	0.1477	0.0325	0.1841
1996	0.2377	0.0206	2.7042	0.0076	0.0022	0.0091	0.0955	0.0423	0.0985
1997	0.2325	0.0232	2.3437	0.0099	(0.0032)	0.0228	0.1091	(0.0698)	0.1793
1998	0.3416	0.0515	1.4889	0.0346	0.0005	0.1197	0.2640	0.0122	0.3451
1999	0.3429	0.0663	1.3217	0.0502	(0.0041)	0.6290	0.3096	(0.0717)	0.8768
2000	0.2799	0.0452	1.5264	0.0296	(0.0005)	0.1125	0.2130	(0.0081)	0.4762
2001	0.9960	(0.6473)	1.0580	(0.6118)	0.0137	0.9516	0.3296	(0.0710)	1.3453
2002	0.2880	0.0594	1.3183	0.0451	(0.0040)	1.4099	0.2635	(0.0645)	1.4461
2003	0.3066	0.0632	1.2883	0.0491	(0.0096)	(18.6812)	0.2871	(0.1805)	26.2256
2004	0.2652	0.0449	1.4435	0.0311	(0.0054)	2.7099	0.2148	(0.0814)	5.1518
2005	0.2297	0.0372	1.5575	0.0239	(0.0049)	0.4528	0.1714	(0.0622)	1.6849
2006	0.1873	0.0263	1.9956	0.0132	(0.0022)	0.0784	0.1070	(0.0237)	0.5104
2007	0.1772	0.0277	1.8436	0.0150	(0.0016)	0.0632	0.1111	(0.0141)	0.4090
2008	0.1408	0.0214	2.3723	0.0090	(0.0030)	0.0372	0.0684	(0.0290)	0.2384
2009	0.1465	0.0602	1.2620	0.0477	(0.0105)	0.7156	0.1638	(0.0728)	0.6537
2010	0.1657	0.0333	1.6123	0.0206	(0.0256)	0.0681	0.1234	(0.0869)	0.5171
2011	0.1239	0.0370	1.5257	0.0243	(0.0048)	0.3064	0.1055	(0.0474)	0.3106
2012	0.1084	0.0250	2.0575	0.0122	(0.0036)	0.0840	0.0648	(0.0379)	0.1865
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
8. Turkey	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	13.25	12.99	14.81	0.1786	0.1604	0.0182	(0.0341)	(0.0137)	(0.0478)
1991	4.09	9.56	9.59	0.1801	0.1519	0.0281	(0.0565)	0.0264	(0.0302)
1992	4.91	10.00	7.24	0.1779	0.1703	0.0076	(0.0462)	0.0145	(0.0318)
1993	5.27	15.58	6.07	0.1982	0.1854	0.0128	(0.0253)	(0.0352)	(0.0605)
1994	7.85	23.37	12.15	0.1840	0.1181	0.0659	(0.0317)	0.0422	0.0104
1995	6.71	31.57	8.92	0.1854	0.1484	0.0370	(0.0215)	(0.0281)	(0.0495)
1996	5.61	5.98	6.78	0.1951	0.1938	0.0013	(0.0238)	(0.0461)	(0.0699)
1997	6.19	10.16	8.95	0.2055	0.1724	0.0331	(0.0477)	(0.0168)	(0.0645)
1998	7.12	43.67	17.99	0.1778	0.1346	0.0432	(0.0387)	0.0515	0.0129
1999	8.94	14.41	34.52	0.1473	0.1014	0.0459	(0.0507)	0.0524	0.0017
2000	8.03	17.76	14.25	0.0186	0.1196	(0.1010)	(0.0292)	(0.0040)	(0.0333)
2001	358.09	4.84	17.05	0.1240	0.0565	0.0675	(0.0466)	0.0924	0.0458
2002	10.70	11.82	84.43	0.1300	0.0846	0.0454	(0.0452)	0.0634	0.0182
2003	10.68	6.18	65.10	0.1323	0.0844	0.0479	(0.0854)	0.0738	(0.0116)
2004	9.12	9.61	37.19	0.1582	0.1043	0.0539	(0.0524)	0.0232	(0.0293)
2005	8.60	10.98	19.94	0.1636	0.1110	0.0526	(0.0428)	0.0040	(0.0388)
2006	7.25	13.89	11.43	0.1734	0.1339	0.0395	(0.0264)	(0.0282)	(0.0545)
2007	6.86	16.07	11.64	0.1666	0.1230	0.0436	(0.0198)	(0.0376)	(0.0573)
2008	5.82	14.72	11.57	0.1547	0.1308	0.0239	(0.0271)	(0.0220)	(0.0491)
2009	13.14	14.15	85.93	0.1311	0.0549	0.0763	(0.0467)	0.0344	(0.0123)
2010	1.21	23.50	9.48	0.0000	0.1059	(0.1059)	(0.0427)	(0.0190)	(0.0617)
2011	1.79	13.21	86.25	0.0000	0.0743	(0.0743)	(0.0361)	0.0360	(0.0001)
2012	1.87	14.12	24.03	0.0000	0.0980	(0.0980)	(0.0331)	0.0330	(0.0001)
Employment	n	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
8. Turkey	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	(0.0113)	0.0000	0.0000	0.0000	0.0000	0.0000	(0.0333)	0.6026	0.4157
1991	0.0219	0.0000	0.0000	0.0000	(0.1010)	0.0157	(0.0374)	0.6600	0.4698
1992	0.0218	0.0000	0.0000	0.0000	(0.0485)	0.0084	(0.0351)	0.7006	0.4676
1993	0.0186	0.0000	0.0000	0.0000	0.0213	(0.0039)	(0.0356)	0.6606	0.4743
1994	0.0173	0.0000	0.0000	0.0000	0.0936	(0.0168)	(0.0347)	1.0627	0.5561
1995	0.0165	0.0000	0.0000	0.0000	0.0421	(0.0067)	(0.0297)	0.8812	0.4653
1996	0.0130	0.0000	0.0000	0.0000	(0.0759)	0.0116	(0.0261)	0.8095	0.4794
1997	0.0133	0.0000	0.0000	0.0000	(0.0570)	0.0094	(0.0311)	0.8596	0.6468
1998	0.0169	0.0000	0.0000	0.0000	0.1483	(0.0262)	(0.0279)	0.8491	0.6185
1999	0.0161	0.0000	0.0000	0.0000	(0.2068)	0.0304	(0.0329)	0.6480	0.5337
2000	0.0156	0.0000	0.0000	0.0000	0.0643	(0.0117)	(0.0297)	0.5480	0.5548
2001	(0.0355)	0.0000	0.0000	0.0000	(0.0490)	0.0083	(0.0378)	0.5440	1.2473
2002	0.0144	0.0000	0.0000	0.0000	(0.0272)	0.0049	(0.0464)	0.4495	0.4455
2003	0.0141	0.0000	0.0000	0.0000	0.0264	(0.0049)	(0.0473)	0.2529	0.3136
2004	0.0138	0.0000	0.0000	0.0000	0.0228	(0.0041)	(0.0046)	0.1059	0.1977
2005	0.0133	0.0000	0.0000	0.0000	0.0111	(0.0019)	(0.0459)	0.1013	0.1668
2006	0.0131	0.0000	0.0000	0.0000	(0.0404)	0.0069	(0.0446)	0.1050	0.1902
2007	0.0127	0.0000	0.0000	0.0000	(0.0505)	0.0091	(0.0459)	0.0878	0.1979
2008	0.0124	0.0000	0.0000	0.0000	0.0131	(0.0025)	(0.0495)	0.1040	0.2077
2009	0.0125	0.0000	0.0000	0.0000	(0.2026)	0.0381	(0.0630)	0.0625	0.1163
2010	0.0126	0.0000	0.0000	0.0000	0.0280	(0.0066)	(0.0536)	0.0858	0.1194
2011	0.0128	0.0000	0.0000	0.0000	0.1854	(0.0420)	(0.0441)	0.0647	0.1052
2012	0.0129	0.0000	0.0000	0.0000	0.0979	(0.0174)	(0.0414)	0.0890	0.1385

Chapter 11

Table C1-2 **Turkey:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
8. Turkey		G	PRI		G	PRI		G	PRI
1990	0.4424	0.7963	0.2356	0.6479	2.7529	0.2540	#NUM!	#NUM!	#NUM!
1991	0.4003	0.7404	0.2234	0.7293	2.6879	0.3438	0.1607	0.4547	0.0968
1992	0.3676	0.6746	0.2351	0.6068	2.0264	0.3296	0.1401	0.3565	0.0933
1993	0.3435	0.6003	0.2582	0.5308	1.4452	0.3566	0.1184	#NUM!	0.0912
1994	0.2864	0.5757	0.1991	0.4244	1.1607	0.2956	0.0980	0.1977	0.0783
1995	0.2720	0.5562	0.1932	0.3802	0.9917	0.2624	0.0893	0.1680	0.0715
1996	0.2923	0.5296	0.2278	0.4008	0.8867	0.3002	0.0820	0.1370	0.0690
1997	0.2874	0.5351	0.2135	0.3973	0.9540	0.2853	0.0826	0.1487	0.0675
1998	0.2446	0.6004	0.1308	0.3256	0.9785	0.2142	0.0812	0.1627	0.0643
1999	0.2515	0.6085	0.1023	0.3477	1.2240	0.3605	0.0826	0.1972	0.0855
2000	0.2541	0.6155	0.1133	0.3513	1.2515	0.1543	0.0824	0.1965	0.0509
2001	0.2207	0.5990	0.0623	0.0932	1.1046	0.2160	#NUM!	#NUM!	#NUM!
2002	0.2300	0.6226	0.0469	0.3223	1.3620	1.8072	0.0750	0.2044	#NUM!
2003	0.2480	0.6823	0.0042	0.3502	1.8955	0.0022	0.0781	0.2706	#NUM!
2004	0.2785	0.7148	0.0160	0.3981	2.0076	0.0313	0.0839	0.2763	0.0202
2005	0.3147	0.7383	0.0502	0.4698	2.3279	0.0654	0.0919	0.3094	#NUM!
2006	0.3514	0.7392	0.1140	0.5473	2.3226	0.1395	0.1015	0.3059	0.0440
2007	0.3879	0.7425	0.1696	0.6413	2.5036	0.2171	0.1110	0.3224	0.0554
2008	0.4122	0.7510	0.2103	0.7173	2.6292	0.2876	0.1194	0.3331	0.0653
2009	0.4432	0.7469	0.2253	0.9544	3.2718	(2.5471)	0.1467	0.4156	0.2339
2010	0.4484	0.7350	0.2694	0.8311	4.4169	0.3428	0.1329	0.5560	0.0706
2011	0.4280	0.7680	0.2267	0.8576	2.8807	19.8024	0.1380	0.3669	2.2867
2012	0.4400	0.7985	0.2213	0.8652	3.1439	0.4814	0.1400	0.3952	0.0935
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
8. Turkey						$x=a/(i\cdot b^*)$		G	PRI
1990	0.0926	0.0885	0.4138	0.7281	0.0941	1.3941	0.1271	0.0781	0.2241
1991	0.0945	(1.6974)	0.4515	0.5914	0.0833	1.3776	0.1598	0.0693	0.3156
1992	0.1036	(0.8270)	0.4089	0.5099	0.1007	1.4871	0.2031	0.0743	0.3625
1993	0.0956	(0.4900)	0.3742	0.4646	0.1160	1.3785	0.2058	0.1119	0.2782
1994	0.0973	(0.3998)	0.3235	0.3562	0.0799	2.5459	0.2732	0.1839	0.3512
1995	0.0935	(0.2893)	0.2989	0.3331	0.1041	2.1089	0.2808	0.2720	0.2879
1996	0.0953	(0.2446)	0.3097	0.3689	0.1338	1.5868	0.2583	0.2902	0.2381
1997	0.0924	(0.2523)	0.3073	0.3613	0.1194	1.7442	0.2557	0.2184	0.2836
1998	0.1112	(0.2785)	0.2714	0.2830	0.0980	3.0454	0.3931	0.3926	0.3938
1999	0.1192	(0.3501)	0.2863	0.2913	0.0724	4.1080	0.4093	0.2123	0.8993
2000	0.0983	(0.2898)	0.2835	0.3025	0.0857	2.8997	0.3251	0.2226	0.5422
2001	0.0929	0.4275	0.0902	0.2663	0.0514	18.2276	0.3487	0.1137	1.2951
2002	0.0928	(0.2932)	0.2649	0.2671	0.0622	4.1413	0.3474	0.1676	1.4609
2003	0.1074	(0.3419)	0.2846	0.2903	0.0604	4.4691	0.3698	0.0851	26.2058
2004	0.1056	(0.3541)	0.3110	0.3405	0.0719	3.2547	0.3101	0.1286	5.1781
2005	0.1079	(0.4418)	0.3479	0.4043	0.0724	2.7938	0.2669	0.1070	1.7344
2006	0.1025	(0.5250)	0.3819	0.4799	0.0828	2.0044	0.2136	0.1173	0.5959
2007	0.1136	(0.8953)	0.4229	0.5546	0.0710	2.1854	0.2049	0.0987	0.4910
2008	0.1010	(1.2192)	0.4468	0.6227	0.0723	1.7287	0.1622	0.0891	0.3178
2009	0.1398	4.3612	0.5291	0.6763	0.0258	4.8170	0.2067	0.0140	0.6651
2010	0.1377	(14.1656)	0.4939	0.6922	0.0536	2.6332	0.1990	(0.0441)	0.6130
2011	0.1063	(13.5149)	0.4929	0.6604	0.0377	2.9024	0.1609	0.0799	0.3235
2012	0.0938	(9.5178)	0.4916	0.7029	0.0498	1.9456	0.1334	0.0963	0.2151
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
8. Turkey					$gy^{**}=gy^*/gy^*(US)$		$e^*(US)=e(US)+(r^*-r^*(US))$		
1990	2.3389	1.7028	18.3955	0.273	3.146	169.7	0.0288	2930	1.0000
1991	2.3174	1.3706	14.5051	0.340	3.130	255.2	0.0706	5080	1.0000
1992	1.7363	0.8854	8.5494	0.297	2.462	301.4	0.1065	8564	1.0000
1993	1.2756	0.5927	6.1992	0.294	2.430	1162.3	0.1190	14473	1.0000
1994	1.3175	0.4692	4.8222	0.327	2.196	6588.5	0.1895	38726	1.0000
1995	1.2032	0.4008	4.2845	0.219	1.780	0.0061	0.1975	0.2572	0.2321
1996	1.0706	0.3949	4.1453	0.242	1.936	0.0106	0.1793	0.2871	0.3755
1997	0.8851	0.3198	3.4618	0.414	2.620	0.0104	0.1836	0.3892	0.5283
1998	0.7271	0.2058	1.8496	0.277	1.704	0.0657	0.3248	0.6393	0.4919
1999	0.6928	0.2018	1.6929	0.191	1.466	0.2012	0.3433	0.8847	0.6120
2000	0.6282	0.1900	1.9321	0.275	1.845	0.2427	0.2596	0.9330	0.7218
2001	0.8205	0.2185	2.3527	0.251	1.721	0.6292	0.2730	1.7231	0.8416
2002	0.7344	0.1962	2.1138	0.157	1.453	0.4179	0.2525	1.8962	0.8668
2003	0.6962	0.2021	1.8823	0.007	1.019	0.3394	0.2670	1.6636	0.8395
2004	0.6336	0.2157	2.0429	(0.068)	0.782	0.3204	0.2065	1.5460	0.8664
2005	1.0113	0.4089	3.7894	(0.063)	0.764	0.3161	0.1547	1.4998	0.8969
2006	0.9090	0.4362	4.2553	0.003	1.013	0.4176	0.1195	1.5285	0.9218
2007	0.8183	0.4538	3.9934	0.021	1.101	0.4631	0.1292	1.3000	0.9006
2008	0.8191	0.5101	5.0489	0.067	1.412	0.4528	0.0782	1.6032	0.9512
2009	0.8504	0.5751	4.1133	(0.030)	0.854	(0.2705)	0.0781	1.5690	0.9502
2010	0.8587	0.5943	4.3160	(0.046)	0.768	0.0465	0.0845	1.6258	0.9480
2011	0.8744	0.5774	5.4338	(0.019)	0.884	45.0006	0.0464	1.9399	0.9761
2012	0.8290	0.5827	6.2141	0.030	1.226	64.8597	0.0189	1.8008	0.9895

Data source of Tables C1-2 and C1-2**:** KEWT 8.14-3 for 15 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C2-1 **Ukraine:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
9. Ukraine	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1993	0.1149	0.0039	8.3339	0.0005	(0.0001)	0.0007	0.0143	(0.0040)	0.0193
1994	0.1191	(0.0040)	2.6337	(0.0015)	(0.0000)	(0.0026)	0.0437	0.0009	0.0560
1995	0.3277	(0.0130)	2.2834	(0.0057)	0.0019	(0.0155)	0.1378	(0.0976)	0.2231
1996	0.2918	(0.0137)	2.2985	(0.0060)	0.0015	(0.0161)	0.1210	(0.0607)	0.1995
1997	0.2698	(0.0145)	2.4373	(0.0060)	0.0013	(0.0141)	0.1047	(0.0368)	0.1795
1998	0.0869	(0.0259)	5.3334	(0.0049)	0.0024	(0.0123)	0.0114	(0.0199)	(0.0042)
1999	0.0976	(0.0168)	2.3426	(0.0072)	0.0005	0.0027	0.0345	(0.0098)	0.0072
2000	0.1287	(0.0165)	2.3756	(0.0069)	(0.0005)	(0.0561)	0.0472	0.0091	0.0161
2001	0.1078	(0.0071)	3.5831	(0.0020)	(0.0000)	0.0038	0.0281	0.0008	(0.0123)
2002	0.1283	(0.0161)	2.1539	(0.0075)	(0.0014)	(0.0148)	0.0521	0.0257	(0.0154)
2003	0.1286	(0.0133)	2.5407	(0.0053)	(0.0008)	0.0439	0.0454	0.0155	(0.0179)
2004	0.2378	(0.0224)	1.5055	(0.0149)	0.0008	0.1219	0.1431	(0.0194)	0.3821
2005	0.1317	(0.0099)	2.9584	(0.0033)	0.0002	0.0459	0.0412	(0.0066)	(0.0460)
2006	0.1125	(0.0063)	10.3683	(0.0006)	(0.0003)	0.0167	0.0102	0.0084	(0.1385)
2007	0.1182	(0.0048)	76.3188	(0.0001)	(0.0001)	0.0111	0.0015	0.0021	(0.1480)
2008	0.1058	(0.0037)	(9.1086)	0.0004	(0.0000)	0.0046	(0.0112)	0.0005	(0.1000)
2009	0.1239	(0.0092)	1.7969	(0.0051)	0.0017	(0.0658)	0.0638	(0.0435)	0.2301
2010	0.1317	(0.0114)	1.7175	(0.0066)	0.0055	(0.0532)	0.0701	(0.0872)	0.3750
2011	0.1271	(0.0086)	2.7350	(0.0031)	0.0048	(0.0103)	0.0433	(0.0241)	0.1914
2012	0.2954	0.0110	0.6504	0.0169	0.0060	0.0451	0.4711	(0.0348)	2.3911
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
9. Ukraine	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1993	1549.70	137.14	1670.20	0.0415	0.8667	(0.8252)	(0.0111)	0.0111	0.0000
1994	63.25	42.41	78.50	0.1880	0.4259	(0.2380)	(0.0088)	(0.0282)	(0.0370)
1995	28.72	19.91	51.20	0.1827	0.3761	(0.1935)	(0.0714)	0.0204	(0.0510)
1996	25.41	17.83	77.86	0.1622	0.3211	(0.1588)	(0.0545)	0.0123	(0.0423)
1997	23.13	20.04	48.99	0.1557	0.3302	(0.1745)	(0.0416)	(0.0071)	(0.0488)
1998	6.44	18.83	43.20	0.1531	0.1423	0.0108	(0.0325)	(0.0152)	(0.0476)
1999	15.92	23.46	192.29	0.1509	0.1121	0.0388	(0.0225)	0.0540	0.0315
2000	16.66	25.65	152.02	0.1536	0.1410	0.0126	(0.0089)	0.0317	0.0229
2001	22.42	22.64	100.94	0.1535	0.1506	0.0029	(0.0147)	0.0131	(0.0016)
2002	17.92	30.30	115.46	0.1495	0.1290	0.0205	0.0049	0.0280	0.0330
2003	19.67	27.77	274.08	0.1606	0.1462	0.0144	(0.0029)	0.0187	0.0158
2004	122.59	24.32	31.24	0.1758	0.1352	0.0406	(0.0293)	0.1037	0.0744
2005	6.64	25.20	476.97	0.1711	0.1529	0.0182	(0.0191)	0.0159	(0.0033)
2006	4.09	26.87	23.08	0.1917	0.1819	0.0098	(0.0074)	(0.0421)	(0.0494)
2007	2.69	26.18	16.98	0.2143	0.2076	0.0068	(0.0128)	(0.0558)	(0.0686)
2008	4.00	24.36	11.85	0.2121	0.2095	0.0025	(0.0115)	(0.0874)	(0.0989)
2009	52.09	18.57	92.59	0.1405	0.1015	0.0390	(0.0398)	(0.0019)	(0.0417)
2010	4.83	10.90	34.05	0.0000	0.0979	(0.0979)	(0.0646)	0.0285	(0.0361)
2011	3.03	34.20	10.31	0.0000	0.1431	(0.1431)	(0.0159)	(0.0599)	(0.0758)
2012	3.33	26.17	3.60	0.0000	(0.2342)	0.2342	(0.0219)	0.2611	0.2392
Employment	n	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
9. Ukraine	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1993	0.0035	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!	0.0000	0.0000	0.2861
1994	(0.0025)	0.0000	0.0000	0.0000	0.8775	2.0785	0.0000	0.0000	0.2840
1995	(0.0073)	0.0000	0.0000	0.0000	0.4020	(0.1057)	(0.0252)	0.0000	0.2630
1996	(0.0077)	0.0000	0.0000	0.0000	0.0100	(0.0014)	(0.0342)	80.3000	0.2337
1997	(0.0086)	0.0000	0.0000	0.0000	(0.0428)	0.0060	(0.0401)	15.9000	0.2345
1998	(0.0210)	0.0000	0.0000	0.0000	0.1732	(0.0254)	(0.0509)	10.6000	0.2257
1999	(0.0096)	0.0000	0.0000	0.0000	0.1459	(0.0172)	(0.0522)	22.7000	0.2230
2000	(0.0095)	0.0000	0.0000	0.0000	(0.0126)	0.0012	(0.0522)	28.2000	0.1907
2001	(0.0051)	0.0000	0.0000	0.0000	(0.1058)	0.0106	(0.0491)	76.2000	0.1422
2002	(0.0086)	0.0000	0.0000	0.0000	0.0625	(0.0070)	(0.0432)	76.8000	0.1359
2003	(0.0081)	0.0000	0.0000	0.0000	(0.0567)	0.0059	(0.0410)	80.7000	0.1328
2004	(0.0075)	0.0000	0.0000	0.0000	0.0208	(0.0023)	(0.0387)	88.1000	0.1453
2005	(0.0065)	0.0000	0.0000	0.0000	0.0943	(0.0102)	(0.0324)	100.0000	0.1259
2006	(0.0057)	0.0000	0.0000	0.0000	(0.0067)	0.0006	(0.0306)	109.1000	0.1192
2007	(0.0047)	0.0000	0.0000	0.0000	0.0512	(0.0050)	(0.0302)	123.1000	0.1181
2008	(0.0041)	0.0000	0.0000	0.0000	0.0303	(0.0028)	(0.0288)	154.1000	0.1205
2009	(0.0041)	0.0000	0.0000	0.0000	(0.0781)	0.0069	(0.0396)	178.5000	0.1118
2010	(0.0048)	0.0000	0.0000	0.0000	(0.0027)	0.0003	(0.0365)	195.4000	0.1170
2011	(0.0054)	0.0000	0.0000	0.0000	0.1282	(0.0124)	(0.0356)	210.9000	0.1017
2012	(0.0059)	0.0000	0.0000	0.0000	(0.1376)	0.0115	(0.0338)	212.1000	0.0730

Data source: KEWT 8.14-3 for 15 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C2-2 **Ukraine:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
9. Ukraine		G	PRI		G	PRI		G	PRI
1993	0.9979	0.9832	1.0019	8.5571	6.5777	9.3018	0.5037	0.3900	0.5464
1994	0.9401	0.9443	0.9389	5.4087	5.1433	5.4591	0.2786	0.2642	0.2814
1995	0.7638	0.8875	0.7203	1.5449	2.3971	1.3104	0.1517	0.2175	0.1331
1996	0.6938	0.8698	0.6226	1.3312	2.4615	1.0319	0.1416	0.2325	0.1167
1997	0.7175	0.8857	0.6398	1.4656	2.9189	1.0946	0.1615	0.2877	0.1285
1998	0.6267	0.8760	0.5111	1.0902	3.0639	(0.5700)	0.2149	0.4783	0.0746
1999	0.5968	0.8942	0.4422	1.1039	3.2483	1.2923	0.1460	0.3381	0.1699
2000	0.5700	0.8912	0.3897	1.0147	3.1010	0.1423	0.1352	0.3215	0.0393
2001	0.5567	0.8819	0.3592	1.0460	3.2492	0.4310	0.1018	0.2479	0.0562
2002	0.5648	0.8991	0.3358	0.9981	3.1873	13.8828	0.1272	0.3133	1.3369
2003	0.5582	0.8967	0.3069	0.9954	3.2886	0.1299	0.1229	0.3132	0.0347
2004	0.5570	0.9057	0.2622	0.9015	3.5629	0.4661	0.1072	0.3255	0.0691
2005	0.5106	0.9014	0.2056	0.8612	3.4729	0.1318	0.0993	0.2962	0.0315
2006	0.5085	0.8984	0.2145	0.8843	3.4360	0.2513	0.0952	0.2749	0.0430
2007	0.5041	0.8989	0.2258	0.8784	3.2890	0.2796	0.0856	0.2380	0.0415
2008	0.4983	0.8928	0.2541	0.8738	3.5542	0.3282	0.0797	0.2404	0.0423
2009	0.5408	0.9031	0.2811	0.9638	5.8167	0.2786	0.0853	0.3922	0.0369
2010	0.5240	0.8952	0.2753	0.8919	8.9909	0.2892	0.0868	0.6574	0.0399
2011	0.5144	0.8920	0.3145	0.8821	6.7519	0.3858	0.0922	0.5324	0.0516
2012	0.4433	0.8856	0.1142	0.6670	6.6777	0.1041	0.0762	0.5502	0.0235

Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
9. Ukraine						$x=a/(i\cdot b^*)$		G	PRI
1993	0.9829	0.6601	0.9980	8.2741	0.0017	1.1364	0.1188	0.1387	0.1135
1994	0.6442	0.3665	0.9381	5.5972	0.0264	1.6121	0.1151	0.1319	0.1102
1995	0.5062	0.5806	0.7565	1.6086	0.0916	1.7792	0.3147	0.2835	0.3282
1996	0.3885	0.5661	0.6836	1.3967	0.1016	1.7701	0.2781	0.2477	0.2953
1997	0.3955	0.5010	0.7062	1.5490	0.0970	1.6957	0.2553	0.2029	0.2889
1998	0.0948	(1.6703)	0.5411	1.5524	0.0653	1.2308	0.0610	0.1523	(0.0115)
1999	0.1077	(0.4172)	0.5506	1.3336	0.0504	1.7448	0.0808	0.1754	(0.0187)
2000	0.1306	(0.0442)	0.5362	1.1634	0.0654	1.7269	0.1122	0.1850	0.0189
2001	0.1128	0.2912	0.5398	1.1197	0.0693	1.3871	0.1007	0.1653	0.0045
2002	0.1280	(0.0478)	0.5316	1.1416	0.0604	1.8666	0.1121	0.1865	(0.0243)
2003	0.1280	0.1557	0.5310	1.1106	0.0686	1.6491	0.1153	0.1751	(0.0146)
2004	0.2144	1.0355	0.5325	0.9954	0.0632	2.9783	0.2154	0.1664	0.3585
2005	0.1134	(1.0091)	0.4911	0.9309	0.0778	1.5106	0.1218	0.1690	(0.0395)
2006	0.0994	(1.7103)	0.4940	0.9371	0.0920	1.1067	0.1061	0.1685	(0.0911)
2007	0.1039	(2.5839)	0.4938	0.9152	0.1051	1.0133	0.1135	0.1845	(0.0857)
2008	0.0924	(1.3706)	0.4895	0.9052	0.1070	0.9011	0.1021	0.1545	(0.0119)
2009	0.1194	0.5308	0.5215	1.0413	0.0486	2.2548	0.1147	0.0584	0.2444
2010	0.1175	5.1594	0.5014	0.9763	0.0488	2.3938	0.1203	(0.0120)	0.4085
2011	0.1121	(3.6580)	0.4970	0.9458	0.0720	1.5764	0.1185	0.0029	0.2921
2012	0.1971	(1.3069)	0.4523	0.6432	(0.1283)	(1.8606)	0.3064	(0.0007)	2.0785

Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
9. Ukraine					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1993	6.1	50.7	52	0.171	2.441	0.01	0.0320	0.16	0.7976
1994	30.8	172.2	267	0.165	2.433	0.21	0.0314	1.07	0.9707
1995	59.3	95.5	189	(0.065)	0.794	0.11	0.2314	2.03	0.8858
1996	61.6	86.1	222	(0.058)	0.791	0.17	0.1992	2.09	0.9046
1997	69.5	107.7	272	(0.035)	0.862	0.08	0.1832	2.08	0.9120
1998	107.7	167.1	1764	0.139	3.273	1.09	(0.0072)	3.42	1.0021
1999	138.7	185.0	1717	0.125	2.553	2.82	0.0148	5.23	0.9972
2000	177.1	206.0	1578	0.062	1.552	2.47	0.0467	5.48	0.9915
2001	219.6	245.9	2180	0.034	1.341	1.67	0.0250	5.32	0.9953
2002	277.2	316.5	2472	0.008	1.068	1.34	0.0172	5.35	0.9968
2003	355.0	394.3	3080	0.004	1.037	1.11	0.0124	5.34	0.9977
2004	405.9	404.0	1884	(0.092)	0.571	1.27	0.1117	5.42	0.9794
2005	522.1	486.1	4286	(0.006)	0.952	1.10	0.0096	5.06	0.9981
2006	565.2	529.7	5326	0.007	1.064	1.35	0.0120	5.06	0.9976
2007	659.1	603.2	5808	(0.000)	0.998	1.36	0.0378	5.09	0.9926
2008	663.5	600.6	6499	0.015	1.144	1.56	0.0181	7.72	0.9977
2009	566.4	589.8	4939	(0.012)	0.895	(0.79)	(0.0140)	7.97	1.0018
2010	627.4	612.6	5215	(0.015)	0.878	0.27	0.0058	7.97	0.9993
2011	608.3	575.4	5133	(0.025)	0.786	98.76	0.0040	7.99	0.9995
2012	938.5	603.6	3063	(0.222)	0.274	(100.18)	0.1919	8.18	0.9766

Data source: KEWT 8.14-3 for 15 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C3-1 **Kazakhstan:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
9. Kazakh:	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1995	0.0606	(0.0051)	62.4548	(0.0001)	0.0009	(0.0007)	0.0009	(0.0241)	0.0057
1996	0.1116	(0.0338)	1.6899	(0.0200)	0.0074	(0.2686)	0.0460	(0.0835)	0.0752
1997	0.1584	(0.0480)	1.4393	(0.0333)	0.0063	(0.7057)	0.0767	(0.0655)	0.1150
1998	0.1997	(0.0700)	1.2548	(0.0558)	0.0062	0.1571	0.1033	(0.0694)	0.1595
1999	0.1176	(0.0344)	1.5234	(0.0226)	0.0033	0.0768	0.0546	(0.0432)	0.0816
2000	0.1822	(0.0318)	1.3338	(0.0239)	(0.0030)	(0.0560)	0.1128	0.0320	0.1481
2001	0.1872	(0.0331)	4.7173	(0.0070)	(0.0124)	(0.0079)	0.0327	0.0224	0.0438
2002	0.1575	0.0050	5.8475	0.0009	0.0011	0.0009	0.0278	0.0247	0.0316
2003	0.1693	0.0125	3.4438	0.0036	0.0014	0.0045	0.0528	0.0251	0.0606
2004	0.1929	0.0155	2.8958	0.0054	0.0031	0.0062	0.0720	0.0460	0.0804
2005	0.2222	0.0144	3.9241	0.0037	0.0058	0.0033	0.0603	0.0776	0.0561
2006	0.2527	0.0148	4.2604	0.0035	0.0056	0.0029	0.0628	0.0968	0.0530
2007	0.2083	0.0121	12.5747	0.0010	(0.0012)	0.0013	0.0175	(0.0141)	0.0258
2008	0.2383	0.0168	2.9284	0.0057	0.0350	0.0034	0.0871	0.2316	0.0570
2009	0.1166	0.0119	12.1451	0.0010	0.0001	0.0012	0.0106	0.0009	0.0126
2010	0.1690	0.0152	4.0251	0.0038	0.0021	0.0041	0.0458	0.0259	0.0500
2011	0.2030	0.0214	2.1163	0.0101	0.0038	0.0118	0.1061	0.0461	0.1194
2012	0.2004	0.0120	8.4610	0.0014	0.0071	0.0007	0.0251	0.0768	0.0143
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
9. Kazakh:	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1995	20.51	12.09	25.06	0.0310	0.1491	(0.1180)	(0.0267)	(0.0321)	(0.0588)
1996	7.62	7.58	58.19	0.0023	0.0866	(0.0843)	(0.0489)	0.0303	(0.0186)
1997	3.54	8.55	70.47	(0.0083)	0.0857	(0.0939)	(0.0443)	(0.0011)	(0.0454)
1998	2.64	9.25	84.05	0.0226	0.0690	(0.0463)	(0.0485)	(0.0001)	(0.0485)
1999	27.19	10.92	90.48	0.0208	0.0689	(0.0481)	(0.0370)	0.0717	0.0348
2000	143.64	19.39	125.54	0.0128	0.0760	(0.0633)	(0.0014)	0.1003	0.0989
2001	1.85	7.35	8.38	0.0961	0.2552	(0.1590)	(0.0046)	(0.0664)	(0.0710)
2002	20.66	20.21	31.50	0.1040	0.2679	(0.1639)	(0.0041)	(0.0510)	(0.0551)
2003	24.45	16.09	37.41	0.0987	0.2488	(0.1501)	(0.0115)	0.0082	(0.0033)
2004	27.58	18.13	45.24	0.1230	0.2545	(0.1315)	(0.0035)	0.0255	0.0220
2005	21.59	21.22	24.48	0.1558	0.3334	(0.1777)	0.0068	(0.0131)	(0.0064)
2006	19.59	21.89	19.55	0.1800	0.3928	(0.2128)	0.0088	(0.0199)	(0.0110)
2007	15.08	14.67	15.79	0.1863	0.4314	(0.2451)	(0.0190)	(0.0486)	(0.0676)
2008	21.27	57.82	18.18	0.1491	0.3493	(0.2002)	0.0527	0.0090	0.0616
2009	17.16	15.69	17.51	0.1538	0.2928	(0.1390)	(0.0155)	(0.0180)	(0.0336)
2010	18.74	16.99	19.13	0.0000	0.3244	(0.3244)	(0.0082)	0.0355	0.0273
2011	26.11	18.78	28.15	0.0000	0.2580	(0.2580)	(0.0017)	0.1338	0.1320
2012	16.20	23.42	15.47	0.0000	0.4516	(0.4516)	0.0108	(0.0466)	(0.0358)
Employment	**n**	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
9. Kazakh:	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1995	(0.0050)	0.0000	0.0000	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0.0051
1996	(0.0138)	0.0000	0.0000	0.0000	(0.0450)	0.0087		0.3927	0.0338
1997	(0.0146)	0.0000	0.0000	0.0000	0.0094	(0.0019)		0.1726	0.0480
1998	(0.0142)	0.0000	0.0000	0.0000	0.0914	(0.0184)		0.0723	0.0700
1999	(0.0118)	0.0000	0.0000	0.0000	0.1038	(0.0186)		0.0833	0.0344
2000	(0.0080)	0.0000	0.0000	0.0000	(0.1618)	0.0254		0.1312	0.0318
2001	(0.0261)	0.0000	0.0000	0.0000	(0.1562)	0.0293		0.0840	0.0859
2002	0.0041	0.0000	0.0000	0.0000	0.0621	(0.0139)		0.0581	0.0470
2003	0.0089	0.0000	0.0000	0.0000	0.0374	(0.0078)		0.0645	0.0461
2004	0.0102	0.0000	0.0000	0.0000	(0.0314)	0.0062		0.0688	0.0173
2005	0.0107	0.0000	0.0000	0.0000	(0.0247)	0.0051		0.0753	0.0184
2006	0.0113	0.0000	0.0000	0.0000	0.0080	(0.0017)		0.0860	0.0180
2007	0.0112	0.0000	0.0000	0.0000	(0.0794)	0.0167		0.1077	0.0580
2008	0.0110	0.0000	0.0000	0.0000	0.0288	(0.0066)		0.1712	0.0532
2009	0.0109	0.0000	0.0000	0.0000	0.0405	(0.0090)		0.0731	0.0581
2010	0.0114	0.0000	0.0000	0.0000	(0.0478)	0.0101		0.0714	0.0548
2011	0.0113	0.0000	0.0000	0.0000	(0.0424)	0.0095		0.0000	0.0486
2012	0.0106	0.0000	0.0000	0.0000	(0.0208)	0.0049		0.0000	0.0580

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C3-2 **Kazakhstan:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
9. Kazakhstan		G	PRI		G	PRI		G	PRI
1995	0.6568	0.6460	0.6588	1.5921	1.4737	1.5846	0.1411	0.1305	0.1409
1996	0.6140	0.6448	0.6071	0.9987	1.4925	0.3051	0.1619	0.2219	0.0713
1997	0.5982	0.6763	0.5777	0.9024	1.6321	0.1672	0.1531	0.2439	0.0505
1998	0.6122	0.7478	0.5709	0.8610	2.1700	73.3365	0.1443	0.3026	#NUM!
1999	0.5480	0.7512	0.4815	0.7881	2.1192	15.1020	0.1260	0.2682	1.6916
2000	0.5322	0.7186	0.4659	0.8074	1.8101	0.5555	0.1035	0.1931	0.0796
2001	0.5516	0.6634	0.5155	0.8704	1.1417	0.7676	0.1982	0.2466	0.1800
2002	0.6029	0.6988	0.5749	1.2524	1.9086	1.1162	0.1029	0.1456	0.0939
2003	0.6097	0.7169	0.5780	1.2977	1.8059	1.1793	0.1546	0.1996	0.1439
2004	0.6107	0.7090	0.5816	1.2676	1.7566	1.1527	0.1612	0.2083	0.1500
2005	0.6376	0.7085	0.6179	1.3131	1.6943	1.2255	0.1685	0.2063	0.1598
2006	0.6718	0.7300	0.6562	1.3897	1.5978	1.3378	0.1785	0.1971	0.1738
2007	0.6939	0.7070	0.6908	1.5880	2.0423	1.5070	0.1997	0.2534	0.1901
2008	0.7133	0.6994	0.7162	1.6180	1.5940	1.6456	0.1994	0.1957	0.2026
2009	0.7018	0.7007	0.7020	1.9747	1.9410	1.9824	0.2429	0.2392	0.2437
2010	0.7187	0.7096	0.7206	1.8788	1.8742	1.8798	0.2342	0.2351	0.2340
2011	0.7177	0.7072	0.7200	1.7765	1.8113	1.7704	0.2200	0.2262	0.2188
2012	0.7537	0.7179	0.7611	1.9533	1.8759	1.9764	0.2296	0.2245	0.2313
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
9. Kazakhstan						$x=a/(i \cdot b^*)$		G	PRI
1995	0.0965	0.0157	0.6368	1.7379	0.0541	1.0163	0.0555	0.1087	0.0458
1996	0.1115	(2.4942)	0.5257	1.4332	0.0411	2.4494	0.0778	0.0723	0.0791
1997	0.1429	(6.0234)	0.5092	1.2947	0.0421	3.2761	0.1104	0.0877	0.1174
1998	0.1719	(10.4481)	0.5062	1.3263	0.0341	4.9250	0.1296	0.0909	0.1451
1999	0.0927	1.7028	0.4619	1.1133	0.0371	2.9105	0.0832	0.1110	0.0691
2000	0.1471	0.6492	0.4843	0.9782	0.0392	3.9959	0.1504	0.1162	0.1692
2001	0.1629	(3.4444)	0.5031	1.0574	0.1268	1.2690	0.1541	0.0695	0.1892
2002	0.1972	0.5678	0.6104	1.2141	0.1044	1.2063	0.1624	0.1159	0.1790
2003	0.2197	0.6344	0.6266	1.2083	0.0929	1.4092	0.1818	0.1875	0.1798
2004	0.2445	0.6974	0.6289	1.1731	0.0944	1.5275	0.2084	0.1961	0.2129
2005	0.2917	0.6664	0.6520	1.2331	0.1160	1.3420	0.2366	0.2219	0.2413
2006	0.3512	0.6476	0.6841	1.3130	0.1241	1.3067	0.2675	0.2905	0.2606
2007	0.3308	0.5363	0.7058	1.5006	0.1269	1.0864	0.2204	0.1163	0.2463
2008	0.3856	0.5780	0.7270	1.5117	0.0954	1.5186	0.2551	0.3046	0.2450
2009	0.2303	0.3880	0.7217	1.7919	0.0815	1.0897	0.1285	0.1307	0.1281
2010	0.3176	0.4684	0.7358	1.7236	0.0857	1.3306	0.1842	0.1668	0.1879
2011	0.3607	0.5410	0.7375	1.6068	0.0677	1.8958	0.2245	0.1831	0.2336
2012	0.3915	0.4803	0.7644	1.8432	0.1064	1.1340	0.2124	0.1905	0.2166
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
9. Kazakhstan					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1995	0.0703	0.1222	1.2670	(0.056)	0.000	12.483	(0.0278)	63.92	1.0004
1996	0.0799	0.1145	1.0265	(0.078)	0.000	22.977	(0.0012)	73.30	1.0000
1997	0.0925	0.1198	0.8381	(0.110)	0.000	29.138	0.0383	75.59	0.9995
1998	0.0753	0.0999	0.5810	(0.130)	0.000	47.933	0.0613	83.86	0.9993
1999	0.1302	0.1450	1.5646	(0.083)	0.000	104.983	0.0173	138.22	0.9999
2000	0.1741	0.1703	1.1579	(0.150)	0.000	108.101	0.0848	144.58	0.9994
2001	0.1852	0.1959	1.2022	(0.101)	0.343	24.507	0.0783	150.28	0.9995
2002	0.1878	0.2279	1.1558	(0.110)	0.320	20.826	0.0675	154.67	0.9996
2003	0.1428	0.1725	0.7853	(0.123)	0.322	20.042	0.0789	144.30	0.9995
2004	0.1896	0.2224	0.9096	(0.176)	0.157	20.230	0.1047	130.10	0.9992
2005	0.1784	0.2199	0.7539	(0.204)	0.139	15.860	0.1244	134.10	0.9991
2006	0.2321	0.3047	0.8677	(0.235)	0.123	18.461	0.1734	127.17	0.9986
2007	0.2088	0.3133	0.9472	(0.150)	0.318	20.409	0.1447	120.44	0.9988
2008	0.2087	0.3155	0.8181	(0.185)	0.274	19.151	0.1711	120.96	0.9986
2009	0.2016	0.3613	1.5690	(0.059)	0.545	(4.650)	(0.956)	147.50	1.0065
2010	0.2016	0.3475	1.0941	(0.114)	0.380	6.426	(3.900)	143.60	1.0272
2011	0.2052	0.3297	0.9142	(0.154)	0.312	1409	(3.860)	144.54	1.0267
2012	0.1662	0.3063	0.7825	(0.142)	0.330	1729	(3.872)	146.87	1.0264

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C4-1 **Pakistan:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y^*$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
11. Pakist:	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0925	0.1274	1.3063	0.0975	(0.0873)	0.5939	0.1683	(0.1137)	1.2366
1991	0.0884	0.0726	1.7034	0.0426	(0.1095)	0.3344	0.0945	(0.1775)	0.8799
1992	0.1064	0.0572	2.0923	0.0274	(0.0848)	0.2059	0.0782	(0.1958)	0.6562
1993	0.1254	0.0625	1.9151	0.0326	(0.0505)	0.2504	0.0981	(0.1958)	0.6179
1994	0.1019	0.0526	2.1199	0.0248	(0.0531)	0.1673	0.0729	(0.1708)	0.4655
1995	0.1073	0.0663	1.7191	0.0386	(0.0516)	0.2138	0.1010	(0.1651)	0.4940
1996	0.1282	0.0631	1.7654	0.0358	(0.0559)	0.1918	0.1084	(0.1983)	0.5279
1997	0.1347	0.0799	1.5927	0.0501	(0.0512)	0.2617	0.1347	(0.1896)	0.5604
1998	0.0944	0.0522	2.0330	0.0257	(0.0440)	0.1439	0.0721	(0.1535)	0.3550
1999	0.1059	0.0827	1.4599	0.0567	(0.0338)	0.4479	0.1292	(0.1515)	0.4904
2000	0.1135	0.0546	1.8429	0.0296	(0.0261)	0.1361	0.0912	(0.1105)	0.3469
2001	0.1906	(0.0264)	1.4807	(0.0178)	0.0068	(0.0883)	0.1109	(0.0803)	0.3283
2002	0.0952	0.0548	1.5422	0.0355	(0.0207)	0.1219	0.0973	(0.0678)	0.3037
2003	0.0711	0.0738	1.3284	0.0555	(0.0202)	0.2530	0.1090	(0.0693)	0.3265
2004	0.0873	0.0651	1.3795	0.0472	(0.0147)	0.1588	0.1105	(0.0484)	0.3071
2005	0.1337	0.0552	1.4903	0.0371	(0.0196)	0.1242	0.1268	(0.0852)	0.3762
2006	0.1599	0.0446	1.7157	0.0260	(0.0589)	0.0696	0.1192	(0.1374)	0.3831
2007	0.1337	0.0371	2.0241	0.0183	(0.0323)	0.0544	0.0844	(0.1306)	0.2610
2008	0.2056	0.0592	1.4645	0.0404	(0.0801)	0.1008	0.1809	(0.2666)	0.4961
2009	0.2011	0.1065	1.2094	0.0881	(0.0868)	0.1813	0.2544	(0.2071)	0.5517
2010	0.1052	0.2731	1.0705	0.2551	(0.0970)	0.6988	0.3534	(0.2400)	0.7383
2011	3.8861	(3.3320)	0.9948	(3.3494)	(0.1710)	(1.4189)	0.5570	(0.3671)	1.2431
2012	1.8734	(0.9844)	0.9831	(1.0014)	(0.1489)	(1.0055)	0.9043	(0.3675)	2.1016
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
11. Pakist:	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	73.68	22.34	13.57	0.1255	0.0519	0.0736	(0.0602)	0.0474	(0.0128)
1991	33.97	14.47	10.91	0.1275	0.0735	0.0541	(0.0843)	0.0931	0.0088
1992	5.42	9.66	8.86	0.1331	0.1022	0.0309	(0.0880)	0.0643	(0.0236)
1993	12.79	6.84	9.55	0.1418	0.1119	0.0299	(0.0992)	0.0393	(0.0599)
1994	13.21	8.87	9.32	0.1285	0.1027	0.0258	(0.0808)	0.0529	(0.0279)
1995	19.53	9.37	9.88	0.1181	0.0866	0.0316	(0.0737)	0.0519	(0.0218)
1996	13.98	7.55	8.61	0.1215	0.1037	0.0178	(0.0888)	0.0348	(0.0540)
1997	37.23	7.27	6.98	0.1088	0.0968	0.0119	(0.0868)	0.0259	(0.0609)
1998	35.04	9.40	8.37	0.0922	0.0958	(0.0036)	(0.0713)	0.0497	(0.0217)
1999	382.70	8.11	49.56	0.0835	0.0715	0.0120	(0.0764)	0.0488	(0.0276)
2000	7.96	10.79	10.45	0.0850	0.0960	(0.0110)	(0.0504)	0.0224	(0.0280)
2001	23.44	10.74	40.07	0.0835	0.0921	(0.0086)	(0.0416)	0.0156	(0.0261)
2002	49.63	18.29	12.13	0.0783	0.0672	0.0110	(0.0317)	0.0366	0.0049
2003	215.15	18.15	162.58	0.0787	0.0405	0.0382	(0.0320)	0.0732	0.0412
2004	49.51	21.43	14.25	0.0821	0.0486	0.0335	(0.0217)	0.0577	0.0360
2005	3.28	14.12	13.04	0.1107	0.0779	0.0328	(0.0356)	0.0155	(0.0201)
2006	0.15	19.49	7.53	0.1465	0.1130	0.0334	(0.0470)	(0.0199)	(0.0669)
2007	1.71	11.88	7.61	0.1524	0.1189	0.0334	(0.0464)	(0.0129)	(0.0593)
2008	7.82	8.42	5.22	0.1501	0.1112	0.0389	(0.0826)	(0.0172)	(0.0999)
2009	19.31	12.66	7.40	0.1200	0.0610	0.0590	(0.0529)	(0.0008)	(0.0537)
2010	91.66	10.92	77.86	0.1031	0.0193	0.0838	(0.0557)	0.0330	(0.0226)
2011	122.35	6.22	184.75	0.0847	(0.0164)	0.1010	(0.0720)	0.0662	(0.0058)
2012	216.02	7.49	42.47	0.0739	(0.0271)	0.1011	(0.0672)	0.0317	(0.0355)
Employment	n	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
11. Pakist:	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0299	0.0000	0.0000	0.0000	0.0000	0.0000	(0.0140)	0.0889	(0.0469)
1991	0.0300	0.0000	0.0000	0.0000	0.1054	(0.0259)	(0.0284)	0.1190	0.0062
1992	0.0299	0.0000	0.0000	0.0000	0.0990	(0.0213)	(0.0266)	0.0942	0.0195
1993	0.0299	0.0000	0.0000	0.0000	(0.0457)	0.0087	(0.0212)	0.1000	0.0115
1994	0.0278	0.0000	0.0000	0.0000	0.1009	(0.0202)	(0.0216)	0.1237	0.0181
1995	0.0277	0.0000	0.0000	0.0000	0.0223	(0.0039)	(0.0243)	0.1236	0.0637
1996	0.0274	0.0000	0.0000	0.0000	(0.0997)	0.0172	(0.0243)	0.1035	0.0669
1997	0.0297	0.0000	0.0000	0.0000	0.0406	(0.0078)	(0.0275)	0.1131	0.0506
1998	0.0265	0.0000	0.0000	0.0000	0.1007	(0.0185)	(0.0266)	0.0624	(0.0043)
1999	0.0261	0.0000	0.0000	0.0000	0.0476	(0.0078)	(0.0266)	0.0413	(0.0411)
2000	0.0250	0.0000	0.0000	0.0000	0.1883	(0.0290)	(0.0351)	0.0438	(0.0130)
2001	(0.0086)	0.0000	0.0000	0.0000	0.1048	(0.0128)	(0.0351)	0.0310	0.0744
2002	0.0193	0.0000	0.0000	0.0000	(0.1167)	0.0126	(0.0374)	0.0330	0.7382
2003	0.0182	0.0000	0.0000	0.0000	(0.0001)	0.0000	(0.0374)	0.0291	(0.0397)
2004	0.0179	0.0000	0.0000	0.0000	0.0705	(0.0086)	(0.0347)	0.0748	(0.0188)
2005	0.0182	0.0000	0.0000	0.0000	0.0194	(0.0022)	(0.0347)	0.0905	0.0067
2006	0.0186	0.0000	0.0000	0.0000	(0.4079)	0.0449	(0.0279)	0.0790	0.0401
2007	0.0188	0.0000	0.0000	0.0000	0.1693	(0.0273)	(0.0239)	0.0760	0.0579
2008	0.0188	0.0000	0.0000	0.0000	(0.4803)	0.0629	(0.0234)	0.2033	0.0574
2009	0.0184	0.0000	0.0000	0.0000	0.3530	(0.0725)	0.0000	0.1360	0.0208
2010	0.0180	0.0000	0.0000	0.0000	(0.0074)	0.0009	0.0000	0.1393	(0.1426)
2011	0.0174	0.0000	0.0000	0.0000	(0.0412)	0.0052	0.0000	0.1189	3.4656
2012	0.0170	0.0000	0.0000	0.0000	(0.1678)	0.0222	0.0000	0.0969	1.1017

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C4-2 **Pakistan:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta}{}^{*}{}_{(i)}$	$HA_{\beta}{}^{*}{}_{(i)G}$	$HA_{\beta}{}^{*}{}_{(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
11. Pakistan		G	PRI		G	PRI		G	PRI
1990	0.4416	0.7592	0.1744	1.5621	17.0898	0.3117	0.3341	3.0605	0.1002
1991	0.4173	0.7480	0.1882	1.1386	11.9672	0.2987	0.2621	2.2018	0.0991
1992	0.4196	0.7516	0.2216	0.9682	8.2561	0.3335	0.2307	1.5553	0.1065
1993	0.4459	0.7587	0.2512	1.0206	5.4479	0.4471	0.2385	1.0466	0.1286
1994	0.4404	0.7647	0.2593	1.0380	6.1807	0.4488	0.2345	1.1339	0.1258
1995	0.4334	0.7588	0.2612	1.0661	5.8081	0.5087	0.2388	1.0677	0.1367
1996	0.4470	0.7451	0.2859	1.0205	5.5687	0.4956	0.2283	1.0282	0.1320
1997	0.4564	0.7588	0.2935	1.1051	5.5329	0.6046	0.2519	1.0587	0.1575
1998	0.4544	0.7718	0.2946	1.1258	5.7812	0.5842	0.2442	1.0362	0.1481
1999	0.4657	0.7957	0.2885	1.3043	5.6237	3.7835	0.2700	0.9942	0.6728
2000	0.4334	0.8038	0.2633	0.9823	5.3350	0.5021	0.2130	0.9184	0.1304
2001	0.4354	0.8206	0.2648	0.5941	3.8733	0.2531	#NUM!	#NUM!	#NUM!
2002	0.4511	0.8106	0.2859	1.1334	6.1722	0.5763	0.2095	0.9237	0.1264
2003	0.4413	0.8070	0.2735	1.4211	5.9587	1.4546	0.2444	0.8702	0.2483
2004	0.4240	0.8062	0.2598	1.1371	5.6315	0.6385	0.2029	0.8143	0.1317
2005	0.4271	0.8064	0.2695	0.9091	5.4444	0.4676	0.1711	0.7990	0.1058
2006	0.4379	0.7312	0.3179	0.8460	6.2408	0.4574	0.1634	0.9365	0.1036
2007	0.4476	0.7567	0.3374	0.8947	4.8651	0.5370	0.1719	0.7428	0.1176
2008	0.4686	0.6787	0.3862	0.9071	5.1379	0.5684	0.1705	0.8126	0.1173
2009	0.4422	0.7348	0.3526	0.9605	8.4193	0.6012	0.1762	1.2575	0.1220
2010	0.4192	0.7190	0.3287	2.0097	8.2925	6.5934	0.3173	1.2350	0.9314
2011	0.3737	0.6885	0.2770	0.0631	14.3314	0.1203	0.0298	2.1091	0.0408
2012	0.3493	0.6602	0.2398	0.1705	8.4942	0.1279	0.0493	1.2647	0.0397
Key ratios	α	δ_0	β^*	Ω	$g_A{}^*=i(1-\beta^*)$	$x=r^*/g_Y{}^*$	$r^*=\alpha/\Omega$	$r^*{}_G=\alpha_G/\Omega_G$	$r^*{}_{PRI}=\alpha_P/\Omega_P$
11. Pakistan						$x=a/(i\cdot b^*)$		G	PRI
1990	0.1444	1.6652	0.6528	0.6570	0.0180	4.2645	0.2199	(0.0748)	1.2988
1991	0.1007	2.7693	0.5660	0.6252	0.0319	2.4216	0.1610	(0.1289)	0.9587
1992	0.1031	5.3668	0.5265	0.6296	0.0484	1.9155	0.1637	(0.1268)	0.7515
1993	0.1280	3.0540	0.5466	0.6813	0.0508	2.0928	0.1879	(0.0801)	0.6916
1994	0.1058	3.1464	0.5440	0.6847	0.0468	1.8930	0.1545	(0.0814)	0.5428
1995	0.1144	2.9579	0.5530	0.6591	0.0387	2.3907	0.1736	(0.0763)	0.5581
1996	0.1308	3.0278	0.5467	0.6837	0.0470	2.3065	0.1913	(0.1013)	0.6033
1997	0.1489	2.2585	0.5721	0.6938	0.0414	2.6872	0.2146	(0.0796)	0.6241
1998	0.1063	2.2506	0.5639	0.7250	0.0418	1.9681	0.1467	(0.0610)	0.4205
1999	0.1381	1.7084	0.6083	0.7322	0.0280	3.1744	0.1886	(0.0346)	0.5189
2000	0.1115	4.2865	0.5312	0.6632	0.0450	2.1864	0.1681	(0.0048)	0.4106
2001	0.1133	0.0918	0.3991	0.6897	0.0554	3.0802	0.1642	0.0214	0.3602
2002	0.1079	2.2745	0.5643	0.7193	0.0293	2.8443	0.1500	(0.0048)	0.3518
2003	0.1010	1.7571	0.6168	0.6974	0.0155	4.0447	0.1448	(0.0067)	0.3500
2004	0.0993	2.7092	0.5624	0.6514	0.0213	3.6354	0.1524	0.0105	0.3418
2005	0.1215	9.4507	0.5131	0.6432	0.0379	3.0397	0.1889	(0.0061)	0.4313
2006	0.1353	#########	0.4991	0.6615	0.0566	2.3972	0.2045	(0.0940)	0.4856
2007	0.1196	11.2675	0.5087	0.7003	0.0584	1.9765	0.1708	(0.0546)	0.3511
2008	0.1865	3.7484	0.5319	0.7042	0.0521	3.1528	0.2649	(0.2041)	0.5885
2009	0.1932	3.4159	0.5480	0.6280	0.0276	5.7750	0.3076	(0.1631)	0.6078
2010	0.2115	1.6099	0.7218	0.5590	0.0054	15.1790	0.3783	(0.1955)	0.7573
2011	0.2452	0.6692	0.0784	0.4426	(0.0151)	#########	0.5541	(0.3297)	1.2279
2012	0.3194	0.2514	0.2030	0.3593	(0.0216)	(58.0023)	0.8890	(0.3256)	2.0662
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_{\Pi}=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
11. Pakistan					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1990	0.6635	0.4359	3.0180	(0.139)	0.366	6.23	0.1215	21.97	0.9945
1991	0.6965	0.4355	4.3255	(0.082)	0.489	3.22	0.0718	24.73	0.9971
1992	0.7544	0.4750	4.6085	(0.087)	0.469	1.88	0.0671	25.70	0.9974
1993	0.7448	0.5074	3.9629	(0.114)	0.394	5.32	0.1011	30.15	0.9966
1994	0.7430	0.5088	4.8103	(0.084)	0.458	8.83	0.0708	30.79	0.9977
1995	0.7346	0.4841	4.2302	(0.044)	0.749	9.17	0.0903	34.34	0.9974
1996	0.7482	0.5116	3.9107	(0.061)	0.680	10.75	0.1124	40.23	0.9972
1997	0.7719	0.5356	3.5972	(0.084)	0.608	17.12	0.1425	44.19	0.9968
1998	0.7226	0.5239	4.9271	(0.099)	0.327	23.09	0.0784	45.96	0.9983
1999	0.6801	0.4980	3.6068	(0.147)	0.221	49.49	0.1226	51.91	0.9976
2000	0.6522	0.4325	3.8796	(0.127)	0.247	39.40	0.1026	58.13	0.9982
2001	0.6315	0.4355	3.8456	(0.116)	0.292	24.09	0.0885	60.95	0.9985
2002	0.6638	0.4775	4.4248	0.643	5.286	31.22	0.0551	58.59	0.9991
2003	0.7405	0.5164	5.1124	(0.111)	0.235	54.86	0.0420	57.26	0.9993
2004	0.8242	0.5369	5.4066	(0.106)	0.304	48.73	0.0488	59.17	0.9992
2005	0.8509	0.5473	4.5046	(0.127)	0.328	26.86	0.0767	59.91	0.9987
2006	0.8089	0.5350	3.9552	(0.120)	0.414	25.86	0.1104	61.03	0.9982
2007	0.8027	0.5621	4.7008	(0.076)	0.556	29.67	0.0950	61.32	0.9985
2008	0.7144	0.5031	2.6972	(0.148)	0.440	30.41	0.1808	79.28	0.9977
2009	0.7400	0.4647	2.4056	(0.180)	0.414	(8.17)	(0.7764)	83.49	1.0093
2010	0.8219	0.4595	2.1726	(0.248)	0.345	68.86	(0.7057)	85.01	1.0083
2011	0.9549	0.4226	1.7235	(0.420)	0.241	(4525)	(0.5300)	89.44	1.0059
2012	1.2018	0.4318	1.3519	(0.772)	0.132	(6134)	(0.1951)	96.94	1.0020

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C5-1 **Bangladesh:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
6. Banglad	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0756	0.0558	1.99	0.0281	(0.0039)	0.0539	0.0660	(0.0130)	0.1094
1991	0.0626	0.0480	2.36	0.0203	(0.0016)	0.0361	0.0469	(0.0051)	0.0737
1992	0.0607	0.0581	1.80	0.0323	(0.0074)	0.0642	0.0661	(0.0200)	0.1176
1993	0.0583	0.0795	1.46	0.0544	(0.0080)	0.1029	0.0942	(0.0169)	0.1649
1994	0.0525	0.0762	1.55	0.0492	0.0031	0.0835	0.0830	0.0064	0.1305
1995	0.0735	0.0595	1.71	0.0348	(0.0035)	0.0593	0.0778	(0.0079)	0.1323
1996	0.0697	0.0388	2.96	0.0131	0.0009	0.0204	0.0366	0.0027	0.0559
1997	0.0572	0.0403	3.20	0.0126	(0.0041)	0.0231	0.0304	(0.0135)	0.0496
1998	0.0526	0.0356	4.62	0.0077	(0.0018)	0.0130	0.0191	(0.0048)	0.0315
1999	0.0555	0.0299	5.63	0.0053	(0.0019)	0.0089	0.0152	(0.0061)	0.0245
2000	0.0611	0.0327	2.30	0.0142	(0.0037)	0.0244	0.0409	(0.0114)	0.0686
2001	2.7389	(2.5796)	1.02	(2.5367)	0.0069	1.0142	0.1567	(0.0070)	0.2392
2002	0.0425	0.0978	1.21	0.0808	(0.0001)	0.1898	0.1160	(0.0003)	0.1777
2003	0.0662	0.0221	3.58	0.0062	0.0007	0.0094	0.0247	0.0025	0.0392
2004	0.0681	0.0194	4.13	0.0047	(0.0030)	0.0087	0.0212	(0.0135)	0.0391
2005	0.0709	0.0156	7.27	0.0021	(0.0041)	0.0052	0.0119	(0.0237)	0.0286
2006	0.0712	0.0159	4.16	0.0038	(0.0045)	0.0083	0.0209	(0.0321)	0.0420
2007	0.0736	0.0149	3.79	0.0039	(0.0038)	0.0080	0.0234	(0.0295)	0.0439
2008	0.0763	0.0142	3.68	0.0038	(0.0014)	0.0063	0.0246	(0.0143)	0.0339
2009	0.0746	0.0166	2.64	0.0063	0.0017	0.0080	0.0346	0.0139	0.0387
2010	0.0746	0.0191	2.34	0.0081	0.0017	0.0110	0.0401	0.0127	0.0467
2011	0.0767	0.0170	3.07	0.0055	0.0019	0.0070	0.0305	0.0123	0.0369
2012	0.0781	0.0164	3.75	0.0044	0.0021	0.0051	0.0252	0.0138	0.0283
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
6. Banglad	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	37.89	25.43	191.26	0.0000	0.1011	(0.1011)	(0.0084)	(0.0502)	(0.0586)
1991	37.14	27.66	266.34	0.0000	0.0990	(0.0990)	(0.0048)	(0.0329)	(0.0377)
1992	41.46	26.11	95.70	0.0000	0.0791	(0.0791)	(0.0106)	(0.0151)	(0.0256)
1993	44.61	29.71	63.49	0.0000	0.0622	(0.0622)	(0.0088)	(0.0172)	(0.0259)
1994	41.36	33.88	55.83	0.0000	0.0641	(0.0641)	0.0012	(0.0203)	(0.0191)
1995	45.21	30.95	138.43	0.0000	0.0823	(0.0823)	(0.0047)	(0.0323)	(0.0370)
1996	38.33	29.02	29.72	0.0000	0.1156	(0.1156)	(0.0013)	(0.0496)	(0.0509)
1997	35.41	24.50	244.65	0.0000	0.1065	(0.1065)	(0.0085)	(0.0221)	(0.0307)
1998	34.19	27.09	189.98	0.1411	0.1111	0.0300	(0.0043)	(0.0144)	(0.0187)
1999	35.13	26.46	77.49	0.1562	0.1180	0.0382	(0.0052)	(0.0171)	(0.0223)
2000	44.84	30.02	233.67	0.1705	0.0907	0.0798	(0.0066)	(0.0112)	(0.0178)
2001	26.72	16.14	33.13	0.1823	0.0418	0.1405	(0.0079)	(0.0239)	(0.0318)
2002	67.94	33.87	68.81	0.1796	0.0331	0.1464	(0.0021)	(0.0001)	(0.0022)
2003	53.12	32.01	4.80	0.1691	0.1092	0.0599	(0.0013)	(0.0020)	(0.0034)
2004	50.26	25.14	6.39	0.1773	0.1166	0.0607	(0.0080)	0.0071	(0.0009)
2005	41.66	21.47	6.22	0.1833	0.1360	0.0474	(0.0123)	(0.0026)	(0.0149)
2006	46.41	19.12	11.75	0.1846	0.1206	0.0640	(0.0158)	0.0188	0.0030
2007	50.21	19.35	8.23	0.1829	0.1188	0.0641	(0.0147)	0.0206	0.0060
2008	58.17	19.67	4.79	0.1808	0.1193	0.0615	(0.0105)	0.0155	0.0050
2009	73.51	26.11	5.80	0.1811	0.1002	0.0809	0.0005	0.0211	0.0216
2010	91.44	25.59	7.34	#REF!	0.0924	#REF!	0.0000	0.0296	0.0296
2011	116.04	26.34	0.02	#REF!	0.1088	#REF!	0.0000	0.0043	0.0043
2012	137.03	25.12	0.35	#REF!	0.1193	#REF!	0.0000	(0.0054)	(0.0054)
Employment	n	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
6. Banglad	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0278	0.0000	0.0000	0.0000	0.0000	0.0000	(0.0086)	0.0620	0.1042
1991	0.0277	0.0000	0.0000	0.0000	0.0403	(0.0023)	0.0000	0.0636	0.1112
1992	0.0258	0.0000	0.0000	0.0000	(0.0890)	0.0048	0.0000	0.0354	0.0919
1993	0.0251	0.0000	0.0000	0.0000	(0.1453)	0.0086	0.0000	0.0306	0.0705
1994	0.0270	0.0000	0.0000	0.0000	0.0287	(0.0020)	0.0000	0.0526	0.0688
1995	0.0247	0.0000	0.0000	0.0000	0.0534	(0.0035)	0.0000	0.0858	0.0805
1996	0.0257	0.0000	0.0000	0.0000	0.0732	(0.0046)	(0.0113)	0.0410	0.1012
1997	0.0277	0.0000	0.0000	0.0000	0.0203	(0.0012)	0.0000	0.0173	0.0997
1998	0.0279	0.0000	0.0000	0.0000	(0.0741)	0.0042	0.0000	0.0689	0.1044
1999	0.0246	0.0000	0.0000	0.0000	0.0322	(0.0020)	0.0000	0.0621	0.1114
2000	0.0184	0.0000	0.0000	0.0000	(0.0391)	0.0023	(0.0194)	0.0213	0.1223
2001	(0.0429)	0.0000	0.0000	0.0000	(0.1536)	0.0094	0.0000	0.0208	2.7379
2002	0.0169	0.0000	0.0000	0.0000	(0.0463)	0.0033	0.0000	0.0332	0.0622
2003	0.0159	0.0000	0.0000	0.0000	0.0783	(0.0059)	(0.0194)	0.0568	0.1379
2004	0.0147	0.0000	0.0000	0.0000	(0.0353)	0.0024	0.0000	0.0911	0.1281
2005	0.0135	0.0000	0.0000	0.0000	(0.0031)	0.0002	0.0000	0.0204	0.1244
2006	0.0121	0.0000	0.0000	0.0000	(0.0013)	0.0001	(0.0189)	0.0680	0.1374
2007	0.0110	0.0000	0.0000	0.0000	0.0020	(0.0001)	0.0000	0.0908	0.1451
2008	0.0103	0.0000	0.0000	0.0000	0.0448	(0.0032)	0.0000	0.0893	0.1496
2009	0.0103	0.0000	0.0000	0.0000	0.0048	(0.0003)	0.0000	0.0536	0.1294
2010	0.0109	0.0000	0.0000	0.0000	(0.0204)	0.0014	0.0000	0.0815	0.1109
2011	0.0114	0.0000	0.0000	0.0000	(0.0763)	0.0053	0.0000	0.1072	0.1155
2012	0.0120	0.0000	0.0000	0.0000	0.0211	(0.0016)	0.0000	0.0874	0.1136

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Chapter 11

Table C5-2 **Bangladesh:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta}{}^{*}{}_{(i)}$	$HA_{\beta}{}^{*}{}_{(i)G}$	$HA_{\beta}{}^{*}{}_{(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
6. Bangladesh		G	PRI		G	PRI		G	PRI
1990	0.5600	0.9047	0.4467	1.8521	7.6028	1.3688	0.3720	1.3133	0.2912
1991	0.5539	0.9059	0.4401	1.8828	7.8350	1.3635	0.3779	1.3487	0.2913
1992	0.5555	0.8992	0.4429	2.0825	9.6537	1.5136	0.3969	1.6037	0.3046
1993	0.5646	0.8901	0.4542	2.5467	11.6488	1.8493	0.4649	#NUM!	0.3533
1994	0.5580	0.8901	0.4474	2.6028	10.2550	1.9257	0.4924	1.7395	0.3807
1995	0.5486	0.8895	0.4407	1.8534	10.2423	1.2190	0.3513	1.6642	0.2497
1996	0.5500	0.8942	0.4456	1.6431	7.5205	1.1226	0.3254	1.2521	0.2408
1997	0.5531	0.8973	0.4483	1.8378	7.2993	1.3644	0.3715	1.2630	0.2924
1998	0.5520	0.8879	0.4518	1.8178	7.9894	1.2671	0.3698	1.3860	0.2768
1999	0.5557	0.8904	0.4582	1.7020	7.2138	1.2089	0.3291	1.1790	0.2509
2000	0.5660	0.8889	0.4718	1.7549	8.5816	1.2319	0.2919	1.2138	0.2195
2001	0.5830	0.8830	0.4888	0.0689	3.0782	(0.2510)	#NUM!	#NUM!	0.0803
2002	0.5726	0.8765	0.4751	3.6663	7.7622	(11.1794)	0.5282	1.0560	1.3987
2003	0.5396	0.8652	0.4472	1.3962	6.5417	0.9673	0.2255	0.8696	0.1699
2004	0.5429	0.8582	0.4561	1.3647	5.8157	0.9774	0.2131	0.7498	0.1647
2005	0.5494	0.8560	0.4678	1.3293	5.4003	0.9738	0.1994	0.6685	0.1569
2006	0.5499	0.8545	0.4699	1.3364	5.1339	1.0024	0.1898	0.6043	0.1521
2007	0.5469	0.8516	0.4684	1.2987	4.9435	0.9784	0.1768	0.5558	0.1423
2008	0.5407	0.8558	0.4598	1.2494	4.1862	0.9642	0.1662	0.4563	0.1369
2009	0.5362	0.8538	0.4555	1.2672	4.2469	0.9715	0.1684	0.4631	0.1379
2010	0.5299	0.8486	0.4491	1.2676	4.1892	0.9810	0.1729	0.4701	0.1426
2011	0.5243	0.8321	0.4481	1.2078	4.1082	0.9170	0.1706	0.4754	0.1387
2012	0.5224	0.8294	0.4494	1.1864	3.9182	0.9128	0.1725	0.4659	0.1418
Key ratios	α	δ_0	β^*	Ω	$g_A{}^*=i(1-\beta^*)$	$x=r^*/g_Y{}^*$	$r^*=\alpha/\Omega$	$r^*{}_G=\alpha_G/\Omega_G$	$r^*{}_{PRI}=\alpha_P/\Omega_P$
6. Bangladesh						$x=a/(i\cdot b^*)$		G	PRI
1990	0.1399	0.9208	0.6888	1.0650	0.0315	2.0094	0.1314	0.0796	0.1659
1991	0.1179	0.9190	0.6869	1.0657	0.0310	1.7345	0.1106	0.0812	0.1302
1992	0.1264	0.9302	0.7098	1.0644	0.0229	2.2531	0.1188	0.0496	0.1648
1993	0.1484	0.9337	0.7540	1.0771	0.0153	3.1636	0.1378	0.0362	0.2052
1994	0.1366	0.9473	0.7559	1.0614	0.0157	2.8178	0.1287	0.0623	0.1727
1995	0.1363	0.9692	0.6874	1.0246	0.0257	2.4084	0.1330	0.0479	0.1873
1996	0.1145	0.9165	0.6556	1.0552	0.0398	1.5101	0.1085	0.0791	0.1264
1997	0.1050	0.8998	0.6785	1.0777	0.0342	1.4540	0.0975	0.0785	0.1090
1998	0.0956	0.8889	0.6738	1.0840	0.0362	1.2763	0.0882	0.0699	0.0989
1999	0.0944	0.8468	0.6582	1.1056	0.0403	1.2159	0.0854	0.0740	0.0918
2000	0.1072	0.8071	0.6669	1.1433	0.0302	1.7717	0.0938	0.0453	0.1204
2001	0.1888	1.0676	0.0752	1.1850	0.0386	60.1215	0.1593	0.0363	0.2291
2002	0.1560	0.9287	0.8154	1.1118	0.0061	5.7765	0.1403	0.0503	0.1935
2003	0.0925	0.8971	0.6098	1.0470	0.0426	1.3882	0.0883	0.0572	0.1054
2004	0.0930	0.8583	0.6042	1.0618	0.0461	1.3197	0.0876	0.0531	0.1054
2005	0.0943	0.7837	0.5980	1.0897	0.0547	1.1594	0.0865	0.0536	0.1025
2006	0.0951	0.7805	0.5992	1.0923	0.0483	1.3166	0.0871	0.0542	0.1028
2007	0.0956	0.7939	0.5921	1.0799	0.0485	1.3588	0.0885	0.0559	0.1038
2008	0.0954	0.8420	0.5825	1.0540	0.0498	1.3728	0.0905	0.0938	0.0889
2009	0.0945	0.8979	0.5857	1.0360	0.0415	1.6100	0.0912	0.0963	0.0888
2010	0.0946	0.9722	0.5860	1.0097	0.0382	1.7473	0.0936	0.0948	0.0931
2011	0.0926	1.0382	0.5738	0.9887	0.0464	1.4840	0.0937	0.0849	0.0977
2012	0.0927	1.0706	0.5696	0.9804	0.0514	1.3639	0.0946	0.0929	0.0953
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_{\Pi}=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*{}_{(US)}$	$e_{(US)}/e^*{}_{(US)}$
6. Bangladesh					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1990	0.2413	0.2570	1.836	0.029	1.218	9.55	0.0330	35.823	0.9991
1991	0.2487	0.2651	2.248	0.049	1.439	9.24	0.0214	38.601	0.9994
1992	0.2579	0.2745	2.171	0.031	1.263	11.10	0.0222	39.022	0.9994
1993	0.2684	0.2891	1.948	0.012	1.089	32.94	0.0510	39.901	0.9987
1994	0.3008	0.3193	2.337	0.016	1.127	44.63	0.0450	40.295	0.9989
1995	0.3103	0.3180	2.334	0.007	1.053	24.66	0.0496	40.800	0.9988
1996	0.3060	0.3229	2.821	0.032	1.291	19.98	0.0295	42.480	0.9993
1997	0.3027	0.3262	3.106	0.043	1.437	31.20	0.0254	45.475	0.9994
1998	0.3026	0.3280	3.432	0.052	1.588	38.10	0.0199	48.520	0.9996
1999	0.3121	0.3451	3.655	0.056	1.655	45.13	0.0194	51.019	0.9996
2000	0.3427	0.3918	3.654	0.061	1.653	68.09	0.0282	54.028	0.9995
2001	0.3792	0.4493	2.380	(0.001)	0.994	35.33	0.0836	57.084	0.9985
2002	0.4167	0.4633	2.970	0.020	1.140	168.37	0.0454	57.945	0.9992
2003	0.4222	0.4421	4.780	0.072	1.812	26.73	(0.0146)	58.767	1.0002
2004	0.4372	0.4642	4.992	0.060	1.684	29.66	(0.0161)	60.726	1.0003
2005	0.4483	0.4885	5.182	0.053	1.618	26.47	(0.0257)	66.184	1.0004
2006	0.4878	0.5328	5.601	0.066	1.760	40.67	(0.0109)	69.054	1.0002
2007	0.4969	0.5366	5.614	0.071	1.808	32.36	(0.0123)	68.564	1.0002
2008	0.5195	0.5476	5.740	0.073	1.810	20.83	(0.0243)	68.896	1.0004
2009	0.5662	0.5866	6.206	0.055	1.600	(0.01)	(0.0377)	69.229	1.0005
2010	0.6259	0.6319	6.683	0.036	1.388	4.60	(0.0367)	70.713	1.0005
2011	0.6633	0.6559	7.082	0.039	1.415	(4.46)	(0.0367)	81.816	1.0004
2012	0.6934	0.6798	7.333	0.035	1.375	2.37	(0.0358)	79.814	1.0004

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C6-1 **Indonesia:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
9. Indones	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.2432	0.0177	2.49	0.0071	0.0038	0.0078	0.1046	0.0447	0.1206
1991	0.2203	0.0173	2.59	0.0067	0.0040	0.0072	0.0916	0.0448	0.1034
1992	0.2316	0.0236	2.29	0.0103	0.0022	0.0120	0.1113	0.0215	0.1328
1993	0.1438	0.0241	2.72	0.0089	0.0060	0.0096	0.0618	0.0469	0.0652
1994	0.1396	0.0236	2.93	0.0080	0.0066	0.0083	0.0556	0.0559	0.0548
1995	0.1213	0.0193	4.85	0.0040	0.0125	0.0019	0.0290	0.0911	0.0139
1996	0.1180	0.0158	4.51	0.0035	0.0056	0.0025	0.0296	0.0636	0.0196
1997	0.1390	0.0160	3.53	0.0045	0.0002	0.0057	0.0439	0.0016	0.0541
1998	0.0963	0.0244	2.33	0.0105	(0.0083)	0.0214	0.0518	(0.0853)	0.0835
1999	0.0538	0.0194	3.44	0.0056	(0.0043)	0.0097	0.0212	(0.0268)	0.0319
2000	0.1400	0.1046	2.06	0.0508	(0.0780)	0.0810	0.1188	(0.1592)	0.1946
2001	0.2588	(0.0167)	1.67	(0.0100)	0.0089	(0.0130)	0.1447	(0.0849)	0.2020
2002	0.1124	0.0249	2.38	0.0105	(0.0063)	0.0146	0.0576	(0.0370)	0.0797
2003	0.0804	0.0231	2.68	0.0086	(0.0077)	0.0143	0.0386	(0.0504)	0.0587
2004	0.0845	0.0249	2.38	0.0105	(0.0080)	0.0154	0.0460	(0.0392)	0.0663
2005	0.1308	0.0205	3.37	0.0061	0.0016	0.0070	0.0449	0.0090	0.0540
2006	0.1513	0.0242	2.46	0.0098	(0.0032)	0.0122	0.0713	(0.0193)	0.0908
2007	0.1397	0.0218	2.92	0.0074	(0.0012)	0.0090	0.0552	(0.0080)	0.0682
2008	0.1965	0.0223	2.73	0.0082	(0.0014)	0.0109	0.0801	(0.0177)	0.0998
2009	0.1937	0.0237	2.41	0.0099	(0.0027)	0.0125	0.0904	(0.0243)	0.1146
2010	0.1945	0.0210	2.77	0.0076	0.0014	0.0086	0.0779	0.0115	0.0912
2011	0.1915	0.0191	3.10	0.0062	(0.0011)	0.0074	0.0678	(0.0110)	0.0830
2012	0.1726	0.0162	4.43	0.0037	(0.0024)	0.0047	0.0426	(0.0264)	0.0556
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
9. Indones	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	23.87	20.85	25.16	0.2631	0.3411	(0.0780)	0.0042	(0.0495)	(0.0453)
1991	23.04	21.02	23.80	0.2615	0.3315	(0.0700)	0.0044	(0.0484)	(0.0440)
1992	26.71	18.44	29.18	0.2515	0.3360	(0.0845)	(0.0043)	(0.0186)	(0.0230)
1993	23.12	21.90	23.65	0.2365	0.2587	(0.0223)	0.0068	(0.0159)	(0.0091)
1994	22.35	22.85	22.80	0.2508	0.2638	(0.0130)	0.0104	(0.0275)	(0.0171)
1995	19.48	28.85	18.28	0.2603	0.2763	(0.0160)	0.0247	(0.0722)	(0.0475)
1996	20.09	23.88	20.25	0.2734	0.2597	0.0137	0.0129	(0.0495)	(0.0366)
1997	20.61	19.36	21.64	0.2590	0.2742	(0.0152)	(0.0075)	(0.0281)	(0.0356)
1998	32.81	11.10	52.45	0.2270	0.1379	0.0891	(0.0328)	0.0785	0.0457
1999	40.37	18.39	59.84	0.1682	0.0998	0.0684	(0.0128)	0.0180	0.0052
2000	21.88	8.93	27.35	0.1650	0.1992	(0.0342)	(0.0444)	0.0876	0.0432
2001	41.46	12.22	2478.08	0.1594	0.1898	(0.0304)	(0.0249)	0.0744	0.0496
2002	33.57	17.34	48.76	0.1568	0.1506	0.0061	(0.0141)	0.0500	0.0359
2003	36.25	15.21	50.59	0.1594	0.1236	0.0358	(0.0193)	0.0577	0.0384
2004	38.62	19.65	52.71	0.1939	0.1188	0.0750	(0.0145)	0.0613	0.0468
2005	26.82	21.86	33.87	0.2071	0.2027	0.0044	(0.0039)	(0.0041)	(0.0080)
2006	30.05	18.63	38.21	0.2125	0.1951	0.0175	(0.0109)	0.0237	0.0128
2007	27.50	18.62	32.94	0.2216	0.2020	0.0196	(0.0088)	0.0081	(0.0008)
2008	25.40	13.01	31.32	0.2522	0.2606	(0.0084)	(0.0196)	(0.0081)	(0.0278)
2009	25.04	14.55	28.76	0.2900	0.2489	0.0410	(0.0173)	0.0096	(0.0077)
2010	21.98	18.16	23.24	0.3004	0.2834	0.0170	(0.0068)	(0.0057)	(0.0126)
2011	20.43	15.03	21.76	0.3004	0.3092	(0.0088)	(0.0144)	(0.0017)	(0.0161)
2012	18.21	13.75	19.20	0.2706	0.3446	(0.0741)	(0.0197)	(0.0298)	(0.0495)
Employment	n	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
9. Indones	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0106	0.0000	0.0000	0.0000	0.0000	0.0000	(0.0113)	0.0793	0.1906
1991	0.0106	0.0000	0.0000	0.0000	0.0213	(0.0045)	(0.0117)	0.0934	0.2380
1992	0.0133	0.0000	0.0000	0.0000	(0.1746)	0.0364	(0.0122)	0.0756	0.2167
1993	0.0152	0.0000	0.0000	0.0000	0.2829	(0.0716)	(0.0126)	0.0964	0.1818
1994	0.0155	0.0000	0.0000	0.0000	0.1122	(0.0191)	(0.0198)	0.0855	0.1540
1995	0.0153	0.0000	0.0000	0.0000	0.0952	(0.0142)	0.0000	0.0941	0.1692
1996	0.0123	0.0000	0.0000	0.0000	0.0520	(0.0069)	(0.0180)	0.0818	0.1764
1997	0.0115	0.0000	0.0000	0.0000	0.0478	(0.0060)	(0.0212)	0.0609	0.2022
1998	0.0140	0.0000	0.0000	0.0000	0.2932	(0.0348)	(0.0248)	0.5842	0.2971
1999	0.0138	0.0000	0.0000	0.0000	(0.0723)	0.0059	(0.0288)	0.2050	0.2572
2000	0.0538	0.0000	0.0000	0.0000	(0.2851)	0.0251	(0.0275)	0.0373	0.0800
2001	(0.0067)	0.0000	0.0000	0.0000	(0.0194)	0.0022	(0.0365)	0.1150	0.2022
2002	0.0145	0.0000	0.0000	0.0000	0.0976	(0.0114)	(0.0410)	0.1184	0.1646
2003	0.0145	0.0000	0.0000	0.0000	(0.0833)	0.0087	(0.0428)	0.0666	0.1463
2004	0.0144	0.0000	0.0000	0.0000	(0.0417)	0.0048	(0.0446)	0.0624	0.1163
2005	0.0144	0.0000	0.0000	0.0000	(0.0346)	0.0041	(0.0504)	0.1050	0.1200
2006	0.0144	0.0000	0.0000	0.0000	(0.1024)	0.0127	(0.0464)	0.1310	0.1356
2007	0.0143	0.0000	0.0000	0.0000	0.0504	(0.0070)	(0.0410)	0.0637	0.1168
2008	0.0142	0.0000	0.0000	0.0000	(0.1119)	0.0146	(0.0365)	0.1006	0.1137
2009	0.0139	0.0000	0.0000	0.0000	(0.1745)	0.0256	(0.0333)	0.0461	0.1213
2010	0.0134	0.0000	0.0000	0.0000	0.0213	(0.0038)	(0.0320)	0.0513	0.1115
2011	0.0130	0.0000	0.0000	0.0000	(0.0154)	0.0027	(0.0302)	0.0536	0.1049
2012	0.0126	0.0000	0.0000	0.0000	0.0113	(0.0020)	(0.0279)	0.0430	0.1018

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Chapter 11

Table C6-2 **Indonesia:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
9. Indonesia		G	PRI		G	PRI		G	PRI
1990	0.7471	0.7764	0.7398	1.7788	2.3841	1.6683	0.2099	0.2757	0.1979
1991	0.7481	0.7726	0.7423	1.8665	2.3783	1.7728	0.2206	0.2763	0.2103
1992	0.7833	0.7755	0.7852	2.0579	2.5125	1.9720	0.2653	0.3250	0.2540
1993	0.7328	0.7855	0.7211	2.1696	2.5950	2.0892	0.3068	0.3564	0.2974
1994	0.7316	0.8071	0.7150	2.1823	2.6315	2.0998	0.3118	0.3610	0.3028
1995	0.7169	0.8081	0.6977	2.1397	2.6145	2.0493	0.3065	0.3550	0.2971
1996	0.7112	0.8171	0.6886	2.0815	2.5401	1.9991	0.2692	0.3094	0.2620
1997	0.7212	0.8297	0.6984	2.0427	3.3792	1.8602	0.2542	0.3945	0.2349
1998	0.6186	0.8229	0.5789	1.6809	4.0168	1.5344	0.2426	0.5186	0.2251
1999	0.5856	0.7954	0.5445	1.7215	3.7235	1.5534	0.2490	0.4818	0.2292
2000	0.6416	0.7870	0.6113	2.0966	8.3125	1.7242	0.5585	2.0564	0.4682
2001	0.6214	0.7533	0.5961	1.1042	2.9746	0.9597	#NUM!	#NUM!	#NUM!
2002	0.5972	0.7500	0.5697	1.4876	3.1241	1.3251	0.2230	0.4248	0.2027
2003	0.5901	0.7343	0.5631	1.5925	2.8743	1.4605	0.2376	0.3951	0.2213
2004	0.5874	0.7229	0.5618	1.5744	2.9846	1.4169	0.2346	0.4091	0.2149
2005	0.6003	0.7130	0.5798	1.3990	2.4392	1.2769	0.2109	0.3379	0.1958
2006	0.6066	0.6880	0.5919	1.3919	2.2684	1.2864	0.2085	0.3195	0.1950
2007	0.6055	0.6886	0.5913	1.4056	2.1712	1.3126	0.2103	0.3055	0.1987
2008	0.6310	0.7020	0.6175	1.3715	1.8113	1.3081	0.2015	0.2543	0.1939
2009	0.6563	0.6889	0.6498	1.4998	2.0137	1.4231	0.2139	0.2808	0.2040
2010	0.6802	0.7044	0.6757	1.6015	2.0871	1.5314	0.2215	0.2829	0.2126
2011	0.7027	0.7175	0.6999	1.7207	2.1442	1.6579	0.2305	0.2841	0.2226
2012	0.7264	0.7397	0.7239	1.9183	2.3418	1.8552	0.2492	0.3015	0.2414
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
9. Indonesia						$x=a/(i\cdot b^*)$		G	PRI
1990	0.4327	0.5614	0.7601	1.6584	0.0818	1.6691	0.2609	0.1679	0.2852
1991	0.4111	0.5290	0.7621	1.7304	0.0789	1.6275	0.2376	0.1642	0.2556
1992	0.4765	0.5480	0.7993	1.8678	0.0674	1.7741	0.2551	0.1504	0.2802
1993	0.3121	0.4676	0.7620	1.8581	0.0616	1.5828	0.1679	0.1652	0.1686
1994	0.3046	0.4614	0.7612	1.8669	0.0630	1.5170	0.1631	0.1880	0.1570
1995	0.2596	0.4303	0.7458	1.8463	0.0702	1.2595	0.1406	0.2024	0.1256
1996	0.2456	0.4088	0.7364	1.8354	0.0685	1.2845	0.1338	0.2047	0.1159
1997	0.2839	0.4290	0.7426	1.8314	0.0706	1.3946	0.1550	0.1201	0.1638
1998	0.1619	0.5869	0.6704	1.3407	0.0455	1.7508	0.1207	0.0577	0.1381
1999	0.0925	0.6405	0.6579	1.2650	0.0341	1.4091	0.0732	0.0591	0.0772
2000	0.2936	0.8399	0.7577	1.2002	0.0483	1.9447	0.2446	(0.0494)	0.3237
2001	0.2857	0.6138	0.6056	1.1801	0.0748	2.4862	0.2421	(0.0210)	0.3058
2002	0.1672	0.6691	0.6444	1.2174	0.0536	1.7223	0.1373	0.0478	0.1585
2003	0.1281	0.6544	0.6495	1.2375	0.0433	1.5949	0.1035	0.0439	0.1181
2004	0.1330	0.6792	0.6482	1.2165	0.0418	1.7271	0.1094	0.0317	0.1282
2005	0.1830	0.6556	0.6347	1.2095	0.0741	1.4224	0.1513	0.0902	0.1650
2006	0.2107	0.6867	0.6414	1.1999	0.0700	1.6835	0.1756	0.0679	0.1982
2007	0.1963	0.6586	0.6395	1.2162	0.0728	1.5196	0.1614	0.0854	0.1766
2008	0.2695	0.6765	0.6556	1.2316	0.0897	1.5771	0.2188	0.1674	0.2298
2009	0.2905	0.6200	0.6819	1.3360	0.0792	1.7116	0.2174	0.1008	0.2421
2010	0.3115	0.5705	0.7021	1.4452	0.0844	1.5654	0.2155	0.1209	0.2342
2011	0.3295	0.5315	0.7222	1.5645	0.0859	1.4752	0.2106	0.1192	0.2281
2012	0.3311	0.4731	0.7438	1.7536	0.0883	1.2915	0.1888	0.1129	0.2030
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
9. Indonesia					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1990	0.2689	0.4459	1.031	(0.053)	0.798	128.7	0.1626	1901	0.9999
1991	0.2554	0.4419	1.075	0.018	1.074	125.1	0.1484	1992	0.9999
1992	0.2508	0.4684	0.983	(0.015)	0.942	119.7	0.1586	2062	0.9999
1993	0.2596	0.4823	1.546	0.038	1.226	350.1	0.0812	2110	1.0000
1994	0.2674	0.4993	1.639	0.014	1.089	488.4	0.0795	2200	1.0000
1995	0.2948	0.5443	2.097	0.048	1.341	438.6	0.0572	2308	1.0000
1996	0.3281	0.6022	2.452	0.058	1.436	555.9	0.0549	2383	1.0000
1997	0.3437	0.6295	2.217	0.063	1.407	1239	0.0830	4650	1.0000
1998	0.5007	0.6712	4.146	0.201	2.663	4657	0.0525	8025	1.0000
1999	0.5161	0.6529	7.055	0.203	3.781	7418	0.0072	7085	1.0000
2000	0.4976	0.5972	2.034	(0.060)	0.755	5995	0.1790	9595	1.0000
2001	0.4718	0.5568	1.949	(0.057)	0.766	2928	0.1664	10400	1.0000
2002	0.4330	0.5271	3.153	0.052	1.380	2928	0.0424	8940	1.0000
2003	0.4214	0.5215	4.072	0.066	1.637	3637	0.0006	8465	1.0000
2004	0.4113	0.5004	3.761	0.032	1.291	4786	0.0057	9290	1.0000
2005	0.3983	0.4817	2.632	(0.011)	0.928	2616	0.0391	9830	1.0000
2006	0.3834	0.4600	2.184	(0.016)	0.910	3202	0.0776	9020	1.0000
2007	0.3815	0.4639	2.363	(0.023)	0.859	2628	0.0606	9419	1.0000
2008	0.3456	0.4257	1.580	(0.083)	0.622	1483	0.1040	10950	1.0000
2009	0.3177	0.4244	1.461	(0.072)	0.667	(0.71)	0.0885	9400	1.0000
2010	0.2947	0.4259	1.367	(0.083)	0.615	201.4	0.0852	8991	1.0000
2011	0.2753	0.4307	1.307	(0.087)	0.589	(197.0)	0.0802	9068	1.0000
2012	0.2540	0.4455	1.346	(0.071)	0.625	123.1	0.0585	9670	1.0000

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C7-1 **Philippines:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y{}^*$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
13. Philipp	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.1114	0.0266	7.34	0.0036	(0.0184)	0.0412	0.0188	(0.0687)	0.2481
1991	0.0892	0.0652	2.23	0.0293	(0.0242)	0.1067	0.0693	(0.0465)	0.2777
1992	0.1090	0.0626	1.71	0.0367	(0.0115)	0.0939	0.1006	(0.0241)	0.2878
1993	0.1339	0.0477	1.76	0.0271	(0.0130)	0.0616	0.1034	(0.0321)	0.2740
1994	0.1130	0.0504	1.75	0.0288	0.0152	0.0435	0.0934	0.0427	0.1492
1995	0.1360	0.0282	1.76	0.0160	0.0069	0.0242	0.0932	0.0328	0.1522
1996	0.1107	0.0513	1.86	0.0276	0.0090	0.0418	0.0872	0.0215	0.1450
1997	0.1198	0.0424	1.95	0.0217	0.0049	0.0306	0.0831	0.0079	0.1432
1998	0.0424	0.1609	1.28	0.1255	(0.0859)	0.2123	0.1586	(0.0714)	0.3035
1999	(1.2223)	1.4120	1.01	1.3912	(0.3121)	#########	0.1869	(0.1577)	0.4052
2000	(4.4103)	4.5855	1.00	4.5651	(0.4166)	(3.7857)	0.1744	(0.1916)	0.4177
2001	0.0799	0.0917	1.29	0.0710	(0.1017)	0.1779	0.1328	(0.1816)	0.3378
2002	0.0678	0.0920	1.29	0.0712	(0.1558)	0.2060	0.1236	(0.2564)	0.3638
2003	0.1061	0.0410	1.99	0.0206	(0.0692)	0.0623	0.0740	(0.2066)	0.2345
2004	0.1035	0.0467	1.73	0.0269	(0.0489)	0.0703	0.0867	(0.1693)	0.2212
2005	0.1007	0.0455	1.71	0.0266	(0.0540)	0.0562	0.0855	(0.1297)	0.1923
2006	0.1169	0.0591	1.44	0.0410	(0.0101)	0.0677	0.1222	(0.0348)	0.1936
2007	0.1202	0.0677	1.34	0.0504	(0.0085)	0.0656	0.1399	(0.0096)	0.2078
2008	0.0893	0.0899	1.23	0.0731	(0.0236)	0.1243	0.1458	(0.0615)	0.2307
2009	0.3240	(0.0806)	0.83	(0.0974)	(0.5648)	(0.1455)	0.2942	(0.2539)	0.5690
2010	0.4933	(0.2575)	0.94	(0.2744)	(0.1725)	(0.3653)	0.2512	(0.2435)	0.5500
2011	8.4326	(8.1323)	1.00	(8.1496)	(0.1135)	(1.7448)	0.3009	(0.1315)	0.5980
2012	0.7040	(0.2812)	0.94	(0.2986)	(0.1041)	(0.4305)	0.4491	(0.1494)	1.0049

Speed years	$1/\lambda^*$	$1/\lambda_G{}^*$	$1/\lambda_{PRI}{}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
13. Philipp	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	1.39	15.26	6.59	0.1862	0.1666	0.0196	(0.0384)	(0.0317)	(0.0700)
1991	61.84	19.76	7.36	0.1614	0.1011	0.0603	(0.0235)	(0.0039)	(0.0273)
1992	52.73	26.09	8.43	0.1685	0.0901	0.0784	(0.0131)	(0.0221)	(0.0353)
1993	26.54	26.49	7.42	0.1915	0.1092	0.0823	(0.0165)	(0.0509)	(0.0674)
1994	46.04	31.44	7.31	0.1904	0.0954	0.0950	0.0119	(0.0534)	(0.0415)
1995	9.92	31.08	8.89	0.1789	0.1067	0.0722	0.0065	(0.0627)	(0.0563)
1996	95.62	30.07	3.92	0.1887	0.1030	0.0857	0.0032	(0.0551)	(0.0519)
1997	65.74	42.36	2.75	0.1967	0.1151	0.0816	0.0007	(0.0691)	(0.0684)
1998	35.01	18.73	32.16	0.1704	0.0432	0.1271	(0.0208)	0.0043	(0.0165)
1999	78.89	36.31	101.86	0.1538	(0.0133)	0.1671	(0.0417)	0.1029	0.0612
2000	110.76	29.95	294.21	0.1706	(0.0167)	0.1873	(0.0451)	0.1362	0.0911
2001	355.27	13.80	66.08	0.1445	0.0391	0.1054	(0.0450)	0.0850	0.0401
2002	503.09	12.77	188.50	0.1419	0.0347	0.1072	(0.0595)	0.1256	0.0661
2003	0.94	15.41	8.65	0.1357	0.0928	0.0429	(0.0515)	0.0666	0.0151
2004	2.32	15.08	9.24	0.1297	0.0792	0.0505	(0.0427)	0.0879	0.0453
2005	3.48	25.24	8.76	0.1161	0.0763	0.0397	(0.0300)	0.0751	0.0451
2006	5.42	25.60	9.09	0.1088	0.0649	0.0439	(0.0115)	0.0927	0.0813
2007	11.10	58.78	8.72	0.1143	0.0567	0.0577	(0.0020)	0.0987	0.0967
2008	96.11	20.63	199.17	0.1138	0.0345	0.0793	(0.0134)	0.1208	0.1074
2009	29.36	9.91	10.80	0.1134	(0.0833)	0.1968	(0.0418)	0.1859	0.1441
2010	533.58	10.95	20.18	0.0000	(0.0349)	0.0349	(0.0384)	0.1704	0.1319
2011	86.55	22.38	67.69	0.0000	(0.0159)	0.0159	(0.0195)	0.1100	0.0905
2012	71.30	31.10	22.67	0.0000	(0.0452)	0.0452	(0.0217)	0.1277	0.1061

Employment	n	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
13. Philipp	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0230	0.0000	0.0000	0.0000	0.0000	0.0000	(0.0365)	0.1311	0.2146
1991	0.0359	0.0000	0.0000	0.0000	0.0036	(0.0005)	(0.0405)	0.1852	0.1655
1992	0.0259	0.0000	0.0000	0.0000	0.0074	(0.0010)	(0.0387)	0.0856	0.1322
1993	0.0205	0.0000	0.0000	0.0000	(0.0683)	0.0095	(0.0401)	0.0688	0.0992
1994	0.0216	0.0000	0.0000	0.0000	(0.0507)	0.0076	(0.0378)	0.0843	0.1002
1995	0.0122	0.0000	0.0000	0.0000	(0.0599)	0.0095	(0.0428)	0.0799	(0.1143)
1996	0.0236	0.0000	0.0000	0.0000	(0.0496)	0.0084	(0.0387)	0.0751	0.0886
1997	0.0207	0.0000	0.0000	0.0000	(0.1124)	0.0202	(0.0392)	0.0559	0.0877
1998	0.0354	0.0000	0.0000	0.0000	(0.0437)	0.0089	(0.0464)	0.0927	0.0189
1999	0.0208	0.0000	0.0000	0.0000	0.0510	(0.0109)	(0.0441)	0.0595	(1.2887)
2000	0.0204	0.0000	0.0000	0.0000	0.0301	(0.0061)	(0.0504)	0.0395	(4.4678)
2001	0.0207	0.0000	0.0000	0.0000	0.0687	(0.0133)	(0.0500)	0.0680	0.0423
2002	0.0208	0.0000	0.0000	0.0000	0.0703	(0.0126)	(0.0513)	0.0300	(0.0051)
2003	0.0204	0.0000	0.0000	0.0000	0.0421	(0.0069)	(0.0513)	0.0345	0.0461
2004	0.0197	0.0000	0.0000	0.0000	0.0852	(0.0133)	(0.0531)	0.0598	0.0560
2005	0.0189	0.0000	0.0000	0.0000	0.0425	(0.0060)	(0.0513)	0.0764	0.0411
2006	0.0181	0.0000	0.0000	0.0000	0.0126	(0.0017)	(0.0356)	0.0550	0.0148
2007	0.0173	0.0000	0.0000	0.0000	0.0046	(0.0006)	(0.0329)	0.0284	(0.0143)
2008	0.0168	0.0000	0.0000	0.0000	0.0619	(0.0082)	(0.0333)	0.0829	(0.0024)
2009	0.0168	0.0000	0.0000	0.0000	(0.1342)	0.0166	(0.0338)	0.0417	0.1663
2010	0.0169	0.0000	0.0000	0.0000	0.0413	(0.0059)	(0.0333)	0.0384	0.3343
2011	0.0172	0.0000	0.0000	0.0000	0.0025	(0.0003)	(0.0315)	0.0464	8.1990
2012	0.0175	0.0000	0.0000	0.0000	(0.1014)	0.0137	(0.0315)	0.0316	0.3380

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C7-2 **Philippines:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
13. Philippines		G	PRI		G	PRI		G	PRI
1990	0.4352	0.8070	0.2237	0.8451	5.2241	0.3046	0.1833	0.8581	0.0911
1991	0.4445	0.8012	0.2566	1.1946	7.4599	0.4815	0.2972	1.4961	0.1523
1992	0.4602	0.8014	0.2897	1.1450	6.7354	0.5148	0.2435	1.1521	0.1350
1993	0.4796	0.7887	0.3327	1.0519	5.7548	0.5348	0.2021	0.8874	0.1224
1994	0.4740	0.7668	0.3428	1.1152	3.7391	0.6470	0.2179	0.6010	0.1460
1995	0.4794	0.7475	0.3646	0.9557	2.9314	0.5968	0.1454	0.3641	0.1034
1996	0.4839	0.7289	0.3837	1.1671	3.7400	0.7507	0.2360	0.6343	0.1690
1997	0.4943	0.6937	0.4171	1.1226	5.2622	0.7634	0.2139	0.8188	0.1591
1998	0.4966	0.6805	0.4258	3.8292	(11.0564)	1.9006	0.7929	1.9782	0.4239
1999	0.4522	0.6578	0.3769	(0.1088)	(2.6607)	0.0008	#NUM!	0.2686	0.0035
2000	0.4087	0.6308	0.3305	(0.0240)	(2.0525)	0.0400	#NUM!	0.1638	0.0264
2001	0.4050	0.6388	0.3272	1.2859	5.2559	0.8531	0.2402	0.8455	0.1725
2002	0.3962	0.6424	0.3191	1.3735	7.3655	0.8940	0.2542	1.1727	0.1789
2003	0.4139	0.6520	0.3436	0.8711	3.7692	0.6025	0.1768	0.6264	0.1333
2004	0.4175	0.6669	0.3484	0.9224	3.4405	0.6690	0.1815	0.5627	0.1418
2005	0.4208	0.6649	0.3577	0.9376	3.9904	0.6771	0.1798	0.6237	0.1402
2006	0.4168	0.6594	0.3558	0.9407	2.5428	0.7364	0.1756	0.3996	0.1460
2007	0.4188	0.6455	0.3651	0.9770	15.3862	0.7192	0.1765	2.0853	0.1399
2008	0.4027	0.6447	0.3479	1.1888	2.9942	1.0000	0.2030	0.4487	0.1768
2009	0.3596	0.6103	0.2952	0.3656	(2.0259)	0.2717	0.0871	0.1226	0.0705
2010	0.3093	0.5931	0.2373	0.1906	7.1747	0.1584	0.0590	1.0208	0.0518
2011	0.2866	0.5834	0.2106	0.0126	11.8909	0.0579	0.0139	1.6353	0.0301
2012	0.2442	0.5512	0.1574	0.1681	4.6828	0.1092	0.0551	0.6910	0.0424
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
13. Philippines						$x=a/(i\cdot b^*)$		G	PRI
1990	0.0942	(7.1837)	0.4883	0.6823	0.0852	1.1578	0.1380	0.0169	0.3865
1991	0.1066	2.1387	0.5807	0.6901	0.0424	1.8144	0.1544	0.0226	0.3712
1992	0.1248	2.0820	0.5730	0.7273	0.0385	2.4163	0.1716	0.0301	0.3672
1993	0.1409	2.1396	0.5555	0.7758	0.0485	2.3235	0.1816	0.0186	0.3652
1994	0.1260	1.9805	0.5659	0.7711	0.0414	2.3343	0.1634	0.1036	0.2233
1995	0.1300	3.2045	0.5265	0.7916	0.0505	2.3140	0.1642	0.0905	0.2288
1996	0.1291	1.7150	0.5784	0.7977	0.0434	2.1681	0.1619	0.0781	0.2270
1997	0.1345	1.6685	0.5697	0.8290	0.0495	2.0502	0.1622	0.0416	0.2399
1998	0.1622	1.1451	0.8256	0.7981	0.0075	4.5462	0.2033	(0.0420)	0.3542
1999	0.1330	0.8936	(0.1469)	0.7012	(0.0153)	67.9479	0.1897	(0.1472)	0.4052
2000	0.1061	0.6984	(0.0282)	0.6055	(0.0172)	225.2510	0.1751	(0.1823)	0.4154
2001	0.1027	2.3500	0.5939	0.5984	0.0159	4.4268	0.1716	(0.1446)	0.3772
2002	0.0931	2.2385	0.6072	0.5830	0.0136	4.4195	0.1598	(0.2221)	0.4005
2003	0.0924	(21.2226)	0.4948	0.6281	0.0469	2.0123	0.1471	(0.1458)	0.3112
2004	0.0955	12.5759	0.5098	0.6357	0.0388	2.3651	0.1502	(0.1009)	0.2833
2005	0.0944	9.1863	0.5133	0.6458	0.0371	2.4088	0.1461	(0.0843)	0.2569
2006	0.1100	7.4183	0.5183	0.6249	0.0312	3.2711	0.1760	0.0276	0.2452
2007	0.1175	4.9524	0.5297	0.6252	0.0266	3.9152	0.1879	0.0099	0.2625
2008	0.1062	2.7335	0.5749	0.5926	0.0146	5.3611	0.1792	(0.0179)	0.2619
2009	0.1185	0.1659	0.2966	0.4867	(0.0586)	(4.7920)	0.2434	(0.2463)	0.5033
2010	0.0940	0.4040	0.1763	0.3989	(0.0288)	(15.2685)	0.2357	(0.2197)	0.5246
2011	0.1060	0.7548	0.0141	0.3530	(0.0157)	#########	0.3002	(0.1116)	0.5921
2012	0.1184	0.2235	0.1625	0.2799	(0.0379)	(16.0991)	0.4228	(0.1244)	0.9641
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
13. Philippines					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1990	0.5577	0.3805	4.041	0.103	1.747	2.91	0.0397	28.040	0.9986
1991	0.5603	0.3866	3.628	0.076	1.494	4.72	0.0653	26.715	0.9976
1992	0.5552	0.4038	3.236	0.023	1.135	4.27	0.0750	25.171	0.9970
1993	0.6114	0.4743	3.367	(0.035)	0.809	7.28	0.0948	27.794	0.9966
1994	0.6790	0.5236	4.156	(0.013)	0.922	10.37	0.0797	24.498	0.9967
1995	0.7278	0.5761	4.433	(0.022)	0.868	8.14	0.0808	26.295	0.9969
1996	0.7842	0.6255	4.844	(0.022)	0.864	11.16	0.0830	26.371	0.9969
1997	0.8314	0.6892	5.126	(0.032)	0.802	18.34	0.0901	40.065	0.9978
1998	0.8537	0.6813	4.199	(0.023)	0.885	136.61	0.1350	39.194	0.9966
1999	1.0168	0.7129	5.360	(0.066)	0.650	(90.14)	0.1237	40.437	0.9969
2000	1.1296	0.6840	6.450	(0.057)	0.672	(111.25)	0.1096	50.108	0.9978
2001	1.0794	0.6459	6.290	(0.038)	0.781	85.82	0.0958	51.500	0.9981
2002	1.1050	0.6442	6.916	(0.073)	0.544	74.39	0.0648	53.161	0.9988
2003	0.9841	0.6182	6.691	(0.060)	0.593	22.97	0.0442	55.613	0.9992
2004	0.9505	0.6043	6.330	(0.047)	0.684	32.58	0.0465	56.313	0.9992
2005	0.8904	0.5750	6.093	(0.060)	0.593	31.22	0.0339	53.101	0.9994
2006	0.9438	0.5898	5.363	(0.102)	0.420	44.03	0.0780	49.210	0.9984
2007	0.8931	0.5583	4.753	(0.135)	0.284	34.67	0.0871	41.488	0.9979
2008	0.8279	0.4906	4.620	(0.092)	0.488	48.21	0.0644	47.549	0.9986
2009	0.9973	0.4854	4.097	(0.158)	0.352	0.01	0.1145	46.470	0.9975
2010	1.1147	0.4447	4.729	(0.159)	0.325	(3.79)	0.1054	43.990	0.9976
2011	1.2024	0.4245	4.005	(0.234)	0.222	6.96	0.1699	44.098	0.9961
2012	1.4129	0.3955	3.342	(0.366)	0.134	(1.61)	0.2925	41.484	0.9929

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C8-1 **Sri Lanka:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
15. Sri Lar	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0635	0.0106	(16.12)	(0.0007)	(0.0228)	0.0173	(0.0046)	(0.2839)	0.0426
1991	0.0781	0.0175	6.20	0.0028	(0.0276)	0.0433	0.0154	(0.3108)	0.0796
1992	0.0678	0.0085	(11.32)	(0.0008)	(0.0160)	0.0080	(0.0067)	(0.1737)	0.0243
1993	0.0612	0.0102	(4.29)	(0.0024)	(0.0195)	0.0068	(0.0166)	(0.2009)	0.0211
1994	0.0371	0.0384	(1.99)	(0.0193)	(0.0850)	0.0105	(0.0380)	(0.2564)	0.0308
1995	0.0658	0.0092	(6.25)	(0.0015)	(0.0256)	0.0064	(0.0120)	(0.2458)	0.0532
1996	0.0656	0.0097	(10.65)	(0.0009)	(0.0116)	0.0076	(0.0071)	(0.1870)	0.0456
1997	0.0558	0.0050	(0.99)	(0.0050)	(0.0103)	(0.0031)	(0.0613)	(0.1446)	(0.0359)
1998	0.0569	0.0038	(3.53)	(0.0011)	(0.0098)	0.0039	(0.0172)	(0.1725)	0.0302
1999	0.0525	0.0036	(1.99)	(0.0018)	(0.0039)	(0.0048)	(0.0281)	(0.1146)	(0.0131)
2000	0.0561	0.0040	(2.14)	(0.0019)	(0.0065)	0.0035	(0.0280)	(0.1635)	0.0096
2001	0.0545	0.0154	15.48	0.0010	(0.0151)	0.0451	0.0045	(0.1684)	0.0676
2002	0.0594	0.0122	17.79	0.0007	(0.0139)	0.0256	0.0040	(0.1318)	0.0597
2003	0.0583	0.0142	8.10	0.0018	(0.0136)	0.0320	0.0090	(0.1184)	0.0631
2004	0.0597	0.0110	(8.25)	(0.0013)	(0.0145)	0.0172	(0.0086)	(0.1270)	0.0428
2005	0.0568	0.0079	(2.84)	(0.0028)	(0.0139)	0.0067	(0.0228)	(0.1254)	0.0224
2006	0.0633	0.0071	(2.91)	(0.0024)	(0.0236)	0.0062	(0.0242)	(0.1451)	0.0290
2007	0.0641	0.0059	(2.87)	(0.0021)	(0.0209)	0.0054	(0.0244)	(0.1529)	0.0238
2008	0.0939	0.0073	(116.31)	(0.0001)	(0.0298)	0.0116	(0.0009)	(0.1825)	0.0584
2009	0.0617	0.0065	(7.44)	(0.0009)	(0.0219)	0.0080	(0.0092)	(0.2600)	0.0813
2010	0.0590	0.0054	(2.32)	(0.0023)	(0.0162)	0.0035	(0.0278)	(0.2156)	0.0398
2011	0.0747	0.0065	(3.73)	(0.0017)	(0.0147)	0.0034	(0.0218)	(0.1994)	0.0418
2012	0.0633	0.0052	(1.76)	(0.0029)	(0.0113)	0.0007	(0.0389)	(0.1746)	0.0091
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
15. Sri Lar	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	22.31	3.63	27.50	0.1665	0.1770	(0.0105)	(0.0850)	(0.0233)	(0.1083)
1991	24.30	2.89	27.08	0.1739	0.1742	(0.0002)	(0.1039)	(0.0290)	(0.1329)
1992	20.81	7.35	25.05	0.1809	0.1881	(0.0071)	(0.0592)	(0.0628)	(0.1220)
1993	20.10	5.67	25.97	0.1939	0.1951	(0.0012)	(0.0706)	(0.0475)	(0.1180)
1994	15.25	4.83	25.89	0.2049	0.2139	(0.0090)	(0.0939)	(0.0516)	(0.1455)
1995	20.10	4.85	30.61	0.1969	0.1953	0.0016	(0.0908)	(0.0353)	(0.1262)
1996	21.42	5.72	39.30	0.1838	0.1837	0.0001	(0.0857)	(0.0285)	(0.1142)
1997	12.80	7.46	16.33	0.1834	0.2865	(0.1031)	(0.0681)	(0.1074)	(0.1755)
1998	19.37	7.91	27.83	0.1947	0.1844	0.0102	(0.0761)	(0.0004)	(0.0765)
1999	17.21	8.75	25.31	0.2122	0.2100	0.0021	(0.0653)	(0.0392)	(0.1044)
2000	16.76	6.30	25.19	0.2181	0.2208	(0.0028)	(0.0933)	(0.0449)	(0.1382)
2001	26.42	6.34	42.26	0.1711	0.1522	0.0189	(0.1038)	0.0157	(0.0881)
2002	25.57	8.67	37.12	0.1561	0.1554	0.0007	(0.0819)	(0.0068)	(0.0886)
2003	27.75	9.46	38.01	0.1559	0.1436	0.0122	(0.0762)	(0.0008)	(0.0771)
2004	21.82	9.00	30.53	0.1761	0.1805	(0.0044)	(0.0815)	(0.0275)	(0.1090)
2005	18.97	9.52	28.86	0.1818	0.2006	(0.0188)	(0.0775)	(0.0353)	(0.1128)
2006	17.75	12.39	26.07	0.1934	0.2151	(0.0216)	(0.0765)	(0.0611)	(0.1376)
2007	17.74	12.18	25.48	0.1923	0.2115	(0.0192)	(0.0725)	(0.0550)	(0.1274)
2008	18.80	14.23	26.01	0.1967	0.2215	(0.0248)	(0.0730)	(0.1055)	(0.1785)
2009	21.67	5.57	38.66	0.1904	0.1732	0.0172	(0.1142)	0.0292	(0.0850)
2010	17.63	6.05	28.57	0.0000	0.2087	(0.2087)	(0.0991)	(0.0066)	(0.1058)
2011	16.66	6.26	25.60	0.0000	0.2339	(0.2339)	(0.0942)	(0.0797)	(0.1739)
2012	14.88	6.57	21.24	0.0000	0.2510	(0.2510)	(0.0879)	(0.0857)	(0.1736)
Employment	n	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
15. Sri Lar	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0113	0.0000	0.0194	0.0000	0.0000	0.0000	(0.0648)	0.1352	0.1194
1991	0.0147	0.0000	0.0250	0.0000	(0.0565)	0.0327	(0.0635)	0.1223	0.1764
1992	0.0093	0.0000	0.0194	0.0000	0.0525	0.0118	(0.0635)	0.1134	0.1883
1993	0.0126	0.0000	0.0152	0.0000	0.0590	0.0072	(0.0662)	0.1175	0.1918
1994	0.0578	0.0000	(0.0277)	0.0000	(0.0670)	(0.0192)	(0.0590)	0.0853	0.1429
1995	0.0107	0.0000	(0.0007)	0.0000	(0.1873)	0.0247	(0.0554)	0.0764	0.1712
1996	0.0106	0.0000	(0.0006)	0.0000	0.0817	(0.0141)	(0.0509)	0.1590	0.1729
1997	0.0100	0.0000	0.0000	0.0415	0.0977	0.0330	(0.0473)	0.0958	0.1419
1998	0.0049	0.0000	0.0051	0.0000	(0.3691)	0.0568	(0.0414)	0.0937	0.1465
1999	0.0054	0.0000	0.0214	0.0000	0.3429	(0.0477)	(0.0401)	0.0468	0.1436
2000	0.0059	0.0000	0.0228	0.0000	(0.1755)	0.0446	(0.0342)	0.0619	0.1576
2001	0.0144	0.0000	0.0110	0.0000	0.0075	0.0099	(0.0356)	0.1422	0.1785
2002	0.0116	0.0000	0.0132	0.0000	(0.2385)	0.0485	(0.0396)	0.0951	0.1195
2003	0.0125	0.0000	0.0141	0.0000	0.0442	0.0057	(0.0374)	0.0639	0.0892
2004	0.0123	0.0000	0.0183	0.0000	(0.0340)	0.0244	(0.0383)	0.0756	0.0837
2005	0.0106	0.0000	0.0168	0.0000	(0.0242)	0.0213	(0.0347)	0.0905	0.0997
2006	0.0095	0.0000	0.0149	0.0000	(0.1835)	0.0502	(0.0293)	0.1000	0.1214
2007	0.0079	0.0000	0.0181	0.0000	0.0105	0.0156	(0.0270)	0.1582	0.1649
2008	0.0074	0.0000	0.0180	0.0000	(0.1093)	0.0434	(0.0234)	0.2261	0.1816
2009	0.0073	0.0000	0.0000	0.0000	(0.0379)	0.0100	(0.0257)	0.0339	0.1502
2010	0.0078	0.0000	0.0000	0.0000	0.1212	(0.0336)	0.0000	0.0594	0.0968
2011	0.0082	0.0000	0.0000	0.0000	0.0220	(0.0052)	0.0000	0.0707	0.0876
2012	0.0081	0.0000	0.0000	0.0000	0.1055	(0.0242)	0.0000	0.0682	0.1276

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C8-2 **Sri Lanka:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
15. Sri Lanka		G	PRI		G	PRI		G	PRI
1990	0.6296	0.7057	0.6206	1.7445	3.9077	2.2504	0.2273	0.4884	0.4605
1991	0.6362	0.7262	0.6239	1.8115	4.6283	2.8162	0.2659	0.6502	0.6338
1992	0.6281	0.7315	0.6121	1.6699	3.7022	1.9457	0.1986	0.4115	0.3934
1993	0.6224	0.7466	0.6010	1.7022	4.0568	1.8729	0.2358	0.5210	0.3763
1994	0.6366	0.7613	0.6025	2.9985	5.9902	1.8971	0.8156	1.5838	0.3944
1995	0.6258	0.7212	0.6032	1.6781	4.5011	1.4200	0.2145	0.5406	0.1784
1996	0.6243	0.7585	0.5900	1.6791	3.4925	1.4884	0.2134	0.4097	0.1870
1997	0.6287	0.7709	0.5935	1.6574	3.6294	1.4134	0.2058	0.4100	0.1803
1998	0.6277	0.7095	0.6066	1.6249	3.2710	1.5032	0.1415	0.2688	0.1881
1999	0.6464	0.8134	0.6072	1.7630	3.7503	2.1819	0.1591	0.3043	0.4241
2000	0.6515	0.8016	0.6126	1.7918	4.4387	2.1160	0.1684	0.3792	0.4249
2001	0.6536	0.8219	0.5999	2.1103	5.1804	3.8034	0.3009	0.6799	0.6698
2002	0.6418	0.7872	0.5916	1.8956	4.4428	2.1225	0.2464	0.5322	0.3943
2003	0.6395	0.8004	0.5818	1.9333	4.6481	2.3723	0.2602	0.5733	0.4501
2004	0.6355	0.7950	0.5779	1.8180	4.6684	1.9155	0.2457	0.5740	0.4017
2005	0.6283	0.7834	0.5731	1.7185	4.5026	1.6195	0.2185	0.5184	0.3308
2006	0.6243	0.7355	0.5866	1.6400	4.3190	1.4676	0.1987	0.4808	0.2861
2007	0.6143	0.7133	0.5850	1.5535	3.7322	1.4917	0.1738	0.3861	0.2995
2008	0.6169	0.6703	0.6040	1.4831	3.3370	1.4511	0.1600	0.3408	0.2855
2009	0.6145	0.6615	0.5991	1.5778	3.1887	1.3375	0.1692	0.3309	0.1450
2010	0.6155	0.6909	0.5920	1.5736	3.1907	1.3321	0.1739	0.3344	0.1498
2011	0.6269	0.7045	0.6030	1.5948	3.2261	1.3509	0.1795	0.3440	0.1549
2012	0.6307	0.7310	0.6008	1.6423	3.3182	1.3920	0.1837	0.3467	0.1593
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
15. Sri Lanka						$x=a/(i \cdot b^*)$		G	PRI
1990	0.1108	0.4137	0.6649	1.4944	0.0593	0.9416	0.0741	(0.1434)	0.1182
1991	0.1415	0.4852	0.6816	1.4798	0.0554	1.1923	0.0956	(0.1455)	0.1526
1992	0.1132	0.3857	0.6552	1.4837	0.0648	0.9188	0.0763	(0.0730)	0.1119
1993	0.1041	0.4236	0.6580	1.4582	0.0667	0.8111	0.0714	(0.0707)	0.1072
1994	0.1111	0.6962	0.7811	1.4718	0.0468	0.6652	0.0755	(0.0820)	0.1193
1995	0.1105	0.4013	0.6560	1.4716	0.0672	0.8621	0.0751	(0.1428)	0.1362
1996	0.1102	0.4105	0.6560	1.4630	0.0632	0.9142	0.0753	(0.0164)	0.1053
1997	0.0924	0.3143	0.6484	1.5217	0.1007	0.4976	0.0607	(0.0037)	0.0815
1998	0.0924	0.2835	0.6427	1.5231	0.0659	0.7794	0.0607	(0.0872)	0.1081
1999	0.0925	0.2518	0.6614	1.6501	0.0711	0.6658	0.0561	0.0453	0.0599
2000	0.1005	0.2604	0.6671	1.6719	0.0735	0.6819	0.0601	(0.0145)	0.0891
2001	0.1151	0.4357	0.7075	1.6462	0.0445	1.0690	0.0699	(0.0078)	0.1057
2002	0.1126	0.4132	0.6836	1.5716	0.0492	1.0595	0.0716	(0.0219)	0.1175
2003	0.1128	0.4425	0.6881	1.5545	0.0448	1.1409	0.0725	(0.0096)	0.1156
2004	0.1085	0.4083	0.6737	1.5354	0.0589	0.8919	0.0706	(0.0192)	0.1190
2005	0.0976	0.3712	0.6581	1.5094	0.0686	0.7396	0.0647	(0.0297)	0.1143
2006	0.1038	0.3669	0.6488	1.4749	0.0755	0.7440	0.0704	(0.0866)	0.1438
2007	0.0996	0.3627	0.6349	1.4228	0.0772	0.7414	0.0700	(0.0948)	0.1387
2008	0.1393	0.4216	0.6345	1.3758	0.0810	0.9915	0.1013	(0.1372)	0.1867
2009	0.0974	0.3701	0.6378	1.4282	0.0627	0.8815	0.0682	(0.1730)	0.1555
2010	0.0928	0.3459	0.6361	1.4410	0.0760	0.6987	0.0644	(0.1121)	0.1284
2011	0.1192	0.3622	0.6461	1.4680	0.0828	0.7887	0.0812	(0.0883)	0.1422
2012	0.1039	0.3201	0.6488	1.5179	0.0882	0.6378	0.0684	(0.0488)	0.1109
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
15. Sri Lanka					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1990	0.2055	0.3072	2.772	0.056	1.753	8.97	(0.0242)	61.261	1.0004
1991	0.2210	0.3271	2.311	0.098	2.027	8.89	0.0065	68.303	0.9999
1992	0.2254	0.3345	2.954	0.120	2.579	7.38	(0.0203)	72.150	1.0003
1993	0.2408	0.3511	3.372	0.131	2.829	16.47	(0.0154)	82.565	1.0002
1994	0.2463	0.3625	3.262	0.106	2.401	35.57	(0.0082)	93.151	1.0001
1995	0.2901	0.4269	3.865	0.105	2.404	23.08	(0.0083)	96.717	1.0001
1996	0.2823	0.4130	3.749	0.107	2.425	28.84	(0.0037)	96.734	1.0000
1997	0.2648	0.4030	4.360	0.086	2.418	24.75	(0.0113)	104.59	1.0001
1998	0.2635	0.4014	4.345	0.090	2.478	44.28	(0.0076)	102.11	1.0001
1999	0.1947	0.3213	3.474	0.091	2.626	54.15	(0.0099)	107.70	1.0001
2000	0.1928	0.3224	3.209	0.102	2.690	56.80	(0.0055)	108.71	1.0001
2001	0.2047	0.3370	2.928	0.124	2.773	66.36	(0.0058)	113.13	1.0001
2002	0.2088	0.3281	2.914	0.060	1.839	36.76	(0.0233)	96.702	1.0002
2003	0.2181	0.3391	3.007	0.031	1.425	40.91	(0.0303)	96.708	1.0003
2004	0.2320	0.3562	3.284	0.024	1.341	39.34	(0.0330)	104.57	1.0003
2005	0.2376	0.3586	3.673	0.043	1.664	32.42	(0.0475)	102.07	1.0005
2006	0.2422	0.3573	3.442	0.058	1.826	40.21	(0.0276)	107.68	1.0003
2007	0.2482	0.3532	3.547	0.101	2.441	32.05	(0.0309)	108.69	1.0003
2008	0.2281	0.3138	2.252	0.088	1.865	20.01	(0.0135)	113.13	1.0001
2009	0.2364	0.3377	3.468	0.089	2.298	(0.01)	(0.0608)	114.32	1.0005
2010	0.2317	0.3339	3.599	0.038	1.587	3.64	(0.0660)	110.89	1.0006
2011	0.2375	0.3486	2.924	0.013	1.159	(3.37)	(0.0491)	113.85	1.0004
2012	0.2393	0.3633	3.497	0.064	1.941	2.17	(0.0619)	127.10	1.0005

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C9-1 **Vietnam:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
17. Vietna	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0500	0.0907	1.33	0.0682	(0.0113)	0.1691	0.1058	(0.0448)	0.1505
1991	0.0849	0.0535	1.77	0.0303	(0.0096)	0.0605	0.0783	(0.0507)	0.1164
1992	0.0822	0.0405	2.48	0.0163	(0.0045)	0.0325	0.0494	(0.0303)	0.0680
1993	0.0756	0.0186	(3.92)	(0.0047)	(0.0099)	(0.0028)	(0.0240)	(0.0932)	(0.0108)
1994	0.0776	0.0168	(4.21)	(0.0040)	(0.0015)	(0.0066)	(0.0224)	(0.0110)	(0.0339)
1995	0.0817	0.0094	(4.81)	(0.0019)	0.0018	(0.0089)	(0.0190)	0.0329	(0.0648)
1996	0.0789	0.0132	(3.60)	(0.0037)	0.0032	(0.0122)	(0.0256)	0.0342	(0.0706)
1997	0.0674	0.0107	(2.17)	(0.0049)	(0.0008)	(0.0116)	(0.0360)	(0.0094)	(0.0672)
1998	0.0679	0.0101	(2.16)	(0.0047)	0.0022	(0.0115)	(0.0361)	0.0230	(0.0783)
1999	0.1086	0.0178	5.12	0.0035	0.0016	0.0029	0.0247	0.0176	0.0171
2000	0.1098	0.0169	7.02	0.0024	(0.0025)	0.0058	0.0181	(0.0333)	0.0309
2001	0.1066	0.0166	9.24	0.0018	0.0043	(0.0008)	0.0133	0.0369	(0.0053)
2002	0.0996	0.0142	(29.84)	(0.0005)	(0.0008)	(0.0018)	(0.0038)	(0.0093)	(0.0117)
2003	0.0912	0.0125	(5.74)	(0.0022)	(0.0030)	(0.0030)	(0.0181)	(0.0377)	(0.0191)
2004	0.0920	0.0124	(6.00)	(0.0021)	(0.0032)	(0.0023)	(0.0174)	(0.0377)	(0.0157)
2005	0.1073	0.0027	(78.20)	(0.0000)	(0.0004)	0.0001	(0.0014)	(0.0232)	0.0025
2006	0.0972	0.0115	(14.38)	(0.0008)	(0.0012)	(0.0013)	(0.0076)	(0.0150)	(0.0103)
2007	0.0887	0.0075	(1.73)	(0.0043)	(0.0009)	(0.0063)	(0.0556)	(0.0111)	(0.0831)
2008	0.0842	0.0074	(1.77)	(0.0041)	(0.0008)	(0.0065)	(0.0516)	(0.0110)	(0.0787)
2009	0.0796	0.0082	(2.73)	(0.0030)	(0.0005)	(0.0051)	(0.0321)	(0.0057)	(0.0514)
2010	0.0989	0.0081	(2.91)	(0.0028)	(0.0007)	(0.0041)	(0.0368)	(0.0101)	(0.0531)
2011	0.0899	0.0000	(2.69)	0.0000	0.0000	0.0000	(0.0334)	(0.0092)	(0.0475)
2012	0.0775	0.0000	(2.40)	0.0000	0.0000	0.0000	(0.0322)	(0.0090)	(0.0452)
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
17. Vietna	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	56.56	18.50	#NUM!	0.1091	0.0946	0.0146	(0.0318)	(0.1416)	(0.1734)
1991	35.26	14.89	46.43	0.1141	0.1172	(0.0031)	(0.0261)	(0.0900)	(0.1161)
1992	34.83	14.51	51.44	0.1430	0.1252	0.0178	(0.0203)	(0.0631)	(0.0833)
1993	24.48	10.48	(156.56)	0.1820	0.2151	(0.0331)	(0.0478)	(0.0919)	(0.1398)
1994	27.42	15.37	(25.66)	0.2018	0.2118	(0.0100)	(0.0157)	(0.1173)	(0.1331)
1995	36.36	18.16	(1.39)	0.2062	0.2043	0.0019	(0.0059)	(0.1073)	(0.1132)
1996	25.64	18.95	(12.91)	0.2069	0.2195	(0.0126)	(0.0021)	(0.1374)	(0.1394)
1997	20.50	16.40	(27.88)	0.2152	0.2230	(0.0078)	(0.0191)	(0.0917)	(0.1108)
1998	18.14	21.01	(2810.61)	0.2252	0.2320	(0.0069)	(0.0014)	(0.1002)	(0.1016)
1999	22.43	22.98	63.09	0.2142	0.2084	0.0058	(0.0018)	(0.0448)	(0.0465)
2000	19.87	19.43	49.44	0.2304	0.2336	(0.0032)	(0.0312)	(0.0121)	(0.0433)
2001	18.74	31.54	24.61	0.2429	0.2493	(0.0064)	0.0144	(0.0547)	(0.0402)
2002	16.54	25.27	22.29	0.2595	0.2823	(0.0228)	(0.0167)	(0.0581)	(0.0748)
2003	15.21	22.42	21.23	0.2780	0.3041	(0.0262)	(0.0389)	(0.0717)	(0.1106)
2004	15.20	22.86	20.62	0.2771	0.3106	(0.0335)	(0.0400)	(0.0647)	(0.1047)
2005	15.84	26.23	20.07	0.2739	0.2944	(0.0205)	(0.0289)	(0.0398)	(0.0687)
2006	16.07	28.43	19.75	0.2779	0.3038	(0.0259)	(0.0211)	(0.0536)	(0.0747)
2007	11.51	29.22	10.58	0.3189	0.4227	(0.1038)	(0.0178)	(0.1917)	(0.2095)
2008	11.93	27.52	11.43	0.2884	0.3885	(0.1001)	(0.0178)	(0.1877)	(0.2055)
2009	14.12	28.89	13.98	0.2877	0.3400	(0.0523)	(0.0133)	(0.1352)	(0.1485)
2010	12.88	29.84	12.01	0.0000	0.4139	(0.4139)	(0.0168)	(0.1346)	(0.1514)
2011	13.51	33.52	11.94	0.0000	0.4139	(0.4139)	(0.0168)	(0.1346)	(0.1514)
2012	14.74	36.83	12.93	0.0000	0.4139	(0.4139)	(0.0168)	(0.1346)	(0.1514)
Employment	n	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
17. Vietna	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0225	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3593
1991	0.0233	0.0000	0.0000	0.0000	0.2919	(0.0431)	0.0000	0.0000	0.3465
1992	0.0242	0.0000	0.0000	0.0000	0.0271	(0.0027)	0.0000	0.0000	0.3095
1993	0.0233	0.0000	0.0000	0.0000	(0.0170)	0.0017	0.0000	0.0000	0.2814
1994	0.0208	0.0000	0.0000	0.0000	(0.1260)	0.0126	0.0000	0.0000	0.2332
1995	0.0113	0.0000	0.0000	0.0000	0.0159	(0.0018)	0.0000	0.0705	0.2106
1996	0.0169	0.0000	0.0000	0.0000	(0.0274)	0.0031	0.0000	0.0575	0.1878
1997	0.0157	0.0000	0.0000	0.0000	0.0373	(0.0043)	0.0000	0.0317	0.1335
1998	0.0148	0.0000	0.0000	0.0000	0.0572	(0.0063)	0.0000	0.0724	0.1339
1999	0.0143	0.0000	0.0000	0.0000	0.0335	(0.0035)	0.0000	0.0409	0.1092
2000	0.0145	0.0000	0.0000	0.0000	0.0384	(0.0038)	0.0000	(0.0167)	0.0886
2001	0.0148	0.0000	0.0000	0.0000	0.0005	(0.0001)	0.0000	(0.0040)	0.0776
2002	0.0147	0.0000	0.0000	0.0000	0.0168	(0.0016)	0.0000	0.0382	0.0764
2003	0.0147	0.0000	0.0000	0.0000	(0.0041)	0.0004	0.0000	0.0309	0.0823
2004	0.0145	0.0000	0.0000	0.0000	(0.0204)	0.0019	0.0000	0.0788	0.0848
2005	0.0027	0.0000	0.0000	0.0000	0.0217	(0.0021)	0.0000	0.0826	0.1076
2006	0.0123	0.0000	0.0000	0.0000	0.0179	(0.0017)	0.0000	0.0740	0.1003
2007	0.0119	0.0000	0.0000	0.0000	0.0089	(0.0008)	0.0000	0.0829	0.1043
2008	0.0115	0.0000	0.0000	0.0000	0.0104	(0.0010)	0.0000	0.2313	0.1504
2009	0.0111	0.0000	0.0000	0.0000	(0.0358)	0.0032	0.0000	0.0698	0.0925
2010	0.0109	0.0000	0.0000	0.0000	0.0215	(0.0020)	0.0000	0.0894	0.1233
2011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1314
2012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1314

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C9-2 **Vietnam:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta}{}^{*}{}_{(i)}$	$HA_{\beta}{}^{*}{}_{(i)G}$	$HA_{\beta}{}^{*}{}_{(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
17. Vietnam		G	PRI		G	PRI		G	PRI
1990	0.7955	0.8776	0.7731	6.9741	7.1446	(17.2607)	1.0938	1.1272	2.5442
1991	0.6543	0.8395	0.6085	2.4018	4.6215	2.5407	0.4214	0.7573	0.4433
1992	0.5776	0.8114	0.5190	1.7129	3.1596	1.7947	0.3252	0.5380	0.3401
1993	0.5614	0.8130	0.4931	1.3946	3.0979	1.1895	0.2718	0.5196	0.2413
1994	0.5539	0.7889	0.4891	1.3278	2.7719	1.0920	0.2471	0.4440	0.2138
1995	0.5414	0.7964	0.4667	1.1762	2.1277	0.9891	0.1659	0.2521	0.1482
1996	0.5564	0.8065	0.4787	1.2930	2.3960	1.0654	0.2181	0.3438	0.1910
1997	0.5698	0.8265	0.4857	1.3722	2.8047	1.1005	0.2209	0.3836	0.1888
1998	0.5865	0.8435	0.5017	1.4479	3.0121	1.1383	0.2237	0.3959	0.1881
1999	0.6219	0.8688	0.5343	1.5664	3.3917	1.2278	0.2312	0.4327	0.1927
2000	0.6436	0.8895	0.5471	1.6760	3.8277	1.3015	0.2455	0.4866	0.2026
2001	0.6660	0.8971	0.5745	1.8282	4.0194	1.3762	0.2663	0.5131	0.2140
2002	0.6820	0.9070	0.5884	1.9467	4.1660	1.4841	0.2801	0.5282	0.2271
2003	0.6907	0.9128	0.5928	2.0385	4.5057	1.5306	0.2921	0.5704	0.2336
2004	0.6990	0.9162	0.5986	2.0972	4.7739	1.5393	0.2968	0.5989	0.2325
2005	0.7023	0.9203	0.5989	1.9162	4.5822	1.3519	0.1193	0.2500	0.0909
2006	0.7098	0.9243	0.6069	2.1392	5.0312	1.5261	0.2767	0.5774	0.2116
2007	0.7213	0.9245	0.6304	2.2270	5.0691	1.6261	0.2825	0.5726	0.2200
2008	0.7085	0.9179	0.6211	2.1416	4.6420	1.6098	0.2696	0.5179	0.2156
2009	0.7229	0.9195	0.6404	2.3190	4.9168	1.7662	0.2841	0.5394	0.2287
2010	0.7413	0.9252	0.6659	2.3533	4.8662	1.8194	0.2825	0.5267	0.2298
2011	0.7714	0.9343	0.7041	2.5888	5.2401	2.0264	0.0000	0.0000	0.0000
2012	0.7965	0.9418	0.7359	3.0027	5.9677	2.3737	0.0000	0.0000	0.0000
Key ratios	α	δ_0	β^*	Ω	$g_A{}^*=i(1-\beta^*)$	$x=r^*/g_Y{}^*$	$r^*=\alpha/\Omega$	$r^*{}_G=\alpha_G/\Omega_G$	$r^*{}_{PRI}=\alpha_P/\Omega_P$
17. Vietnam						$x=a/(i\cdot b^*)$		G	PRI
1990	0.3487	0.6208	0.9163	2.4781	0.0079	4.0247	0.1407	0.0446	0.1706
1991	0.2038	0.6566	0.7553	1.4726	0.0287	2.3027	0.1384	0.0715	0.1612
1992	0.1408	0.8077	0.6712	1.1471	0.0412	1.6748	0.1227	0.1333	0.1186
1993	0.1054	0.7590	0.6147	1.1191	0.0829	0.7969	0.0942	0.1259	0.0799
1994	0.1030	0.7891	0.6018	1.0910	0.0843	0.8081	0.0944	0.1438	0.0724
1995	0.0961	0.8041	0.5682	1.0553	0.0882	0.8277	0.0911	0.2388	0.0172
1996	0.1021	0.7325	0.5942	1.1074	0.0891	0.7824	0.0922	0.2161	0.0273
1997	0.0925	0.6072	0.6057	1.1836	0.0879	0.6850	0.0782	0.1762	0.0235
1998	0.0983	0.5262	0.6197	1.2602	0.0882	0.6834	0.0780	0.1785	0.0222
1999	0.1701	0.5425	0.6569	1.3460	0.0715	1.2425	0.1264	0.1719	0.1001
2000	0.1841	0.4917	0.6757	1.4524	0.0757	1.1662	0.1267	0.1568	0.1076
2001	0.1949	0.4505	0.6974	1.5820	0.0754	1.1213	0.1232	0.1649	0.0974
2002	0.1940	0.4057	0.7102	1.7035	0.0818	0.9676	0.1139	0.1589	0.0850
2003	0.1859	0.3745	0.7176	1.7919	0.0859	0.8517	0.1037	0.1446	0.0760
2004	0.1930	0.3669	0.7250	1.8473	0.0854	0.8571	0.1045	0.1358	0.0823
2005	0.2057	0.2920	0.7075	1.8690	0.0861	0.9874	0.1100	0.1353	0.0916
2006	0.2080	0.3547	0.7322	1.9137	0.0814	0.9350	0.1087	0.1337	0.0904
2007	0.1975	0.3034	0.7374	2.0529	0.1110	0.6337	0.0962	0.1324	0.0725
2008	0.1802	0.3025	0.7255	1.9696	0.1067	0.6394	0.0915	0.1424	0.0601
2009	0.1847	0.2960	0.7420	2.1036	0.0877	0.7322	0.0878	0.1327	0.0608
2010	0.2328	0.3134	0.7561	2.1750	0.1009	0.7440	0.1070	0.1399	0.0883
2011	0.2328	0.2179	0.7714	2.5888	0.0946	0.7292	0.0899	0.1205	0.0732
2012	0.2328	0.1942	0.7965	3.0027	0.0842	0.7063	0.0775	0.1058	0.0625
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
17. Vietnam					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1990	0.0962	0.2384	0.683	0.309	3.198	6528	0.0424	8125	1.0000
1991	0.1574	0.2318	1.137	0.262	2.890	2686	0.0492	11500	1.0000
1992	0.2203	0.2527	1.795	0.227	2.852	1649	0.0261	10565	1.0000
1993	0.1998	0.2236	2.122	0.206	3.186	1738	0.0074	10843	1.0000
1994	0.1997	0.2178	2.115	0.156	2.649	2364	0.0107	11051	1.0000
1995	0.2083	0.2198	2.287	0.129	2.416	2034	0.0077	11015	1.0000
1996	0.2100	0.2325	2.278	0.109	2.181	2379	0.0132	11149	1.0000
1997	0.2119	0.2507	2.710	0.066	1.845	3330	0.0061	12292	1.0000
1998	0.2134	0.2690	2.737	0.066	1.847	4468	0.0097	13890	1.0000
1999	0.3003	0.4041	2.376	0.001	1.005	6416	0.0604	14028	1.0000
2000	0.3412	0.4956	2.693	(0.021)	0.833	6676	0.0612	14514	1.0000
2001	0.3660	0.5791	2.971	(0.029)	0.765	4750	0.0475	15084	1.0000
2002	0.3459	0.5893	3.038	(0.023)	0.796	3196	0.0189	15403	1.0000
2003	0.3821	0.6848	3.684	(0.009)	0.914	3166	0.0008	15646	1.0000
2004	0.4166	0.7696	3.987	(0.007)	0.930	3704	0.0008	15777	1.0000
2005	0.4594	0.8587	4.175	0.000	1.002	3543	(0.0022)	15916	1.0000
2006	0.5012	0.9591	4.612	0.003	1.029	4916	0.0107	16054	1.0000
2007	0.5934	1.2182	6.168	0.016	1.162	2945	(0.0046)	16114	1.0000
2008	0.5750	1.1324	6.284	0.066	1.725	2171	(0.0233)	16977	1.0000
2009	0.6085	1.2801	6.931	0.013	1.147	(1.40)	(0.0411)	17941	1.0000
2010	0.6391	1.3901	5.971	0.024	1.228	395.3	(0.0233)	18932	1.0000
2011	0.5370	1.3901	5.971	0.041	1.461	(427.3)	(0.0404)	18932	1.0000
2012	0.4630	1.3901	5.971	0.054	1.695	289.8	(0.0528)	18932	1.0000

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C10-1 **Mexico:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r*(i)}$	r^*-$HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y{}^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
5. Mexico	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0544	0.0299	3.13	0.0095	(0.0196)	0.0187	0.0269	(0.0789)	0.0487
1991	0.0612	0.0349	2.33	0.0150	0.0411	0.0063	0.0413	0.1543	0.0161
1992	0.0835	0.0526	1.71	0.0307	0.1398	0.0181	0.0795	0.2211	0.0503
1993	0.0589	0.0220	184.49	0.0001	0.0147	(0.0041)	0.0004	0.0668	(0.0142)
1994	0.0621	0.0178	(21.32)	(0.0008)	0.0079	(0.0032)	(0.0037)	0.0413	(0.0138)
1995	0.0728	0.0166	21.05	0.0008	0.0038	(0.0007)	0.0042	0.0300	(0.0032)
1996	0.1105	0.0221	5.87	0.0038	0.0067	0.0027	0.0226	0.0487	0.0154
1997	0.1239	0.0186	6.21	0.0030	0.0008	0.0035	0.0229	0.0071	0.0259
1998	0.0815	0.0151	(8.37)	(0.0018)	(0.0007)	(0.0025)	(0.0115)	(0.0060)	(0.0148)
1999	0.0788	0.0150	(17.79)	(0.0008)	0.0002	(0.0020)	(0.0053)	0.0016	(0.0108)
2000	0.0753	0.0174	(11.23)	(0.0016)	0.0018	(0.0046)	(0.0083)	0.0158	(0.0206)
2001	0.0355	0.0467	(6.53)	(0.0071)	0.0023	(0.0135)	(0.0126)	0.0056	(0.0214)
2002	0.0637	0.0143	11.87	0.0012	(0.0016)	0.0023	0.0066	(0.0152)	0.0098
2003	0.0709	0.0124	(80.21)	(0.0002)	0.0008	(0.0012)	(0.0010)	0.0070	(0.0070)
2004	0.0774	0.0150	5.43	0.0028	0.0012	0.0024	0.0170	0.0132	0.0112
2005	0.0718	0.0118	(22.22)	(0.0005)	0.0017	(0.0034)	(0.0038)	0.0187	(0.0200)
2006	0.0844	0.0127	71.42	0.0002	(0.0007)	0.0001	0.0014	(0.0073)	0.0009
2007	0.0799	0.0124	(71.58)	(0.0002)	(0.0023)	0.0007	(0.0013)	(0.0182)	0.0054
2008	0.0718	0.0118	(12.79)	(0.0009)	(0.0004)	(0.0019)	(0.0065)	(0.0038)	(0.0116)
2009	0.0476	0.0106	(5.42)	(0.0020)	(0.0030)	(0.0017)	(0.0108)	(0.0216)	(0.0082)
2010	0.0485	0.0110	(6.96)	(0.0016)	(0.0042)	(0.0002)	(0.0086)	(0.0306)	(0.0011)
2011	0.0541	0.0113	(9.66)	(0.0012)	(0.0034)	(0.0001)	(0.0068)	(0.0264)	(0.0003)
2012	0.0526	0.0115	(11.18)	(0.0010)	(0.0030)	(0.0001)	(0.0057)	(0.0229)	(0.0004)

Speed years	$1/\lambda^*$	$1/\lambda_G{}^*$	$1/\lambda_{PRI}{}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	s_{PRI}-i_{PRI}	bop
5. Mexico	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	31.29	14.98	35.93	0.0000	0.1302	(0.1302)	(0.0299)	(0.0215)	(0.0513)
1991	35.21	39.30	35.17	0.0000	0.1105	(0.1105)	0.0351	(0.1026)	(0.0675)
1992	38.23	62.93	34.09	0.0000	0.1047	(0.1047)	0.0504	(0.1428)	(0.0925)
1993	26.55	25.38	27.15	0.0000	0.1539	(0.1539)	0.0057	(0.0810)	(0.0753)
1994	25.20	23.62	25.84	0.0000	0.1651	(0.1651)	(0.0003)	(0.0862)	(0.0865)
1995	30.24	19.15	36.26	0.0000	0.1600	(0.1600)	(0.0059)	(0.0153)	(0.0213)
1996	44.05	20.57	95.45	0.0000	0.1915	(0.1915)	(0.0024)	(0.0206)	(0.0230)
1997	46.13	16.82	218.96	0.0000	0.2108	(0.2108)	(0.0120)	(0.0238)	(0.0358)
1998	38.18	15.53	98.71	0.0000	0.1940	(0.1940)	(0.0161)	(0.0426)	(0.0587)
1999	38.97	15.32	92.78	0.0000	0.1784	(0.1784)	(0.0172)	(0.0295)	(0.0467)
2000	35.24	15.89	76.09	0.1663	0.1800	(0.0136)	(0.0140)	(0.0350)	(0.0490)
2001	18.85	15.83	19.54	0.1556	0.1441	0.0115	(0.0081)	(0.0403)	(0.0484)
2002	32.03	15.02	54.85	0.1498	0.1381	0.0117	(0.0198)	(0.0207)	(0.0405)
2003	29.65	17.22	65.70	0.1473	0.1618	(0.0145)	(0.0111)	(0.0236)	(0.0348)
2004	33.67	16.63	89.58	0.1535	0.1436	0.0099	(0.0101)	0.0103	0.0001
2005	24.24	17.43	43.06	0.1576	0.1764	(0.0188)	(0.0075)	(0.0280)	(0.0356)
2006	21.72	16.22	35.63	0.1632	0.1982	(0.0350)	(0.0162)	(0.0197)	(0.0359)
2007	20.67	17.62	27.99	0.1648	0.2018	(0.0370)	(0.0175)	(0.0206)	(0.0381)
2008	20.05	17.22	25.20	0.1721	0.2034	(0.0313)	(0.0149)	(0.0275)	(0.0424)
2009	23.34	18.34	28.46	0.1661	0.1686	(0.0025)	(0.0218)	(0.0134)	(0.0352)
2010	23.70	17.47	29.88	0.1613	0.1674	(0.0061)	(0.0270)	(0.0021)	(0.0291)
2011	22.64	17.55	28.15	0.1641	0.1789	(0.0148)	(0.0257)	(0.0023)	(0.0280)
2012	23.23	18.35	28.89	0.1519	0.1757	(0.0238)	(0.0238)	(0.0006)	(0.0243)

Employment	n	$n_{EQUI(G)}$-n	$n_{EQUI(PRI)}$-n	n_{EQUI}-n	$n_{EQUI(G)}$-n_G	$n_{EQUI(PRI)}$-n_P	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
5. Mexico	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0203	0.0000	0.0000	0.0000	0.0000	0.0000	(0.0158)	0.2125	0.7701
1991	0.0199	0.0000	0.0000	0.0000	(0.0997)	0.0131	(0.0099)	0.2270	0.6651
1992	0.0219	0.0000	0.0000	0.0000	(0.1603)	0.0234	(0.0135)	0.1557	0.5474
1993	0.0219	0.0000	0.0000	0.0000	0.0737	(0.0127)	(0.0108)	0.0983	0.5280
1994	0.0186	0.0000	0.0000	0.0000	(0.0464)	0.0073	(0.0158)	0.0693	0.5072
1995	0.0158	0.0000	0.0000	0.0000	0.0947	(0.0158)	(0.0212)	0.3495	0.5008
1996	0.0183	0.0000	0.0000	0.0000	0.0415	(0.0062)	(0.0167)	0.3429	0.3060
1997	0.0156	0.0000	0.0000	0.0000	(0.0400)	0.0057	(0.0117)	0.2071	0.1958
1998	0.0170	0.0000	0.0000	0.0000	0.0047	(0.0007)	(0.0104)	0.1583	0.1899
1999	0.0158	0.0000	0.0000	0.0000	(0.0583)	0.0086	(0.0081)	0.1660	0.1861
2000	0.0190	0.0000	0.0000	0.0000	(0.0118)	0.0019	(0.0072)	0.0953	0.1407
2001	0.0538	0.0000	0.0000	0.0000	(0.0523)	0.0083	(0.0081)	0.0640	0.0561
2002	0.0131	0.0000	0.0000	0.0000	(0.0312)	0.0053	(0.0090)	0.0498	0.0870
2003	0.0126	0.0000	0.0000	0.0000	0.0223	(0.0039)	(0.0108)	0.0457	0.0774
2004	0.0122	0.0000	0.0000	0.0000	0.0798	(0.0136)	(0.0122)	0.0471	0.0804
2005	0.0123	0.0000	0.0000	0.0000	0.0067	(0.0010)	(0.0162)	0.0395	0.0824
2006	0.0126	0.0000	0.0000	0.0000	0.0018	(0.0003)	(0.0162)	0.0360	0.0712
2007	0.0126	0.0000	0.0000	0.0000	(0.0068)	0.0010	(0.0167)	0.0396	0.0655
2008	0.0127	0.0000	0.0000	0.0000	(0.0230)	0.0035	(0.0180)	0.0520	0.0713
2009	0.0126	0.0000	0.0000	0.0000	(0.0829)	0.0131	(0.0248)	0.0530	0.0690
2010	0.0126	0.0000	0.0000	0.0000	0.0094	(0.0016)	(0.0243)	0.0411	0.0601
2011	0.0125	0.0000	0.0000	0.0000	(0.0075)	0.0013	(0.0234)	0.0346	0.0552
2012	0.0125	0.0000	0.0000	0.0000	0.0184	(0.0032)	(0.0225)	0.0405	0.0445

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C10-2 **Mexico:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
5. Mexico		G	PRI		G	PRI		G	PRI
1990	0.6738	0.7571	0.6584	2.6786	4.0240	2.5771	0.4375	0.6392	0.4220
1991	0.6378	0.7127	0.6235	2.3264	2.1290	2.4031	0.3831	0.3421	0.3967
1992	0.6303	0.6665	0.6232	2.2162	3.5474	2.1410	0.3823	0.5710	0.3731
1993	0.5920	0.6523	0.5805	1.7495	1.8023	1.7458	0.3171	0.3172	0.3180
1994	0.5942	0.6472	0.5838	1.6578	1.7853	1.6353	0.2797	0.2922	0.2776
1995	0.5677	0.6566	0.5504	1.4232	1.6684	1.3903	0.2278	0.2533	0.2246
1996	0.5497	0.6519	0.5302	1.2409	1.5997	1.1816	0.2177	0.2615	0.2104
1997	0.5519	0.6458	0.5335	1.1893	1.6028	1.1226	0.1941	0.2442	0.1859
1998	0.5423	0.6475	0.5213	1.2418	1.6267	1.1800	0.2116	0.2578	0.2040
1999	0.5433	0.6556	0.5186	1.2559	1.5898	1.2071	0.2065	0.2430	0.2013
2000	0.5457	0.6745	0.5151	1.3083	1.6728	1.2555	0.2332	0.2752	0.2275
2001	0.5720	0.6973	0.5399	2.6578	2.8372	2.8205	0.7093	0.7380	0.7501
2002	0.5737	0.7063	0.5372	1.4740	2.1022	1.3853	0.2139	0.2819	0.2044
2003	0.5651	0.7081	0.5255	1.3623	2.0787	1.2198	0.1964	0.2724	0.1810
2004	0.5698	0.7414	0.5205	1.3932	2.1890	1.2647	0.1968	0.2777	0.1837
2005	0.5877	0.7642	0.5342	1.4670	2.3469	1.2896	0.2063	0.2951	0.1881
2006	0.6057	0.7800	0.5512	1.5217	2.7238	1.2867	0.2133	0.3418	0.1877
2007	0.6218	0.7861	0.5709	1.6311	3.2304	1.3480	0.2260	0.4029	0.1941
2008	0.6373	0.7968	0.5857	1.7632	2.9460	1.5187	0.2423	0.3678	0.2159
2009	0.6589	0.8016	0.6102	2.1009	3.6300	1.7963	0.2814	0.4490	0.2477
2010	0.6620	0.8077	0.6114	2.1290	3.8325	1.8045	0.2847	0.4728	0.2485
2011	0.6673	0.8126	0.6156	2.1196	3.7843	1.7885	0.2813	0.4631	0.2448
2012	0.6731	0.8217	0.6193	2.1907	3.9594	1.8409	0.2895	0.4822	0.2510
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
5. Mexico						$x=a/(i\cdot b^*)$		G	PRI
1990	0.1458	0.5291	0.7619	1.7292	0.0310	1.4697	0.0843	0.0031	0.1015
1991	0.1423	0.6143	0.7345	1.4807	0.0293	1.7539	0.0961	0.2291	0.0671
1992	0.1851	0.6995	0.7354	1.3596	0.0277	2.4045	0.1362	0.2557	0.1112
1993	0.1031	0.6491	0.6659	1.2738	0.0514	1.0054	0.0809	0.1664	0.0626
1994	0.1030	0.5983	0.6531	1.2893	0.0573	0.9552	0.0799	0.1380	0.0672
1995	0.1037	0.6914	0.6173	1.1590	0.0612	1.0499	0.0895	0.1550	0.0742
1996	0.1372	0.9110	0.5942	1.0345	0.0777	1.2052	0.1326	0.1814	0.1211
1997	0.1473	0.9041	0.5862	1.0339	0.0872	1.1919	0.1425	0.1460	0.1416
1998	0.1012	0.8642	0.5842	1.0473	0.0807	0.8933	0.0967	0.1412	0.0856
1999	0.0990	0.8458	0.5861	1.0551	0.0738	0.9468	0.0938	0.1635	0.0744
2000	0.0986	0.8445	0.5966	1.0627	0.0726	0.9182	0.0928	0.1827	0.0648
2001	0.0944	0.8773	0.7557	1.1486	0.0352	0.8672	0.0822	0.1376	0.0639
2002	0.0939	0.6291	0.6224	1.2036	0.0522	1.0920	0.0780	0.1100	0.0664
2003	0.0965	0.6504	0.6043	1.1594	0.0640	0.9877	0.0833	0.1224	0.0687
2004	0.1078	0.6620	0.6125	1.1673	0.0556	1.2255	0.0923	0.1489	0.0692
2005	0.1053	0.5444	0.6240	1.2597	0.0663	0.9569	0.0836	0.1558	0.0523
2006	0.1284	0.5098	0.6387	1.3222	0.0716	1.0142	0.0971	0.1212	0.0864
2007	0.1304	0.4621	0.6551	1.4120	0.0696	0.9862	0.0923	0.0797	0.0977
2008	0.1267	0.4190	0.6715	1.5151	0.0668	0.9275	0.0836	0.1200	0.0676
2009	0.1000	0.3717	0.7027	1.7169	0.0501	0.8442	0.0582	0.0692	0.0533
2010	0.1034	0.3722	0.7063	1.7346	0.0492	0.8743	0.0596	0.0614	0.0587
2011	0.1148	0.3657	0.7080	1.7536	0.0522	0.9062	0.0654	0.0700	0.0633
2012	0.1153	0.3611	0.7149	1.7990	0.0501	0.9179	0.0641	0.0714	0.0606
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
5. Mexico					$gy^{**}=gy^*/gy^*(US)$		$e^*(US)=e(US)+(r^*-r^*(US))$		
1990	0.2508	0.4337	2.976	0.716	9.491	0.79	(0.0141)	2.931	1.0048
1991	0.2901	0.4296	3.018	0.604	7.282	0.76	0.0069	3.078	0.9977
1992	0.3005	0.4086	2.207	0.464	4.407	0.69	0.0396	3.155	0.9875
1993	0.3262	0.4155	4.032	0.469	6.798	0.80	(0.0059)	3.100	1.0019
1994	0.3360	0.4332	4.205	0.445	6.571	1.68	(0.0038)	5.321	1.0007
1995	0.3937	0.4563	4.401	0.428	5.784	2.02	0.0061	7.649	0.9992
1996	0.4232	0.4378	3.192	0.196	2.474	1.85	0.0536	7.905	0.9932
1997	0.4367	0.4516	3.065	0.072	1.505	2.07	0.0704	8.154	0.9914
1998	0.4588	0.4805	4.746	0.108	2.121	3.46	0.0284	9.893	0.9971
1999	0.4654	0.4911	4.961	0.107	2.143	4.57	0.0278	9.542	0.9971
2000	0.4438	0.4716	4.784	0.065	1.704	5.07	0.0272	9.599	0.9972
2001	0.4548	0.5225	5.533	0.021	1.251	6.94	0.0064	9.149	0.9993
2002	0.4463	0.5372	5.723	0.023	1.299	3.77	(0.0169)	10.30	1.0016
2003	0.4338	0.5030	5.210	0.007	1.078	3.39	(0.0196)	11.22	1.0017
2004	0.4201	0.4904	4.550	0.003	1.033	4.49	(0.0113)	11.25	1.0010
2005	0.4159	0.5239	4.975	0.011	1.127	3.51	(0.0286)	10.75	1.0027
2006	0.4018	0.5313	4.138	(0.013)	0.864	4.17	(0.0009)	10.88	1.0001
2007	0.3753	0.5299	4.064	(0.014)	0.844	3.43	(0.0085)	10.86	1.0008
2008	0.3783	0.5732	4.525	(0.001)	0.994	2.95	(0.0312)	13.51	1.0023
2009	0.3631	0.6233	6.233	0.021	1.367	(0.00)	(0.0707)	12.99	1.0054
2010	0.3543	0.6146	5.947	0.012	1.193	0.62	(0.0708)	12.29	1.0058
2011	0.3561	0.6244	5.441	0.001	1.016	(0.66)	(0.0649)	13.93	1.0047
2012	0.3479	0.6258	5.428	(0.008)	0.874	0.39	(0.0663)	12.94	1.0051

Data source: KEWT 8.14-1 for 17 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C11-1 **Argentina:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
1. Argenti	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.4121	(0.0909)	0.8663	(0.1049)	0.0164	(0.4595)	0.3709	(0.0064)	3.7872
1991	1.7692	(0.2112)	0.9398	(0.2248)	0.0224	0.5642	1.6577	(0.0437)	(7.5958)
1992	3.7410	(0.5190)	0.9744	(0.5326)	0.0154	0.3888	3.3067	(0.0364)	(4.0190)
1993	0.3800	0.0485	1.3844	0.0350	(0.0138)	0.3699	0.3095	(0.0261)	4.4942
1994	0.2677	0.0358	1.5913	0.0225	(0.0075)	0.0562	0.1907	(0.0216)	0.6045
1995	0.1778	0.0330	1.8184	0.0182	(0.0107)	0.0339	0.1160	(0.0198)	0.2731
1996	0.1438	0.0216	2.4010	0.0090	(0.0062)	0.0197	0.0689	(0.0445)	0.1536
1997	0.1250	0.0162	3.3190	0.0049	(0.0032)	0.0096	0.0426	(0.0251)	0.0869
1998	0.1027	0.0154	5.0348	0.0031	(0.0050)	0.0066	0.0235	(0.0280)	0.0553
1999	0.0954	0.0199	2.4912	0.0080	(0.0133)	0.0181	0.0463	(0.0741)	0.1062
2000	0.0801	0.0170	2.7953	0.0061	(0.0129)	0.0133	0.0348	(0.0602)	0.0805
2001	0.0667	0.0178	2.3719	0.0075	(0.0110)	(0.0345)	0.0356	(0.6481)	2.8920
2002	0.1044	0.0255	1.6076	0.0159	(0.0101)	(0.0092)	0.0808	(0.4259)	6.9049
2003	0.1127	0.0187	1.9359	0.0096	(0.0085)	(0.0093)	0.0678	(0.1863)	(4.3928)
2004	0.1284	0.0148	2.6315	0.0056	(0.0078)	(0.0069)	0.0544	(0.0858)	0.5564
2005	0.1418	0.0168	2.2668	0.0074	(0.0107)	(0.0111)	0.0700	(0.3736)	(1.4344)
2006	0.1819	0.0200	1.9639	0.0102	(0.0131)	(0.0216)	0.1028	(0.1655)	(0.4988)
2007	0.1847	0.0189	2.0565	0.0092	(0.0095)	(0.0166)	0.0990	(0.1296)	(0.4911)
2008	0.2128	0.0103	1.8796	0.0055	(0.0048)	(0.0090)	0.1187	(0.1226)	(0.5591)
2009	0.1416	0.0266	1.4758	0.0180	(0.0091)	(0.0107)	0.1140	(0.1658)	(0.9152)
2010	0.2098	0.0608	1.5792	0.0385	(0.0419)	(0.0385)	0.1713	(0.0298)	(1.1158)
2011	0.2273	0.0660	1.6698	0.0395	(0.0330)	(0.0643)	0.1756	(0.0850)	(0.9677)
2012	0.1827	0.0623	1.7509	0.0356	(0.0772)	(0.0494)	0.1400	(0.0506)	(1.0348)

Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
1. Argenti	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	8.35	12.10	11.36	0.0116	(0.0883)	0.0999	(0.0020)	0.0497	0.0477
1991	11.86	4.48	15.56	0.1166	(0.0942)	0.2108	(0.0058)	0.0099	0.0041
1992	15.84	4.07	17.17	0.1329	(0.0700)	0.2029	(0.0004)	(0.0277)	(0.0281)
1993	8.04	57.80	6.63	0.1535	0.1217	0.0318	(0.0074)	(0.0334)	(0.0408)
1994	7.90	343.70	7.09	0.1606	0.1267	0.0339	(0.0081)	(0.0420)	(0.0501)
1995	7.93	53.85	7.72	0.1445	0.1147	0.0298	(0.0061)	(0.0187)	(0.0248)
1996	6.89	16.94	8.68	0.1457	0.1296	0.0160	(0.0214)	(0.0085)	(0.0299)
1997	5.12	18.05	7.73	0.1560	0.1442	0.0118	(0.0165)	(0.0320)	(0.0485)
1998	2.19	21.59	5.63	0.1606	0.1497	0.0109	(0.0154)	(0.0404)	(0.0558)
1999	232.29	17.98	5.22	0.1451	0.1168	0.0283	(0.0318)	(0.0168)	(0.0487)
2000	54.39	23.40	33.79	0.1304	0.1127	0.0177	(0.0267)	(0.0096)	(0.0362)
2001	45.75	1.00	1.31	0.1142	0.0945	0.0198	(0.8432)	0.8257	(0.0174)
2002	59.05	1.66	0.67	0.0964	0.0897	0.0067	(0.8044)	0.8910	0.0866
2003	62.70	6.49	1.55	0.1219	0.1143	0.0076	(0.3704)	0.4268	0.0564
2004	52.07	13.44	10.03	0.1545	0.1610	(0.0065)	(0.1615)	0.1782	0.0168
2005	59.36	0.47	7.97	0.1728	0.1585	0.0144	(0.8836)	0.9112	0.0277
2006	80.41	2.27	60.24	0.1881	0.1716	0.0165	(0.3644)	0.3989	0.0345
2007	111.06	8.30	90.51	0.1950	0.1799	0.0151	(0.2741)	0.2993	0.0253
2008	146.62	8.37	38.31	0.1867	0.1785	0.0082	(0.2365)	0.2680	0.0315
2009	332.92	5.62	18.09	0.1685	0.0903	0.0783	(0.3476)	0.4412	0.0936
2010	6.20	33.85	0.74	#VALUE!	0.1302	#VALUE!	(0.0327)	0.0999	0.0672
2011	6.60	14.80	1.58	0.1048	0.1526	(0.0478)	(0.0992)	0.1516	0.0524
2012	1.80	23.91	0.28	0.8605	0.1318	0.7286	(0.0513)	0.1006	0.0493

Employment	n	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
1. Argenti	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0140	0.0000	0.0000	0.0000	0.0000	0.0000	(0.0414)	2.8000	0.4409
1991	0.0135	0.0000	0.0000	0.0000	(0.2214)	0.0629	(0.0284)	1.7206	0.5112
1992	0.0136	0.0000	0.0000	0.0000	0.0101	(0.0037)	(0.0324)	0.2485	0.7890
1993	0.0135	0.0000	0.0000	0.0000	0.3787	(0.1378)	(0.0410)	0.1073	0.1815
1994	0.0133	0.0000	0.0000	0.0000	0.0210	(0.0042)	(0.0527)	0.0409	0.1642
1995	0.0149	0.0000	0.0000	0.0000	(0.0036)	0.0007	(0.0720)	0.0341	0.1455
1996	0.0126	0.0000	0.0000	0.0000	0.0677	(0.0133)	(0.0747)	0.0020	0.0835
1997	0.0113	0.0000	0.0000	0.0000	0.0344	(0.0062)	(0.0603)	0.0050	0.0762
1998	0.0123	0.0000	0.0000	0.0000	(0.0370)	0.0064	(0.0545)	0.0089	0.0910
1999	0.0119	0.0000	0.0000	0.0000	(0.1199)	0.0217	(0.0608)	(0.0118)	0.0905
2000	0.0109	0.0000	0.0000	0.0000	0.0032	(0.0007)	(0.0662)	(0.0089)	0.0939
2001	0.0103	0.0000	0.0000	0.0000	(0.0268)	0.0055	(0.0815)	(0.0110)	0.2593
2002	0.0096	0.0000	0.0000	0.0000	0.0907	(0.0193)	(0.0788)	0.2588	0.4913
2003	0.0090	0.0000	0.0000	0.0000	0.0754	(0.0143)	(0.0756)	0.1349	0.1728
2004	0.0092	0.0000	0.0000	0.0000	0.0132	(0.0023)	(0.0612)	0.0439	0.0530
2005	0.0094	0.0000	0.0000	0.0000	(0.0889)	0.0152	(0.0522)	0.0834	0.0448
2006	0.0098	0.0000	0.0000	0.0000	(0.0964)	0.0182	(0.0459)	0.1090	0.0663
2007	0.0097	0.0000	0.0000	0.0000	(0.0392)	0.0083	(0.0383)	0.0884	0.0916
2008	0.0048	0.0000	0.0000	0.0000	(0.0520)	0.0115	(0.0356)	0.0862	0.1844
2009	0.0086	0.0000	0.0000	0.0000	(0.0608)	0.0143	(0.0392)	0.0625	0.1300
2010	0.0223	0.0000	0.0000	0.0000	(0.1335)	0.0295	(0.0351)	0.2784	0.0448
2011	0.0265	0.0000	0.0000	0.0000	(0.1157)	0.0272	(0.0338)	0.2883	0.0749
2012	0.0267	0.0000	0.0000	0.0000	(0.0900)	0.0227	(0.0324)	0.3345	0.0783

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C11-2 **Argentina:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
1. Argentina		G	PRI		G	PRI		G	PRI
1990	0.5498	0.8340	0.1242	0.6769	1.4858	0.0824	0.1148	0.2298	0.0291
1991	0.2753	0.6307	(0.1234)	0.2084	1.2630	(0.0547)	0.0484	0.2017	#NUM!
1992	0.1631	0.5687	(0.2720)	0.1023	1.0031	(0.1024)	0.0315	0.1690	#NUM!
1993	0.2108	0.5921	0.0287	0.2671	3.0335	0.0280	0.0644	0.4053	0.0184
1994	0.2804	0.5913	0.1546	0.3903	2.1361	0.1753	0.0813	0.2966	0.0493
1995	0.3399	0.5970	0.2452	0.5434	3.1364	0.3247	0.1076	0.4377	0.0761
1996	0.3865	0.6341	0.3009	0.6490	1.8398	0.4405	0.1125	0.2530	0.0861
1997	0.4274	0.6566	0.3523	0.7552	1.9392	0.5492	0.1189	0.2492	0.0949
1998	0.4737	0.6671	0.4117	0.9251	2.2339	0.7080	0.1441	0.2945	0.1181
1999	0.5236	0.6793	0.4703	1.1663	2.5937	0.9158	0.1685	0.3334	0.1390
2000	0.5484	0.6930	0.4998	1.3043	2.9027	1.0339	0.1768	0.3526	0.1466
2001	0.5815	0.8814	0.0926	1.5604	10.7042	0.0828	0.1982	1.1552	0.0278
2002	0.5769	0.9291	(6.5920)	1.4296	18.0646	(0.6821)	0.1770	1.8392	#NUM!
2003	0.5567	0.9366	12.3087	1.2468	12.9877	(0.9315)	0.1537	1.2730	0.0255
2004	0.5577	0.9345	(25.4282)	1.1824	12.8430	(0.8025)	0.1484	1.2709	#NUM!
2005	0.5597	0.9450	2.3652	1.1740	77.3182	(1.2504)	0.1484	7.6980	0.0792
2006	0.5661	0.9391	2.4942	1.1376	45.7895	(1.1916)	0.1465	4.6689	0.0771
2007	0.5609	0.9329	2.9673	1.1089	14.2353	(1.1851)	0.1429	1.4492	0.0700
2008	0.5528	0.9233	4.3711	1.0119	12.3871	(0.9807)	0.0934	0.8929	0.0334
2009	0.5375	0.9209	3.0811	1.1463	13.7338	(1.1689)	0.1393	1.3219	0.0624
2010	0.4673	0.8746	(2.2040)	0.8981	(18.6733)	(0.5295)	0.1840	2.7056	#NUM!
2011	0.4733	0.8690	(1.7701)	0.8989	11.8471	(0.4923)	0.1996	2.0141	#NUM!
2012	0.4392	0.8534	(1.7127)	0.8619	(13.3046)	(0.4998)	0.1969	2.0752	#NUM!
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
1. Argentina						$x=a/(i \cdot b^*)$		G	PRI
1990	0.2790	(1.8691)	0.4877	0.8683	(0.0452)	(6.4772)	0.3213	(0.0120)	3.6716
1991	0.3687	(0.3163)	0.2507	0.2367	(0.0706)	(15.6175)	1.5580	(0.0701)	(7.7779)
1992	0.3826	(0.1941)	0.1438	0.1187	(0.0599)	(38.0251)	3.2220	(0.0686)	(4.1601)
1993	0.1015	(0.2005)	0.2315	0.2369	0.0935	3.6018	0.4285	(0.0005)	4.6578
1994	0.1045	(0.3046)	0.3063	0.3443	0.0879	2.6913	0.3034	0.0166	0.7473
1995	0.0966	(0.5808)	0.3790	0.4583	0.0712	2.2219	0.2109	0.0077	0.3928
1996	0.0934	(0.7794)	0.4203	0.5641	0.0752	1.7138	0.1655	0.0467	0.2521
1997	0.0944	(1.3654)	0.4575	0.6684	0.0782	1.4312	0.1413	0.0630	0.1890
1998	0.0950	7.3455	0.5086	0.8045	0.0736	1.2478	0.1181	0.0406	0.1583
1999	0.1113	1.1251	0.5704	0.9651	0.0502	1.6706	0.1153	(0.0078)	0.1762
2000	0.1045	0.8118	0.5955	1.0756	0.0456	1.5570	0.0972	(0.0092)	0.1468
2001	0.1041	0.6307	0.6376	1.2321	0.0342	1.7289	0.0845	(0.0409)	2.0307
2002	0.1493	0.7376	0.6292	1.1488	0.0333	2.6458	0.1300	(0.0204)	(0.3014)
2003	0.1405	0.8234	0.5941	1.0696	0.0464	2.0685	0.1313	0.0123	(0.1488)
2004	0.1518	0.8297	0.5845	1.0599	0.0669	1.6129	0.1432	0.0150	(0.1818)
2005	0.1665	0.8621	0.5871	1.0497	0.0654	1.7894	0.1586	(0.0454)	(0.2234)
2006	0.2069	0.9336	0.5916	1.0249	0.0701	2.0375	0.2018	(0.0417)	(0.2722)
2007	0.2048	0.9829	0.5847	1.0059	0.0747	1.9465	0.2036	0.0032	(0.2040)
2008	0.2153	1.1363	0.5644	0.9653	0.0778	2.1369	0.2230	0.0005	(0.2614)
2009	0.1623	1.1101	0.5799	0.9652	0.0379	3.1016	0.1682	(0.0096)	(0.1844)
2010	0.1884	3.9349	0.5308	0.6964	0.0611	2.7264	0.2705	(0.0140)	(0.4699)
2011	0.2043	3.4416	0.5369	0.6967	0.0707	2.4931	0.2932	(0.0168)	(0.5698)
2012	0.1575	9.9900	0.5123	0.6427	0.0643	2.3317	0.2450	(0.0331)	(0.4749)
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
1. Argentina					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1990	0.1453	0.1262	0.452	0.029	1.089	(0.05)	0.2229	0.7814	0.7147
1991	0.4902	0.1160	0.315	(1.258)	0.193	(0.04)	1.4688	2.4673	0.4047
1992	1.2659	0.1503	0.393	(2.952)	0.084	(0.04)	3.1254	4.1159	0.2407
1993	0.9015	0.2135	2.104	(0.198)	0.537	0.10	0.3417	1.3402	0.7450
1994	0.6702	0.2308	2.209	(0.103)	0.659	0.15	0.2198	1.2193	0.8198
1995	0.4883	0.2238	2.316	(0.032)	0.847	0.15	0.1275	1.1275	0.8869
1996	0.4469	0.2521	2.700	(0.060)	0.635	0.17	0.0865	1.0860	0.9203
1997	0.4400	0.2941	3.115	(0.049)	0.654	0.22	0.0692	1.0687	0.9353
1998	0.3957	0.3183	3.350	(0.012)	0.901	0.29	0.0498	1.0493	0.9525
1999	0.3620	0.3494	3.138	(0.005)	0.957	0.55	0.0493	1.0488	0.9530
2000	0.3290	0.3539	3.385	0.014	1.141	0.67	0.0316	1.0311	0.9693
2001	0.1289	0.1588	1.525	0.193	3.278	0.65	0.0088	1.0083	0.9913
2002	0.1255	0.1442	0.966	0.387	3.977	1.49	0.0350	3.3550	0.9896
2003	0.1808	0.1933	1.377	0.060	1.458	0.89	0.0284	2.9334	0.9903
2004	0.2152	0.2281	1.502	(0.075)	0.473	0.73	0.0396	2.9986	0.9868
2005	0.2229	0.2340	1.406	(0.097)	0.388	0.74	0.0464	3.0584	0.9848
2006	0.2210	0.2265	1.095	(0.116)	0.428	0.96	0.1078	3.1498	0.9658
2007	0.2287	0.2301	1.123	(0.093)	0.543	1.07	0.1279	3.2569	0.9607
2008	0.2170	0.2095	0.973	(0.028)	0.873	0.85	0.1390	3.5720	0.9611
2009	0.2302	0.2222	1.369	(0.012)	0.931	(0.28)	(0.9159)	2.8641	1.3198
2010	0.3513	0.2446	1.298	(0.165)	0.390	0.29	(3.8135)	0.1425	27.762
2011	0.3397	0.2367	1.159	(0.152)	0.481	48.50	(3.7908)	0.4932	8.6864
2012	0.4306	0.2767	1.757	(0.104)	0.574	128.71	(3.8390)	1.0590	4.6251

Data source: KEWT 8.14-4 for 19 Europe Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C12-1 **Bolivia:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
2. Bolivia	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	(0.0026)	0.1774	1.1399	0.1556	(0.4344)	0.0033	0.1533	(0.9601)	0.2488
1991	0.0963	0.1062	1.2974	0.0819	(0.1559)	0.1532	0.1561	(0.6680)	0.2393
1992	0.1192	0.0973	1.3505	0.0721	(0.3963)	0.1114	0.1603	(0.7754)	0.2525
1993	0.1213	0.0982	1.3347	0.0736	(0.0559)	0.1106	0.1645	(0.8755)	0.2630
1994	0.0891	0.1398	1.2076	0.1158	(0.3912)	0.1624	0.1896	(0.6188)	0.2673
1995	0.1212	0.1206	1.2417	0.0971	(0.0905)	0.0739	0.1947	(0.2825)	0.2575
1996	0.1428	0.1083	1.2893	0.0840	(0.0621)	0.0637	0.1947	(0.2371)	0.2631
1997	0.1656	0.0688	1.5258	0.0451	(0.0524)	0.0841	0.1536	(0.3195)	0.2401
1998	0.1574	0.0524	2.0648	0.0254	(0.0697)	0.0449	0.1016	(0.2970)	0.1771
1999	0.1322	0.0627	1.5147	0.0414	(0.0769)	0.0384	0.1286	(0.2898)	0.2188
2000	0.1225	0.0645	1.4785	0.0436	(0.2267)	0.0381	0.1265	(0.3881)	0.2283
2001	0.0119	0.1729	1.3095	0.1320	(0.3212)	0.1884	0.1412	(0.5705)	0.3008
2002	0.0991	0.0793	1.3550	0.0585	(0.1397)	0.1030	0.1317	(0.6089)	0.3115
2003	0.0469	0.1393	1.1601	0.1201	(0.5033)	0.2317	0.1605	(0.5475)	0.3243
2004	0.1040	0.0930	1.2544	0.0742	(0.3837)	(0.0286)	0.1570	(0.4996)	0.3144
2005	0.0955	0.1142	1.1936	0.0956	0.0320	0.0688	0.1757	0.0532	0.2073
2006	0.1154	0.1437	1.1449	0.1255	0.6745	0.0564	0.2263	0.4496	0.1843
2007	0.1623	0.1046	1.1914	0.0878	0.0804	0.0910	0.2240	0.3190	0.2027
2008	0.2138	0.0719	1.2750	0.0564	0.2754	0.0382	0.2241	0.4933	0.1694
2009	0.1044	0.0575	1.3953	0.0412	(0.1148)	0.0535	0.1160	(0.2133)	0.1602
2010	0.1190	0.0658	1.3490	0.0488	(0.0648)	0.0589	0.1370	(0.1353)	0.1729
2011	0.1559	0.0486	1.4794	0.0328	(0.0224)	0.0491	0.1382	(0.1477)	0.1840
2012	0.1505	0.0699	1.3324	0.0525	0.1153	0.0420	0.1654	0.3792	0.1315
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
2. Bolivia	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	53.55	9.73	55.13	0.0988	0.0173	0.0815	(0.0582)	0.0453	(0.0130)
1991	99.35	7.38	63.46	0.1139	0.0515	0.0624	(0.0529)	(0.0088)	(0.0617)
1992	323.82	5.55	1360.10	0.1283	0.0641	0.0643	(0.0510)	(0.0503)	(0.1013)
1993	223.18	66.71	385.11	0.1311	0.0625	0.0685	(0.0533)	(0.0512)	(0.1046)
1994	83.53	1.63	79.10	0.1168	0.0379	0.0789	(0.0367)	(0.0255)	(0.0622)
1995	104.84	9.00	7.99	0.1222	0.0477	0.0745	(0.0243)	(0.0278)	(0.0521)
1996	15.54	7.29	4.05	0.1272	0.0588	0.0684	(0.0260)	(0.0267)	(0.0527)
1997	1.31	5.08	10.02	0.1492	0.0970	0.0522	(0.0481)	(0.0446)	(0.0927)
1998	3.75	3.29	5.62	0.1821	0.1416	0.0405	(0.0460)	(0.0988)	(0.1448)
1999	51.04	7.44	10.21	0.1502	0.0873	0.0629	(0.0459)	(0.0710)	(0.1169)
2000	164.89	34.24	13.26	0.1407	0.0803	0.0604	(0.0501)	(0.0515)	(0.1017)
2001	28.81	12.21	107.83	0.1095	0.0367	0.0728	(0.0818)	0.0224	(0.0594)
2002	107.61	2.17	189.63	0.1231	0.0595	0.0636	(0.1056)	0.0372	(0.0683)
2003	65.14	30.51	78.14	0.0996	0.0251	0.0745	(0.0789)	0.0703	(0.0086)
2004	216.53	33.99	21.62	0.0919	0.0467	0.0452	(0.0669)	0.0745	0.0076
2005	128.18	106.97	61.12	0.1022	0.0366	0.0656	0.0045	0.0343	0.0388
2006	263.96	40.08	10.87	0.1124	0.0322	0.0803	0.0484	0.0528	0.1012
2007	18.54	2.63	55.60	0.1269	0.0470	0.0799	0.0270	0.0576	0.0846
2008	2.71	231.77	3.33	0.1357	0.0736	0.0620	0.0463	0.0317	0.0780
2009	98.55	130.02	92.32	260818	0.0671	260818	(0.0259)	0.0576	0.0317
2010	124.54	179.61	107.97	329075	0.0675	329075	(0.0169)	0.0941	0.0771
2011	70.33	5.11	403.22	354024	0.0962	354024	(0.0299)	0.0940	0.0641
2012	502.82	4.62	181.69	357252	0.0749	357251	0.0364	0.0692	0.1056
Employment	**n**	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
2. Bolivia	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0218	0.0000	(0.0217)	0.0000	0.0000	0.0000	(0.0329)	0.1728	0.0529
1991	0.0244	0.0000	0.0000	0.0000	(0.0295)	0.0054	(0.0266)	0.2140	0.1089
1992	0.0253	0.0000	0.0000	0.0000	(0.0722)	0.0136	(0.0227)	0.1199	0.0940
1993	0.0246	(0.0236)	0.0000	0.0000	(0.0645)	0.0083	(0.0270)	0.0852	0.0864
1994	0.0240	0.0000	0.0000	0.0000	(0.0119)	0.0026	(0.0140)	0.0797	0.0248
1995	0.0235	0.0000	(0.0135)	0.0000	0.0025	(0.0140)	(0.0162)	0.1013	0.0480
1996	0.0243	0.0000	(0.0143)	0.0000	0.0193	(0.0185)	(0.0171)	0.1240	0.0681
1997	0.0237	0.0000	0.0000	0.0000	(0.0443)	0.0094	(0.0167)	0.0472	0.0960
1998	0.0270	0.0000	0.0000	0.0000	(0.0241)	0.0054	(0.0225)	0.0773	0.1042
1999	0.0213	0.0000	(0.0113)	0.0000	(0.0454)	(0.0009)	(0.0324)	0.0224	0.0976
2000	0.0209	0.0000	(0.0109)	0.0000	0.0192	(0.0155)	(0.0338)	0.0451	0.0923
2001	0.0409	0.0000	(0.0259)	0.0000	(0.0850)	(0.0058)	(0.0383)	0.0163	(0.0283)
2002	0.0208	0.0000	(0.0108)	0.0000	(0.0139)	(0.0072)	(0.0392)	0.0092	0.0418
2003	0.0192	0.0000	0.0000	0.0000	(0.0332)	0.0088	(0.0437)	0.0341	(0.0363)
2004	0.0189	0.0000	(0.0218)	0.0000	0.0153	(0.0260)		0.0440	0.0070
2005	0.0185	0.0000	(0.0085)	0.0000	0.0151	(0.0126)		0.0204	(0.0009)
2006	0.0182	0.0000	(0.0082)	0.0000	0.0883	(0.0316)		0.0430	(0.0272)
2007	0.0168	0.0000	0.0000	0.0000	0.0216	(0.0051)		0.0872	0.0005
2008	0.0155	0.0000	0.0000	0.0000	0.0480	(0.0111)		0.1393	0.0427
2009	0.0163	0.0000	0.0000	0.0000	(0.0879)	0.0192		0.0341	0.0549
2010	0.0170	0.0000	0.0000	0.0000	0.0452	(0.0109)		0.0247	0.0181
2011	0.0157	0.0000	0.0000	0.0000	(0.0044)	0.0010		0.0979	0.0330
2012	0.0174	0.0000	0.0000	0.0000	0.0122	(0.0028)		0.0459	0.0094

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C12-2 **Bolivia:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
2. Bolivia		G	PRI		G	PRI		G	PRI
1990	0.4936	0.3064	0.5120	(53.9625)	1.3033	0.8378	7.9004	0.2878	0.0117
1991	0.4599	0.3233	0.4797	1.4963	0.8253	2.0014	0.2915	0.2079	0.3683
1992	0.4508	0.3034	0.4736	1.2393	1.2565	1.2346	0.2546	0.2909	0.2498
1993	0.4488	0.2802	0.4747	1.2246	0.6239	1.1859	0.2490	0.0364	0.2385
1994	0.4329	0.2730	0.4588	1.6358	1.2665	1.6813	0.3117	0.2763	0.3154
1995	0.4150	0.2861	0.4337	1.1843	0.6277	0.8709	0.2371	0.1579	0.1210
1996	0.4045	0.3160	0.4170	0.9997	0.6538	0.7689	0.2112	0.1642	0.1103
1997	0.4213	0.3781	0.4301	0.8629	0.7925	0.9248	0.1865	0.1881	0.1943
1998	0.4505	0.4114	0.4587	0.9115	1.0149	0.8954	0.2074	0.2415	0.2019
1999	0.4737	0.4351	0.4795	1.1089	1.2192	0.8840	0.2143	0.2487	0.1217
2000	0.4816	0.4347	0.4889	1.1869	2.4661	0.8928	0.2239	0.4421	0.1221
2001	0.4896	0.4410	0.4947	12.1905	2.7857	1.9665	2.5459	0.7020	0.2831
2002	0.4904	0.4658	0.4939	1.4529	1.9885	1.0850	0.2631	0.3935	0.1409
2003	0.4758	0.4409	0.4847	3.0347	16.1576	2.4408	0.4756	2.3527	0.3865
2004	0.4632	0.4239	0.4676	1.3755	4.7412	0.6187	0.2398	0.7469	0.0499
2005	0.4522	0.4155	0.4591	1.5208	1.6571	1.0486	0.2578	0.2816	0.1402
2006	0.4263	0.3998	0.4303	1.3780	(1.0045)	0.9271	0.2350	0.0676	0.1284
2007	0.4177	0.4123	0.4189	0.9764	0.7285	1.0994	0.1721	0.1358	0.1893
2008	0.4140	0.3990	0.4172	0.7753	1.1040	0.7791	0.1385	0.1773	0.1400
2009	0.5245	0.4052	0.5464	1.4308	1.6540	1.4264	0.2298	0.2734	0.2268
2010	0.5174	0.4057	0.5373	1.3703	1.3804	1.3800	0.2262	0.2391	0.2254
2011	0.5033	0.4226	0.5187	1.0869	0.8771	1.1500	0.1806	0.1617	0.1871
2012	0.5015	0.4287	0.5154	1.1889	0.8017	1.2868	0.2034	0.1470	0.2176
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
2. Bolivia						$x=a/(i\cdot b^*)$		G	PRI
1990	0.1429	1.0484	1.0158	0.8176	(0.0003)	8.1470	0.1747	(0.9119)	0.2563
1991	0.1441	1.5844	0.6417	0.7114	0.0184	4.3627	0.2025	(0.5637)	0.2773
1992	0.1478	1.9569	0.5985	0.6824	0.0257	3.8527	0.2166	(0.7260)	0.3098
1993	0.1486	2.0069	0.5958	0.6767	0.0253	3.9877	0.2196	(0.8598)	0.3215
1994	0.1458	1.6702	0.6623	0.6368	0.0128	5.8158	0.2290	(0.5807)	0.3069
1995	0.1435	2.5016	0.5860	0.5936	0.0197	5.1367	0.2418	(0.2092)	0.2923
1996	0.1427	4.1769	0.5443	0.5686	0.0268	4.4566	0.2511	(0.1444)	0.3044
1997	0.1429	17.4330	0.5075	0.6095	0.0478	2.9019	0.2344	(0.1748)	0.3078
1998	0.1434	5.2796	0.5222	0.6838	0.0677	1.9391	0.2098	(0.1818)	0.2838
1999	0.1466	2.0065	0.5703	0.7522	0.0375	2.9429	0.1949	(0.2095)	0.2758
2000	0.1454	1.7198	0.5864	0.7778	0.0332	3.0898	0.1870	(0.3524)	0.2883
2001	0.1456	1.0885	0.9369	0.7876	0.0023	4.2309	0.1848	(0.4979)	0.3247
2002	0.1440	1.3905	0.6340	0.8069	0.0218	3.8168	0.1784	(0.5183)	0.3417
2003	0.1423	1.2100	0.7829	0.7639	0.0054	7.2459	0.1862	(0.5266)	0.3513
2004	0.1430	1.6514	0.6205	0.7259	0.0177	4.9302	0.1970	(0.4750)	0.3463
2005	0.1452	1.6174	0.6444	0.6927	0.0130	6.1648	0.2097	0.0839	0.2374
2006	0.1590	1.9537	0.6252	0.6138	0.0121	7.9029	0.2591	0.4617	0.2170
2007	0.1584	4.1547	0.5412	0.5937	0.0216	6.2236	0.2669	0.3857	0.2401
2008	0.1658	(8.4135)	0.4856	0.5803	0.0379	4.6368	0.2857	0.5211	0.2381
2009	0.1494	1.1493	0.6309	0.9230	0.0248	3.5297	0.1619	(0.1830)	0.2089
2010	0.1630	1.2453	0.6248	0.8824	0.0253	3.8654	0.1847	(0.0998)	0.2229
2011	0.1694	1.6609	0.5707	0.8286	0.0413	3.0858	0.2045	(0.0438)	0.2431
2012	0.1789	1.5383	0.5957	0.8118	0.0303	4.0087	0.2204	0.4366	0.1860
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
2. Bolivia					$gy^{**}=gy^*/gy^*(US)$		$e^*(US)=e(US)+(r^*-r^*(US))$		
1990	0.1208	0.0988	0.6916	0.056	1.318	(64.1831)	0.0764	3.4764	0.9780
1991	0.1615	0.1149	0.7972	0.013	1.062	0.8033	0.1134	3.8584	0.9706
1992	0.1979	0.1351	0.9139	(0.025)	0.883	0.5363	0.1200	4.2150	0.9715
1993	0.2406	0.1628	1.0957	(0.035)	0.841	1.5524	0.1328	4.6078	0.9712
1994	0.2895	0.1843	1.2643	(0.064)	0.719	4.7249	0.1453	4.8403	0.9700
1995	0.3206	0.1903	1.3259	(0.073)	0.697	2.5037	0.1585	5.0935	0.9689
1996	0.4226	0.2403	1.6834	(0.075)	0.703	2.4014	0.1721	5.3571	0.9679
1997	0.4499	0.2742	1.9194	(0.070)	0.703	1.8216	0.1623	5.5273	0.9706
1998	0.4048	0.2768	1.9296	(0.053)	0.747	1.6806	0.1415	5.7865	0.9755
1999	0.3478	0.2616	1.7849	(0.035)	0.823	4.2312	0.1289	6.1189	0.9789
2000	0.3527	0.2743	1.8865	(0.030)	0.839	5.6575	0.1214	6.5114	0.9814
2001	0.4076	0.3210	2.2050	(0.040)	0.782	62.149	0.1091	6.9291	0.9843
2002	0.3793	0.3060	2.1259	(0.057)	0.679	5.1579	0.0835	7.5735	0.9890
2003	0.4329	0.3307	2.3247	(0.083)	0.553	20.415	0.0833	7.9133	0.9895
2004	0.3619	0.2627	1.8373	(0.097)	0.508	7.5669	0.0933	8.1433	0.9885
2005	0.4135	0.2864	1.9721	(0.096)	0.540	10.250	0.0975	8.1375	0.9880
2006	0.5036	0.3091	1.9437	(0.143)	0.450	15.469	0.1650	8.1450	0.9797
2007	0.6542	0.3884	2.4514	(0.162)	0.394	9.5606	0.1911	7.8111	0.9755
2008	0.7114	0.4129	2.4905	(0.171)	0.401	3.8048	0.2016	7.2216	0.9721
2009	0.5234	0.4831	3.2329	(0.049)	0.694	(0.7995)	0.0778	7.0978	0.9890
2010	0.5522	0.4873	2.9891	(0.101)	0.454	1.2639	0.1007	7.0907	0.9858
2011	0.5752	0.4766	2.8135	(0.123)	0.399	139.72	0.1204	7.0304	0.9829
2012	0.6123	0.4971	2.7779	(0.141)	0.360	381.49	0.1364	7.1564	0.9809

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C13-1 **Chile:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
4. Chile	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0870	0.0126	6.9633	0.0018	0.0044	(0.0000)	0.0143	0.0716	(0.0002)
1991	0.0784	0.0196	7.0170	0.0028	0.0118	(0.0007)	0.0140	0.0834	(0.0033)
1992	0.0970	0.0188	8.1917	0.0023	0.0132	(0.0026)	0.0141	0.1196	(0.0143)
1993	0.1226	0.0193	8.3458	0.0023	0.0137	(0.0006)	0.0170	0.1024	(0.0041)
1994	0.1797	0.0243	2.9262	0.0083	0.0105	0.0076	0.0697	0.0959	0.0629
1995	0.0996	0.0361	4.8173	0.0075	0.0357	0.0022	0.0282	0.1129	0.0085
1996	0.0756	0.0146	(10.3861)	(0.0014)	0.0217	(0.0051)	(0.0087)	0.1035	(0.0332)
1997	0.0727	0.0127	(7.8220)	(0.0016)	0.0170	(0.0047)	(0.0109)	0.0936	(0.0330)
1998	0.0532	0.0102	(3.0849)	(0.0033)	0.0062	(0.0059)	(0.0205)	0.0456	(0.0352)
1999	0.0444	0.0122	(25.9550)	(0.0005)	(0.0007)	(0.0005)	(0.0022)	(0.0062)	(0.0020)
2000	0.0482	0.0114	(10.0321)	(0.0011)	0.0045	(0.0026)	(0.0059)	0.0256	(0.0135)
2001	0.0699	0.0133	13.9780	0.0010	0.0136	(0.0009)	0.0060	0.0587	(0.0057)
2002	0.0730	0.0130	8.7945	0.0015	0.0070	0.0005	0.0098	0.0391	0.0034
2003	0.0735	0.0121	9.2180	0.0013	0.0083	(0.0000)	0.0093	0.0528	(0.0001)
2004	0.1261	0.0175	2.5562	0.0068	0.0192	0.0049	0.0562	0.1228	0.0422
2005	0.1461	0.0185	2.5158	0.0074	0.0324	0.0041	0.0655	0.1995	0.0386
2006	0.2177	0.0215	1.9452	0.0110	0.0355	0.0075	0.1230	0.3057	0.0874
2007	0.1995	0.0209	1.9759	0.0106	0.0518	0.0060	0.1115	0.3463	0.0683
2008	0.1292	0.0134	3.5108	0.0038	0.0283	0.0011	0.0406	0.2047	0.0119
2009	0.0628	0.0146	4.4146	0.0033	(0.0019)	0.0069	0.0175	(0.0243)	0.0261
2010	0.0773	0.0120	4.6480	0.0026	0.0065	0.0017	0.0192	0.0545	0.0120
2011	0.0611	0.0095	46.3927	0.0002	0.0107	(0.0018)	0.0015	0.0761	(0.0136)
2012	0.0507	0.0073	(5.1263)	(0.0014)	0.0120	(0.0036)	(0.0113)	0.0800	(0.0294)
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
4. Chile	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	21.21	21.00	23.76	0.1438	0.2323	(0.0885)	0.0089	(0.0370)	(0.0281)
1991	22.23	24.47	22.51	0.1119	0.2023	(0.0903)	0.0171	(0.0302)	(0.0131)
1992	19.90	25.83	19.56	0.1397	0.2296	(0.0899)	0.0245	(0.0591)	(0.0346)
1993	17.82	25.43	16.65	0.1606	0.2783	(0.1176)	0.0206	(0.0857)	(0.0651)
1994	21.15	23.67	20.86	0.1416	0.2893	(0.1477)	0.0170	(0.0540)	(0.0370)
1995	20.54	29.31	19.13	0.1533	0.2258	(0.0725)	0.0262	(0.0452)	(0.0190)
1996	18.51	33.18	16.46	0.1465	0.2299	(0.0834)	0.0234	(0.0789)	(0.0555)
1997	18.28	31.16	16.42	0.1597	0.2323	(0.0726)	0.0199	(0.0788)	(0.0589)
1998	19.09	22.21	18.65	0.1491	0.2142	(0.0652)	0.0040	(0.0667)	(0.0627)
1999	26.82	17.14	32.00	0.0818	0.1550	(0.0733)	(0.0150)	0.0064	(0.0086)
2000	24.11	25.47	23.94	0.0864	0.1742	(0.0879)	0.0015	(0.0234)	(0.0218)
2001	22.15	36.60	20.15	0.0920	0.2049	(0.1129)	0.0158	(0.0365)	(0.0207)
2002	22.58	29.09	21.46	0.0850	0.2085	(0.1236)	0.0074	(0.0248)	(0.0174)
2003	22.41	29.50	21.19	0.0798	0.2126	(0.1328)	0.0123	(0.0323)	(0.0200)
2004	25.38	39.69	23.20	0.0774	0.2327	(0.1553)	0.0367	(0.0267)	0.0100
2005	24.90	53.24	21.44	0.1053	0.2621	(0.1568)	0.0617	(0.0636)	(0.0019)
2006	31.95	71.31	27.50	0.0881	0.2890	(0.2008)	0.0909	(0.0640)	0.0269
2007	31.51	94.87	25.87	0.0970	0.2823	(0.1853)	0.1057	(0.0791)	0.0266
2008	22.52	54.02	19.33	0.1033	0.2995	(0.1962)	0.0630	(0.1047)	(0.0416)
2009	28.23	13.76	38.55	0.1018	0.1862	(0.0844)	(0.0284)	0.0407	0.0122
2010	24.95	26.82	24.62	0.0884	0.2123	(0.1239)	0.0124	(0.0171)	(0.0047)
2011	23.14	33.57	21.42	0.0808	0.2124	(0.1316)	0.0229	(0.0490)	(0.0262)
2012	21.65	37.66	19.39	0.0752	0.2188	(0.1436)	0.0255	(0.0740)	(0.0484)
Employment	**n**	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
4. Chile	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0108	0.0000	0.0000	0.0000	0.0000	0.0000	(0.0252)	0.2602	0.4761
1991	0.0168	0.0000	0.0000	0.0000	0.0463	(0.0073)	(0.0239)	0.2180	0.2662
1992	0.0165	0.0000	0.0000	0.0000	0.0179	(0.0027)	(0.0198)	0.1538	0.2209
1993	0.0170	0.0000	0.0000	0.0000	(0.0500)	0.0073	(0.0203)	0.1279	0.2242
1994	0.0160	0.0000	0.0000	0.0000	(0.0969)	0.0150	(0.0356)	0.1146	0.1791
1995	0.0286	0.0000	0.0000	0.0000	0.0057	(0.0010)	(0.0212)	0.0823	0.0635
1996	0.0160	0.0000	0.0000	0.0000	0.0206	(0.0035)	(0.0243)	0.0733	0.0781
1997	0.0144	0.0000	0.0000	0.0000	(0.0119)	0.0020	(0.0239)	0.0623	0.0822
1998	0.0135	0.0000	0.0000	0.0000	0.0009	(0.0001)	(0.0324)	0.0507	0.0771
1999	0.0126	0.0000	0.0000	0.0000	(0.0737)	0.0124	(0.0401)	0.0333	0.0616
2000	0.0125	0.0000	0.0000	0.0000	(0.0120)	0.0022	(0.0374)	0.0384	0.0662
2001	0.0123	0.0000	0.0000	0.0000	(0.0258)	0.0048	(0.0356)	0.0360	0.0417
2002	0.0115	0.0000	0.0000	0.0000	(0.0325)	0.0062	(0.0351)	0.0241	0.0253
2003	0.0108	0.0000	0.0000	0.0000	0.0478	(0.0095)	(0.0333)	0.0283	0.0216
2004	0.0107	0.0000	0.0000	0.0000	(0.0965)	0.0181	(0.0396)	0.0110	0.0120
2005	0.0112	0.0000	0.0000	0.0000	(0.0334)	0.0070	(0.0360)	0.0309	0.0259
2006	0.0104	0.0000	0.0000	0.0000	(0.2053)	0.0447	(0.0347)	0.0340	0.0362
2007	0.0103	0.0000	0.0000	0.0000	(0.0032)	0.0009	(0.0320)	0.0435	0.0376
2008	0.0096	0.0000	0.0000	0.0000	0.1282	(0.0353)	(0.0351)	0.0880	0.0363
2009	0.0113	0.0000	0.0000	0.0000	0.0775	(0.0180)	(0.0441)	0.0196	0.0184
2010	0.0094	0.0000	0.0000	0.0000	0.0059	(0.0012)	(0.0374)	0.0140	0.0060
2011	0.0093	0.0000	0.0000	0.0000	0.0755	(0.0158)	(0.0324)	0.0335	0.0069
2012	0.0087	0.0000	0.0000	0.0000	0.0205	(0.0039)	(0.0288)	0.0296	0.0111

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Chapter 11

Table C13-2 **Chile:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
4. Chile		G	PRI		G	PRI		G	PRI
1990	0.7207	0.7758	0.7094	2.3300	1.9773	2.4799	0.2802	0.2317	0.2988
1991	0.6833	0.7597	0.6676	2.1963	2.2228	2.2078	0.3332	0.3248	0.3372
1992	0.6637	0.7571	0.6437	1.8926	1.8878	1.9078	0.2903	0.2751	0.2956
1993	0.6722	0.7520	0.6551	1.8151	2.0467	1.7658	0.2820	0.3024	0.2776
1994	0.7000	0.7597	0.6867	1.7752	1.9906	1.7296	0.2634	0.2849	0.2588
1995	0.6662	0.7236	0.6539	2.0927	2.4521	2.0279	0.4138	0.4657	0.4047
1996	0.6587	0.7114	0.6480	1.9348	2.1386	1.9013	0.2930	0.3107	0.2904
1997	0.6673	0.7096	0.6589	1.9874	2.0761	1.9735	0.2843	0.2875	0.2841
1998	0.6761	0.7214	0.6669	2.1707	2.1553	2.1765	0.2985	0.2891	0.3008
1999	0.6890	0.7329	0.6794	2.4804	2.4206	2.5823	0.3245	0.3128	0.3372
2000	0.6915	0.7337	0.6822	2.4176	2.6061	2.3783	0.3151	0.3320	0.3116
2001	0.7030	0.7316	0.6969	2.3296	2.6924	2.2743	0.3011	0.3385	0.2956
2002	0.7149	0.7327	0.7111	2.4073	2.5781	2.3754	0.2992	0.3157	0.2961
2003	0.7199	0.7440	0.7148	2.4315	2.5285	2.4126	0.2915	0.2981	#NUM!
2004	0.7457	0.7463	0.7456	2.3327	2.2176	2.3656	0.2745	0.2597	0.2786
2005	0.7595	0.7459	0.7623	2.3241	1.9485	2.4349	0.2780	0.2334	0.2910
2006	0.7981	0.7477	0.8086	2.2205	1.5361	2.4398	0.2515	0.1787	0.2748
2007	0.8002	0.7402	0.8121	2.3371	1.5269	2.6194	0.2629	0.1768	0.2928
2008	0.7798	0.7347	0.7882	2.5812	1.8155	2.8058	0.2836	0.2039	0.3070
2009	0.7546	0.7477	0.7560	3.0346	2.3576	3.4370	0.3628	0.2870	0.4066
2010	0.7502	0.7470	0.7509	2.7153	2.3870	2.7942	0.2991	0.2639	0.3075
2011	0.7408	0.7513	0.7387	2.7286	2.4450	2.7954	0.3008	0.2676	0.3086
2012	0.7391	0.7500	0.7369	2.7613	2.4836	2.8304	0.2941	0.2619	0.3020
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
4. Chile						$x=a/(i \cdot b^*)$		G	PRI
1990	0.2027	0.3441	0.7471	2.0349	0.0588	1.1677	0.0996	0.2469	0.0668
1991	0.1721	0.4319	0.7295	1.7571	0.0547	1.1662	0.0979	0.2023	0.0734
1992	0.1836	0.4625	0.7021	1.5852	0.0684	1.1390	0.1158	0.2693	0.0772
1993	0.2225	0.4796	0.7036	1.5682	0.0825	1.1361	0.1419	0.2290	0.1204
1994	0.3191	0.5408	0.7259	1.5640	0.0793	1.5191	0.2040	0.2425	0.1945
1995	0.2083	0.5709	0.7311	1.5360	0.0607	1.2620	0.1356	0.2033	0.1197
1996	0.1462	0.4201	0.6972	1.6219	0.0696	0.9122	0.0901	0.1797	0.0702
1997	0.1446	0.3870	0.7021	1.6913	0.0692	0.8866	0.0855	0.1730	0.0668
1998	0.1154	0.3417	0.7132	1.8217	0.0614	0.7552	0.0633	0.1452	0.0455
1999	0.1102	0.3579	0.7384	1.9471	0.0406	0.9629	0.0566	0.0999	0.0464
2000	0.1164	0.3414	0.7348	1.9564	0.0462	0.9094	0.0595	0.0972	0.0505
2001	0.1629	0.3514	0.7380	1.9577	0.0537	1.0771	0.0832	0.1119	0.0767
2002	0.1758	0.3405	0.7471	2.0430	0.0527	1.1283	0.0860	0.1035	0.0822
2003	0.1787	0.3283	0.7495	2.0882	0.0532	1.1217	0.0856	0.1214	0.0778
2004	0.2941	0.4054	0.7696	2.0483	0.0536	1.6426	0.1436	0.1909	0.1337
2005	0.3396	0.4297	0.7806	2.0625	0.0575	1.6597	0.1647	0.2683	0.1440
2006	0.4834	0.5208	0.8128	2.0212	0.0541	2.0580	0.2392	0.3956	0.2091
2007	0.4662	0.4961	0.8156	2.1155	0.0521	2.0247	0.2204	0.4153	0.1850
2008	0.3335	0.3771	0.7963	2.3379	0.0610	1.3983	0.1426	0.2744	0.1199
2009	0.1904	0.3241	0.7913	2.4612	0.0389	1.2929	0.0774	0.1193	0.0689
2010	0.2100	0.3130	0.7763	2.3506	0.0475	1.2741	0.0893	0.1337	0.0803
2011	0.1666	0.2816	0.7677	2.3601	0.0493	1.0220	0.0706	0.1421	0.0561
2012	0.1399	0.2494	0.7640	2.4155	0.0516	0.8368	0.0579	0.1377	0.0420
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
4. Chile						gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))	
1990	0.2184	0.4443	2.1922	0.389	4.906	27.44	0.0013	336.9	1.0000
1991	0.2475	0.4348	2.5269	0.188	2.918	26.23	0.0088	374.9	1.0000
1992	0.2610	0.4137	2.2528	0.124	2.069	18.04	0.0193	382.3	0.9999
1993	0.2648	0.4153	1.8669	0.102	1.716	41.86	0.0551	431.1	0.9999
1994	0.2403	0.3759	1.1781	(0.001)	0.997	52.26	0.1203	404.2	0.9997
1995	0.2666	0.4094	1.9653	(0.036)	0.734	62.09	0.0523	407.2	0.9999
1996	0.2748	0.4456	3.0481	0.003	1.028	75.51	0.0112	425.0	1.0000
1997	0.2948	0.4986	3.4482	0.009	1.110	102.89	0.0134	439.8	1.0000
1998	0.2945	0.5365	4.6497	0.024	1.378	160.48	(0.0049)	473.8	1.0000
1999	0.3064	0.5966	5.4129	0.017	1.304	361.26	(0.0094)	530.1	1.0000
2000	0.3045	0.5958	5.1173	0.018	1.304	376.49	(0.0060)	572.7	1.0000
2001	0.2662	0.5211	3.1995	(0.028)	0.661	252.87	0.0074	656.2	1.0000
2002	0.2534	0.5178	2.9457	(0.048)	0.445	195.02	(0.0089)	712.4	1.0000
2003	0.2268	0.4737	2.6504	(0.052)	0.394	153.01	(0.0173)	599.4	1.0000
2004	0.2403	0.4923	1.6738	(0.114)	0.205	143.37	0.0399	559.9	0.9999
2005	0.2545	0.5250	1.5458	(0.120)	0.270	114.51	0.0524	514.3	0.9999
2006	0.2576	0.5206	1.0769	(0.181)	0.241	141.90	0.1451	534.6	0.9997
2007	0.2712	0.5737	1.2305	(0.162)	0.265	163.56	0.1447	496.0	0.9997
2008	0.2710	0.6335	1.8996	(0.093)	0.348	169.20	0.0586	629.2	0.9999
2009	0.2460	0.6055	3.1797	(0.044)	0.426	(32.35)	(1.0067)	467.4	1.0022
2010	0.2348	0.5519	2.6280	(0.071)	0.201	47.45	(0.9947)	520.5	1.0019
2011	0.2652	0.6260	3.7567	(0.054)	0.232	6430	(1.0134)	377.6	1.0027
2012	0.2606	0.6296	4.5013	(0.040)	0.318	16924	(1.0261)	505.4	1.0020

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C14-1 **Columbia:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit	$HA_{r*(i)}$	$r^*-HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
5. Colombi	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.1165	0.0281	2.2738	0.0124	0.0012	0.0187	0.0636	0.0091	0.0830
1991	0.1114	0.0415	1.5292	0.0271	0.0059	0.0499	0.1000	0.0509	0.1095
1992	0.1121	0.0295	1.7584	0.0168	(0.0065)	0.0612	0.0805	(0.0755)	0.1553
1993	0.1289	0.0223	2.2975	0.0097	0.0020	0.0143	0.0658	0.0180	0.0877
1994	0.1433	0.0120	7.7065	0.0016	(0.0040)	0.0035	0.0202	(0.0308)	0.0499
1995	0.1564	0.0134	4.4449	0.0030	(0.0055)	0.0055	0.0382	(0.0555)	0.0743
1996	0.1313	0.0183	3.4388	0.0053	(0.0495)	0.0126	0.0435	(0.2027)	0.1179
1997	0.1434	0.0235	2.4361	0.0097	(0.1775)	0.0169	0.0685	(0.2763)	0.1466
1998	0.1545	0.0268	1.8937	0.0141	(0.0374)	0.0268	0.0957	(0.2530)	0.1820
1999	0.1157	0.0745	1.2759	0.0584	(0.0672)	0.1835	0.1490	(0.3519)	0.2971
2000	0.1068	0.0492	1.5224	0.0323	(0.0738)	0.0713	0.1025	(0.2692)	0.2148
2001	0.1242	0.0588	1.5105	0.0389	(0.1648)	0.0574	0.1211	(0.2177)	0.2117
2002	0.1301	0.0415	1.6453	0.0252	(0.0302)	0.0598	0.1043	(0.1990)	0.1995
2003	0.1011	0.0240	2.9211	0.0082	(0.0238)	0.0151	0.0428	(0.0962)	0.0838
2004	0.1017	0.0547	1.4048	0.0389	(0.0074)	(0.0560)	0.1113	(0.1364)	0.2184
2005	0.0921	0.0595	1.3453	0.0443	0.5057	(0.0463)	0.1127	0.5389	(0.1443)
2006	0.1034	0.0341	1.8138	0.0188	(0.0067)	(0.1120)	0.0758	(0.1019)	0.1657
2007	0.1041	0.0287	2.0998	0.0137	0.0007	0.0335	0.0633	0.0058	0.0964
2008	0.1023	0.0270	2.1812	0.0124	0.0109	0.0130	0.0593	0.0557	0.0606
2009	0.0930	0.0236	2.5628	0.0092	(0.0019)	0.0243	0.0455	(0.0137)	0.0909
2010	0.0862	0.0253	2.2377	0.0113	0.0020	0.0208	0.0498	0.0095	0.0874
2011	0.1033	0.0234	2.4395	0.0096	0.0015	0.0178	0.0519	0.0096	0.0857
2012	0.0917	0.0208	2.7364	0.0076	(0.0010)	0.0168	0.0411	(0.0067)	0.0790
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
5. Colombi	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	35.58	17.35	0.56	0.1340	0.1256	0.0084	(0.0090)	0.0421	0.0331
1991	16.87	20.23	18.30	0.1176	0.0727	0.0449	0.0011	0.0750	0.0761
1992	4.00	10.82	10.27	0.1253	0.0834	0.0419	(0.0370)	0.0553	0.0182
1993	6.22	19.16	9.89	0.1514	0.1181	0.0333	(0.0083)	(0.0114)	(0.0197)
1994	5.40	39.81	5.53	0.1876	0.1924	(0.0048)	(0.0169)	(0.0686)	(0.0855)
1995	4.22	49.82	4.88	0.1804	0.1945	(0.0141)	(0.0255)	(0.0649)	(0.0904)
1996	2.54	199.93	2.64	0.1740	0.1585	0.0155	(0.0417)	(0.0445)	(0.0862)
1997	0.00	78.95	1.89	0.1628	0.1461	0.0167	(0.0411)	(0.0493)	(0.0904)
1998	4.08	8.71	10.99	0.1525	0.1279	0.0246	(0.0549)	(0.0304)	(0.0853)
1999	32471.04	8.65	100.82	0.1067	0.0526	0.0541	(0.0773)	0.0628	(0.0145)
2000	31.96	1.92	50.71	0.1417	0.0713	0.0704	(0.0563)	0.0493	(0.0069)
2001	64.99	46.16	40.82	0.1522	0.0827	0.0695	(0.0371)	(0.0032)	(0.0403)
2002	37.50	19.02	90.03	0.1582	0.0976	0.0607	(0.0577)	0.0038	(0.0539)
2003	23.92	111.98	16.11	0.1754	0.1281	0.0473	(0.0283)	(0.0251)	(0.0534)
2004	35.34	10.33	23.15	0.1616	0.0574	0.1042	(0.0919)	0.1040	0.0121
2005	45.06	117.80	7.48	0.1741	0.0472	0.1270	0.1384	(0.1060)	0.0324
2006	0.15	8.90	113.19	0.1956	0.0830	0.1126	(0.0726)	0.0938	0.0212
2007	0.44	17.00	13.03	0.1960	0.0972	0.0988	(0.0160)	0.0290	0.0130
2008	1.94	28.27	10.27	0.1998	0.1005	0.0993	0.0104	0.0098	0.0201
2009	11.22	16.98	10.14	0.1923	0.1074	0.0849	(0.0217)	0.0301	0.0084
2010	33.93	25.34	9.00	1.1921	0.0940	1.0981	(0.0060)	0.0264	0.0205
2011	23.92	20.27	8.22	1.1832	0.1170	1.0662	(0.0095)	0.0357	0.0262
2012	102.70	19.07	7.01	1.5141	0.1164	1.3977	(0.0167)	0.0370	0.0203
Employment	**n**	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
5. Colombi	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0157	0.0000	0.0000	0.0000	0.0000	0.0000	(0.0459)	0.2902	0.4239
1991	0.0143	0.0000	0.0000	0.0000	0.0113	(0.0017)	(0.0441)	0.3040	0.4295
1992	0.0127	0.0000	0.0000	0.0000	(0.1272)	0.0188	(0.0414)	0.2681	0.3435
1993	0.0126	0.0000	0.0000	0.0000	0.0159	(0.0027)	(0.0351)	0.2279	0.3357
1994	0.0105	0.0000	0.0000	0.0000	(0.2446)	0.0407	(0.0342)	0.2380	0.3930
1995	0.0104	0.0000	0.0000	0.0000	(0.0584)	0.0126	(0.0392)	0.2092	0.4138
1996	0.0130	0.0000	0.0000	0.0000	(0.1983)	0.0457	(0.0536)	0.2029	0.4016
1997	0.0139	0.0000	0.0000	0.0000	(0.1292)	0.0373	(0.0545)	0.1857	0.3187
1998	0.0126	0.0000	0.0000	0.0000	(0.0387)	0.0131	(0.0675)	0.1868	0.3956
1999	0.0161	0.0000	0.0000	0.0000	(0.1007)	0.0358	(0.0905)	0.1090	0.1832
2000	0.0169	0.0000	0.0000	0.0000	0.0788	(0.0319)	(0.0923)	0.0917	0.1387
2001	0.0199	0.0000	0.0000	0.0000	(0.0120)	0.0043	(0.0662)	0.0800	0.1484
2002	0.0163	0.0000	0.0000	0.0000	0.0623	(0.0229)	(0.2565)	0.0630	0.1218
2003	0.0158	0.0000	0.0000	0.0000	0.0881	(0.0298)	(0.0639)	0.0714	0.1279
2004	0.0158	0.0000	0.0000	0.0000	0.0465	(0.0139)	(0.0612)	0.0593	0.0961
2005	0.0153	0.0000	0.0000	0.0000	0.0892	(0.0252)	(0.0531)	0.0504	0.0861
2006	0.0153	0.0000	0.0000	0.0000	0.0416	(0.0105)	(0.0545)	0.0430	0.0948
2007	0.0151	0.0000	0.0000	0.0000	0.0075	(0.0018)	(0.0500)	0.0556	0.1251
2008	0.0146	0.0000	0.0000	0.0000	0.0069	(0.0016)	(0.0509)	0.0699	0.1448
2009	0.0144	0.0000	0.0000	0.0000	(0.0661)	0.0155	(0.0540)	0.0416	0.1065
2010	0.0140	0.0000	0.0000	0.0000	(0.0257)	0.0065	(0.0531)	0.0228	0.0685
2011	0.0138	0.0000	0.0000	0.0000	0.0370	(0.0097)	(0.0486)	0.0343	0.0888
2012	0.0132	0.0000	0.0000	0.0000	(0.0242)	0.0060	(0.0468)	0.0316	0.1051

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C14-2 **Columbia:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta}{}^{*}{}_{(i)}$	$HA_{\beta}{}^{*}{}_{(i)G}$	$HA_{\beta}{}^{*}{}_{(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
5. Colombia		G	PRI		G	PRI		G	PRI
1990	0.4981	0.7145	0.4339	1.0627	2.1607	0.8735	0.1795	0.3145	0.1554
1991	0.4569	0.6997	0.3832	1.0100	1.8562	1.0351	0.1653	0.2611	0.1698
1992	0.4231	0.6670	0.3413	0.8297	1.8981	0.7703	0.1350	0.2584	0.1280
1993	0.4090	0.6504	0.3323	0.7264	1.6739	0.5432	0.1217	0.2281	0.0997
1994	0.3985	0.5315	0.3594	0.6451	1.2181	0.5368	0.1022	0.1659	0.0896
1995	0.4332	0.5210	0.4082	0.7278	1.1334	0.6440	0.1101	0.1561	0.1004
1996	0.4500	0.4578	0.4477	0.8210	1.2605	0.7515	0.1346	0.1976	0.1241
1997	0.4621	0.3953	0.4815	0.8642	2.1558	0.8314	0.1439	0.3158	0.1368
1998	0.4758	0.4069	0.4966	0.9046	0.8971	0.9064	0.1416	0.1509	0.1391
1999	0.4772	0.4163	0.4984	1.2613	1.0681	1.9427	0.2066	0.1980	0.2902
2000	0.4582	0.4243	0.4696	1.0753	1.1753	1.0583	0.1879	0.2151	0.1821
2001	0.4759	0.4195	0.4940	1.1280	3.3734	1.0319	0.2102	#NUM!	0.1922
2002	0.4877	0.4729	0.4926	1.0646	1.1322	1.0981	0.1820	0.2015	0.1838
2003	0.4903	0.4874	0.4912	1.0476	1.2828	0.9961	0.1785	0.2156	0.1701
2004	0.4457	0.5952	0.3812	1.0834	1.2490	0.4407	0.1829	0.2010	0.0965
2005	0.4329	0.5915	0.3716	1.1114	12.9127	0.9085	0.1841	1.6300	0.1646
2006	0.4299	0.6658	0.3144	0.8959	1.6676	0.2532	0.1565	0.2499	0.0675
2007	0.4375	0.6822	0.3123	0.8872	1.9046	0.6454	0.1543	0.2773	0.1236
2008	0.4491	0.6851	0.3318	0.9197	2.0844	0.5870	0.1560	0.2948	0.1139
2009	0.4715	0.6929	0.3533	1.0002	2.1541	0.6821	0.1652	0.3038	0.1252
2010	0.4820	0.6914	0.3703	1.0768	2.3845	0.7020	0.1722	0.3279	0.1257
2011	0.4903	0.7026	0.3797	1.0384	2.2277	0.6977	0.1657	0.3049	0.1241
2012	0.5063	0.7091	0.3984	1.1143	2.3570	0.7600	0.1713	0.3142	0.1290
Key ratios	α	δ_0	β^*	Ω	$g_A{}^*=i(1-\beta^*)$	$x=r^*/g_Y{}^*$	$r^*=\alpha/\Omega$	$r^*{}_G=\alpha_G/\Omega_G$	$r^*{}_{PRI}=\alpha_P/\Omega_P$
5. Colombia						$x=a/(i \cdot b^*)$		G	PRI
1990	0.1238	1.7444	0.5520	0.8562	0.0563	1.7850	0.1446	0.1278	0.1528
1991	0.1125	3.1349	0.5358	0.7361	0.0337	2.8896	0.1529	0.1742	0.1410
1992	0.0930	(4.5017)	0.4809	0.6568	0.0433	2.3186	0.1416	0.0713	0.1876
1993	0.0937	(1.2936)	0.4480	0.6195	0.0652	1.7707	0.1512	0.1293	0.1648
1994	0.0924	(0.5685)	0.4180	0.5951	0.1120	1.1491	0.1553	0.0509	0.2008
1995	0.1138	(1.1435)	0.4535	0.6705	0.1063	1.2903	0.1698	0.0498	0.2134
1996	0.1078	(3.6586)	0.4824	0.7206	0.0820	1.4100	0.1496	(0.1497)	0.2396
1997	0.1239	#########	0.5000	0.7424	0.0730	1.6963	0.1669	(0.2547)	0.2672
1998	0.1398	5.1351	0.5157	0.7711	0.0620	2.1189	0.1813	(0.1677)	0.2676
1999	0.1459	1.6527	0.6001	0.7673	0.0210	4.6239	0.1902	(0.2675)	0.3232
2000	0.1148	2.4492	0.5526	0.7362	0.0319	2.9142	0.1560	(0.2076)	0.2656
2001	0.1401	1.9176	0.5723	0.7656	0.0354	2.9590	0.1830	(0.1914)	0.2850
2002	0.1385	1.9407	0.5567	0.8071	0.0432	2.5496	0.1716	(0.0917)	0.2538
2003	0.1059	1.9557	0.5434	0.8467	0.0585	1.5205	0.1250	(0.0325)	0.1716
2004	0.1101	2.6494	0.5529	0.7044	0.0257	3.4702	0.1564	0.1555	0.1569
2005	0.1024	2.7184	0.5569	0.6750	0.0209	3.8963	0.1517	0.5552	(0.0967)
2006	0.0926	161.5376	0.5006	0.6739	0.0415	2.2288	0.1374	0.1320	0.1431
2007	0.0924	(45.8065)	0.4981	0.6953	0.0488	1.9093	0.1329	0.1268	0.1397
2008	0.0941	11.7093	0.5074	0.7279	0.0495	1.8466	0.1293	0.1303	0.1283
2009	0.0930	3.0163	0.5280	0.7977	0.0507	1.6399	0.1166	0.0897	0.1447
2010	0.0928	1.9885	0.5462	0.8327	0.0426	1.8079	0.1114	0.0768	0.1460
2011	0.1073	2.0079	0.5411	0.8469	0.0537	1.6947	0.1267	0.1002	0.1521
2012	0.1022	1.4182	0.5570	0.9086	0.0516	1.5759	0.1124	0.0823	0.1410
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_{\Pi}=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*{}_{(US)}$	$e^*{}_{(US)}$	$e_{(US)}/e^*{}_{(US)}$
5. Colombia					$gy^{**}=gy^*/gy^*(US)$		$e^*(US)=e(US)+(r^*-r^*(US))$		
1990	0.0250	0.0214	0.1732	0.307	3.126	53.15	0.0462	568.78	0.9999
1991	0.2730	0.2010	1.7862	0.318	3.081	85.98	0.0637	706.92	0.9999
1992	0.3469	0.2279	2.4504	0.231	2.634	67.23	0.0450	811.82	0.9999
1993	0.3866	0.2395	2.5565	0.207	2.368	131.39	0.0644	917.39	0.9999
1994	0.3655	0.2175	2.3534	0.250	2.608	101.48	0.0716	831.34	0.9999
1995	0.5684	0.3811	3.3482	0.257	2.516	96.30	0.0864	987.74	0.9999
1996	0.5330	0.3841	3.5632	0.270	2.807	158.43	0.0706	1005.4	0.9999
1997	0.5386	0.3998	3.2267	0.175	2.050	293.63	0.0948	1293.7	0.9999
1998	0.4981	0.3841	2.7471	0.241	2.330	492.33	0.1130	1507.6	0.9999
1999	0.5128	0.3935	2.6964	0.068	1.355	2364	0.1242	1873.9	0.9999
2000	0.4848	0.3569	3.1078	0.032	1.205	2087	0.0904	2187.1	1.0000
2001	0.4797	0.3672	2.6219	0.024	1.133	1382	0.1072	2301.4	1.0000
2002	0.4508	0.3638	2.6276	(0.008)	0.952	999.48	0.0766	2864.9	1.0000
2003	0.4265	0.3612	3.4113	0.027	1.215	703.32	0.0221	2780.8	1.0000
2004	0.4666	0.3286	2.9840	(0.006)	0.964	1627	0.0527	2412.2	1.0000
2005	0.5107	0.3447	3.3679	(0.006)	0.960	1902	0.0394	2284.3	1.0000
2006	0.5258	0.3543	3.8259	(0.009)	0.938	1354	0.0434	2225.5	1.0000
2007	0.5323	0.3701	4.0057	0.021	1.157	1190	0.0572	1987.9	1.0000
2008	0.5358	0.3900	4.1436	0.042	1.329	990.35	0.0453	2198.1	1.0000
2009	0.4906	0.3914	4.2087	0.014	1.116	(121.27)	(0.9675)	2043.2	1.0005
2010	0.4796	0.3993	4.3044	(0.018)	0.842	231.68	(3.9726)	1985.9	1.0020
2011	0.4914	0.4162	3.8789	(0.014)	0.886	32480	(3.9574)	1938.7	1.0020
2012	0.4983	0.4527	4.4313	0.013	1.120	59772	(3.9716)	1707.5	1.0023

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C15-1 **Paraguay:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rate rates of change in population and unemployment

Cost of capit:	$HA_{r^*(i)}$	$r^*-HA_{r^*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
6. Paragua	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.0896	0.0589	2.1721	0.0271	12.0483	0.0117	0.0684	0.2699	0.0202
1991	0.1168	0.0423	2.6021	0.0163	(0.1352)	0.0197	0.0612	0.0850	0.0449
1992	0.1083	0.0457	2.5374	0.0180	0.0083	0.0208	0.0607	0.0412	0.0575
1993	0.1149	0.0459	2.4242	0.0189	0.0095	0.0178	0.0663	0.0559	0.0463
1994	0.1271	0.0512	2.2510	0.0227	0.0075	0.0300	0.0792	0.0444	0.0758
1995	0.1220	0.0473	2.4085	0.0196	0.0062	0.0245	0.0703	0.0391	0.0597
1996	0.1240	0.0368	2.2839	0.0161	0.0034	0.0267	0.0704	0.0261	0.0779
1997	0.1112	0.0350	2.3775	0.0147	0.0025	0.0271	0.0615	0.0170	0.0783
1998	0.0944	0.0350	2.3157	0.0151	0.0017	0.0275	0.0559	0.0054	0.1097
1999	0.0833	0.0401	2.1509	0.0186	(0.0121)	0.0521	0.0574	(0.0426)	0.1483
2000	0.0734	0.0537	1.6414	0.0327	(0.0188)	0.1160	0.0774	(0.0645)	0.2067
2001	0.0767	0.0476	1.7595	0.0271	(0.0034)	0.0562	0.0707	(0.0090)	0.1459
2002	0.0704	0.0559	1.5629	0.0358	(0.0121)	0.1591	0.0808	(0.0502)	0.1958
2003	0.0939	0.0491	1.6723	0.0294	0.0001	0.0728	0.0855	0.0003	0.1598
2004	0.1063	0.0444	1.7733	0.0250	0.0115	0.0379	0.0850	0.0532	0.1051
2005	0.1054	0.0406	1.8810	0.0216	0.0070	0.0369	0.0776	0.0324	0.1140
2006	0.1031	0.0435	1.8784	0.0232	0.0075	0.0393	0.0780	0.0306	0.1180
2007	0.1078	0.0477	1.6208	0.0294	0.0089	0.0550	0.0959	0.0455	0.1297
2008	0.1154	0.0522	1.5245	0.0342	0.0177	0.0490	0.1099	0.0782	0.1302
2009	0.0888	0.0948	1.2285	0.0772	0.0033	0.1259	0.1495	0.0033	0.2973
2010	0.0805	0.0412	1.7263	0.0239	0.0111	0.0296	0.0705	0.0602	0.0562
2011	0.0991	0.0481	1.5473	0.0311	0.0125	0.0489	0.0952	0.0425	0.1428
2012	0.2882	0.0366	1.9974	0.0183	0.0123	0.0228	0.1626	0.0416	0.2596

Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
6. Paragua	in equilibrium	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	38.84	2.94	56.45	0.1712	0.1183	0.0529	0.0325	(0.0773)	(0.0448)
1991	115.92	3.39	17.74	0.1843	0.1493	0.0350	(0.0017)	(0.0722)	(0.0740)
1992	71.49	23.98	2.77	0.1703	0.1408	0.0294	0.0089	(0.1232)	(0.1142)
1993	186.25	24.26	1.36	0.1714	0.1399	0.0315	0.0129	(0.1304)	(0.1176)
1994	761.07	22.50	0.11	0.1750	0.1426	0.0325	0.0074	(0.2079)	(0.2005)
1995	52327.31	21.81	0.16	0.1794	0.1448	0.0347	0.0050	(0.1772)	(0.1722)
1996	412.30	21.34	3.71	0.1759	0.1408	0.0351	0.0006	(0.1726)	(0.1721)
1997	56.81	21.79	0.41	0.1764	0.1388	0.0377	(0.0016)	(0.1667)	(0.1683)
1998	41.11	27.28	2.34	0.1507	0.1259	0.0248	(0.0026)	(0.0871)	(0.0897)
1999	38.53	18.96	34.20	0.1425	0.1137	0.0288	(0.0309)	(0.0722)	(0.1031)
2000	46.12	17.25	107.87	0.1360	0.0808	0.0552	(0.0435)	(0.0583)	(0.1018)
2001	44.10	28.25	80.12	0.1351	0.0900	0.0451	(0.0095)	(0.0910)	(0.1005)
2002	49.57	17.09	62.20	0.1342	0.0726	0.0616	(0.0363)	0.0060	(0.0303)
2003	57.60	22.25	32.61	0.1475	0.0897	0.0578	(0.0073)	(0.0141)	(0.0214)
2004	71.04	27.99	1.06	0.1452	0.1025	0.0426	0.0187	(0.0403)	(0.0216)
2005	68.78	25.04	0.43	0.1502	0.1086	0.0416	0.0080	(0.0605)	(0.0526)
2006	65.75	25.20	0.94	0.1482	0.1072	0.0410	0.0072	(0.0656)	(0.0585)
2007	112.26	25.49	6.06	0.1352	0.0893	0.0459	0.0127	(0.0566)	(0.0440)
2008	1251.79	32.22	4.73	0.1371	0.0823	0.0548	0.0270	(0.0775)	(0.0505)
2009	87.56	60.54	2.34	0.0000	0.0421	(0.0421)	0.0013	0.0685	0.0698
2010	60.71	25.62	2.41	2.7977	0.0692	2.7285	0.0143	0.0202	0.0345
2011	34.92	32.81	10.30	3.3613	0.0690	3.2923	0.0107	(0.0078)	0.0030
2012	202.05	30.78	4.27	3.5102	0.2534	3.2568	0.0099	(0.0133)	(0.0034)

Employment	n	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
6. Paragua	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0318	(0.5518)	0.0000	0.0000	0.0000	0.0000	(0.0297)	0.3802	0.1011
1991	0.0261	(0.2561)	0.0000	0.0000	(0.3212)	0.0057	(0.0230)	0.2431	0.1077
1992	0.0277	0.0000	0.0000	0.0000	0.0185	(0.0017)	(0.0239)	0.1527	0.0943
1993	0.0270	0.0000	0.0000	0.0000	(0.0288)	0.0026	(0.0230)	0.1809	0.0841
1994	0.0284	0.0000	0.0000	0.0000	(0.0242)	0.0023	(0.0198)	0.2066	0.0756
1995	0.0277	0.0000	0.0000	0.0000	(0.0600)	0.0058	0.0000	0.1338	0.0930
1996	0.0207	0.0000	0.0000	0.0000	(0.0728)	0.0075	(0.0369)	0.0980	0.1067
1997	0.0203	0.0000	0.0000	0.0000	(0.0485)	0.0054	0.0000	0.0701	0.1003
1998	0.0199	0.0000	0.0000	0.0000	(0.4838)	0.0569	0.0000	0.1149	0.0953
1999	0.0214	0.0000	0.0000	0.0000	0.0129	(0.0024)	(0.0423)	0.0667	0.0816
2000	0.0210	0.0000	0.0000	0.0000	(0.0762)	0.0138	(0.0464)	0.0905	0.0650
2001	0.0206	0.0000	0.0000	0.0000	0.0468	(0.0092)	0.0000	0.0724	0.0640
2002	0.0201	0.0000	0.0000	0.0000	0.0671	(0.0125)	(0.0662)	0.1055	0.0372
2003	0.0197	0.0000	0.0000	0.0000	0.0769	(0.0132)	(0.0504)	0.1412	0.0544
2004	0.0194	0.0000	0.0000	0.0000	0.0569	(0.0089)		0.0435	0.0364
2005	0.0190	0.0000	0.0000	0.0000	(0.0996)	0.0146		0.0204	0.0507
2006	0.0203	0.0000	0.0000	0.0000	(0.0334)	0.0055		0.0960	0.0478
2007	0.0183	0.0000	0.0000	0.0000	0.0737	(0.0125)		0.0812	0.0398
2008	0.0179	0.0000	0.0000	0.0000	0.0721	(0.0112)		0.1013	0.0506
2009	0.0176	0.0000	0.0000	0.0000	(0.1460)	0.0209		0.0261	0.0200
2010	0.0173	0.0000	0.0000	0.0000	0.1087	(0.0182)		0.0463	0.0516
2011	0.0170	0.0000	0.0000	0.0000	0.0015	(0.0002)		0.0828	0.0450
2012	0.0183	0.0000	0.0000	0.0000	(0.5608)	0.0821		0.0369	0.0678

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C15-2 **Paraguay:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
6. Paraguay		G	PRI		G	PRI		G	PRI
1990	0.5409	0.7313	0.4345	1.6183	(0.0527)	1.6724	0.3548	0.1474	#NUM!
1991	0.5228	0.8074	0.4027	1.2436	0.9340	1.0955	0.2594	0.5697	0.2394
1992	0.5249	0.8522	0.4033	1.3121	3.4995	0.9466	0.2794	0.6216	0.2197
1993	0.5141	0.8468	0.3880	1.2368	3.0128	0.9346	0.2629	0.5306	0.2155
1994	0.5078	0.8448	0.3760	1.1937	2.9920	0.8926	0.2618	0.5418	0.2130
1995	0.5098	0.8439	0.3703	1.1991	2.9454	0.9037	0.2595	0.5266	0.2127
1996	0.5220	0.8456	0.3759	1.1841	3.1180	0.8305	0.2225	0.4829	0.1728
1997	0.5451	0.8545	0.3934	1.3181	3.5656	0.8948	0.2400	0.5435	0.1806
1998	0.5663	0.8056	0.4395	1.5054	4.6626	0.8961	0.2650	0.7095	0.1767
1999	0.5790	0.8138	0.4545	1.7097	5.2320	1.0749	0.3057	0.8266	0.2099
2000	0.5774	0.8039	0.4527	1.9808	5.5035	1.5426	0.3423	0.8635	0.2765
2001	0.5802	0.8104	0.4573	1.8783	5.6699	1.1532	0.3239	0.8701	0.2175
2002	0.5726	0.8214	0.4379	2.0215	5.1555	3.4861	0.3414	0.7899	0.5511
2003	0.5459	0.8187	0.4054	1.5365	4.1882	1.0810	0.2685	0.6366	0.2037
2004	0.5364	0.8214	0.3943	1.3740	3.4975	0.9063	0.2426	0.5266	0.1776
2005	0.5382	0.8072	0.4015	1.3572	3.5156	0.8742	0.2381	0.5279	0.1708
2006	0.5366	0.7992	0.4041	1.3835	3.5693	0.8909	0.2501	0.5553	0.1789
2007	0.5210	0.8037	0.3825	1.3216	3.2117	0.9555	0.2286	0.4749	0.1794
2008	0.5015	0.8024	0.3624	1.2309	3.1658	0.8149	0.2140	0.4627	0.1581
2009	0.4995	0.7731	0.3732	1.7177	184.8357	0.8466	0.2779	24.6017	0.1577
2010	0.4606	0.7706	0.3274	1.1514	2.6864	0.9681	0.2019	0.3942	0.1790
2011	0.4555	0.7625	0.3284	1.0899	3.4005	0.6689	0.1911	0.4900	0.1337
2012	0.5881	0.7383	0.5201	1.0857	3.0637	0.7792	0.1868	0.4628	0.1429
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
6. Paraguay						$x=a/(i\cdot b^*)$		G	PRI
1990	0.1450	1.0357	0.6613	0.9764	0.0401	1.8532	0.1485	0.2583	0.0751
1991	0.1452	1.2279	0.5988	0.9127	0.0599	1.6242	0.1591	0.2296	0.1043
1992	0.1420	1.1787	0.6111	0.9224	0.0548	1.6504	0.1540	0.1793	0.1342
1993	0.1421	1.3151	0.5969	0.8837	0.0564	1.7022	0.1608	0.2143	0.1166
1994	0.1517	1.4368	0.5914	0.8509	0.0583	1.7993	0.1783	0.2131	0.1477
1995	0.1462	1.3982	0.5907	0.8640	0.0592	1.7100	0.1692	0.2134	0.1272
1996	0.1468	1.2616	0.5862	0.9129	0.0583	1.7789	0.1608	0.1831	0.1382
1997	0.1465	0.9946	0.6118	1.0025	0.0539	1.7260	0.1462	0.1550	0.1368
1998	0.1421	0.8389	0.6415	1.0983	0.0451	1.7601	0.1294	0.0681	0.1889
1999	0.1425	0.7979	0.6707	1.1545	0.0374	1.8689	0.1234	0.0330	0.2092
2000	0.1454	0.8442	0.7029	1.1436	0.0240	2.5590	0.1271	0.0075	0.2440
2001	0.1441	0.8171	0.6913	1.1589	0.0278	2.3167	0.1244	0.0452	0.1992
2002	0.1423	0.8643	0.7063	1.1264	0.0213	2.7766	0.1263	0.0336	0.2206
2003	0.1443	0.9854	0.6468	1.0089	0.0317	2.4875	0.1431	0.0852	0.2032
2004	0.1461	1.0633	0.6212	0.9691	0.0388	2.2931	0.1507	0.1429	0.1589
2005	0.1431	1.0419	0.6174	0.9802	0.0415	2.1350	0.1460	0.1199	0.1727
2006	0.1426	1.0550	0.6221	0.9729	0.0405	2.1385	0.1466	0.1140	0.1790
2007	0.1424	1.1945	0.6108	0.9161	0.0348	2.6108	0.1555	0.1386	0.1728
2008	0.1421	1.4362	0.5936	0.8477	0.0335	2.9066	0.1676	0.1576	0.1778
2009	0.1526	1.2557	0.6735	0.8310	0.0138	5.3770	0.1836	0.0212	0.3389
2010	0.0927	2.0657	0.5635	0.7617	0.0302	2.3768	0.1217	0.1538	0.0891
2011	0.1081	2.4250	0.5541	0.7337	0.0308	2.8272	0.1473	0.1003	0.1925
2012	0.3129	1.0783	0.6167	0.9635	0.0971	2.0026	0.3248	0.1031	0.4674
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
6. Paraguay					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1990	0.2357	0.2302	1.5873	0.011	1.077	161.18	0.0502	1258	1.0000
1991	0.2955	0.2697	1.8570	(0.009)	0.943	91.02	0.0699	1380	0.9999
1992	0.3507	0.3235	2.2774	(0.014)	0.909	100.95	0.0574	1630	1.0000
1993	0.3807	0.3364	2.3675	(0.031)	0.808	294.64	0.0740	1880	1.0000
1994	0.3919	0.3334	2.1982	(0.051)	0.711	422.12	0.0946	1925	1.0000
1995	0.3949	0.3412	2.3335	(0.029)	0.829	333.65	0.0859	1980	1.0000
1996	0.3811	0.3480	2.3700	(0.017)	0.892	447.60	0.0819	2110	1.0000
1997	0.3536	0.3545	2.4188	(0.011)	0.926	707.34	0.0741	2360	1.0000
1998	0.2992	0.3286	2.3125	0.001	1.007	1270	0.0611	2840	1.0000
1999	0.3183	0.3675	2.5791	(0.002)	0.986	2368	0.0574	3329	1.0000
2000	0.3076	0.3518	2.4205	(0.008)	0.934	4318	0.0615	3527	1.0000
2001	0.3381	0.3918	2.7185	(0.013)	0.897	3565	0.0486	4682	1.0000
2002	0.3144	0.3541	2.4883	(0.033)	0.737	5006	0.0314	7104	1.0000
2003	0.3200	0.3228	2.2368	(0.040)	0.723	2733	0.0402	6115	1.0000
2004	0.3240	0.3140	2.1496	(0.070)	0.536	2673	0.0471	6250	1.0000
2005	0.3120	0.3059	2.1372	(0.055)	0.625	2448	0.0338	6120	1.0000
2006	0.3066	0.2983	2.0917	(0.055)	0.623	3054	0.0525	5190	1.0000
2007	0.3635	0.3330	2.3377	(0.068)	0.563	3869	0.0798	4875	1.0000
2008	0.4599	0.3899	2.7448	(0.065)	0.613	3120	0.0835	4945	1.0000
2009	0.5272	0.4381	2.8711	(0.069)	0.625	(941)	(0.9004)	4609	1.0002
2010	0.5851	0.4457	4.8093	(0.029)	0.763	752	(3.9624)	4570	1.0009
2011	0.6035	0.4428	4.0976	(0.054)	0.632	129462	(3.9368)	4436	1.0009
2012	0.4994	0.4811	1.5375	(0.220)	0.321	60852	(3.7592)	4285	1.0009

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C16-1 **Peru:** Inflation rate, real rate of return, the valuation ratio, and the costs of capital, speed years, net investment, $\Delta d + PRI = bop$, the rates of change in population and unemployment

Cost of capit:	$HA_{r*(i)}$	r^*-$HA_{r*(i)}$	$v^*=r^*/(r^*-g_Y^*)$	CC^*_{REAL}	$CC^*_{REAL(G)}$	$CC^*_{REAL(PRI)}$	$CC^*_{NOMINAL}$	$CC^*_{NOMI(G)}$	$CC^*_{NOMI(P)}$
7. Peru	max. endo. in	REAL	to bubbles	*REAL*	G	PRI	*NOMINAL*	G	PRI
1990	0.6579	0.0284	4.3099	0.0066	(0.0038)	0.0077	0.1592	(0.0982)	0.1840
1991	0.0737	0.0329	2.5342	0.0130	(0.0306)	0.0209	0.0421	(0.1613)	0.0631
1992	0.1217	0.0447	1.8434	0.0243	(0.1034)	0.0408	0.0903	(0.4547)	0.1488
1993	0.1577	0.0246	2.1060	0.0117	(0.0235)	0.0193	0.0866	(0.2801)	0.1330
1994	0.1299	0.0235	3.7114	0.0063	0.2417	(0.0002)	0.0413	0.4611	(0.0014)
1995	0.1048	0.0327	28.4554	0.0011	(0.0511)	0.0105	0.0048	(0.2944)	0.0421
1996	0.1098	0.0201	4.8494	0.0041	(0.1053)	0.0070	0.0268	(0.2068)	0.0490
1997	0.0891	0.0232	44.2447	0.0005	0.0093	(0.0011)	0.0025	0.0667	(0.0050)
1998	0.0843	0.0174	19.2834	0.0009	(0.0417)	0.0026	0.0053	(0.1053)	0.0163
1999	0.0717	0.0192	6.5529	0.0029	(0.0598)	0.0096	0.0139	(0.2747)	0.0456
2000	0.0683	0.0194	4.6520	0.0042	(0.0539)	0.0103	0.0188	(0.2320)	0.0467
2001	0.0656	0.0215	2.9699	0.0072	(0.0542)	0.0141	0.0293	(0.2190)	0.0572
2002	0.0603	0.0195	3.3434	0.0058	(0.0412)	0.0107	0.0239	(0.1577)	0.0442
2003	0.0572	0.0174	3.6968	0.0047	(0.0751)	0.0083	0.0202	(0.1496)	0.0378
2004	0.0610	0.0194	2.6908	0.0072	(0.0037)	0.0105	0.0299	(0.0310)	0.0376
2005	0.0755	0.0228	2.0519	0.0111	0.0021	0.0143	0.0479	0.0192	0.0520
2006	0.1515	0.0314	1.5523	0.0202	0.0283	0.0192	0.1179	0.1503	0.1134
2007	0.1664	0.0256	1.7199	0.0149	0.0189	0.0140	0.1116	0.2020	0.0983
2008	0.1253	0.0157	3.0913	0.0051	0.0219	0.0024	0.0456	0.2053	0.0219
2009	0.0744	0.0160	2.8935	0.0055	0.0312	0.0023	0.0313	0.1527	0.0135
2010	0.1219	0.0194	2.4344	0.0080	0.0110	0.0074	0.0580	0.0999	0.0517
2011	0.0551	0.0124	3.2284	0.0038	0.0142	0.0028	0.0209	0.0551	0.0158
2012	0.0618	0.0244	2.9946	0.0082	0.0106	0.0061	0.0288	0.0909	0.0165
Speed years	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	i_{actual}	$i_{endoge.}$	difference	Δd	$s_{PRI}-i_{PRI}$	bop
7. Peru	in equilibriu	G	PRI	actual	endogenous		G	PRI	TOTAL
1990	344.92	22.30	833.38	0.0341	0.7563	(0.7222)	(0.0245)	0.0214	(0.0031)
1991	38.56	12.39	42.52	0.1287	0.1132	0.0156	(0.0246)	(0.0326)	(0.0573)
1992	38.41	4.92	35.04	0.1281	0.1079	0.0202	(0.0411)	(0.0185)	(0.0595)
1993	4.45	6.54	4.62	0.1426	0.1344	0.0082	(0.0331)	(0.0408)	(0.0739)
1994	4.71	25.93	4.46	0.1649	0.1530	0.0119	0.0240	(0.0784)	(0.0545)
1995	0.28	2.98	1.15	0.1872	0.1786	0.0086	(0.0377)	(0.0393)	(0.0770)
1996	0.06	144.09	1.01	0.1746	0.1549	0.0197	(0.0161)	(0.0511)	(0.0672)
1997	13.00	0.52	21.61	0.1853	0.1676	0.0177	(0.0089)	(0.0508)	(0.0597)
1998	389.80	755.98	751.98	0.1836	0.1619	0.0218	(0.0126)	(0.0573)	(0.0699)
1999	52.18	27.73	54.91	0.1694	0.1336	0.0358	(0.0350)	(0.0004)	(0.0355)
2000	43.67	23.08	46.32	0.1578	0.1228	0.0350	(0.0311)	0.0008	(0.0304)
2001	41.78	21.28	44.72	0.1451	0.1067	0.0385	(0.0312)	0.0036	(0.0276)
2002	39.99	26.34	41.89	0.1374	0.1060	0.0314	(0.0238)	0.0057	(0.0182)
2003	39.05	54.95	38.62	0.1388	0.1058	0.0330	(0.0195)	0.0116	(0.0079)
2004	44.90	29.32	50.26	0.1391	0.0954	0.0437	(0.0139)	0.0473	0.0334
2005	48.21	30.54	54.81	0.1426	0.0940	0.0485	(0.0078)	0.0672	0.0594
2006	52.20	92.23	49.24	0.1502	0.1171	0.0331	0.0158	0.0751	0.0909
2007	41.90	102.49	40.07	0.1698	0.1486	0.0212	0.0204	0.0465	0.0669
2008	26.82	67.35	23.89	0.2068	0.1888	0.0180	0.0245	(0.0216)	0.0029
2009	34.27	68.19	31.10	0.1786	0.1222	0.0564	0.0217	0.0135	0.0351
2010	28.50	33.31	28.26	0.3761	0.1703	0.2058	0.0077	0.0210	0.0287
2011	38.14	58.17	36.07	1.8942	0.1018	1.7924	0.0077	0.0210	0.0287
2012	34.15	23.19	40.67	2.8372	0.1171	2.7201	0.0069	0.0337	0.0405
Employment	**n**	$n_{EQUI(G)}-n$	$n_{EQUI(PRI)}-n$	$n_{EQUI}-n$	$n_{EQUI(G)}-n_G$	$n_{EQUI(PRI)}-n_P$	Unem.rate(act	$g_{CPI(actual)}$	Infla. rate
7. Peru	under attaining equilibrium			under the same wage rate by sector			actual; to population		
1990	0.0218	0.0000	0.0000	0.0000	0.0000	0.0000	(0.0293)	4.5000	47.7166
1991	0.0199	0.0000	0.0000	0.0000	0.8415	(1.0770)	(0.0261)	4.1273	7.4821
1992	0.0205	0.0000	0.0000	0.0000	(0.0353)	0.0038	(0.0423)	0.7340	1.6933
1993	0.0129	0.0000	0.0000	0.0000	0.0024	(0.0003)	(0.0446)	0.4867	0.9494
1994	0.0172	0.0000	0.0000	0.0000	(0.0651)	0.0073	(0.0401)	0.2380	0.5125
1995	0.0316	0.0000	0.0000	0.0000	(0.1111)	0.0134	(0.0320)	0.1111	0.2393
1996	0.0159	0.0000	0.0000	0.0000	(0.0415)	0.0056	(0.0315)	0.1158	0.2409
1997	0.0227	0.0000	0.0000	0.0000	0.0312	(0.0044)	(0.0347)	0.0863	0.2768
1998	0.0165	0.0000	0.0000	0.0000	(0.0638)	0.0087	(0.0351)	0.0713	0.1508
1999	0.0163	0.0000	0.0000	0.0000	(0.0383)	0.0056	(0.0360)	0.0354	0.1285
2000	0.0152	0.0000	0.0000	0.0000	0.0176	(0.0027)	(0.0333)	0.0373	0.1066
2001	0.0142	0.0000	0.0000	0.0000	(0.0178)	0.0027	(0.0356)	0.0200	0.0802
2002	0.0137	0.0000	0.0000	0.0000	0.0584	(0.0089)	(0.0437)	0.0020	0.0820
2003	0.0127	0.0000	0.0000	0.0000	(0.0133)	0.0019	(0.0423)	0.0225	0.0759
2004	0.0122	0.0000	0.0000	0.0000	0.0342	(0.0050)	(0.0428)	0.0364	0.0725
2005	0.0117	0.0000	0.0000	0.0000	(0.0323)	0.0045	(0.0428)	0.0163	0.0813
2006	0.0112	0.0000	0.0000	0.0000	(0.0612)	0.0089	(0.0383)	0.0210	0.0766
2007	0.0107	0.0000	0.0000	0.0000	0.0196	(0.0030)	(0.0378)	0.0167	0.0789
2008	0.0106	0.0000	0.0000	0.0000	0.0722	(0.0109)	(0.0378)	0.0578	0.0897
2009	0.0105	0.0000	0.0000	0.0000	(0.0714)	0.0099	(0.0374)	0.0291	0.0703
2010	0.0114	0.0000	0.0000	0.0000	(0.0720)	0.0108	(0.0360)	0.0159	0.0660
2011	0.0085	0.0000	0.0000	0.0000	0.1043	(0.0170)	(0.0347)	0.0331	0.0652
2012	0.0163	0.0000	0.0000	0.0000	0.0834	(0.0120)	(0.0311)	0.0371	0.0571

Data source: KEWT 8.14-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

Table C16-2 **Peru:** Robustness, endogenous parameters and variables, and neutrality of the financial/market assets to the real assets, using M2, ten year debt yield, and the exchange rate

Robustnes	$HA_{\beta^*(i)}$	$HA_{\beta^*(i)G}$	$HA_{\beta^*(i)PRI}$	$HA_{\Omega*(i)}$	$HA_{\Omega G*(iG)}$	$HA_{\Omega PRI*(iPRI)}$	$Widt_{\Omega(i)}$	$Width_{\Omega G(iG)}$	$Width_{\Omega P(iP)}$
7. Peru		G	PRI		G	PRI		G	PRI
1990	0.9710	0.8364	0.9859	1.4554	1.5534	1.4470	0.2179	0.2499	0.2151
1991	0.5742	0.5617	0.5755	1.6764	1.6676	1.7064	0.2911	0.3008	0.2944
1992	0.4835	0.4718	0.4848	1.0882	1.6641	1.0534	0.2077	0.3250	0.2005
1993	0.4280	0.4558	0.4247	0.7525	1.0078	0.7340	0.1256	0.1657	0.1225
1994	0.4065	0.3648	0.4112	0.7206	0.9280	0.7393	0.1411	0.1643	0.1445
1995	0.4348	0.4144	0.4375	0.8876	0.8995	0.8921	0.2225	0.2353	0.2221
1996	0.4585	0.3862	0.4674	0.8894	1.4161	0.8841	0.1587	0.2384	0.1569
1997	0.4809	0.4569	0.4841	1.0365	0.8049	1.0795	0.2127	0.1724	0.2200
1998	0.5142	0.4468	0.5227	1.1363	1.3844	1.1362	0.1951	0.2354	0.1942
1999	0.5364	0.4634	0.5459	1.3082	1.3090	1.3080	0.2164	0.2305	0.2147
2000	0.5503	0.4836	0.5589	1.4001	1.4201	1.3977	0.2210	0.2364	0.2192
2001	0.5716	0.5035	0.5804	1.5662	1.5851	1.5640	0.2337	0.2496	0.2319
2002	0.5788	0.5259	0.5855	1.6190	1.6747	1.6128	0.2355	0.2526	0.2336
2003	0.5840	0.5155	0.5924	1.6391	2.4266	1.6159	0.2299	0.3316	0.2260
2004	0.5762	0.5443	0.5803	1.5980	1.2358	1.7027	0.2202	0.1798	0.2319
2005	0.5783	0.5675	0.5798	1.5572	1.2505	1.6683	0.2102	0.1751	0.2226
2006	0.5963	0.5698	0.6001	1.3918	1.2656	1.4117	0.1839	0.1700	0.1861
2007	0.6082	0.6031	0.6090	1.3685	1.1238	1.4174	0.1767	0.1469	0.1826
2008	0.6068	0.6201	0.6048	1.4134	1.2125	1.4489	0.1826	0.1552	0.1874
2009	0.6085	0.6024	0.6094	1.6407	1.4428	1.6771	0.2077	0.1824	0.2123
2010	0.6291	0.6168	0.6311	1.5714	1.3505	1.6132	0.2061	0.1797	0.2111
2011	0.6199	0.6276	0.6187	1.7857	1.9622	1.7698	0.2022	0.2177	0.2009
2012	0.6218	0.6794	0.6127	1.9804	1.5920	2.2435	0.3027	0.2417	0.3386
Key ratios	α	δ_0	β^*	Ω	$g_A^*=i(1-\beta^*)$	$x=r^*/g_Y^*$	$r^*=\alpha/\Omega$	$r^*_G=\alpha_G/\Omega_G$	$r^*_{PRI}=\alpha_P/\Omega_P$
7. Peru						$x=a/(i \cdot b^*)$		G	PRI
1990	0.9574	0.9063	0.9722	1.3952	0.0210	1.3021	0.6862	0.4695	0.7065
1991	0.1236	0.7794	0.6611	1.1588	0.0384	1.6518	0.1067	(0.0561)	0.1234
1992	0.1324	1.9248	0.5614	0.7959	0.0473	2.1857	0.1664	(0.3648)	0.2234
1993	0.1187	(1.9564)	0.4638	0.6510	0.0721	1.9042	0.1823	(0.1262)	0.2218
1994	0.0936	(1.3256)	0.4471	0.6104	0.0846	1.3688	0.1534	0.4938	0.1196
1995	0.0930	42.1786	0.5024	0.6764	0.0889	1.0364	0.1375	(0.1124)	0.1683
1996	0.0976	219.5441	0.5003	0.7520	0.0774	1.2598	0.1298	(0.1756)	0.1609
1997	0.0924	2.2610	0.5387	0.8223	0.0773	1.0231	0.1123	0.2288	0.0980
1998	0.0958	1.2465	0.5609	0.9414	0.0711	1.0547	0.1017	(0.0635)	0.1196
1999	0.0937	0.9184	0.5947	1.0318	0.0541	1.1801	0.0909	(0.2000)	0.1229
2000	0.0956	0.8088	0.6111	1.0903	0.0477	1.2738	0.0877	(0.1665)	0.1159
2001	0.1028	0.7099	0.6390	1.1802	0.0385	1.5076	0.0871	(0.1616)	0.1150
2002	0.0976	0.6626	0.6452	1.2236	0.0376	1.4267	0.0797	(0.1055)	0.1006
2003	0.0938	0.6230	0.6469	1.2563	0.0374	1.3708	0.0747	(0.1243)	0.0958
2004	0.0974	0.6701	0.6418	1.2122	0.0342	1.5914	0.0804	0.0713	0.0815
2005	0.1176	0.6908	0.6410	1.1962	0.0338	1.9506	0.0983	0.1265	0.0944
2006	0.2109	0.7544	0.6407	1.1526	0.0421	2.8105	0.1829	0.2097	0.1793
2007	0.2278	0.7069	0.6417	1.1863	0.0532	2.3891	0.1920	0.3166	0.1736
2008	0.1771	0.5860	0.6345	1.2565	0.0690	1.4782	0.1409	0.3044	0.1167
2009	0.1221	0.5277	0.6538	1.3502	0.0423	1.5281	0.0904	0.2041	0.0738
2010	0.1916	0.5494	0.6628	1.3560	0.0574	1.6972	0.1413	0.2036	0.1317
2011	0.0983	0.4550	0.6664	1.4579	0.0340	1.4487	0.0674	0.0882	0.0643
2012	0.1224	0.5779	0.6964	1.4196	0.0356	1.5014	0.0862	0.2311	0.0609
Neutral tests	$m_K=M/K$	$m=M/Y$	$m_\Pi=M/\Pi$	$r_{(DEBT)}-r^*$	$r_{(DEBT)}/r^*$	$(e_{(US)})/gy^{**}$	$r^*-r^*_{(US)}$	$e^*_{(US)}$	$e_{(US)}/e^*_{(US)}$
7. Peru					gy**=gy*/gy*(US)		e*(US)=e(US)+(r*-r*(US))		
1990	0.0282	0.0393	0.0410	47.06	69.58	6.28	0.5879	517.49	0.9989
1991	0.0577	0.0669	0.5413	7.408	70.46	101	0.0175	960.02	1.0000
1992	0.0883	0.0703	0.5306	1.572	10.44	118	0.0698	1630.07	1.0000
1993	0.1069	0.0696	0.5861	0.792	5.341	272	0.0956	2160.10	1.0000
1994	0.1032	0.0630	0.6728	0.383	3.494	352	0.0697	2180.07	1.0000
1995	0.1019	0.0689	0.7413	0.135	1.979	0.28	0.0541	2.36	0.9771
1996	0.0968	0.0728	0.7456	0.131	2.010	0.44	0.0509	2.65	0.9808
1997	0.1304	0.1072	1.1605	0.188	2.670	0.61	0.0403	2.77	0.9855
1998	0.1363	0.1284	1.3405	0.066	1.654	0.95	0.0334	3.19	0.9895
1999	0.1379	0.1423	1.5183	0.057	1.626	1.82	0.0249	3.53	0.9930
2000	0.1158	0.1263	1.3211	0.038	1.437	2.30	0.0221	3.55	0.9938
2001	0.0683	0.0806	0.7846	0.015	1.168	1.98	0.0113	3.46	0.9967
2002	0.0682	0.0835	0.8556	0.022	1.273	1.48	(0.0152)	3.50	1.0043
2003	0.0680	0.0854	0.9104	0.019	1.250	1.39	(0.0282)	3.43	1.0082
2004	0.0830	0.1006	1.0327	0.012	1.144	1.69	(0.0233)	3.26	1.0072
2005	0.1011	0.1209	1.0282	0.006	1.059	1.74	(0.0139)	3.42	1.0041
2006	0.1071	0.1234	0.5853	(0.075)	0.590	1.67	0.0889	3.28	0.9729
2007	0.1256	0.1489	0.6540	(0.087)	0.544	1.40	0.1163	3.11	0.9626
2008	0.1345	0.1690	0.9545	(0.036)	0.748	0.92	0.0569	3.20	0.9822
2009	0.1408	0.1900	1.5564	(0.004)	0.954	(0.20)	(0.9936)	1.90	1.5241
2010	0.1609	0.2182	1.1393	(0.056)	0.605	0.22	(3.9428)	(1.13)	(2.476)
2011	0.1736	0.2531	2.5749	0.010	1.151	71.94	(4.0166)	(1.32)	(2.041)
2012	0.1967	0.2792	2.2804	(0.005)	0.945	126.2	(3.9978)	(1.45)	(1.761)

Data source: KEWT 8.11-4 for 19 Rest Area by sector, 1990-2012, whose original data are from *International Financial Statistics Yearbook*, IMF.

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Chapter 12

Revisit Two Tax Multipliers, Tax and Government Spending, by Area and by Country

Signpost to Chapter 12 and towards watershed

Chapters 12 and 13 finalize the essence of fiscal analysis and its policy, reinforced by Samuelson's two fiscal multipliers and also scientific discovery. Empirical results for fiscal policy were examined in Chapters 3, 4, and 5, by aspect. This chapter follows Samuelson (1998) and approaches the essence of macro real assets. Samuelson (1938, 1939) clarified the acceleration principle and the multiplier. Today, the multiplier is still estimated and forecasted in the literature. The multiplier of the literature and the multiplier of the endogenous system have the same root of the real assets of national accounts. Statistics databases and the endogenous KEWT database will cross soon. The crossing is the multiplier whose inverse is the corresponding endogenous data. In detail, see Appendix: Broader interpretation of the multipliers as the inverses of the endogenous KEWT data-sets at the end of this Chapter.

12.1 Introduction

A multiplier and its inverse have a deep meaning behind. A multiplier in the literature represents an accepted thought while the inverse of that multiplier reflects the thought of the endogenous system. It implies that the literature and the endogenous system are connected with each other closely by nature. In a few other chapters, the author discussed the relationship between the actual statistics data and endogenous data prevailing in the endogenous system. The relationship between actual and endogenous data constitutes one aspect and, the relationship between multiplier and its inverse, the other aspect.

For tax policy, the endogenous system has realized a unique integration of economic policies among real, financial, market, central and local banks, and others. Tax policy is not a part of financial and market polices. Tax policy is attributed to real asset policy. And, tax policy presents a clue of integrated policies. Two multipliers in the literature are *GDP/Taxes* and *GDP/government spending*, where government spending is the sum of consumption and investment at the government sector; $E_G = C_G + I_G$. The corresponding ratios are; $Y_G/Y = T_{AX}/Y$ and $(C_G + I_G)/Y$, and *Y*=income= expenditures=output holds in the endogenous system. The differences between the multipliers and the inverse numbers/ratios reflect the differences between the literature and the endogenous system. Conclusively speaking and abbreviating each proof in this chapter, the differences are as follows:

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The multipliers in the literature:

1. GDP differs from net disposable income of wages and profits.
2. Taxes are actual taxes and do not determine the size of government.
3. Government spending remains statistics data.
4. Therefore, each inverse, $Taxes/GDP$ or E_G/GDP, is independent of $GDP/Taxes$ or GDP/E_G. Econometrically, variable versus independent variable exist.

The inverse numbers in the endogenous system:

1. $Y = C + S = W + \Pi$ holds and satisfies the three equality advocated by Meade, J. E., and Stone, J. R. N. (1969).
2. Taxes are endogenous taxes and endogenously determine the size of government.
3. Government spending is measured as endogenous data. The balance of payments, deficit, and the residual at the private sector are all set endogenously, each as the difference between saving and net investment by sector and, in an open economy by country.
4. Therefore, each inverse, T_{AX}/Y or E_G/Y, is exactly the same as the fiscal multiplier Y/T_{AX} or Y/E_G. There is no room for econometrics to work in the endogenous system.

From the above context, tax policy is connected with fiscal multipliers. Fiscal multipliers remain unsolved in the literature, as clarified in Chapter 13. Tax design completed by Mirrlees, J. A. (2010, 2011) requires the essence based on Samuelson's discovery (1942). And, tax policy is able to serve an integrated set of policies as a core in reality. Policy-oriented fact is proved at the endogenous system: This fact is beyond a function of time, as shown in the literature. Actual or estimated data are always within a range of endogenous data in the endogenous-equilibrium, as theoretically and empirically proved in the *EES*. If actual or estimated data become close to endogenous data in equilibrium, actual or estimated data are useful and able to cooperate with endogenous data. For example, actual or estimated multipliers are comparable with endogenous multipliers or, actual or estimated inverse numbers with endogenous inverse numbers. In other words, fiscal multipliers or the inverse numbers are directly compared with those in the endogenous system. The direct connector between fiscal multipliers in the literature and those in the endogenous system is a moderate level of the endogenous equilibrium. This level is measured by the speed years for convergence by country, or variables simultaneously measured such as the rate of return and the growth rate of output in equilibrium. These variables are shocked suddenly by rapid changes in tax policy and lose a moderate level of endogenous equilibrium.

Section 2 compares fiscal multipliers with the inverse numbers by country using the KEWT database 6.12, 1990-2010 by sector. The author selected 72 countries including three area averages, as shown in Tables 1 to 12 by country. Appendix summarizes multipliers and the inverse numbers much more broadly than fiscal multipliers in the text, with a few historical reviews. According to Davar Ezra (25, 2010), modern general equilibrium theory sets investment the cause and sets national income the effect. Author's point at issue still differs from Davar Ezra's and clarifies a true story. Appendix covers essential ratios that control an integrated set of policies and corresponding evidences in equilibrium. It shows what position multipliers occupy within the endogenous system. Figure DA1 in Appendix illustrates the characters of multipliers, marginal versus average, using the plane of the y axis to the x axis. Figure DA1 is useful for readers to broadly back to the original base, compared with the points in the literature.

12.2 Two Fiscal Multipliers and Implications for 72 Countries, 1990-2010

Tables 1 to **12** show the trends of two fiscal multipliers, 1990-2010, by country. These are results within the same data-sets and without the use of econometrics. Two fiscal multipliers and the inverse numbers/ratios each show the same evidences. The relationship between two fiscal multipliers or two endogenous ratios is complete when readers endogenously confirm the importance of each corresponding rate of technological progress, $g_A^* = i(1-\beta^*)$. The ratio of net investment to output, $i = I/Y$, and the qualitative net investment coefficient, $(1-\beta^*)$, are not directly included in two fiscal multipliers. Nevertheless, $i = I/Y$ and $(1-\beta^*)$ are involved in the speed years for convergence by country and accordingly, in fundamental variables. As the author stresses everywhere, the endogenous system measures the rate of technological progress exclusively in the literature. Then, Tables 1 to 12 each reinforce the essence of the endogenous system by country.

Selected countries in these tables are: 1) 17 Asian & Pacific, the US, Canada, Australia, New Zealand, and Mexico; 2) Bangladesh, China, India, Indonesia, Japan, Korea; 3) Malaysia, Philippines, Singapore, Sri Lanka, Thailand, Vietnam; 4) 14 Euro area, Austria, Belgium, Finland, France, Germany; 5) Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal; 6) Slovak, Slovenia, Spain, Romania, Russia, Turkey; 7) 15 Non-Euro area, Denmark, Iceland, Norway, Sweden, Switzerland; 8) the UK, Bulgaria, Czech Republic, Hungary, Latvia, Poland; 9) Argentina, Bolivia, Brazil, Chile, Colombia, Paraguay; 10) Peru, Iran, Kazakhstan, Kuwait, Pakistan, Saudi Arabia; 11) Algeria, Egypt, Kenya, Morocco, Nigeria, South Africa; 12) Tanzania, Ukraine, Taiwan, Honduras, Estonia, Lithuania. Note in the above data, 72=6×12, three area averages are included.

First of all, endogenous taxes determine the size of government endogenously. However, it never means that the government sector is determined by the size of government. The size of government determines a base for all the economic policies and even the future of national economic framework, robust or weak. A sincere researcher may advocate that deficit determines the government sector alone and deflation is a problem of the total economy. This must be a big mistake. The size of government dominates a decisive source of economic power.

Look at $T_{AX}/Y$and E_G/Y or, Y/T_{AX} and Y/E_G in Tables 1 to 12. The trends by country are stable or changing over the last 21 years. These are the results of tax policy by country and reflect some parts of national taste and culture. A problem is the relationship between tax policy and the rate of technological progress. It seems that this relationship differs significantly by country and by year and as a result, is not controllable. It seems to be true yet, an underlining truth is the existence behind the ratio of net investment to output $i = I/Y$, and the qualitative net investment coefficient, $(1-\beta^*)$.

Endogenous equations each reduce to corresponding hyperbolas. A hyperbola, $r^*(i)$, determines the rate of inflation or deflation endogenously. A hyperbola, $\beta^*(i)$, determines the rate of technological progress endogenously. Both hyperbolas are similar and each form a type of $y = (cx + d)/ax$ and, the vertical asymptote is zero while the horizontal asymptote determines either the rate of inflation/deflation or the rate of technological progress. Therefore, tax policy is involved in the rate of technological progress and its evidences.

Tax multipliers in the literature do not reveal these backgrounds. Nevertheless, actual and endogenous data of multipliers are closely related and besides, 25 statistics data are absorbed into the endogenous system. Therefore, the relationship between tax multipliers and the rate of technological progress totally reflects the results of an integrated set of economic policies, real, financial, market, and central and local banks. The author does not here indicate these performances by country. Readers are able to interpret results of $T_{AX}/Y$and E_G/Y or, Y/T_{AX} and Y/E_G, each shown in Tables 1 to 12.

In general, a young-developing countries have difficulties much more than those at robust stage young countries (see *PRSCE* 52 (Feb), 2012, although the aspect differs using all the basic data). This chapter, using two fiscal multipliers, expresses the same phenomena as inverse ratios, with related evidences.

Next, let the author summarize the differences between Y/T_{AX} and Y/E_G or T_{AX}/Y and E_G/Y in Tables 1 to 12. The size of government is determined by T_{AX}/Y, starting with $i = I/Y$, $i_G = I_G/Y$, and accordingly, $i_{PRI} = I_{PRI}/Y$. On the other hand, Y/E_G includes net investment at the government sector in $E_G = C_G + I_G$. Net investment after capital consumption by sector is not directly expressed yet, the balance between sectors is most important. Otherwise, sustainable and moderate endogenous equilibrium does not hold. In this sense, the essence of two fiscal multipliers does not differ al all. It seems to have some differences striking at some countries. These results come from sudden shocks of fundamental variables. Young and weak developing countries need infrastructures to stabilize foreign direct investment for many years and during these years, developed countries need to be patient.

12.3 A Short Remark

Financial market assets do not always work as the second best by country. Young developing countries need experiences, if possible with a bright lighthouse such as two fiscal multipliers in this chapter. For country comparison, the multiplier appears sensitive much more than its inverse. Two fiscal multipliers are the results, but at the same time are causes when the endogenous system is used. A problem on endogenous data is that it takes many years for young developing countries to have statistics trustworthy, partly due to unpublished deficit by some reasons. Developed countries differently each have difficulties under the decrease in population in addition to a delicate relationship between republic and democracy. For developed countries, the size of government must be openly discussed year by year towards the future drawing of the national direction.

It is true that a country is able to maintain sustainable growth in corporation with globalization. The marker principle and the price-equilibrium regrettably do not answer this truth. For example, pertinent articles appear by year from the viewpoint of economic policy.[1] Therefore, the author advocates that the endogenous system reinforce the price-equilibrium by presenting two fiscal multipliers. Otherwise, the range of each multiplier in the literature is not appropriately settled when model parameters are set given or fixed while these parameters actually change by year.

An essence comes not from the second best but the first best based on the real assets. More improvement in the current econometrics is promising in cooperation with the endogenous system. Reinforce the SNA's records and recording objective by introducing policy-oriented sub-system, endogenously with an integrated set of economic policies, real, fiscal, financial, market, and central and local banks.

BOX 12-1 Remark on Real Business Cycle (RBC) Theory

The price-equilibrium	The endogenous-equilibrium
1. $g_{y(t)} = \alpha \cdot g_{r(t)} + (1-\alpha) g_{w(t)}$	1. $g_{A(FLOW)(t^*)} = g_{TFP(STOCK)(t^*)}$
Relative price level p=1.000, and σ=1.000.	$g_{A(FLOW)(t^*)} = i_{t^*} \cdot (1-\beta_{(t^*)})$
2. $g_{y(t)} = \alpha \cdot g_{r(t)} + (1-\alpha) g_{w(t)}$	2. $A_{TFP(t^*)} = A_0(1+g_{A(t^*)})^{1/\lambda^*}$

Note: RBC theory remains a partial aspect. A true business cycle shows results of both equilibriums always the same under the neutrality of the financial/market assets to the real assets (see Notes, Chapters 1 and 14).

[1] In *American Economic Journal: Economic Policy*: #3) A model-based evaluating of the debate on the size of the tax multiplier; #4) Fiscal policy multipliers on sub-national government spending; #5) Measuring tax multipliers: the narrative method in fiscal VARs. For VARs: See (1) Kydland, Finn, E., and Prescott, Edward, C, 1977, Rules Rather than Discretion: The Inconsistency of Optimal Plans, *Journal of Political Economy* 85 (June, 3): 473-491. (2) Engle, Robert, F., and Granger, C. W., 1987, 'Co-integration and error correction: representation, estimation, and testing,' *Econometrica* 55 (March, 2): 251-276.

Conclusively, this chapter expresses a severe reply to Dr. Paul, where the market principles and six nature-neutrals are harmoniously united. The author could not reply without Dr. Paul's very earlier work on utility and deficit at the end of 1930s. Under the price-equilibrium, it is impossible for one to step into true solution, due to vertical price level by goods and services. The market principles are destined to show results. No one is responsible for difficult development of the market principles.

Appendix Broader interpretation of the multipliers as the inverses of the endogenous KEWT data-sets

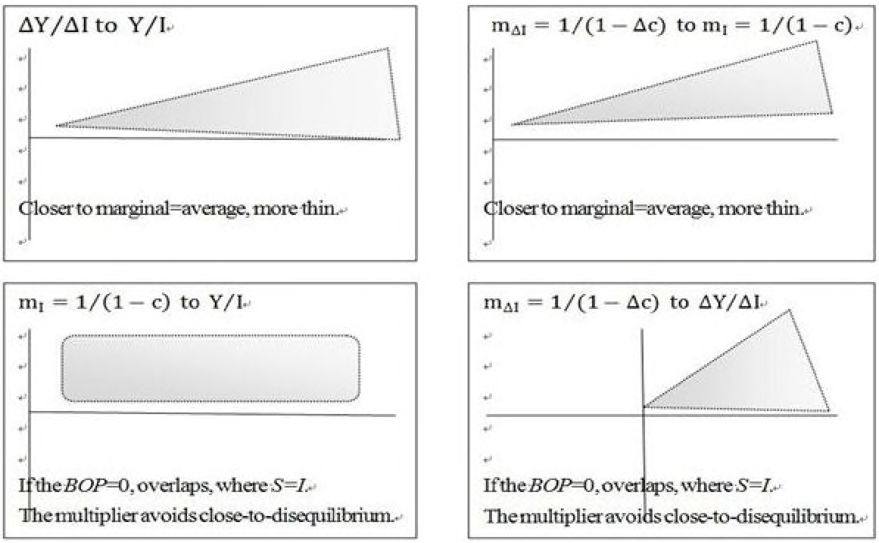
The purpose of this Appendix is to compare the multipliers each with its inverse (or, specified endogenous ratios each with its inverse). The author here theoretically summarizes the relationship between the multipliers and their inverses. **BOX 12-2** illustrates the characters of the multipliers, both marginal and average, on the plane of the y axis to the x axis. KEWT 6.12 measures all these multipliers, marginal and average. The multipliers are each exactly the inverse of the corresponding ratio at the endogenous system. Note that the multipliers in the literature are estimated using econometrics and based on actual data statistics and that these multipliers do not express a consistent relationship between the multipliers, growth rates, and the rate of return.

The multiplier was first presented by Samuelson, Paul (1939a, 1939b). Samuelson integrated the multiplier with the principle of accumulation. The principle of accumulation implies that investment is effective not only for the investment year but also for consecutive several years and, this fact has been precisely proved in the KEWT data-sets. There were no accurate national accounts data in 1939 yet, Samuelson first designed the relationship between investment and output as a general idea. Even today, for example, his concept to the multipliers is influential in the literature. For example, Keynesian multipliers set national income the cause and, set investment the effect. According to Davar Ezra (25, 2010), modern general equilibrium theory conversely sets investment the cause and, sets national income the effect.

In the endogenous data-sets, however, investment and income=output are two-ways and, causes and results march simultaneously. Furthermore, Samuelson's principle of accumulation is connected with consecutive changes in the capital-output ratio, $\Omega = K/Y$. When econometrics inevitably formulates equations linearly based on actual data and in the continuous time, it is difficult for policy-makers to know the work of capital stock, which influences output by year and over years. In the endogenous data-sets, multipliers are broadly designed with each inverse (i.e., the corresponding endogenous ratio) and consistently measured by year and over years. Or, a multiplier remains another expression of the corresponding endogenous ratio.

Multipliers in the literature are based on the price-equilibrium and use prices but it is difficult to settle prices wholly as a system. This is because the root of the multipliers comes from the micro level. It is a fact that the aggregated amount of micro data differs from that of macro data. The author interprets this fact such that there is no accurate utility-measure to connect micro with macro. Hence, the author created a new method to measure the utility function at the macro level and, this is the relative discount rate function of each consumption goods and capital goods to the propensity to consume: $(rho/r)(C/Y)$. This function expresses national taste/preferences, culture, and history, by country and by sector. For the total economy by country, this function is generalized, commonly to any country and as a standard for comparison. This is because, by so doing, we are able to compare any country with others, commonly and consistently.

BOX 12-2 Illustrative results of multipliers and its inverse ratios common to 86 countries using panel data by area: four combinations



Data sources: KEWT 8.14, 1990-2012. Note: Four data, Y/I and $\Delta Y/\Delta I$, $m_I = 1/(1-c)$ and $m_{\Delta I} = 1/(1-\Delta c)$. For four combinations, see each box above.

Function, $(rho/r)(C/Y)$, was finally settled after a plenty of experimental tests and practices, as explained in a few chapters in the *EES*. The function is expressed as $(rho/r)(c) = 13.301c^2 - 22.608c + 10.566$ and applicable to 86 countries, except for several countries. Exceptional countries are excessively saving-oriented and/or government leadership-oriented. The national taste function at the government sector is set $(rho_G/r_G) = 1.0$ by country. This is because government spending must be neutral to the propensity to consume, C_G/Y_G. As a result, $(rho_{PRI}/r_{PRI})(C_{PRI}/Y_{PRI})$ at the private sector differs significantly by country. The multipliers in the literature do not solve a problem of national taste/preferences and culture at the macro level. The endogenous system measures the world economies in equilibrium, respecting and integrating diversification by country, with globalization. This direction matches human supreme philosophy for survival, by nature. By reinforcing the merits of the price-equilibrium, the endogenous system presents a bright lighthouse to sea routes of the market principles.

There are four multipliers at an open macro economy, investment, saving, government taxes=government output, and money. The multipliers in the endogenous data-sets are expressed each as $i = I/Y$, $s = S/Y$, $t_{AX} = Y_G/Y = T_{AX}/Y$, and M/Y or M/K. These multipliers are also expressed by sector -- for simplicity, this Appendix does not express the multipliers by sector except for $t_{AX} = Y_G/Y = T_{AX}/Y$. The multipliers in the literature start with the micro level and melt away money into the multipliers. Such direction is unavoidable since there is no theoretical/endogenous data behind. Money is macro-based yet must work with micro-based multipliers, where it is difficult to integrate macro money with multipliers.

For macro money, Davar Ezra (29, ibid.) compares four (value, commodity, circulation, and standard) function of money lying between 'gold' as value and 'fiat' money as standard money or American dollars. Davar Ezra points out several reasons why Davar is against the current stream of leading articles. The author partially agrees with his indications but not wholly. Davar's stand point is far from the endogenous system. The author asserts that if endogenous data are used, money will remain confirmation-means or, the neutrality of money will be proved by country, as the author has already showed proofs and evidences of money, the rate of return/the cost of capital, and the exchange rate, using the KEWT database. According to the author's interpretation, a base for money is endogenous capital at the total economy; not gold or fiat money. Fiat money has worked since 1973 yet, repeating bubbles. However, bubbles are not the responsibility of fiat money; differently from Davar's assertion. Gold remains the most delicate property of value/commodity yet, cannot be a base for the endogenous system. This is because the world economies should be moderate and balanced by country, sector, and year. It implies that policy-making must be dynamic, not influenced by the production of gold and their circulation quantity. Gold, nevertheless, remains the best property under any world system, which the author does not deny.

Finally, regarding the relationship between the multipliers and the inverse numbers, the author adds severe but friendly review to Friedman, M. and Schwartz, A. J. (32-62, 1986) and also to Blinder, A. S. and Solow, R. M. (319-337, 1973). It is true that monetarists must distinguish themselves with Keynesians, as pursued by the above distinguished two articles and, also cited by Davar (29, ibid.). Again here, the author stresses that it is not the responsibility of monetarists why bubbles are repeated a few times in a decade particularly after 1973. Rather the author respects the behavior of Friedman who had accumulated empirical experiments towards the integration of theory and practice.

Under no theoretical data, money is most reliable if actions of the central bank by country or area are fair without influenced by group-oriented leaders. This comes from the neutrality of money to the real assets, as empirically proved by Friedman, M. (451-472, 1977) and now by Author's KEWT database by country. In short, the financial and real assets by country constitute national accounts, actually and endogenously. Money exists rationally, regardless of whether data are actual or endogenous and, under any economic system.

Blinder and Solow (335-336, ibid.), most pertinently (as long as the author has investigated), formulated linear equations to integrate the real assets with the financial assets, introducing money equilibrium. The author was most impressively encouraged by 'the summary and conclusion' of Blinder and Solow, which universally shows the essence of fiscal policy. To the author's understanding, it implies, between the lines, that deficit=zero is most balanced in equilibrium and that an unbalanced government budget causes monetarist instability. With the increase in deficits, as stated above, 'deficit spending contracts the economy, thus enlarging the deficit and contracting the economy still more.' For necessary and sufficient conditions to equilibrium, see those discussed in Chapter 9. Blinder and Solow (336, ibid.; the last sentence) states that the evidence seems to require a comfortable 'yes' to the question posed in the title of 'does fiscal policy matter?'. The endogenous data always show moderate results based on non-linear equations at the endogenous system, deleting any condition and assumption, and guarantees monetarist stability as it is. In short, the moderate and balanced equilibrium always exists and is clarified, by controllable fiscal policy by country and with processes towards improved equilibrium.

A problem of the multipliers in the literature: How to initialize the starting point of time in a framework. The effects of the multipliers last at least several years even if rival capital and labor are only used. In reality, rival and non-rival (e.g., education and R & D for strategies) are mixed and influence on the effects and results by year and over years. In the case of the endogenous system, the problem of initialization was solved by simultaneously measuring endogenous values. Millions data are consistent each other by year, sector, and over years, starting with statistics data of *IFSY*, IMF. Causes and results change together non-linearly and dynamically.

<u>For readers' convenience: contents of Tables hereunder</u>

Tables M1 to M12: Multipliers and each inverse in equilibrium:
Each Table has six countries, 1990-2012. Twelve Tables show 36 countries, 1990-2012.
Data source: KEWT 6.12-1 to 6.12-3 for M1 to M11. For M12, KEWT 6.12-5 is added.

Table M1 Multipliers and each inverse in equilibrium: 17 Asian & Pacific, the US, Canada, Australia, New Zealand, and Mexico, 1990-2012

17 Asian c	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**3. Australi**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1628	6.1407	4.4750	0.2235	0.0130	**1990**	0.2500	4.0000	4.3991	0.2273	0.0451
1991	0.1666	6.0018	4.4660	0.2239	0.0120	**1991**	0.2380	4.2017	4.3020	0.2324	0.0266
1992	0.1669	5.9901	4.4819	0.2231	0.0104	**1992**	0.2100	4.7619	4.2355	0.2361	0.0250
1993	0.1645	6.0779	4.5371	0.2204	0.0094	**1993**	0.2000	5.0000	4.2055	0.2378	0.0278
1994	0.1680	5.9524	4.4931	0.2226	0.0085	**1994**	0.2000	5.0000	4.2778	0.2338	0.0355
1995	0.1722	5.8060	4.4406	0.2252	0.0093	**1995**	0.2070	4.8309	4.2840	0.2334	0.0247
1996	0.1793	5.5774	4.3318	0.2309	0.0070	**1996**	0.2240	4.4643	4.2678	0.2343	0.0245
1997	0.1752	5.7078	4.6202	0.2164	0.0071	**1997**	0.2350	4.2553	4.3322	0.2308	0.0239
1998	0.1701	5.8803	3.4357	0.2911	0.0043	**1998**	0.2650	3.7736	4.2668	0.2344	0.0345
1999	0.1697	5.8925	3.9723	0.2517	0.0051	**1999**	0.2330	4.2918	4.1836	0.2390	0.0347
2000	0.1691	5.9151	3.9586	0.2526	0.0036	**2000**	0.2450	4.0816	4.2777	0.2338	0.0314
2001	0.1628	6.1438	4.4187	0.2263	0.0069	**2001**	0.2400	4.1667	4.3938	0.2276	0.0200
2002	0.1665	6.0049	4.0546	0.2466	0.0033	**2002**	0.2400	4.1667	4.4345	0.2255	0.0307
2003	0.1748	5.7220	3.9375	0.2540	0.0039	**2003**	0.2500	4.0000	4.2928	0.2329	0.0345
2004	0.1733	5.7705	4.2756	0.2339	0.0048	**2004**	0.2500	4.0000	4.3418	0.2303	0.0355
2005	0.1799	5.5583	4.3693	0.2289	0.0051	**2005**	0.2600	3.8462	4.2332	0.2362	0.0367
2006	0.1826	5.4750	4.5571	0.2194	0.0053	**2006**	0.2700	3.7037	4.2021	0.2380	0.0327
2007	0.1859	5.3797	4.8176	0.2076	0.0058	**2007**	0.2700	3.7037	4.1676	0.2399	0.0353
2008	0.1865	5.3628	4.3395	0.2304	0.0066	**2008**	0.2400	4.1667	4.7022	0.2127	0.0377
2009	0.1806	5.5357	3.5560	0.2812	0.0042	**2009**	0.2300	4.3478	4.0514	0.2468	0.0311
2010	0.1814	5.5141	3.7125	0.2694	0.0058	**2010**	0.2300	4.3478	3.8493	0.2598	0.0318
2011	0.1826	5.4768	3.7001	0.2703	0.0031	**2011**	0.2300	4.3478	3.8765	0.2580	0.0343
2012	0.1834	5.4540	3.6491	0.2740	0.0091	**2012**	0.2300	4.3478	3.8890	0.2571	0.0392

1. the US	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**4. New Ze**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.2000	5.0000	4.1290	0.2422	0.0064	**1990**	0.2850	3.5088	4.1659	0.2400	0.0194
1991	0.1800	5.5556	4.3258	0.2312	0.0053	**1991**	0.2710	3.6900	4.0178	0.2489	(0.0015)
1992	0.1800	5.5556	4.3204	0.2315	0.0046	**1992**	0.2430	4.1152	3.7268	0.2683	0.0174
1993	0.1650	6.0606	4.8061	0.2081	0.0130	**1993**	0.2440	4.0984	4.1182	0.2428	0.0229
1994	0.1730	5.7803	4.8714	0.2053	0.0174	**1994**	0.2450	4.0816	4.2348	0.2361	0.0273
1995	0.1730	5.7803	5.1293	0.1950	0.0235	**1995**	0.2400	4.1667	4.2520	0.2352	0.0270
1996	0.1700	5.8824	5.3836	0.1857	0.0250	**1996**	0.2950	3.3898	4.2054	0.2378	0.0341
1997	0.1850	5.4054	5.3960	0.1853	0.0280	**1997**	0.2950	3.3898	3.9800	0.2513	0.0291
1998	0.1950	5.1282	5.3166	0.1881	0.0291	**1998**	0.2400	4.1667	4.2611	0.2347	0.0236
1999	0.1950	5.1282	5.5426	0.1804	0.0317	**1999**	0.2630	3.8023	4.1363	0.2418	0.0288
2000	0.2000	5.0000	5.7600	0.1736	0.0321	**2000**	0.2400	4.1667	4.3441	0.2302	0.0306
2001	0.1950	5.1282	5.5168	0.1813	0.0254	**2001**	0.2350	4.2553	4.3690	0.2289	0.0277
2002	0.2000	5.0000	4.6159	0.2166	0.0232	**2002**	0.2480	4.0323	4.3971	0.2274	0.0289
2003	0.1950	5.1282	4.3043	0.2323	0.0227	**2003**	0.2580	3.8760	4.3665	0.2290	0.0300
2004	0.1600	6.2500	5.0341	0.1986	0.0262	**2004**	0.2930	3.4130	3.7966	0.2634	0.0323
2005	0.1700	5.8824	5.0534	0.1979	0.0284	**2005**	0.3200	3.1250	3.7129	0.2693	0.0367
2006	0.1750	5.7143	5.1119	0.1956	0.0302	**2006**	0.3250	3.0769	2.9274	0.3416	0.0321
2007	0.2050	4.8780	4.5894	0.2179	0.0254	**2007**	0.3050	3.2787	3.1744	0.3150	0.0396
2008	0.2350	4.2553	3.7186	0.2689	0.0184	**2008**	0.3050	3.2787	3.0634	0.3264	0.0310
2009	0.2250	4.4444	2.9544	0.3385	0.0067	**2009**	0.3050	3.2787	2.5532	0.3917	0.0196
2010	0.2350	4.2553	2.9939	0.3340	0.0099	**2010**	0.3050	3.2787	2.5215	0.3966	0.0019
2011	0.2350	4.2553	3.0235	0.3307	0.0092	**2011**	0.3050	3.2787	2.5430	0.3932	0.0318
2012	0.2350	4.2553	3.0569	0.3271	0.0074	**2012**	0.3050	3.2787	2.5519	0.3919	(0.0826)

2. Canada	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**5. Mexico**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1940	5.1546	4.0335	0.2479	0.0253	**1990**	0.1000	10.0000	7.7008	0.1299	0.0310
1991	0.2180	4.5872	3.5647	0.2805	0.0191	**1991**	0.1700	5.8824	7.4123	0.1349	0.0293
1992	0.2150	4.6512	3.5316	0.2832	0.0159	**1992**	0.1800	5.5556	7.7151	0.1296	0.0277
1993	0.2120	4.7170	3.5922	0.2784	0.0165	**1993**	0.1600	6.2500	6.4811	0.1543	0.0514
1994	0.2110	4.7393	3.7756	0.2649	0.0201	**1994**	0.1600	6.2500	6.2383	0.1603	0.0573
1995	0.2200	4.5455	3.8318	0.2610	0.0213	**1995**	0.1500	6.6667	6.4136	0.1559	0.0612
1996	0.2300	4.3478	3.9822	0.2511	0.0187	**1996**	0.1430	6.9930	6.8757	0.1454	0.0777
1997	0.2500	4.0000	4.1129	0.2431	0.0258	**1997**	0.1390	7.1942	6.6244	0.1510	0.0872
1998	0.2500	4.0000	4.2744	0.2340	0.0258	**1998**	0.1450	6.8966	6.2089	0.1611	0.0807
1999	0.2500	4.0000	4.4671	0.2239	0.0267	**1999**	0.1600	6.2500	5.6421	0.1772	0.0738
2000	0.2550	3.9216	4.5879	0.2180	0.0260	**2000**	0.1700	5.8824	5.4344	0.1840	0.0726
2001	0.2500	4.0000	4.1338	0.2419	0.0209	**2001**	0.1700	5.8824	5.6147	0.1781	0.0352
2002	0.2450	4.0816	4.2297	0.2364	0.0225	**2002**	0.1700	5.8824	5.2688	0.1898	0.0522
2003	0.2480	4.0323	4.1654	0.2401	0.0222	**2003**	0.1700	5.8824	5.5205	0.1811	0.0640
2004	0.2500	4.0000	4.3992	0.2273	0.0227	**2004**	0.1700	5.8824	5.5516	0.1801	0.0556
2005	0.2600	3.8462	4.3016	0.2325	0.0243	**2005**	0.1785	5.6022	5.3751	0.1860	0.0663
2006	0.2700	3.7037	4.2150	0.2372	0.0246	**2006**	0.1650	6.0606	5.5180	0.1812	0.0716
2007	0.2600	3.8462	4.2299	0.2364	0.0269	**2007**	0.1500	6.6667	5.9706	0.1675	0.0696
2008	0.2550	3.9216	3.8989	0.2565	0.0271	**2008**	0.1750	5.7143	5.2664	0.1899	0.0668
2009	0.2610	3.8314	3.3677	0.2969	0.0209	**2009**	0.1700	5.8824	5.2146	0.1918	0.0501
2010	0.2550	3.9216	3.3309	0.3002	0.0247	**2010**	0.1650	6.0606	5.2090	0.1920	0.0492
2011	0.2500	4.0000	3.5494	0.2817	0.0267	**2011**	0.1700	5.8824	5.1110	0.1957	0.0522
2012	0.2500	4.0000	3.5816	0.2792	0.0405	**2012**	0.1700	5.8824	5.1613	0.1938	0.0501

Table M2 Multipliers and each inverse in equilibrium: Bangladesh, China, India, Indonesia, Japan, Korea, 1990-2012

6. Banglad	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	9. Indones	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.0800	12.5000	11.3079	0.0884	0.0315	**1990**	0.1575	6.3492	6.5234	0.1533	0.0818
1991	0.0800	12.5000	11.7963	0.0848	0.0310	**1991**	0.1575	6.3492	6.5302	0.1531	0.0789
1992	0.0700	14.2857	12.4113	0.0806	0.0229	**1992**	0.1600	6.2500	6.0860	0.1643	0.0674
1993	0.0700	14.2857	12.6960	0.0788	0.0153	**1993**	0.1600	6.2500	6.5274	0.1532	0.0616
1994	0.0800	12.5000	12.6931	0.0788	0.0157	**1994**	0.1600	6.2500	6.6849	0.1496	0.0630
1995	0.0700	14.2857	13.3899	0.0747	0.0257	**1995**	0.1600	6.2500	7.3885	0.1353	0.0702
1996	0.0800	12.5000	12.2969	0.0813	0.0398	**1996**	0.1600	6.2500	6.7978	0.1471	0.0685
1997	0.0800	12.5000	11.2977	0.0885	0.0342	**1997**	0.1200	8.3333	7.8460	0.1275	0.0706
1998	0.0800	12.5000	11.8649	0.0843	0.0362	**1998**	0.0800	12.5000	8.8673	0.1128	0.0455
1999	0.0800	12.5000	11.7437	0.0852	0.0403	**1999**	0.0900	11.1111	9.7299	0.1028	0.0341
2000	0.0700	14.2857	13.0598	0.0766	0.0302	**2000**	0.0600	16.6667	9.5807	0.1044	0.0483
2001	0.0700	14.2857	12.8363	0.0779	0.0386	**2001**	0.0700	14.2857	10.5413	0.0949	0.0748
2002	0.0800	12.5000	12.1832	0.0821	0.0061	**2002**	0.0900	11.1111	9.6058	0.1041	0.0536
2003	0.0800	12.5000	12.2977	0.0813	0.0426	**2003**	0.1000	10.0000	8.3831	0.1193	0.0433
2004	0.0800	12.5000	11.3654	0.0880	0.0461	**2004**	0.1000	10.0000	8.7365	0.1145	0.0418
2005	0.0800	12.5000	10.8340	0.0923	0.0547	**2005**	0.1100	9.0909	8.7767	0.1139	0.0741
2006	0.0800	12.5000	10.4377	0.0958	0.0483	**2006**	0.1100	9.0909	8.2717	0.1209	0.0700
2007	0.0800	12.5000	10.5649	0.0947	0.0485	**2007**	0.1100	9.0909	8.4152	0.1188	0.0728
2008	0.0900	11.1111	9.9493	0.1005	0.0498	**2008**	0.1300	7.6923	6.6831	0.1496	0.0897
2009	0.0900	11.1111	11.1755	0.0895	0.0415	**2009**	0.1300	7.6923	6.7876	0.1473	0.0792
2010	0.0900	11.1111	11.1111	0.0900	0.0382	**2010**	0.1300	7.6923	7.3076	0.1368	0.0844
2011	0.0900	11.1111	11.1111	0.0900	0.0464	**2011**	0.1300	7.6923	6.9272	0.1444	0.0859
2012	0.0900	11.1111	11.1111	0.0900	0.0514	**2012**	0.1300	7.6923	6.6807	0.1497	0.0883
7. China	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**10. Japan**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1600	6.2500	5.9278	0.1687	0.0543	**1990**	0.1569	6.3738	4.5742	0.2186	0.0229
1991	0.1750	5.7143	5.3455	0.1871	0.0567	**1991**	0.1740	5.7471	4.2993	0.2326	0.0218
1992	0.1700	5.8824	5.5348	0.1807	0.0670	**1992**	0.1750	5.7143	4.3001	0.2326	0.0183
1993	0.1750	5.7143	5.4276	0.1842	0.0825	**1993**	0.1760	5.6818	4.2911	0.2330	0.0179
1994	0.1700	5.8824	5.4565	0.1833	0.0837	**1994**	0.1770	5.6497	4.2828	0.2335	0.0174
1995	0.1750	5.7143	5.3820	0.1858	0.0757	**1995**	0.1780	5.6180	4.2844	0.2334	0.0180
1996	0.1850	5.4054	5.1709	0.1934	0.0727	**1996**	0.1810	5.5249	4.2521	0.2352	0.0180
1997	0.1750	5.7143	5.4558	0.1833	0.0631	**1997**	0.1844	5.4233	4.3817	0.2282	0.0175
1998	0.1750	5.7143	5.3378	0.1873	0.0591	**1998**	0.1060	9.4340	4.2060	0.2378	0.0143
1999	0.1750	5.7143	5.0788	0.1969	0.0609	**1999**	0.1390	7.1942	4.3828	0.2282	0.0122
2000	0.1750	5.7143	4.9202	0.2032	0.0606	**2000**	0.1580	6.3291	4.0112	0.2493	0.0130
2001	0.1750	5.7143	4.9782	0.2009	0.0631	**2001**	0.1650	6.0606	4.2803	0.2336	0.0110
2002	0.1750	5.7143	4.8928	0.2044	0.0635	**2002**	0.1700	5.8824	3.8824	0.2576	0.0085
2003	0.1750	5.7143	5.0220	0.1991	0.0680	**2003**	0.2000	5.0000	3.4768	0.2876	0.0083
2004	0.1750	5.7143	5.2755	0.1896	0.0710	**2004**	0.1530	6.5359	4.5336	0.2206	0.0083
2005	0.1750	5.7143	5.2975	0.1888	0.0653	**2005**	0.1800	5.5556	4.2607	0.2347	0.0079
2006	0.1750	5.7143	5.4446	0.1837	0.0617	**2006**	0.1900	5.2632	4.3200	0.2315	0.0088
2007	0.1750	5.7143	5.9383	0.1684	0.0633	**2007**	0.2000	5.0000	4.4698	0.2237	0.0078
2008	0.1750	5.7143	5.5659	0.1797	0.0654	**2008**	0.1900	5.2632	4.2246	0.2367	0.0080
2009	0.1750	5.7143	4.9985	0.2001	0.0722	**2009**	0.1820	5.4945	3.3322	0.3001	0.0050
2010	0.1750	5.7143	5.1611	0.1938	0.0715	**2010**	0.1820	5.4945	3.4693	0.2882	0.0054
2011	0.1750	5.7143	5.3264	0.1877	0.0644	**2011**	0.1820	5.4945	3.4163	0.2927	0.0051
2012	0.1750	5.7143	5.1621	0.1937	0.0667	**2012**	0.1820	5.4945	3.3474	0.2987	0.0043
8. India	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**11. Korea**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1100	9.0909	5.1304	0.1949	0.0308	**1990**	0.1500	6.6667	6.3423	0.1577	0.0587
1991	0.1200	8.3333	5.5267	0.1809	0.0298	**1991**	0.1500	6.6667	5.9404	0.1683	0.0663
1992	0.1200	8.3333	5.5791	0.1792	0.0396	**1992**	0.1500	6.6667	6.4311	0.1555	0.0607
1993	0.1100	9.0909	5.3114	0.1883	0.0377	**1993**	0.1500	6.6667	6.9919	0.1430	0.0568
1994	0.1300	7.6923	5.2013	0.1923	0.0476	**1994**	0.1500	6.6667	6.8240	0.1465	0.0609
1995	0.1350	7.4074	5.2363	0.1910	0.0532	**1995**	0.1750	5.7143	5.8122	0.1721	0.1281
1996	0.1300	7.6923	5.4256	0.1843	0.0428	**1996**	0.1750	5.7143	5.7502	0.1739	0.0677
1997	0.1250	8.0000	6.3911	0.1565	0.0459	**1997**	0.1750	5.7143	5.7091	0.1752	0.0598
1998	0.1300	7.6923	5.9751	0.1674	0.0444	**1998**	0.1550	6.4516	5.3757	0.1860	0.0315
1999	0.1300	7.6923	5.9832	0.1671	0.0509	**1999**	0.1750	5.7143	4.8010	0.2083	0.0355
2000	0.1300	7.6923	5.7772	0.1731	0.0492	**2000**	0.1900	5.2632	7.1281	0.1403	0.0418
2001	0.1300	7.6923	5.5840	0.1791	0.0486	**2001**	0.1850	5.4054	6.4906	0.1541	0.0406
2002	0.1300	7.6923	5.4764	0.1826	0.0529	**2002**	0.1900	5.2632	6.7299	0.1486	0.0417
2003	0.1450	6.8966	5.3776	0.1860	0.0574	**2003**	0.1750	5.7143	6.4267	0.1556	0.0412
2004	0.1750	5.7143	4.7493	0.2106	0.0724	**2004**	0.1750	5.7143	5.7510	0.1739	0.0381
2005	0.1750	5.7143	4.7549	0.2103	0.0720	**2005**	0.1750	5.7143	6.0735	0.1646	0.0393
2006	0.1750	5.7143	5.0019	0.1999	0.0757	**2006**	0.1850	5.4054	5.8134	0.1720	0.0390
2007	0.1700	5.8824	5.0370	0.1985	0.0778	**2007**	0.2150	4.6512	5.3009	0.1886	0.0382
2008	0.1700	5.8824	4.2830	0.2335	0.0751	**2008**	0.2050	4.8780	5.3654	0.1864	0.0416
2009	0.1700	5.8824	4.1109	0.2433	0.0733	**2009**	0.2000	5.0000	5.0054	0.1998	0.0293
2010	0.1700	5.8824	4.4464	0.2249	0.0725	**2010**	0.2100	4.7619	5.2035	0.1922	0.0368
2011	0.1700	5.8824	4.5416	0.2202	0.0759	**2011**	0.2100	4.7619	5.2835	0.1893	0.0366
2012	0.1700	5.8824	4.5416	0.2202	0.0759	**2012**	0.2100	4.7619	5.3284	0.1877	0.0315

Chapter 12

Table M3 Multipliers and each inverse in equilibrium: Malaysia, Philippines, Singapore, Sri Lanka, Thailand, Vietnam, 1990-2012

12. Malay	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	15. Sri Lan	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1750	5.7143	4.8293	0.2071	0.0488	**1990**	0.0700	14.2857	6.4531	0.1550	0.0593
1991	0.1750	5.7143	5.0837	0.1967	0.0628	**1991**	0.0670	14.9254	5.8522	0.1709	0.0554
1992	0.1900	5.2632	5.0209	0.1992	0.0541	**1992**	0.0850	11.7647	6.9347	0.1442	0.0648
1993	0.1850	5.4054	5.4730	0.1827	0.0588	**1993**	0.0800	12.5000	6.6412	0.1506	0.0667
1994	0.1850	5.4054	6.2523	0.1599	0.0609	**1994**	0.0800	12.5000	5.7509	0.1739	0.0468
1995	0.1850	5.4054	5.6913	0.1757	0.0666	**1995**	0.0800	12.5000	5.8537	0.1708	0.0672
1996	0.1750	5.7143	5.9862	0.1671	0.0573	**1996**	0.1100	9.0909	5.1095	0.1957	0.0632
1997	0.1750	5.7143	6.7173	0.1489	0.0584	**1997**	0.1100	9.0909	5.6153	0.1781	0.1007
1998	0.1750	5.7143	5.1382	0.1946	0.0236	**1998**	0.1200	8.3333	5.1005	0.1961	0.0659
1999	0.1750	5.7143	4.7607	0.2101	0.0198	**1999**	0.1200	8.3333	5.3980	0.1853	0.0711
2000	0.1750	5.7143	4.7481	0.2106	0.0328	**2000**	0.1100	9.0909	4.9185	0.2033	0.0735
2001	0.1750	5.7143	4.7695	0.2097	0.0234	**2001**	0.1100	9.0909	4.6774	0.2138	0.0445
2002	0.1750	5.7143	5.0455	0.1982	0.0279	**2002**	0.1300	7.6923	4.7203	0.2119	0.0492
2003	0.1750	5.7143	4.8975	0.2042	0.0229	**2003**	0.1300	7.6923	4.8486	0.2062	0.0448
2004	0.1750	5.7143	4.8669	0.2055	0.0246	**2004**	0.1300	7.6923	4.7285	0.2115	0.0589
2005	0.1750	5.7143	4.8332	0.2069	0.0192	**2005**	0.1300	7.6923	4.8189	0.2075	0.0686
2006	0.1750	5.7143	4.9485	0.2021	0.0177	**2006**	0.1300	7.6923	4.8431	0.2065	0.0755
2007	0.1750	5.7143	4.9762	0.2010	0.0207	**2007**	0.1300	7.6923	4.9393	0.2025	0.0772
2008	0.1750	5.7143	4.8797	0.2049	0.0203	**2008**	0.1300	7.6923	4.9265	0.2030	0.0810
2009	0.1750	5.7143	4.4638	0.2240	0.0061	**2009**	0.1300	7.6923	4.0950	0.2442	0.0627
2010	0.1650	6.0606	4.6345	0.2158	0.0224	**2010**	0.1300	7.6923	4.3643	0.2291	0.0760
2011	0.1650	6.0606	4.7815	0.2091	0.0300	**2011**	0.1300	7.6923	4.4596	0.2242	0.0828
2012	0.1650	6.0606	4.8431	0.2065	0.0810	**2012**	0.1300	7.6923	4.5888	0.2179	0.0882

13. Philipp	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	16. Thailan	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1200	8.3333	6.3145	0.1584	0.0852	**1990**	0.1900	5.2632	7.3786	0.1355	0.0565
1991	0.1200	8.3333	6.9706	0.1435	0.0424	**1991**	0.1770	5.6497	7.5488	0.1325	0.0588
1992	0.1200	8.3333	7.5118	0.1331	0.0385	**1992**	0.1900	5.2632	6.1796	0.1618	0.0567
1993	0.1200	8.3333	7.3262	0.1365	0.0485	**1993**	0.1750	5.7143	6.4319	0.1555	0.0573
1994	0.1600	6.2500	6.7517	0.1481	0.0414	**1994**	0.1750	5.7143	6.9442	0.1440	0.0598
1995	0.1600	6.2500	6.5128	0.1535	0.0505	**1995**	0.1750	5.7143	7.1851	0.1392	0.0631
1996	0.1600	6.2500	6.3776	0.1568	0.0434	**1996**	0.1750	5.7143	6.0766	0.1646	0.0604
1997	0.1600	6.2500	6.2781	0.1593	0.0495	**1997**	0.1750	5.7143	5.6011	0.1785	0.0344
1998	0.1350	7.4074	6.4169	0.1558	0.0075	**1998**	0.1750	5.7143	4.8551	0.2060	0.0188
1999	0.1050	9.5238	6.8178	0.1467	(0.0153)	**1999**	0.1750	5.7143	4.7182	0.2119	0.0187
2000	0.1010	9.9010	6.8455	0.1461	(0.0172)	**2000**	0.1750	5.7143	5.0153	0.1994	0.0230
2001	0.1020	9.8039	6.8035	0.1470	0.0159	**2001**	0.1750	5.7143	4.9961	0.2002	0.0231
2002	0.0780	12.8205	7.2740	0.1375	0.0136	**2002**	0.1750	5.7143	6.6370	0.1507	0.0234
2003	0.0900	11.1111	7.0675	0.1415	0.0469	**2003**	0.1750	5.7143	5.8971	0.1696	0.0259
2004	0.0900	11.1111	7.5378	0.1327	0.0388	**2004**	0.1750	5.7143	6.8425	0.1461	0.0320
2005	0.0900	11.1111	8.3340	0.1200	0.0371	**2005**	0.1750	5.7143	6.2034	0.1612	0.0453
2006	0.1100	9.0909	8.2318	0.1215	0.0312	**2006**	0.1750	5.7143	5.7808	0.1730	0.0430
2007	0.1050	9.5238	9.3459	0.1070	0.0266	**2007**	0.1750	5.7143	5.7840	0.1729	0.0375
2008	0.0950	10.5263	9.2286	0.1084	0.0146	**2008**	0.1850	5.4054	4.4752	0.2235	0.0466
2009	0.0680	14.7059	9.1044	0.1098	(0.0586)	**2009**	0.1850	5.4054	5.5029	0.1817	0.0278
2010	0.0740	13.5135	8.8933	0.1124	(0.0288)	**2010**	0.1820	5.4945	4.8250	0.2073	0.0391
2011	0.0900	11.1111	9.1289	0.1095	(0.0157)	**2011**	0.1820	5.4945	4.6770	0.2138	0.0402
2012	0.0980	10.2041	8.3567	0.1197	(0.0379)	**2012**	0.1820	5.4945	5.4945	0.1820	0.0455

Table M4 Multipliers and each inverse in equilibrium: 14 Euro area, Austria, Belgium, Finland, France, Germany, 1990-2012

E0. Euro A	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	3. Finland	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990						**1990**	0.2850	3.5088	3.5343	0.2829	0.0834
1991						**1991**	0.2350	4.2553	3.1779	0.3147	0.0354
1992						**1992**	0.1280	7.8125	3.4039	0.2938	0.0234
1993						**1993**	0.1180	8.4746	3.7264	0.2684	0.0120
1994						**1994**	0.1400	7.1429	3.7103	0.2695	0.0188
1995						**1995**	0.1730	5.7803	3.5894	0.2786	0.0453
1996						**1996**	0.2150	4.6512	3.5134	0.2846	0.0369
1997						**1997**	0.2500	4.0000	3.9377	0.2540	0.0410
1998						**1998**	0.2700	3.7037	3.6953	0.2706	0.0459
1999	0.2450	4.0816	3.9355	0.2541	0.0442	**1999**	0.2900	3.4483	3.6297	0.2755	0.0426
2000	0.2450	4.0816	3.9987	0.2501	0.0459	**2000**	0.3400	2.9412	3.2607	0.3067	0.0455
2001	0.2400	4.1667	3.9296	0.2545	0.0537	**2001**	0.3100	3.2258	4.0287	0.2482	0.0413
2002	0.2386	4.1915	3.8336	0.2609	0.0718	**2002**	0.3080	3.2468	3.9236	0.2549	0.0346
2003	0.2427	4.1195	3.6900	0.2710	0.0412	**2003**	0.3150	3.1746	3.5698	0.2801	0.0374
2004	0.2475	4.0412	3.6481	0.2741	0.0384	**2004**	0.2970	3.3670	3.7984	0.2633	0.0301
2005	0.2522	3.9658	3.6421	0.2746	0.0399	**2005**	0.3090	3.2362	3.6361	0.2750	0.0390
2006	0.2476	4.0381	3.8951	0.2567	0.0407	**2006**	0.3100	3.2258	3.8063	0.2627	0.0354
2007	0.2500	4.0000	4.0018	0.2499	0.0479	**2007**	0.3200	3.1250	3.9005	0.2564	0.0439
2008	0.2476	4.0381	3.7853	0.2642	0.0451	**2008**	0.3200	3.1250	3.7479	0.2668	0.0378
2009	0.2600	3.8462	3.0966	0.3229	0.0295	**2009**	0.3200	3.1250	2.9096	0.3437	0.0200
2010	0.2600	3.8462	3.0758	0.3251	0.0305	**2010**	0.2700	3.7037	3.3580	0.2978	0.0190
2011	0.2600	3.8462	3.2817	0.3047	0.0327	**2011**	0.2800	3.5714	3.4682	0.2883	0.0331
2012	0.2600	3.8462	3.3096	0.3022	0.0284	**2012**	0.2700	3.7037	3.4350	0.2911	0.0289

E1. Austri	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	4. France	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.2350	4.2553	3.4743	0.2878	0.0936	**1990**	0.2300	4.3478	3.9438	0.2536	0.1181
1991	0.2350	4.2553	3.4365	0.2910	0.0899	**1991**	0.2300	4.3478	4.0951	0.2442	0.0947
1992	0.2350	4.2553	3.5618	0.2808	0.0797	**1992**	0.2000	5.0000	4.0986	0.2440	0.0743
1993	0.2350	4.2553	3.3966	0.2944	0.0697	**1993**	0.2000	5.0000	3.7904	0.2638	0.0509
1994	0.2350	4.2553	3.3236	0.3009	0.0750	**1994**	0.2000	5.0000	3.8074	0.2626	0.0540
1995	0.2300	4.3478	3.4675	0.2884	0.0523	**1995**	0.2300	4.3478	3.3105	0.3021	0.0543
1996	0.2270	4.4053	3.6513	0.2739	0.0472	**1996**	0.2500	4.0000	3.2501	0.3077	0.0427
1997	0.2240	4.4643	4.0930	0.2443	0.0441	**1997**	0.2650	3.7736	3.2956	0.3034	0.0381
1998	0.2210	4.5249	4.0377	0.2477	0.0448	**1998**	0.2650	3.7736	3.4154	0.2928	0.0439
1999	0.2180	4.5872	4.0983	0.2440	0.0517	**1999**	0.2700	3.7037	3.4503	0.2898	0.0304
2000	0.2180	4.5872	4.0926	0.2443	0.0489	**2000**	0.2800	3.5714	3.4985	0.2858	0.0417
2001	0.2300	4.3478	4.2493	0.2353	0.0422	**2001**	0.2600	3.8462	3.7330	0.2679	0.0319
2002	0.2300	4.3478	4.1446	0.2413	0.0316	**2002**	0.2600	3.8462	3.4879	0.2867	0.0294
2003	0.2300	4.3478	3.9770	0.2514	0.0319	**2003**	0.2600	3.8462	3.3803	0.2958	0.0248
2004	0.2200	4.5455	3.6193	0.2763	0.0411	**2004**	0.2600	3.8462	3.4471	0.2901	0.0244
2005	0.2200	4.5455	4.1112	0.2432	0.0410	**2005**	0.2700	3.7037	3.4379	0.2909	0.0280
2006	0.2200	4.5455	4.1070	0.2435	0.0382	**2006**	0.2700	3.7037	3.4986	0.2858	0.0302
2007	0.2300	4.3478	4.1204	0.2427	0.0397	**2007**	0.2700	3.7037	3.4564	0.2893	0.0350
2008	0.2300	4.3478	4.1168	0.2429	0.0394	**2008**	0.2650	3.7736	3.4178	0.2926	0.0337
2009	0.2300	4.3478	3.5820	0.2792	0.0321	**2009**	0.2400	4.1667	3.1813	0.3143	0.0201
2010	0.2300	4.3478	3.5063	0.2852	0.0342	**2010**	0.2300	4.3478	3.2975	0.3033	0.0206
2011	0.2300	4.3478	3.5063	0.2852	0.0349	**2011**	0.2500	4.0000	3.2976	0.3033	0.0232
2012	0.2300	4.3478	3.5063	0.2852	0.0336	**2012**	0.2500	4.0000	3.3300	0.3003	0.0198

E2. Belgiu	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	5. Germany	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1300	7.6923	5.0957	0.1962	0.0295	**1990**	0.2215	4.5147	4.1703	0.2398	0.0802
1991	0.1300	7.6923	4.9451	0.2022	0.0226	**1991**	0.2215	4.5147	4.0646	0.2460	0.0762
1992	0.1300	7.6923	4.8232	0.2073	0.0336	**1992**	0.2215	4.5147	4.0272	0.2483	0.0676
1993	0.1300	7.6923	4.9595	0.2016	0.0190	**1993**	0.2215	4.5147	4.0070	0.2496	0.0535
1994	0.1400	7.1429	5.1633	0.1937	0.0091	**1994**	0.2215	4.5147	4.2304	0.2364	0.0598
1995	0.2000	5.0000	3.8206	0.2617	0.0285	**1995**	0.2215	4.5147	4.1543	0.2407	0.0584
1996	0.2300	4.3478	3.6656	0.2728	0.0340	**1996**	0.2200	4.5455	4.1200	0.2427	0.0492
1997	0.2300	4.3478	3.8077	0.2626	0.0378	**1997**	0.2200	4.5455	4.2610	0.2347	0.0477
1998	0.2300	4.3478	3.9063	0.2560	0.0356	**1998**	0.2300	4.3478	4.1621	0.2403	0.0495
1999	0.2440	4.0984	4.0396	0.2475	0.0676	**1999**	0.2280	4.3860	4.1051	0.2436	0.0491
2000	0.2540	3.9370	3.9826	0.2511	0.0637	**2000**	0.2280	4.3860	4.1275	0.2423	0.0583
2001	0.2540	3.9370	3.9882	0.2507	0.0611	**2001**	0.2060	4.8544	4.1734	0.2396	0.0373
2002	0.2800	3.5714	3.5495	0.2817	0.0521	**2002**	0.1930	5.1813	4.2364	0.2360	0.0319
2003	0.2800	3.5714	3.5505	0.2817	0.0227	**2003**	0.1880	5.3191	4.2382	0.2359	0.0290
2004	0.2800	3.5714	3.5205	0.2840	0.0514	**2004**	0.1800	5.5556	4.4281	0.2258	0.0196
2005	0.2600	3.8462	3.4319	0.2914	0.0436	**2005**	0.1800	5.5556	4.5205	0.2212	0.0183
2006	0.2870	3.4843	3.4698	0.2882	0.0333	**2006**	0.1950	5.1282	4.6201	0.2164	0.0197
2007	0.2800	3.5714	3.5103	0.2849	0.0298	**2007**	0.2150	4.6512	4.6509	0.2150	0.0253
2008	0.2800	3.5714	3.3782	0.2960	0.0314	**2008**	0.2200	4.5455	4.4900	0.2227	0.0263
2009	0.2700	3.7037	2.9561	0.3383	0.0176	**2009**	0.1960	5.1020	4.3160	0.2317	0.0123
2010	0.2700	3.7037	3.1280	0.3197	0.0178	**2010**	0.1800	5.5556	4.3506	0.2299	0.0162
2011	0.2700	3.7037	3.1280	0.3197	0.0202	**2011**	0.2180	4.5872	4.3879	0.2279	0.0210
2012	0.2700	3.7037	3.1280	0.3197	0.0197	**2012**	0.2260	4.4248	4.3955	0.2275	0.0174

Chapter 12

Table M5 Multipliers and each inverse in equilibrium: Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, 1990-2012

6. Greece	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.0500	20.0000	0.0058	171.5608	0.1616
1991	0.0500	20.0000	0.0062	161.8078	0.1236
1992	0.0800	12.5000	0.0065	154.0235	0.0733
1993	0.0500	20.0000	0.0065	154.9107	0.0675
1994	0.0050	200.0000	0.0065	155.0171	0.0766
1995	0.0500	20.0000	0.0058	172.1704	0.0329
1996	0.0800	12.5000	0.0061	163.1448	0.0527
1997	0.1300	7.6923	0.0066	151.7487	0.1220
1998	0.1700	5.8824	0.0065	153.2752	0.1157
1999	0.1700	5.8824	0.0065	154.6382	0.1143
2000	0.2000	5.0000	0.0050	199.9748	0.1505
2001	0.1800	5.5556	4.6372	0.2156	0.0910
2002	0.1800	5.5556	4.6125	0.2168	0.0736
2003	0.1800	5.5556	4.5002	0.2222	0.0796
2004	0.1600	6.2500	4.5144	0.2215	0.0323
2005	0.1700	5.8824	4.7923	0.2087	0.0298
2006	0.1800	5.5556	4.3588	0.2294	0.0414
2007	0.1800	5.5556	4.2059	0.2378	0.0493
2008	0.1750	5.7143	3.7635	0.2657	0.0420
2009	0.1560	6.4103	3.1375	0.3187	0.0251
2010	0.0700	14.2857	5.1928	0.1926	0.0231
2011	0.1000	10.0000	4.4709	0.2237	0.0181
2012	0.1000	10.0000	4.3899	0.2278	0.0042

9. Luxemb	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990					
1991					
1992					
1993					
1994					
1995	0.2140	4.6729	5.1133	0.1956	0.0134
1996	0.2110	4.7393	5.0204	0.1992	0.0216
1997	0.2470	4.0486	4.7233	0.2117	0.0456
1998	0.2470	4.0486	4.6578	0.2147	0.0592
1999	0.2450	4.0816	5.6383	0.1774	0.1355
2000	0.2690	3.7175	5.6199	0.1779	0.1261
2001	0.2800	3.5714	4.9312	0.2028	0.1072
2002	0.2970	3.3670	4.2089	0.2376	0.1097
2003	0.2690	3.7175	4.3115	0.2319	0.1048
2004	0.2450	4.0816	4.3454	0.2301	0.0676
2005	0.1990	5.0251	5.9133	0.1691	0.0683
2006	0.1750	5.7143	7.4573	0.1341	0.0753
2007	0.2500	4.0000	5.2404	0.1908	0.0620
2008	0.2600	3.8462	4.8065	0.2081	0.0650
2009	0.2600	3.8462	4.0494	0.2470	0.0545
2010	0.2600	3.8462	4.0132	0.2492	0.0577
2011	0.2600	3.8462	4.0132	0.2492	0.0590
2012	0.2600	3.8462	4.0132	0.2492	0.0545

7. Ireland	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1750	5.7143	5.1414	0.1945	0.0732
1991	0.1900	5.2632	5.0158	0.1994	0.0567
1992	0.1700	5.8824	5.0955	0.1963	0.0461
1993	0.1900	5.2632	5.0231	0.1991	0.0452
1994	0.1900	5.2632	4.9900	0.2004	0.0454
1995	0.1900	5.2632	5.0751	0.1970	0.0493
1996	0.1900	5.2632	5.3337	0.1875	0.0522
1997	0.1900	5.2632	5.4398	0.1838	0.0564
1998	0.2150	4.6512	5.2013	0.1923	0.0595
1999	0.2600	3.8462	4.8439	0.2064	0.0634
2000	0.2550	3.9216	4.7874	0.2089	0.0642
2001	0.2400	4.1667	5.0577	0.1977	0.0577
2002	0.2300	4.3478	4.9106	0.2036	0.0554
2003	0.2300	4.3478	4.9894	0.2004	0.0496
2004	0.2300	4.3478	5.2152	0.1917	0.0471
2005	0.2300	4.3478	5.3189	0.1880	0.0511
2006	0.2500	4.0000	5.2357	0.1910	0.0516
2007	0.2400	4.1667	4.9124	0.2036	0.0528
2008	0.2200	4.5455	3.8742	0.2581	0.0443
2009	0.1800	5.5556	3.2074	0.3118	0.0299
2010	0.1700	5.8824	2.0301	0.4926	0.0214
2011	0.1000	10.0000	4.2314	0.2363	0.0229
2012	0.1600	6.2500	4.1579	0.2405	0.0195

10. Nether	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1400	7.1429	5.3003	0.1887	0.0543
1991	0.1400	7.1429	5.8922	0.1697	0.0491
1992	0.1400	7.1429	5.6661	0.1765	0.0460
1993	0.1800	5.5556	5.2600	0.1901	0.0386
1994	0.1800	5.5556	5.3965	0.1853	0.0424
1995	0.1530	6.5359	5.2129	0.1918	0.0384
1996	0.1640	6.0976	5.5686	0.1796	0.0387
1997	0.1640	6.0976	5.5341	0.1807	0.0391
1998	0.1800	5.5556	5.4172	0.1846	0.0420
1999	0.2900	3.4483	3.2582	0.3069	0.0379
2000	0.3000	3.3333	3.3223	0.3010	0.0309
2001	0.2850	3.5088	3.5788	0.2794	0.0364
2002	0.2730	3.6630	3.5068	0.2852	0.0268
2003	0.2660	3.7594	3.4392	0.2908	0.0242
2004	0.2700	3.7037	3.4969	0.2860	0.0169
2005	0.3000	3.3333	3.3470	0.2988	0.0243
2006	0.3000	3.3333	3.4303	0.2915	0.0214
2007	0.3100	3.2258	3.3056	0.3025	0.0269
2008	0.3100	3.2258	3.3733	0.2964	0.0392
2009	0.3100	3.2258	2.7778	0.3600	0.0330
2010	0.3100	3.2258	2.7964	0.3576	0.0254
2011	0.3000	3.3333	2.9023	0.3446	0.0199
2012	0.3000	3.3333	2.9425	0.3398	0.0192

8. Italy	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.0900	11.1111	4.6394	0.2155	0.0578
1991	0.1000	10.0000	4.5736	0.2186	0.0666
1992	0.1200	8.3333	4.5753	0.2186	0.0426
1993	0.1300	7.6923	4.7352	0.2112	0.0293
1994	0.1300	7.6923	4.8336	0.2069	0.0311
1995	0.1400	7.1429	4.5736	0.2186	0.0466
1996	0.1500	6.6667	4.3725	0.2287	0.0345
1997	0.2100	4.7619	4.4485	0.2248	0.0387
1998	0.2000	5.0000	4.5163	0.2214	0.0340
1999	0.2100	4.7619	4.7152	0.2121	0.0257
2000	0.2200	4.5455	4.4147	0.2265	0.0296
2001	0.2000	5.0000	4.1876	0.2388	0.0284
2002	0.2140	4.6729	4.2711	0.2341	0.0272
2003	0.2300	4.3478	4.2749	0.2339	0.0258
2004	0.2100	4.7619	4.2232	0.2368	0.0454
2005	0.2090	4.7847	4.0704	0.2457	0.0044
2006	0.2200	4.5455	4.1613	0.2403	0.0290
2007	0.2320	4.3103	4.0892	0.2445	0.0276
2008	0.2400	4.1667	3.9449	0.2535	0.0247
2009	0.2100	4.7619	3.6334	0.2752	0.0132
2010	0.2100	4.7619	3.7300	0.2681	0.0196
2011	0.2100	4.7619	3.7799	0.2646	0.0144
2012	0.2100	4.7619	3.9279	0.2546	0.0083

11. Portug	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1600	6.2500	4.7014	0.2127	0.0601
1991	0.1700	5.8824	4.1950	0.2384	0.0522
1992	0.1850	5.4054	4.7348	0.2112	0.0533
1993	0.1800	5.5556	3.7145	0.2692	0.0417
1994	0.1800	5.5556	4.2249	0.2367	0.0372
1995	0.1800	5.5556	4.2268	0.2366	0.0385
1996	0.2150	4.6512	4.1598	0.2404	0.0430
1997	0.2200	4.5455	4.1086	0.2434	0.0469
1998	0.2300	4.3478	4.0907	0.2445	0.0478
1999	0.2300	4.3478	3.8298	0.2611	0.0602
2000	0.2350	4.2553	3.9958	0.2503	0.0404
2001	0.2350	4.2553	3.8123	0.2623	0.0459
2002	0.2400	4.1667	3.8345	0.2608	0.0338
2003	0.2450	4.0816	3.7567	0.2662	0.0325
2004	0.2500	4.0000	3.6361	0.2750	0.0287
2005	0.2500	4.0000	3.2602	0.3067	0.0363
2006	0.2500	4.0000	3.4125	0.2930	0.0369
2007	0.2300	4.3478	3.8549	0.2594	0.0378
2008	0.2300	4.3478	3.6698	0.2725	0.0371
2009	0.2100	4.7619	3.1929	0.3132	0.0265
2010	0.2000	5.0000	3.4125	0.2930	0.0260
2011	0.2000	5.0000	4.0971	0.2441	0.0186
2012	0.2000	5.0000	4.0713	0.2456	0.0065

Table M6 Multipliers and each inverse in equilibrium: Slovak, Slovenia, Spain, Romania, Russia, Turkey, 1990-2012

12. Slovak	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	6. Romani	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1995	0.2770	3.6101	3.2704	0.3058	0.1000	**1995**	0.1400	7.1429	5.7362	0.1743	0.0766
1996	0.2850	3.5088	3.3373	0.2996	0.1497	**1996**	0.1440	6.9444	5.2271	0.1913	0.0849
1997	0.2770	3.6101	3.1109	0.3215	0.1339	**1997**	0.1480	6.7568	5.2124	0.1918	0.0749
1998	0.2700	3.7037	3.2169	0.3109	0.1186	**1998**	0.1520	6.5789	5.4274	0.1842	0.0773
1999	0.2500	4.0000	3.5044	0.2854	0.0995	**1999**	0.1560	6.4103	5.4596	0.1832	0.0667
2000	0.2498	4.0032	3.5377	0.2827	0.0842	**2000**	0.1650	6.0606	5.4944	0.1820	0.0760
2001	0.2570	3.8911	2.9553	0.3384	0.0977	**2001**	0.1640	6.0976	5.4988	0.1819	0.0956
2002	0.2500	4.0000	2.8530	0.3505	0.0895	**2002**	0.1750	5.7143	5.8271	0.1716	0.0950
2003	0.2580	3.8760	3.3050	0.3026	0.0658	**2003**	0.2100	4.7619	4.1013	0.2438	0.0962
2004	0.2630	3.8023	3.3123	0.3019	0.0719	**2004**	0.1780	5.6180	5.2464	0.1906	0.0937
2005	0.2650	3.7736	3.2744	0.3054	0.0799	**2005**	0.2100	4.7619	4.7927	0.2087	0.0920
2006	0.2600	3.8462	3.2267	0.3099	0.0737	**2006**	0.2050	4.8780	5.0326	0.1987	0.1121
2007	0.2550	3.9216	3.7138	0.2693	0.0703	**2007**	0.1970	5.0761	5.3832	0.1858	0.1298
2008	0.2400	4.1667	3.9719	0.2518	0.0696	**2008**	0.1950	5.1282	4.6744	0.2139	0.1248
2009	0.1800	5.5556	4.3535	0.2297	0.0001	**2009**	0.1950	5.1282	3.8650	0.2587	0.0823
2010	0.1800	5.5556	3.9118	0.2556	0.0023	**2010**	0.1950	5.1282	4.2571	0.2349	0.0826
2011	0.1800	5.5556	3.9118	0.2556	0.0026	**2011**	0.1950	5.1282	4.2571	0.2349	0.0736
2012	0.1800	5.5556	3.9118	0.2556	0.0026	**2012**	0.1950	5.1282	4.2571	0.2349	0.0680

13. Sloven	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	7. Russia	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990											
1991											
1992											
1993											
1994											
1995	0.2200	4.5455	4.4840	0.2230	0.0516	**1995**	0.2050	4.8780	3.8603	0.2590	0.0909
1996	0.2200	4.5455	4.5591	0.2193	0.0557	**1996**	0.1800	5.5556	3.8215	0.2617	0.0885
1997	0.2080	4.8077	4.4844	0.2230	0.0829	**1997**	0.2000	5.0000	3.6855	0.2713	0.0760
1998	0.2150	4.6512	4.4875	0.2228	0.0858	**1998**	0.1700	5.8824	4.4479	0.2248	0.0337
1999	0.2200	4.5455	4.3809	0.2283	0.0924	**1999**	0.1600	6.2500	5.7787	0.1730	0.0365
2000	0.2200	4.5455	4.2942	0.2329	0.0863	**2000**	0.2300	4.3478	5.2254	0.1914	0.0636
2001	0.2200	4.5455	4.3236	0.2313	0.0697	**2001**	0.2350	4.2553	4.8858	0.2047	0.0846
2002	0.2200	4.5455	4.3656	0.2291	0.0666	**2002**	0.2800	3.5714	4.9262	0.2030	0.0718
2003	0.2200	4.5455	4.2655	0.2344	0.0715	**2003**	0.2400	4.1667	4.5644	0.2191	0.0744
2004	0.2200	4.5455	4.2346	0.2361	0.0786	**2004**	0.2600	3.8462	5.1095	0.1957	0.0731
2005	0.2200	4.5455	4.2917	0.2330	0.0707	**2005**	0.2900	3.4483	4.5922	0.2178	0.0672
2006	0.2200	4.5455	4.4100	0.2268	0.0735	**2006**	0.3200	3.1250	4.5607	0.2193	0.0741
2007	0.2300	4.3478	4.7295	0.2114	0.0764	**2007**	0.2900	3.4483	4.7635	0.2099	0.0921
2008	0.2300	4.3478	4.3471	0.2300	0.0772	**2008**	0.2800	3.5714	4.5348	0.2205	0.0932
2009	0.2300	4.3478	3.3782	0.2960	0.0456	**2009**	0.2000	5.0000	3.9888	0.2507	0.0503
2010	0.2300	4.3478	3.3924	0.2948	0.0435	**2010**	0.2200	4.5455	4.2350	0.2361	0.0641
2011	0.2300	4.3478	3.3924	0.2948	0.0423	**2011**	0.2400	4.1667	5.1157	0.1955	0.0510
2012	0.2300	4.3478	3.3924	0.2948	0.0404	**2012**	0.2600	3.8462	4.3126	0.2319	0.0632

14. Spain	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	8. Turkey	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1700	5.8824	4.7733	0.2095	0.0746	**1990**	0.1600	6.2500	5.1531	0.1941	0.0941
1991	0.1700	5.8824	4.5993	0.2174	0.0854	**1991**	0.1600	6.2500	4.6182	0.2165	0.0833
1992	0.1700	5.8824	4.6078	0.2170	0.0531	**1992**	0.1600	6.2500	4.8488	0.2062	0.1007
1993	0.1350	7.4074	4.7321	0.2113	0.0362	**1993**	0.1600	6.2500	5.3960	0.1853	0.1160
1994	0.1200	8.3333	4.8737	0.2052	0.0326	**1994**	0.1550	6.4516	5.3550	0.1867	0.0799
1995	0.1700	5.8824	4.5183	0.2213	0.0396	**1995**	0.1600	6.2500	5.5105	0.1815	0.1041
1996	0.1650	6.0606	4.5796	0.2184	0.0371	**1996**	0.1700	5.8824	5.1608	0.1938	0.1338
1997	0.1900	5.2632	4.7424	0.2109	0.0377	**1997**	0.1700	5.8824	4.5926	0.2177	0.1194
1998	0.2000	5.0000	4.9147	0.2035	0.0388	**1998**	0.1800	5.5556	4.5729	0.2187	0.0980
1999	0.2000	5.0000	4.8858	0.2047	0.0393	**1999**	0.1800	5.5556	4.3344	0.2307	0.0724
2000	0.2300	4.3478	4.8656	0.2055	0.0389	**2000**	0.1760	5.6818	4.8722	0.2052	0.0857
2001	0.2400	4.1667	4.8933	0.2044	0.0293	**2001**	0.1620	6.1728	4.7938	0.2086	0.0514
2002	0.2400	4.1667	5.0606	0.1976	0.0274	**2002**	0.1800	5.5556	4.4401	0.2252	0.0622
2003	0.2500	4.0000	4.8549	0.2060	0.0249	**2003**	0.1600	6.2500	4.0746	0.2454	0.0604
2004	0.2600	3.8462	4.6658	0.2143	0.0293	**2004**	0.1750	5.7143	4.3967	0.2274	0.0719
2005	0.2700	3.7037	4.7747	0.2094	0.0394	**2005**	0.1700	5.8824	4.6991	0.2128	0.0724
2006	0.2800	3.5714	4.7936	0.2086	0.0502	**2006**	0.1820	5.4945	4.7991	0.2084	0.0828
2007	0.2800	3.5714	4.7751	0.2094	0.0503	**2007**	0.1820	5.4945	4.9565	0.2018	0.0710
2008	0.2300	4.3478	4.3116	0.2319	0.0354	**2008**	0.1800	5.5556	4.8281	0.2071	0.0723
2009	0.1800	5.5556	3.7140	0.2693	0.0179	**2009**	0.1700	5.8824	4.6156	0.2167	0.0258
2010	0.1700	5.8824	3.8575	0.2592	0.0136	**2010**	0.1400	7.1429	5.4743	0.1827	0.0536
2011	0.1500	6.6667	3.6752	0.2721	0.0046	**2011**	0.1700	5.8824	4.8513	0.2061	0.0377
2012	0.1500	6.6667	3.3593	0.2977	0.0012	**2012**	0.1700	5.8824	4.9238	0.2031	0.0498

Table M7 Multipliers and each inverse in equilibrium: 15 Non-Euro area, Denmark, Iceland, Norway, Sweden, Switzerland, 1990-2012

15 Europe	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**3. Norway**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.2227	4.4910	4.3823	0.2282	0.0383	**1990**	0.2000	5.0000	5.1548	0.1940	0.0612
1991	0.2194	4.5570	4.0678	0.2458	0.0330	**1991**	0.2100	4.7619	4.1217	0.2426	0.0520
1992	0.1872	5.3419	4.3961	0.2275	(0.1055)	**1992**	0.2000	5.0000	3.6455	0.2743	0.0430
1993	0.2018	4.9554	3.6939	0.2707	0.0369	**1993**	0.2200	4.5455	3.5473	0.2819	0.0465
1994	0.2010	4.9751	3.8791	0.2578	(0.2537)	**1994**	0.2600	3.8462	3.5550	0.2813	0.0470
1995	0.2047	4.8860	4.1338	0.2419	0.0764	**1995**	0.3000	3.3333	3.5367	0.2827	0.0404
1996	0.2076	4.8170	4.1897	0.2387	0.0899	**1996**	0.2800	3.5714	3.6642	0.2729	0.0373
1997	0.2176	4.5956	4.0581	0.2464	0.0799	**1997**	0.2800	3.5714	3.6880	0.2711	0.0419
1998	0.2225	4.4937	4.0125	0.2492	0.0864	**1998**	0.2600	3.8462	3.4252	0.2920	0.0549
1999	0.2221	4.5018	3.8643	0.2588	0.0713	**1999**	0.2600	3.8462	3.3027	0.3028	0.0384
2000	0.2307	4.3353	3.9671	0.2521	0.0827	**2000**	0.2620	3.8168	3.8179	0.2619	0.0345
2001	0.2265	4.4144	3.8742	0.2581	0.0659	**2001**	0.2600	3.8462	3.8485	0.2598	0.0237
2002	0.2252	4.4398	3.9430	0.2536	0.0717	**2002**	0.2230	4.4843	4.4866	0.2229	0.0224
2003	0.2283	4.3796	3.4242	0.2920	0.0719	**2003**	0.2300	4.3478	4.3411	0.2304	0.0201
2004	0.2323	4.3048	3.7405	0.2673	0.0798	**2004**	0.2130	4.6948	4.7872	0.2089	0.0268
2005	0.2473	4.0437	3.6952	0.2706	0.0799	**2005**	0.2600	3.8462	3.9284	0.2546	0.0292
2006	0.2490	4.0166	3.8294	0.2611	0.0947	**2006**	0.2600	3.8462	4.0048	0.2497	0.0318
2007	0.2481	4.0301	3.9451	0.2535	0.0942	**2007**	0.2600	3.8462	3.8795	0.2578	0.0413
2008	0.2360	4.2373	3.9057	0.2560	0.0957	**2008**	0.2600	3.8462	3.8823	0.2576	0.0415
2009	0.2130	4.6948	3.7934	0.2636	0.0508	**2009**	0.2650	3.7736	4.0035	0.2498	0.0250
2010	0.2097	4.7695	3.9766	0.2515	0.0650	**2010**	0.2650	3.7736	3.8927	0.2569	0.0297
2011	0.2127	4.7022	4.0195	0.2488	0.0534	**2011**	0.2650	3.7736	3.8532	0.2595	0.1951
2012	0.2140	4.6729	4.0294	0.2482	0.0585	**2012**	0.2650	3.7736	3.9106	0.2557	0.1556
1. Denmar	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**4. Sweden**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.3100	3.2258	3.1466	0.3178	0.0590	**1990**	0.3500	2.8571	2.9520	0.3388	0.0597
1991	0.3000	3.3333	3.1936	0.3131	0.0508	**1991**	0.3200	3.1250	2.9685	0.3369	0.0467
1992	0.2900	3.4483	3.2513	0.3076	0.0409	**1992**	0.2800	3.5714	3.0695	0.3258	0.0419
1993	0.2900	3.4483	3.1712	0.3153	0.0306	**1993**	0.1900	5.2632	2.8288	0.3535	0.0316
1994	0.2800	3.5714	3.2633	0.3064	0.0322	**1994**	0.2000	5.0000	2.9438	0.3397	0.0342
1995	0.2800	3.5714	3.2668	0.3061	0.0453	**1995**	0.2300	4.3478	3.0850	0.3241	0.0423
1996	0.3100	3.2258	3.1925	0.3132	0.0436	**1996**	0.2900	3.4483	3.0783	0.3249	0.0394
1997	0.3100	3.2258	3.3629	0.2974	0.0509	**1997**	0.3200	3.1250	3.0329	0.3297	0.0304
1998	0.3200	3.1250	3.3202	0.3012	0.0510	**1998**	0.3200	3.1250	3.1628	0.3162	0.0313
1999	0.3200	3.1250	3.2297	0.3096	0.0424	**1999**	0.3400	2.9412	3.0868	0.3240	0.0327
2000	0.3400	2.9412	3.1345	0.3190	0.0493	**2000**	0.3500	2.8571	3.2720	0.3056	0.0351
2001	0.3200	3.1250	3.2395	0.3087	0.0426	**2001**	0.3300	3.0303	3.2609	0.3067	0.0305
2002	0.3200	3.1250	3.1337	0.3191	0.0398	**2002**	0.3200	3.1250	3.0484	0.3280	0.0260
2003	0.3200	3.1250	3.0830	0.3244	0.0345	**2003**	0.3250	3.0769	3.0088	0.3324	0.0173
2004	0.3400	2.9412	3.1303	0.3195	0.0320	**2004**	0.3300	3.0303	3.1382	0.3187	0.0217
2005	0.3600	2.7778	3.2696	0.3058	0.0301	**2005**	0.3350	2.9851	3.2632	0.3064	0.0211
2006	0.3600	2.7778	3.3028	0.3028	0.0350	**2006**	0.3300	3.0303	3.3650	0.2972	0.0232
2007	0.3600	2.7778	3.2688	0.3059	0.0376	**2007**	0.3400	2.9412	3.4341	0.2912	0.0248
2008	0.3500	2.8571	3.2063	0.3119	0.0278	**2008**	0.3400	2.9412	3.2590	0.3068	0.0178
2009	0.3200	3.1250	2.8623	0.3494	0.0133	**2009**	0.3250	3.0769	3.0737	0.3253	0.0098
2010	0.3200	3.1250	2.8764	0.3477	0.0131	**2010**	0.3250	3.0769	3.1866	0.3138	0.0175
2011	0.3100	3.2258	3.0370	0.3293	0.0118	**2011**	0.3200	3.1250	3.2401	0.3086	0.0160
2012	0.2900	3.4483	3.0253	0.3305	0.0095	**2012**	0.3200	3.1250	3.1677	0.3157	0.0144
2. Iceland	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**5. Switzerl**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.2200	4.5455	4.0381	0.2476	0.0416	**1990**	0.2000	5.0000	5.1169	0.1954	0.0629
1991	0.2200	4.5455	3.7159	0.2691	0.0439	**1991**	0.2000	5.0000	4.7342	0.2112	0.0478
1992	0.2200	4.5455	3.9173	0.2553	0.0335	**1992**	0.1900	5.2632	5.0506	0.1980	0.0370
1993	0.2080	4.8077	3.9371	0.2540	0.0271	**1993**	0.1700	5.8824	5.0728	0.1971	0.0291
1994	0.1920	5.2083	4.0192	0.2488	0.0242	**1994**	0.1800	5.5556	5.1553	0.1940	0.0335
1995	0.2210	4.5249	3.6742	0.2722	0.0267	**1995**	0.1400	7.1429	6.4302	0.1555	0.0320
1996	0.2600	3.8462	3.6993	0.2703	0.0365	**1996**	0.1500	6.6667	6.1263	0.1632	0.0360
1997	0.2780	3.5971	3.6493	0.2740	0.0399	**1997**	0.1500	6.6667	6.0832	0.1644	0.0425
1998	0.3200	3.1250	3.4624	0.2888	0.0579	**1998**	0.1500	6.6667	6.7128	0.1490	0.0383
1999	0.3280	3.0488	3.4294	0.2916	0.0459	**1999**	0.1500	6.6667	6.3820	0.1567	0.0341
2000	0.3200	3.1250	3.2861	0.3043	0.0531	**2000**	0.1500	6.6667	6.2434	0.1602	0.0341
2001	0.3000	3.3333	3.5876	0.2787	0.0487	**2001**	0.1500	6.6667	6.8292	0.1464	0.0315
2002	0.3000	3.3333	3.3033	0.3027	0.0241	**2002**	0.1500	6.6667	6.2375	0.1603	0.0254
2003	0.3000	3.3333	3.2038	0.3121	0.0325	**2003**	0.1500	6.6667	6.3463	0.1576	0.0223
2004	0.3300	3.0303	3.2581	0.3069	0.0564	**2004**	0.1500	6.6667	6.3783	0.1568	0.0236
2005	0.4000	2.5000	3.4233	0.2921	0.0700	**2005**	0.1500	6.6667	6.6243	0.1510	0.0242
2006	0.4000	2.5000	3.2764	0.3052	0.1004	**2006**	0.1500	6.6667	6.9152	0.1446	0.0260
2007	0.4000	2.5000	3.2079	0.3117	0.0755	**2007**	0.1500	6.6667	5.9532	0.1680	0.0249
2008	0.3000	3.3333	3.5278	0.2835	0.1114	**2008**	0.1500	6.6667	5.9532	0.1680	0.0205
2009	0.2800	3.5714	2.7511	0.3635	0.0603	**2009**	0.1500	6.6667	7.0356	0.1421	0.0168
2010	0.2800	3.5714	2.8858	0.3465	0.0450	**2010**	0.1500	6.6667	6.8531	0.1459	0.0173
2011	0.2800	3.5714	3.0446	0.3285	0.0400	**2011**	0.1500	6.6667	6.8483	0.1460	0.0180
2012	0.2800	3.5714	3.0371	0.3293	0.0455	**2012**	0.1500	6.6667	6.8483	0.1460	0.0206

Table M8 Multipliers and each inverse in equilibrium: the UK, Bulgaria, Czech Republic, Hungary, Latvia, Poland, 1990-2012

6. the UK	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	3. Hungary	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.2440	4.0984	4.2417	0.2358	0.0405	1990	0.1300	7.6923	6.9155	0.1446	0.0527
1991	0.2450	4.0816	3.9027	0.2562	0.0236	1991	0.1300	7.6923	6.3853	0.1566	0.0397
1992	0.2020	4.9505	3.8623	0.2589	0.0137	1992	0.1300	7.6923	6.0972	0.1640	0.0486
1993	0.1800	5.5556	3.9503	0.2531	0.0129	1993	0.1300	7.6923	4.8736	0.2052	0.0395
1994	0.1900	5.2632	4.0218	0.2486	0.0133	1994	0.1260	7.9365	5.1264	0.1951	0.0542
1995	0.1850	5.4054	4.0623	0.2462	0.0309	1995	0.1100	9.0909	5.4457	0.1836	0.0502
1996	0.1900	5.2632	4.3374	0.2306	0.0290	1996	0.1210	8.2645	6.3013	0.1587	0.0503
1997	0.2070	4.8309	4.3651	0.2291	0.0289	1997	0.1100	9.0909	6.0689	0.1648	0.0585
1998	0.2170	4.6083	4.7455	0.2107	0.0288	1998	0.0910	10.9890	5.9757	0.1673	0.0739
1999	0.2270	4.4053	4.6760	0.2139	0.0342	1999	0.1180	8.4746	4.8303	0.2070	0.0711
2000	0.2350	4.2553	4.5808	0.2183	0.0321	2000	0.1170	8.5470	6.0724	0.1647	0.0807
2001	0.2350	4.2553	4.4896	0.2227	0.0255	2001	0.1160	8.6207	5.9546	0.1679	0.0567
2002	0.2195	4.5558	4.2237	0.2368	0.0183	2002	0.0700	14.2857	6.2814	0.1592	0.0650
2003	0.2220	4.5045	3.9402	0.2538	0.0164	2003	0.1000	10.0000	5.3241	0.1878	0.0442
2004	0.2245	4.4543	3.9239	0.2548	0.0171	2004	0.0900	11.1111	5.9549	0.1679	0.0518
2005	0.2245	4.4543	3.7496	0.2667	0.0156	2005	0.0900	11.1111	5.6550	0.1768	0.0375
2006	0.2295	4.3573	3.9820	0.2511	0.0240	2006	0.1100	9.0909	4.9540	0.2019	0.0734
2007	0.2320	4.3103	3.9421	0.2537	0.0241	2007	0.1250	8.0000	5.6544	0.1769	0.0576
2008	0.2200	4.5455	3.8067	0.2627	0.0122	2008	0.1300	7.6923	5.6063	0.1784	0.0570
2009	0.1600	6.2500	3.6793	0.2718	0.0021	2009	0.1100	9.0909	6.1865	0.1616	0.0336
2010	0.1700	5.8824	3.7067	0.2698	0.0084	2010	0.1100	9.0909	5.7612	0.1736	0.0277
2011	0.1800	5.5556	3.8909	0.2570	0.0022	2011	0.1100	9.0909	5.7612	0.1736	0.0258
2012	0.2000	5.0000	3.8340	0.2608	0.0080	2012	0.1100	9.0909	5.7612	0.1736	0.0251

1. Bulgaria	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	4. Latvia	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1995	0.1300	7.6923	5.5408	0.1805	0.1579	1995	0.2800	3.5714	3.4662	0.2885	0.0467
1996	0.1100	9.0909	7.8180	0.1279	0.1140	1996	0.2500	4.0000	3.7655	0.2656	0.0781
1997	0.1730	5.7803	6.6453	0.1505	0.0340	1997	0.2600	3.8462	3.9540	0.2529	0.0938
1998	0.2200	4.5455	5.2547	0.1903	0.0876	1998	0.2900	3.4483	3.4660	0.2885	0.1174
1999	0.2200	4.5455	4.9088	0.2037	0.0809	1999	0.2530	3.9526	2.9296	0.3413	0.0984
2000	0.2200	4.5455	4.6824	0.2136	0.0872	2000	0.2550	3.9216	3.0773	0.3250	0.0947
2001	0.2200	4.5455	5.0201	0.1992	0.0954	2001	0.2550	3.9216	3.2038	0.3121	0.1022
2002	0.2100	4.7619	4.7543	0.2103	0.0501	2002	0.2590	3.8610	3.1469	0.3178	0.0979
2003	0.2400	4.1667	4.3140	0.2318	0.0675	2003	0.2550	3.9216	3.4962	0.2860	0.1058
2004	0.2650	3.7736	4.3900	0.2278	0.0922	2004	0.2750	3.6364	3.5132	0.2846	0.1283
2005	0.3000	3.3333	4.3408	0.2304	0.1015	2005	0.2650	3.7736	3.7065	0.2698	0.1278
2006	0.2650	3.7736	4.3845	0.2281	0.1205	2006	0.2670	3.7453	4.0429	0.2473	0.1491
2007	0.2500	4.0000	4.7387	0.2110	0.1059	2007	0.2690	3.7175	4.2967	0.2327	0.1502
2008	0.2500	4.0000	4.5364	0.2204	0.1448	2008	0.2600	3.8462	3.5100	0.2849	0.1099
2009	0.2500	4.0000	3.9656	0.2522	0.0948	2009	0.2000	5.0000	3.3573	0.2979	0.0121
2010	0.2500	4.0000	3.3830	0.2956	0.0721	2010	0.2000	5.0000	3.5697	0.2801	0.0316
2011	0.2500	4.0000	3.3830	0.2956	0.0632	2011	0.2000	5.0000	3.5697	0.2801	0.0278
2012	0.2500	4.0000	3.3830	0.2956	0.0590	2012	0.2000	5.0000	3.5697	0.2801	0.0270

2. Czech R	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	5. Poland	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
						1990	0.1900	5.2632	4.1439	0.2413	0.0571
						1991	0.1900	5.2632	3.6814	0.2716	0.0484
						1992	0.2000	5.0000	4.0929	0.2443	0.0403
						1993	0.2000	5.0000	4.2487	0.2354	0.0427
						1994	0.1870	5.3476	4.7261	0.2116	0.0599
1995	0.2900	3.4483	3.5094	0.2850	0.1885	1995	0.2000	5.0000	4.5575	0.2194	0.0519
1996	0.2600	3.8462	3.8297	0.2611	0.1613	1996	0.1990	5.0251	4.5369	0.2204	0.0576
1997	0.2600	3.8462	3.7114	0.2694	0.1221	1997	0.1980	5.0505	4.6162	0.2166	0.0757
1998	0.2510	3.9841	3.7301	0.2681	0.0836	1998	0.1970	5.0761	4.7577	0.2102	0.0843
1999	0.2530	3.9526	3.7265	0.2683	0.0969	1999	0.1670	5.9880	5.8778	0.1701	0.0808
2000	0.2550	3.9216	3.6074	0.2772	0.0989	2000	0.1850	5.4054	5.8724	0.1703	0.0745
2001	0.2570	3.8911	3.4747	0.2878	0.0913	2001	0.1940	5.1546	4.1904	0.2386	0.0459
2002	0.2590	3.8610	3.5708	0.2800	0.0769	2002	0.1930	5.1813	4.0748	0.2454	0.0312
2003	0.2610	3.8314	3.2559	0.3071	0.0763	2003	0.1920	5.2083	4.1074	0.2435	0.0317
2004	0.2630	3.8023	3.3355	0.2998	0.0720	2004	0.1910	5.2356	4.0655	0.2460	0.0399
2005	0.2650	3.7736	3.5000	0.2857	0.0591	2005	0.1900	5.2632	4.3475	0.2300	0.0349
2006	0.2670	3.7453	3.4850	0.2869	0.0586	2006	0.1890	5.2910	4.3546	0.2296	0.0451
2007	0.2670	3.7453	3.7127	0.2693	0.0581	2007	0.2000	5.0000	4.6015	0.2173	0.0810
2008	0.2670	3.7453	3.3421	0.2992	0.0477	2008	0.1880	5.3191	4.4695	0.2237	0.0770
2009	0.2600	3.8462	3.0451	0.3284	0.0412	2009	0.1900	5.2632	3.9408	0.2538	0.0525
2010	0.2600	3.8462	3.1171	0.3208	0.0434	2010	0.1900	5.2632	4.0088	0.2495	0.0530
2011	0.2600	3.8462	3.1171	0.3208	0.0437	2011	0.1900	5.2632	4.0088	0.2495	0.0497
2012	0.2600	3.8462	3.1171	0.3208	0.0415	2012	0.1900	5.2632	4.0088	0.2495	0.0471

Chapter 12

Table M9 Multipliers and each inverse in equilibrium: Argentina, Bolivia, Brazil, Chile, Colombia, Paraguay, 1990-2012

1. Argenti	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**4. Chile**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1500	6.6667	6.5784	0.1520	(0.0452)	**1990**	0.2000	5.0000	5.2337	0.1911	0.0588
1991	0.1500	6.6667	6.4168	0.1558	(0.0706)	**1991**	0.1750	5.7143	6.3326	0.1579	0.0547
1992	0.1500	6.6667	6.6510	0.1504	(0.0599)	**1992**	0.1900	5.2632	6.0434	0.1655	0.0684
1993	0.1500	6.6667	6.3535	0.1574	0.0935	**1993**	0.1750	5.7143	6.4748	0.1544	0.0825
1994	0.1500	6.6667	6.3236	0.1581	0.0879	**1994**	0.1750	5.7143	6.3274	0.1580	0.0793
1995	0.1500	6.6667	6.4045	0.1561	0.0712	**1995**	0.1750	5.7143	6.7197	0.1488	0.0607
1996	0.1500	6.6667	5.8354	0.1714	0.0752	**1996**	0.1750	5.7143	6.5962	0.1516	0.0696
1997	0.1500	6.6667	6.0049	0.1665	0.0782	**1997**	0.1750	5.7143	6.4493	0.1551	0.0692
1998	0.1500	6.6667	6.0453	0.1654	0.0736	**1998**	0.1750	5.7143	5.8482	0.1710	0.0614
1999	0.1500	6.6667	5.4992	0.1818	0.0502	**1999**	0.1750	5.7143	5.2623	0.1900	0.0406
2000	0.1500	6.6667	5.6608	0.1767	0.0456	**2000**	0.1750	5.7143	5.7652	0.1735	0.0462
2001	0.1100	9.0909	1.0491	0.9532	0.0342	**2001**	0.1750	5.7143	6.2814	0.1592	0.0537
2002	0.1000	10.0000	1.1057	0.9044	0.0333	**2002**	0.1750	5.7143	5.9651	0.1676	0.0527
2003	0.1500	6.6667	1.9217	0.5204	0.0464	**2003**	0.1750	5.7143	6.1457	0.1627	0.0532
2004	0.1500	6.6667	3.2107	0.3115	0.0669	**2004**	0.1900	5.2632	6.5225	0.1533	0.0536
2005	0.0300	33.3333	1.0946	0.9136	0.0654	**2005**	0.2100	4.7619	6.7416	0.1483	0.0575
2006	0.0500	20.0000	2.4133	0.4144	0.0701	**2006**	0.2400	4.1667	6.7070	0.1491	0.0541
2007	0.1500	6.6667	2.3581	0.4241	0.0747	**2007**	0.2500	4.0000	6.9321	0.1443	0.0521
2008	0.1500	6.6667	2.5871	0.3865	0.0778	**2008**	0.2200	4.5455	6.3700	0.1570	0.0610
2009	0.1500	6.6667	2.0097	0.4976	0.0379	**2009**	0.1900	5.2632	4.5785	0.2184	0.0389
2010	0.1500	6.6667	5.4729	0.1827	0.0611	**2010**	0.1900	5.2632	5.6293	0.1776	0.0475
2011	0.1500	6.6667	4.0124	0.2492	0.0707	**2011**	0.1900	5.2632	5.9831	0.1671	0.0493
2012	0.1500	6.6667	4.9667	0.2013	0.0643	**2012**	0.1900	5.2632	6.0804	0.1645	0.0516

2. Bolivia	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**5. Colombi**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.0800	12.5000	7.2356	0.1382	(0.0003)	**1990**	0.1500	6.6667	6.2896	0.1590	0.0563
1991	0.1000	10.0000	6.5421	0.1529	0.0184	**1991**	0.1600	6.2500	6.2922	0.1589	0.0337
1992	0.1000	10.0000	6.6208	0.1510	0.0257	**1992**	0.1500	6.6667	5.3464	0.1870	0.0433
1993	0.1000	10.0000	6.5217	0.1533	0.0253	**1993**	0.1600	6.2500	5.9406	0.1683	0.0652
1994	0.1200	8.3333	6.3827	0.1567	0.0128	**1994**	0.1700	5.8824	5.3504	0.1869	0.1120
1995	0.1400	7.1429	6.0866	0.1643	0.0197	**1995**	0.1750	5.7143	4.9869	0.2005	0.1063
1996	0.1400	7.1429	6.0237	0.1660	0.0268	**1996**	0.1750	5.7143	4.6146	0.2167	0.0820
1997	0.1400	7.1429	5.3161	0.1881	0.0478	**1997**	0.1850	5.4054	4.4225	0.2261	0.0730
1998	0.1400	7.1429	5.3763	0.1860	0.0677	**1998**	0.2000	5.0000	3.9232	0.2549	0.0620
1999	0.1400	7.1429	5.3780	0.1859	0.0375	**1999**	0.2000	5.0000	3.6056	0.2773	0.0210
2000	0.1200	8.3333	5.8777	0.1701	0.0332	**2000**	0.2000	5.0000	3.9023	0.2563	0.0319
2001	0.1100	9.0909	5.2143	0.1918	0.0023	**2001**	0.2000	5.0000	4.2169	0.2371	0.0354
2002	0.1000	10.0000	4.8645	0.2056	0.0218	**2002**	0.2000	5.0000	3.8799	0.2577	0.0432
2003	0.1100	9.0909	5.2927	0.1889	0.0054	**2003**	0.2000	5.0000	4.3798	0.2283	0.0585
2004	0.1200	8.3333	5.3493	0.1869	0.0177	**2004**	0.2400	4.1667	3.0126	0.3319	0.0257
2005	0.1900	5.2632	5.3909	0.1855	0.0130	**2005**	0.3230	3.0960	5.4167	0.1846	0.0209
2006	0.2100	4.7619	6.1879	0.1616	0.0121	**2006**	0.2200	4.5455	3.4180	0.2926	0.0415
2007	0.2000	5.0000	5.7811	0.1730	0.0216	**2007**	0.2200	4.5455	4.2375	0.2360	0.0488
2008	0.2000	5.0000	6.5065	0.1537	0.0379	**2008**	0.2200	4.5455	4.7707	0.2096	0.0495
2009	0.1450	6.8966	5.8516	0.1709	0.0248	**2009**	0.2200	4.5455	4.1372	0.2417	0.0507
2010	0.1450	6.8966	6.1749	0.1619	0.0253	**2010**	0.2200	4.5455	4.4256	0.2260	0.0426
2011	0.1500	6.6667	5.5583	0.1799	0.0413	**2011**	0.2200	4.5455	4.3566	0.2295	0.0537
2012	0.2000	5.0000	6.1118	0.1636	0.0303	**2012**	0.2200	4.5455	4.2244	0.2367	0.0516

3. Brazil	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**6. Paragua**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1800	5.5556	4.0873	0.2447	0.0787	**1990**	0.1700	5.8824	7.2748	0.1375	0.0401
1991	0.1800	5.5556	4.3982	0.2274	0.0724	**1991**	0.1650	6.0606	5.9977	0.1667	0.0599
1992	0.1700	5.8824	4.7119	0.2122	0.0620	**1992**	0.1450	6.8966	7.3490	0.1361	0.0548
1993	0.1300	7.6923	4.2800	0.2336	0.0263	**1993**	0.1600	6.2500	6.7959	0.1471	0.0564
1994	0.1600	6.2500	4.3922	0.2277	0.0585	**1994**	0.1600	6.2500	6.5542	0.1526	0.0583
1995	0.1800	5.5556	4.5586	0.2194	(0.0194)	**1995**	0.1700	5.8824	6.0614	0.1650	0.0592
1996	0.1700	5.8824	4.4911	0.2227	0.0101	**1996**	0.1700	5.8824	5.9018	0.1694	0.0583
1997	0.1500	6.6667	4.4381	0.2253	0.0127	**1997**	0.1700	5.8824	5.8278	0.1716	0.0539
1998	0.1500	6.6667	4.3399	0.2304	0.0102	**1998**	0.1700	5.8824	5.7924	0.1726	0.0451
1999	0.1700	5.8824	4.7230	0.2117	0.0149	**1999**	0.1500	6.6667	5.5274	0.1809	0.0374
2000	0.2300	4.3478	4.1768	0.2394	0.0125	**2000**	0.1450	6.8966	5.3050	0.1885	0.0240
2001	0.2200	4.5455	4.1108	0.2433	0.0075	**2001**	0.1600	6.2500	5.8989	0.1695	0.0278
2002	0.2300	4.3478	4.1141	0.2431	0.0053	**2002**	0.1450	6.8966	5.5151	0.1813	0.0213
2003	0.1800	5.5556	4.3782	0.2284	0.0072	**2003**	0.1600	6.2500	5.9773	0.1673	0.0317
2004	0.2100	4.7619	4.3343	0.2307	0.0139	**2004**	0.1800	5.5556	6.1991	0.1613	0.0388
2005	0.2000	5.0000	4.1659	0.2400	0.0129	**2005**	0.1800	5.5556	5.8123	0.1720	0.0415
2006	0.2200	4.5455	4.0983	0.2440	0.0161	**2006**	0.1800	5.5556	5.7855	0.1728	0.0405
2007	0.2400	4.1667	3.9731	0.2517	0.0230	**2007**	0.1800	5.5556	5.9756	0.1673	0.0348
2008	0.2400	4.1667	3.6842	0.2714	0.0334	**2008**	0.1750	5.7143	6.7590	0.1480	0.0335
2009	0.2400	4.1667	3.7500	0.2667	0.0236	**2009**	0.1300	7.6923	7.7707	0.1287	0.0138
2010	0.2600	3.8462	3.7787	0.2646	0.0346	**2010**	0.1750	5.7143	6.2245	0.1607	0.0302
2011	0.2500	4.0000	3.7791	0.2646	0.0260	**2011**	0.1500	6.6667	7.1803	0.1393	0.0308
2012	0.2550	3.9216	3.8132	0.2622	(0.0064)	**2012**	0.1750	5.7143	6.0564	0.1651	0.0971

Table M10 Multipliers and each inverse in equilibrium: Peru, Iran, Kazakhstan, Kuwait, Pakistan, Saudi Arabia, 1990-2012

7. Peru	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	10. Kuwait	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.0800	12.5000	9.5694	0.1045	0.0210	1990	0.3000	3.3333	1.4035	0.7125	(0.1493)
1991	0.0800	12.5000	9.5558	0.1046	0.0384	1991	0.3000	3.3333	1.5187	0.6585	0.2066
1992	0.0600	16.6667	9.8932	0.1011	0.0473	1992	0.3000	3.3333	1.4766	0.6772	0.1331
1993	0.0800	12.5000	8.8409	0.1131	0.0721	1993	0.3000	3.3333	1.6558	0.6039	(0.0486)
1994	0.1250	8.0000	9.8963	0.1010	0.0846	1994	0.4000	2.5000	1.8333	0.5455	(0.0743)
1995	0.1000	10.0000	7.2630	0.1377	0.0889	1995	0.5000	2.0000	1.7112	0.5844	(0.0855)
1996	0.1000	10.0000	8.6157	0.1161	0.0774	1996	0.6000	1.6667	2.0785	0.4811	(0.0595)
1997	0.1300	7.6923	7.1993	0.1389	0.0773	1997	0.6000	1.6667	2.1067	0.4747	(0.1114)
1998	0.1100	9.0909	8.1585	0.1226	0.0711	1998	0.6000	1.6667	1.2728	0.7857	(0.1047)
1999	0.1000	10.0000	7.4047	0.1350	0.0541	1999	0.8000	1.2500	1.3680	0.7310	(0.0986)
2000	0.1000	10.0000	7.6254	0.1311	0.0477	2000	0.8000	1.2500	1.6178	0.6181	(0.1488)
2001	0.1000	10.0000	7.6212	0.1312	0.0385	2001	0.9000	1.1111	1.7486	0.5719	(0.0894)
2002	0.1000	10.0000	8.0764	0.1238	0.0376	2002	0.8000	1.2500	1.4817	0.6749	(0.0096)
2003	0.1000	10.0000	8.3677	0.1195	0.0374	2003	0.8000	1.2500	1.4214	0.7036	0.0028
2004	0.1200	8.3333	7.4681	0.1339	0.0342	2004	0.8000	1.2500	1.3869	0.7210	0.0025
2005	0.1300	7.6923	7.2584	0.1378	0.0338	2005	1.1000	0.9091	1.0139	0.9863	(0.0074)
2006	0.1350	7.4074	8.3890	0.1192	0.0421	2006	1.1000	0.9091	1.4047	0.7119	(0.0404)
2007	0.1500	6.6667	7.7178	0.1296	0.0532	2007	1.1000	0.9091	1.1596	0.8623	0.0070
2008	0.1500	6.6667	7.9709	0.1255	0.0690	2008	0.8000	1.2500	2.2327	0.4479	0.0138
2009	0.1500	6.6667	7.7922	0.1283	0.0423	2009	0.8000	1.2500	1.4893	0.6715	0.0236
2010	0.1500	6.6667	7.0259	0.1423	0.0574	2010	0.8000	1.2500	1.9997	0.5001	0.0421
2011	0.1300	7.6923	8.1746	0.1223	0.0340	2011	0.8000	1.2500	1.8867	0.5300	(0.0042)
2012	0.1500	6.6667	6.9858	0.1431	0.0356	2012	0.8000	1.2500	1.3938	0.7175	0.0097

8. Iran	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	11. Pakista	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1900	5.2632	4.7628	0.2100	0.1155	1990	0.1300	7.6923	5.2586	0.1902	0.0180
1991	0.1720	5.8140	5.0803	0.1968	0.1380	1991	0.1000	10.0000	5.4270	0.1843	0.0319
1992	0.1900	5.2632	4.9377	0.2025	0.1191	1992	0.0900	11.1111	5.6190	0.1780	0.0484
1993	0.1900	5.2632	5.0575	0.1977	0.0766	1993	0.1100	9.0909	4.7800	0.2092	0.0508
1994	0.1850	5.4054	5.4852	0.1823	0.0468	1994	0.1000	10.0000	5.5307	0.1808	0.0468
1995	0.1750	5.7143	5.7625	0.1735	0.0651	1995	0.1000	10.0000	5.7575	0.1737	0.0387
1996	0.1750	5.7143	5.7872	0.1728	0.1103	1996	0.1000	10.0000	5.2962	0.1888	0.0470
1997	0.1750	5.7143	5.3586	0.1866	0.1080	1997	0.1000	10.0000	5.3521	0.1868	0.0414
1998	0.1750	5.7143	4.2817	0.2336	0.0896	1998	0.1000	10.0000	5.8363	0.1713	0.0418
1999	0.1750	5.7143	5.6383	0.1774	0.0765	1999	0.1000	10.0000	5.6692	0.1764	0.0280
2000	0.1750	5.7143	5.4758	0.1826	0.0940	2000	0.0950	10.5263	6.8769	0.1454	0.0450
2001	0.1750	5.7143	5.5787	0.1793	0.0991	2001	0.0950	10.5263	7.3181	0.1366	0.0554
2002	0.1750	5.7143	5.0143	0.1994	0.1104	2002	0.0950	10.5263	7.8901	0.1267	0.0293
2003	0.1750	5.7143	4.8633	0.2056	0.1145	2003	0.0950	10.5263	7.8715	0.1270	0.0155
2004	0.1750	5.7143	4.8567	0.2059	0.1088	2004	0.0950	10.5263	8.5699	0.1167	0.0213
2005	0.1750	5.7143	4.7189	0.2119	0.0841	2005	0.0850	11.7647	8.2925	0.1206	0.0379
2006	0.1750	5.7143	4.0217	0.2487	0.0822	2006	0.0900	11.1111	7.2997	0.1370	0.0566
2007	0.1750	5.7143	4.7163	0.2120	0.0841	2007	0.0850	11.7647	7.6117	0.1314	0.0584
2008	0.1750	5.7143	#DIV/0!	#DIV/0!	#DIV/0!	2008	0.0800	12.5000	6.1490	0.1626	0.0521
2009	0.1750	5.7143	#DIV/0!	#DIV/0!	#DIV/0!	2009	0.0500	20.0000	9.7197	0.1029	0.0276
2010	0.1750	5.7143	#DIV/0!	#DIV/0!	#DIV/0!	2010	0.0450	22.2222	9.9328	0.1007	0.0054
2011	0.1750	5.7143	4.7163	0.2120	0.0962	2011	0.0250	40.0000	10.3069	0.0970	(0.0151)
2012	0.1750	5.7143	4.7163	0.2120	0.0691	2012	0.0350	28.5714	9.7803	0.1022	(0.0216)

9. Kazakh	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	12. Saudi A	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
						1990	0.3400	2.9412	2.7148	0.3683	0.0190
						1991	0.4200	2.3810	2.2214	0.4502	0.0241
						1992	0.3800	2.6316	2.4746	0.4041	0.0490
						1993	0.3400	2.9412	2.6663	0.3750	0.0513
						1994	0.3300	3.0303	2.7617	0.3621	0.0350
1995	0.1750	5.7143	4.9585	0.2017	0.0541	1995	0.2500	4.0000	3.5426	0.2823	0.0060
1996	0.1700	5.8824	4.5685	0.2189	0.0411	1996	0.2750	3.6364	3.2279	0.3098	0.0074
1997	0.1700	5.8824	4.6661	0.2143	0.0421	1997	0.2900	3.4483	3.1194	0.3206	0.0064
1998	0.1600	6.2500	4.7971	0.2085	0.0341	1998	0.3200	3.1250	2.8044	0.3566	0.0247
1999	0.1650	6.0606	4.9512	0.2020	0.0371	1999	0.2300	4.3478	3.2155	0.3110	0.0185
2000	0.1750	5.7143	5.6687	0.1764	0.0392	2000	0.2750	3.6364	3.2186	0.3107	0.0151
2001	0.1750	5.7143	5.5687	0.1796	0.1268	2001	0.2900	3.4483	2.9980	0.3336	0.0128
2002	0.1750	5.7143	5.5836	0.1791	0.1044	2002	0.2900	3.4483	3.1035	0.3222	0.0152
2003	0.1900	5.2632	4.9630	0.2015	0.0929	2003	0.3500	2.8571	3.3301	0.3003	0.0178
2004	0.1900	5.2632	5.1670	0.1935	0.0944	2004	0.4000	2.5000	3.5822	0.2792	0.0159
2005	0.1900	5.2632	5.4576	0.1832	0.1160	2005	0.4500	2.2222	4.0758	0.2454	0.0175
2006	0.2000	5.0000	5.2311	0.1912	0.1241	2006	0.4900	2.0408	3.8952	0.2567	0.0178
2007	0.1600	6.2500	5.5871	0.1790	0.1269	2007	0.4000	2.5000	3.8136	0.2622	0.0253
2008	0.1900	5.2632	7.2823	0.1373	0.0954	2008	0.2900	3.4483	3.3339	0.3000	0.0287
2009	0.1750	5.7143	5.2488	0.1905	0.0815	2009	0.2900	3.4483	2.7842	0.3592	0.0409
2010	0.1750	5.7143	5.4593	0.1832	0.0857	2010	0.2900	3.4483	2.7657	0.3616	0.0163
2011	0.1750	5.7143	5.6582	0.1767	0.0677	2011	0.2900	3.4483	2.7842	0.3592	0.0578
2012	0.1750	5.7143	6.0898	0.1642	0.1064	2012	0.2900	3.4483	2.7842	0.3592	0.0437

Chapter 12

Table M11 Multipliers and each inverse in equilibrium: Algeria, Egypt, Kenya, Morocco, Nigeria, South Africa, 1990-2012

13. Algeri	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	16. Moroc	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.2300	4.3478	3.7026	0.2701	0.0511	**1990**	0.2200	4.5455	4.0841	0.2449	0.0342
1991	0.2200	4.5455	3.9648	0.2522	0.0701	**1991**	0.2000	5.0000	4.4782	0.2233	0.0182
1992	0.2020	4.9505	4.1092	0.2434	0.0699	**1992**	0.2100	4.7619	4.4364	0.2254	0.0105
1993	0.1950	5.1282	4.0590	0.2464	0.0629	**1993**	0.2100	4.7619	4.1838	0.2390	0.0139
1994	0.1990	5.0251	4.0969	0.2441	0.0784	**1994**	0.1900	5.2632	4.4353	0.2255	0.0092
1995	0.1990	5.0251	4.6587	0.2147	0.0845	**1995**	0.1800	5.5556	4.3712	0.2288	0.0150
1996	0.2045	4.8900	4.6380	0.2156	0.0595	**1996**	0.1700	5.8824	4.9261	0.2030	0.0016
1997	0.1900	5.2632	4.5877	0.2180	0.0501	**1997**	0.2070	4.8309	4.6580	0.2147	0.0101
1998	0.1800	5.5556	4.5511	0.2197	0.0609	**1998**	0.2100	4.7619	4.3255	0.2312	(0.0266)
1999	0.2250	4.4444	4.3698	0.2288	0.0581	**1999**	0.2000	5.0000	4.4592	0.2243	0.0490
2000	0.2600	3.8462	6.5696	0.1522	0.0451	**2000**	0.2200	4.5455	3.5884	0.2787	0.0443
2001	0.2350	4.2553	5.3618	0.1865	0.0548	**2001**	0.2100	4.7619	3.8151	0.2621	0.0348
2002	0.2250	4.4444	4.7153	0.2121	0.0643	**2002**	0.2195	4.5558	3.7468	0.2669	0.0371
2003	0.2450	4.0816	5.4401	0.1838	0.0592	**2003**	0.2220	4.5045	3.7068	0.2698	0.0410
2004	0.2600	3.8462	4.9747	0.2010	0.0646	**2004**	0.2245	4.4543	3.7492	0.2667	0.0441
2005	0.2850	3.5088	7.3420	0.1362	0.0537	**2005**	0.2270	4.4053	3.5965	0.2780	0.0375
2006	0.2850	3.5088	7.5706	0.1321	0.0461	**2006**	0.2295	4.3573	3.9554	0.2528	0.0384
2007	0.2500	4.0000	5.5230	0.1811	0.0525	**2007**	0.2320	4.3103	3.9708	0.2518	0.0458
2008	0.2500	4.0000	6.8392	0.1462	0.0593	**2008**	0.2320	4.3103	3.9033	0.2562	0.0689
2009	0.2500	4.0000	3.2968	0.3033	0.0778	**2009**	0.2320	4.3103	3.8211	0.2617	0.0739
2010	0.2500	4.0000	#DIV/0!	#DIV/0!	#DIV/0!	**2010**	0.2100	4.7619	4.0607	0.2463	0.0699
2011	0.2500	4.0000	3.2968	0.3033	0.0844	**2011**	0.2320	4.3103	3.8211	0.2617	0.0757
2012	0.2500	4.0000	3.2968	0.3033	0.0677	**2012**	0.2320	4.3103	3.8211	0.2617	0.0626

14. Egypt	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	17. Nigeria	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1100	9.0909	5.7630	0.1735	0.1059						
1991	0.1350	7.4074	6.8710	0.1455	0.0690						
1992	0.1450	6.8966	5.4469	0.1836	0.0551						
1993	0.1450	6.8966	7.9326	0.1261	0.0603						
1994	0.1450	6.8966	7.0791	0.1413	0.0526						
1995	0.1450	6.8966	7.4050	0.1350	0.0268	**1995**	0.0900	11.1111	11.1809	0.0894	0.0619
1996	0.1450	6.8966	6.0109	0.1664	0.0384	**1996**	0.0800	12.5000	15.2852	0.0654	0.0334
1997	0.1450	6.8966	5.9720	0.1674	0.0551	**1997**	0.0750	13.3333	13.0057	0.0769	0.0404
1998	0.1450	6.8966	6.4509	0.1550	0.0264	**1998**	0.0320	31.2500	11.9841	0.0834	0.0205
1999	0.1500	6.6667	6.6315	0.1508	0.0498	**1999**	0.0350	28.5714	7.6694	0.1304	0.0185
2000	0.1450	6.8966	6.3054	0.1586	0.0390	**2000**	0.0450	22.2222	14.6736	0.0681	0.0181
2001	0.1000	10.0000	6.1984	0.1613	0.0316	**2001**	0.0600	16.6667	9.0501	0.1105	0.0390
2002	0.1000	10.0000	5.7160	0.1749	0.0296	**2002**	0.0600	16.6667	9.3473	0.1070	0.0192
2003	0.1000	10.0000	6.0744	0.1646	0.0248	**2003**	0.0600	16.6667	11.6587	0.0858	0.0399
2004	0.1000	10.0000	6.1599	0.1623	0.0270	**2004**	0.0700	14.2857	11.9643	0.0836	0.0318
2005	0.1000	10.0000	6.1766	0.1619	0.0328	**2005**	0.0700	14.2857	12.1696	0.0822	(0.0138)
2006	0.0850	11.7647	5.8727	0.1703	0.0379	**2006**	0.0600	16.6667	18.8622	0.0530	0.0067
2007	0.1000	10.0000	6.3600	0.1572	0.0507	**2007**	0.0900	11.1111	10.4030	0.0961	0.0633
2008	0.1000	10.0000	5.8594	0.1707	0.0597	**2008**	0.1000	10.0000	8.9566	0.1116	0.0597
2009	0.1000	10.0000	5.7830	0.1729	0.0438	**2009**	0.1000	10.0000	9.7588	0.1025	0.0896
2010	0.1000	10.0000	5.3759	0.1860	0.0469	**2010**	0.1000	10.0000	9.0000	0.1111	0.0808
2011	0.1000	10.0000	5.3759	0.1860	0.0519	**2011**	0.1000	10.0000	9.7588	0.1025	0.0798
2012	0.1000	10.0000	5.3759	0.1860	0.0490	**2012**	0.1000	10.0000	9.7588	0.1025	0.0628

15. Kenya	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	18. S.Afric	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1900	5.2632	4.2090	0.2376	0.1074	**1990**	0.1850	5.4054	4.4427	0.2251	0.0163
1991	0.1750	5.7143	4.3271	0.2311	0.0302	**1991**	0.1750	5.7143	4.5083	0.2218	0.0246
1992	0.1900	5.2632	4.8915	0.2044	0.0575	**1992**	0.1600	6.2500	4.1863	0.2389	0.0245
1993	0.1660	6.0241	4.6355	0.2157	0.0223	**1993**	0.1600	6.2500	4.2753	0.2339	0.0369
1994	0.1450	6.8966	4.7636	0.2099	0.0507	**1994**	0.1600	6.2500	4.0134	0.2492	0.0451
1995	0.1750	5.7143	5.2707	0.1897	0.1140	**1995**	0.1600	6.2500	4.8177	0.2076	0.0617
1996	0.1750	5.7143	6.0627	0.1649	0.0140	**1996**	0.1800	5.5556	4.3223	0.2314	0.0527
1997	0.1750	5.7143	5.1381	0.1946	0.0169	**1997**	0.1900	5.2632	4.4600	0.2242	0.0506
1998	0.1700	5.8824	5.6521	0.1769	0.0062	**1998**	0.2000	5.0000	4.3767	0.2285	0.0512
1999	0.1600	6.2500	6.1424	0.1628	0.0029	**1999**	0.1980	5.0505	4.6321	0.2159	0.0445
2000	0.1700	5.8824	6.1971	0.1614	0.0207	**2000**	0.2000	5.0000	4.4970	0.2224	0.0462
2001	0.1700	5.8824	5.4267	0.1843	0.0266	**2001**	0.2000	5.0000	4.7675	0.2098	0.0424
2002	0.1750	5.7143	4.9004	0.2041	(0.0002)	**2002**	0.2000	5.0000	4.7706	0.2096	0.0459
2003	0.1750	5.7143	4.7593	0.2101	(0.0018)	**2003**	0.2000	5.0000	4.3757	0.2285	0.0455
2004	0.1940	5.1546	5.0451	0.1982	0.0190	**2004**	0.2100	4.7619	4.2721	0.2341	0.0558
2005	0.1940	5.1546	5.1837	0.1929	0.0280	**2005**	0.2200	4.5455	4.5041	0.2220	0.0502
2006	0.1700	5.8824	5.2072	0.1920	0.0348	**2006**	0.2300	4.3478	4.4601	0.2242	0.0572
2007	0.1850	5.4054	4.8638	0.2056	0.0342	**2007**	0.2400	4.1667	4.4720	0.2236	0.0727
2008	0.1700	5.8824	4.8689	0.2054	0.0587	**2008**	0.2300	4.3478	4.2177	0.2371	0.0771
2009	0.1700	5.8824	4.5114	0.2217	0.0346	**2009**	0.1900	5.2632	4.0838	0.2449	0.0506
2010	0.1700	5.8824	4.5893	0.2179	0.0226	**2010**	0.2300	4.3478	3.8283	0.2612	0.0524
2011	0.1700	5.8824	4.5893	0.2179	0.0315	**2011**	0.2000	5.0000	4.0555	0.2466	0.0547
2012	0.1700	5.8824	4.5893	0.2179	0.0301	**2012**	0.2180	4.5872	3.9492	0.2532	0.0523

Table M12 Multipliers and each inverse in equilibrium: Tanzania, Ukraine, Taiwan, Honduras, Estonia, Lithuania, 1990-2012

19. Tanzar	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**Honduras**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.2200	4.5455	4.1577	0.2405	0.1112	**1990**	0.1300	7.6923	5.6214	0.1779	0.0611
1991	0.2100	4.7619	3.8699	0.2584	0.0883	**1991**	0.1300	7.6923	6.2145	0.1609	0.0731
1992	0.2100	4.7619	4.9453	0.2022	0.0915	**1992**	0.1300	7.6923	5.5310	0.1808	0.0766
1993	0.2000	5.0000	4.0576	0.2465	0.0855	**1993**	0.1300	7.6923	5.0424	0.1983	0.0933
1994	0.1700	5.8824	4.5348	0.2205	0.0628	**1994**	0.1300	7.6923	5.4352	0.1840	0.0991
1995	0.1670	5.9880	5.2425	0.1907	0.0270	**1995**	0.1300	7.6923	5.9554	0.1679	0.0847
1996	0.1370	7.2993	6.9797	0.1433	0.0400	**1996**	0.1300	7.6923	6.1005	0.1639	0.0860
1997	0.1300	7.6923	8.9464	0.1118	0.0389	**1997**	0.1300	7.6923	6.5980	0.1516	0.0875
1998	0.0950	10.5263	9.2090	0.1086	0.0484	**1998**	0.1300	7.6923	7.4568	0.1341	0.0824
1999	0.1000	10.0000	10.4404	0.0958	0.0411	**1999**	0.1600	6.2500	5.3547	0.1868	0.0928
2000	0.0770	12.9870	10.5821	0.0945	0.0467	**2000**	0.1600	6.2500	5.2902	0.1890	0.0883
2001	0.0800	12.5000	10.7653	0.0929	0.0459	**2001**	0.1600	6.2500	5.1293	0.1950	0.0770
2002	0.0900	11.1111	10.5596	0.0947	0.0539	**2002**	0.1600	6.2500	4.9941	0.2002	0.0678
2003	0.0800	12.5000	10.4833	0.0954	0.0609	**2003**	0.1600	6.2500	4.7080	0.2124	0.0685
2004	0.0700	14.2857	9.6766	0.1033	0.0485	**2004**	0.1600	6.2500	5.2555	0.1903	0.0787
2005	0.0700	14.2857	8.9132	0.1122	0.0546	**2005**	0.1600	6.2500	5.3505	0.1869	0.0714
2006	0.0850	11.7647	#DIV/0!	#DIV/0!	#DIV/0!	**2006**	0.1600	6.2500	5.7663	0.1734	0.0691
2007	0.0850	11.7647	#DIV/0!	#DIV/0!	#DIV/0!	**2007**	0.1600	6.2500	5.2074	0.1920	0.0810
2008	0.0850	11.7647	#DIV/0!	#DIV/0!	#DIV/0!	**2008**	0.1600	6.2500	5.3765	0.1860	0.0846
2009	0.0850	11.7647	#DIV/0!	#DIV/0!	#DIV/0!	**2009**	0.1500	6.6667	4.5100	0.2217	0.0382
2010	0.0850	11.7647	#DIV/0!	#DIV/0!	#DIV/0!	**2010**	0.1500	6.6667	4.2403	0.2358	0.0458
2011	0.0700	14.2857	8.9132	0.1122	#DIV/0!	**2011**	0.1500	6.6667	4.2403	0.2358	0.0556
2012	0.0700	14.2857	8.9132	0.1122	0.0576	**2012**	0.1500	6.6667	4.2403	0.2358	0.0522

9. Ukraine	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**Estonia 1.3**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
						1990	0.1750	5.7143	#DIV/0!	#DIV/0!	#DIV/0!
						1991	0.1750	5.7143	5.7431	0.1741	0.0196
						1992	0.1950	5.1282	5.1442	0.1944	0.0227
1993	0.2700	3.7037	3.5573	0.2811	0.0017	**1993**	0.2500	4.0000	4.1376	0.2417	0.0381
1994	0.2400	4.1667	4.0194	0.2488	0.0264	**1994**	0.2600	3.8462	3.6094	0.2771	0.0461
1995	0.1990	5.0251	3.6988	0.2704	0.0916	**1995**	0.3100	3.2258	3.3481	0.2987	0.0389
1996	0.2000	5.0000	3.9288	0.2545	0.1016	**1996**	0.2900	3.4483	3.3904	0.2950	0.0512
1997	0.2000	5.0000	4.1384	0.2416	0.0970	**1997**	0.2700	3.7037	3.6033	0.2775	0.0560
1998	0.2000	5.0000	4.3013	0.2325	0.0653	**1998**	0.3000	3.3333	3.6319	0.2753	0.0778
1999	0.2000	5.0000	4.4945	0.2225	0.0504	**1999**	0.2500	4.0000	3.9906	0.2506	0.0916
2000	0.2000	5.0000	4.7874	0.2089	0.0654	**2000**	0.2500	4.0000	4.0209	0.2487	0.0850
2001	0.2000	5.0000	4.6578	0.2147	0.0693	**2001**	0.2500	4.0000	4.0260	0.2484	0.0819
2002	0.2200	4.5455	4.6494	0.2151	0.0604	**2002**	0.2500	4.0000	4.0432	0.2473	0.0867
2003	0.2200	4.5455	4.4861	0.2229	0.0686	**2003**	0.2500	4.0000	4.0478	0.2470	0.0910
2004	0.2000	5.0000	4.3611	0.2293	0.0632	**2004**	0.2500	4.0000	4.0378	0.2477	0.0811
2005	0.2000	5.0000	4.5636	0.2191	0.0778	**2005**	0.2500	4.0000	4.0406	0.2475	0.0774
2006	0.2000	5.0000	4.8228	0.2074	0.0920	**2006**	0.2500	4.0000	4.0575	0.2465	0.0889
2007	0.2000	5.0000	4.6993	0.2128	0.1051	**2007**	0.2500	4.0000	4.0665	0.2459	0.0936
2008	0.1700	5.8824	5.5101	0.1815	0.1070	**2008**	0.2500	4.0000	4.0084	0.2495	0.0689
2009	0.1200	8.3333	6.2567	0.1598	0.0486	**2009**	0.2650	3.7736	3.7827	0.2644	0.0368
2010	0.0700	14.2857	7.4277	0.1346	0.0488	**2010**	0.2500	4.0000	4.0031	0.2498	0.0396
2011	0.0700	14.2857	11.6412	0.0859	0.0720	**2011**	0.2500	4.0000	4.0031	0.2498	0.0365
2012	0.0700	14.2857	10.8792	0.0919	(0.1283)	**2012**	0.2500	4.0000	4.0031	0.2498	0.0345

Taiwan	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$	**Lithuania 3**	$m_{(Y/TAX)}$	T_{AX}/Y	$m_{(Y/(CG+IG))}$	$(C_G+I_G)/Y$	$g_A^*=i(1-\beta^*)$
1990	0.1850	5.4054	4.9485	0.2021	0.1157	**1990**	0.2300	4.3478	#DIV/0!	#DIV/0!	#DIV/0!
1991	0.1850	5.4054	4.9397	0.2024	0.1036	**1991**	0.2300	4.3478	#DIV/0!	#DIV/0!	#DIV/0!
1992	0.1750	5.7143	5.1405	0.1945	0.1040	**1992**	0.2300	4.3478	#DIV/0!	#DIV/0!	#DIV/0!
1993	0.1700	5.8824	5.2781	0.1895	0.0953	**1993**	0.2300	4.3478	3.4816	0.2872	0.0263
1994	0.1700	5.8824	5.2350	0.1910	0.0852	**1994**	0.2300	4.3478	3.6313	0.2754	0.0327
1995	0.1700	5.8824	5.2823	0.1893	0.0793	**1995**	0.2300	4.3478	3.6098	0.2770	0.0535
1996	0.1700	5.8824	5.2490	0.1905	0.0677	**1996**	0.2300	4.3478	3.7589	0.2660	0.0563
1997	0.1700	5.8824	5.4016	0.1851	0.0666	**1997**	0.2320	4.3103	3.9820	0.2511	0.0631
1998	0.1600	6.2500	5.7830	0.1729	0.0665	**1998**	0.2480	4.0323	3.9639	0.2523	0.0614
1999	0.1500	6.6667	6.1200	0.1634	0.0583	**1999**	0.2300	4.3478	3.3279	0.3005	0.0580
2000	0.1500	6.6667	5.1418	0.1945	0.0571	**2000**	0.2450	4.0816	3.8498	0.2598	0.0508
2001	0.1500	6.6667	4.5810	0.2183	0.0388	**2001**	0.2500	4.0000	3.9344	0.2542	0.0503
2002	0.1500	6.6667	5.5374	0.1806	0.0356	**2002**	0.2300	4.3478	4.1413	0.2415	0.0526
2003	0.1500	6.6667	5.7264	0.1746	0.0359	**2003**	0.2300	4.3478	4.2994	0.2326	0.0581
2004	0.1500	6.6667	5.6626	0.1766	0.0463	**2004**	0.2300	4.3478	4.0747	0.2454	0.0584
2005	0.1500	6.6667	6.5257	0.1532	0.0423	**2005**	0.2300	4.3478	4.1594	0.2404	0.0647
2006	0.1500	6.6667	6.5666	0.1523	0.0386	**2006**	0.2300	4.3478	4.3481	0.2300	0.0752
2007	0.1500	6.6667	6.5608	0.1524	0.0359	**2007**	0.2300	4.3478	4.2546	0.2350	0.0900
2008	0.1500	6.6667	6.2838	0.1591	0.0366	**2008**	0.2300	4.3478	3.9019	0.2563	0.0820
2009	0.1500	6.6667	5.2800	0.1894	0.0239	**2009**	0.2300	4.3478	3.1453	0.3179	0.0307
2010	0.1500	6.6667	5.5691	0.1796	0.0351	**2010**	0.2300	4.3478	3.3740	0.2964	0.0422
2011	0.1500	6.6667	5.5691	0.1796	0.0344	**2011**	0.2300	4.3478	3.3740	0.2964	0.0342
						2012	0.2300	4.3478	3.3740	0.2964	0.0329

Chapter 12

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Chapter 13

Government Spending and Taxes to Guarantee Growth: Samuelson's Balanced Budget (1942) to Answer Krugman's (July, 2012)

<u>Signpost to Chapter 13 and towards summit</u>

Fiscal policy spreads over economic policies as a whole by country. Solid foundation is attributed to two facts that (1) if the balance of payments is within a certain range of minus, this situation stimulates net investment, (2) if real-assets deficit is zero, this situation makes a country steadily stimulate economic growth, as Samuelson discovered in 1942 and, (3) as a result, under a certain minus balance of payments and zero deficit, the country is most efficient and effective in growth and returns. Furthermore, Chapter 15 proves the less the rate of change in population the more steadily the rate of technological progress is guaranteed, with full-employment and a low inflation, where stop-macro inequality is also in reality. This is because the level of the relative share of capital or labor by country is indifferent of the level of technological progress. We are waiting for dawn just before sunshine at a universal summit in reality.

Before sunshine, the author here incites Rose and Milton Friedman's (309-310, 1980, 1979) following universal paragraph:

> *Fortunately, we are waking up. We are again recognizing the dangers of an over governed society, coming to understand that good objectives can be perverted by bad means, that reliance on the freedom of people to control their own lives in accordance with their own values is the surest way to achieve the full potential of a great society.*

The author proves the neutrality of the financial/market assets to the real assets at national accounts in Chapters 2 to 5. As long as we stay at a moderate range of the endogenous-equilibrium by country, we are free from too much supply of money, M2 and/or others. Keynesians, Neo-classicists, and other schools climb up towards the universe summit. Chapter 16 at the end of the *EES* will clarify and confirm this crossing and summarize Harcourt's lifework, cooperating endogenous database with the transitional path by year.

Conclusively, so called monetarists eventually have the same ideas and notions as those of adverse schools. The author's Money-neutral unites all of schools based on the real assets. It is a fact that the real assets have no methods/tools to express its pure endogeneity. This chapter connects money-neutral with stop macro inequality-neutral.

Chapter 13

13.1 Introduction of Samuelson's Scientific Discovery

This chapter definitely answers an alternative universe defined by Krugman's Opinion Page in *New York Times* dated on 1st of July, 2012: Krugman here indicates that European opinion lives in the universe where austerity would still work if only everyone had faith and everyone can cut spending at the same time without producing a depression. The alternative universe was clarified by Samuelson (*QJE* 54: 575-605, 1942), when there were no data at the real assets of national accounts. Samuelson (*History of Political Economy* 7: 43-55, 1975) recollected its summary, comparing with Salant, W. S. (3-18, 19-27, 1975). The author here uses KEWT data-sets/database of 36 countries, 1990-2010 by sector, and endogenously proves the contents of Samuelson (ibid.--1942). Samuelson and Salant, incidentally in 1942, were exceptionally against financial/market-oriented policies. Samuelson (ibid., 45) supposes that deficit is government spending less taxes, similarly to the balance of payments, exports less imports, where taxes correspond with imports. This framework is the same as the endogenous system and its KEWT database. The differences are delicate as follows:

<u>Delicate differences lying between Samuelson's and KENT's</u>

1-1. Samuelson defines disposable income after taxes *y* as *GNP* less taxes. The relationship between *GNP* and disposable income remains actual or statistical.
1-2. The KEWT measures national disposable income *Y*, after redistributing taxes.
2-1. Samuelson uses the multiplier whose numerator is disposable income. The multiplier is calculated using differential.
2-2. The KEWT uses endogenous ratios whose denominator is disposable income so that there is no difference between the multiplier and the endogenous ratio.
3-1. Samuelson and Salant could not test the results since there were no appropriate data at that time.
3-2. The KEWT measures all the data simultaneously and proves Samuelson's scientific discovery numerically correct by country.
4-1. Salant and Samuelson each use the propensity to consume or save, average and marginal, where the multiplier is each estimated using the propensity.
4-2. The KEWT endogenously measures the multiplier using the propensity to consume or save. In the transitional path by year of the KEWT, the author proves that the average propensity equals the marginal propensity, using recursive programming (for recursive programming, wholly as a system, see Chapter 16). Furthermore, the author first proves that the marginal multiplier includes the growth rate of disposable income in its equation (for the multiplier in detail, see Chapter 12).[1]

[1] The average investment multiplier is defined as $m_S = 1/(1-c)$ and, the marginal investment multiplier as $m_{\Delta S} = 1/(1-\Delta c)$, where $c = C/Y$ and $\Delta c = \Delta C/\Delta Y$. The denominator of marginal disposable income, ΔY, is expressed using the growth rate of disposable income, defined by

Now let the author explain the contents of Samuelson (45-46, 1975), first using Samuelson's real assets equations and, second using Salant's (1964; 1-31, 1975) secondary effects equations from government to individuals.

Samuelson's (1942, 1975) discovery, with Salant (1975)

The KEWT sets government spending, E_G, a base for the relationship between taxes, T_{AX}, and deficit, ΔD. Notate C_G government consumption and I_G government net investment, and Y government disposable income=government output, $Y_G = C_G + S_G$. Deficit is defined as $\Delta D = S_G - I_G$ using the real assets instead of cash flow deficit.

$$E_G = C_G + I_G = Y_G - \Delta D \quad (1)$$

Eq.1 means a fact that if deficit is surplus, $E_G > Y_G$ and if deficit is surplus is minus (which is so called deficit originally), $E_G < Y_G$. Samuelson stresses that $E_G = Y_G$ is most growth-oriented by showing this is consistent with Salant's multiplier. The author stresses that deficit is a result and should be increased if people really wants moderate growth fore ever.

Salant's (21-22, 1975) distinguishes total effects of the multiplier with secondary effects for income expanding, using each multiplier as follows:

For total effect, $\frac{1}{1-c}$, and the sum of the infinite series is $1 + c + c^2 + c^3 \ldots$ (2)

For secondary effects, $\frac{1}{1-c} - 1 = \frac{c}{1-c}$, and the sum of the infinite series is

$1 + c + c^2 + c^3 \ldots.$ Thus, $1/(1-\mathrm{c}) - \mathrm{c}/(1-\mathrm{c}) = 1$ (3)

Samuelson proves that Eqs. 1 and 3 are consistent with each other or that Eq.1 holds only if Eq.3 holds.

The author empirically proves the same discovery as Samuelson's, using endogenous simulation (for numerically, see a series of **BOX**ES in the next sections below).

Author's discovery with endogenous simulation

1. On the first line, we set a base of government spending, $E_G = C_G + I_G$. For convenience, E_G is divided by disposable income or output, where three equality of expenditures, income, and output is guaranteed; E_G/Y. E_G/Y has twelve levels by cell in the Excel and ranges from 0.05 to 0.6. All the lines below the E_G/Y line are

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$g_{Y(BACK)} = (Y_t - Y_{t-1})/Y_t$, instead of using $g_Y = (Y_t - Y_{t-1})/Y_{t-1}$: $\Delta c = \frac{c_t - c_{t-1}(1 - g_{Y(BACK)})}{g_{Y(BACK)}}$.

For deficit= zero, see soon below, as shown by Salant (1964, 1975).

controlled by the change in E_G/Y.

2. The second line shows $T_{AX}/Y = Y_G/Y$ (for endogenous taxes=government output, see Chapter 12). T_{AX}/Y is calculated, dividing E_G/Y by the tax coefficient, which is defined as $a_{TAX} = T_{AX}/E_G$.
3. The third line shows two treatments at the same time. The first treatment preliminarily shows net investment divided by output, $i_{G/Y} = I_G/Y$. $i_{G/Y} = I_G/Y$ is calculated, multiplying T_{AX}/Y by the net investment coefficient, $b_{IG/YG} = I_G/Y_G$: $\frac{I_G}{Y} = \frac{T_{AX}}{Y}\frac{I_G}{Y_G}$, where $T_{AX} = Y_G$. The second treatment aims at discover proof and shows net investment divided by government output, $i_G = I_G/Y_G$.
4. The fourth line and hereunder principally follow the first treatment. A key ratio is the qualitative net investment coefficient, $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$. Then, the rate of technological progress, $g_A^* = i(1-\beta^*)$, the growth rate of per capita output, $g_y^* = g_A^*/(1-\alpha)$, and the inverse of the speed years, $\lambda^* = (1-\alpha)n + (1-\delta_0)g_A^*$, are calculated using three endogenous parameters, the capital-output ratio, $\Omega = K/Y$ or $\Omega = \Omega_0 = \Omega^* = \frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)(1+n)+n(1-\alpha)}$, the rate of change in population, $n_E = n$, and the relative share of capital, $\alpha = \Pi/Y$.
5. Samuelson's scientific discovery level is empirically tested only at the row that shows the endogenous $\frac{E_G}{Y}$. Particularly, policy-makers need to watch the difference between $i_{\frac{G}{Y}} = I_G/Y$ and $i_G = I_G/Y_G$, at the fourth line, where $i_G = I_G/Y_G$ is only shown at the above endogenous $\frac{E_G}{Y}$. The greater the difference the more risky the situation is. Note that if the fourth line is all converted to $i_G = I_G/Y_G$ by row, the difference between the total economy and the government sector is not revealed. Also, three parameters, $\Omega = K/Y$, $n_E = n$, and $\alpha = \Pi/Y$ at the total economy and those at the government sector, $\Omega_G = K_G/Y_G$, $n_{E(G)} = n_G$, and $\alpha_G = \Pi_G/Y_G$ are consistent in simulation since both coexist at the same time, although the results at the total economy appear implicitly.

This chapter concentrates on the government sector and does not step into the difference between saving and net investment by sector: $(S-I) = (S_G - I_G) + (S_{PRI} - I_{PRI})$, where $S-I$ is the balance of payments and, $S_G - I_G$ is deficit (see related chapters). Also, this chapter does not step into the structure of $i = i_G + i_{PRI}$, where $i = I/Y$, $i_G = I_G/Y$, and $i_{PRI} = I_{PRI}/Y$. Furthermore, there exists individual utility behind consumption and the multiplier, but this chapter does not step into macro-based utility of the author's.[2] The author indicates: Samuelson's (355-385, 1950) the first topological illustration to the integrability in utility theory had to wait until the introduction of hyperbolas. For the relationship between consumption/saving and wages/returns at the macro level, see *JES* and *PRSCE*, Sep 2012.

Besides, this chapter does not step into the relationship between real and financial/market assets. Behind this relationship there exists the neutrality of the financial/market assets to the real assets. The author indicates that Du Grauwe's (147, 225, 2005) $G - T + rB = dB/dt + dM/dt$ (Eq. B19.1) holds under the price-equilibrium yet, with the above neutrality.

13.2 Empirical Proofs on Government Spending and Taxes in KEWT Database 6.12 by Country

This section clarifies a new relationship between Samuelson's discovery and the growth rate of per capita output in the endogenous-equilibrium, $g_y^* = g_A^*/(1-\alpha)$, where the rate of technological progress, $g_A^* = i(1-\beta^*)$. This relationship is consistent with the thought of the multiplier, whose numerator is output of the total economy. This relationship does not treat proper variables designed for the government sector; e.g., $g_{y(G)}^* = g_{A(G)}^*/(1-\alpha_G)$ and $g_{A(G)}^* = i_G(1-\beta_G^*)$. This is because the government sector's proper variables measured by the endogenous system are not familiar for researchers and policy-makers. Two determinants, $a_{TAX} = T_{AX}/E_G$ and $b_{IG/YG} = I_G/Y_G$, do not disturb the work of the multiplier but cooperate with the multiplier.

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[2] The author summarizes the stream of utility equations lying between literature's utility and macro-based utility as follows: Let the author introduce the concept of instantaneous utility by Cass David (1964, 4-5). Formulating each utility function of consumption and wages/compensation, $U(C) = \frac{C}{rho} = \sum_{t=1}^{\infty}\frac{C}{(1+rho)^t}$ and $U(W) = \frac{W}{r} = \sum_{t=1}^{\infty}\frac{W}{(1+r)^t}$ are derived, where $U(C) = U(W)$ holds. The author's $1-\alpha = c/(rho/r)$ was derived as shown above, where related definitions are $(1-\alpha) = W/Y$ and $c = C/Y$. The present value of $U(C)$ or $U(W)$ may be called social welfare as a stock. Cass David's use of $U(C) = U(W)$ is a great gift to the endogenous model and system. As a result, the author's use of (rho/r) is justified.

Chapter 13

BOX 13-1 Proof of Samuelson's scientific discovery, 1942: BOX A versus BOX B

$T_{AX}=a_{TAX}\cdot E_G$			E_G: G size		BOX A:	$b_{IG/YG}=0.25$			$E_G=C_G+I_G=T_{AX}+\Delta D$		$T_{AX}=Y_G=C_G+S_G$		$g^*_{y\ G}=g^*_{A\ G}/(1-alpha_G)$	
$I_G=b_{IG/YG}\cdot Y_G$	a_{TAX} & $b_{IG/YG}$		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
Case 1	**1.00**	Speed yrs G	#NUM!	#NUM!	113.11	96.00	81.87	70.73	61.93	54.91	49.22	44.54	40.64	37.34
	0.25	$g^*_{y\ G}$	(0.0038)	0.0000	0.0038	0.0076	0.0114	0.0152	0.0189	0.0227	0.0265	0.0303	0.0341	0.0379
Case 2	**0.85**	Speed yrs G	#NUM!	#NUM!	121.14	105.98	92.16	80.63	71.22	63.53	57.20	51.92	47.48	43.71
	0.25	$g^*_{y\ G}$	(0.0044)	(0.0011)	0.0021	0.0053	0.0085	0.0117	0.0150	0.0182	0.0214	0.0246	0.0278	0.0311
Case 3	**0.60**	Speed yrs G	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	124.56	116.07	107.47	99.41	92.08	85.50	79.63
	0.25	$g^*_{y\ G}$	(0.0067)	(0.0052)	(0.0036)	(0.0021)	(0.0005)	0.0010	0.0026	0.0042	0.0057	0.0073	0.0088	0.0104
Case 4	**0.525**	Speed yrs G	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	127.29	121.19	114.57	108.04	101.84
	0.25	$g^*_{y\ G}$	(0.0075)	(0.0063)	(0.0052)	(0.0041)	(0.0030)	(0.0018)	(0.0007)	0.0004	0.0016	0.0027	0.0038	0.0049
Case 4-Ω	**0.525**	Speed yrs G	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	127.84	123.10
	0.25	$g^*_{y\ G}$	(0.0081)	(0.0072)	(0.0064)	(0.0056)	(0.0047)	(0.0039)	(0.0031)	(0.0022)	(0.0014)	(0.0006)	0.0003	0.0011
Case 4-n_E	**0.675**	Speed yrs G	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	51.50
	0.25	$g^*_{y\ G}$	(0.0188)	(0.0171)	(0.0153)	(0.0136)	(0.0119)	(0.0101)	(0.0084)	(0.0067)	(0.0049)	(0.0032)	(0.0015)	0.0003
Case 4-α	**0.525**	Speed yrs G	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	147.39	138.68	129.93	121.64	113.98	106.98
	0.25	$g^*_{y\ G}$	(0.0071)	(0.0057)	(0.0043)	(0.0029)	(0.0015)	(0.0001)	0.0013	0.0027	0.0041	0.0055	0.0069	0.0083

$T_{AX}=a_{TAX}\cdot E_G$			E_G: G size		BOX B:	$b_{IG/YG}=0.50$			$E_G=C_G+I_G=T_{AX}+\Delta D$		$T_{AX}=Y_G=C_G+S_G$		$g^*_{y\ G}=g^*_{A\ G}/(1-alpha_G)$	
$I_G=b_{IG/YG}\cdot Y_G$	a_{TAX} & $b_{IG/YG}$		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
Case 1	**1.00**	Speed yrs G	#NUM!	96.00	70.73	54.91	44.54	37.34	32.08	28.09	24.97	22.46	20.41	18.69
	0.50	$g^*_{y\ G}$	0.0000	0.0076	0.0152	0.0227	0.0303	0.0379	0.0455	0.0530	0.0606	0.0682	0.0758	0.0833
Case 2	**0.85**	Speed yrs G	#NUM!	105.98	80.63	63.53	51.92	43.71	37.65	33.01	29.37	26.44	24.03	22.02
	0.50	$g^*_{y\ G}$	(0.0011)	0.0053	0.0117	0.0182	0.0246	0.0311	0.0375	0.0439	0.0504	0.0568	0.0633	0.0697
Case 3	**0.60**	Speed yrs G	#NUM!	#NUM!	124.56	107.47	92.08	79.63	69.74	61.82	55.40	50.12	45.71	41.99
	0.50	$g^*_{y\ G}$	(0.0052)	(0.0021)	0.0010	0.0042	0.0073	0.0104	0.0135	0.0166	0.0197	0.0228	0.0260	0.0291
Case 4	**0.525**	Speed yrs G	#NUM!	#NUM!	#NUM!	127.29	114.57	101.84	90.73	81.34	73.45	66.81	61.18	56.36
	0.50	$g^*_{y\ G}$	(0.0063)	(0.0041)	(0.0018)	0.0004	0.0027	0.0049	0.0072	0.0094	0.0117	0.0139	0.0162	0.0185
Case 4-Ω	**0.525**	Speed yrs G	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	123.10	112.63	102.66	93.75	85.94	79.14	73.21
	0.50	$g^*_{y\ G}$	(0.0072)	(0.0056)	(0.0039)	(0.0022)	(0.0006)	0.0011	0.0028	0.0045	0.0061	0.0078	0.0095	0.0112
Case 4-n_E	**0.675**	Speed yrs G	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	51.50	48.88	45.82	42.78	39.92	37.29	34.91
	0.50	$g^*_{y\ G}$	(0.0171)	(0.0136)	(0.0101)	(0.0067)	(0.0032)	0.0003	0.0037	0.0072	0.0106	0.0141	0.0176	0.0210
Case 4-α	**0.525**	Speed yrs G	#NUM!	#NUM!	#NUM!	138.68	121.64	106.98	94.87	84.90	76.66	69.77	63.96	58.99
	0.50	$g^*_{y\ G}$	(0.0057)	(0.0029)	(0.0001)	0.0027	0.0055	0.0083	0.0111	0.0139	0.0167	0.0195	0.0223	0.0251

Look at BOXES A and B each and then, compare A with B. The purpose of this comparison is to prove the real assets-side of Samuelson's discovery. Repeating: Replace Samuelson's *GNP* and disposable income by endogenous disposable income or *Y*. At the same time, precisely measure government consumption, net investment, and deficit. Then, Samuelson's unitary balanced-budget- multiplier theorem is derived and proved empirically.

The growth rate of per capita output, g_y^*, in BOX A is much lower than g_y^* in BOX B. This is because the coefficient, $b_{IG/YG}$, in BOX A is 0.25, while $b_{IG/YG}$ in BOX B is 0.50. The higher the $b_{IG/YG}$, the higher the g_y^* is. Then, compare BOX A with BOX B by Case. The value of g_y^* in Case 1 is highest among Cases, both in BOXES A and B. It implies that g_y^* is highest when deficit is zero. Samuelson's final discovery station, similarly to that of Salant's, shows a fact that if and only if deficit is zero the sum of the government spending multiplier and the tax multiplier equals 1.0, while all other cases always minus. This fact will be proved separately at the next section.

BOXES A and B by Case are based on real-assets discovery and, wholly cooperating with the multiplier.

This section, by Case, compares the speed years to show the level of equilibrium and g_y^*. Case 4 shows a limit to falling into disequilibrium roughly at a_{TAX}=0.5. In Case 4, government spends twice of taxes endogenously. Along with the increase in deficit from

Case 2 to Case 4, the speed years become definitely abnormal. Watch the range of government spending, E_G/Y, at the first line marked by bold. Normal ranges of equilibrium distinguished by government spending level become narrower: In other words, abnormal ranges of disequilibrium by government spending level spread widely and are shown by #NUM!. At the same time, each corresponding g_y^* decreases. Case 4 shows g_y^* close to zero under disequilibrium.

The above facts imply: Increase in deficit weakens technology and productivity. Or, increase in taxes strengthens technology and productivity. This fact expresses real-assets side of Samuelson's scientific discovery in the endogenous system. This fact is indifferent of any money supply policy under the author's neutrality of the financial/market assets to the real assets.

Under the current financial crisis, as pointed out by Krugman (2012), decrease in deficit never satisfies people without a guarantee to recover growth in reality. The first urgent priority is to rise up the endogenous rate of technological progress, regardless of the level of the quantitative/qualitative net investment coefficient, $\beta^*, \beta_G^*,$ or β_{PRI}^*. After having financial institutions rescued, the second urgent priority is to decrease deficit within as less periods as possible. As a result, the rate of inflation or deflation will be settled endogenously and corresponding indicators such as *CPI* and others will be normalized.

13.3 Empirical Proofs Using Two Multipliers in KEWT and Its Recursive Programming

This section first clarifies the relationship between real assets and the multiplier to finalize Samuelson's scientific discovery, using a series of BOX and also related recursive programming. Second, this section tests and interprets the level of the multiplier by country, using 24 countries, 2010. KEWT data-sets in 2010 show the worst results in some countries while indifferent of the current financial crisis in other countries. As a whole in 2010, world economies are not so much pessimistic but stable. This fact implies that many countries are already cooperative in the global world. When Samuelson's discovery was not urgently realized, however, the world economies must fall into the worst in reality.

First, let the author present finalized BOX C. BOX C connects real-assets discovery with the multiplier. The multiplier is generally shown by the propensity to saving, $m_S = 1/(1-c)$, except for deficit=zero. Under deficit=zero, $m_S = c/(1-c)$ is correctly shown (see Eqs. 2 and 3 above). Then, when $m_S = 1/(1-c)$ is applied to Cases A, B, C, D, and E, the sum of two multipliers of government spending and taxes, becomes 0.0, only at Case A, whose deficit is zero. The sum increases minus rapidly along with from Case B to Case E. Furthermore, when deficit is plus (i.e., surplus), the same turns plus. These facts and proofs a final reply to Samuelson's scientific discovery.

And, let us together cry Eureka!, to these proofs in BOX C.

BOX 13-2 Samuelson's (46, 1975) Eureka!—BOX C, adding a case of surplus

Case Surplus (i.e., minus deficit)			using each inverse of two multipliers				**Case Surplus-inverse: Eureka!**				using two multipliers	
a_{TAX}	E_G/Y	0.0100	0.2500	0.5000	0.7500	1.0000	Y/E_G	100.00	4.00	2.00	1.33	1.00
1.2	T_{AX}/Y	0.012	0.3	0.6	0.9	1.2	Y/T_{AX}	(83.33)	(3.33)	(1.67)	(1.11)	(0.83)
$b_{IG/YG}$	$\Delta D=S_G-I_G$	(0.0020)	(0.0500)	(0.1000)	(0.1500)	(0.2000)	$b_{IG/YG}$	sum of two multipliers				
0.25	$I_G=b_{IG/YG}\cdot Y_G$	0.0030	0.0750	0.1500	0.2250	0.3000	0.25	**16.67**	**0.67**	**0.33**	**0.22**	**0.17**
Case A							**Case A-inverse: Samuelson's (46, 1975) Eureka!**					
a_{TAX}	E_G/Y	0.0100	0.2500	0.5000	0.7500	1.0000	Y/E_G	100.00	4.00	2.00	1.33	1.00
1.0	T_{AX}/Y	0.01	0.25	0.5	0.75	1	Y/T_{AX}	(100.00)	(4.00)	(2.00)	(1.33)	(1.00)
$b_{IG/YG}$	$\Delta D=S_G-I_G$	0.0000	0.0000	0.0000	0.0000	0.0000	$b_{IG/YG}$	sum of two multipliers				
0.25	$I_G=b_{IG/YG}\cdot Y_G$	0.0025	0.0625	0.1250	0.1875	0.2500	0.25	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Case B							Case B-inverse					
a_{TAX}	E_G/Y	0.0100	0.2500	0.5000	0.7500	1.0000	Y/E_G	100.00	4.00	2.00	1.33	1.00
0.75	T_{AX}/Y	0.0075	0.1875	0.375	0.5625	0.75	Y/T_{AX}	(133.33)	(5.33)	(2.67)	(1.78)	(1.33)
$b_{IG/YG}$	$\Delta D=S_G-I_G$	0.0025	0.0625	0.1250	0.1875	0.2500	$b_{IG/YG}$	sum of two multipliers				
0.25	$I_G=b_{IG/YG}\cdot Y_G$	0.0019	0.0469	0.0938	0.1406	0.1875	0.25	(33.33)	(1.33)	(0.67)	(0.44)	(0.33)
Case C							Case C-inverse					
a_{TAX}	E_G/Y	0.0100	0.2500	0.5000	0.7500	1.0000	Y/E_G	100.00	4.00	2.00	1.33	1.00
0.5	T_{AX}/Y	0.005	0.125	0.25	0.375	0.5	Y/T_{AX}	(200.00)	(8.00)	(4.00)	(2.67)	(2.00)
$b_{IG/YG}$	$\Delta D=S_G-I_G$	0.0050	0.1250	0.2500	0.3750	0.5000	$b_{IG/YG}$	sum of two multipliers				
0.25	$I_G=b_{IG/YG}\cdot Y_G$	0.0013	0.0313	0.0625	0.0938	0.1250	0.25	**(100.00)**	**(4.00)**	**(2.00)**	**(1.33)**	**(1.00)**
Case D							Case D-inverse					
a_{TAX}	E_G/Y	0.0100	0.2500	0.5000	0.7500	1.0000	Y/E_G	100.00	4.00	2.00	1.33	1.00
0.25	T_{AX}/Y	0.0025	0.0625	0.125	0.1875	0.25	Y/T_{AX}	(400.00)	(16.00)	(8.00)	(5.33)	(4.00)
$b_{IG/YG}$	$\Delta D=S_G-I_G$	0.0075	0.1875	0.3750	0.5625	0.7500	$b_{IG/YG}$	sum of two multipliers				
0.50	$I_G=b_{IG/YG}\cdot Y_G$	0.0013	0.0313	0.0625	0.0938	0.1250	**0.50**	(300.00)	(12.00)	(6.00)	(4.00)	(3.00)
Case E							Case E-inverse					
a_{TAX}	E_G/Y	0.0100	0.2500	0.5000	0.7500	1.0000	Y/E_G	100.00	4.00	2.00	1.33	1.00
0.01	T_{AX}/Y	0.0001	0.0025	0.005	0.0075	0.01	Y/T_{AX}	(10000)	(400)	(200)	(133.33)	(100.00)
$b_{IG/YG}$	$\Delta D=S_G-I_G$	0.0099	0.2475	0.4950	0.7425	0.9900	$b_{IG/YG}$	sum of two multipliers				
0.75	$I_G=b_{IG/YG}\cdot Y_G$	0.0001	0.0019	0.0038	0.0056	0.0075	**0.75**	(9900)	(396)	(198)	(132.00)	(99.00)

Note: For each Case, $a_{TAX} = T_{AX}/E_G$ and $b_{IG/YG} = I_G/Y_G$, determine the sum of two multipliers.

There hold national taste and culture using relative discounting rate, *rho/r*, and equations related to $\alpha(rho/r)$ and $(r/w)(\alpha)$.[3] These are discussed in a few other chapters.

The propensity to save is directly related to growth. This is proved using recursive programming by year and of course based on the KEWT. In recursive programming, the average propensity to save equals the marginal propensity to save: $1/(1-c) = 1/(1-\Delta c)$, where $\Delta c = \frac{C_t - C_{t-1}}{Y_t - Y_{t-1}} = \frac{\Delta C}{\Delta Y}$. At the KEWT, $\Delta c = \frac{c_t - c_{t-1}(1-g_{Y(BACK)})}{g_{Y(BACK)}} = \frac{\Delta C}{\Delta Y}$ holds, where $g_{Y(BACK)} \equiv \frac{Y_t - Y_{t-1}}{Y_t}$. These values are available at the KEWT series by year and, over years. It is an endogenous fact that the marginal propensity to save is another expression of the growth rate of output in equilibrium.

[3] $(rho/r) = 13.301c^2 - 22.608c + 10.566$ for 81 countries, exceptionally $(rho/r) = 1.8638c^2 - 2.4547c + 1.758$ for several saving-oriented countries. In many countries, each R^2 shows 0.95 to 1.0. $(rho/r)(c)$ is endogenously related to $\alpha = 1-(c/(rho/r))$; $(r/w) = (\alpha/(1-\alpha))/(K/L)$; $r = \alpha/(K/Y)$.

The cases of Samuelson (1942, 1975) and Salant (1942, 1975) each use the same propensity to saving/investment, average and marginal. In the endogenous system, the third coefficient, $c_{-BOP/Y}$, is required in an open economy. The more negatively the balance of payments (*BOP*), the more net investment at the total economy has. When *BOP*=0, saving equals net investment, $1/1-c$ and $1/1-\Delta c$, also if and only if $\Delta D=0$, $c/1-c$ and $c/1-\Delta c$ hold. When *BOP*≠0, $1-c$ is replaced by $1-c+c_{-BOP/Y}\cdot i$, to have net investment adjusted under *BOP*≠0. Twin deficits to *BOP* and Δ*D* are not always the worst when deficit level does not increase and accepts a certain range of government net investment. At Samuelson's discovery, $a_{TAX}=T_{AX}/E_G$ and $b_{IG/YG}=I_G/Y_G$ must be measured and, $c_{-BOP/Y}$ be added acculately.

As a result, BOX 13-3 shows a way to a good circulation and, BOX 13-4 shows its final sufficient and necessary conditions.

BOX 13-3 From resulting in bubbles to no bubble ever adjusting the valuation ratio in equilibrium

Current no solution	Bad circulation	Good circulation
Bubbles	Under a certain range of Δ*D*	Bubbles do not occur
Rescue of financial institutions	Private banks survive	Private banks invest in tech.
Growth approaches zero, under ever increasing Δ*D*	Growth decreases over years Δ*D* does not decrease	Growth robustly target is Δ*D*=0
No method for growth	Have to waif the next bubbles	Much innovation
Vertically, stuck and fight	Behavior to the lower spirit	Behavior, happier

BOX 13-4 An empirical framework of ever growth based on Samuelson's discovery (1975)

Sufficient conditions	Necessary condition	Ideal target
$a_{TAX}=T_{AX}/E_G$ aiming at 1.0	$b_{IG/YG}=I_G/Y_G$ aiming at lower	$a_{TAX}=1.0$
$c_{-BOP/Y}$ towards zero/minus	$b_{IG/YG}=0.075$	$c_{-BOP/Y}=0$
T_{AX} up = ΔD down = growth up C_G down = I_G up, $E_G=C_G+I_G$ flat or down	shortly, I_G be higher e.g., $\Delta T_{AX}=\Delta I_G$, E_G never increase	$T_{AX}=E_G$, set ΔD = zero plan robust growth

Social science pursues mankind equality and happiness boldly but without numerical backbone of scientific discovery. Policy-makers must prefer the backbone of real assets policies to social scientific strategies widely spread. Otherwise, social science, ideas, and philosophy do not realize final happy target and, without glancing at unborn-generations. Leaders need to publish facts to people and convey the contents understandably. People, particularly young wives, feel intuitively and correctly what are going on right now. Conveyers are political.

Figure 1 below shows the relationship between the propensity to save and the growth rate of output using recursive programming, after adjusted by $c_{-BOP/Y}$. Figure 1 also expresses a whole picture of real-assets discovery in the transitional path. Each country has its own personality or national taste, culture, and history, which are not denied but expressed only through real-assets policies by country. Figure 1 shows an illustration to wholly evaluate real-assets policies. For example, the US is more robust than expected. This is related to a high $b_{IG/YG} = I_G/Y_G$. This does not implies that the US will be robust in the near future since the decrease in public net investment is required in order to decrease deficit significantly and it might be difficult to accept bold tax increase. The current circumstances by country are summed up right now below.

Second, the author shows the results of scientific discovery using 24 countries, 2010. The counties chosen in this chapter correspond with the area of i) and the area of ii), excluding the area of iii), among 36 countries commonly used for six nature-aspects in the *EES*. For i): the US, Japan, Australia, France, Germany, the UK; China, India, Mexico, Russia, South Africa. For ii): Denmark, Finland, Netherlands, Norway, Sweden, Canada; Greece, Iceland, Ireland, Italy, Portugal, Spain. Results by country exactly present endogenous conditions required for recovering growth. Endogenous conditions by country answer Krugman's inquiry dated on July 1, 2012. When a leader by country concentrates on realizing real-assets policy closer to endogenous conditions, each country recovers growth power and enjoys full employment at the real assets.

Watch **Table 3-1** and then **Tables 3-2**, **3-3**, **3-4**, and **3-5** for 24 countries, 2010. Table 3-1 each is multiplier-oriented throughout simulation by country, except for one row, which shows the current government spending. This row is distinguished from other rows by level of government spending. All other rows each are based on output *Y*. The speed years and the growth rate of per capita output or labor productivity are consistently comparable by country, free from each country's fiscal position. How low labor productivity is at the limit of equilibrium! This fact is related to the rate of return endogenously. It implies that a low productivity is another expression of close-to-disequilibrium. The multiplier, the speed years, growth, and returns are all related implicitly and reflect results of fiscal policy. Even if we do not distinguish one row of the current government spending, the whole picture is vividly alive.

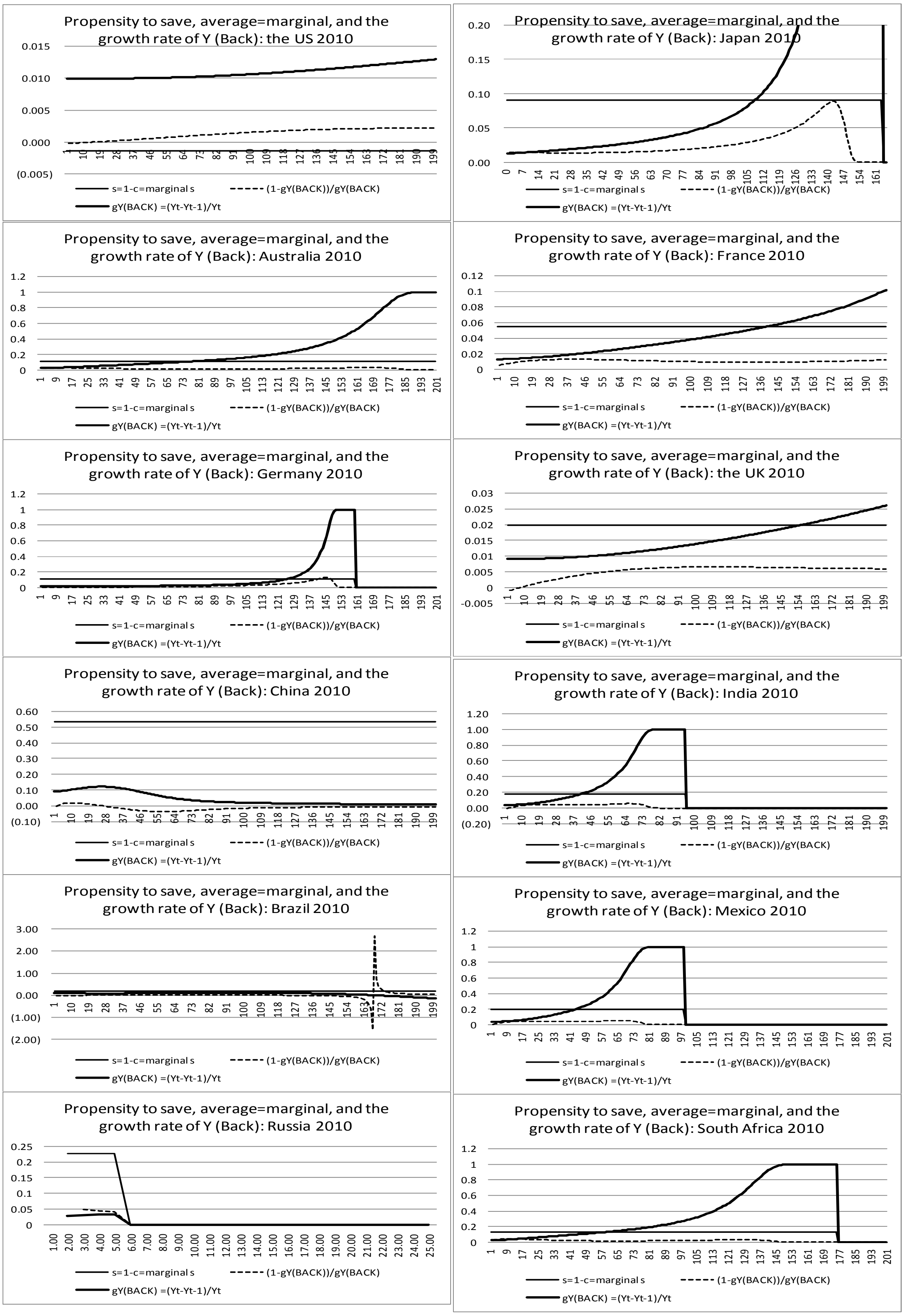

Figure 1 Propensity to save tightly connected with the growth rate in the transitional path

Left problem is how quickly policy-makers could erase real-assets causes from the screen. In general, real-assets causes have been accelerated by the rescue of financial institutions. Think of no problem for financial institutions. Then, real-assets causes are much less than today at the current financial crisis. The cause of financial institutions' aggregation comes from bubbles. Bubbles are results of high inflation or land and housing boom, as indicated by Paul Krugman.

The endogenous system avoids bubbles completely by using the endogenous valuation ratio, $v^* = V/K$. This was already discussed when the cost of capital was summarized in Chapter 5. This chapter does not repeat how to avoid bubbles. This is originally the work of the financial and market policies and also the central bank by country. Leaders and policy-makers have been defeated by surrounding circumstances partly due to a fact that some enterprises could earn much money at bubbles. Instead of bubbles, we could enjoy winning and winning together. This is the best way we operate earth economics and happiness of all people.

13.4 Conclusions

This chapter proposes, from a purely endogenous viewpoint of real assets, that the EU could moderately recover its growth by member country in the current financial crisis and be vividly sustainable as a challenging system in Europe. In short, the decrease in government consumption by member country must be much less than the increase in government net investment which is definitely required for steady growth by member country. This proposal is based on Samuelson's scientific discovery (1942, 1975) and it is proved by using 24 country data-sets of KEWT 1990-2010 by sector. Samuelson uses the multiplier and simultaneously, similarly, Salant (1942, 1975). Simulation specified for scientific discovery principally applies the multiplier to the endogenous data-sets since in general there is no way but actual and statistics data up to date.

The results were expressed by using 24 countries including EU financial crisis countries, Greece, Iceland, Ireland, Italy, Portugal, and Spain and comparing each country with each other. Each country under financial crisis even requires a certain level of public/government net investment. Each level is based on each country's national taste, preferences, culture, and history, and consistently with the global economies. Krugman's (June 11, and July 1, 2012, New York Times) righteousness could results in good fortune definitely if and only if the EU member countries each boldly increase government net investment and severely cut government consumption, with bold tax increase for the next generation. The author loudly cries 'the increase in government net investment within the range of tax increase.' Tax reduction competition is completely meaningless for growth.

Leaders and policy-makers of the EU system, right now and by year, are able to execute Samuelson's scientific discovery. For this execution, an absolute condition of the increase in government net investment must be cooperatively systematized by country as the whole EU system. In short, financial crisis countries need much more growth than the current level.

This chapter, for the first time in economic history, revealed the relationship between taxes, deficit, and growth to empirically satisfy Samuelson's discovery. Tables 3-1 to 3-4 each show the growth rate of per capita output by country and reveals that the current level of growth is terribly low compared with moderate level by country. Money supply is required for funding financial institutions but remains countermeasure. Real cause of extremely low growth at the current financial crisis comes from extremely low level of net investment. Please do not confuse the above indication with another important fact that maximum returns and profits are attained at minimum net investment, as proved by related hyperbola by country. Also, dynamic balances are important between government and private sectors. These facts are common to any country among 81 countries endogenously measured by the endogenous system.

We have entered into new decade for social and economic cooperation among countries and, we are promised to be relaxed by country and people peacefully. We recovered scientific discovery, with its avoiding-bubbles indicator of $v^* = V/K$ as a god gift. We have now stepped into a real assets-path, starting with Keynes (1944) and through Samuelson's (1975), Eureka!

Conclusively, the relationship between taxes and deficit is endogenously solved and measured by year and over years. There is no put off any more. Policy-makers are not afraid of estimates, results, and forecasts, by year and over years. The relationship between taxes, subsidies, and deficits determine the robustness of an economy, not only some periods but also long tendency of the economy. In other words, there are a lot of priorities for economic policies, which are reinforced by strategies and tactics to households and enterprises. Policies are limited to the *EES*, just before the redistribution of taxes after adjusting subsidies. Strategies and tactics are limited to individual households and enterprises. Each roles and functions become better by cooperating each other, continuously over years. Here is practice and execution by leaders and policy-makers and the *EES* supplies a container to their decision-making.

As a result, yearly results accurately show the qualitative level of leaders and policy-makers. Therefore, six nature-aspects (money, consumption, *alpha* or stop-macro inequality, deficit and *RRR*=0, politics, and spirituality) are wholly interrelated and express the level of optimum equilibrium. This chapter proves that among others, the relationship between taxes, subsidies, and deficits are vital factors in the real assets. Or deficit and *RRR*=0 are tightly connected with money-neutral.

Chapter 13

Table 1-1 Growth guaranteed by the increase in taxes and G net investment with the decrease in G consumption

a_{TAX}	1.00												
	Case 1	EG: G size											
Case of Samuelson, 1998		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	Y_G=T_{AX}	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6
0.25	ΔD=S_G-I_G	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Omega G	I_G=$b_{IG/YG}$·Y_G	0.0125	0.0250	0.0375	0.0500	0.0625	0.0750	0.0875	0.1000	0.1125	0.1250	0.1375	0.1500
2.5	$beta^*_G$	1.2348	1.0000	0.9217	0.8826	0.8591	0.8434	0.8323	0.8239	0.8173	0.8121	0.8079	0.8043
n_{EG}=n_G	B^*_G	(0.1902)	0.0000	0.0849	0.1330	0.1640	0.1856	0.2016	0.2138	0.2235	0.2313	0.2379	0.2433
0.01	LN(B^*_G)	#NUM!	#NUM!	(2.4659)	(2.0171)	(1.8078)	(1.6840)	(1.6017)	(1.5427)	(1.4984)	(1.4639)	(1.4361)	(1.4133)
alpha G	LN(Ω_G)/LN(E	#NUM!	#NUM!	(0.3716)	(0.4543)	(0.5069)	(0.5441)	(0.5721)	(0.5939)	(0.6115)	(0.6259)	(0.6380)	(0.6483)
0.225	delta$_{0\ G}$	#NUM!	#NUM!	0.628	0.546	0.493	0.456	0.428	0.406	0.388	0.374	0.362	0.352
	$g_A{}^*_G$	(0.0029)	0.0000	0.0029	0.0059	0.0088	0.0117	0.0147	0.0176	0.0205	0.0235	0.0264	0.0294
	1−delta$_{0\ G}$	#NUM!	#NUM!	0.3716	0.4543	0.5069	0.5441	0.5721	0.5939	0.6115	0.6259	0.6380	0.6483
	(1−delta$_{0\ G}$)g_A	#NUM!	#NUM!	0.0011	0.0027	0.0045	0.0064	0.0084	0.0105	0.0126	0.0147	0.0169	0.0190
	(1-α_G)n_G	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda$^*_G$	#NUM!	#NUM!	0.0088	0.0104	0.0122	0.0141	0.0161	0.0182	0.0203	0.0225	0.0246	0.0268
	Speed years	#NUM!	#NUM!	113.11	96.00	81.87	70.73	61.93	54.91	49.22	44.54	40.64	37.34
$g_Y{}^*_G$=$g_A{}^*_G$/(1-alpha$_G$)		(0.0038)	0.0000	0.0038	0.0076	0.0114	0.0152	0.0189	0.0227	0.0265	0.0303	0.0341	0.0379

a_{TAX}		0.85											
	Case 2	EG: G size											
Case of weakened PRI		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	Y_G=T_{AX}	0.0425	0.085	0.1275	0.17	0.2125	0.255	0.2975	0.34	0.3825	0.425	0.4675	0.51
0.25	ΔD=S_G-I_G	0.0075	0.0150	0.0225	0.0300	0.0375	0.0450	0.0525	0.0600	0.0675	0.0750	0.0825	0.0900
Omega G	I_G=$b_{IG/YG}$·Y_G	0.0106	0.0213	0.0319	0.0425	0.0531	0.0638	0.0744	0.0850	0.0956	0.1063	0.1169	0.1275
2.5	$beta^*_G$	1.3177	1.0414	0.9493	0.9033	0.8757	0.8572	0.8441	0.8342	0.8265	0.8204	0.8154	0.8112
n_{EG}=n_G	B^*_G	(0.2411)	(0.0398)	0.0534	0.1071	0.1420	0.1665	0.1847	0.1987	0.2098	0.2189	0.2264	0.2327
0.01	LN(B^*_G)	#NUM!	#NUM!	(2.9308)	(2.2344)	(1.9520)	(1.7926)	(1.6890)	(1.6159)	(1.5614)	(1.5191)	(1.4854)	(1.4578)
alpha G	LN(Ω_G)/LN(E	#NUM!	#NUM!	(0.3126)	(0.4101)	(0.4694)	(0.5111)	(0.5425)	(0.5671)	(0.5869)	(0.6032)	(0.6169)	(0.6285)
0.225	delta$_{0\ G}$	#NUM!	#NUM!	0.687	0.590	0.531	0.489	0.457	0.433	0.413	0.397	0.383	0.371
	$g_A{}^*_G$	(0.0034)	(0.0009)	0.0016	0.0041	0.0066	0.0091	0.0116	0.0141	0.0166	0.0191	0.0216	0.0241
	1−delta$_{0\ G}$	#NUM!	#NUM!	0.3126	0.4101	0.4694	0.5111	0.5425	0.5671	0.5869	0.6032	0.6169	0.6285
	(1−delta$_{0\ G}$)g_A	#NUM!	#NUM!	0.0005	0.0017	0.0031	0.0047	0.0063	0.0080	0.0097	0.0115	0.0133	0.0151
	(1-α_G)n_G	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda$^*_G$	#NUM!	#NUM!	0.0083	0.0094	0.0109	0.0124	0.0140	0.0157	0.0175	0.0193	0.0211	0.0229
	Speed years	#NUM!	#NUM!	121.14	105.98	92.16	80.63	71.22	63.53	57.20	51.92	47.48	43.71
$g_Y{}^*_G$=$g_A{}^*_G$/(1-alpha$_G$)		(0.0044)	(0.0011)	0.0021	0.0053	0.0085	0.0117	0.0150	0.0182	0.0214	0.0246	0.0278	0.0311

a_{TAX}			0.6										
	Case 3	EG: G size											
Case of no growth		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	Y_G=T_{AX}	0.03	0.06	0.09	0.12	0.15	0.18	0.21	0.24	0.27	0.3	0.33	0.36
0.25	ΔD=S_G-I_G	0.0200	0.0400	0.0600	0.0800	0.1000	0.1200	0.1400	0.1600	0.1800	0.2000	0.2200	0.2400
Omega G	I_G=$b_{IG/YG}$·Y_G	0.0075	0.0150	0.0225	0.0300	0.0375	0.0450	0.0525	0.0600	0.0675	0.0750	0.0825	0.0900
4.00	$beta^*_G$	1.6975	1.2683	1.1252	1.0537	1.0107	0.9821	0.9617	0.9463	0.9344	0.9249	0.9171	0.9106
n_{EG}=n_G	B^*_G	(0.4109)	(0.2115)	(0.1113)	(0.0509)	(0.0106)	0.0182	0.0398	0.0567	0.0702	0.0812	0.0904	0.0982
0.01	LN(B^*_G)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(4.0058)	(3.2226)	(2.8701)	(2.6567)	(2.5107)	(2.4034)	(2.3207)
alpha G	LN(Ω_G)/LN(E	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(0.3461)	(0.4302)	(0.4830)	(0.5218)	(0.5522)	(0.5768)	(0.5973)
0.225	delta$_{0\ G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.654	0.570	0.517	0.478	0.448	0.423	0.403
	$g_A{}^*_G$	(0.0052)	(0.0040)	(0.0028)	(0.0016)	(0.0004)	0.0008	0.0020	0.0032	0.0044	0.0056	0.0068	0.0080
	1−delta$_{0\ G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.3461	0.4302	0.4830	0.5218	0.5522	0.5768	0.5973
	(1−delta$_{0\ G}$)g_A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0003	0.0009	0.0016	0.0023	0.0031	0.0039	0.0048
	(1-α_G)n_G	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda$^*_G$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0080	0.0086	0.0093	0.0101	0.0109	0.0117	0.0126
	Speed years	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	124.56	116.07	107.47	99.41	92.08	85.50	79.63
$g_Y{}^*_G$=$g_A{}^*_G$/(1-alpha$_G$)		(0.0067)	(0.0052)	(0.0036)	(0.0021)	(0.0005)	0.0010	0.0026	0.0042	0.0057	0.0073	0.0088	0.0104

a_{TAX}				0.525									
	Case 4	EG: G size											
Case of bankrupcy		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	Y_G=T_{AX}	0.02625	0.0525	0.07875	0.105	0.13125	0.1575	0.18375	0.21	0.23625	0.2625	0.28875	0.315
0.25	ΔD=S_G-I_G	0.0238	0.0475	0.0713	0.0950	0.1188	0.1425	0.1663	0.1900	0.2138	0.2375	0.2613	0.2850
Omega G	I_G=$b_{IG/YG}$·Y_G	0.0066	0.0131	0.0197	0.0263	0.0328	0.0394	0.0459	0.0525	0.0591	0.0656	0.0722	0.0788
5.00	$beta^*_G$	1.8806	1.3738	1.2049	1.1204	1.0697	1.0359	1.0118	0.9937	0.9796	0.9683	0.9591	0.9514
n_{EG}=n_G	B^*_G	(0.4683)	(0.2721)	(0.1700)	(0.1074)	(0.0652)	(0.0347)	(0.0116)	0.0064	0.0208	0.0327	0.0426	0.0511
0.01	LN(B^*_G)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(5.0552)	(3.8709)	(3.4199)	(3.1550)	(2.9749)
alpha G	LN(Ω_G)/LN(E	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(0.3184)	(0.4158)	(0.4706)	(0.5101)	(0.5410)
0.225	delta$_{0\ G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.682	0.584	0.529	0.490	0.459
	$g_A{}^*_G$	(0.0058)	(0.0049)	(0.0040)	(0.0032)	(0.0023)	(0.0014)	(0.0005)	0.0003	0.0012	0.0021	0.0030	0.0038
	1−delta$_{0\ G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.3184	0.4158	0.4706	0.5101	0.5410
	(1−delta$_{0\ G}$)g_A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0001	0.0005	0.0010	0.0015	0.0021
	(1-α_G)n_G	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda$^*_G$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0079	0.0083	0.0087	0.0093	0.0098
	Speed years	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	127.29	121.19	114.57	108.04	101.84
$g_Y{}^*_G$=$g_A{}^*_G$/(1-alpha$_G$)		(0.0075)	(0.0063)	(0.0052)	(0.0041)	(0.0030)	(0.0018)	(0.0007)	0.0004	0.0016	0.0027	0.0038	0.0049

Table 1-2 Growth guaranteed by the increase in taxes and G net investment with the decrease in G consumption

a_{TAX}				0.525									
Case 4-Omega		EG: G size											
Sacrificing technology		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.02625	0.0525	0.07875	0.105	0.13125	0.1575	0.18375	0.21	0.23625	0.2625	0.28875	0.315
0.25	$\Delta D=S_G-I_G$	0.0238	0.0475	0.0713	0.0950	0.1188	0.1425	0.1663	0.1900	0.2138	0.2375	0.2613	0.2850
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0066	0.0131	0.0197	0.0263	0.0328	0.0394	0.0459	0.0525	0.0591	0.0656	0.0722	0.0788
7.00	beta $^*_G$	1.9550	1.4281	1.2525	1.1646	1.1120	1.0768	1.0517	1.0329	1.0183	1.0066	0.9970	0.9890
$n_{EG}=n_G$	B^*_G	(0.4885)	(0.2998)	(0.2016)	(0.1414)	(0.1007)	(0.0714)	(0.0492)	(0.0319)	(0.0180)	(0.0065)	0.0030	0.0111
0.01	$LN(B^*_G)$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(5.8083)	(4.5010)
alpha $_G$	$LN(\Omega_G)/LN(E$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(0.3350)	(0.4323)
0.225	delta $_{0\,G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.665	0.568
	$g_A{}^*_G$	(0.0063)	(0.0056)	(0.0050)	(0.0043)	(0.0037)	(0.0030)	(0.0024)	(0.0017)	(0.0011)	(0.0004)	0.0002	0.0009
	1−delta $_{0\,G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.3350	0.4323
	(1−delta $_{0\,G}$)g_A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0001	0.0004
	$(1-\alpha_G)n_G$	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda $^*_G$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0078	0.0081
	Speed years	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	127.84	123.10
$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$		(0.0081)	(0.0072)	(0.0064)	(0.0056)	(0.0047)	(0.0039)	(0.0031)	(0.0022)	(0.0014)	(0.0006)	0.0003	0.0011

a_{TAX}				0.675									
Case 4-n_E		EG: G size											
Sacrificing technology		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.03375	0.0675	0.10125	0.135	0.16875	0.2025	0.23625	0.27	0.30375	0.3375	0.37125	0.405
0.25	$\Delta D=S_G-I_G$	0.0163	0.0325	0.0488	0.0650	0.0813	0.0975	0.1138	0.1300	0.1463	0.1625	0.1788	0.1950
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0084	0.0169	0.0253	0.0338	0.0422	0.0506	0.0591	0.0675	0.0759	0.0844	0.0928	0.1013
4.00	beta $^*_G$	2.7252	1.7831	1.4691	1.3121	1.2179	1.1550	1.1102	1.0765	1.0504	1.0294	1.0123	0.9980
$n_{EG}=n_G$	B^*_G	(0.6330)	(0.4392)	(0.3193)	(0.2378)	(0.1789)	(0.1342)	(0.0993)	(0.0711)	(0.0480)	(0.0286)	(0.0122)	0.0020
0.025	$LN(B^*_G)$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(6.2315)
alpha $_G$	$LN(\Omega_G)/LN(E$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(0.2225)
0.225	delta $_{0\,G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.778
	$g_A{}^*_G$	(0.0146)	(0.0132)	(0.0119)	(0.0105)	(0.0092)	(0.0078)	(0.0065)	(0.0052)	(0.0038)	(0.0025)	(0.0011)	0.0002
	1−delta $_{0\,G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.2225
	(1−delta $_{0\,G}$)g_A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0000
	$(1-\alpha_G)n_G$	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194
	lambda $^*_G$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0194
	Speed years	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	51.50
$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$		(0.0188)	(0.0171)	(0.0153)	(0.0136)	(0.0119)	(0.0101)	(0.0084)	(0.0067)	(0.0049)	(0.0032)	(0.0015)	0.0003

a_{TAX}				0.525									
Case 4-alpha		EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.02625	0.0525	0.07875	0.105	0.13125	0.1575	0.18375	0.21	0.23625	0.2625	0.28875	0.315
0.25	$\Delta D=S_G-I_G$	0.0238	0.0475	0.0713	0.0950	0.1188	0.1425	0.1663	0.1900	0.2138	0.2375	0.2613	0.2850
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0066	0.0131	0.0197	0.0263	0.0328	0.0394	0.0459	0.0525	0.0591	0.0656	0.0722	0.0788
4.00	beta $^*_G$	1.7062	1.2838	1.1430	1.0726	1.0304	1.0022	0.9821	0.9670	0.9553	0.9459	0.9382	0.9318
$n_{EG}=n_G$	B^*_G	(0.4139)	(0.2211)	(0.1251)	(0.0677)	(0.0295)	(0.0022)	0.0182	0.0341	0.0468	0.0572	0.0659	0.0732
0.01	$LN(B^*_G)$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(4.0041)	(3.3777)	(3.0613)	(2.8610)	(2.7201)	(2.6147)
alpha $_G$	$LN(\Omega_G)/LN(E$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(0.3462)	(0.4104)	(0.4528)	(0.4846)	(0.5096)	(0.5302)
0.35	delta $_{0\,G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.654	0.590	0.547	0.515	0.490	0.470
	$g_A{}^*_G$	(0.0046)	(0.0037)	(0.0028)	(0.0019)	(0.0010)	(0.0001)	0.0008	0.0017	0.0026	0.0036	0.0045	0.0054
	1−delta $_{0\,G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.3462	0.4104	0.4528	0.4846	0.5096	0.5302
	(1−delta $_{0\,G}$)g_A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0003	0.0007	0.0012	0.0017	0.0023	0.0028
	$(1-\alpha_G)n_G$	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065
	lambda $^*_G$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0068	0.0072	0.0077	0.0082	0.0088	0.0093
	Speed years	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	147.39	138.68	129.93	121.64	113.98	106.98
$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$		(0.0071)	(0.0057)	(0.0043)	(0.0029)	(0.0015)	(0.0001)	0.0013	0.0027	0.0041	0.0055	0.0069	0.0083

Chapter 13

Table 2-1 Growth guaranteed by the increase in taxes and G net investment with the decrease in G consumption

a_{TAX}	1.00												
	Case 1	EG: G size											
Case of Samuelson, 1998		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6
0.50	$\Delta D=S_G-I_G$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0250	0.0500	0.0750	0.1000	0.1250	0.1500	0.1750	0.2000	0.2250	0.2500	0.2750	0.3000
2.5	beta$^*_G$	1.0000	0.8826	0.8434	0.8239	0.8121	0.8043	0.7987	0.7945	0.7912	0.7886	0.7865	0.7847
$n_{EG}=n_G$	B^*_G	0.0000	0.1330	0.1856	0.2138	0.2313	0.2433	0.2520	0.2586	0.2638	0.2680	0.2715	0.2743
0.01	LN(B^*_G)	#NUM!	(2.0171)	(1.6840)	(1.5427)	(1.4639)	(1.4133)	(1.3782)	(1.3523)	(1.3325)	(1.3167)	(1.3040)	(1.2934)
alpha $_G$	LN(Ω_G)/LN(B	#NUM!	(0.4543)	(0.5441)	(0.5939)	(0.6259)	(0.6483)	(0.6648)	(0.6776)	(0.6877)	(0.6959)	(0.7027)	(0.7084)
0.225	delta$_{0\ G}$	#NUM!	0.546	0.456	0.406	0.374	0.352	0.335	0.322	0.312	0.304	0.297	0.292
	$g^*_{A\ G}$	0.0000	0.0059	0.0117	0.0176	0.0235	0.0294	0.0352	0.0411	0.0470	0.0528	0.0587	0.0646
	1−delta$_{0\ G}$	#NUM!	0.4543	0.5441	0.5939	0.6259	0.6483	0.6648	0.6776	0.6877	0.6959	0.7027	0.7084
	(1−delta$_{0\ G}$)g_A	#NUM!	0.0027	0.0064	0.0105	0.0147	0.0190	0.0234	0.0278	0.0323	0.0368	0.0413	0.0458
	(1-α_G)n_G	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda$^*_G$	#NUM!	0.0104	0.0141	0.0182	0.0225	0.0268	0.0312	0.0356	0.0400	0.0445	0.0490	0.0535
	Speed years	#NUM!	96.00	70.73	54.91	44.54	37.34	32.08	28.09	24.97	22.46	20.41	18.69
$g_y{}^*_G=g_A{}^*_G/(1\text{-alpha}_G)$		0.0000	0.0076	0.0152	0.0227	0.0303	0.0379	0.0455	0.0530	0.0606	0.0682	0.0758	0.0833
a_{TAX}		0.85											
	Case 2	EG: G size											
Case of weakened PRI		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0425	0.085	0.1275	0.17	0.2125	0.255	0.2975	0.34	0.3825	0.425	0.4675	0.51
0.50	$\Delta D=S_G-I_G$	0.0075	0.0150	0.0225	0.0300	0.0375	0.0450	0.0525	0.0600	0.0675	0.0750	0.0825	0.0900
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0213	0.0425	0.0638	0.0850	0.1063	0.1275	0.1488	0.1700	0.1913	0.2125	0.2338	0.2550
2.5	beta$^*_G$	1.0414	0.9033	0.8572	0.8342	0.8204	0.8112	0.8046	0.7997	0.7959	0.7928	0.7903	0.7882
$n_{EG}=n_G$	B^*_G	(0.0398)	0.1071	0.1665	0.1987	0.2189	0.2327	0.2428	0.2505	0.2565	0.2614	0.2654	0.2688
0.01	LN(B^*_G)	#NUM!	(2.2344)	(1.7926)	(1.6159)	(1.5191)	(1.4578)	(1.4154)	(1.3843)	(1.3606)	(1.3418)	(1.3265)	(1.3140)
alpha $_G$	LN(Ω_G)/LN(B	#NUM!	(0.4101)	(0.5111)	(0.5671)	(0.6032)	(0.6285)	(0.6474)	(0.6619)	(0.6735)	(0.6829)	(0.6907)	(0.6973)
0.225	delta$_{0\ G}$	#NUM!	0.590	0.489	0.433	0.397	0.371	0.353	0.338	0.327	0.317	0.309	0.303
	$g^*_{A\ G}$	(0.0009)	0.0041	0.0091	0.0141	0.0191	0.0241	0.0291	0.0341	0.0390	0.0440	0.0490	0.0540
	1−delta$_{0\ G}$	#NUM!	0.4101	0.5111	0.5671	0.6032	0.6285	0.6474	0.6619	0.6735	0.6829	0.6907	0.6973
	(1−delta$_{0\ G}$)g_A	#NUM!	0.0017	0.0047	0.0080	0.0115	0.0151	0.0188	0.0225	0.0263	0.0301	0.0339	0.0377
	(1-α_G)n_G	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda$^*_G$	#NUM!	0.0094	0.0124	0.0157	0.0193	0.0229	0.0266	0.0303	0.0340	0.0378	0.0416	0.0454
	Speed years	#NUM!	105.98	80.63	63.53	51.92	43.71	37.65	33.01	29.37	26.44	24.03	22.02
$g_y{}^*_G=g_A{}^*_G/(1\text{-alpha}_G)$		(0.0011)	0.0053	0.0117	0.0182	0.0246	0.0311	0.0375	0.0439	0.0504	0.0568	0.0633	0.0697
a_{TAX}			0.6										
	Case 3	EG: G size											
Case of no growth		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.03	0.06	0.09	0.12	0.15	0.18	0.21	0.24	0.27	0.3	0.33	0.36
0.50	$\Delta D=S_G-I_G$	0.0200	0.0400	0.0600	0.0800	0.1000	0.1200	0.1400	0.1600	0.1800	0.2000	0.2200	0.2400
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0150	0.0300	0.0450	0.0600	0.0750	0.0900	0.1050	0.1200	0.1350	0.1500	0.1650	0.1800
4.00	beta$^*_G$	1.2683	1.0537	0.9821	0.9463	0.9249	0.9106	0.9004	0.8927	0.8867	0.8820	0.8781	0.8748
$n_{EG}=n_G$	B^*_G	(0.2115)	(0.0509)	0.0182	0.0567	0.0812	0.0982	0.1107	0.1202	0.1277	0.1338	0.1389	0.1431
0.01	LN(B^*_G)	#NUM!	#NUM!	(4.0058)	(2.8701)	(2.5107)	(2.3207)	(2.2012)	(2.1186)	(2.0578)	(2.0112)	(1.9742)	(1.9442)
alpha $_G$	LN(Ω_G)/LN(B	#NUM!	#NUM!	(0.3461)	(0.4830)	(0.5522)	(0.5973)	(0.6298)	(0.6543)	(0.6737)	(0.6893)	(0.7022)	(0.7130)
0.225	delta$_{0\ G}$	#NUM!	#NUM!	0.654	0.517	0.448	0.403	0.370	0.346	0.326	0.311	0.298	0.287
	$g^*_{A\ G}$	(0.0040)	(0.0016)	0.0008	0.0032	0.0056	0.0080	0.0105	0.0129	0.0153	0.0177	0.0201	0.0225
	1−delta$_{0\ G}$	#NUM!	#NUM!	0.3461	0.4830	0.5522	0.5973	0.6298	0.6543	0.6737	0.6893	0.7022	0.7130
	(1−delta$_{0\ G}$)g_A	#NUM!	#NUM!	0.0003	0.0016	0.0031	0.0048	0.0066	0.0084	0.0103	0.0122	0.0141	0.0161
	(1-α_G)n_G	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda$^*_G$	#NUM!	#NUM!	0.0080	0.0093	0.0109	0.0126	0.0143	0.0162	0.0181	0.0200	0.0219	0.0238
	Speed years	#NUM!	#NUM!	124.56	107.47	92.08	79.63	69.74	61.82	55.40	50.12	45.71	41.99
$g_y{}^*_G=g_A{}^*_G/(1\text{-alpha}_G)$		(0.0052)	(0.0021)	0.0010	0.0042	0.0073	0.0104	0.0135	0.0166	0.0197	0.0228	0.0260	0.0291
a_{TAX}				0.525									
	Case 4	EG: G size											
Case of bankrupcy		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.02625	0.0525	0.07875	0.105	0.13125	0.1575	0.18375	0.21	0.23625	0.2625	0.28875	0.315
0.50	$\Delta D=S_G-I_G$	0.0238	0.0475	0.0713	0.0950	0.1188	0.1425	0.1663	0.1900	0.2138	0.2375	0.2613	0.2850
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0131	0.0263	0.0394	0.0525	0.0656	0.0788	0.0919	0.1050	0.1181	0.1313	0.1444	0.1575
5.00	beta$^*_G$	1.3738	1.1204	1.0359	0.9937	0.9683	0.9514	0.9394	0.9303	0.9233	0.9176	0.9130	0.9092
$n_{EG}=n_G$	B^*_G	(0.2721)	(0.1074)	(0.0347)	0.0064	0.0327	0.0511	0.0646	0.0749	0.0831	0.0898	0.0953	0.0999
0.01	LN(B^*_G)	#NUM!	#NUM!	#NUM!	(5.0552)	(3.4199)	(2.9749)	(2.7402)	(2.5914)	(2.4876)	(2.4107)	(2.3512)	(2.3038)
alpha $_G$	LN(Ω_G)/LN(B	#NUM!	#NUM!	#NUM!	(0.3184)	(0.4706)	(0.5410)	(0.5873)	(0.6211)	(0.6470)	(0.6676)	(0.6845)	(0.6986)
0.225	delta$_{0\ G}$	#NUM!	#NUM!	#NUM!	0.682	0.529	0.459	0.413	0.379	0.353	0.332	0.315	0.301
	$g^*_{A\ G}$	(0.0049)	(0.0032)	(0.0014)	0.0003	0.0021	0.0038	0.0056	0.0073	0.0091	0.0108	0.0126	0.0143
	1−delta$_{0\ G}$	#NUM!	#NUM!	#NUM!	0.3184	0.4706	0.5410	0.5873	0.6211	0.6470	0.6676	0.6845	0.6986
	(1−delta$_{0\ G}$)g_A	#NUM!	#NUM!	#NUM!	0.0001	0.0010	0.0021	0.0033	0.0045	0.0059	0.0072	0.0086	0.0100
	(1-α_G)n_G	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda$^*_G$	#NUM!	#NUM!	#NUM!	0.0079	0.0087	0.0098	0.0110	0.0123	0.0136	0.0150	0.0163	0.0177
	Speed years	#NUM!	#NUM!	#NUM!	127.29	114.57	101.84	90.73	81.34	73.45	66.81	61.18	56.36
$g_y{}^*_G=g_A{}^*_G/(1\text{-alpha}_G)$		(0.0063)	(0.0041)	(0.0018)	0.0004	0.0027	0.0049	0.0072	0.0094	0.0117	0.0139	0.0162	0.0185

Table 2-2 Growth guaranteed by the increase in taxes and G net investment with the decrease in G consumption

a_{TAX}				**0.525**									
	Case 4-Omega	EG: G size											
Sacrificing technology		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.02625	0.0525	0.07875	0.105	0.13125	0.1575	0.18375	0.21	0.23625	0.2625	0.28875	0.315
0.50	$\Delta D=S_G-I_G$	0.0238	0.0475	0.0713	0.0950	0.1188	0.1425	0.1663	0.1900	0.2138	0.2375	0.2613	0.2850
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0131	0.0263	0.0394	0.0525	0.0656	0.0788	0.0919	0.1050	0.1181	0.1313	0.1444	0.1575
7.00	beta $^*_G$	1.4281	1.1646	1.0768	1.0329	1.0066	0.9890	0.9765	0.9671	0.9598	0.9539	0.9491	0.9451
$n_{EG}=n_G$	B^*_G	(0.2998)	(0.1414)	(0.0714)	(0.0319)	(0.0065)	0.0111	0.0241	0.0341	0.0419	0.0483	0.0536	0.0581
0.01	$LN(B^*_G)$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(4.5010)	(3.7261)	(3.3799)	(3.1716)	(3.0297)	(2.9258)	(2.8461)
alpha $_G$	$LN(\Omega_G)/LN(B$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(0.4323)	(0.5222)	(0.5757)	(0.6135)	(0.6423)	(0.6651)	(0.6837)
0.225	delta $_{0G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.568	0.478	0.424	0.386	0.358	0.335	0.316
	$g_A{}^*_G$	(0.0056)	(0.0043)	(0.0030)	(0.0017)	(0.0004)	0.0009	0.0022	0.0035	0.0048	0.0061	0.0073	0.0086
	1−delta $_{0G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.4323	0.5222	0.5757	0.6135	0.6423	0.6651	0.6837
	(1−delta $_{0G}$)g_A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0004	0.0011	0.0020	0.0029	0.0039	0.0049	0.0059
	$(1-\alpha_G)n_G$	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda $^*_G$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0081	0.0089	0.0097	0.0107	0.0116	0.0126	0.0137
	Speed years	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	123.10	112.63	102.66	93.75	85.94	79.14	73.21
	$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$	(0.0072)	(0.0056)	(0.0039)	(0.0022)	(0.0006)	0.0011	0.0028	0.0045	0.0061	0.0078	0.0095	0.0112
a_{TAX}				**0.675**									
	Case 4-n_E	EG: G size											
Sacrificing technology		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.03375	0.0675	0.10125	0.135	0.16875	0.2025	0.23625	0.27	0.30375	0.3375	0.37125	0.405
0.50	$\Delta D=S_G-I_G$	0.0163	0.0325	0.0488	0.0650	0.0813	0.0975	0.1138	0.1300	0.1463	0.1625	0.1788	0.1950
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0169	0.0338	0.0506	0.0675	0.0844	0.1013	0.1181	0.1350	0.1519	0.1688	0.1856	0.2025
4.00	beta $^*_G$	1.7831	1.3121	1.1550	1.0765	1.0294	0.9980	0.9756	0.9588	0.9457	0.9352	0.9267	0.9195
$n_{EG}=n_G$	B^*_G	(0.4392)	(0.2378)	(0.1342)	(0.0711)	(0.0286)	0.0020	0.0250	0.0430	0.0574	0.0693	0.0791	0.0875
0.025	$LN(B^*_G)$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(6.2315)	(3.6888)	(3.1469)	(2.8574)	(2.6700)	(2.5366)	(2.4360)
alpha $_G$	$LN(\Omega_G)/LN(B$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(0.2225)	(0.3758)	(0.4405)	(0.4852)	(0.5192)	(0.5465)	(0.5691)
0.225	delta $_{0G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.778	0.624	0.559	0.515	0.481	0.453	0.431
	$g_A{}^*_G$	(0.0132)	(0.0105)	(0.0078)	(0.0052)	(0.0025)	0.0002	0.0029	0.0056	0.0082	0.0109	0.0136	0.0163
	1−delta $_{0G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.2225	0.3758	0.4405	0.4852	0.5192	0.5465	0.5691
	(1−delta $_{0G}$)g_A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0000	0.0011	0.0025	0.0040	0.0057	0.0074	0.0093
	$(1-\alpha_G)n_G$	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194	0.0194
	lambda $^*_G$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0194	0.0205	0.0218	0.0234	0.0250	0.0268	0.0286
	Speed years	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	51.50	48.88	45.82	42.78	39.92	37.29	34.91
	$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$	(0.0171)	(0.0136)	(0.0101)	(0.0067)	(0.0032)	0.0003	0.0037	0.0072	0.0106	0.0141	0.0176	0.0210
a_{TAX}				**0.525**									
	Case 4-alpha	EG: G size		using each inverse of EG and tax multipliers									
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.02625	0.0525	0.07875	0.105	0.13125	0.1575	0.18375	0.21	0.23625	0.2625	0.28875	0.315
0.50	$\Delta D=S_G-I_G$	0.0238	0.0475	0.0713	0.0950	0.1188	0.1425	0.1663	0.1900	0.2138	0.2375	0.2613	0.2850
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0131	0.0263	0.0394	0.0525	0.0656	0.0788	0.0919	0.1050	0.1181	0.1313	0.1444	0.1575
4.00	beta $^*_G$	1.2838	1.0726	1.0022	0.9670	0.9459	0.9318	0.9217	0.9142	0.9083	0.9036	0.8998	0.8966
$n_{EG}=n_G$	B^*_G	(0.2211)	(0.0677)	(0.0022)	0.0341	0.0572	0.0732	0.0849	0.0938	0.1009	0.1066	0.1114	0.1153
0.01	$LN(B^*_G)$	#NUM!	#NUM!	#NUM!	(3.3777)	(2.8610)	(2.6147)	(2.4663)	(2.3661)	(2.2935)	(2.2384)	(2.1951)	(2.1601)
alpha $_G$	$LN(\Omega_G)/LN(B$	#NUM!	#NUM!	#NUM!	(0.4104)	(0.4846)	(0.5302)	(0.5621)	(0.5859)	(0.6044)	(0.6193)	(0.6316)	(0.6418)
0.35	delta $_{0G}$	#NUM!	#NUM!	#NUM!	0.590	0.515	0.470	0.438	0.414	0.396	0.381	0.368	0.358
	$g_A{}^*_G$	(0.0037)	(0.0019)	(0.0001)	0.0017	0.0036	0.0054	0.0072	0.0090	0.0108	0.0126	0.0145	0.0163
	1−delta $_{0G}$	#NUM!	#NUM!	#NUM!	0.4104	0.4846	0.5302	0.5621	0.5859	0.6044	0.6193	0.6316	0.6418
	(1−delta $_{0G}$)g_A	#NUM!	#NUM!	#NUM!	0.0007	0.0017	0.0028	0.0040	0.0053	0.0065	0.0078	0.0091	0.0105
	$(1-\alpha_G)n_G$	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065	0.0065
	lambda $^*_G$	#NUM!	#NUM!	#NUM!	0.0072	0.0082	0.0093	0.0105	0.0118	0.0130	0.0143	0.0156	0.0170
	Speed years	#NUM!	#NUM!	#NUM!	138.68	121.64	106.98	94.87	84.90	76.66	69.77	63.96	58.99
	$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$	(0.0057)	(0.0029)	(0.0001)	0.0027	0.0055	0.0083	0.0111	0.0139	0.0167	0.0195	0.0223	0.0251

Table 3-1 Differences of the growth rate of per capita output between the total economy and the government sector by country in equilibrium: 24 countries, 2010

BOX C	$_{AX}$=a_{TAX}·E_G		**EG: G size**		all items are each divided by Y_G=C_G+S_G									
I_G=$b_{IG/YG}$·Y_G	a_{TAX} & $b_{IG/YG}$		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
the US	**1.00**	Speed yrs G	#NUM!	106.14	80.25	62.85	51.14	42.89	8.88	32.25	28.64	25.74	23.37	21.39
	0.50	$g^{*}_{y\,G}$	(0.0014)	0.0045	0.0103	0.0162	0.0220	0.0279	0.1592	0.0396	0.0454	0.0513	0.0571	0.0630
2. Japan	**0.85**	Speed yrs G	217.42	193.23	151.07	121.74	101.39	17.90	75.62	67.03	60.17	54.57	49.92	46.00
	0.50	$g^{*}_{y\,G}$	0.0023	0.0034	0.0046	0.0058	0.0070	0.0388	0.0094	0.0105	0.0117	0.0129	0.0141	0.0153
3. Australi	**0.60**	Speed yrs G	#NUM!	99.39	100.81	103.15	(104.21)	111.13	117.25	125.34	136.10	150.69	171.08	201.04
	0.50	$g^{*}_{y\,G}$	(0.0014)	0.0023	0.0060	0.0097	0.0795	0.0171	0.0208	0.0245	0.0282	0.0319	0.0356	0.0393
4. France	**0.525**	Speed yrs G	183.37	167.52	142.74	117.68	96.13	9.49	65.27	54.73	46.46	39.93	34.70	30.46
	0.50	$g^{*}_{y\,G}$	0.0001	0.0028	0.0054	0.0080	0.0106	0.0649	0.0158	0.0184	0.0210	0.0237	0.0263	0.0289
5. Germany	**0.525**	Speed yrs G	(528.99)	(339.83)	(214.00)	(140.02)	(2.23)	(68.63)	(50.80)	(38.67)	(30.13)	(23.92)	(19.29)	(15.75)
	0.50	$g^{*}_{y\,G}$	0.0023	0.0039	0.0055	0.0071	0.0394	0.0103	0.0119	0.0135	0.0151	0.0167	0.0183	0.0199
6. the UK	**0.675**	Speed yrs G	#NUM!	#NUM!	#NUM!	#NUM!	48.41	#NUM!	#NUM!	#NUM!	120.45	117.81	114.44	110.64
	0.50	$g^{*}_{y\,G}$	(0.0028)	(0.0025)	(0.0021)	(0.0017)	0.0086	(0.0010)	(0.0006)	(0.0002)	0.0001	0.0005	0.0009	0.0012
7. China	**0.525**	Speed yrs G	200.06	142.80	104.78	15.10	66.02	55.37	47.59	41.69	37.06	33.35	30.30	27.76
	0.50	$g^{*}_{y\,G}$	0.0016	0.0075	0.0134	0.1248	0.0251	0.0310	0.0369	0.0428	0.0487	0.0546	0.0605	0.0663
8. Inidia	**1.00**	Speed yrs G	#NUM!	#NUM!	86.05	13.71	63.22	54.68	47.90	42.47	38.07	34.44	31.41	28.86
	0.50	$g^{*}_{y\,G}$	(0.0064)	(0.0019)	0.0026	0.1027	0.0116	0.0161	0.0206	0.0251	0.0296	0.0341	0.0386	0.0431
9. Brazil	**0.85**	Speed yrs G	#NUM!	136.65	123.01	106.86	25.39	80.73	71.10	63.26	56.81	51.46	46.97	43.15
	0.50	$g^{*}_{y\,G}$	(0.0030)	0.0000	0.0031	0.0062	0.0563	0.0123	0.0154	0.0184	0.0215	0.0246	0.0276	0.0307
10. Mexic	**0.60**	Speed yrs G	#NUM!	141.12	112.08	17.06	74.59	63.29	54.81	48.27	43.08	38.88	35.40	32.49
	0.50	$g^{*}_{y\,G}$	(0.0029)	0.0019	0.0068	0.1033	0.0165	0.0213	0.0262	0.0310	0.0359	0.0407	0.0456	0.0504
11. Russia	**0.525**	Speed yrs G	(349.94)	(610.69)	1312.28	201.45	82.49	(8.73)	20.61	9.62	3.04	(1.11)	(3.83)	(5.65)
	0.50	$g^{*}_{y\,G}$	0.0083	0.0147	0.0211	0.0275	0.0340	0.1572	0.0468	0.0532	0.0596	0.0661	0.0725	0.0789
12. S. Afric	**0.525**	Speed yrs G	#NUM!	#NUM!	113.28	111.48	32.43	105.13	100.96	96.35	91.47	86.44	81.40	76.43
	0.50	$g^{*}_{y\,G}$	(0.0024)	(0.0010)	0.0004	0.0018	0.0305	0.0046	0.0059	0.0073	0.0087	0.0101	0.0115	0.0128

BOX D	$_{AX}$=a_{TAX}·E_G		**EG: G size**		all items are each divided by Y_G=C_G+S_G									
IG=bIG/YG·Y	**aTAX & bIG/YG**		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
1. Denmark	**1.00**	Speed yrs G	354.30	188.49	125.50	93.53	74.38	61.68	52.67	16.82	40.72	36.57	33.18	30.37
	0.50	$g^{*}_{y\,G}$	0.0039	0.0091	0.0142	0.0193	0.0244	0.0295	0.0346	0.1088	0.0449	0.0500	0.0551	0.0602
2. Finland	**0.85**	Speed yrs G	#NUM!	215.09	160.41	123.69	99.25	82.30	18.80	60.80	53.65	47.96	43.33	39.50
	0.50	$g^{*}_{y\,G}$	(0.0005)	0.0018	0.0040	0.0062	0.0084	0.0106	0.0511	0.0151	0.0173	0.0195	0.0217	0.0239
3. Netherla	**0.60**	Speed yrs G	272.95	221.61	170.45	133.08	106.94	88.36	20.01	64.49	56.54	50.23	45.12	40.91
	0.50	$g^{*}_{y\,G}$	0.0003	0.0028	0.0053	0.0078	0.0102	0.0127	0.0543	0.0177	0.0201	0.0226	0.0251	0.0276
4. Norway	**0.525**	Speed yrs G	#NUM!	#NUM!	#NUM!	#NUM!	179.92	102.91	103.85	105.21	107.01	109.26	112.05	115.44
	0.50	$g^{*}_{y\,G}$	(0.0040)	(0.0031)	(0.0022)	(0.0013)	0.0127	0.0005	0.0015	0.0024	0.0033	0.0042	0.0051	0.0060
5. Sweden	**0.525**	Speed yrs G	211.16	224.80	246.14	277.77	(139.15)	398.67	526.07	792.14	1671.34	(11472)	(1264.63)	(662.37)
	0.50	$g^{*}_{y\,G}$	(0.0057)	(0.0094)	(0.0131)	(0.0167)	(0.0737)	(0.0241)	(0.0278)	(0.0315)	(0.0352)	(0.0388)	(0.0425)	(0.0462)
6. Canada	**0.675**	Speed yrs G	#NUM!	#NUM!	102.48	97.77	91.67	27.29	78.53	72.32	66.57	61.35	56.65	52.44
	0.50	$g^{*}_{y\,G}$	(0.0034)	(0.0013)	0.0008	0.0029	0.0050	0.0421	0.0092	0.0114	0.0135	0.0156	0.0177	0.0198
7. Greece	**0.525**	Speed yrs G	356.32	206.23	130.79	92.35	8.71	56.22	46.65	39.76	34.58	30.56	27.35	24.74
	0.50	$g^{*}_{y\,G}$	0.0007	0.0024	0.0041	0.0059	0.0526	0.0093	0.0111	0.0128	0.0146	0.0163	0.0180	0.0198
8. Iceland	**1.00**	Speed yrs G	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	18.90	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
	0.50	$g^{*}_{y\,G}$	(0.0282)	(0.0267)	(0.0251)	(0.0236)	(0.0220)	(0.0205)	0.0071	(0.0173)	(0.0158)	(0.0142)	(0.0127)	(0.0111)
9. Ireland	**0.85**	Speed yrs G	#NUM!	60.45	49.37	39.60	32.42	27.20	23.31	20.33	17.99	16.12	2.88	13.31
	0.50	$g^{*}_{y\,G}$	(0.0056)	0.0007	0.0070	0.0132	0.0195	0.0258	0.0321	0.0383	0.0446	0.0509	0.3161	0.0634
10. Italy	**0.60**	Speed yrs G	238.47	202.93	160.84	126.48	101.02	14.49	68.74	58.42	50.47	44.22	39.21	35.13
	0.50	$g^{*}_{y\,G}$	0.0003	0.0028	0.0052	0.0076	0.0101	0.0576	0.0149	0.0174	0.0198	0.0222	0.0247	0.0271
11. Portuga	**0.525**	Speed yrs G	(167.61)	28.59	79.27	87.49	27.39	78.21	71.90	66.06	60.87	56.31	52.31	48.79
	0.50	$g^{*}_{y\,G}$	0.0025	0.0038	0.0051	0.0063	0.0306	0.0088	0.0101	0.0114	0.0126	0.0139	0.0151	0.0164
12. Spain	**0.525**	Speed yrs G	#NUM!	83.71	106.23	500.16	(35.15)	13.47	13.94	17.88	19.57	20.24	20.39	20.26
	0.50	$g^{*}_{y\,G}$	(0.0009)	0.0014	0.0037	0.0060	0.0083	0.0639	0.0128	0.0151	0.0174	0.0197	0.0220	0.0243

Table 3-2 Answers to Krugman's (July 1st, 2012) righteousness at the current EU financial crisis: by country

a_{TAX}			**0.7026**										
	1. the US	EG: G size											
Case of Samuelson, 1998		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	**0.3345**	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0351	0.0703	0.1054	0.1405	0.1757	0.2108	**0.2350**	0.2811	0.3162	0.3513	0.3865	0.4216
0.5966	$\Delta D=S_G-I_G$	0.0149	0.0297	0.0446	0.0595	0.0743	0.0892	0.0995	0.1189	0.1338	0.1487	0.1635	0.1784
Omega $_G$	$I_G=b_{IG/YG}\cdot Y$	0.0210	0.0419	0.0629	0.0838	0.1048	0.1258	**0.5966**	0.1677	0.1886	0.2096	0.2306	0.2515
2.7319	beta$^*_G$	1.0541	0.9117	0.8643	0.8406	0.8263	0.8168	**0.7794**	0.8050	0.8010	0.7979	0.7953	0.7931
$n_{EG}=n_G$	B^*_G	(0.0513)	0.0968	0.1570	0.1897	0.2102	0.2242	0.2831	0.2423	0.2484	0.2534	0.2574	0.2609
0.0095	LN(B^*_G)	#NUM!	(2.3349)	(1.8513)	(1.6624)	(1.5598)	(1.4951)	(1.2621)	(1.4177)	(1.3927)	(1.3730)	(1.3570)	(1.3438)
alpha $_G$	LN(Ω_G)/LN(E	#NUM!	(0.4304)	(0.5429)	(0.6046)	(0.6443)	(0.6722)	(0.7963)	(0.7089)	(0.7216)	(0.7320)	(0.7406)	(0.7479)
0.1734	delta$_{0\ G}$	#NUM!	0.570	0.457	0.395	0.356	0.328	0.2037	0.291	0.278	0.268	0.259	0.252
	$g_A{}^*_G$	(0.0011)	0.0037	0.0085	0.0134	0.0182	0.0230	0.1316	0.0327	0.0375	0.0424	0.0472	0.0520
	1−delta$_{0\ G}$	#NUM!	0.4304	0.5429	0.6046	0.6443	0.6722	0.7963	0.7089	0.7216	0.7320	0.7406	0.7479
	(1−delta$_{0\ G}$)g_A	#NUM!	0.0016	0.0046	0.0081	0.0117	0.0155	0.1048	0.0232	0.0271	0.0310	0.0350	0.0389
	$(1-\alpha_G)n_G$	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
	lambda$^*_G$	#NUM!	0.0094	0.0125	0.0159	0.0196	0.0233	0.1126	0.0310	0.0349	0.0388	0.0428	0.0467
	Speed years	#NUM!	106.14	80.25	62.85	51.14	42.89	8.88	32.25	28.64	25.74	23.37	21.39
	$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$	(0.0014)	0.0045	0.0103	0.0162	0.0220	0.0279	0.1592	0.0396	0.0454	0.0513	0.0571	0.0630
a_{TAX}				**0.6273**									
	2. Japan	EG: G size											
Case of weakened PRI		0.0500	0.1000	0.1500	0.2000	0.2500	**0.2901**	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0314	0.0627	0.0941	0.1255	0.1568	**0.1820**	0.2196	0.2509	0.2823	0.3137	0.3450	0.3764
0.3202	$\Delta D=S_G-I_G$	0.0186	0.0373	0.0559	0.0745	0.0932	0.1081	0.1304	0.1491	0.1677	0.1863	0.2050	0.2236
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0100	0.0201	0.0301	0.0402	0.0502	**0.3202**	0.0703	0.0804	0.0904	0.1004	0.1105	0.1205
7.2225	beta$^*_G$	0.7141	0.7820	0.8046	0.8160	0.8227	**0.8456**	0.8305	0.8329	0.8348	0.8363	0.8376	0.8386
$n_{EG}=n_G$	B^*_G	0.4004	0.2788	0.2428	0.2256	0.2154	0.1825	0.2041	0.2006	0.1979	0.1957	0.1939	0.1925
(0.0013)	LN(B^*_G)	(0.9154)	(1.2774)	(1.4156)	(1.4892)	(1.5351)	(1.7009)	(1.5892)	(1.6066)	(1.6202)	(1.6312)	(1.6402)	(1.6478)
alpha $_G$	LN(Ω_G)/LN(E	(2.1599)	(1.5478)	(1.3968)	(1.3277)	(1.2880)	(1.1625)	(1.2441)	(1.2307)	(1.2204)	(1.2122)	(1.2055)	(1.1999)
(0.2739)	delta$_{0\ G}$	(1.160)	(0.548)	(0.397)	(0.328)	(0.288)	(0.162)	(0.244)	(0.231)	(0.220)	(0.212)	(0.205)	(0.200)
	$g_A{}^*_G$	0.0029	0.0044	0.0059	0.0074	0.0089	0.0494	0.0119	0.0134	0.0149	0.0164	0.0179	0.0195
	1−delta$_{0\ G}$	2.1599	1.5478	1.3968	1.3277	1.2880	1.1625	1.2441	1.2307	1.2204	1.2122	1.2055	1.1999
	(1−delta$_{0\ G}$)g_A	0.0062	0.0068	0.0082	0.0098	0.0115	0.0575	0.0148	0.0165	0.0182	0.0199	0.0216	0.0233
	$(1-\alpha_G)n_G$	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)
	lambda$^*_G$	0.0046	0.0052	0.0066	0.0082	0.0099	0.0559	0.0132	0.0149	0.0166	0.0183	0.0200	0.0217
	Speed years	217.42	193.23	151.07	121.74	101.39	17.90	75.62	67.03	60.17	54.57	49.92	46.00
	$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$	0.0023	0.0034	0.0046	0.0058	0.0070	0.0388	0.0094	0.0105	0.0117	0.0129	0.0141	0.0153
a_{TAX}	**0.8747**												
	3. Australi	EG: G size											
Case of no growth		0.0500	0.1000	0.1500	0.2000	**0.2629**	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0437	0.0875	0.1312	0.1749	**0.2300**	0.2624	0.3062	0.3499	0.3936	0.4374	0.4811	0.5248
0.1656	$\Delta D=S_G-I_G$	0.0063	0.0125	0.0188	0.0251	0.0329	0.0376	0.0438	0.0501	0.0564	0.0626	0.0689	0.0752
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0072	0.0145	0.0217	0.0290	**0.1656**	0.0434	0.0507	0.0579	0.0652	0.0724	0.0797	0.0869
0.9693	beta$^*_G$	1.1915	0.8459	0.7308	0.6732	**0.5307**	0.6156	0.5992	0.5868	0.5772	0.5695	0.5633	0.5580
$n_{EG}=n_G$	B^*_G	(0.1607)	0.1821	0.3684	0.4855	0.8844	0.6244	0.6690	0.7041	0.7324	0.7558	0.7754	0.7920
0.0103	LN(B^*_G)	#NUM!	(1.7032)	(0.9986)	(0.7227)	(0.1228)	(0.4710)	(0.4020)	(0.3508)	(0.3114)	(0.2800)	(0.2544)	(0.2332)
alpha $_G$	LN(Ω_G)/LN(E	#NUM!	0.0183	0.0312	0.0431	0.2535	0.0661	0.0775	0.0887	0.1000	0.1112	0.1224	0.1335
0.0224	delta$_{0\ G}$	#NUM!	1.018	1.031	1.043	1.253	1.066	1.077	1.089	1.100	1.111	1.122	1.134
	$g_A{}^*_G$	(0.0014)	0.0022	0.0058	0.0095	0.0777	0.0167	0.0203	0.0239	0.0276	0.0312	0.0348	0.0384
	1−delta$_{0\ G}$	#NUM!	(0.0183)	(0.0312)	(0.0431)	(0.2535)	(0.0661)	(0.0775)	(0.0887)	(0.1000)	(0.1112)	(0.1224)	(0.1335)
	(1−delta$_{0\ G}$)g_A	#NUM!	(0.0000)	(0.0002)	(0.0004)	(0.0197)	(0.0011)	(0.0016)	(0.0021)	(0.0028)	(0.0035)	(0.0043)	(0.0051)
	$(1-\alpha_G)n_G$	0.0101	0.0101	0.0101	0.0101	0.0101	0.0101	0.0101	0.0101	0.0101	0.0101	0.0101	0.0101
	lambda$^*_G$	#NUM!	0.0101	0.0099	0.0097	(0.0096)	0.0090	0.0085	0.0080	0.0073	0.0066	0.0058	0.0050
	Speed years	#NUM!	99.39	100.81	103.15	(104.21)	111.13	117.25	125.34	136.10	150.69	171.08	201.04
	$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$	(0.0014)	0.0023	0.0060	0.0097	0.0795	0.0171	0.0208	0.0245	0.0282	0.0319	0.0356	0.0393
a_{TAX}		0.7760											
	4. France	EG: G size											
Case of bankrupcy		0.0500	0.1000	0.1500	0.2000	0.2500	**0.3222**	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0388	0.0776	0.1164	0.1552	0.1940	**0.2500**	0.2716	0.3104	0.3492	0.3880	0.4268	0.4656
0.1571	$\Delta D=S_G-I_G$	0.0112	0.0224	0.0336	0.0448	0.0560	0.0722	0.0784	0.0896	0.1008	0.1120	0.1232	0.1344
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0061	0.0122	0.0183	0.0244	0.0305	**0.1571**	0.0427	0.0488	0.0549	0.0610	0.0671	0.0732
1.1962	beta$^*_G$	0.9730	0.7440	0.6677	0.6296	0.6067	**0.5329**	0.5805	0.5723	0.5660	0.5609	0.5567	0.5533
$n_{EG}=n_G$	B^*_G	0.0278	0.3440	0.4976	0.5884	0.6483	0.8766	0.7226	0.7472	0.7669	0.7829	0.7962	0.8075
0.0048	LN(B^*_G)	(3.5833)	(1.0670)	(0.6979)	(0.5304)	(0.4334)	(0.1317)	(0.3249)	(0.2914)	(0.2654)	(0.2448)	(0.2279)	(0.2138)
alpha $_G$	LN(Ω_G)/LN(E	(0.0500)	(0.1679)	(0.2568)	(0.3379)	(0.4135)	(1.3611)	(0.5516)	(0.6150)	(0.6751)	(0.7321)	(0.7863)	(0.8380)
(0.1315)	delta$_{0\ G}$	0.950	0.832	0.743	0.662	0.586	(0.361)	0.448	0.385	0.325	0.268	0.214	0.162
	$g_A{}^*_G$	0.0002	0.0031	0.0061	0.0090	0.0120	0.0734	0.0179	0.0209	0.0238	0.0268	0.0297	0.0327
	1−delta$_{0\ G}$	0.0500	0.1679	0.2568	0.3379	0.4135	1.3611	0.5516	0.6150	0.6751	0.7321	0.7863	0.8380
	(1−delta$_{0\ G}$)g_A	0.0000	0.0005	0.0016	0.0031	0.0050	0.0999	0.0099	0.0128	0.0161	0.0196	0.0234	0.0274
	$(1-\alpha_G)n_G$	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054
	lambda$^*_G$	0.0055	0.0060	0.0070	0.0085	0.0104	0.1054	0.0153	0.0183	0.0215	0.0250	0.0288	0.0328
	Speed years	183.37	167.52	142.74	117.68	96.13	9.49	65.27	54.73	46.46	39.93	34.70	30.46
	$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$	0.0001	0.0028	0.0054	0.0080	0.0106	0.0649	0.0158	0.0184	0.0210	0.0237	0.0263	0.0289
a_{TAX}		0.8302											
	5. Germany	EG: G size											
Sacrificing technology		0.0500	0.1000	0.1500	0.2000	**0.2409**	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0415	0.0830	0.1245	0.1660	**0.2000**	0.2491	0.2906	0.3321	0.3736	0.4151	0.4566	0.4981
0.0874	$\Delta D=S_G-I_G$	0.0085	0.0170	0.0255	0.0340	0.0409	0.0509	0.0594	0.0679	0.0764	0.0849	0.0934	0.1019
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0036	0.0073	0.0109	0.0145	**0.0874**	0.0218	0.0254	0.0290	0.0326	0.0363	0.0399	0.0435
1.1430	beta$^*_G$	0.2967	0.4010	0.4358	0.4532	**0.4967**	0.4706	0.4756	0.4793	0.4822	0.4845	0.4864	0.4880
$n_{EG}=n_G$	B^*_G	2.3708	1.4936	1.2946	1.2065	1.0132	1.1250	1.1028	1.0864	1.0739	1.0639	1.0559	1.0492
(0.0013)	LN(B^*_G)	0.8632	0.4012	0.2582	0.1877	0.0131	0.1177	0.0978	0.0829	0.0713	0.0620	0.0544	0.0480
alpha $_G$	LN(Ω_G)/LN(E	0.1548	0.3332	0.5177	0.7120	10.1867	1.1352	1.3665	1.6129	1.8757	2.1568	2.4581	2.7819
(0.1172)	delta$_{0\ G}$	1.155	1.333	1.518	1.712	11.187	2.135	2.367	2.613	2.876	3.157	3.458	3.782
	$g_A{}^*_G$	0.0026	0.0043	0.0061	0.0079	0.0440	0.0115	0.0133	0.0151	0.0169	0.0187	0.0205	0.0223
	1−delta$_{0\ G}$	(0.1548)	(0.3332)	(0.5177)	(0.7120)	(10.1867)	(1.1352)	(1.3665)	(1.6129)	(1.8757)	(2.1568)	(2.4581)	(2.7819)
	(1−delta$_{0\ G}$)g_A	(0.0004)	(0.0014)	(0.0032)	(0.0056)	(0.4478)	(0.0131)	(0.0182)	(0.0244)	(0.0317)	(0.0403)	(0.0504)	(0.0620)
	$(1-\alpha_G)n_G$	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)
	lambda$^*_G$	(0.0019)	(0.0029)	(0.0047)	(0.0071)	(0.4493)	(0.0146)	(0.0197)	(0.0259)	(0.0332)	(0.0418)	(0.0519)	(0.0635)
	Speed years	(528.99)	(339.83)	(214.00)	(140.02)	(2.23)	(68.63)	(50.80)	(38.67)	(30.13)	(23.92)	(19.29)	(15.75)
	$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$	0.0023	0.0039	0.0055	0.0071	0.0394	0.0103	0.0119	0.0135	0.0151	0.0167	0.0183	0.0199
a_{TAX}				**0.6300**									
	6. the UK	EG: G size											
Sacrificing technology		0.0500	0.1000	0.1500	0.2000	**0.2619**	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0315	0.0630	0.0945	0.1260	**0.1650**	0.1890	0.2205	0.2520	0.2835	0.3150	0.3465	0.3780
0.0458	$\Delta D=S_G-I_G$	0.0185	0.0370	0.0555	0.0740	0.0969	0.1110	0.1295	0.1480	0.1665	0.1850	0.2035	0.2220
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0014	0.0029	0.0043	0.0058	**0.0458**	0.0087	0.0101	0.0115	0.0130	0.0144	0.0159	0.0173
2.3285	beta$^*_G$	4.0398	2.3214	1.7486	1.4622	**0.7112**	1.1758	1.0939	1.0326	0.9848	0.9466	0.9154	0.8894
$n_{EG}=n_G$	B^*_G	(0.7525)	(0.5692)	(0.4281)	(0.3161)	0.4060	(0.1495)	(0.0859)	(0.0315)	0.0154	0.0564	0.0924	0.1244
0.0054	LN(B^*_G)	#NUM!	#NUM!	#NUM!	#NUM!	(0.9013)	#NUM!	#NUM!	#NUM!	(4.1733)	(2.8759)	(2.3814)	(2.0843)
alpha $_G$	LN(Ω_G)/LN(E	#NUM!	#NUM!	#NUM!	#NUM!	(0.9377)	#NUM!	#NUM!	#NUM!	(0.2025)	(0.2939)	(0.3549)	(0.4055)
(0.5415)	delta$_{0\ G}$	#NUM!	#NUM!	#NUM!	#NUM!	0.062	#NUM!	#NUM!	#NUM!	0.797	0.706	0.645	0.594
	$g_A{}^*_G$	(0.0044)	(0.0038)	(0.0032)	(0.0027)	**0.0132**	(0.0015)	(0.0009)	(0.0004)	0.0002	0.0008	0.0013	0.0019
	1−delta$_{0\ G}$	#NUM!	#NUM!	#NUM!	#NUM!	0.9377	#NUM!	#NUM!	#NUM!	0.2025	0.2939	0.3549	0.4055
	(1−delta$_{0\ G}$)g_A	#NUM!	#NUM!	#NUM!	#NUM!	0.0124	#NUM!	#NUM!	#NUM!	0.0000	0.0002	0.0005	0.0008
	$(1-\alpha_G)n_G$	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083	0.0083
	lambda$^*_G$	#NUM!	#NUM!	#NUM!	#NUM!	0.0207	#NUM!	#NUM!	#NUM!	0.0083	0.0085	0.0087	0.0090
	Speed years	#NUM!	#NUM!	#NUM!	#NUM!	**48.41**	#NUM!	#NUM!	#NUM!	120.45	117.81	114.44	110.64
	$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$	(0.0028)	(0.0025)	(0.0021)	(0.0017)	0.0086	(0.0010)	(0.0006)	(0.0002)	0.0001	0.0005	0.0009	0.0012

Chapter 13

Table 3-3 Answers to Krugman's (July 1st, 2012) righteousness at the current EU financial crisis: by country

a_{TAX}	**0.9120**												
	7. China	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	**0.1919**	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0456	0.0912	0.1368	**0.1750**	0.2280	0.2736	0.3192	0.3648	0.4104	0.4560	0.5016	0.5472
0.3328	$\Delta D=S_G-I_G$	0.0044	0.0088	0.0132	0.0169	0.0220	0.0264	0.0308	0.0352	0.0396	0.0440	0.0484	0.0528
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0152	0.0304	0.0455	**0.3328**	0.0759	0.0911	0.1062	0.1214	0.1366	0.1518	0.1670	0.1821
1.8028	beta $^*_G$	0.9208	0.8123	0.7761	**0.7136**	0.7471	0.7399	0.7347	0.7309	0.7279	0.7254	0.7235	0.7218
$n_{EG}=n_G$	B^*_G	0.0861	0.2311	0.2885	0.4013	0.3384	0.3515	0.3610	0.3682	0.3739	0.3785	0.3822	0.3854
0.0062	$LN(B^*_G)$	(2.4528)	(1.4647)	(1.2430)	(0.9131)	(1.0834)	(1.0455)	(1.0188)	(0.9990)	(0.9838)	(0.9716)	(0.9617)	(0.9535)
alpha $_G$	$LN(\Omega_G)/LN(B$	(0.2403)	(0.4024)	(0.4741)	(0.6454)	(0.5440)	(0.5637)	(0.5785)	(0.5899)	(0.5991)	(0.6066)	(0.6128)	(0.6181)
0.2364	delta $_{0G}$	0.760	0.598	0.526	0.355	0.456	0.436	0.422	0.410	0.401	0.393	0.387	0.382
	$g_A{}^*_G$	0.0012	0.0057	0.0102	0.0953	0.0192	0.0237	0.0282	0.0327	0.0372	0.0417	0.0462	0.0507
	1−delta $_{0G}$	0.2403	0.4024	0.4741	0.6454	0.5440	0.5637	0.5785	0.5899	0.5991	0.6066	0.6128	0.6181
	(1−delta $_{0G}$) g_A	0.0003	0.0023	0.0048	0.0615	0.0104	0.0134	0.0163	0.0193	0.0223	0.0253	0.0283	0.0313
	$(1-\alpha_G)n_G$	0.0047	0.0047	0.0047	0.0047	0.0047	0.0047	0.0047	0.0047	0.0047	0.0047	0.0047	0.0047
	lambda $^*_G$	0.0050	0.0070	0.0095	0.0662	0.0151	0.0181	0.0210	0.0240	0.0270	0.0300	0.0330	0.0360
	Speed years	200.06	142.80	104.78	15.10	66.02	55.37	47.59	41.69	37.06	33.35	30.30	27.76
$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$		0.0016	0.0075	0.0134	0.1248	0.0251	0.0310	0.0369	0.0428	0.0487	0.0546	0.0605	0.0663
a_{TAX}		0.7929											
	8. Inidia	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	**0.2207**	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0396	0.0793	0.1189	**0.1750**	0.1982	0.2379	0.2775	0.3171	0.3568	0.3964	0.4361	0.4757
0.4692	$\Delta D=S_G-I_G$	0.0104	0.0207	0.0311	0.0457	0.0518	0.0621	0.0725	0.0829	0.0932	0.1036	0.1139	0.1243
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0186	0.0372	0.0558	**0.4692**	0.0930	0.1116	0.1302	0.1488	0.1674	0.1860	0.2046	0.2232
3.2909	beta $^*_G$	1.2746	1.0413	0.9636	**0.8266**	0.9014	0.8859	0.8748	0.8664	0.8600	0.8548	0.8505	0.8470
$n_{EG}=n_G$	B^*_G	(0.2154)	(0.0397)	0.0378	0.2097	0.1094	0.1288	0.1432	0.1542	0.1629	0.1699	0.1757	0.1806
0.0137	$LN(B^*_G)$	#NUM!	#NUM!	(3.2762)	(1.5619)	(2.2130)	(2.0492)	(1.9437)	(1.8698)	(1.8149)	(1.7725)	(1.7388)	(1.7112)
alpha $_G$	$LN(\Omega_G)/LN(B$	#NUM!	#NUM!	(0.3636)	(0.7627)	(0.5382)	(0.5813)	(0.6128)	(0.6371)	(0.6563)	(0.6720)	(0.6851)	(0.6961)
0.2079	delta $_{0G}$	#NUM!	#NUM!	0.636	0.237	0.462	0.419	0.387	0.363	0.344	0.328	0.315	0.304
	$g_A{}^*_G$	(0.0051)	(0.0015)	0.0020	0.0813	0.0092	0.0127	0.0163	0.0199	0.0234	0.0270	0.0306	0.0342
	1−delta $_{0G}$	#NUM!	#NUM!	0.3636	0.7627	0.5382	0.5813	0.6128	0.6371	0.6563	0.6720	0.6851	0.6961
	(1−delta $_{0G}$) g_A	#NUM!	#NUM!	0.0007	0.0620	0.0049	0.0074	0.0100	0.0127	0.0154	0.0182	0.0209	0.0238
	$(1-\alpha_G)n_G$	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109
	lambda $^*_G$	#NUM!	#NUM!	0.0116	0.0729	0.0158	0.0183	0.0209	0.0235	0.0263	0.0290	0.0318	0.0347
	Speed years	#NUM!	#NUM!	86.05	13.71	63.22	54.68	47.90	42.47	38.07	34.44	31.41	28.86
$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$		(0.0064)	(0.0019)	0.0026	0.1027	0.0116	0.0161	0.0206	0.0251	0.0296	0.0341	0.0386	0.0431
a_{TAX}	**0.9833**												
	9. Brazil	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	**0.2593**	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0492	0.0983	0.1475	0.1967	**0.2550**	0.2950	0.3442	0.3933	0.4425	0.4917	0.5408	0.5900
0.1784	$\Delta D=S_G-I_G$	0.0008	0.0017	0.0025	0.0033	0.0043	0.0050	0.0058	0.0067	0.0075	0.0083	0.0092	0.0100
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0088	0.0175	0.0263	0.0351	**0.1784**	0.0526	0.0614	0.0702	0.0789	0.0877	0.0965	0.1052
2.0024	beta $^*_G$	1.2910	0.9988	0.9014	0.8527	**0.7354**	0.8040	0.7901	0.7797	0.7716	0.7651	0.7597	0.7553
$n_{EG}=n_G$	B^*_G	(0.2254)	0.0012	0.1094	0.1727	0.3599	0.2438	0.2657	0.2826	0.2961	0.3071	0.3162	0.3239
0.0087	$LN(B^*_G)$	#NUM!	(6.7377)	(2.2131)	(1.7561)	(1.0219)	(1.4116)	(1.3256)	(1.2637)	(1.2171)	(1.1806)	(1.1513)	(1.1272)
alpha $_G$	$LN(\Omega_G)/LN(B$	#NUM!	(0.1031)	(0.3137)	(0.3954)	(0.6794)	(0.4919)	(0.5238)	(0.5494)	(0.5705)	(0.5881)	(0.6031)	(0.6160)
0.1614	delta $_{0G}$	#NUM!	0.897	0.686	0.605	0.321	0.508	0.476	0.451	0.430	0.412	0.397	0.384
	$g_A{}^*_G$	(0.0026)	0.0000	0.0026	0.0052	0.0472	0.0103	0.0129	0.0155	0.0180	0.0206	0.0232	0.0257
	1−delta $_{0G}$	#NUM!	0.1031	0.3137	0.3954	0.6794	0.4919	0.5238	0.5494	0.5705	0.5881	0.6031	0.6160
	(1−delta $_{0G}$) g_A	#NUM!	0.0000	0.0008	0.0020	0.0321	0.0051	0.0067	0.0085	0.0103	0.0121	0.0140	0.0159
	$(1-\alpha_G)n_G$	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073
	lambda $^*_G$	#NUM!	0.0073	0.0081	0.0094	0.0394	0.0124	0.0141	0.0158	0.0176	0.0194	0.0213	0.0232
	Speed years	#NUM!	136.65	123.01	106.86	25.39	80.73	71.10	63.26	56.81	51.46	46.97	43.15
$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$		(0.0030)	0.0000	0.0031	0.0062	0.0563	0.0123	0.0154	0.0184	0.0215	0.0246	0.0276	0.0307
a_{TAX}	**0.8734**												
	10. Mexic	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	**0.2004**	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0437	0.0873	0.1310	**0.1750**	0.2183	0.2620	0.3057	0.3493	0.3930	0.4367	0.4803	0.5240
0.4488	$\Delta D=S_G-I_G$	0.0063	0.0127	0.0190	0.0254	0.0317	0.0380	0.0443	0.0507	0.0570	0.0633	0.0697	0.0760
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0196	0.0392	0.0588	**0.4488**	0.0980	0.1176	0.1372	0.1568	0.1764	0.1960	0.2156	0.2352
3.3115	beta $^*_G$	1.1040	0.9658	0.9198	**0.8397**	0.8829	0.8737	0.8671	0.8622	0.8583	0.8553	0.8527	0.8507
$n_{EG}=n_G$	B^*_G	(0.0942)	0.0354	0.0872	0.1909	0.1326	0.1446	0.1533	0.1599	0.1650	0.1692	0.1727	0.1756
0.0095	$LN(B^*_G)$	#NUM!	(3.3412)	(2.4390)	(1.6559)	(2.0202)	(1.9340)	(1.8756)	(1.8334)	(1.8015)	(1.7765)	(1.7563)	(1.7398)
alpha $_G$	$LN(\Omega_G)/LN(B$	#NUM!	(0.3584)	(0.4909)	(0.7231)	(0.5927)	(0.6191)	(0.6384)	(0.6531)	(0.6647)	(0.6740)	(0.6818)	(0.6883)
0.3037	delta $_{0G}$	#NUM!	0.642	0.509	0.277	0.407	0.381	0.362	0.347	0.335	0.326	0.318	0.312
	$g_A{}^*_G$	(0.0020)	0.0013	0.0047	0.0719	0.0115	0.0149	0.0182	0.0216	0.0250	0.0284	0.0317	0.0351
	1−delta $_{0G}$	#NUM!	0.3584	0.4909	0.7231	0.5927	0.6191	0.6384	0.6531	0.6647	0.6740	0.6818	0.6883
	(1−delta $_{0G}$) g_A	#NUM!	0.0005	0.0023	0.0520	0.0068	0.0092	0.0116	0.0141	0.0166	0.0191	0.0216	0.0242
	$(1-\alpha_G)n_G$	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066
	lambda $^*_G$	#NUM!	0.0071	0.0089	0.0586	0.0134	0.0158	0.0182	0.0207	0.0232	0.0257	0.0282	0.0308
	Speed years	#NUM!	141.12	112.08	17.06	74.59	63.29	54.81	48.27	43.08	38.88	35.40	32.49
$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$		(0.0029)	0.0019	0.0068	0.1033	0.0165	0.0213	0.0262	0.0310	0.0359	0.0407	0.0456	0.0504
a_{TAX}		0.8267											
	11. Russia	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	0.2500	**0.2782**	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0413	0.0827	0.1240	0.1653	0.2067	**0.2300**	0.2893	0.3307	0.3720	0.4133	0.4547	0.4960
0.2932	$\Delta D=S_G-I_G$	0.0087	0.0173	0.0260	0.0347	0.0433	0.0482	0.0607	0.0693	0.0780	0.0867	0.0953	0.1040
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0121	0.0242	0.0364	0.0485	0.0606	**0.2932**	0.0848	0.0970	0.1091	0.1212	0.1333	0.1454
0.9738	beta $^*_G$	0.3758	0.4450	0.4681	0.4797	0.4866	**0.5086**	0.4945	0.4970	0.4989	0.5004	0.5017	0.5028
$n_{EG}=n_G$	B^*_G	1.6611	1.2470	1.1362	1.0848	1.0551	0.9663	1.0222	1.0121	1.0044	0.9982	0.9932	0.9890
(0.0035)	$LN(B^*_G)$	0.5075	0.2207	0.1277	0.0814	0.0536	(0.0343)	0.0220	0.0121	0.0044	(0.0018)	(0.0068)	(0.0110)
alpha $_G$	$LN(\Omega_G)/LN(B$	(0.0522)	(0.1201)	(0.2076)	(0.3257)	(0.4942)	0.7727	(1.2070)	(2.1971)	(6.0686)	14.8140	3.8826	2.4042
0.0836	delta $_{0G}$	0.948	0.880	0.792	0.674	0.506	1.773	(0.207)	(1.197)	(5.069)	15.814	4.883	3.404
	$g_A{}^*_G$	0.0076	0.0135	0.0193	0.0252	0.0311	0.1441	0.0429	0.0488	0.0547	0.0605	0.0664	0.0723
	1−delta $_{0G}$	0.0522	0.1201	0.2076	0.3257	0.4942	(0.7727)	1.2070	2.1971	6.0686	(14.8140)	(3.8826)	(2.4042)
	(1−delta $_{0G}$) g_A	0.0004	0.0016	0.0040	0.0082	0.0154	(0.1114)	0.0518	0.1072	0.3317	(0.8970)	(0.2579)	(0.1739)
	$(1-\alpha_G)n_G$	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)
	lambda $^*_G$	(0.0029)	(0.0016)	0.0008	0.0050	0.0121	(0.1146)	0.0485	0.1039	0.3285	(0.9002)	(0.2612)	(0.1771)
	Speed years	(349.94)	(610.69)	1312.28	201.45	82.49	(8.73)	20.61	9.62	3.04	(1.11)	(3.83)	(5.65)
$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$		0.0083	0.0147	0.0211	0.0275	0.0340	0.1572	0.0468	0.0532	0.0596	0.0661	0.0725	0.0789
a_{TAX}		0.8062											
	12. S. Afric	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	**0.2481**	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0403	0.0806	0.1209	0.1612	**0.2000**	0.2419	0.2822	0.3225	0.3628	0.4031	0.4434	0.4837
0.0791	$\Delta D=S_G-I_G$	0.0097	0.0194	0.0291	0.0388	0.0481	0.0581	0.0678	0.0775	0.0872	0.0969	0.1066	0.1163
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0032	0.0064	0.0096	0.0127	**0.0791**	0.0191	0.0223	0.0255	0.0287	0.0319	0.0351	0.0382
1.1370	beta $^*_G$	1.8586	1.1776	0.9506	0.8371	**0.5515**	0.7236	0.6912	0.6668	0.6479	0.6328	0.6204	0.6101
$n_{EG}=n_G$	B^*_G	(0.4620)	(0.1508)	0.0520	0.1946	0.8133	0.3820	0.4468	0.4996	0.5434	0.5803	0.6118	0.6391
0.0076	$LN(B^*_G)$	#NUM!	#NUM!	(2.9573)	(1.6368)	(0.2067)	(0.9624)	(0.8056)	(0.6940)	(0.6100)	(0.5442)	(0.4913)	(0.4477)
alpha $_G$	$LN(\Omega_G)/LN(B$	#NUM!	#NUM!	(0.0434)	(0.0785)	(0.6212)	(0.1334)	(0.1594)	(0.1850)	(0.2105)	(0.2360)	(0.2614)	(0.2868)
(0.1614)	delta $_{0G}$	#NUM!	#NUM!	0.957	0.922	0.379	0.867	0.841	0.815	0.789	0.764	0.739	0.713
	$g_A{}^*_G$	(0.0027)	(0.0011)	0.0005	0.0021	0.0355	0.0053	0.0069	0.0085	0.0101	0.0117	0.0133	0.0149
	1−delta $_{0G}$	#NUM!	#NUM!	0.0434	0.0785	0.6212	0.1334	0.1594	0.1850	0.2105	0.2360	0.2614	0.2868
	(1−delta $_{0G}$) g_A	#NUM!	#NUM!	0.0000	0.0002	0.0220	0.0007	0.0011	0.0016	0.0021	0.0028	0.0035	0.0043
	$(1-\alpha_G)n_G$	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088	0.0088
	lambda $^*_G$	#NUM!	#NUM!	0.0088	0.0090	0.0308	0.0095	0.0099	0.0104	0.0109	0.0116	0.0123	0.0131
	Speed years	#NUM!	#NUM!	113.28	111.48	32.43	105.13	100.96	96.35	91.47	86.44	81.40	76.43
$g_y{}^*_G=g_A{}^*_G/(1-alpha_G)$		(0.0024)	(0.0010)	0.0004	0.0018	0.0305	0.0046	0.0059	0.0073	0.0087	0.0101	0.0115	0.0128

Table 3-4 Answers to Krugman's (July 1st, 2012) righteousness at the current EU financial crisis: by country

a_{TAX}	**0.9309**												
	1. Denmark	EG: G size											
Case of Samuelson, 1998		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	**0.4082**	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0465	0.0931	0.1396	0.1862	0.2327	0.2793	0.3258	**0.3800**	0.4189	0.4654	0.5120	0.5585
0.2556	$\Delta D=S_G-I_G$	0.0035	0.0069	0.0104	0.0138	0.0173	0.0207	0.0242	0.0282	0.0311	0.0346	0.0380	0.0415
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0119	0.0238	0.0357	0.0476	0.0595	0.0714	0.0833	**0.2556**	0.1071	0.1190	0.1309	0.1428
1.5029	beta$^*_G$	0.7291	0.6885	0.6749	0.6681	0.6641	0.6613	0.6594	**0.6516**	0.6568	0.6559	0.6552	0.6546
$n_{EG}=n_G$	B^*_G	0.3715	0.4525	0.4817	0.4967	0.5059	0.5121	0.5165	0.5348	0.5225	0.5246	0.5263	0.5277
0.0018	LN(B^*_G)	(0.9902)	(0.7929)	(0.7304)	(0.6997)	(0.6814)	(0.6693)	(0.6606)	(0.6259)	(0.6492)	(0.6452)	(0.6419)	(0.6392)
alpha $_G$	LN(Ω_G)/LN(E	(0.4114)	(0.5138)	(0.5577)	(0.5822)	(0.5979)	(0.6087)	(0.6167)	(0.6508)	(0.6276)	(0.6315)	(0.6347)	(0.6374)
0.1814	delta$_{0G}$	0.589	0.486	0.442	0.418	0.402	0.391	0.383	0.349	0.372	0.369	0.365	0.363
	g^*_{AG}	0.0032	0.0074	0.0116	0.0158	0.0200	0.0242	0.0284	0.0891	0.0367	0.0409	0.0451	0.0493
	1−delta$_{0G}$	0.4114	0.5138	0.5577	0.5822	0.5979	0.6087	0.6167	0.6508	0.6276	0.6315	0.6347	0.6374
	(1−delta$_{0G}$)g_A	0.0013	0.0038	0.0065	0.0092	0.0119	0.0147	0.0175	0.0580	0.0231	0.0258	0.0286	0.0314
	(1-α_G)n_G	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	lambda$^*_G$	0.0028	0.0053	0.0080	0.0107	0.0134	0.0162	0.0190	0.0595	0.0246	0.0273	0.0301	0.0329
	Speed years	354.30	188.49	125.50	93.53	74.38	61.68	52.67	16.82	40.72	36.57	33.18	30.37
	$g^*_{yG}=g^*_{AG}$/(1-alpha$_G$)	0.0039	0.0091	0.0142	0.0193	0.0244	0.0295	0.0346	0.1088	0.0449	0.0500	0.0551	0.0602
a_{TAX}		**0.8242**											
	2. Finland	EG: G size											
Case of weakened PRI		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	**0.3276**	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0412	0.0824	0.1236	0.1648	0.2060	0.2473	**0.2700**	0.3297	0.3709	0.4121	0.4533	0.4945
0.1922	$\Delta D=S_G-I_G$	0.0088	0.0176	0.0264	0.0352	0.0440	0.0527	0.0576	0.0703	0.0791	0.0879	0.0967	0.1055
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0079	0.0158	0.0238	0.0317	0.0396	0.0475	**0.1922**	0.0634	0.0713	0.0792	0.0871	0.0951
2.5435	beta$^*_G$	1.0585	0.8864	0.8290	0.8004	0.7832	0.7717	**0.7285**	0.7573	0.7526	0.7487	0.7456	0.7430
$n_{EG}=n_G$	B^*_G	(0.0553)	0.1281	0.2062	0.2494	0.2769	0.2959	0.3727	0.3204	0.3288	0.3356	0.3412	0.3459
0.0038	LN(B^*_G)	#NUM!	(2.0546)	(1.5789)	(1.3885)	(1.2841)	(1.2178)	(0.9870)	(1.1381)	(1.1123)	(1.0919)	(1.0753)	(1.0616)
alpha $_G$	LN(Ω_G)/LN(E	#NUM!	(0.4544)	(0.5913)	(0.6723)	(0.7270)	(0.7666)	(0.9458)	(0.8203)	(0.8393)	(0.8550)	(0.8682)	(0.8794)
(0.0211)	delta$_{0G}$	#NUM!	0.546	0.409	0.328	0.273	0.233	0.054	0.180	0.161	0.145	0.132	0.121
	g^*_{AG}	(0.0005)	0.0018	0.0041	0.0063	0.0086	0.0109	0.0522	0.0154	0.0176	0.0199	0.0222	0.0244
	1−delta$_{0G}$	#NUM!	0.4544	0.5913	0.6723	0.7270	0.7666	0.9458	0.8203	0.8393	0.8550	0.8682	0.8794
	(1−delta$_{0G}$)g_A	#NUM!	0.0008	0.0024	0.0043	0.0062	0.0083	0.0494	0.0126	0.0148	0.0170	0.0192	0.0215
	(1-α_G)n_G	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038
	lambda$^*_G$	#NUM!	0.0046	0.0062	0.0081	0.0101	0.0122	0.0532	0.0164	0.0186	0.0209	0.0231	0.0253
	Speed years	#NUM!	215.09	160.41	123.69	99.25	82.30	18.80	60.80	53.65	47.96	43.33	39.50
	$g^*_{yG}=g^*_{AG}$/(1-alpha$_G$)	(0.0005)	0.0018	0.0040	0.0062	0.0084	0.0106	0.0511	0.0151	0.0173	0.0195	0.0217	0.0239
a_{TAX}	**0.8765**												
	3. Netherla	EG: G size											
Case of no growth		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	**0.3651**	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0438	0.0877	0.1315	0.1753	0.2191	0.2630	**0.3200**	0.3506	0.3944	0.4383	0.4821	0.5259
0.1400	$\Delta D=S_G-I_G$	0.0062	0.0123	0.0185	0.0247	0.0309	0.0370	0.0451	0.0494	0.0556	0.0617	0.0679	0.0741
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0061	0.0123	0.0184	0.0246	0.0307	0.0368	**0.1400**	0.0491	0.0552	0.0614	0.0675	0.0737
1.4731	beta$^*_G$	0.9467	0.7715	0.7131	0.6839	0.6664	0.6547	**0.6117**	0.6401	0.6353	0.6314	0.6282	0.6255
$n_{EG}=n_G$	B^*_G	0.0563	0.2961	0.4023	0.4621	0.5006	0.5274	0.6348	0.5622	0.5742	0.5839	0.5919	0.5987
0.0036	LN(B^*_G)	(2.8777)	(1.2170)	(0.9106)	(0.7719)	(0.6920)	(0.6399)	(0.4544)	(0.5759)	(0.5548)	(0.5381)	(0.5244)	(0.5131)
alpha $_G$	LN(Ω_G)/LN(E	(0.1346)	(0.3183)	(0.4254)	(0.5019)	(0.5598)	(0.6054)	(0.8526)	(0.6727)	(0.6982)	(0.7200)	(0.7387)	(0.7551)
(0.0008)	delta$_{0G}$	0.865	0.682	0.575	0.498	0.440	0.395	0.147	0.327	0.302	0.280	0.261	0.245
	g^*_{AG}	0.0003	0.0028	0.0053	0.0078	0.0102	0.0127	0.0544	0.0177	0.0201	0.0226	0.0251	0.0276
	1−delta$_{0G}$	0.1346	0.3183	0.4254	0.5019	0.5598	0.6054	0.8526	0.6727	0.6982	0.7200	0.7387	0.7551
	(1−delta$_{0G}$)g_A	0.0000	0.0009	0.0022	0.0039	0.0057	0.0077	0.0464	0.0119	0.0141	0.0163	0.0185	0.0208
	(1-α_G)n_G	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036
	lambda$^*_G$	0.0037	0.0045	0.0059	0.0075	0.0094	0.0113	0.0500	0.0155	0.0177	0.0199	0.0222	0.0244
	Speed years	272.95	221.61	170.45	133.08	106.94	88.36	20.01	64.49	56.54	50.23	45.12	40.91
	$g^*_{yG}=g^*_{AG}$/(1-alpha$_G$)	0.0003	0.0028	0.0053	0.0078	0.0102	0.0127	0.0543	0.0177	0.0201	0.0226	0.0251	0.0276
a_{TAX}	**1.0318**												
	4. Norway	EG: G size											
Case of bankrupcy		0.0500	0.1000	0.1500	0.2000	**0.2568**	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0516	0.1032	0.1548	0.2064	**0.2650**	0.3096	0.3611	0.4127	0.4643	0.5159	0.5675	0.6191
0.0313	$\Delta D=S_G-I_G$	(0.0016)	(0.0032)	(0.0048)	(0.0064)	(0.0082)	(0.0096)	(0.0111)	(0.0127)	(0.0143)	(0.0159)	(0.0175)	(0.0191)
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0016	0.0032	0.0049	0.0065	**0.0313**	0.0097	0.0113	0.0129	0.0146	0.0162	0.0178	0.0194
0.8398	beta$^*_G$	3.3089	1.8919	1.4196	1.1835	**0.6212**	0.9473	0.8798	0.8292	0.7899	0.7584	0.7326	0.7112
$n_{EG}=n_G$	B^*_G	(0.6978)	(0.4714)	(0.2956)	(0.1550)	0.6097	0.0556	0.1366	0.2059	0.2660	0.3186	0.3649	0.4061
0.0104	LN(B^*_G)	#NUM!	#NUM!	#NUM!	#NUM!	(0.4947)	(2.8894)	(1.9910)	(1.5803)	(1.3242)	(1.1439)	(1.0080)	(0.9011)
alpha $_G$	LN(Ω_G)/LN(E	#NUM!	#NUM!	#NUM!	#NUM!	0.3529	0.0604	0.0877	0.1105	0.1318	0.1526	0.1732	0.1938
0.0622	delta$_{0G}$	#NUM!	#NUM!	#NUM!	#NUM!	1.353	1.060	1.088	1.110	1.132	1.153	1.173	1.194
	g^*_{AG}	(0.0037)	(0.0029)	(0.0020)	(0.0012)	0.0119	0.0005	0.0014	0.0022	0.0031	0.0039	0.0048	0.0056
	1−delta$_{0G}$	#NUM!	#NUM!	#NUM!	#NUM!	(0.3529)	(0.0604)	(0.0877)	(0.1105)	(0.1318)	(0.1526)	(0.1732)	(0.1938)
	(1−delta$_{0G}$)g_A	#NUM!	#NUM!	#NUM!	#NUM!	(0.0042)	(0.0000)	(0.0001)	(0.0002)	(0.0004)	(0.0006)	(0.0008)	(0.0011)
	(1-α_G)n_G	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097
	lambda$^*_G$	#NUM!	#NUM!	#NUM!	#NUM!	0.0056	0.0097	0.0096	0.0095	0.0093	0.0092	0.0089	0.0087
	Speed years	#NUM!	#NUM!	#NUM!	#NUM!	179.92	102.91	103.85	105.21	107.01	109.26	112.05	115.44
	$g^*_{yG}=g^*_{AG}$/(1-alpha$_G$)	(0.0040)	(0.0031)	(0.0022)	(0.0013)	0.0127	0.0005	0.0015	0.0024	0.0033	0.0042	0.0051	0.0060
a_{TAX}	**1.0282**												
	5. Sweden	EG: G size											
Sacrificing technology		0.0500	0.1000	0.1500	0.2000	**0.2665**	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0514	0.1028	0.1542	0.2056	**0.2740**	0.3085	0.3599	0.4113	0.4627	0.5141	0.5655	0.6169
(0)	$\Delta D=S_G-I_G$	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	(0)	(0)	(0)	(0)	**(0)**	(0)	(0)	(0)	(0)	(0)	(0)	(0)
0.9711	beta$^*_G$	0.1742	0.3195	0.3679	0.3922	**0.4499**	0.4164	0.4233	0.4285	0.4325	0.4358	0.4384	0.4406
$n_{EG}=n_G$	B^*_G	4.7421	2.1300	1.7178	1.5500	1.2228	1.4016	1.3623	1.3337	1.3119	1.2948	1.2810	1.2696
0.0043	LN(B^*_G)	1.5565	0.7561	0.5411	0.4382	0.2011	0.3376	0.3092	0.2880	0.2715	0.2584	0.2476	0.2387
alpha $_G$	LN(Ω_G)/LN(E	(0.0188)	(0.0387)	(0.0541)	(0.0668)	(0.1456)	(0.0867)	(0.0947)	(0.1017)	(0.1078)	(0.1133)	(0.1182)	(0.1227)
(0.1229)	delta$_{0G}$	0.981	0.961	0.946	0.933	0.854	0.913	0.905	0.898	0.892	0.887	0.882	0.877
	g^*_{AG}	(0.0064)	(0.0105)	(0.0147)	(0.0188)	(0.0827)	(0.0271)	(0.0312)	(0.0353)	(0.0395)	(0.0436)	(0.0478)	(0.0519)
	1−delta$_{0G}$	0.0188	0.0387	0.0541	0.0668	0.1456	0.0867	0.0947	0.1017	0.1078	0.1133	0.1182	0.1227
	(1−delta$_{0G}$)g_A	(0.0001)	(0.0004)	(0.0008)	(0.0013)	(0.0120)	(0.0023)	(0.0030)	(0.0036)	(0.0043)	(0.0049)	(0.0056)	(0.0064)
	(1-α_G)n_G	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049
	lambda$^*_G$	0.0047	0.0044	0.0041	0.0036	(0.0072)	0.0025	0.0019	0.0013	0.0006	(0.0001)	(0.0008)	(0.0015)
	Speed years	211.16	224.80	246.14	277.77	(139.15)	398.67	526.07	792.14	1671.34	(11471.71)	(1264.63)	(662.37)
	$g^*_{yG}=g^*_{AG}$/(1-alpha$_G$)	(0.0057)	(0.0094)	(0.0131)	(0.0167)	(0.0737)	(0.0241)	(0.0278)	(0.0315)	(0.0352)	(0.0388)	(0.0425)	(0.0462)
a_{TAX}	**0.8855**												
	6. Canada	EG: G size											
Sacrificing technology		0.0500	0.1000	0.1500	0.2000	0.2500	**0.2880**	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0443	0.0886	0.1328	0.1771	0.2214	**0.2550**	0.3099	0.3542	0.3985	0.4428	0.4870	0.5313
0.1159	$\Delta D=S_G-I_G$	0.0057	0.0114	0.0172	0.0229	0.0286	0.0330	0.0401	0.0458	0.0515	0.0572	0.0630	0.0687
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0051	0.0103	0.0154	0.0205	0.0257	**0.1159**	0.0359	0.0410	0.0462	0.0513	0.0564	0.0616
1.4072	beta$^*_G$	1.6721	1.1279	0.9465	0.8558	0.8013	**0.6318**	0.7391	0.7197	0.7046	0.6925	0.6826	0.6744
$n_{EG}=n_G$	B^*_G	(0.4019)	(0.1134)	0.0566	0.1686	0.2479	0.5827	0.3529	0.3895	0.4193	0.4441	0.4650	0.4829
0.0095	LN(B^*_G)	#NUM!	#NUM!	(2.8722)	(1.7805)	(1.3946)	(0.5401)	(1.0415)	(0.9430)	(0.8692)	(0.8118)	(0.7657)	(0.7279)
alpha $_G$	LN(Ω_G)/LN(E	#NUM!	#NUM!	(0.1189)	(0.1919)	(0.2449)	(0.6325)	(0.3280)	(0.3623)	(0.3930)	(0.4208)	(0.4461)	(0.4693)
(0.0134)	delta$_{0G}$	#NUM!	#NUM!	0.881	0.808	0.755	0.368	0.672	0.638	0.607	0.579	0.554	0.531
	g^*_{AG}	(0.0034)	(0.0013)	0.0008	0.0030	0.0051	0.0427	0.0094	0.0115	0.0136	0.0158	0.0179	0.0201
	1−delta$_{0G}$	#NUM!	#NUM!	0.1189	0.1919	0.2449	0.6325	0.3280	0.3623	0.3930	0.4208	0.4461	0.4693
	(1−delta$_{0G}$)g_A	#NUM!	#NUM!	0.0001	0.0006	0.0012	0.0270	0.0031	0.0042	0.0054	0.0066	0.0080	0.0094
	(1-α_G)n_G	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097	0.0097
	lambda$^*_G$	#NUM!	#NUM!	0.0098	0.0102	0.0109	0.0366	0.0127	0.0138	0.0150	0.0163	0.0177	0.0191
	Speed years	#NUM!	#NUM!	102.48	97.77	91.67	27.29	78.53	72.32	66.57	61.35	56.65	52.44
	$g^*_{yG}=g^*_{AG}$/(1-alpha$_G$)	(0.0034)	(0.0013)	0.0008	0.0029	0.0050	0.0421	0.0092	0.0114	0.0135	0.0156	0.0177	0.0198

Table 3-5 Answers to Krugman's (July 1st, 2012) righteousness at the current EU financial crisis: by country

a_{TAX}				**0.6478**									
	7. Greece	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	**0.2408**	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0324	0.0648	0.0972	0.1296	**0.1560**	0.1943	0.2267	0.2591	0.2915	0.3239	0.3563	0.3887
0.1858	$\Delta D=S_G-I_G$	0.0176	0.0352	0.0528	0.0704	0.0848	0.1057	0.1233	0.1409	0.1585	0.1761	0.1937	0.2113
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0060	0.0120	0.0181	0.0241	**0.1858**	0.0361	0.0421	0.0481	0.0542	0.0602	0.0662	0.0722
2.1002	beta$^*_G$	0.8531	0.7304	0.6895	0.6691	**0.6157**	0.6486	0.6428	0.6384	0.6350	0.6323	0.6301	0.6282
$n_{EG}=n_G$	B^*_G	0.1722	0.3691	0.4503	0.4946	0.6242	0.5417	0.5557	0.5664	0.5748	0.5816	0.5872	0.5919
0.0018	$LN(B^*_G)$	(1.7590)	(0.9967)	(0.7979)	(0.7040)	(0.4713)	(0.6131)	(0.5875)	(0.5685)	(0.5538)	(0.5420)	(0.5325)	(0.5245)
alpha $_G$	LN(Ω_G)/LN(E	(0.4218)	(0.7444)	(0.9299)	(1.0539)	(1.5743)	(1.2103)	(1.2629)	(1.3052)	(1.3399)	(1.3690)	(1.3936)	(1.4148)
(0.3579)	delta$_{0\,G}$	0.578	0.256	0.070	(0.054)	(0.574)	(0.210)	(0.263)	(0.305)	(0.340)	(0.369)	(0.394)	(0.415)
	$g_A{}^*_G$	0.0009	0.0032	0.0056	0.0080	0.0714	0.0127	0.0150	0.0174	0.0198	0.0221	0.0245	0.0268
	1−delta$_{0\,G}$	0.4218	0.7444	0.9299	1.0539	1.5743	1.2103	1.2629	1.3052	1.3399	1.3690	1.3936	1.4148
	(1−delta$_{0\,G}$)g_A	0.0004	0.0024	0.0052	0.0084	0.1124	0.0154	0.0190	0.0227	0.0265	0.0303	0.0341	0.0380
	$(1-\alpha_G)n_G$	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
	lambda$^*_G$	0.0028	0.0048	0.0076	0.0108	0.1148	0.0178	0.0214	0.0252	0.0289	0.0327	0.0366	0.0404
	Speed years	356.32	206.23	130.79	92.35	8.71	56.22	46.65	39.76	34.58	30.56	27.35	24.74
$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$		0.0007	0.0024	0.0041	0.0059	0.0526	0.0093	0.0111	0.0128	0.0146	0.0163	0.0180	0.0198
a_{TAX}		**0.8435**											
	8. Iceland	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	**0.3319**	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0422	0.0844	0.1265	0.1687	0.2109	0.2531	**0.2800**	0.3374	0.3796	0.4218	0.4640	0.5061
0.1146	$\Delta D=S_G-I_G$	0.0078	0.0156	0.0235	0.0313	0.0391	0.0469	0.0519	0.0626	0.0704	0.0782	0.0860	0.0939
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0048	0.0097	0.0145	0.0193	0.0242	0.0290	**0.1146**	0.0387	0.0435	0.0483	0.0532	0.0580
1.9435	beta$^*_G$	7.2571	3.9562	2.8559	2.3058	1.9757	1.7556	**0.9338**	1.4805	1.3888	1.3155	1.2555	1.2055
$n_{EG}=n_G$	B^*_G	(0.8622)	(0.7472)	(0.6498)	(0.5663)	(0.4938)	(0.4304)	0.0709	(0.3246)	(0.2800)	(0.2398)	(0.2035)	(0.1704)
0.0476	$LN(B^*_G)$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(2.6460)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
alpha $_G$	LN(Ω_G)/LN(E	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	(0.2511)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
(0.0709)	delta$_{0\,G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.749	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
	$g_A{}^*_G$	(0.0302)	(0.0286)	(0.0269)	(0.0252)	(0.0236)	(0.0219)	0.0076	(0.0186)	(0.0169)	(0.0152)	(0.0136)	(0.0119)
	1−delta$_{0\,G}$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.2511	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
	(1−delta$_{0\,G}$)g_A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0019	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
	$(1-\alpha_G)n_G$	0.0510	0.0510	0.0510	0.0510	0.0510	0.0510	0.0510	0.0510	0.0510	0.0510	0.0510	0.0510
	lambda$^*_G$	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.0529	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
	Speed years	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	18.90	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$		(0.0282)	(0.0267)	(0.0251)	(0.0236)	(0.0220)	(0.0205)	0.0071	(0.0173)	(0.0158)	(0.0142)	(0.0127)	(0.0111)
a_{TAX}				**0.3827**									
	9. Ireland	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	0.2500	0.3000	0.3500	0.4000	0.4500	0.5000	**0.5487**	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0191	0.0383	0.0574	0.0765	0.0957	0.1148	0.1339	0.1531	0.1722	0.1914	**0.2100**	0.2296
1.5586	$\Delta D=S_G-I_G$	0.0309	0.0617	0.0926	0.1235	0.1543	0.1852	0.2161	0.2469	0.2778	0.3086	0.3387	0.3704
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0298	0.0596	0.0895	0.1193	0.1491	0.1789	0.2088	0.2386	0.2684	0.2982	**1.5586**	0.3579
3.6414	beta$^*_G$	1.1977	0.9879	0.9180	0.8830	0.8620	0.8480	0.8381	0.8306	0.8247	0.8201	**0.7861**	0.8131
$n_{EG}=n_G$	B^*_G	(0.1650)	0.0123	0.0894	0.1325	0.1601	0.1792	0.1932	0.2040	0.2125	0.2194	0.2720	0.2299
0.0155	$LN(B^*_G)$	#NUM!	(4.4021)	(2.4151)	(2.0212)	(1.8323)	(1.7194)	(1.6438)	(1.5896)	(1.5488)	(1.5169)	(1.3019)	(1.4702)
alpha $_G$	LN(Ω_G)/LN(E	#NUM!	(0.2936)	(0.5351)	(0.6394)	(0.7053)	(0.7517)	(0.7862)	(0.8130)	(0.8344)	(0.8520)	(0.9927)	(0.8791)
(0.0544)	delta$_{0\,G}$	#NUM!	0.706	0.465	0.361	0.295	0.248	0.214	0.187	0.166	0.148	0.007	0.121
	$g_A{}^*_G$	(0.0059)	0.0007	0.0073	0.0140	0.0206	0.0272	0.0338	0.0404	0.0470	0.0537	0.3333	0.0669
	1−delta$_{0\,G}$	#NUM!	0.2936	0.5351	0.6394	0.7053	0.7517	0.7862	0.8130	0.8344	0.8520	0.9927	0.8791
	(1−delta$_{0\,G}$)g_A	#NUM!	0.0002	0.0039	0.0089	0.0145	0.0204	0.0266	0.0329	0.0393	0.0457	0.3309	0.0588
	$(1-\alpha_G)n_G$	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163
	lambda$^*_G$	#NUM!	0.0165	0.0203	0.0253	0.0308	0.0368	0.0429	0.0492	0.0556	0.0620	0.3472	0.0751
	Speed years	#NUM!	60.45	49.37	39.60	32.42	27.20	23.31	20.33	17.99	16.12	2.88	13.31
$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$		(0.0056)	0.0007	0.0070	0.0132	0.0195	0.0258	0.0321	0.0383	0.0446	0.0509	0.3161	0.0634
a_{TAX}		**0.8159**											
	10. Italy	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	0.2500	**0.2844**	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0408	0.0816	0.1224	0.1632	0.2040	**0.2320**	0.2856	0.3264	0.3671	0.4079	0.4487	0.4895
0.1435	$\Delta D=S_G-I_G$	0.0092	0.0184	0.0276	0.0368	0.0460	0.0524	0.0644	0.0736	0.0829	0.0921	0.1013	0.1105
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0059	0.0117	0.0176	0.0234	0.0293	**0.1435**	0.0410	0.0468	0.0527	0.0585	0.0644	0.0702
1.3170	beta$^*_G$	0.9390	0.7444	0.6796	0.6472	0.6277	**0.5657**	0.6055	0.5985	0.5931	0.5888	0.5853	0.5823
$n_{EG}=n_G$	B^*_G	0.0649	0.3433	0.4715	0.5452	0.5931	0.7676	0.6516	0.6708	0.6860	0.6984	0.7087	0.7173
0.0038	$LN(B^*_G)$	(2.7343)	(1.0692)	(0.7519)	(0.6066)	(0.5224)	(0.2645)	(0.4283)	(0.3993)	(0.3768)	(0.3590)	(0.3444)	(0.3322)
alpha $_G$	LN(Ω_G)/LN(E	(0.1007)	(0.2575)	(0.3662)	(0.4539)	(0.5271)	(1.0409)	(0.6429)	(0.6896)	(0.7306)	(0.7670)	(0.7996)	(0.8288)
(0.0822)	delta$_{0\,G}$	0.899	0.742	0.634	0.546	0.473	(0.041)	0.357	0.310	0.269	0.233	0.200	0.171
	$g_A{}^*_G$	0.0004	0.0030	0.0056	0.0083	0.0109	0.0623	0.0162	0.0188	0.0214	0.0241	0.0267	0.0293
	1−delta$_{0\,G}$	0.1007	0.2575	0.3662	0.4539	0.5271	1.0409	0.6429	0.6896	0.7306	0.7670	0.7996	0.8288
	(1−delta$_{0\,G}$)g_A	0.0000	0.0008	0.0021	0.0037	0.0057	0.0648	0.0104	0.0130	0.0157	0.0185	0.0213	0.0243
	$(1-\alpha_G)n_G$	0.0042	0.0042	0.0042	0.0042	0.0042	0.0042	0.0042	0.0042	0.0042	0.0042	0.0042	0.0042
	lambda$^*_G$	0.0042	0.0049	0.0062	0.0079	0.0099	0.0690	0.0145	0.0171	0.0198	0.0226	0.0255	0.0285
	Speed years	238.47	202.93	160.84	126.48	101.02	14.49	68.74	58.42	50.47	44.22	39.21	35.13
$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$		0.0003	0.0028	0.0052	0.0076	0.0101	0.0576	0.0149	0.0174	0.0198	0.0222	0.0247	0.0271
a_{TAX}		**0.8596**											
	11. Portuga	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	**0.2676**	0.3000	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0430	0.0860	0.1289	0.1719	**0.2300**	0.2579	0.3009	0.3438	0.3868	0.4298	0.4728	0.5157
0.0986	$\Delta D=S_G-I_G$	0.0070	0.0140	0.0211	0.0281	0.0376	0.0421	0.0491	0.0562	0.0632	0.0702	0.0772	0.0843
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0042	0.0085	0.0127	0.0169	**0.0986**	0.0254	0.0297	0.0339	0.0381	0.0424	0.0466	0.0508
2.2990	beta$^*_G$	0.3625	0.5228	0.5762	0.6029	**0.6693**	0.6296	0.6373	0.6430	0.6474	0.6510	0.6539	0.6563
$n_{EG}=n_G$	B^*_G	1.7589	0.9129	0.7355	0.6586	0.4942	0.5883	0.5692	0.5553	0.5446	0.5361	0.5293	0.5236
(0.0019)	$LN(B^*_G)$	0.5647	(0.0911)	(0.3071)	(0.4176)	(0.7049)	(0.5306)	(0.5635)	(0.5883)	(0.6078)	(0.6234)	(0.6363)	(0.6470)
alpha $_G$	LN(Ω_G)/LN(E	1.4742	(9.1398)	(2.7104)	(1.9936)	(1.1810)	(1.5690)	(1.4774)	(1.4150)	(1.3698)	(1.3354)	(1.3084)	(1.2867)
(0.0648)	delta$_{0\,G}$	2.474	(8.140)	(1.710)	(0.994)	(0.181)	(0.569)	(0.477)	(0.415)	(0.370)	(0.335)	(0.308)	(0.287)
	$g_A{}^*_G$	0.0027	0.0040	0.0054	0.0067	0.0326	0.0094	0.0108	0.0121	0.0134	0.0148	0.0161	0.0175
	1−delta$_{0\,G}$	(1.4742)	9.1398	2.7104	1.9936	1.1810	1.5690	1.4774	1.4150	1.3698	1.3354	1.3084	1.2867
	(1−delta$_{0\,G}$)g_A	(0.0040)	0.0370	0.0146	0.0134	0.0385	0.0148	0.0159	0.0171	0.0184	0.0197	0.0211	0.0225
	$(1-\alpha_G)n_G$	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)
	lambda$^*_G$	(0.0060)	0.0350	0.0126	0.0114	0.0365	0.0128	0.0139	0.0151	0.0164	0.0178	0.0191	0.0205
	Speed years	(167.61)	28.59	79.27	87.49	27.39	78.21	71.90	66.06	60.87	56.31	52.31	48.79
$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$		0.0025	0.0038	0.0051	0.0063	0.0306	0.0088	0.0101	0.0114	0.0126	0.0139	0.0151	0.0164
a_{TAX}			**0.6816**										
	12. Spain	EG: G size											
Stoping macro-inequali		0.0500	0.1000	0.1500	0.2000	0.2500	**0.2787**	0.3500	0.4000	0.4500	0.5000	0.5500	0.6000
$b_{IG/YG}$	$Y_G=T_{AX}$	0.0341	0.0682	0.1022	0.1363	0.1704	**0.1900**	0.2386	0.2726	0.3067	0.3408	0.3749	0.4090
0.1359	$\Delta D=S_G-I_G$	0.0159	0.0318	0.0478	0.0637	0.0796	0.0887	0.1114	0.1274	0.1433	0.1592	0.1751	0.1910
Omega $_G$	$I_G=b_{IG/YG}\cdot Y_G$	0.0046	0.0093	0.0139	0.0185	0.0232	**0.1359**	0.0324	0.0371	0.0417	0.0463	0.0510	0.0556
0.6875	beta$^*_G$	1.2552	0.7989	0.6468	0.5708	0.5252	**0.3738**	0.4730	0.4567	0.4441	0.4339	0.4256	0.4187
$n_{EG}=n_G$	B^*_G	(0.2033)	0.2517	0.5460	0.7519	0.9041	1.6755	1.1141	1.1895	1.2520	1.3046	1.3495	1.3883
0.0094	$LN(B^*_G)$	#NUM!	(1.3796)	(0.6052)	(0.2851)	(0.1008)	0.5161	0.1080	0.1735	0.2247	0.2659	0.2997	0.3281
alpha $_G$	LN(Ω_G)/LN(E	#NUM!	0.2716	0.6192	1.3143	3.7186	(0.7260)	(3.4693)	(2.1595)	(1.6674)	(1.4092)	(1.2501)	(1.1421)
(0.3312)	delta$_{0\,G}$	#NUM!	1.272	1.619	2.314	4.719	0.274	(2.469)	(1.159)	(0.667)	(0.409)	(0.250)	(0.142)
	$g_A{}^*_G$	(0.0012)	0.0019	0.0049	0.0080	0.0110	0.0851	0.0171	0.0201	0.0232	0.0262	0.0293	0.0323
	1−delta$_{0\,G}$	#NUM!	(0.2716)	(0.6192)	(1.3143)	(3.7186)	0.7260	3.4693	2.1595	1.6674	1.4092	1.2501	1.1421
	(1−delta$_{0\,G}$)g_A	#NUM!	(0.0005)	(0.0030)	(0.0105)	(0.0409)	0.0618	0.0593	0.0435	0.0386	0.0370	0.0366	0.0369
	$(1-\alpha_G)n_G$	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
	lambda$^*_G$	#NUM!	0.0119	0.0094	0.0020	(0.0284)	0.0743	0.0717	0.0559	0.0511	0.0494	0.0490	0.0494
	Speed years	#NUM!	83.71	106.23	500.16	(35.15)	13.47	13.94	17.88	19.57	20.24	20.39	20.26
$g_y{}^*_G=g_A{}^*_G/(1-\text{alpha}_G)$		(0.0009)	0.0014	0.0037	0.0060	0.0083	0.0639	0.0128	0.0151	0.0174	0.0197	0.0220	0.0243

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Chapter 14

Net Investment and Business Cycle: Using 'sin' in G and PRI Sectors

Signpost to Chapter 14

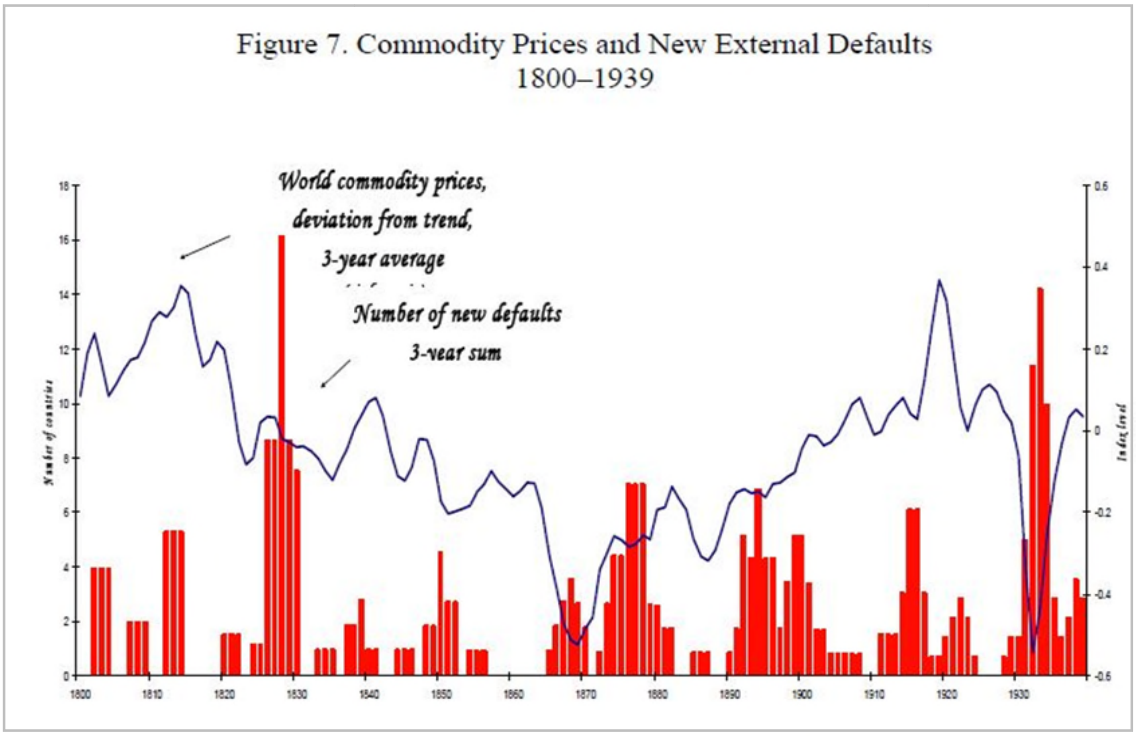
This chapter summarizes Author's business cycle. Author's business cycle under the endogenous-equilibrium differs from business cycle in the literature in several points:

1. The purpose of business cycle is to analyze dynamic policy balances between the private (PRI) sector and government (G) sector. The literature usually investigates private business cycle because final income or *GDP* is distributed to enterprises and households, which follows the SNA (1993). Contrarily the endogenous system approves consumption + saving = returns + wages each at the PRI and G sectors since final disposable income is replaced by that just before the redistribution of endogenous taxes.
2. Endogenous business cycle, beyond space and time, fully reflects the neutrality of the financial/market assets to the real assets (recall Chapter 2). The results of the business cycle based on the real assets are just 'turn over' the business cycle based on the financial/market assets. There is no difference between both results under the neutrality.
3. Business cycle is another integrated expression of the endogenous system, where seven endogenous parameters, hidden in the discrete Cobb-Douglas production function, simultaneously determine all the parameters and variables. This is because endogenous business cycle is shown using net investment and its growth that hold in an open endogenous economy. Minimum net investment produces maximum returns by country, sector, and year and over years. Business cycle totally reflects resultant policies executed economic, real and financial/market, and the central bank. Yet, finally business cycle follows the above neutrality. For example, see Figure 7 of Reinhart and Rogoff (33, 2008) below. The Figure 7 reflects the real assets, although endogenous net investment has not been measured accurately up to date. True causes always come from the real assets.
4. Unsolved serious problem is represented by the rate of unemployment. Leaders and policy-makers are eager to directly erase unemployment even using fiscal policy. Historically the current economic policies have been unsuccessful. Fiscal policy reduces real endogenous growth. Recall that Samuelson (1942, 1975). Zero deficit results in most robust economic activities and, this discovery has been theoretically and empirically proved in Chapters 3, 4, 5, 12, and 13. This chapter first of all clarifies why the rate of involuntary unemployment is always zero at the endogenous system. The rate of change in population and the rate of unemployment is closely related. It is

another discovery that under the decrease in population, the rate of technological progress increases more than that under increasing population (see Chapter 15).

5. Business cycle is indispensable even under no unemployment. Adjustments by net investment guarantee the sustainability of an economy. Business cycle, however, reflects various levels of qualitative shocks. Directly; these shocks are expressed by the speed years for convergence by country and sector. The endogenous system has an optimum range of the speed years and is shown by the speed year hyperbola function each to net investment and population (see Chapters 7, 11, Appendix). Surprisingly, net investment and population growth rate are related numerically. Nature promises us bright future.

Reinhart, C. M., and K. S. Rogoff (page 33, WP 13882, 2008, NBER, Cambridge, MA, 123p.).



(The author got Permissions for the use of Figure 7 from Reinhart and Rogoff, via NBER, Cambridge, MA, on Oct 14, 2012 and accordingly, from Princeton Univ. Press, 2009, for page 781 Figure, the same as the above Figure 7).

Note 1: During the last 21 years, we have had financial crisis called once a hundred years. The author, separately from the *EES*, intends to compare endogenous results with those in 1910-1940 or 1920-1940 statistics or measuring endogenous data that are converted from Maddison's estimated data. Also, the author intends to compare longer unique results estimated by Maddison Angus (1987, 1995, 1996), e.g., in 1820-1992 and also in 1960-2010 (see Chapter 6 for capital stock, 1960-2010). Maddison's methodology really presents an available base not only for PWT and EPWT but also for a few representative databases. The author expresses revere thankfulness for life-work of Reinhart, C. M., and K. S. Rogoff and, Angus Maddison.

Note 2: For methodologies to KEWT data-sets, Chapter 14 is interrelated to Chapter 15. The aspect of Chapter 14 is net investment to output, $i = (I/Y)$ or more accurately, $i^* = (I^*/Y^*)$, while the aspect of Chapter 15 is the rate of change in population, $n = (L_t - L_{t-1})/L_{t-1}$ or more accurately, $n_E = (L_t - L_{t-1})/L_{t-1}$, where $n_E = n$ under full-employment.

14.1 Proof of Full-employment in the KEWT Database 6.12

Before entering Hicks' (1950) sin business cycle, this chapter first proves full-employment theoretically and empirically (see **Tables UN1** and **UN2** for 46 countries). The author defines the rate of unemployment as the difference between the actual growth rate of population, n, and the endogenous rate of change in population, n_E.

Theoretically, full-employment exists with no assumption at the endogenous-equilibrium by country (see **BOX 14-1** below). Why full-employment? The intercept of the rate of return function to the rate of change in population, $r(n)$ or $r^*(n)$, where $r = r^* = r_0$, guarantees no unemployment. Because: The intercept by country is always higher than $n_E = n$. The vertical asymptote crosses the intercept, which is composed of two endogenous parameters, the relative share of capital, $\alpha = \Pi/Y$, and the qualitative net investment coefficient, β^*: $Intercept = (\alpha(1 - \beta^*)/\beta^*(1 - \alpha))$. A country that shows a high actual statistical rate of unemployment is out of a dynamic balance required for α and β^*. This country does not compatibly connect α with β^*. $\alpha = \Omega \cdot r$ controls a core of the real assets and, β^* determines the quality of net investment. As a result, unemployment does not exist endogenously.

A specific warning against a high rate of unemployment is the gradient of $r(n)$. Look at Tables UN1 and UN2. If an actual rate of unemployment rises, the $gradient(i, n, \alpha, \beta^*)$ simultaneously rises up. The gradient crosses the two-dimension origin. The gradient is always positive to the right but, big difference appears between countries. It is essential for policy-makers to lower the actual rate of unemployment; i.e, by reducing $gradient(i, n, \alpha, \beta^*)$.

In short, there exists no unemployment endogenously. Nevertheless we are waked up by perceiving the controllability of seven endogenous parameters. National taste and technology are wholly integrated in any country. A developing country must carefully march on the correct road, watching dynamic balance between its technological progress and taste, culture, and history.

BOX 14-1 Endogenous proof using a reduced linear form of hyperbola (see geographical hyperbola at 2-3 $r^*(n)$ by country in Appendix of the *EES*)

$$r^*(n) = \frac{\{i \cdot \alpha(1-\beta^*) + \alpha(1-\alpha)\}n + i \cdot \alpha(1-\beta^*)}{i \cdot \beta^*(1-\alpha)}.$$

$$y = \frac{C}{B}x + \frac{D}{B} = \frac{Cx+D}{B}. \quad B = i \cdot \beta^*(1-\alpha). \quad C = i \cdot \alpha(1-\beta^*) + \alpha(1-\alpha).$$

$$D = i \cdot \alpha(1-\beta^*). \quad \frac{C}{B} = \frac{i \cdot \alpha(1-\beta^*) + \alpha(1-\alpha)}{i \cdot \beta^*(1-\alpha)}. \quad \frac{D}{B} = \frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)}.$$

$$r^*(n) = \left(\frac{i \cdot \alpha(1-\beta^*) + \alpha(1-\alpha)}{i \cdot \beta^*(1-\alpha)}\right)n + \frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)}.$$

$$Gradient_{r^*(n)} = \frac{\alpha\{i(1-\beta^*) + (1-\alpha)\}}{i \cdot \beta^*(1-\alpha)}. \quad Intercept_{r^*(n)} = \frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)}.$$

14.2 Fingleton (2012), Blinder (2012), and Bernanke and Blinder (1992): Related to Unemployment

Why doesn't full-employment exist by country in the actual world? Let the author briefly review *three articles* related to unemployment: i) Fingleton (2012), ii) Blinder (2012), and iii) Bernanke and Blinder (1992).

The first **article**: "The Myth if Japan's Failure" by Fingleton, Eamonn (*New York Times* Sunday Review, Jan 8, 2012) stresses that Japan stands on the opposite side of economic failure as a country, by raising several phenomenal robust facts compared with those of other countries. The author agrees to a rate of unemployment at the lowest level of 4.2% among countries. These facts are true from a phenomenal viewpoint of policies and strategies. But, these facts remain results and a decisive fact is hidden. These facts only appear at the sacrifice of unbelievable deficits and debts.

For the above Myth, the author states two real stories. The first story (i): The rate of unemployment in statistics shows how far the marginal productivity of labor, *MPL*, is from the actual wage rate. Unfortunately Japan has realized a sort of flexibility of the actual wage rate to labor productivity, as an excuse of globalization, and by introducing western drama into Japan's traditional labor system. It implies that Japan has approached an endogenous condition compulsively and resultantly. It does not mean that Japan's economic policies have been appropriate, from the viewpoint of traditional human life and, as warned by the will of Peter, F. Drucker early in the 2000s. The author adds a word to this fact: if workers are each aware of what is happiness then there exists no problem.

The second story (ii): Robust economy is most guaranteed by zero deficit by year, as the author has proved theoretically and empirically in Chapters 12 and 13, based on Samuelson's (1942, 1975) great discovery at the real assets.

Chapter 14

Table UN1 Actual unemployment rate and full-employment guaranteed in KEWT database 6.12

	Unem.rate	n_E=n	Gradient	Intercept	Unem.rate	n_E=n	Gradient	Intercept
	Actual				*Actual*			
	1. the US				**3. Finland**			
2005	(0.051)	0.0097	3.196	0.060	(0.0860)	0.0019	2.257	0.095
2006	(0.046)	0.0098	2.123	0.056	(0.0790)	0.0038	2.374	0.090
2007	(0.046)	0.0097	1.560	0.048	(0.0690)	0.0038	2.287	0.128
2008	(0.058)	0.0097	2.141	0.050	(0.0640)	0.0038	1.992	0.090
2009	(0.093)	0.0096	27.344	(0.150)	(0.0820)	0.0057	2.755	0.052
2010	(0.096)	0.0095	9.187	0.017	(0.0840)	0.0038	2.136	0.060
	2. Canada				**4. France**			
2005	(0.068)	0.0103	1.368	0.034	(0.0930)	0.0063	2.655	0.063
2006	(0.063)	0.0099	1.246	0.037	(0.0920)	0.0059	2.159	0.059
2007	(0.060)	0.0098	1.155	0.038	(0.0840)	0.0055	1.624	0.056
2008	(0.061)	0.0094	1.146	0.038	(0.0780)	0.0053	1.701	0.056
2009	(0.083)	0.0093	2.064	0.042	(0.0950)	0.0048	3.029	0.061
2010	(0.080)	0.0095	1.790	0.042	(0.0980)	0.0048	2.875	0.063
	3. Australia				**5. Germany**			
2005	(0.505)	0.0159	0.953	0.042	(0.1170)	0.0004	7.644	0.053
2006	(0.479)	0.0000	1.060	0.056	(0.1080)	(0.0002)	7.778	0.058
2007	(0.044)	0.0107	0.870	0.044	(0.0900)	(0.0006)	7.469	0.064
2008	(0.043)	0.0106	0.800	0.044	(0.0780)	(0.0010)	4.919	0.065
2009	(0.056)	0.0104	0.985	0.039	(0.0810)	(0.0011)	6.887	0.065
2010	(0.052)	0.0103	0.925	0.038	(0.0770)	(0.0013)	4.550	0.063
	5. Mexico				**6. Greece**			
2005	(0.036)	0.0104	1.181	0.095	(0.0986)	0.0018	6.044	0.184
2006	(0.036)	0.0103	1.299	0.112	(0.0888)	0.0027	2.716	0.142
2007	(0.037)	0.0101	1.267	0.106	(0.0830)	0.0018	2.619	0.153
2008	(0.040)	0.0100	1.225	0.100	(0.0770)	0.0027	3.285	0.172
2009	(0.055)	0.0097	1.103	0.074	(0.0950)	0.0018	5.165	0.177
2010	(0.054)	0.0095	1.231	0.089	(0.1250)	0.0018	6.024	0.157
	7. China				**7. Ireland**			
2005	(0.042)	0.0066	1.468	0.156	(0.0430)	0.0220	1.870	0.180
2006	(0.041)	0.0064	1.545	0.162	(0.0440)	0.0191	1.803	0.169
2007	(0.040)	0.0064	1.338	0.171	(0.0460)	0.0211	1.573	0.131
2008	(0.042)	0.0062	1.325	0.164	(0.0600)	0.0183	1.172	0.067
2009	(0.043)	0.0063	1.320	0.163	(0.1190)	0.0180	1.140	0.043
2010	0.000	0.0062	1.319	0.163	(0.1370)	0.0155	1.545	0.037
	9. Indonesia				**8. Italy**			
2005	(0.112)	0.0128	1.574	0.133	(0.0680)	0.0062	2.614	0.075
2006	(0.103)	0.0125	1.911	0.164	(0.0610)	0.0056	2.249	0.074
2007	(0.091)	0.0123	1.757	0.156	(0.0610)	0.0056	2.095	0.070
2008	(0.081)	0.0119	1.859	0.213	(0.0670)	0.0049	2.202	0.075
2009	(0.074)	0.0115	1.992	0.211	(0.0780)	0.0045	3.830	0.083
2010	(0.071)	0.0111	2.068	0.238	(0.0840)	0.0038	3.218	0.086
	10. Japan				**10. Netherlands**			
2005	(0.044)	0.0005	6.164	0.027	(0.0650)	0.0049	3.855	0.082
2006	(0.041)	0.0000	7.541	0.030	(0.0550)	0.0043	4.272	0.111
2007	(0.039)	(0.0004)	8.205	0.032	(0.0450)	0.0043	3.779	0.128
2008	(0.040)	(0.0009)	4.987	0.035	(0.0390)	0.0043	2.495	0.131
2009	(0.050)	(0.0010)	4.063	0.034	(0.0490)	0.0036	1.902	0.087
2010	(0.050)	(0.0013)	2.614	0.029	(0.0550)	0.0036	2.884	0.088
	11. Korea				**11. Portugal**			
2005	(0.037)	0.0042	1.730	0.097	(0.0760)	0.0057	1.525	0.077
2006	(0.035)	0.0042	1.505	0.081	(0.0770)	0.0047	2.109	0.091
2007	(0.033)	0.0040	1.697	0.104	(0.0800)	0.0038	2.083	0.087
2008	(0.032)	0.0040	1.412	0.090	(0.0770)	0.0038	2.352	0.099
2009	(0.036)	0.0037	1.816	0.085	(0.0960)	0.0047	3.391	0.092
2010	(0.037)	0.0035	1.865	0.111	(0.1100)	(0.0019)	4.338	0.120
	12. Malaysia				**14. Spain**			
2005	(0.036)	0.0183	2.162	0.095	(0.0920)	0.0134	1.405	0.066
2006	(0.033)	0.0179	2.284	0.100	(0.0850)	0.0121	1.061	0.061
2007	(0.032)	0.0176	2.151	0.110	(0.0830)	0.0108	1.015	0.059
2008	(0.033)	0.0166	2.407	0.111	(0.1130)	0.0100	1.532	0.066
2009	(0.036)	0.0170	2.560	0.064	(0.1800)	0.0092	2.183	0.055
2010	(0.033)	0.0160	1.930	0.087	(0.2010)	0.0094	3.188	0.056
	13. Philippines				**15. Sri Lanka**			
2005	(0.114)	0.0189	2.297	0.195	(0.077)	0.0088	0.853	0.067
2006	(0.079)	0.0187	2.552	0.171	(0.065)	0.0087	0.852	0.072
2007	(0.073)	0.0186	2.738	0.180	(0.060)	0.0091	0.836	0.069
2008	(0.074)	0.0184	2.860	0.186	(0.052)	0.0091	1.116	0.100
2009	(0.075)	0.0180	3.638	0.149	(0.057)	0.0090	0.963	0.065
2010	(0.074)	0.0178	6.526	(0.011)	0.000	0.0084	0.776	0.063
	14. Singapore				**16. Thailand**			
2005	0.000	0.0167	2.257	0.091	(0.019)	0.0103	1.035	0.080
2006	(0.045)	0.0211	2.436	0.102	(0.016)	0.0085	1.147	0.083
2007	(0.040)	0.0298	2.596	0.101	(0.014)	0.0071	1.363	0.085
2008	(0.032)	0.0290	1.716	0.088	(0.014)	0.0061	1.111	0.077
2009	(0.043)	0.0260	2.003	0.071	(0.015)	0.0055	1.466	0.067
2010	(0.031)	0.0211	2.277	0.093	(0.010)	0.0056	1.269	0.075

Note: Compare a high rate of unemployment at *IFSY*, IMF, with KEWT 6.12 database, where the intercept is higher than the rate of change in population, n_E=*n*, and this guarantees full-employment at the endogenous system.

Table UN2 Actual unemployment rate and full-employment guaranteed in KEWT database 6.12

	Unem.rate	n_E=n	Gradient	Intercept	Unem.rate	n_E=n	Gradient	Intercept
	Actual				*Actual*			
	1. Denmark				**1. Argentina**			
2005	(0.0560)	0.0037	2.915	0.131	(0.1160)	0.0094	2.106	0.175
2006	(0.0410)	0.0018	2.529	0.160	(0.1020)	0.0098	2.306	0.211
2007	(0.0290)	0.0037	2.476	0.233	(0.0850)	0.0097	2.263	0.219
2008	(0.0180)	0.0018	2.324	0.169	(0.0790)	0.0099	2.384	0.240
2009	(0.0330)	0.0018	2.142	0.098	(0.0870)	0.0100	2.873	0.186
2010	(0.0590)	0.0018	2.533	0.106	(0.0780)	0.0097	2.318	0.226
	2. Iceland				**3. Brazil**			
2005	(0.0210)	0.0135	1.290	0.108	(0.0940)	0.0121	1.357	0.079
2006	(0.0130)	0.0126	0.572	0.069	(0.0840)	0.0112	1.346	0.080
2007	(0.0100)	0.0125	0.837	0.070	(0.0930)	0.0104	1.364	0.092
2008	(0.0160)	0.0104	0.796	0.083	(0.0790)	0.0097	1.380	0.110
2009	(0.0810)	0.0103	0.642	0.043	(0.0810)	0.0092	1.048	0.062
2010	(0.0790)	0.0476	0.576	0.018	(0.0670)	0.0087	1.123	0.078
	3. Norway				**4. Chile**			
2005	(0.0450)	0.0087	5.235	0.197	(0.0800)	0.0112	3.751	0.236
2006	(0.0340)	0.0086	5.011	0.222	(0.0770)	0.0104	8.801	0.250
2007	(0.0250)	0.0085	3.367	0.229	(0.0710)	0.0103	6.761	0.294
2008	(0.0250)	0.0106	3.688	0.246	(0.0780)	0.0096	2.539	0.179
2009	(0.0310)	0.0084	3.121	0.154	(0.0980)	0.0101	3.080	0.114
2010	(0.0350)	0.0104	3.044	0.151	(0.0830)	0.0100	3.441	0.179
	4. Sweden				**5. Colombia**			
2005	(0.0780)	0.0055	4.392	0.061	(0.1180)	0.0153	1.625	0.089
2006	(0.0710)	0.0044	3.710	0.105	(0.1210)	0.0151	1.703	0.117
2007	(0.0610)	0.0055	3.689	0.121	(0.1110)	0.0151	1.664	0.121
2008	(0.0620)	0.0055	4.092	0.102	(0.1130)	0.0147	1.754	0.126
2009	(0.0830)	0.0043	4.480	0.057	(0.1200)	0.0144	1.616	0.104
2010	(0.0840)	0.0043	3.122	0.074	(0.1170)	0.0140	1.667	0.114
	5. Switzerland				**7. Peru**			
2005	(0.0380)	0.0068	2.146	0.077	(0.0950)	0.0127	2.107	0.083
2006	(0.0330)	0.0054	2.562	0.103	(0.0850)	0.0122	3.107	0.182
2007	(0.0280)	0.0040	3.191	0.129	(0.0840)	0.0117	2.749	0.212
2008	(0.0260)	0.0040	3.508	0.130	(0.0840)	0.0116	1.878	0.174
2009	(0.0370)	0.0040	3.311	0.099	(0.0830)	0.0114	1.839	0.116
2010	(0.0390)	0.0040	3.709	0.099	(0.0790)	0.0113	2.108	0.175
	6. the UK				**9. Kazakhstan**			
2005	(0.0480)	0.0050	3.820	0.084	(0.0810)	0.0066	2.701	0.321
2006	(0.0540)	0.0053	3.942	0.090	(0.0780)	0.0066	2.621	0.369
2007	(0.0540)	0.0053	4.136	0.086	(0.0740)	0.0065	2.064	0.331
2008	(0.0570)	0.0054	6.040	0.082	(0.0660)	0.0071	3.407	0.382
2009	(0.0470)	0.0056	8.530	0.074	(0.0580)	0.0077	2.096	0.217
2010	(0.0790)	0.0054	7.210	0.084	(0.0660)	0.0070	2.176	0.330
	1. Bulgaria				**11. Pakistan**			
2005	(0.1010)	(0.0064)	2.047	0.222	(0.0770)	0.0222	1.434	0.080
2006	(0.0900)	(0.0065)	1.517	0.193	(0.0620)	0.0220	1.187	0.085
2007	(0.0690)	(0.0065)	1.776	0.211	(0.0530)	0.0219	1.122	0.077
2008	(0.0560)	(0.0065)	0.746	0.106	(0.0520)	0.0218	2.076	0.121
2009	(0.0690)	(0.0053)	0.711	0.067		0.0218	2.199	0.104
2010	(0.1030)	(0.0066)	0.961	0.072		0.0218	3.506	0.100
	2. Czech Republic				**14. Egypt**			
2005	(0.0890)	0.0019	1.494	0.113	(0.1100)	0.0189	2.164	0.078
2006	(0.0810)	0.0029	1.536	0.119	(0.1070)	0.0188	1.432	0.072
2007	(0.0660)	0.0039	1.538	0.121	(0.0900)	0.0186	1.653	0.088
2008	(0.0540)	0.0049	1.465	0.089	(0.0870)	0.0184	1.094	0.082
2009	(0.0810)	0.0048	1.190	0.058	(0.0940)	0.0180	1.878	0.107
2010	(0.0900)	0.0039	1.093	0.056	(0.0900)	0.0177	1.402	0.080
	3. Hungary				**16. Morocco**			
2005	(0.0720)	(0.0020)	3.695	0.159	(0.1130)	0.0116	2.085	0.095
2006	(0.0750)	(0.0030)	1.550	0.121	(0.0960)	0.0115	2.088	0.097
2007	(0.0740)	(0.0020)	1.756	0.109	(0.0950)	0.0120	1.714	0.094
2008	(0.0780)	(0.0020)	1.617	0.099	(0.0960)	0.0125	1.223	0.098
2009	(0.1000)	(0.0020)	2.570	0.095	(0.0910)	0.0120	1.067	0.091
2010	(0.1110)	(0.0020)	3.344	0.104	(0.0910)	0.0122	0.873	0.068
	5. Poland				18. South Africa			
2005	(0.1820)	(0.0010)	4.150	0.164	(0.2390)	0.0124	1.164	0.080
2006	(0.1390)	(0.0010)	2.922	0.146	(0.2260)	0.0119	1.034	0.076
2007	(0.1270)	(0.0008)	1.377	0.116	(0.2230)	0.0109	0.939	0.080
2008	(0.0990)	(0.0008)	1.249	0.100	(0.2290)	0.0102	0.958	0.084
2009	(0.1100)	(0.0008)	1.675	0.094	(0.2390)	0.0089	1.063	0.058
2010	(0.1210)	(0.0008)	1.554	0.087	(0.2490)	0.0076	1.070	0.062
	6. Romania				**8. Turkey**			
2005	(0.0580)	(0.0041)	2.023	0.188	(0.1020)	0.0131	3.665	0.257
2006	(0.0550)	(0.0046)	1.444	0.161	(0.0990)	0.0129	2.604	0.210
2007	(0.0430)	(0.0042)	1.084	0.138	(0.1020)	0.0126	2.872	0.203
2008	(0.0400)	(0.0042)	1.026	0.126	(0.1100)	0.0125	1.935	0.148
2009	(0.0630)	(0.0037)	1.244	0.105	(0.1400)	0.0123	4.051	0.147
2010	(0.0760)	(0.0042)	0.995	0.084	(0.1190)	0.0119	2.168	0.147
	7. Russia				**9. Ukraine**			
2005	(0.0760)	(0.0048)	4.718	0.406	(0.0720)	(0.0074)	1.492	0.110
2006	(0.0720)	(0.0045)	4.113	0.385	(0.0680)	(0.0072)	1.129	0.098
2007	(0.0610)	(0.0041)	3.072	0.315	(0.0670)	(0.0067)	1.067	0.106
2008	(0.0620)	(0.0039)	2.975	0.312	(0.0640)	(0.0065)	0.965	0.098
2009	(0.0840)	(0.0037)	3.269	0.183	(0.0880)	(0.0061)	2.322	0.119
2010	(0.0750)	(0.0035)	3.986	0.328	(0.0810)	(0.0061)	1.846	0.111

The second **article**: "A Contribution to *Nikkei* Newspaper at Economic School dated on Oct 4, 2012," by Blinder, Alan, S. was understandably edited by Nikkei but the spirit is the same. Blinder analyzes that the current crisis is not 'a Keynesian recession' but 'a Reinhart-Rogoff-Minsky (RRM) recession.' Blinder says "choose to deleverage," but sometimes the accumulation of too much sovereign debt leaves little choice—they are forced to cut spending and raise taxes in a recession. Blinder concludes that for RRM recession non-traditional policy may not work well. The author of *EES* got a reply from Blinder by email dated on Oct 9: Blinder's intension is that traditional policies may not be enough—not that they don't work.

The author respects his theoretical and empirical experiences and supports his penetrating conclusion. The author stresses one word. The central bank should be neutral from political powers since no effect is expected at all. Leaders use some policies as if it is attractive, even if leaders know the real fact. What we need universally is that each person is aware of the true meaning of democracy: When each person has to plan, do, and see everything by herself or himself, assuming that there is no person besides the person in a country, then, an economy will become steadily recover. Convey true stories to people, without escaping from true stories. Give and given is true. Prefer great cooperation to little differences is true.

For the above two articles, the author sums up why net investment is a base of economic activities. Both actual and endogenous economic activities are simultaneously destined to stay within a moderate range of the endogenous-equilibrium. When an economy becomes out of endogenous equilibrium, a final solution is expressed by net investment in an open economy. A shock is indispensable and it results in business cycle. This fact is not a parable but a real story. A unique adjustor is the net investment to output, $i = I/Y$, $i_{PRI/Y} = I_{PRI}/Y$, and $i_{G/Y} = I_G/Y$, by sector. A healthy road is arranged. Empirically we are now ready to step into business cycle discussions.

The third **article:** "The federal Funds rate and the Channels of Monetary Transmission," by Bernanke, Ben, S., and Blinder, Alan, S. (901-921, 1992). This is related to the author's neutrality of the financial/market assets to the real assets. Bernanke and Blinder (1992) shows the first half of one cycle on the following Figure 4, where financial/market assets, securities, deposits, and loans, are compared with the unemployment rate as the real assets. Figure 4 starts with the shock and this shock comes at the end of the second half hidden here. The unemployment rate hits its peak at the end of the first half. These results are clearly explained as the author cites on the same page 918 (now under getting permissions from American Economic Association):

> As is apparent, the effects of unemployment are essentially zero during the first two or three quarters after the shock to the funds rate; but at about the nine-month point,

unemployment begins to rise, building gradually to a peak after about two years, before declining back to zero (the decline is not shown in the graph).

At first, the author intuitively looked at this Figure 4. Fureka!, this proves the existence of the author's neutrality of the financial/market assets to the real assets (see Chapter 2). The character of their 'shock' is similar to the author's, described at the above second article. Our economies run well with the shock. The shock is a given carrier of an economy, although it is actually controlled by policy-makers. In other words, business cycle is a good thermometer of an economy.

Bernanke, Ben, S., and Blinder, Alan, S. (Figure 4, page 918,
AER 82 (Sep, 4): 901-921, 1992)

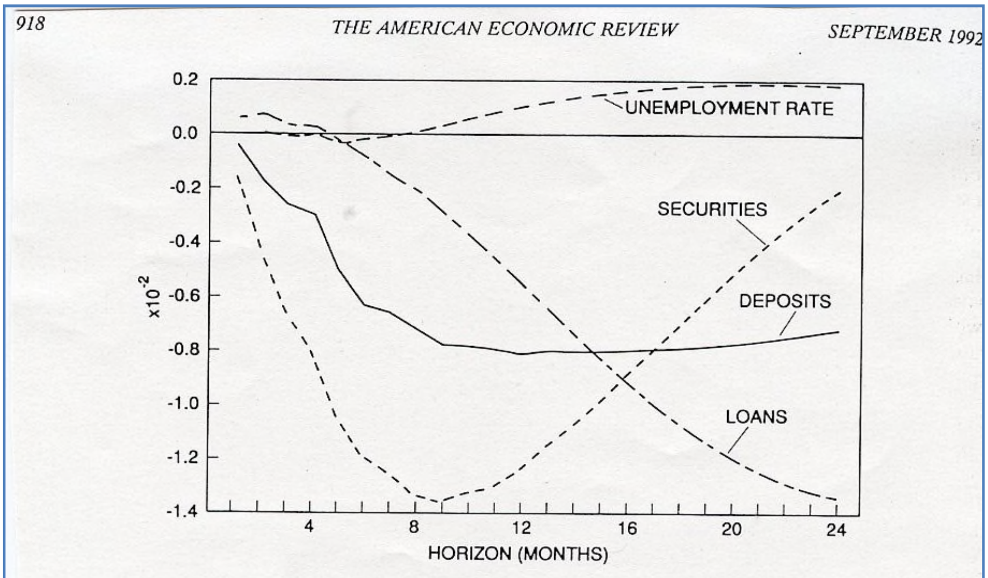


FIGURE 4. RESPONSES TO A SHOCK TO THE FUNDS RATE

(With Permissions to cite Figure 4 from Subscription Department,
American Economic Association)

14.3 Standpoint of Real Business Cycle to Obey Samuelson (1998)

This section outlines the essence of business cycle. The concept of business cycle is divided into two sorts: (1) Real business cycle in the literature, where the price-equilibrium is indispensable. (2) Endogenous real business cycle under the neutrality of the financial/market assets to the real assets at the endogenous-equilibrium, where results of both assets are the same in cooperation with the price-equilibrium. Endogenous business cycle holds only when a system is wholly integrated. Here partial/specified endogenous and partial/specified system does not produce real business cycle. This chapter connects real business cycle with endogenous business cycle. Note that endogenous business cycle never excludes real business cycle in the literature. First, the author sums up the outline of Kydland, Finn, E., and Prescott, Edward, C. (1977), Kydland, Finn, E., and Prescott, Edward, C. (1982), and Backus, David, K., Kehoe, Patrick, J., and Kydland, Finn, E. (1992). These articles have taught us essential problems lying between the financial/market assets and the real assets. Their aspect is natural since the relationship between the financial/market assets and the real assets is in vague and the real assets must be a base for business cycle.

First, Kydland and Prescott (1977) is policy-oriented, which is consistent with the endogenous-system. This paper (479, ibid.) shows Figure 1 using topology and compares consistent equilibrium with optimal equilibrium. The optimal equilibrium locates at the origin of the two dimensions; the x axis shows the difference between unemployment and full-employment, and the y axis shows the forecasted or expected inflation rate. The optimal equilibrium holds with no inflation. The endogenous system holds under no unemployment but with a low rate of endogenous inflation rate. This is the endogenous NAIRU (see, Chapters 7 and 11). Two sorts of business cycle are close each other. An answer is given by the endogenous system, where endogenous business cycle and the neutrality of the financial/market assets to the real assets are proved empirically using 81 countries.

Second, Kydland and Prescott (1982) is model calibration-oriented. This paper (1363, ibid.) shows Table 1 using the small number of free parameters, preference and technology, with shock variance. At the endogenous system, the free parameters in the above Table are, contrarily, replaced by 'seven' endogenous measured parameters. The same resultant shocks exist between shocks of Kydland and Prescott (1982) and the author's shocks (see Signpost above). The estimated shocks in the literature need the auto-covariance of output (VARs) (see Chapter 12). The endogenous system measures preferences and technology wholly in its system.

Third, Backus, Patrick, and Kydland (1992) present results of empirical researches internationally. The author pays attention to Figures 1, 2, and 3 each on pages 749, 764, and 770. This is because data are based on Citibank's Citibase, *International Financial Statistics*, IMF, and Hodrick-Prescott (1980) filtered data. We use the same data of *IFS*, IMF. The only difference is statistics or purely endogenous data.

Following the stream of business cycle, the author leads real business cycle to endogenous business cycle more concretely hereunder; i) starting with Kalecky, ii) touching the essence of real assets penetrated by Samuelson, and iii) leading individual utility to a macro utility and sums up the essence of business cycle in the KEWT database. Business cycle is broadly explained using real assets, financial/market assets, and totally of real and financial assets, under the price-equilibrium. The author does not deny this fact but favorably accept all of these phenomena, under the author's neutrality of financial/ market assets to real assets (see Chapter 2).

A real-assets oriented business cycle was earlier set by Kalecky, Michael (88, 91-92, 1937), ever under the price-equilibrium. The idea is unique in that Kalecky illustrated several diagrams based on 45^0 diagonal. The author was, in a moment, excited with his imaginable discovery of the diagonal. His hyperbolic curves are shown by 'D' on the y axis and D may or may not cross the diagonal, taking total investment 'I' on the x axis. D is an increasing function of the difference between the prospective rate of profit and the rate of interest to net investment. His first one-half process is shown by $\mathrm{I}_1 < \mathrm{D}_1 < \mathrm{I}_2 < \mathrm{D}_2 < \mathrm{I}_3 < \mathrm{D}_3 < \mathrm{I}_4 < \mathrm{D}_4 < \mathrm{I}_5 = \mathrm{D}_5 = \mathrm{I}_6 = \mathrm{D}_6$ so that $\mathrm{I}_1 < \mathrm{I}_2 < \mathrm{I}_3 < \mathrm{I}_4$ corresponds with $\mathrm{Y}_1 < \mathrm{Y}_2 < \mathrm{Y}_3 < \mathrm{Y}_4$, where $\mathrm{d}Y/\mathrm{d}I = f'(I)$ prevails. His second half process is just reversed and, a business cycle is formed. His business cycle seems to come up with the scheme of changes in prices (i.e., rates of profit and interest) yet, essentially real-assets oriented. Kalecky does not contradict with Samuelson (33-36, 1998).

Business cycle typically belongs to macroeconomics. The author realized two great discoveries of Samuelson (155-161, 1937; use of a fixed discount rate, connected with Fisher, I.) and Samuelson (1942; 1975, revisiting with Salant, W. S.). These two discoveries were based on the real assets under the price-equilibrium. Nevertheless, these two discoveries, to the author's understanding, properly connect the micro level with the macro level by his own way and, resultantly delete the difference between the price-equilibrium and the endogenous-equilibrium. Author's KEWT 6.12 database exactly proves Samuelson's theoretical framework. And, the author's business cycle is a typical case of the two discoveries or another expression of Samuelson's theoretical framework.

The bridge between Samuelson's and Author's frameworks is summarized as follows: A moment was the use of a fixed exponential discount rate to individual utility. This discovery simply made it possible for anyone to connect the rate of return for some periods with a fixed discount rate in an infinite time: $\sum_{n=1}^{\infty}(\frac{1}{1+r})^n = \frac{1}{r}$. The endogenous system, suggested by Samuelson's (155-161, ibid.--1937) utility idea, measures a rate of return endogenously and, instead of an external rate of interest, it is now possible for anyone to measure the relative discount rate of consumer goods to capital goods, *rho/r*, as a function of the propensity to consume, $c = C/Y$: $(rho/r)(c)$ and $(rho/r) = 13.301c^2 - 22.608c + 10.566$. This function is common to 81 countries and each country expresses national taste/preferences, culture, and history, by country. Several saving-oriented countries are exceptional among 81 countries: $(rho/r) = 1.8638c^2 - 2.4547c + 1.758$. This is because $(rho/r)(c)$ is determined simultaneously with endogenous equations such as $\alpha = \Pi/Y$: $(1 - \alpha) = c/(rho/r)$ and, $\frac{K}{L} = \frac{(\alpha/(1-\alpha)}{(r/w)}$ or $k = \frac{w \cdot \Omega}{1 - r \cdot \Omega}$ (for endogenous equations, see 'Notations' at the beginning of the *EES*). The above process, regardless of the character of equilibrium, turns the individual utility at the micro utility to the macro utility at the macro level. As a result, the first discovery by Samuelson (1937) could be proved empirically by the endogenous system and the KEWT database.

Secondly, two fiscal multipliers discovered by Samuelson (1942) guarantee the growth rate of per capita output within a moderate range of the endogenous-equilibrium. This was already discussed at Chapter 13, to answer the unsolved problems raised by Krugman (July 1st, 2012).

Let the author repeat the dictum of Samuelson (1998). Historically, micro market efficiency has prevailed for many decades in the literature. Meantime, Samuelson has exceptionally raised hands to macro market efficiency based on the real assets. Samuelson (1939) had clarified the acceleration principle and the multiplier, which is the inverse of corresponding endogenous ratios, as discussed in Chapter 12. Samuelson (1946) was against Keynesians' reliance of financial assets. These facts show the essence of Samuelson's view. The essence is reinforced by the empirical proof of the neutrality of financial/market assets to real assets (see Chapters 2 to 5).

Real business cycle is now reliable because the neutrality of financial/market assets to real assets has been endogenously proved every year, since KEWT 1.07, 1960-2005, established in 2007. This is endogenous real business cycle. Some countries suddenly fell into disequilibrium or close-to-disequilibrium, during 1990-2010. Suddenly fallen is a shock. The neutrality is required for recovering equilibrium at the real assets. Then, shocks in business cycle reflect some features behind the endogenous-equilibrium. Typical features are the speed years and the valuation ratio, by sector (see related Chapters, 2, 6, 7, 8, 12, and 13).

Among others, business cycle has been most diversified in macroeconomics topics: financial/market assets to real assets and, synthesized contents. Kuznets, S. S. (1941, 1952, 1966, 1971) has devoted his life-work to the study of business cycle (for his philosophy, see Chapter 15). Numerous investigations by Kuznets are beyond description. This is because, the real assets, the financial assets, and market indicators, all of these are historically interrelated. Among others, endogenous real business cycle is most essential, as Samuelson proved theoretically when statistics data were not yet reliable by country. This chapter does not repeat Samuelson's performances but Ramsey and J & G (see Chapter 6 or section 14.4 soon below). The character of business cycle will be more understandable.

14.4 Revisit: Ramsey (1928), Jorgenson (1963), and Jorgenson and Griliches (1967)

The author revisits the stream of Ramsey, F. P. (1928), Jorgenson (1963), and Jorgenson and Griliches (1967) (recall Chapter 6). Economics and Financing have recently been behavior-oriented, as shown by Shiller, R. J. (2003). Behavioral science needs its robust reciprocal and leadership of philosophy. Social science and economics aim at finding scientific discoveries, as the author stressed in Chapter 1. It is important to distinguish scientific discovery under a fixed level of spirituality with various levels of spirituality spread over social science. Business cycle deepens the essence of reciprocal at real assets staying a fixed level of spirituality. In this viewpoint, the author does not step into the current behavioral economics.

Ramsey (1928) and Jorgenson (1963) respectively hold under the price-equilibrium. These two papers are individual-utility oriented, commonly to Neo-classical school. Ramsey (1928) uses saving behavior and sets the saving rate as a variable in a process from close-to-disequilibrium to equilibrium/the steady state. Jorgenson (1963) uses investment behavior and sets vintage embodied to cope with heterogeneous capital.

Author of *EES* never blames Neo-classical school since the author has been brought up by converting Solow's (1956) exogenous framework to endogenous one. The author always broadly looks for a lighthouse from the Sea of Samuelson's numerous specified researches in his lifetime. Two articles, Ramsey (1928) and Jorgenson (1963), clarify why Neo-classical articles hit a wall and cannot get rid of this wall. The difference between two articles and the endogenous system reveals what we need for economic policies and leads to how to answer unsolved problems at the current literature.

First Ramsey, F. P. (1928) historically and mathematically left an indispensable fact. In a word, Ramsey challenged for a model including processes to attain equilibrium from statistics data under the price-equilibrium. Ramsey's challenge remained theoretical, since statistics became reliable after the SNA (1993). Maddison's long estimation for population and *GDP*, 1820-1992, has been exceptionally accepted. The methodology was explained at Maddison (Growth and Slowdown; 649-698, 1987) and accepted by representative database, starting with capital stock rather than the capital-labor ratio.

For mathematical integration of disequilibrium and equilibrium relying on the price levels at macroeconomics, Ramsey uses quadratic equations. Quadratic equations are composed of parabola, hyperbola, and oval or ellipse. It is impossible for researchers to set up an expression of the third order. Researchers naturally use various quadratic equations and with various assumptions to justify scientific. Hyperbola belongs to quadratic expression and is relative. The Excel does not treat hyperbolas. A quadratic expression needs parameters, but unknown unless whole values exist consistently within a system and over years. For parameters, values of elasticity w. r. t. so and so are given with assumptions. A problem is that assumptions are indifferent of reality or empirical results, although assumptions are convenient to researchers.

Barro, R. J., and Sala-i-Martin (59-90, 1995) develops Ramsey's behavior of the saving rate. At their Appendix (ibid., 462-528; in particularly, 474-483 and 493- 497), 'mathematical methods' are shown with first-order ordinary differential equations and also with phase diagrams related to rotations. If these diagrams are empirically proved, hyperbolic may appear although no word of hyperbola was found in a few suggestive diagrams. The serious problem is traced back to a fact that the speed years for convergence are estimated not endogenously but exogenously. An optimum point at the above diagrams remains a version. At the endogenous system, an optimum range of a maximum rate of return to a minimum net investment is measured accurately by country and by sector, using 36 country hyperbolas, as shown in Appendix.

Jorgenson, D. W. (1963) presents capital theory and investment behavior, with regression coefficients using unrestricted versus restricted. Jorgenson, D. W. (247, ibid.) connects investment behavior with Irving Fisher's (87-116, 1907) interest rate and, tries to open a door to bury the difference between econometric practice and neoclassical theory. The difference is whether the price-equilibrium is indispensable or not; the price-equilibrium is 'entirely absent from the econometric literature on investment,' according to Jorgenson. Investment behavior is more decision-making oriented, as generally expressed in behavioral economics. Jorgenson, D. W. (ibid., 248) states: 'Demand for capital stock is determined to maximize net worth' by using a fixed rate of interest or a constant exponential rate. This leads to embodied investment. As a result, Jorgenson, D. W. (1966) raises his embodiment hypothesis, after referring to the first appearance of 'embodied' in Solow (312-13, 1957). Embodiment is a means to avoid heterogeneous capital and, vintage is a means to satisfy heterogeneous capital. Denison Edward, F. (90-93, 1964) states 'Unimportance of the Embodied Question,' partly due to empirical changes in the rate of return over years.

Conclusively, we need both embodied and disembodied in capital stock or we must accept a constant exponential rate since real assets remain the same, as first discovered by Samuelson (1937, 1942). The KEWT database 6.12 represents one case of disembodied.

The endogenous system measures capital stock simultaneously with the rate of return. Capital stock is a mixture of quantity and quality which cannot be divided by year. Net investment is purely qualitative and absorbs qualitative net investment entirely by year. Then, what is the relationship between capital stock and net investment? The growth rate of capital stock is expressed as total factor productivity (*TFP*); $g^*_{A(STOCK)} = g^*_{TFP}$. The growth rate of capital flow or net investment is expressed as the rate of technological progress; $g^*_{A(FLOW)} = i(1-\beta^*)$. Schumpeter's (1939) idea is realized endogenously. One discovery: $g^*_{A=TFP(STOCK)} = g^*_{A(FLOW)}$ holds at convergence (see BOX 14-2).

BOX 14-2 Proof of growth rates of technology, STOCK=FLOW, $g^*_{A=TFP(STOCK)} = g^*_{A(FLOW)}$

5. Proof of productivity growth, at convergence in the transitional path, using FLOW and STOCK:

$g_{A(FLOW)}(t^*) = g_{TFP(STOCK)}(t^*)$, where A=total factor productivity (TFP) as STOCK.

$g_{A(FLOW)}(t^*) = i(t^*) \cdot (1 - \beta(t^*))$. $\quad A_{TFP(STOCK)}(t^*) = A_0(1 + g_{A(FLOW)}(t^*))^{1/\lambda^*}$.

6. Proof at KEWT database, differently from the above $g_{TFP(STOCK)}(t^*) = g_{A(FLOW)}(t^*)$:

Starting with endogenous Conservation Laws, $\Omega = \Omega^* = \Omega_0$ and $r = r^* = r_0$,

under $\alpha = const.$: $\alpha = r^* \cdot \Omega^*$,

1). $A^* = A_0(1 + g^*_A)^{1/\lambda^*} = k^{*1-\alpha}/\Omega^*$. $\quad k^* = (A^* \cdot \Omega^*)^{1/1-\alpha}$. $\quad y^* = A^* k^{*\alpha}$.

2). $L^* = L_0(1 + n)^{1/\lambda^*}$. $\quad K^* = k^* L^*$. $\quad Y^* = A^* K^{*\alpha} L^{*(1-\alpha)}$. $\quad$ Or, $Y^* = y^* L^*$.

3). Equations prevailing commonly to KEWT and its recursive programming,

$A(t) = \frac{k(t)^{1-\alpha}}{\Omega(t)}$. (See Note 11 on page25, PhD thesis, 2003/Nov). $1/\lambda^* = 1/\big((1 - \alpha)n + (1 - \delta_0)g^*_A\big)$.

Source: Reproduced from B. Equations in Notes, at the beginning of the *EES*.

The author confirms that results of growth accounting and continuous differential are finally within a certain range of those of the endogenous system. The elasticity of substitution, $\sigma = \eta(k/r/w)$, is accurately 1.000 in the transitional path by time/year when data are based on KEWT series; e.g., as shown in *PRSCE* 52 (Sep, 1): 67-111, 2011. It is suggestive for researchers to make use of econometric methods for the differences of data and results between the literature and the endogenous system. Because the endogenous system is an immovable base, as long as 'purely endogenous with no assumption' is guaranteed at the endogenous system. A typical case is the business cycle. The author reconfirms that a base data for 'sin' must be 'purely endogenous with no assumption'. Otherwise, results of 'sin' business cycle change every time when a researcher works on 'sin' business cycle.

14.5 Hicks 'sin' Business Cycle in G and PRI Sectors with Empirical Results

This section empirically presents J. Hicks' (65-82, 170-181; 1950) sin business cycle. The author (PRSCE, 48 (Sep), 49 (Feb); and JES 11 (Sep)) presented the same empirical results with KEWT 1.07, 1960-2005. The previous work only used the total economy while this section compares 'sin' business cycle at the government (G) sector with that at the private (PRI) sector. A fruitful finding of this section is that the sin adjustment process by 'an arbitrary parameter' used for sin cycles corresponds with the adjustment process by 'the speed years' used for realizing the endogenous-equilibrium.

For example: (i) If the endogenous-equilibrium is moderate and smooth, the adjustment process is easily finished. (ii) If the endogenous-equilibrium is close to disequilibrium, it takes time to finish adjusting. In the case of (i), the wave of sin business cycle smoothly overlaps the wave of $i_{PRI/Y} = I_{PRI}/Y$ or $i_{G/Y} = I_G/Y$. Contrarily in the case of (ii), the wave of sin business cycle does not overlap the wave of $i_{PRI/Y} = I_{PRI}/Y$ or $i_{G/Y} = I_G/Y$, where the difference between these two waves is not buried easily. This implies that the situation is complicated.

14.5.1 Structure of sin curve

Hicks, John R. (1950), for the first time, formulated 'sin' type of business cycle. No one has proved his 'sin' empirically and endogenously up to date.

What are a ratio and/or ratios most fitted for determining (endogenous) real business cycle? The author has compared various combinations, similarly to Kuznets. As a preparation of this determination, the author needs to clarify the relationship between capital flow/net investment and capital stock, together with the relationship between the government and private sector. The author cites a paragraph in an earlier paper[1] (page 37, *PRSCE* 48 (Sep, 1): 29-63, 2007), which tested Hicks' 'sin' using KEWT 1.07 data-sets:

> Hicks J. (1950, 65-82, 170-181) formulated equations, paying attention to the multipliers and accelerators, separating the trend of consumption from the trend of investment, and introducing no consumption multiplier. Hicks (ibid., p.176, p.179 in Mathematical Appendix) shows 'cos' and 'sin' equations, referring to Moivre's theorem. The author does not review his equations in detail in this section. The author, however, found that Hicks's 'sin' measurement to business cycle is the best among others after testing various measurements, although Hicks did not show empirical results probably due to the lack of pertinent data at those times, similarly to Tinbergen Jan (1956).

In detail, let the author show how to formulate business cycle using Hicks' sin equations. Basically we need eleven elements to draw sin curve at two dimensions. The sin curve is composed of amplitude, *Am*; period, *Pe*; radians *x*, *Rad*; topological, *Top*; and business cycle, *Bc* or $B_{c(START)}$. Eleven elements are used for sin curve as expressed by parameters, *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, *j*, *l*, and $_{START}$. Three year averages of $i_{PRI} = I_{PRI}/Y_{PRI}$ and $i_G = I_G/Y_G$ are each designed for smoothness.[2] For example, the same

[1] For example, see the following equations to the multiplier theory and the accelerator theory, $I_n = A\sin(nh+k)$ to investment, or the combinations of cos and sin, $a = \rho\cos\vartheta$, $b = \rho\sin\vartheta$, $\rho = \sqrt{a^2+b^2}$, where $\tan\theta = b/a$, $u_1 = \rho(\cos\vartheta + i\sin\vartheta)$, and $A_1 = k(\cos\varepsilon + i\sin\varepsilon)$.

[2] The author got Hidetsugu Nagai's software newly this time. Nagai's software is similar to K. Tomoda's software to hyperbola drawing (see Appendix at the end of the *EES*)

Chari, V. V., Kehoe, Patrick J., McGrattan, Ellen, R. (781-836, 801-809, 815-818, 2007) shows five year average although the background is similar to neo classical. We think that three is better to five in the case of sin curve.

value of $i_{PRI} = I_{PRI}/Y_{PRI}$ at 1990 is arbitrarily added to that at 1989. Similarly, the same value of $i_{PRI} = I_{PRI}/Y_{PRI}$ at 2010 is arbitrarily added to that at 2011.

Am shows a hyperbolic curve of $Am = (1/(t-a)) + b$. Pe shows a non-linear curve of $Pe = c-(t/d)^3$. *Rad* shows an exponent curve of $Rad = RADIANS(t-e)$. *Top* shows a linear equation of $Top = f \cdot Rad + g$. Finally, business cycle, *Bc*, shows a sin curve of $Bc = Am \cdot SIN(Pe \cdot Rad) + Top$. If a resultant pattern of business cycle seems to be unnatural, *Bc* is replaced by $B_{c(START)}$, where the starting point of height is adjusted: $Bc = Am \cdot SIN(Pe \cdot Rad) + Top$, or $B_{c(START)} = Am \cdot SIN(Pe \cdot Rad +_{START}) + Top$.

As a criterion to determine each value of the above eleven parameters introduced into the sin equation, the author uses the trend of the growth rate of net investment by sector. This trend is expressed by a quadratic curve of $trend_{gI(PRI)} = h \cdot t^2 + j \cdot t + l$ or $trend_{gI(G)} = h \cdot t^2 + j \cdot t + l$.

14.5.2 Adjustment process of sin curve: five steps

Adjustment process for sin cycles is composed of five steps based on

$y = a(sin\, x) + b$:

1. Topology *b*; $b_{PRI} = f_{PRI}x + g_{PRI}$ and $b_G = f_G x + g_G$.
2. Starting point for the first cycle
3. Start angle, change so as to match, where $90^0 = \frac{\pi}{2} rad$.
4. Matching the number of peaks; *x* or period.
5. An arbitrary parameter for adjustment by year; amplitude *a* is adjusted as a result.

The above adjustment differs by the level of the endogenous-equilibrium, as explained at first. It implies that business cycle wholly reflects the quality of the endogenous-equilibrium. Behind the curtain, huge deficit and debts are hidden. Therefore, business cycle has been discussed in so many ways—using the real assets, financial and market assets, or both combinations, partially and wholly, in the literature.

14.5.3 Empirical adjustment process of sin curve

Table T1 shows topology equations at G and PRI. Needless to say, a positive gradient is preferred to negative gradient. Contrarily the intercept has its meaning: If it is too high, the country may aims at higher growth, apart from maximum return minimum net investment. A true leader does not aim at mere expansion.

Table T1 shows 36 countries, 2005-2010, developed versus developing; small populated versus six countries suffering from the current financial crisis; and Asian steady countries versus unique countries. Business cycle shows a result of real-assets economic policies. Each country enjoys higher growth more money and suffers from bubbles and resultant financial crisis. Each country is able to stop the occurrence of bubbles by using an endogenous valuation ratio, as the author repeatedly indicated hitherto. Moderate growth is controllable and business cycle becomes moderate and sustainable. **Figures BC-1** to **BC-6** and **BCL** follow Table T1.

The author added long results of business cycle, 1960-2010, at PRI and G sectors. The results suggest that we need moderate equilibrium. Otherwise, growth power is weakened and bubbles are repeated wastefully. In this sense, topology, $b_{PRI} = f_{PRI}x + g_{PRI}$ and $b_G = f_G x + g_G$, are good indicators. Most important is dynamic balance between PRI and G sectors. Some countries serve PRI sector while other countries serve G sector. The PRI sector is the first priority, as the golden saying of the people, for the people, and to the people. This level depends on people's consciousness and no others. We march step by step towards cooperative real world by integrating national taste with technology.

Full employment is guaranteed at any level of the endogenous-equilibrium. Behind the curtain, another relationship is hidden. This is the relationship between the rate of change in population and the ratio of net investment to disposable income, $i_{PRI} = I_{PRI}/Y_{PRI}$ and $i_G = I_G/Y_G$. This relationship is expressed by another hyperbola, $i(n)$ or $i(n)$ (see Appendix Hyperbolas at the end of the *EES*). The next chapter sums up the rate of technological progress and different levels of net investment which differ from an endogenous net investment. A true discovery is found only when the rate of change in population changes along with various levels of net investment.

For readers' convenience: contents of figures hereunder

Notes for Figures IS1, IS2, and IS3:

Figure IS1 compares 6 developed countries with BRICs countries: the US, Japan, Australia, France, Germany, and the UK; China, India, Brazil, Russia, and South Africa, and Mexico. **Figure IS2** compares EU countries with non-EU Europe countries: Denmark, Finland, Netherlands, Norway, Sweden, and Canada; Greece, Iceland, Ireland, Italy, Portugal, and Spain. **Figure IS3** compares Asia countries with Rest countries: Indonesia, Korea, Malaysia, Philippines, Singapore, and Thailand; Bangladesh, Pakistan, Saudi Arabia, Sri Lanka, Czech Rep, and Poland.

The author does not comment the contents by country, for simplicity here but summarizes suggestions expressed by Figures IS1, IS2, and IS3. The following summary is worthy of a preparatory step to interpret business cycle observed at the PRI and G sectors.

1. Changes in net investment level, 1990-2010, express the loci of policy-makers by country.
2. Each country has its own characteristics in whole economic policies to real, financial, market, and central bank. Readers may confirm the differences between economic policies over years.
3. Policy-makers' efforts are surprising by year, coping with national taste, preferences, culture, and even civilization. The author feels their sincere efforts over years, beyond description. Results reflect philosophy of leaders and policy-makers.
4. A simple litmus paper to their efforts and prompt execution of policies is the balances between the government and private sectors and those between actual/statistics data and endogenous data.
5. The above balances must be moderate or within a controllability of leaders and policy-makers.
6. Democracy is not the best but the second political system. Democracy needs immediate openness and publication, as advocated by Kant. People must be interested in country's future and responsible for next generations, each by each and; towards cooperative global economies in reality by country.

Here is a story of wash hand basin/wash tab, filled with water and on a flat floor.

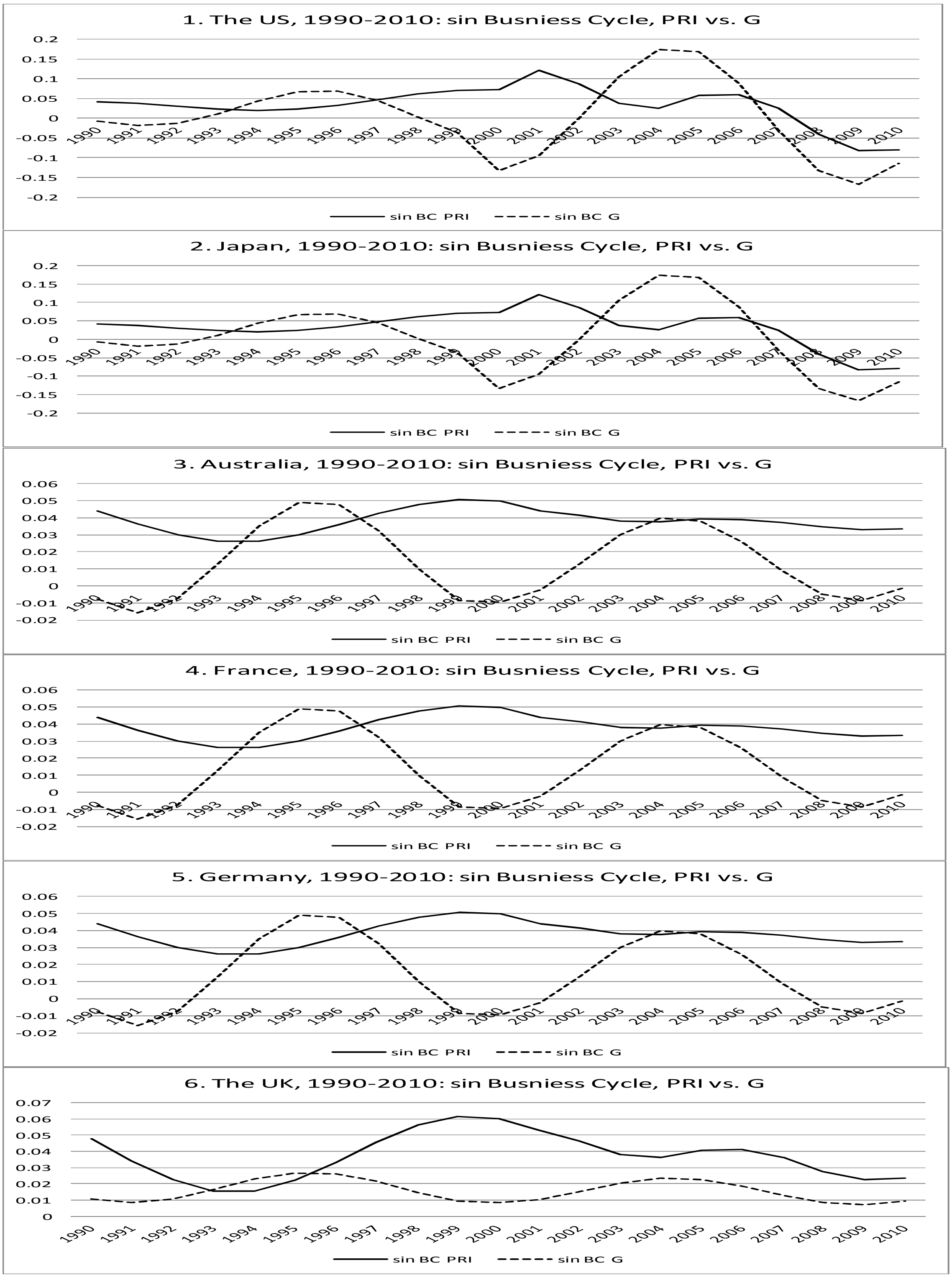
1) *First give* person wants water to give water for an opposite person but, water soon returns back to *first give* person.
2) *First take* person wants water to take water near to the *first take* person but, water soon runs opposite side of the *first take* person.
3) The flat surface of water is moderate and most composed. Democracy requires ever-lasting moderation in practice and decision-making.

Table T1 Topology of sin in $y = a(\sin x) + b$, by sector, 1990-2010

1. the US	bPRI=-0.0035x+0.0784	bG=0.004x-0.0129
2. Japan	bPRI=0.0005x+0.0071	bG=0.004x-0.0129
3. Australia	bPRI=0.0041x+0.0522	bG=0.0015x-0.0041
4. France	bPRI=0.0002x+0.04	bG=0.0015x-0.0041
5. Germany	bPRI=-0.0038x+0.0858	bG=0.0015x-0.0041
6. the UK	bPRI=-0.00009x+0.0395	bG=-0.0002x+0.0187
7. China	bPRI=0.0073x+0.2764	bG=0.00005x+0.0448
8. India	bPRI=.0022x+0.0398	bG=0.004x+0.0711
9. Brazil	bPRI=-0.0052x+0.2063	bG=0.0002x+0.0096
10. Mexico	bPRI=-0.0004x+0.1539	bG=-0.0005x+0.0823
11. Russia	bPRI=0.0049x+0.0133	bG=-0.0005x+0.0823
12. Sourth Africa	bPRI=0.0044x+0.0672	bG=0.0004x+0.033
1. Denmark	bPRI=0.0019x+0.0156	bG=0.0039x-0.0153
2. Finland	bPRI=0.004x-0.0129	bG=-0.0035x+0.0784
3. Netherlands	bPRI=-0.0027x+0.0908	bG=0.0001x+0.0263
4. Norway	bPRI=0.0014x+0.0616	bG=0.0008x+0.0009
5. Sweden	bPRI=0.0005x+0.0422	bG=-0.001x+0.0227
6. Canada	bPRI=-0.002x+0.1108	bG=0.0002x+0.0096
7. Greece	bPRI=0.0026x+0.0877	bG=0.0005x+0.0116
8. Iceland	bPRI=0.0084x+0.0026	bG=0.0032x+0.0012
9. Ireland	bPRI=-0.0004x+0.2123	bG=0.0051x-0.0134
10. Italy	bPRI=-0.0028x+0.0999	bG=0.0005x+0.013
11. Portugal	bPRI=-0.0058x+0.1817	bG=0.0007x+0.0299
12. Spain	bPRI=-0.0009x+0.119	bG=-0.0012x+0.021
1. Indonesia	bPRI=-0.0035x+0.2331	bG=-0.0016x+0.0582
2. Korea	bPRI=-0.0082x+0.3071	bG=-0.0013x+0.04
3. Malaysia	bPRI=-0.0138x+0.3819	bG=0.002x+0.0409
4. Philippine	bPRI=0.0021x+0.0621	bG=-0.0005x+0.0823
5. Singapore	bPRI=-0.0037x+0.2706	bG=0.0004x+0.033
6. Thailand	bPRI=-0.0066x+0.3077	bG=0.0015x+0.0428
7. Bangladesh	bPRI=0.0017x+0.0314	bG=-0.0002x+0.0517
8. Pakistan	bPRI=0.0011x+0.0525	bG=0.0001x+0.0416
9. Sadi Arabia	bPRI=-0.0013x+0.0912	bG=0.0009x+0.0294
10. Sri Lanka	bPRI=0.0006x+0.1289	bG=-0.0003x+0.0634
11. Czech Rep	bPRI=0.0055x+0.1006	bG=0.0028x+0.0136
12. Poland	bPRI=-0.0006x+0.092	bG=0.0013x+0.0027
1. Japan, 1960-2010	bPRI=-0.0045x+0.2336	bG=-0.0011x+0.0781
2. the US, 1960-2010	bPRI=-0.002x+0.1254	bG=-0.0011x+0.0781

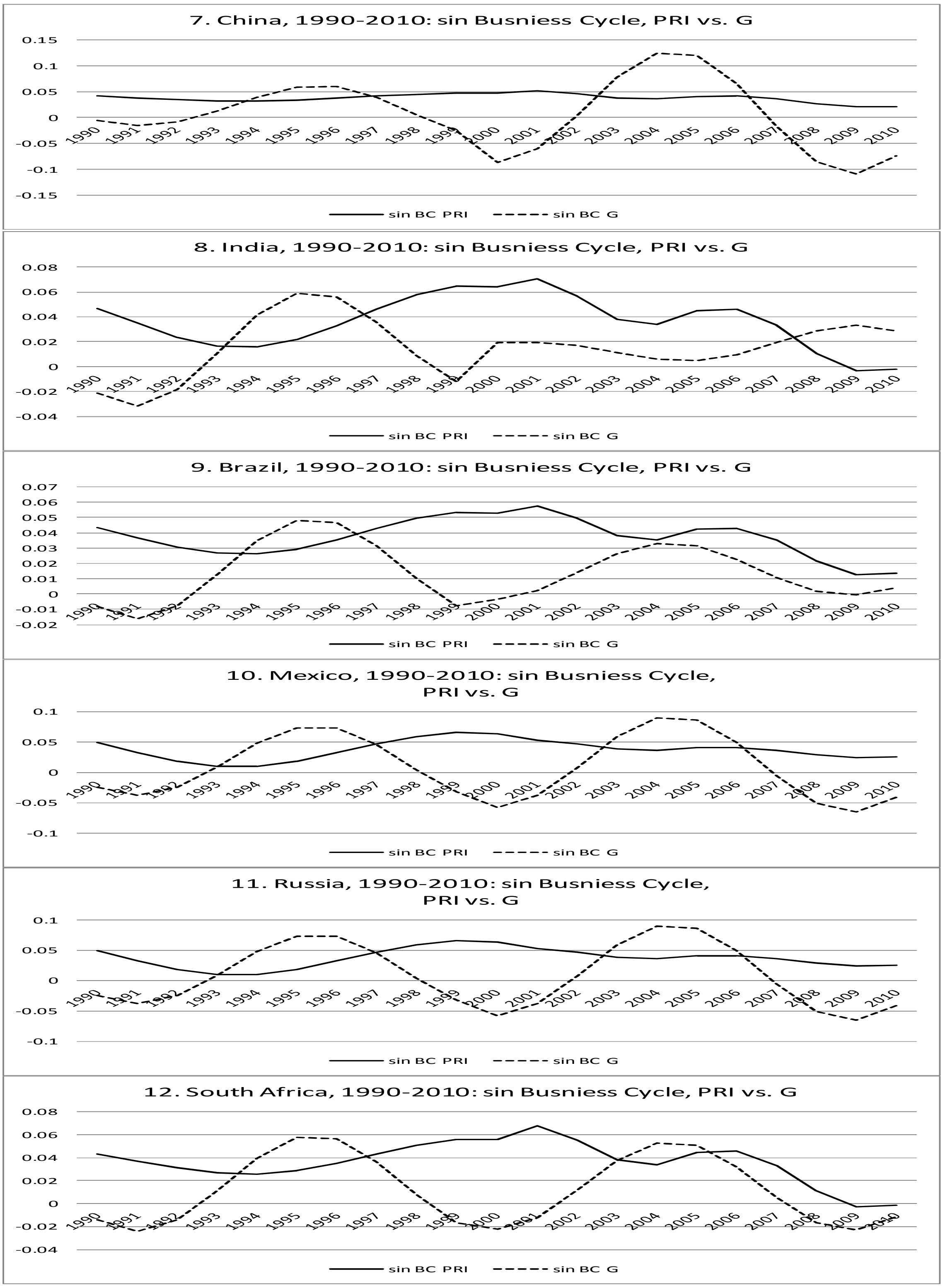
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Note: $y = ax + b$ is divided into two parts: $b_{PRI} = ax + c$ and $b_G = dx + e$, as shown in this table.



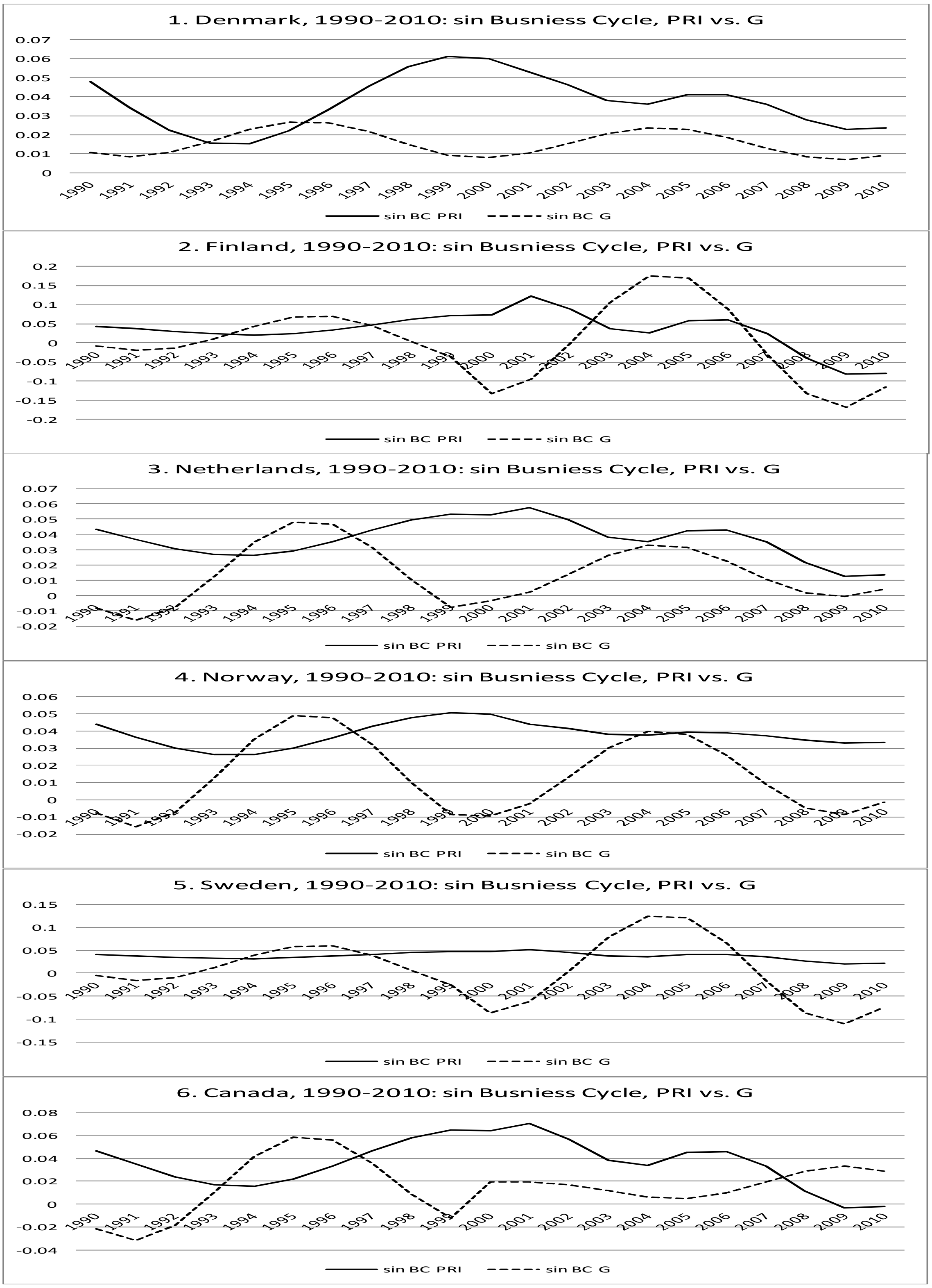
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BC1 sin business cycle, G vs. PRI: six developed countries



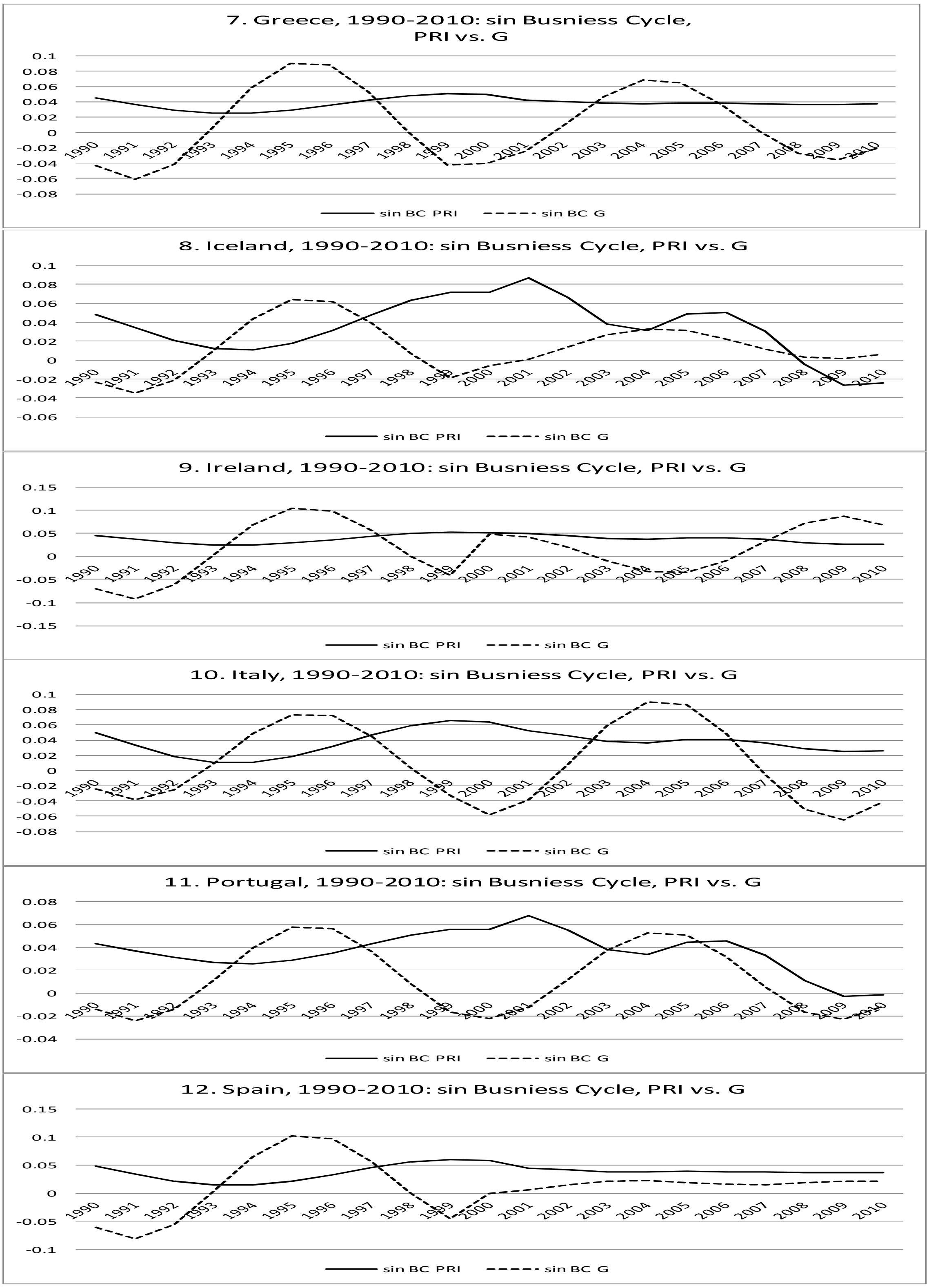
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BC2 sin business cycle, G vs. PRI: six developing countries



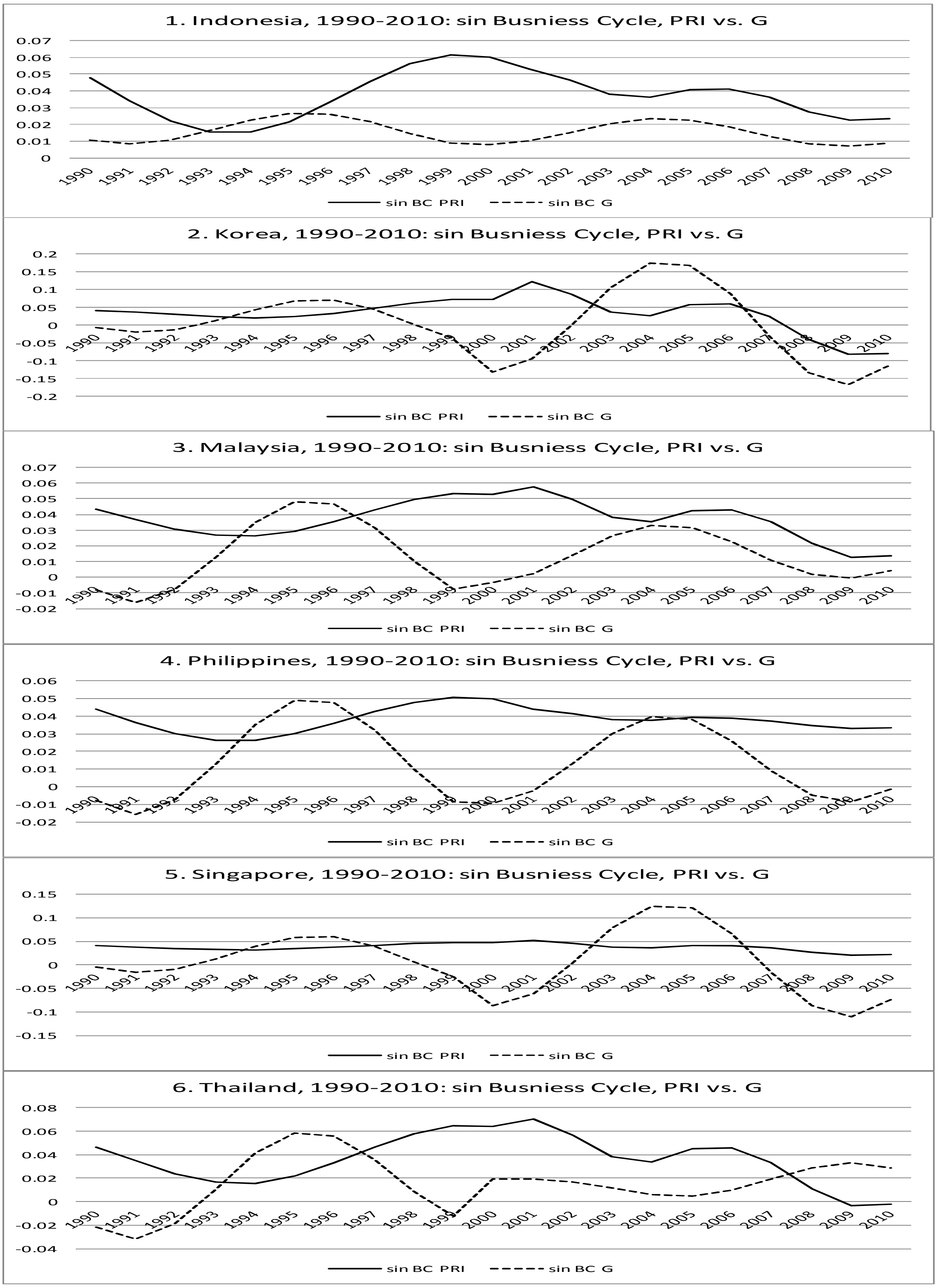
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BC3 sin business cycle, G vs. PRI: developed countries with small population



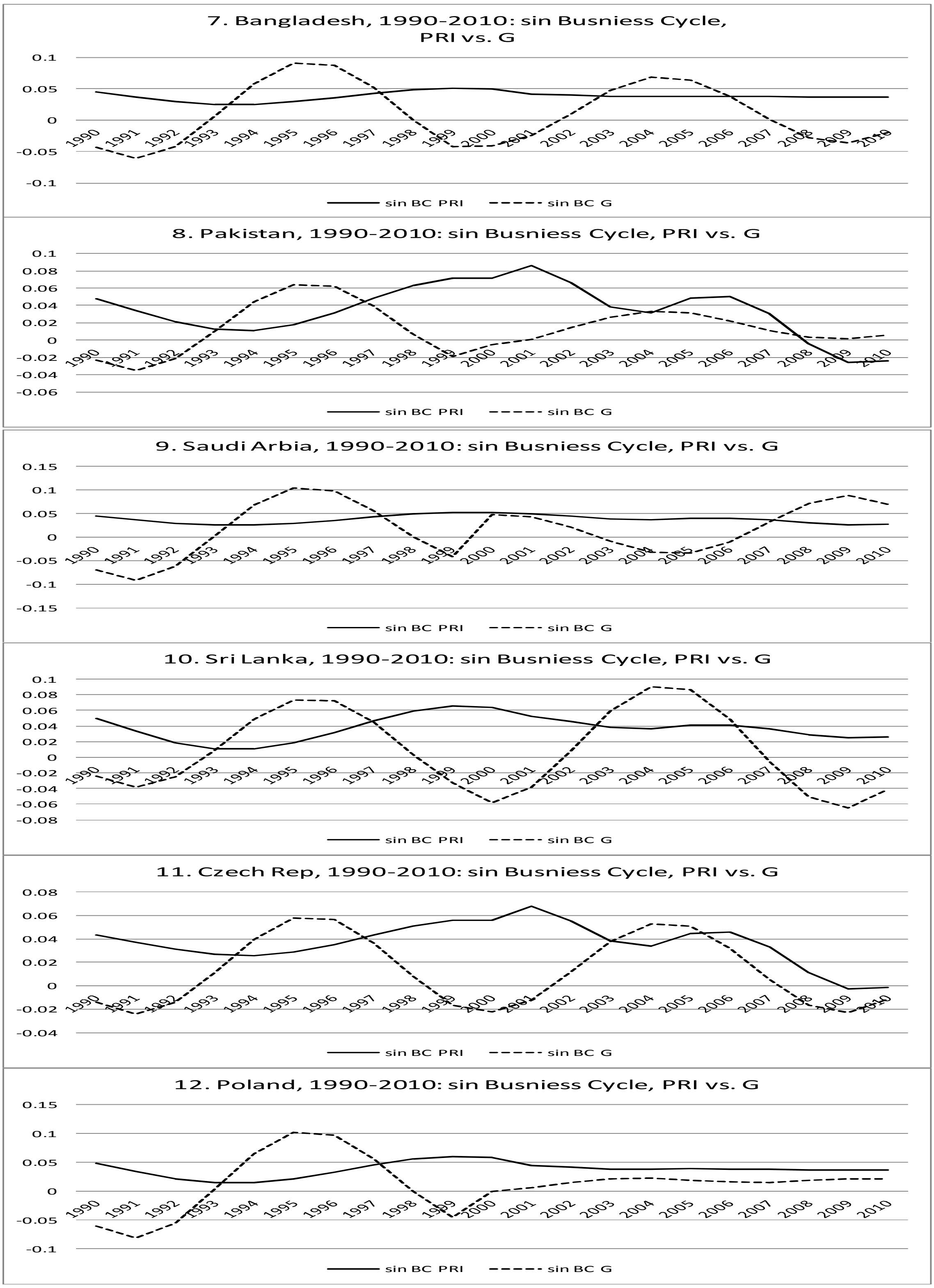
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BC4 sin business cycle, G vs. PRI: developed countries with huge debts



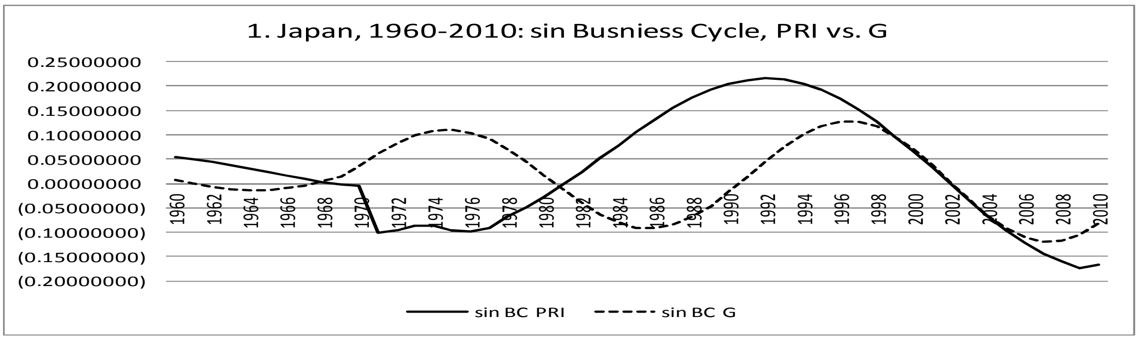
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

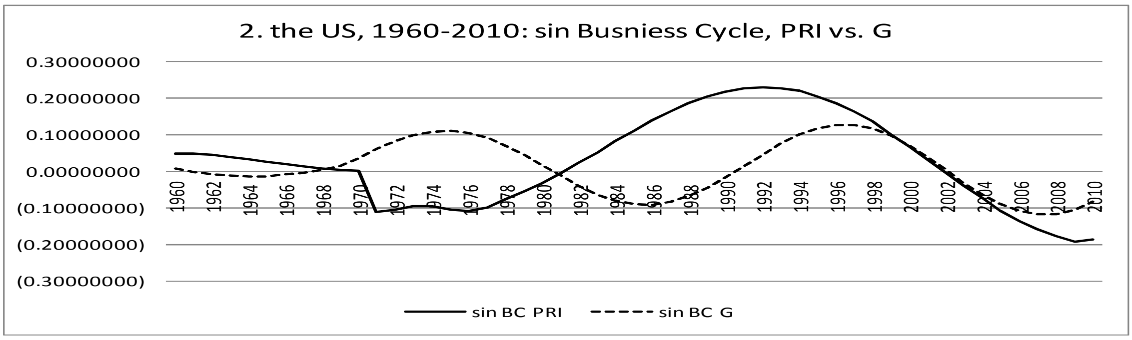
Figure BC5 sin business cycle, G vs. PRI: Asian developing countries



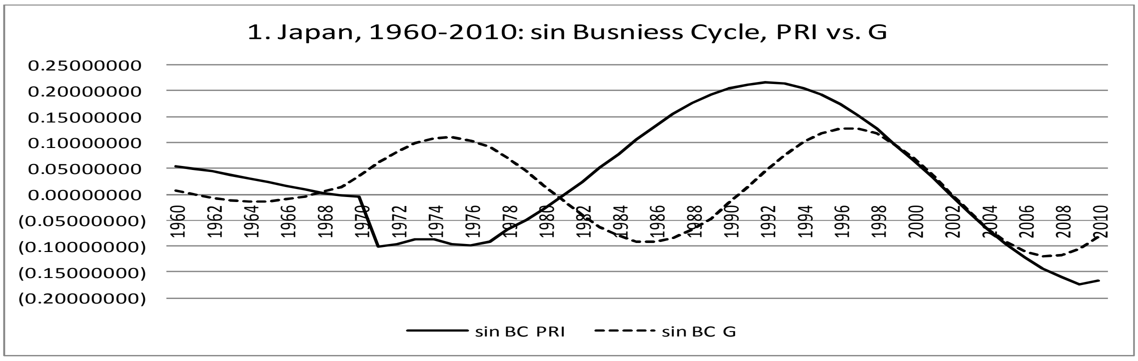
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

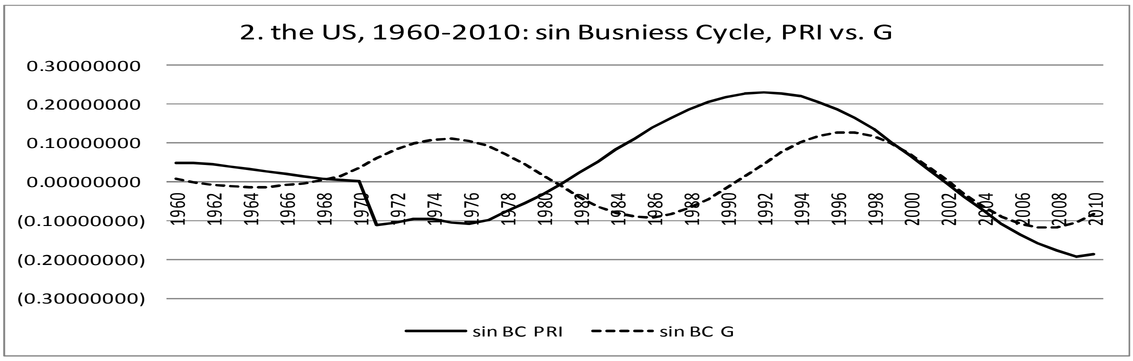
Figure BC6 sin business cycle, G vs. PRI: unique and East European countries





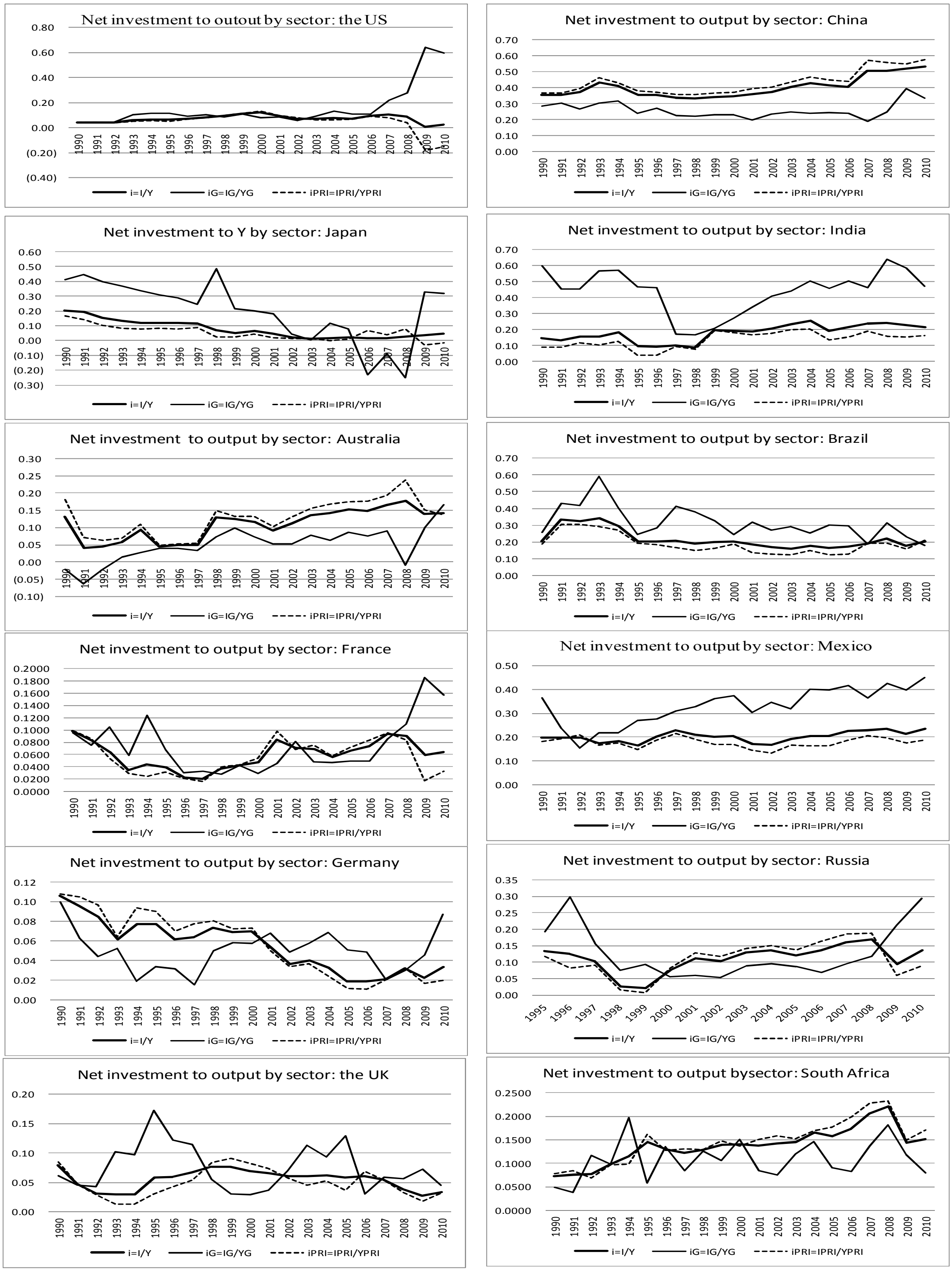
Above before adjustment process and, **below** after adjustment process: Almost no difference. It implies that there exists moderate equilibrium for 51 years at Japan and the US and, data are exact.





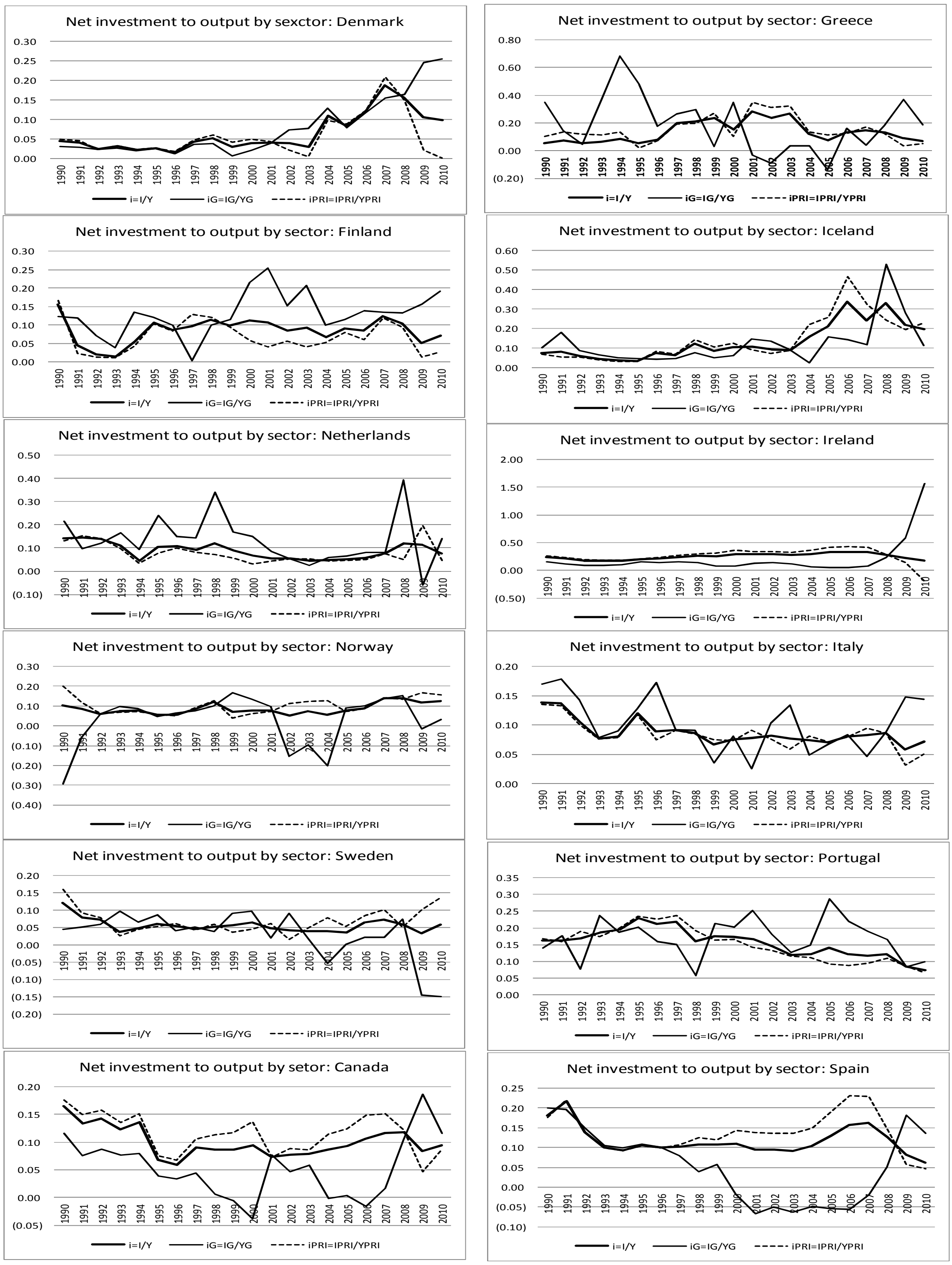
Data source: KEWT 6.12-6 by sector, 1960-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure BCL sin business cycle, G vs. PRI: Japan, 1960-2010 and the US, 1960-2010



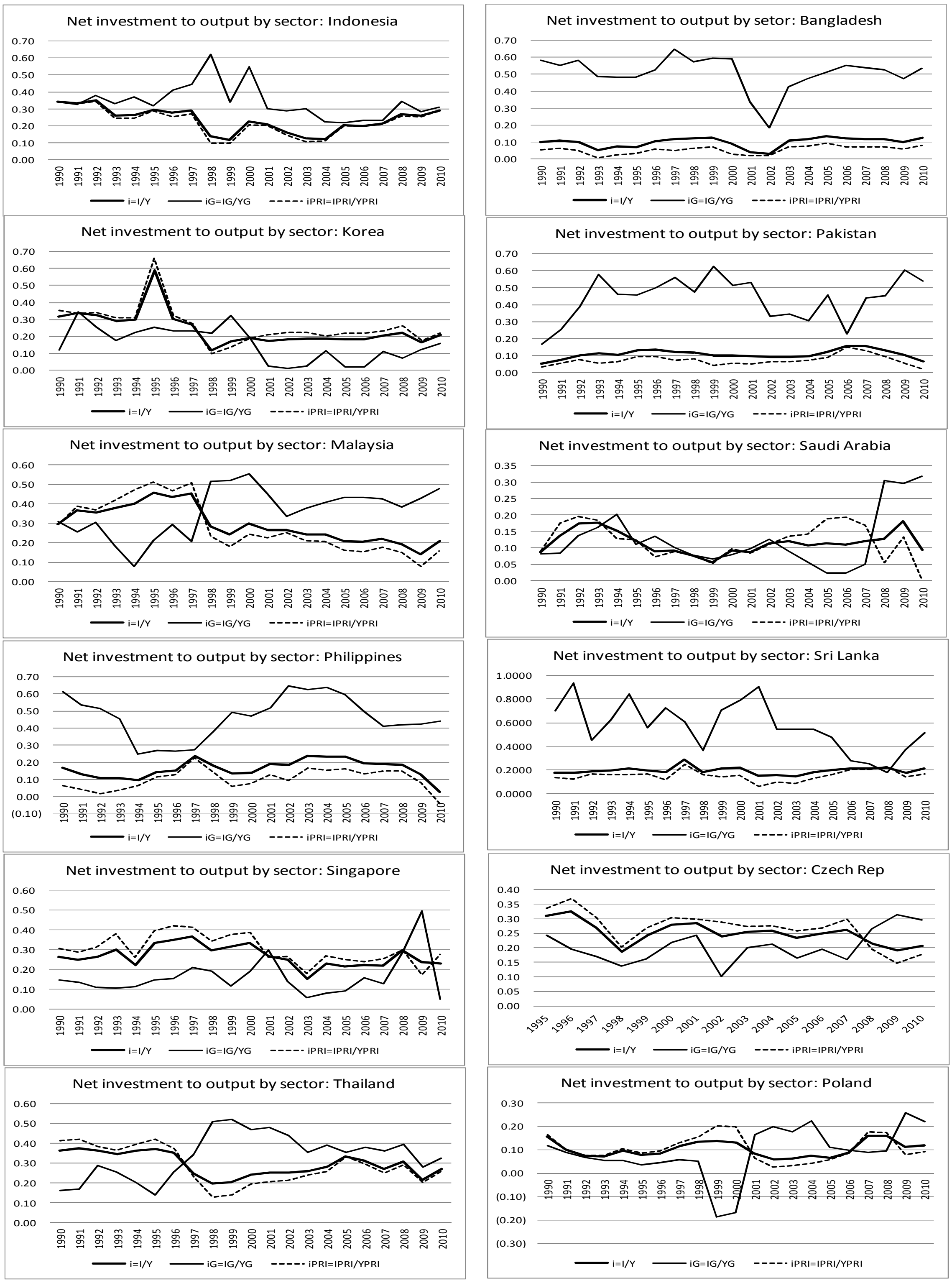
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure IS1 Net investment levels by sector as a base for business cycle: 6 developed countries *vs.* 5 BRICs countries and Mexico



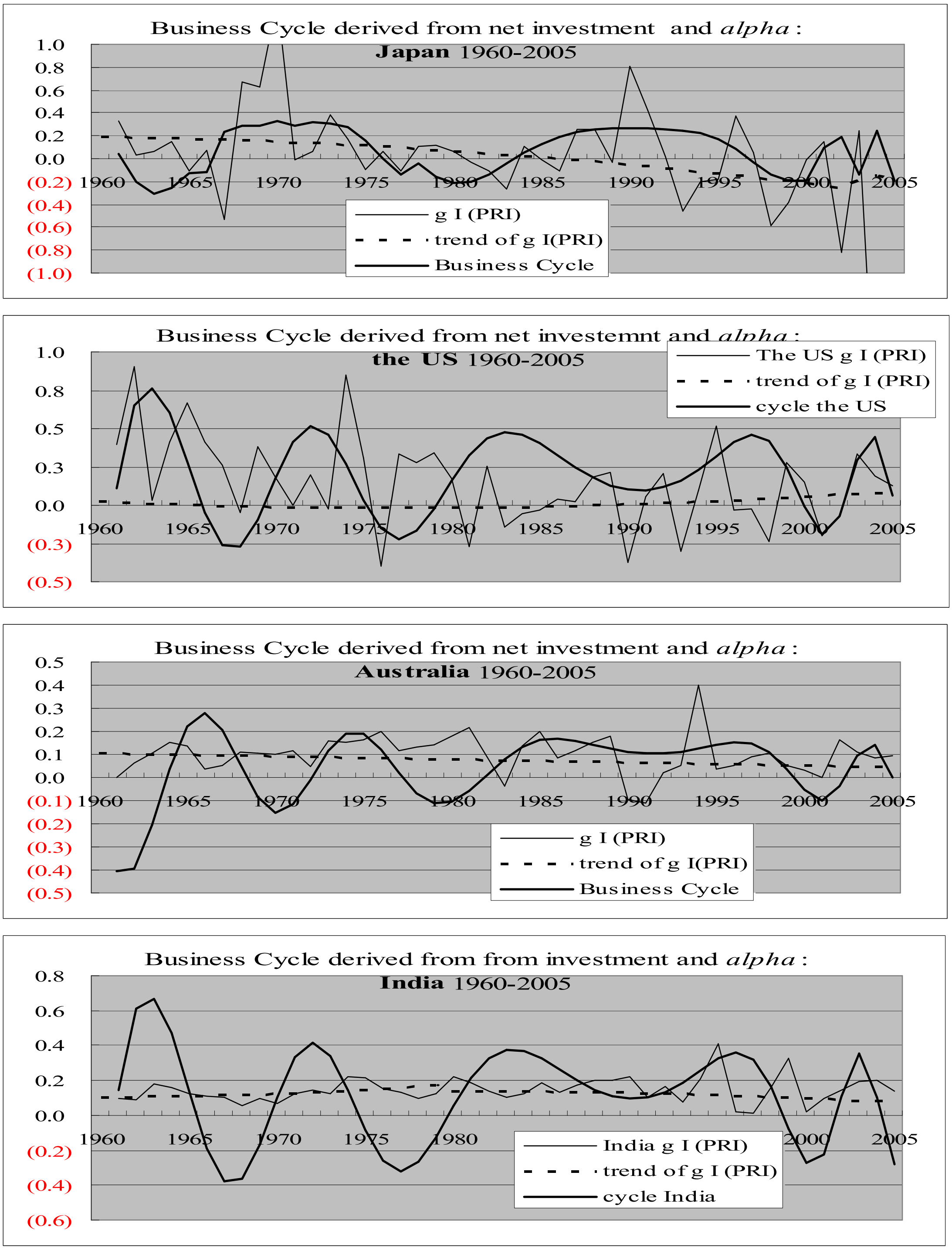
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Figure IS2 Net investment levels by sector as a base for business cycle: 12 Europe countries



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

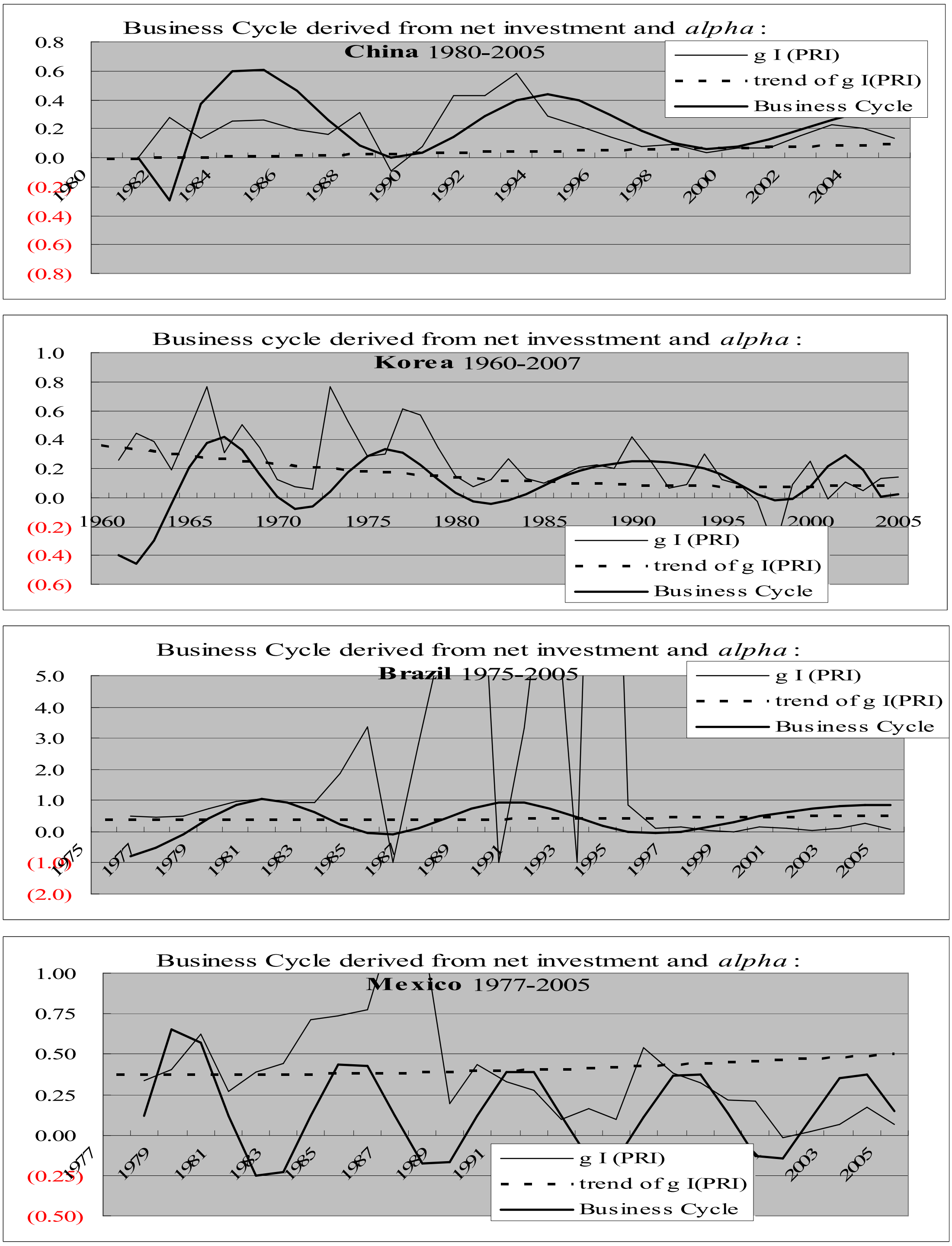
Figure IS3 Net investment levels by sector as a base for business cycle: 12 Asian and Rest countries



Data source: KEWT 1.07

Note: A base of cyclical trend is made of the growth rate of net investment in the private sector and the difference of the economic stage. For whole background analysis to BRICs, China, Korea, Mexico, Russia, see *Finance India* 23 (Sep, 3): 821-866 (FI233-Art02 BRICs 1.07.pdf). The author got Permissions to use, on 19 Aug, 2012.

Figure LBC1 Business cycle: Japan, the US, Australia, and India 1960-2005



Data source: KEWT 1.07

Note: A base of cyclical trend is made of the growth rate of net investment in the private sector and the difference of the economic stage. For whole background analysis to BRICs, China, Korea, Mexico, Russia, see *Finance India* 23 (Sep, 3): 821-866 (FI233-Art02 BRICs 1.07.pdf). The author got Permissions to use, on 19 Aug, 2012.

Figure LBC2 Business cycle: China, Korea, Brazil, and Mexico 1980/60/75/77-2005

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Chapter 15

Population Growth Negatively Related to Technology and Its Growth

Signpost to Chapter 15

This Chapter states one lucky discovery that the less the rate of change in population the more the rate of technological progress in the endogenous-equilibrium. For example, if an annual growth rate of population of a country is beyond 3%, it is difficult for the country to maintain endogenous equilibrium moderately and sustainably. Adversely, even if an annual growth rate of population of a country is minus 0.5%, it is all right for the country to maintain endogenous equilibrium moderately and sustainably. This discovery commonly works in developing and developed countries. This discovery simultaneously realizes stop-macro inequality since the level of the relative share of capital is indifferent from inequality. This discovery eventually follows the law of the Nature. This discovery is cyclical and peaceful with limited resources of the Earth, because the rate of technological progress is essentially accelerated by limited resources.

Now the time has come when everlasting green technological progress becomes at the best. For us green cyclical economics are most welcome. The endogenous system ever starts with the rate of technological progress. Now we preserve and enjoy an endogenous rate of technological progress with mankind, animals, and plants on this universe Earth. The rate of technological progress is endowed with pure quality. Yet it is possible for the same level of quality to exist at different levels of spirituality, transiting from money and expansion to love Nature, people, and animals and plants.

Recall, in Chapter 1, BOX 1-3 'Cross-Roads Scientific Discovery (C-RSD) Diagram: positioning of natural, social, and behavioral sciences on a two dimensional topology.' We remain a fixed level of spirituality. The *EES*, for the sake of finding scientific discoveries, stays at the same level of spirituality. Within the current fixed level of spirituality, we are now embracing love Nature, people, and animals and plants. People have already stepped into various natural fields and sciences. People, leaders, and policy-makers, as a result, recover calm spirit with our lucky discovery of Chapter 15 as a highlight of the *EES*.

15.1 Introduction: Endogenous Framework of Population to Technology

This chapter challenges for an unsolved problem lying between population and technological progress. Theoretical and empirical proofs are reinforced by hyperbolas at the end. Chapter 14 challenged for 'sin' business cycle by sector, with capital (stock) and the ratio of net investment to output (flow), $i = I/Y$. Chapter 15 simulates population (stock) and the rate of change in population (flow), $n_E = n$, and revisits a few memorial papers. Technological progress, using stock and flow, is measured by the growth rate of total factor productivity (*TFP*, stock), g^*_{TFP}, and the rate of technological progress (flow), $g^*_A = i(1-\beta^*)$. For g^*_{TFP}, see Chapter 6 that simultaneously measures capital stock and its rate of return. The rate of technological progress is related to the growth rates of per capita output and output, commonly to the literature.

This chapter spreads population-simulation as a means. Simulates different arbitrary levels of net investment and gets resultant population levels, here apart from the data measured at the endogenous-equilibrium. An idea of 'Plans' is set up. The author sets Plans by length of periods, 10, 20, and 50 years, and calculates each discount rate of population by arbitrary net investment level. Notation is the same for (i) the (endogenous) rate of change in population, $n_E = n$, under the endogenous-equilibrium and for (ii) an arbitrary discount rate used for simulation, $n_E = n$. Only difference is the length of periods: (i), infinite versus (ii), finite, 10, 20, and 50 years. [1]

The idea of Plans was born with two incentives: First; there is no definite answer to population and technology in the literature. Second; Shanghai City now plans to build a green economy at Island Zhangjim, 張江. This island faces to Shanghai, which has 20 million residents. Shanghai government experiments a 'green economy area' on this Island. The project starts in 2012. A problem remains: Whether it is endogenously acceptable or not for the island to rapidly raise population from the current 50 thousands up to 250 thousands by 2022. The level of green economy is characterized by the Earth, mankind, and high philosophy of Island. The author hears that Jianxiong Wang is responsible for cyclical eco-oriented work. Thus the author has experimented population-simulations using KEWT database 6.12, 1990-2010 (for some results, see Special Note to Jianxiong, at the end of this Chapter).

15.2 Simulation Results of the Rate of Change in Population, from the Viewpoint of Whole Policies

This section presents simulation results of the change in population on growth and returns under the endogenous-equilibrium. The rate of change in population is one of the most fundamental ratios in the endogenous system. Maddison, A. (in particular, 1987,

[1] A fixed discount rate is originally used in an infinite time as $\sum_{n=1}^{\infty}(1+r)^{-n} = 1/r$. For example, the endogenous-system, based on Samuelson's (155-161, 1937) utility idea, measures a rate of return endogenously instead of an external rate of interest. It is justified for a policy-maker to measure the relative discount rate of consumer goods to capital goods, *rho/r*, as a preferences function of the propensity to consume, $c = C/Y$, where (rho/r) indicates national taste/preferences/culture: $(rho/r)(c)$ and $(rho/r) = 13.301c^2 - 22.608c + 10.566$. This is because technology and national taste/ preferences/culture are favorably integrated at the endogenous-system.

1991, 1995, and 1996) historically clarified the importance between the rate of change in population and *GDP*. Before starting, the author needs to clarify the relationship between the rate of change in population and the discount rate used for population-simulation. The relationship is indispensable for the framework of population and technology. The rate of change in population is denoted as n_E. The growth rate of population in statistics is denoted as $n = (L_t - L_{t-1})/L_{t-1}$. KEWT 6.12 sets $n_E = n$. $n_E = n$ implies that there exists no unemployment because the rate of unemployment is endogenously zero under a condition of $n_E = n$.

The discount rate holds with a sufficient condition that a simulated rate of net investment to output is free from the rate of net investment to output endogenously measured at the endogenous-system. As a result, we are able to freely compare respective values of variables by $i = I/Y$. The discount rate also holds with a necessary condition that guarantees $n_E = n$ at population-simulation. Thus, the discount rate is defined as a rate of change in population that guarantees full-employment, $n_E = n$, each for three Plans; 10, 20, and 50 periods/years.

BOX 15-1 shows simulation results, with related **Figure P1**, and **Tables P1** to **P3**.

BOX 15-1 Endogenous results of simulation by population-change, using China data-sets in KEWT

Simulation	i=I/Y	n	α	Ω	β^*	$B^*=(1-\beta^*)/\beta^*$	δ_0	$g_A^*=i(1-\beta^*)$	**$1/\lambda^*$**	g_y^*	$r^*=\alpha/\Omega$	$g_Y^*=r^*/x$	v*=V*/K
China T	0.53	0.00617	0.54	3.17	0.8793	0.137	0.4187	0.0645	**24.81**	0.1411	0.1712	0.1481	7.42
Case 1	0.20	0.17462	0.20	2.00	1.18956	(0.159)	#NUM!	(0.0379)	**#NUM!**	(0.0474)	0.1000	0.1190	(5.28)
Case 2	0.20	0.09596	0.20	2.00	0.98919	0.011	0.8465	0.0022	**12.97**	0.0027	0.1000	0.0989	92.52
Case 3	0.20	**0.05241**	0.20	2.00	0.86893	0.151	0.6336	0.0262	**19.40**	0.0328	0.1000	**0.0869**	7.63
Case 4	0.20	**0.02257**	0.20	2.00	0.78227	0.278	0.4580	0.0435	**24.01**	0.0544	0.1000	**0.0782**	4.59
Case 5	0.20	0.17462	0.25	2.00	1.18057	(0.153)	#NUM!	(0.0361)	**#NUM!**	(0.0482)	0.1250	0.1181	18.01
Case 6	0.20	0.09596	0.25	2.00	0.98970	0.010	0.8482	0.0021	**13.83**	0.0027	0.1250	0.0990	4.80
Case 7	0.20	**0.05241**	0.25	2.00	0.87497	0.143	0.6437	0.0250	**20.74**	0.0333	0.1250	**0.0875**	3.33
Case 8	0.20	**0.02257**	0.25	2.00	0.79222	0.262	0.4821	0.0416	**26.01**	0.0554	0.1250	**0.0792**	2.73
Case 1-2	0.20	0.17462	0.20	1.50	1.09669	(0.088)	#NUM!	(0.0193)	**#NUM!**	(0.0242)	0.1333	0.1462	(10.34)
Case 2-2	0.20	0.09596	0.20	1.50	0.90824	0.101	0.8231	0.0184	**12.50**	0.0229	0.1333	0.1211	10.90
Case 3-2	0.20	**0.05241**	0.20	1.50	0.79587	0.256	0.7020	0.0408	**18.49**	0.0510	0.1333	**0.1061**	4.90
Case 4-2	0.20	**0.02257**	0.20	1.50	0.71523	0.398	0.5597	0.0570	**23.19**	0.0712	0.1333	**0.0954**	3.51
Case 5-2	0.20	0.17462	0.25	2.50	1.24062	(0.194)	#NUM!	(0.0481)	**#NUM!**	(0.0642)	0.1000	0.0992	133.26
Case 6-2	0.20	0.09596	0.25	2.50	1.04287	(0.041)	#NUM!	(0.0086)	**#NUM!**	(0.0114)	0.1000	0.0834	6.03
Case 7-2	0.20	**0.05241**	0.25	2.50	0.92350	0.083	0.6321	0.0153	**22.25**	0.0204	0.1000	**0.0739**	3.83
Case 8-2	0.20	**0.02257**	0.25	2.50	0.83715	0.195	0.4403	0.0326	**28.45**	0.0434	0.1000	**0.0670**	3.03
KEWT6.12	i=I/Y	n	α	Ω	β^*	$B^*=(1-\beta^*)/\beta^*$	δ_0	$g_A^*=i(1-\beta^*)$	**$1/\lambda^*$**	g_y^*	$r^*=\alpha/\Omega$	$g_Y^*=r^*/x$	v*=V*/K
Japan, 2010	0.05	**(0.00126)**	0.10	3.69	0.7837	0.276	(0.0138)	0.0103	**107.87**	0.0114	0.0261	0.0101	1.63
the US, 201	0.02	**0.00947**	0.21	2.00	0.9386	0.065	0.7462	0.0015	**126.96**	0.0019	0.1042	0.0114	1.12
China, 2010	0.53	**0.00617**	0.54	3.17	0.8793	0.137	0.4187	0.0645	**24.81**	0.1411	0.1712	0.1481	7.42
India, 2010	0.22	**0.01374**	0.20	1.60	0.7023	0.424	0.4513	0.0644	**21.56**	0.0800	0.1219	0.0949	4.50

Note 1: For the above simulation, the discount rate of Cases 1 to 8 and 1-2 to 8-2 were tested. The followings are selected moderate cases:

Note 2: The rate of change in population presents a base for any whole policies by area. The above simulations roughly suggest that the rate of change in population should be less than 5.0%; or more moderately, 2.25%. If the rate of change in population is too high, the endogenous- equilibrium is broken at any country (see the speed years, $1/\lambda^*$, shown by bold in the above BOX 15-1).

Note 3: Seven endogenous parameters determine all the parameters and variables simultaneously using the discrete Cobb-Douglas production function under constant returns to scale. Seven endogenous parameters are: the ratio of net investment to output, $i = I/Y$; the rate of change in population, $n_E = n$; the relative share of capital, $\alpha = \Pi/Y$; the capital-output ratio, $\Omega = K/Y$; the technology coefficient or the qualitative/quantitative net investment coefficient, β^*; the diminishing returns to capital coefficient, δ_0. (For each equation, see Notations at the beginning of the *EES*). The above simulations, each time, set $i = I/Y$, $n_E = n$, and $\alpha = \Pi/Y$ fixed.

base	Periods	i=I/Y	n	α	Ω
	10yrs				
Case 3 & 4	Plan 10	0.20	0.05241 fixed	0.20	1.50
	Plan 10-2	0.20	0.05242→0	0.20	1.50
	Plan 10-3	0.20	0→0.05242	0.20	1.50
	20 yrs				
Case 3 & 4	Plan 20	0.20	0.05241 fixed	0.20	1.50
	Plan 20-2	0.20	0.05242→0	0.20	1.50
	Plan 20-3	0.20	0→0.05242	0.20	1.50
	50yrs				
Case 7 & 8	Plan 50	0.20	Min at 25yrs	0.25	2.50
	Plan 50-2	0.20	0.02257 fixed	0.25	2.50
	Plan 50-3	0.20	Max at 25yrs	0.25	2.50

After deleting unstable Case 1 (n=0.17463) & Case 2 (n=0.09596).

Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Now look at **Tables P1, P2,** and **P3** and confirm simulation results numerically in these tables, in particular, the valuation ration, by sector.

1. Changes in population, implicitly and explicitly and, in the long run, influence the execution of policy-makers by country.

2. Each country has its own characteristics in whole economic policies to real, financial, market, and the central bank.

3. Policy-makers' efforts are respectable by year, cooperating national taste, preferences, culture, and even civilization. The author accepts their sincere efforts over years, beyond description. Results reflect philosophy of leaders and policy-makers.

4. What is a simple litmus paper to their efforts and prompt execution of policies? This is the balance between the government sector and the private sector, as well as the balance between actual/statistics data and endogenous data.

5. The above balances must be moderate or within a controllability of leaders and policy-makers.

6. Democracy is not the best but the second political system. Democracy needs immediate openness and publication, as advocated by Kant. People must be interested in country's future and responsible for next generations, each by each and cooperatively.

BOX 15-2 Summing up: three discount rates, increasing, fixed, and decreasing, to control periods under the rate of change in population

1. Periods: 50 years. 50 years are divided into three periods: The first 20 years, constant 10 years, and the third 20 years.

2. The rate of change in population, $n_E = n$:

Cases 10 and 20, 0.05241, each fixed by year. Case 10-2; decreasing, set from 0.05241 to 0.00591 for 10 years. Case 20-2; decreasing, set from 0.05241 to 0.00510 for 20 years. Cases 10-3; increasing, set from 0.00591 to 0.05221 for 10 years. Case 20-3; increasing, set from 0.005 to 0.05262 for 20 years.

Case 50; set 0.02257 fixed, by year and for 50 years.

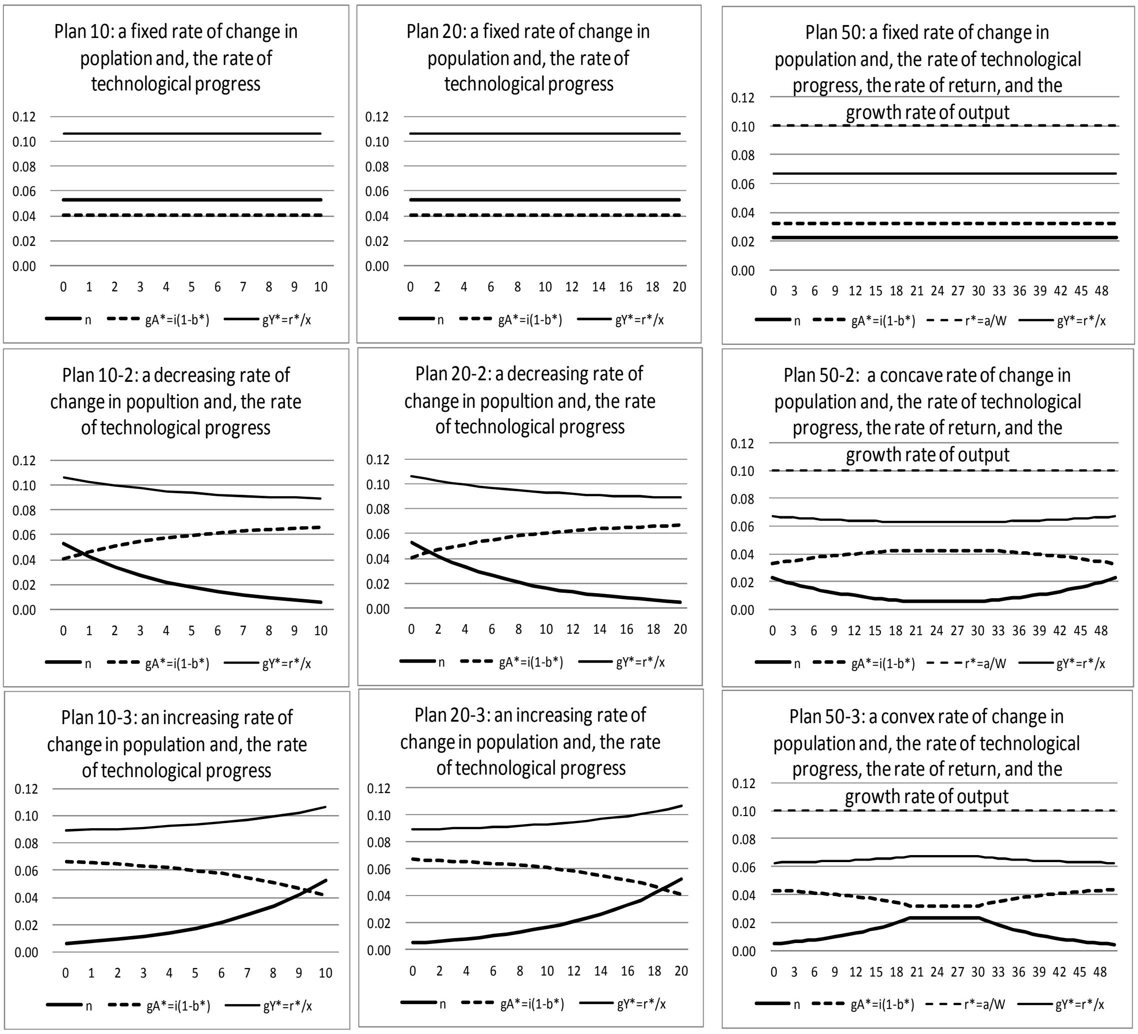
Case 50-2 concave; set from 0.02257 to 0.00569 for the first 20 years; set 0.00568 for 10 years; and set from 0.00568 to 0.02265 for the third 20 years.

Case 50-3, convex; set from 0.005 to 0.02330 for the first 20 years; set 0.02330 for 10 years; and set from 0.02330 to 0.00440 for the third 20 years.
Minimum is 0.00617; average is 0.02257; maximum is 0.05241.

3. For the discount rate: Cases 10, 20, and 50; the discount rate is *constant* over years, no estimation needed. Case 10-2, 0.1960967 estimated; Case 10-3, 0.2434174 estimated. Case 20-2, 0.11 estimated; Case 20-3, 0.1247788 estimated. Case 50-2, 0.0666137 estimated; Case 50-3, 0.08 estimated.

4. Four common ratios for simulations: $i = I/Y$; the rate of change in population, $n_E = n$; the relative share of capital, $\alpha = \Omega^* \cdot r^*$; and the capital-output ratio, $\Omega^* = K/Y$. BOX 15-1 uses changes in $n_E = n$, as shown at the above 1.

5. Ratios drawn from BOX 15-1: $n_E = n$ and; $g^*_{A(FLOW)} = i(1-\beta^*)$, $r^* = \alpha/\Omega^*$, and g^*_Y. These items, for comparison, are summarized at Tables P1, P2, and P3, by sector (the total economy, the government sector, and the private sector).



Note: Periods of each Plan are 10, 20, and 50 years, respectively. The lower the rate of change in population, the higher the rate of technological progress is. Plan 50 uses a fixed rate of change in population, $n = (L_t - L_{t-1})/L_{t-1}$; Plan 50-2, based on a concave rate of change in population; Plan 50-3, based on a convex rate of change in population. Simulation of three Plans was set consistently with data source below. Three Plans are connected with those for net investment embodiment in Chapter 14.

Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, where 10 original data of the real assets and 15 original data, each from *International Financial Statistics Yearbook*, IMF.

Figure P1 Population changes, negatively related to technology and growth

Table P1 Plan 50-T: By the rate of change in population, negatively related to technology and growth; using Japan, the US, China, and India, at the total economy

Simulation	i=I/Y	n	α	Ω	β^*	$B^*=(1-\beta^*)/[$	δ_0	$g_A^*=i(1-\beta^*)$	$1/\lambda^*$	$r^*=\alpha/\Omega$	$x=\alpha/(i\cdot\beta^*)$	$g_Y^*=r^*/x$	$v^*=r^*/(r^*-g_Y^*)$
Japan T	0.0475	**(0.00126)**	0.0962	3.6885	0.7837	0.276	(0.0138)	0.0103	107.87	0.0261	2.58	0.0101	1.63
Case 1	0.0475	**(0.00500)**	0.0962	3.6885	0.7256	0.378	(0.3421)	0.0130	77.15	0.0261	2.79	0.0093	1.56
Case 2	0.0475	**0.00000**	0.0962	3.6885	0.8032	0.245	0.0719	0.0093	115.32	0.0261	2.52	0.0103	1.66
Case 3	0.0475	**0.00500**	0.0962	3.6885	0.8801	0.136	0.3453	0.0057	121.29	0.0261	2.30	0.0113	1.77
Case 4	0.0475	**0.01000**	0.0962	3.6885	0.9565	0.046	0.5775	0.0021	100.89	0.0261	2.12	0.0123	1.89
the US T	0.0242	**0.00947**	0.2081	1.9974	0.9386	0.065	0.7462	0.0015	**126.96**	0.1042	9.17	0.0114	1.12
Case 1	0.0242	**(0.00500)**	0.2081	1.9974	0.5974	0.674	(0.7524)	0.0097	76.32	0.1042	14.41	0.0072	1.07
Case 2	0.0242	**0.00000**	0.2081	1.9974	0.7161	0.396	0.2522	0.0069	194.77	0.1042	12.02	0.0087	1.09
Case 3	0.0242	**0.00500**	0.2081	1.9974	0.8339	0.199	0.5713	0.0040	176.02	0.1042	10.32	0.0101	1.11
Case 4	0.0242	**0.01000**	0.2081	1.9974	0.9509	0.052	0.7666	0.0012	122.02	0.1042	9.05	0.0115	1.12
China T	0.5341	**0.00617**	0.5428	3.1712	0.8793	0.137	0.4187	0.0645	**24.81**	0.1712	1.16	0.1481	7.42
Case 1	0.5341	**(0.00500)**	0.5428	3.1712	0.8697	0.150	0.3920	0.0696	24.98	0.1712	1.17	0.1465	6.94
Case 2	0.5341	**0.00000**	0.5428	3.1712	0.8740	0.144	0.4041	0.0673	24.93	0.1712	1.16	0.1472	7.15
Case 3	0.5341	**0.00500**	0.5428	3.1712	0.8783	0.139	0.4160	0.0650	24.84	0.1712	1.16	0.1479	7.37
Case 4	0.5341	**0.01000**	0.5428	3.1712	0.8825	0.133	0.4276	0.0628	24.69	0.1712	1.15	0.1486	7.60
India T	0.2163	**0.01374**	0.1953	1.6014	0.7023	0.424	0.4513	0.0644	**21.56**	0.1219	1.29	0.0949	4.50
Case 1	0.2163	**(0.00500)**	0.0962	1.6014	0.6247	0.601	0.0756	0.0812	14.18	0.0601	0.71	0.0844	(2.47)
Case 2	0.2163	**0.00000**	0.0962	1.6014	0.6392	0.564	0.1768	0.0780	15.57	0.0601	0.70	0.0863	(2.28)
Case 3	0.2163	**0.00500**	0.0962	1.6014	0.6537	0.530	0.2588	0.0749	16.65	0.0601	0.68	0.0883	(2.13)
Case 4	0.2163	**0.01000**	0.0962	1.6014	0.6681	0.497	0.3267	0.0718	17.43	0.0601	0.67	0.0902	(1.99)

Simulation	i=I/Y	n	α	Ω	β^*	$B^*=(1-\beta^*)/[$	δ_0	$g_A^*=i(1-\beta^*)$	$1/\lambda^*$	$r^*=\alpha/\Omega$	$x=\alpha/(i\cdot\beta^*)$	$g_Y^*=r^*/x$	$v^*=r^*/(r^*-g_Y^*)$
Japan T	0.0475	**(0.00126)**	0.0962	3.6885	0.7837	0.276	(0.0138)	0.0103	107.87	0.0261	2.58	0.0101	1.63
Case 1	0.0475	**0.01000**	0.0962	3.6885	0.9565	0.046	0.5775	0.0021	100.89	0.0261	2.12	0.0123	1.89
Case 2	0.0475	**0.02000**	0.0962	3.6885	1.1073	(0.097)	#NUM!	(0.0051)	#NUM!	0.0261	1.83	0.0143	2.21
Case 3	0.0475	**0.03000**	0.0962	3.6885	1.2558	(0.204)	#NUM!	(0.0121)	#NUM!	0.0261	1.61	0.0162	2.63
Case 4	0.0475	**0.05000**	0.0962	3.6885	1.5459	(0.353)	#NUM!	(0.0259)	#NUM!	0.0261	1.31	0.0199	4.22
the US T	0.0242	**0.00947**	0.2081	1.9974	0.9386	0.065	0.7462	0.0015	**126.96**	0.1042	9.17	0.0114	1.12
Case 1	0.0242	**0.01000**	0.2081	1.9974	0.95092	0.052	0.7666	0.0012	122.02	0.1042	9.05	0.0115	1.12
Case 2	0.0242	**0.02000**	0.2081	1.9974	1.18241	(0.154)	#NUM!	(0.0044)	#NUM!	0.1042	7.28	0.0143	1.16
Case 3	0.0242	**0.03000**	0.2081	1.9974	1.41066	(0.291)	#NUM!	(0.0099)	#NUM!	0.1042	6.10	0.0171	1.20
Case 4	0.0242	**0.05000**	0.2081	1.9974	1.85768	(0.462)	#NUM!	(0.0207)	#NUM!	0.1042	4.63	0.0225	1.28
China T	0.5341	**0.00617**	0.5428	3.1712	0.8793	0.137	0.4187	0.0645	**24.81**	0.1712	1.16	0.1481	7.42
Case 1	0.5341	**0.01000**	0.5428	3.1712	0.88250	0.133	0.4276	0.0628	24.69	0.1712	1.15	0.1486	7.60
Case 2	0.5341	**0.02000**	0.5428	3.1712	0.89086	0.123	0.4503	0.0583	24.28	0.1712	1.14	0.1500	8.11
Case 3	0.5341	**0.03000**	0.5428	3.1712	0.89908	0.112	0.4723	0.0539	23.72	0.1712	1.13	0.1514	8.68
Case 4	0.5341	**0.05000**	0.5428	3.1712	0.91511	0.093	0.5146	0.0453	22.29	0.1712	1.11	0.1541	10.05
India T	0.2163	**0.01374**	0.1953	1.6014	0.7023	0.424	0.4513	0.0644	**21.56**	0.1219	1.29	0.0949	4.50
Case 1	0.2163	**0.01000**	0.0962	1.6014	0.66805	0.497	0.3267	0.0718	17.43	0.0601	0.67	0.0902	(1.99)
Case 2	0.2163	**0.02000**	0.0962	1.6014	0.69652	0.436	0.4332	0.0656	18.09	0.0601	0.64	0.0941	(1.76)
Case 3	0.2163	**0.03000**	0.0962	1.6014	0.72463	0.380	0.5133	0.0596	17.82	0.0601	0.61	0.0979	(1.59)
Case 4	0.2163	**0.05000**	0.0962	1.6014	0.77981	0.282	0.6276	0.0476	15.89	0.0601	0.57	0.1053	(1.33)

Table P2 Plan 50-G: By the rate of change in population, negatively related to technology and growth; using Japan, the US, China, and India, at the government sector

Simulation	$i_G=I_G/Y_G$	n_G	α_G	$\Omega_G=K_G/Y_G$	β^*_G	$B^*_G=(1-\beta^*_G)$	$d_{0\,G}$	$g^*_{A\,G}$	$1/\lambda^*_G$	$r^*_G=\alpha_G/\Omega_G$	x_G	$g^*_{Y\,G}=r^*_G/x_G$	v^*_G
Japan G	0.3202	**(0.00126)**	(0.2739)	7.2225	0.8456	0.183	(0.1625)	0.0494	17.90	(0.0379)	(1.01)	0.0375	0.50
Case 1	0.3202	**(0.00500)**	(0.2739)	7.2225	0.8324	0.201	(0.2334)	0.0537	16.72	(0.0379)	(1.03)	0.0369	0.51
Case 2	0.3202	**0.00000**	(0.2739)	7.2225	0.8501	0.176	(0.1395)	0.0480	18.28	(0.0379)	(1.01)	0.0377	0.50
Case 3	0.3202	**0.00500**	(0.2739)	7.2225	0.8675	0.153	(0.0521)	0.0424	19.61	(0.0379)	(0.99)	0.0385	0.50
Case 4	0.3202	**0.01000**	(0.2739)	7.2225	0.8849	0.130	0.0305	0.0369	20.62	(0.0379)	(0.97)	0.0392	0.49
the US G	0.5966	**0.00947**	0.1734	2.7319	0.7794	0.283	0.2037	0.1316	**8.88**	0.0635	0.37	0.1702	(0.59)
Case 1	0.5966	**(0.00500)**	0.1734	2.7319	0.7615	0.313	0.1342	0.1423	8.40	0.0635	0.38	0.1663	(0.62)
Case 2	0.5966	**0.00000**	0.1734	2.7319	0.7677	0.303	0.1593	0.1386	8.58	0.0635	0.38	0.1677	(0.61)
Case 3	0.5966	**0.00500**	0.1734	2.7319	0.7739	0.292	0.1832	0.1349	8.75	0.0635	0.38	0.1690	(0.60)
Case 4	0.5966	**0.01000**	0.1734	2.7319	0.7800	0.282	0.2061	0.1312	8.89	0.0635	0.37	0.1703	(0.59)
China G	0.3328	**0.00617**	0.2364	1.8028	0.7136	0.401	0.3546	0.0953	**15.10**	0.1311	1.00	0.1318	(205.66)
Case 1	0.3328	**(0.00500)**	0.2364	1.8028	0.6933	0.442	0.2775	0.1021	14.30	0.1311	1.02	0.1280	42.12
Case 2	0.3328	**0.00000**	0.2364	1.8028	0.7025	0.424	0.3139	0.0990	14.72	0.1311	1.01	0.1297	91.91
Case 3	0.3328	**0.00500**	0.2364	1.8028	0.7115	0.405	0.3472	0.0960	15.04	0.1311	1.00	0.1314	(528.24)
Case 4	0.3328	**0.01000**	0.2364	1.8028	0.7205	0.388	0.3778	0.0930	15.26	0.1311	0.99	0.1330	(68.60)
India G	0.4692	**0.01374**	0.2079	3.2909	0.8266	0.210	0.2373	0.0813	**13.71**	0.0632	0.54	0.1179	(1.16)
Case 1	0.4692	**(0.00500)**	0.2079	3.2909	0.7984	0.253	0.1345	0.0946	12.84	0.0632	0.56	0.1138	(1.25)
Case 2	0.4692	**0.00000**	0.2079	3.2909	0.8060	0.241	0.1637	0.0910	13.14	0.0632	0.55	0.1149	(1.22)
Case 3	0.4692	**0.00500**	0.2079	3.2909	0.8136	0.229	0.1915	0.0875	13.39	0.0632	0.54	0.1160	(1.20)
Case 4	0.4692	**0.01000**	0.2079	3.2909	0.8211	0.218	0.2181	0.0840	13.59	0.0632	0.54	0.1171	(1.17)

Simulation	$i_G=I_G/Y_G$	n_G	α_G	$\Omega_G=K_G/Y_G$	β^*_G	$B^*_G=(1-\beta^*_G)$	$d_{0\,G}$	$g^*_{A\,G}$	$1/\lambda^*_G$	$r^*_G=\alpha_G/\Omega_G$	x_G	$g^*_{Y\,G}=r^*_G/x_G$	v^*_G
Japan G	0.3202	**(0.00126)**	(0.2739)	7.2225	0.8456	0.183	(0.1625)	0.0494	17.90	(0.0379)	(1.01)	0.0375	0.50
Case 1	0.3202	**0.01000**	(0.2739)	7.2225	0.8849	0.130	0.0305	0.0369	20.62	(0.0379)	(0.97)	0.0392	0.49
Case 2	0.3202	**0.02000**	(0.2739)	7.2225	0.9191	0.088	0.1863	0.0259	21.48	(0.0379)	(0.93)	0.0407	0.48
Case 3	0.3202	**0.03000**	(0.2739)	7.2225	0.9527	0.050	0.3417	0.0151	20.75	(0.0379)	(0.90)	0.0422	0.47
Case 4	0.3202	**0.05000**	(0.2739)	7.2225	1.0184	(0.018)	#NUM!	(0.0059)	#NUM!	(0.0379)	(0.84)	0.0452	0.46
the US G	0.5966	**0.00947**	0.1734	2.7319	0.7794	0.283	0.2037	0.1316	**8.88**	0.0635	0.37	0.1702	(0.59)
Case 1	0.5966	**0.01000**	0.1734	2.7319	0.7800	0.282	0.2061	0.1312	8.89	0.0635	0.37	0.1703	(0.59)
Case 2	0.5966	**0.02000**	0.1734	2.7319	0.7922	0.262	0.2489	0.1240	9.12	0.0635	0.37	0.1730	(0.58)
Case 3	0.5966	**0.03000**	0.1734	2.7319	0.8041	0.244	0.2884	0.1169	9.26	0.0635	0.36	0.1756	(0.57)
Case 4	0.5966	**0.05000**	0.1734	2.7319	0.8275	0.208	0.3591	0.1029	9.32	0.0635	0.35	0.1807	(0.54)
China G	0.3328	**0.00617**	0.2364	1.8028	0.7136	0.401	0.3546	0.0953	**15.10**	0.1311	1.00	0.1318	(205.66)
Case 1	0.3328	**0.01000**	0.2364	1.8028	0.7205	0.388	0.3778	0.0930	15.26	0.1311	0.99	0.1330	(68.60)
Case 2	0.3328	**0.02000**	0.2364	1.8028	0.7384	0.354	0.4320	0.0871	15.45	0.1311	0.96	0.1363	(25.20)
Case 3	0.3328	**0.03000**	0.2364	1.8028	0.7559	0.323	0.4787	0.0812	15.33	0.1311	0.94	0.1396	(15.52)
Case 4	0.3328	**0.05000**	0.2364	1.8028	0.7904	0.265	0.5560	0.0698	14.46	0.1311	0.90	0.1459	(8.85)
India G	0.4692	**0.01374**	0.2079	3.2909	0.8266	0.210	0.2373	0.0813	**13.71**	0.0632	0.54	0.1179	(1.16)
Case 1	0.4692	**0.01000**	0.2079	3.2909	0.8211	0.218	0.2181	0.0840	13.59	0.0632	0.54	0.1171	(1.17)
Case 2	0.4692	**0.02000**	0.2079	3.2909	0.8359	0.196	0.2682	0.0770	13.85	0.0632	0.53	0.1192	(1.13)
Case 3	0.4692	**0.03000**	0.2079	3.2909	0.8504	0.176	0.3147	0.0702	13.92	0.0632	0.52	0.1212	(1.09)
Case 4	0.4692	**0.05000**	0.2079	3.2909	0.8789	0.138	0.3991	0.0568	13.56	0.0632	0.50	0.1253	(1.02)

Table P3 Plan 50-PRI: By the rate of change in population, negatively related to technology and growth; using Japan, the US, China, and India, at the private sector

Simulation	$i_{PRI}=I_{PRI}/Y_P$	n_{PRI}	α_{PRI}	Ω_{PRI}	β^*_{PRI}	$B^*_P=(1-\beta^*_P)/$	$\delta_{0\,PRI}$	$g^*_{A\,PRI}$	λ^*_{PRI}	r^*_{PRI}	x_{PRI}	$g^*_{Y\,PRI}$	v^*_{PRI}
Japan PRI	(0.0132)	**(0.00126)**	0.1785	2.9022	0.8402	0.190	0.3580	(0.0021)	(418.52)	0.0615	(16.08)	(0.0038)	0.94
Case 1	(0.0132)	**(0.00500)**	0.1785	2.9022	1.0217	(0.021)	#NUM!	0.0003	#NUM!	0.0615	(13.22)	(0.0047)	0.93
Case 2	(0.0132)	**0.00000**	0.1785	2.9022	0.7794	0.283	0.1558	(0.0029)	(406.31)	0.0615	(17.33)	(0.0035)	0.95
Case 3	(0.0132)	**0.00500**	0.1785	2.9022	0.5389	0.856	(5.8283)	(0.0061)	(26.67)	0.0615	(25.06)	(0.0025)	0.96
Case 4	(0.0132)	**0.01000**	0.1785	2.9022	0.3003	2.330	2.2599	(0.0092)	50.34	0.0615	(44.98)	(0.0014)	0.98
the US PR	(0.1517)	**0.00947**	0.2188	1.7718	0.6624	0.510	0.1512	(0.0512)	**(27.73)**	0.1235	(2.18)	(0.0567)	0.69
Case 1	(0.1517)	**(0.00500)**	0.2188	1.7718	0.7109	0.407	0.3642	(0.0438)	(31.46)	0.1235	(2.03)	(0.0608)	0.67
Case 2	(0.1517)	**0.00000**	0.2188	1.7718	0.6940	0.441	0.3016	(0.0464)	(30.85)	0.1235	(2.08)	(0.0594)	0.68
Case 3	(0.1517)	**0.00500**	0.2188	1.7718	0.6773	0.477	0.2283	(0.0489)	(29.53)	0.1235	(2.13)	(0.0580)	0.68
Case 4	(0.1517)	**0.01000**	0.2188	1.7718	0.6606	0.514	0.1412	(0.0515)	(27.48)	0.1235	(2.18)	(0.0565)	0.69
China PRI	0.5768	**0.00617**	0.6078	3.4615	0.9025	0.108	0.4421	0.0562	**29.60**	0.1756	1.17	0.1504	6.97
Case 1	0.5768	**(0.00500)**	0.6078	3.4615	0.8947	0.118	0.4197	0.0607	30.04	0.1756	1.18	0.1491	6.63
Case 2	0.5768	**0.00000**	0.6078	3.4615	0.8982	0.113	0.4298	0.0587	29.87	0.1756	1.17	0.1497	6.78
Case 3	0.5768	**0.00500**	0.6078	3.4615	0.9017	0.109	0.4398	0.0567	29.66	0.1756	1.17	0.1503	6.93
Case 4	0.5768	**0.01000**	0.6078	3.4615	0.9052	0.105	0.4497	0.0547	29.39	0.1756	1.16	0.1508	7.10
India PRI	0.1627	**0.01374**	0.1926	1.2430	0.6505	0.537	0.6497	0.0569	**32.25**	0.1549	1.82	0.0851	2.22
Case 1	0.1627	**(0.00500)**	0.1926	1.2430	0.5899	0.695	0.4018	0.0667	27.88	0.1549	2.01	0.0772	1.99
Case 2	0.1627	**0.00000**	0.1926	1.2430	0.6062	0.650	0.4958	0.0641	30.96	0.1549	1.95	0.0793	2.05
Case 3	0.1627	**0.00500**	0.1926	1.2430	0.6224	0.607	0.5647	0.0614	32.50	0.1549	1.90	0.0814	2.11
Case 4	0.1627	**0.01000**	0.1926	1.2430	0.6385	0.566	0.6176	0.0588	32.72	0.1549	1.85	0.0836	2.17

Simulation	$i_{PRI}=I_{PRI}/Y_P$	n_{PRI}	α_{PRI}	Ω_{PRI}	β^*_{PRI}	$B^*_P=(1-\beta^*_P)/$	$\delta_{0\,PRI}$	$g^*_{A\,PRI}$	λ^*_{PRI}	r^*_{PRI}	x_{PRI}	$g^*_{Y\,PRI}$	v^*_{PRI}
Japan PRI	(0.0132)	**(0.00126)**	0.1785	2.9022	0.8402	0.190	0.3580	(0.0021)	(418.52)	0.0615	(16.08)	(0.0038)	0.94
Case 1	(0.0132)	**0.01000**	0.1785	2.9022	0.3003	2.330	2.2599	(0.0092)	50.34	0.0615	(44.98)	(0.0014)	0.98
Case 2	(0.0132)	**0.02000**	0.1785	2.9022	(0.1714)	(6.835)	#NUM!	(0.0155)	#NUM!	0.0615	78.82	0.0008	1.01
Case 3	(0.0132)	**0.03000**	0.1785	2.9022	(0.6359)	(2.573)	#NUM!	(0.0216)	#NUM!	0.0615	21.24	0.0029	1.05
Case 4	(0.0132)	**0.05000**	0.1785	2.9022	(1.5440)	(1.648)	#NUM!	(0.0336)	#NUM!	0.0615	8.75	0.0070	1.13
the US PR	(0.1517)	**0.00947**	0.2188	1.7718	0.6624	0.510	0.1512	(0.0512)	**(27.73)**	0.1235	(2.18)	(0.0567)	0.69
Case 1	(0.1517)	**0.01000**	0.2188	1.7718	0.6606	0.514	0.1412	(0.0515)	(27.48)	0.1235	(2.18)	(0.0565)	0.69
Case 2	(0.1517)	**0.02000**	0.2188	1.7718	0.6277	0.593	(0.0952)	(0.0565)	(21.64)	0.1235	(2.30)	(0.0537)	0.70
Case 3	(0.1517)	**0.03000**	0.2188	1.7718	0.5952	0.680	(0.4839)	(0.0614)	(14.78)	0.1235	(2.42)	(0.0509)	0.71
Case 4	(0.1517)	**0.05000**	0.2188	1.7718	0.5315	0.881	(3.5302)	(0.0710)	(3.54)	0.1235	(2.71)	(0.0455)	0.73
China PRI	0.5768	**0.00617**	0.6078	3.4615	0.9025	0.108	0.4421	0.0562	**29.60**	0.1756	1.17	0.1504	6.97
Case 1	0.5768	**0.01000**	0.6078	3.4615	0.9052	0.105	0.4497	0.0547	29.39	0.1756	1.16	0.1508	7.10
Case 2	0.5768	**0.02000**	0.6078	3.4615	0.9120	0.096	0.4690	0.0507	28.74	0.1756	1.16	0.1520	7.44
Case 3	0.5768	**0.03000**	0.6078	3.4615	0.9187	0.088	0.4880	0.0469	27.96	0.1756	1.15	0.1531	7.81
Case 4	0.5768	**0.05000**	0.6078	3.4615	0.9318	0.073	0.5252	0.0393	26.12	0.1756	1.13	0.1553	8.65
India PRI	0.1627	**0.01374**	0.1926	1.2430	0.6505	0.537	0.6497	0.0569	**32.25**	0.1549	1.82	0.0851	2.22
Case 1	0.1627	**0.01000**	0.1926	1.2430	0.6385	0.566	0.6176	0.0588	32.72	0.1549	1.85	0.0836	2.17
Case 2	0.1627	**0.02000**	0.1926	1.2430	0.6704	0.492	0.6936	0.0536	30.70	0.1549	1.77	0.0877	2.31
Case 3	0.1627	**0.03000**	0.1926	1.2430	0.7019	0.425	0.7460	0.0485	27.37	0.1549	1.69	0.0919	2.46
Case 4	0.1627	**0.05000**	0.1926	1.2430	0.7638	0.309	0.8147	0.0384	21.06	0.1549	1.55	0.1000	2.82

Chapter 15

The author answers the unsolved problems in macroeconomics as follows:

1. A fixed rate of change in population over years never influences technology, returns, and growth, in the endogenous-equilibrium.
2. Concave-oriented rate of change in population negatively influences technology, returns, and growth, in the endogenous-equilibrium.
3. If the rate of change in population increases, the rate of technology, the rate of return and the growth rate of output decreases. This endogenous fact differs from common sense. The fact urges us the importance of qualitative labor effectiveness, similarly to capital stock (recall, another endogenous fact in Chapter 14 that the rate of return is maximized with minimum net investment). This fact is discussed in the next section using the technological coefficient (i.e., the qualitative/quantitative net investment coefficient), $\beta^* \ or\ 1-\beta^*$.
4. What is a sign of unstable rate of change in population? Again, it is the valuation ratio; $v^* = r^*/(r^* - g_Y^*)$. Watch the speed years in Tables P1 to P3. When the rate of change in population overruns a upper limit, the speed years falls into endogenous disequilibrium. This is because the rate of technological progress is directly oppressed. The decrease in population never aggravates growth and returns but is only used for an excuse of the failures of whole policies in immature democratic countries. Recall that population is a mixture of quality and quantity and that human capital works for strategies to reinforce labor. If the valuation ratio by year is lower, then the damage is smaller. Each country must be responsible for other countries and the Earth environment. This spirit will return back to cooperative countries. This is the spirit of moderation and altruistic.

15.3 For Population-related Hyperbolas Precisely

This section clarifies the contents of hyperbola equations/functions related to the increase/decrease in actual population by year (see **BOX 15-3**). These equations are obtained each by reducing corresponding endogenous equations in the endogenous system and accordingly, KEWT series data-sets by year, country, and sector.

There are twelve basic hyperbola equations/functions in KEWT. The standard form of hyperbola is expressed by $y = \frac{cx+d}{ax+b}$, or $\left(y - \frac{c}{a}\right)\left(x + \frac{b}{a}\right) = \frac{f}{a}$. When each of four elements, a, b, c, and d, has a value except for zero, the standard form holds, where $f = d - \frac{b \cdot c}{a}$ is calculated. The vertical asymptote (VA) is shown by $VA = \frac{-b}{a}$, and the horizontal asymptote (HA) by $HA = -\frac{c}{a}$. When one or two of four elements are zero, standard form is reduced. A reduced form is called a type. Six types exist by function including the standard form of $y = \frac{cx+d}{ax+b}$: If a=0, $y = \frac{cx+d}{b}$; if b=0, $y = \frac{cx+d}{ax}$; if c=0, $y=\frac{d}{ax+b}$; if d=0, $y=\frac{cx}{ax+b}$; if c=d=0, $y=\frac{1}{ax+b}$. If a=0 and b=0 happen at the same time, there exists no hyperbola. In short, basic concepts are composed of four elements, six forms, and twelve hyperbolas.

BOX 15-3 Population-related hyperbolic framework designed for an optimum policy-system

Hyperbolas to population-related framework

As a base for sustainable growth under a given actual population change by year.

For the rate of technological progress, $g_A^* = i(1-\beta^*)$:

(1)	$n \rightarrow i = I/Y$	$i(n)$
(2)	$n \rightarrow \beta^*$	$\beta^*(n)$ or $\widetilde{\beta^*}(n)$,

$\beta^*(i)$ or $\widetilde{\beta^*}(i)$, connects the above (1) and (2).

Notes:

1. $i(n)$ determines a range of net investment, to which $\beta^*(n)$ corresponds.
2. Then, $\beta^*(i)$ and $r^*(i)$ lead to an optimum range of $i = I/Y$, where $\Omega^*(i)$, $\Omega^*(n)$, and accordingly, $\Omega^*(\beta^*)$ are examined for optimums.
3. $\alpha(i)$ and $\alpha(n)$ are examined to review stop-macro inequality.
4. These hyperbolas are essentially related to full-employment with low inflation.

For population-related hyperbolas, the following conceptual framework is required in advance.

First, assume that the rate of unemployment is zero at $n_E = n$. The condition of $n_E = n$ implies that if the actual growth rate, *n*, of population equals the rate of change in population in equilibrium, n_E, there exists no unemployment. KEWT 6.12, 1990-2010, satisfies this condition always in a moderate range of equilibrium. KEWT 5.11, 1990-2009, allowed the rate of unemployment to be the last means for maintaining a moderate range of equilibrium, where an endogenous NAIRU (a non-accelerated-inflation rate of unemployment) endogenously exists. It is convenient for KEWT 5.11 to draw a hyperbola of $r^*(n_E)$ and prove the existence of the endogenous NAIRU. The hyperbola of $r^*(n_E)$ reduces to a linear form since $r^*(n_E)$ is shown by $y=\frac{cx+d}{b}$, where a=0. In the case of KEWT 6.12, $r^*(n_E)$ only shows a point at the hyperbola origin due to $n_E - n = 0$.

Population-related hyperbolas each set as the x axis the rate of change in population or the growth rate of actual population, $n_E = n$. This setting is a base for population-related hyperbolas. Population-related framework is shown in **Figure P1** and aims at an optimum policy-system. The author recognizes that 'the Mirrlees review' for the Institute for Fiscal Studies (see at the next section) is optimum-oriented. Therefore, the author intends to clarify some differences between KEWT and Mirrlees's system. The rate of technological progress is shown by $g_A^* = i(1-\beta^*)$. Therefore, $i(n)$, $\beta^*(n)$ or $\widetilde{\beta^*}(n)$, and accordingly, $\beta^*(i)$ or $\widetilde{\beta^*}(i)$ and $\Omega^*(i)$ are most fitted for population-related hyperbolas. It is not necessary to use $\widetilde{\beta^*}(i)$ instead of $\beta^*(i)$. Both express the same results differently in shape.

An optimum range of the endogenous-equilibrium is measured using $r^*(i)$. The optimum range is first measured by the rate of return to $i = I/Y$ in equilibrium. An optimum condition is determined by a maximized rate of return to a minimized net investment to output in equilibrium. $i = I/Y$ is connected with not only the qualitative net investment coefficient, β^* or $\widetilde{\beta^*}$, but also $n_E = n$.

Furthermore, $\alpha = r^* \cdot \Omega^*$ constitutes a core of policy-making as the structural ratio. In this respect, $\Omega^*(n)$ and $\Omega^*(\beta^*)$ or $\Omega^*(\widetilde{\beta^*})$ is also useful to the review of population-related hyperbolas. Figure P1 indicates how important these contents are. And, for stop-macro inequality, $\alpha(i)$ and $\alpha(n)$ are examined to review stop-macro inequality and dynamic balances between hyperbolas. In the literature, the relative share of capital or profits/returns are in vague. Since Solow, R. M. (618-631, 1958), profits or returns have remained unsolved partly due to the SNA recording that shows final redistribution income and neglects government income. Hyperbolas, $\alpha(i)$ and $\alpha(n)$, will clarify unknown policy-oriented problems precisely and empirically.

The above hyperbolas are concisely put in order as shown in **BOX 15-4**. Also, for empirical proofs, population-related hyperbola graphs, the author show **Figures H2, H3, H4, H5, H6,** and **H7**, each by type, fact, explanation, and implication. These hyperbola graphs are thoroughly consistent with the results simulated in the previous section. After reviewing a few articles in the next section, some facts proved empirically are summarized in the final section of Conclusions.

BOX 15-4 Hyperbolas of inflation, returns, and technology to net investment and change in population

I. $y = \frac{cx+d}{ax}$, b=0 and VA=0:

1). $r^*(i)$, where $r^*(i)$ guarantees a maximized rate of return with a minimized net investment in a moderate endogenous-equilibrium Also, the rates of inflation/deflation are determined by $r^* - HA_{r^*(i)}$.

2). $\beta^*(i)$ or $\widetilde{\beta^*}(i)$. β^* is the quantitative net investment coefficient and, $\widetilde{\beta^*} = 1 - \beta^*$ is the qualitative net investment coefficient but, the same technology coefficient. This hyperbola presents an endogenous base for the rate of technological progress, $g_A^* = i(1-\beta^*)$. Endogenous technology is tied up with green economies nowadays.

II. $y = \frac{cx+d}{b}$, a=0 and VA=0:

3). $r^*(n)$, where the relationship between the rate of change in population or the increase/decrease in actual population and the rate of return is shown (for the use, see note 1).

III. $y = \frac{cx}{ax+b}$,

6). $\Omega^*(i)$, where net investment and the capital-output ratio are examined.

7). $i(n)$, where labor and net investment are examined.

8). $\Omega^*(\beta^*)$, where Ω^* is the capital-output ratio, $\Omega = K/Y$. Similarly, $\Omega^*(\widetilde{\beta^*})$ shows the relationship between technology and capital stock, towards green economics.

IV. $y = \frac{d}{ax+b}$,

9). $\Omega^*(n)$, where labor and capital are examined.

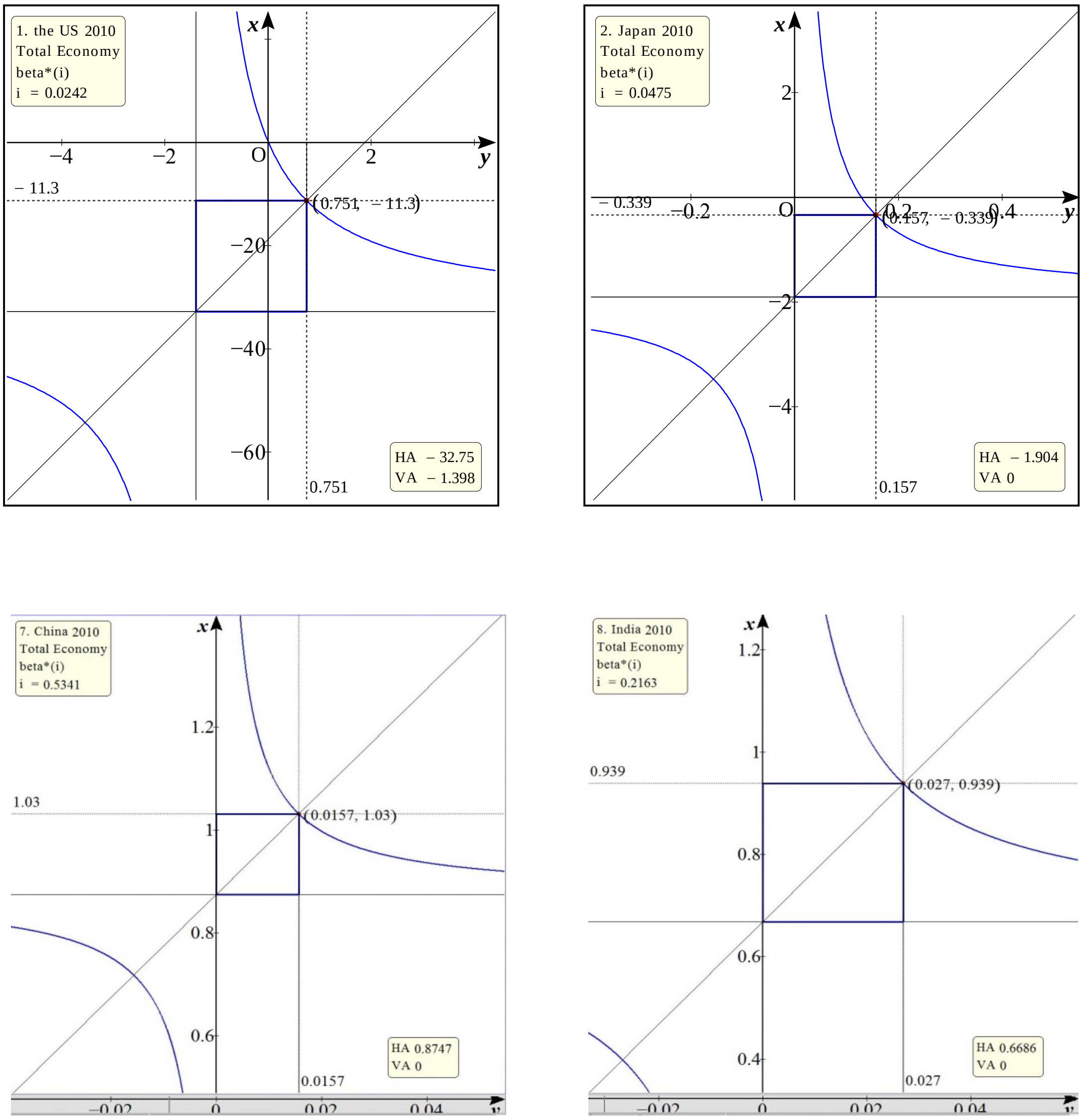
V. $y = \frac{cx+d}{ax+b}$, $VA = \frac{-b}{a}$ and $HA = -\frac{c}{a}$:

10). $\beta^*(n)$ or $\widetilde{\beta^*}(n)$, where even if $n_E = n$, this hyperbola presents the relationship between the qualitative net investment coefficient and the increase/decrease in actual population.

11). $\alpha(i)$. This hyperbola determines an optimum range of stop-macro inequality to net investment.

12). $\alpha(n)$. This hyperbola determines stop-macro inequality and the increase/decrease in actual population.

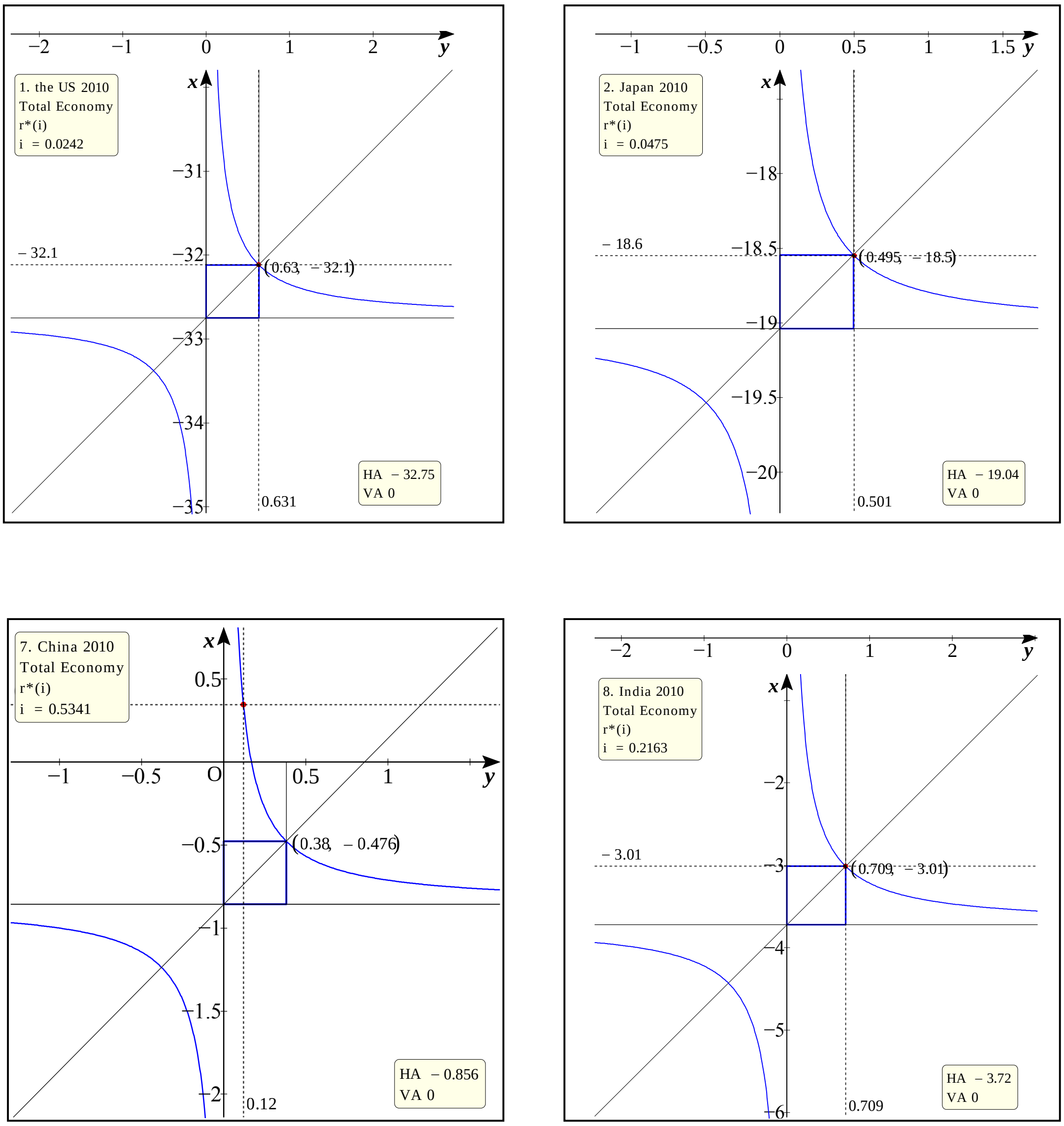
Note: In the above hyperbolas, the author does not include the speed years for convergence by country hyperbolas each to $i = I/Y$ and $n_E = n$: $speed(i)$and $speed\ (n)$ (see Chapter 7). Chapter 10 discusses the background of hyperbolas, spiritually but exceptionally in the *EES*. A whole version of hyperbolas is each by each numerically explained in Appendix at the end of the *EES*.



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and 15 from the financial assets come from *International Financial Statistics Yearbook*, IMF.

Fact finding and explanation: The technology coefficient or the qualitative net investment coefficient is strongly green-oriented nowadays. β^*, endogenously and wholly, determines technology level. A high level of $i = I/Y$ is a quick remedy of growth but, it delays sustainable progress of technology in the long run. Policy-makers are able to look for a moderate range of minimum level of net investment using $\beta^*(i)$. Hyperbolic curves of four countries seem to be similar. But, each curve differs significantly by country. The origin of hyperbola is not the same as the origin of the x axis and the y axis. The horizontal asymptote differs significantly. Higher technology is essentially more green-oriented, with higher offering spirit.

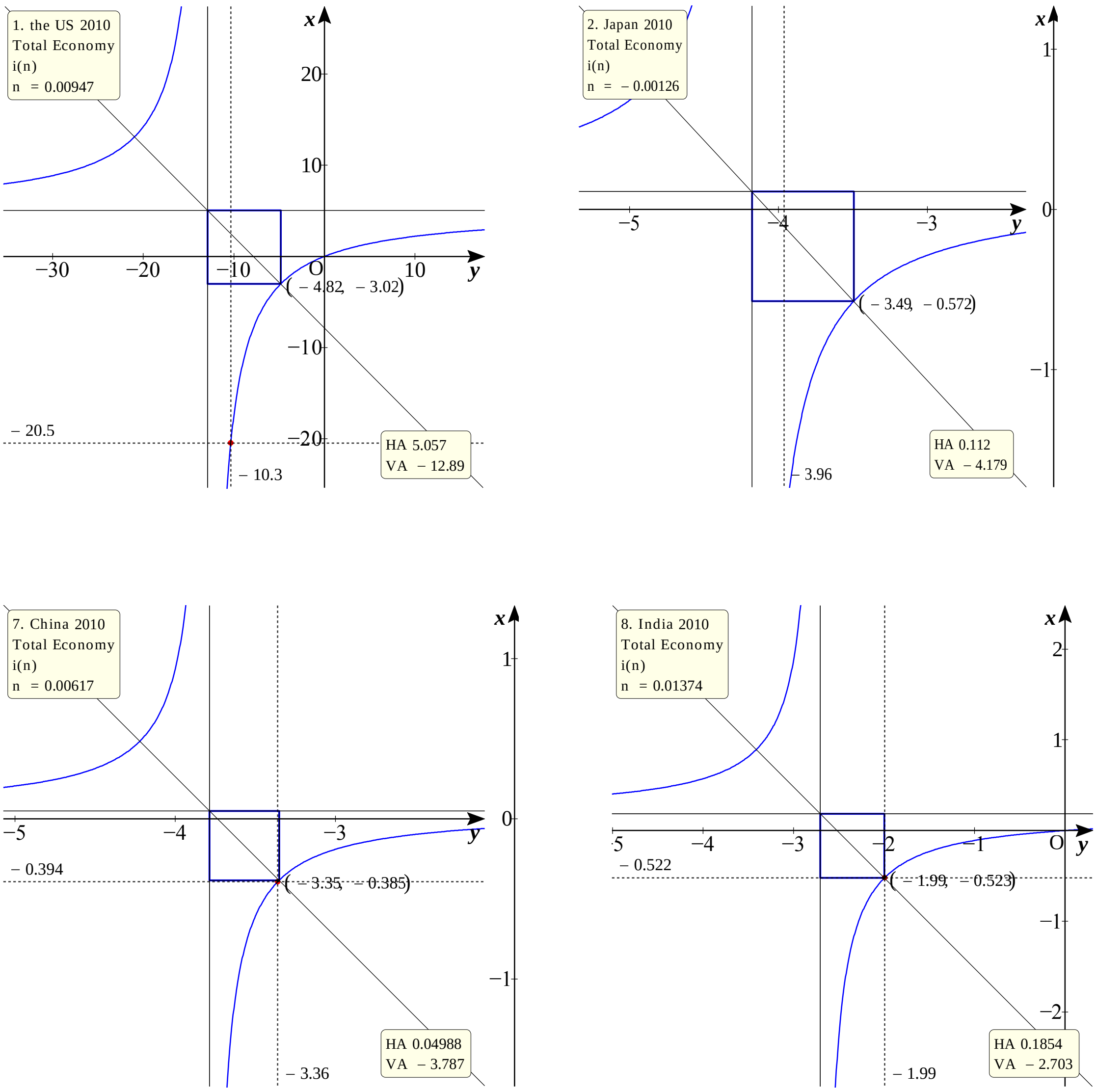
Figure H2 Hyperbola of the technology coefficient to changes in population, $\beta^*(i)$



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and 15 from the financial assets come from *International Financial Statistics Yearbook*, IMF.

Fact finding and explanation: The fact is that the rate of return should be higher with less net investment. This fact is against a notion that a low interest rate or a low rate of return helps to raise net investment and accordingly, net investment accelerates growth. The closer to zero the rate of return the more risky of deflation is. This fact results in raising the real cost of capital. Policy-makers need to watch the HA (horizontal asymptote) that shows a limit of inflation or deflation. Deflation has its own cause; policy-makers first of all must decrease deficit by year. Any strategies cannot convert deflation to inflation without recovering the balance between the government sector and the private sector.

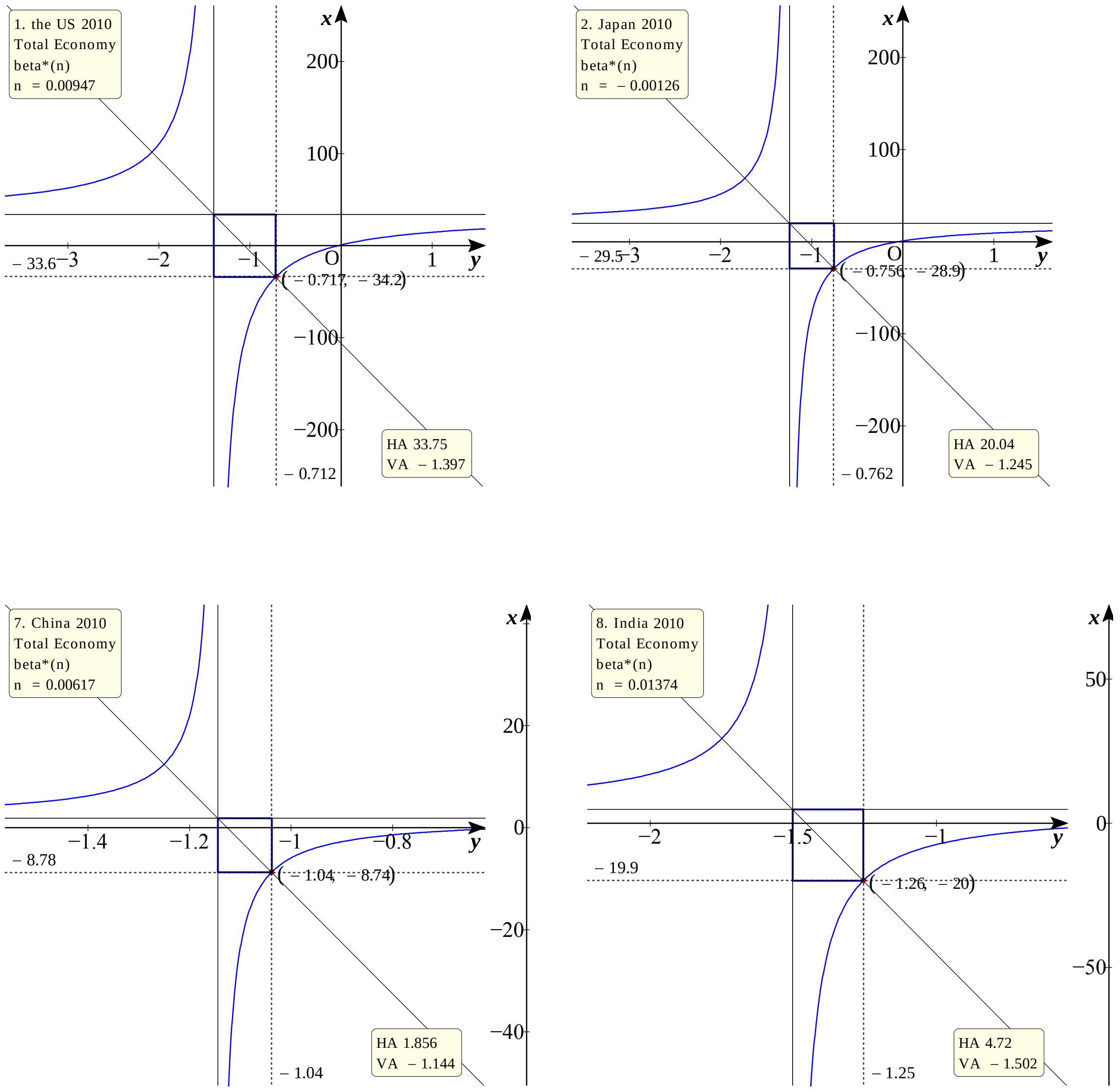
Figure H3 Hyperbola of the rate of return to changes in net investment, $r^*(i)$



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and 15 from the financial assets come from *International Financial Statistics Yearbook*, IMF.

Fact finding and explanation: Both $i = I/Y$ and the rate of change in population, $n_E = n$, are fixed by year and its transitional path. Nevertheless, $i = I/Y$ is negatively related to $n_E = n$. This fact encourages developed countries. Of course, policy-makers of developed countries must accelerate technology higher than that of developing countries. The differences between developed and developing countries are much less important than those between the government sector and the private sector by country and also those between statistics actual data and endogenous data. This fact implicitly expresses that policy-makers must focus the improvement of the qualitative net investment coefficient, β^*.

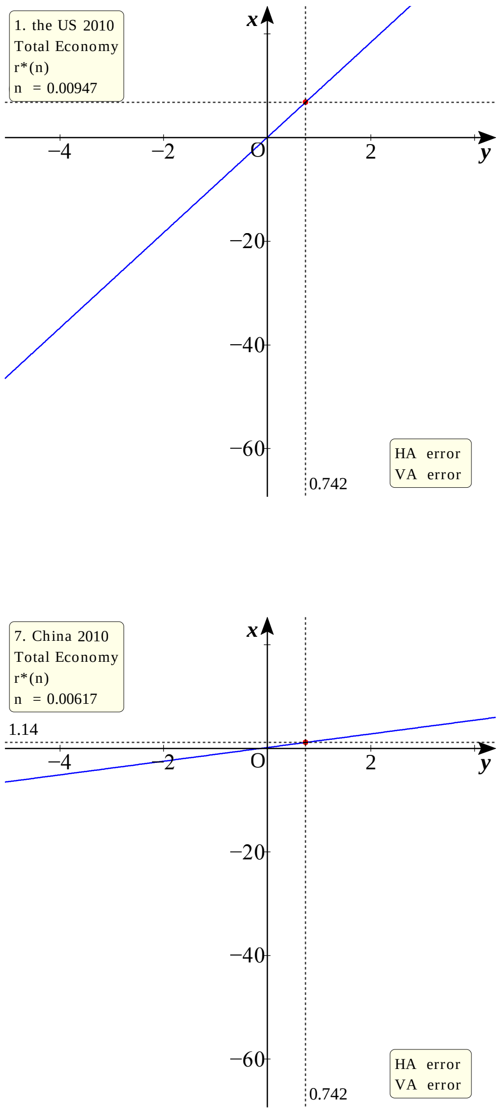
Figure H4 Hyperbola of net investment to changes in population, $i(n)$



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and 15 from the financial assets come from *International Financial Statistics Yearbook*, IMF.

Fact finding and explanation: The technology coefficient or the qualitative net investment coefficient, β^*, is negatively related to the rate of change in population. Negative was proved using simulation as shown in this chapter. This fact is consistent with the essence of technology towards green economics. The origin of the hyperbola differs significantly by country, partly due to national taste, culture, and history. This fact is against a notion that the increase in population is essential to technology and growth. Compare the origin of the hyperbola and the origin of the x axis and the y axis, confirming the values of the HA (horizontal asymptote) and the VA (vertical asymptote). Strategies to reinforce a whole set of policies must differ by country.

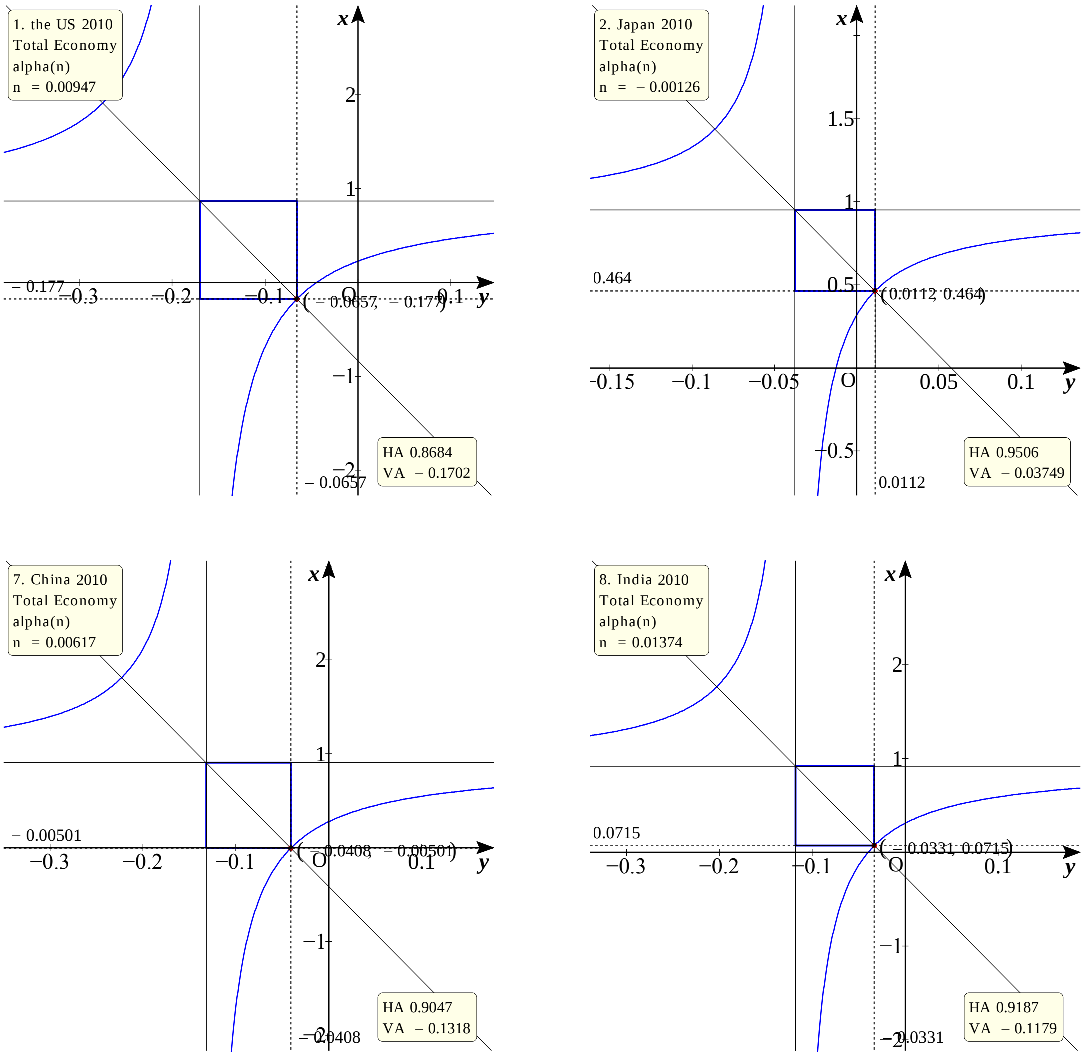
Figure H5 Hyperbola of the technology coefficient to changes in population, $\beta^*(n)$



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and 15 from the financial assets come from *International Financial Statistics Yearbook*, IMF.

Fact finding and explanation: The rate of return exceptionally reduces to a linear line. Hyperbola software only shows error to the HA and the VA since the reduction is due to denominator's zero. $r^*(n)$ is worthy of attention. This is because the slope positively indicates the relationship between returns and full-employment. For example, if the slope is 45°, wages and unemployment are correlated strongly. Full employment is in reality if actual data approach endogenous data. Policy-makers need to simultaneously integrate $r^*(n)$ with $r^*(i)$ that controls inflation and deflation.

Figure H6 Hyperbola of the rate of return to changes in population, $r^*(n)$



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose ten original data for the real assets and 15 from the financial assets come from *International Financial Statistics Yearbook*, IMF.

Fact finding and explanation: The relative share of capital, α, is determined as the product of the capital-output ratio and the rate of return. When the rate of return is high with less net investment, the capital-output ratio is also not so high. This fact warns against a wrong notion that it is necessary for policy-makers to increase α, which in turn aggravates stop-macro inequality. Each country has its proper α, in corporation with national taste, culture and history and in harmony with globalization. Political leaders are apt to spend money at the cost of next generations. People must study that a preferable choice is to decrease government expenditures with a government minimum net investment. People must be responsible for a true meaning of democracy that one person must determine everything without relying on others. Then, government size will be determined by people. Stop-macro inequality is indifferent of α. These facts march with government openness and publication.

Figure H7 Hyperbola of net investment to changes in population, $\alpha(n)$

15.4 Revisit Maddison, A. (1987, 1995), Mirrlees, J. A. (2010, 2011), and MRW (1992)

This section revisits a few memorial papers. First, rather historically and philosophically, the author takes Maddison, A. and Mirrlees, J. A.; with thoughts behind, backing to Kant Immanuel, 1724-1804, whose translation, Nisbet, H. B. (1970). Second, the author revisits Mankiw, Romer, and Weil (1992) as a preparatory step to answer problems unsolved at neoclassical school that uses the Cobb-Douglas production function.

First, Maddison, A. (in particular, 1987, 1991, 1995, and 1996) historically publishes long trends of economic data for the total economy by country. His methodology differs from the author's. This section does not directly compare the differences of each data. The author impressively admires his efforts to publish his life work, creating his own data when there had been no reliable data, and intuitively beyond scientific approach. The author's KEWT database, purely endogenous data, is universally and accurately measured by country, 1990-2010, for 81 countries. But without *International Financial Statistics Yearbooks*, IMF, KEWT database does not exist.

From the viewpoint of an open developed country tax system, Sir Mirrlees, J. A. published *Dimensions of Tax Design* (xii, 1347, 2010) and also, *Tax by Design* (xvii, 533, 2011); each as the Mirrlees review / chair and for the Institute for Fiscal Studies (IFS). His intention is, to the author's understanding, to integrate a tax system of the UK, historically, theoretically, empirically, and more openly. His conceptual thought is influenced and supported by Meade, J. E. (1962, Revised) and Meade, J. E., and J. R. N., Stone (1969). It implies that his design for tax system is consistent with KEWT database if the three-item equality of income, expenditures, and output at the SNA (1993) were realized in his use of data. Endogenous data at KEWT database satisfies the three-item equality everywhere. The author indicates that Mirrlees' system is consistent with KEWT database in that statistics data exist always within a certain range of endogenous data; apart from author's policy-oriented integration of real, financial/market, and the central bank. A similarity is related to Mirrlees' neutrality of a tax system.

'The Mirrlees review' directs towards neutrality, openness, and transparency. This thought is traced back to Kant, Immanuel. Reiss, Hans -edited and Nisbet, H. B. -translated (1970, 1977), translated Kant's essence under the title of *Kant's Political Writings*. According to Reiss, H. (189, 16-29 in Appendix, ibid.) human beings only modestly follow genuine principles of right; citing here:

> And in view of the frailty of human nature and the fortuitous circumstances which can intensify its efforts, we can expect man's hopes of progress to be fulfilled only under the positive condition of a higher wisdom (which, if it is invisible to us, is known as providence); and in so far as *human beings* can themselves accomplish anything or anything can be expected of them, it can only be through their negative wisdom in furthering their own ends. In the latte event, they will find themselves compelled to ensure that *war*, the greatest

> obstacle to morality and the invariable enemy of progress, first becomes gradually more humane, then, more infrequent, and finally disappears completely as a mode of aggression. They will thereby enter into a constitution based on genuine principles of right, which is by its very nature capable of constant progress and improvement without forfeiting its strength.

Kant and, accordingly, Reiss, H. concludes: Eternal peace is never a hollow idea but a homework we human beings must obey. This task will be solved gradually by openness and publications as it is.[2] The periods when the same magnitude progress occurs as the goal will become gradually and inevitably shorter. Thus, we human beings approach eternal peace continuously ever and more closely.

What the author wishes express here is that human beings and a variety of systems have historically bright future ahead. Mankind future is beyond religions and, ideas and philosophy and; robustly in harmony with these, beyond the differences between each. Keynesian spirit started with the establishment of IMF in 1944 and is ever alive today.

Turning back to KEWT database by country, KEWT follows scientific proofs defined as the same as mathematics proofs, where any proof, regardless of the difference of partiality levels, holds consistently with the whole proofs as much as possible to spread the level. The *EES* has only one chapter for the Essence of Endogenous System and Geometrical Philosophy. In fact, hyperbolas are tightly related to geometric philosophy. This chapter does not repeat geometric philosophy but follows mathematics proofs with Kant. The author wishes: readers who are interested in hyperbolas in this chapter pay attention to Chapter 10 that steps into 'beyond space and time.' Physics and element chemistry, quantum and macro, have entered into this area earlier and faced at the entrance to prove methodologies to connect spiritual with physical zones. However, they need expensive tools specified for proofs.

Contrarily KEWT does not need any new methodology to prove 'beyond space and time.' A reason is that money magnitudes invented by human are uniquely homogenous quantity-oriented in an open economy and among countries using the exchange markets. As a result, the endogenous system and KEWT database were invented consistently by country, sector, and year and over years. Hyperbolas summed up in this chapter, without device, spread beyond space and time. In a moderate level of the endogenous-equilibrium, the 1st quadrant is a base for hyperbolas. In the close-to-equilibrium, each hyperbola extends its dimension to the 2nd or the 3rd quadrant. These are examined and analyzed in the next section to find facts and hypotheses.

[2] Also, the author is grateful to Yoshiaki Utsunomiya, translator to Japanese, *For Eternal Peace*, and Iwanami pocket edition 625.9, 1985 up to 2011. The author is deeply impressed with Kunitsugu Kosaka, *Study of Zen/Good* (2006, 518 p.), Kodansha Academic 1781. Also; Daisetsu Suzuki, *Mind of the Orient* (1965, 1996, 208p.), Shunjusha. As Kant foresaw, Peace is coming, harmonizing the West with the Orient.

Lastly, let the author refer to optimum principles in 'the Mirrlees review' (see, Mirrlees, James, A., 107-108, 1090-1094, 1104, 2010). The Mirrlees review is supplemented by empirical data. For optimum terminology, there are a few different uses. For example, *Dimensions of Tax Design* (1335 for index, ibid.) shows optimal income tax model, optimal tax theory, and Mirrlees model. According to 2.2.2 at the Mirrlees model (ibid.,101-105), i) the optimal top marginal tax rate, and ii) optimal marginal tax schedule, are each explained, with equations. The methodology differs from KEWT in that the Mirrlees review is much micro-oriented and, aims at the difference of income and uses effective marginal tax rate (EMTR). The importance of *neutrality* and *transparency* in tax design, however, correspond with the spirit of KEWT, apart from each point of view. The Mirrlees review extends its view into changes in population demographics, the growth of new technologies, and the broadened objectives of policy makers, as shown in abstract of *Tax by Design* (2011; see Wikipedia, the free encyclopedia). Each system has its own spread and extension. KEWT does not enter into the micro level but concentrates on the macro integration of economic policies, real, financial, market, and central bank by country and among areas, and towards an optimum policy-system.

Second, turning to Mankiw, Romer, and Weil (1992; here under MRW), MRW starts with the Solow model and separates human capital from physical capital under a *given* rate of technological progress. MRW sets capital quantitative and human capital qualitative. Saving is used for quantitative investment similarly to capital stock. According to empirical analysis in MRW, the rate of saving *positively* and population *negatively* each influence the growth rate; saving/investment and population, each differently from Solow's. The endogenous-system is based on a discrete Cobb-Douglas (C-D) production function; $Y = AK^{\alpha}L^{1-\alpha}$. Both stocks, capital K and labor L, cannot separate quality from quantity. Net investment is flow and its quality is expressed by the rate of technological progress. The rate of technological progress is purely endogenous and qualitative.

The endogenous system accepts human capital, education, R & D, knowledge and leaning by doing, each as an object of strategies to support whole economic policies solely expressed by seven endogenous parameters in the discrete C-D production function. This point definitely differs from neo-classical school: For example, Lucas, R. E. (1988) introduces human capital instead of the level of technology.[3] Romer, P. M. (S71-S102, 1990) selects R & D, instead of human capital, with learning by doing parameter.[4]

Nevertheless, the empirical results of MRW do not contradict those of the

[3] $y_1(t) = H_1^{\theta}k(t)^{\alpha}$ and $y_2(t) = H_2^{\theta}k(t)^{1-\alpha}$.

[4] Romer, P. M. (1986) assumes that the relative share of profit (*alpha*) is 1.0 in his first endogenous model. $y(t) = Ak(t)$. Romer, P. M. (1990) later stresses that R&D-based ideas are vital factors in economic growth: $A(t) = BK(t)^{\phi}$and $Y(t) = K(t)^{\alpha}B^{1-\alpha}K(t)^{\phi(1-\alpha)}L(t)^{1-\alpha}$, where a "learning by doing" parameter that expresses knowledge accumulation, ϕ , is related to population growth (refer to Romer , D. (116-117, 1996)). Now assuming $\alpha = 1.0$, $y = Ak^{\alpha}$ reduces to $y = Ak$, but the endogenous-equilibrium is destroyed, as shown in KEWT database.

endogenous system and its database of KEWT 6.12. What is the reason? This is because if empirical results are, though exogenously, close to those of the endogenous system, no contradiction exists. Because, original statistical data are similar and human capital only differently works each at exogenous and endogenous models.

Differences: The endogenous system holds using the discrete C-D production function under constant returns to scale. MRW requires an assumption of constant returns to capital (CRC), even following the market equilibrium.

15.5 Conclusions: Empirical Results and Implications as Answers to Unsolved Problems

Researchers have suffered from the mismatches of models and data.[5] Some start with discrete models and finally apply continuous methodology. Others insist no using of the production functions as seen in Keynesian school. An endogenous rate of technological progress is a conclusive factor as shown in the endogenous system. For purely endogenous, any parameter and variable, including national taste or macro utility, must not be estimated or forecasted using assumptions and the correlation coefficient, values of elasticity, and probability. Any parameter and variable must be precisely measured. Three, $i = I/Y$, $n_E = n$, and α, must be endogenous, and these three after measurement are fixed in the transitional path.

There are a few facts uniquely found in the endogenous system and KEWT database:

(1) Population and labor are negatively related to technological progress and, endogenously, precisely, and numerically. This is a fact hidden in the neoclassical school historically and, holds commonly to any model and data in the discrete time. Population or labor is a mixture of quantity and quality, similarly to capital. Population or labor, however, *negatively* related to technology, differently to capital. And, the rate of change in population is most fundamentally related to the rate of technological progress.

(2) Ratio of net investment to output, $i = I/Y$, is *negatively* related to the rate of change in population.

(3) The technology coefficient, β^*, is *negatively* related to the rate of change in population.

(4) The relative share of capital, α, is *negatively* related to the rate of change in population.

The above facts imply that the rate of change in population is negatively related to not only the rate of technological progress but also $i = I/Y$, β^*, and α. The above (1), (2), and (3) belong to technological progress. (4) is related to a fact that stop-macro inequality is indifferent of α. Policy-makers are endogenously free from a threat that the

[5] Stylized facts of Kaldor (1978) are found in actual statistics data in the discrete time and no mismatch happens. Nevertheless, an endogenous rate of technological progress is derived solely using the discrete time, which neoclassical school has not formulated up to date (see facts of Jones C. I. (1998)).

higher the level of α, the worse the stop-macro inequality is. Social policy separated is able to reinforce micro-stop inequality.

The above facts absorb the relationship between unemployment and the rate of change of money wage rates, as investigated by Phillips, A. W. (1958) and price expectations as strictly framed by R. E. Jr., Lucas, et al. (1969). Conclusively no unemployment spreads with no assumption and under perfect competition by country.

Human and technology march together, due to a fact that human capital creates technology. Mankind and food march together and agriculture is a base for life. This fact has been respected historically. Maddison A. (1987, 1995), as the author revisited in the previous section, naturally took this idea and estimated the relationship between population and *GDP*, for so long Centuries surprisingly.

Nevertheless, mankind or human has its will and decision-making, differently from capital. Thus, population or labor has a wider range of technology selected by leaders; between natural science that follows Absolute Existence and social science that accepts money-oriented. Philosophy and idea, therefore, must be a base for technology. The endogenous system remains a receptacle. Results depend on human philosophy. Thus, in the previous section, the author revisited the openness and disclosure of Kant, referring to Nisbet, H. B. (1970), and similar to Mirrlees J. A. (2010, 2011).

This chapter has not referred to demographic, transitional, or post-transitional aspects that are based on the lifecycle of production and consumption. A reason is that the endogenous system holds with an endogenous rate of technological progress under no assumption, while the concept of lifecycle and the reallocation system holds with some assumptions such as a highly stylized model of the economy, steady-state, and golden rule growth, as shown by Wang Feng (7, 8, 2005). The author is stimulated by the proofs of the demographic dividends and the support ratio used as tools for the prime working ages and production-deficit ages.

The author is confident that the age structure will cooperate with the endogenous system in the near future and, that the actual/estimated consumption of demographic study and the endogenous consumption integrated with technology will be precisely connected when the models behind demographic study become completely free from the above assumptions. A clue is the relationship between exogenous and endogenous or $C_{MAX} \leftrightarrow W$ in the literature and $Y = C + S = W + \Pi$ in the endogenous-equilibrium. The author intends to show a preparative framework and empirically compare elasticity results of the assumption-oriented Cobb-Douglas production function with those of author's production function.

Conclusively, Chapter 15 reaches six nature-aspects in Essence of Earth Endogenous System, which is also united with six organic aspects for measure in Notations. Measure and nature in the *EES* are only distinguished by role/function, as summarized in this chapter. Therefore, distinguished characteristics by stream and its school reduce to common essentials, historically and in the current streams. And, we find, these streams approach results of natural science endowed with no human decision.

It implies that agriculture must be a base for human life. Earlier economists suppose this direction to be gradually inclined to money-oriented so called mercantilism with international trade expansion. Eventually, money is the unique assets in that its quality=its quantity in this world. And endogenously, money-neutral prevails by country all over the world, as externally tested by country. For example, agriculture makes us alive by barter trading in under-populated areas in mountains, small islands, and villages far from cities. This fact suggest us up-stream of organic and nature- aspects in the *EES*.

In this sense, sum-up facts listed in Conclusions here are useful to people all over the world. In particular, technology is a strange but everlasting monster in favor of human and people. Strange is endogenous an evidence such that adverse of common sense is correct as in quiz.

Essence of Earth Endogenous System of the top of the *EES* is the unique water filtered from endogenous data under two ways of results = causes. Water after tested by corresponding hyperbolas each reduced from endogenous equations in the *EES*. The author has investigated the first appearance of hyperbola in the literature, whichever of academic fields. The originals appear in the later part of 1850s but, the author confirms that hyperbola remains *supposed* one, not yet concreted historically, and up-date. Here the author never steps into another (spiritual of five-dimensions) world, to order to stay at scientific as in mathematics (see Appendices in Chapter 10).

At the end of this chapter, the author sums up six types of hyperbolas using positive (+) and negative (−) of each diagonal. Policy-makers feel relaxed to know the differences of + and −.

1) Hyperbola of the technology coefficient to changes in net investment, $\beta^*(i)$: +.
2) Hyperbola of the rate of return to changes in net investment, $r^*(i)$: +.
3) Hyperbola of net investment to changes in population, $i(n)$: −.
4) Hyperbola of the technology coefficient to changes in population, $\beta^*(n)$: −.
5) Hyperbola of the rate of return to changes in population, $r^*(n)$:+, as a reduced line.
6) Hyperbola of net investment to changes in population, $\alpha(n)$: −.

The above results are consistent with those in simulations (see, Tables P1 to P3).

Chapter 15

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Chapter 15

Special Note to Wang, Jianxiong:

This chapter tests each of 36 countries for proving the relationship between the rate of technological progress and the rate of change in population by country. I presented China data-sets in this chapter. One reason is related to my graduate student, Dr. Wang Jianxiong, Shanghai, President of Japan-China Cooperation Association for small and medium enterprises. Jianxiong asked me how to set up and realize an eco- and cyclical-experimental green area at an island in the River facing at City Shanghai. Jianxiong was, exceptionally at that time, a green-oriented student when he was attending at a forest university near his home town. He has not changed his original intention since then. I have similar experiences attending at Lincoln College, Canterbury, New Zealand, in the early 1980s. Lincoln, at University of Canterbury, was established in 1878 by Queen Elizabeth as the first agricultural college in the South Hemisphere. We hope that China will spread green areas with the spirit of Moderation, step by step.

Proposal to a plan for Island Changxing, Shanghai in China

Theory and practice are united at the endogenous system. Here, I present a proposal. For causes and reasons, see Chapters 14 and 15, and for stage risky difficulties, see Chapter 11. The proposal is successful since endogenous circular is endogenously guaranteed at Island Changxing.

The size is similar to Island Oshima, Prefecture Yamaguchi; 160 km^2 in length and roughly 67 km^2 for living area. Currently, 50,000 people live. After ten years the island has population of 250,000. Ideal area will be realized after years. The plan realizes sustainable moderation between the rate of technology, growth, and returns/profits by year.

Natural agriculture, forest, and fishing are by nature cooperative with small and intermediate enterprises. Environmental Utopia is already indispensable. Once urgently required, this model case spread over other areas in China. China has leadership and execution power, towards clean air, water, and cyclical country. Policies published become moderate and controllable, by single tax rate of rentals for government totally-owned lands, as George Henry's (1898) discovered.

Results:

1. Capital and population are fitted for sustainability without bubbles or at the least cost for management.
2. The rate of technological progress is 5-6% by year.
3. The growth rate of output is 8-9% by year.
4. The rate of return is 10-13% at a high level.
5. No inflation and full-employment along with human capital education-oriented.
6. The capital-output ratio is stable and less than 2.5-3.0, where agriculture is a base using no chemicals and preventing medical care in advance.
7. People feel happy, out of money and money, and celebrated by high human philosophy of Island.
8. Economic robustness essentially comes from a fact that government owns lands, whose rentals are replaced by tax increase and thus, endogenously minimize government size.

Chapter 16

Recursive Programming to Reinforce the KEWT Data-Sets by Country

16.1 Introduction

This last Chapter *first* intentionally synthesizes the relationship between recursive programming and KEWT data-sets. The author shows related proofs deeply. Each chapter in the *EES* has presented each issue, rather focusing and narrowing the range of spread for simplicity. This chapter widely spreads the related issues and refers to other issues. This chapter compares each country's recursive programming and uses five types of combinations between parameters and variables. The five type combinations were selected among others so that characteristics by country are most effectively presented from various aspects. All the results of recursive programming are only compiled in this chapter. Readers are able to compare 36 countries in recursive programming by type. All the results of hyperbola graphs for 36 countries are compiled in Appendix at the end of the *EES*. Readers are able to compare each characteristic by country, comparing results of recursive programming and hyperbola graphs. This chapter, for simplicity, does not refer to hyperbola results.

Second, this Chapter is able to reply to some problems penetrated by Harcourt, G. C. (1972, 272p.) as the successor of Robinson, J. This is because Harcourt summarized the essence of UK Keynesians, comparing with Neo-classical theories, and showed hundred surprising diagrams; full of insight, yet without empirical results. This chapter does not wholly intend to comment or review his life-work. Yet, the author cites several diagrams of his and intends to bury the differences between UK and US (both) Keynesians. This challenge is hopeful, by using tight cooperation lying between the endogenous system and KEWT data-sets by country and, applying to one of his diagram the above five types of combinations obtained from recursive programming. For example, the relationship between the marginal productivity of labor and the average productivity of labor is solved using one of five types by country. Even his diagrams to double-switching and capital-reversing correspond with those of several countries shown in another of five types by country.

Harcourt (ibid., 35) refers to five assumptions set by Swan (1956): investment determined by saving, constant returns to scale, full employment, static expectations and perfect competition. Meade (1962) raises nine assumptions as the author discussed in earlier chapters. According to the author's viewpoint of purely endogenous, two assumptions of perfect competition and the price-equilibrium are decisively common to Keynesian and Neo-classical schools. The endogenous system totally decreased nine assumptions each by each although some assumptions were interrelated. Perfect assumption is shown by an endogenous fact that marginal productivity of labor (MPL) equal the wage rate and marginal productivity of capital (MPK) equals the rate of return, each in equilibrium. It implies that an average equals its marginal value. This fact is not realized when the price-equilibrium prevails in the global economies. Since a ratio such as the rate of return has no unit, capital must have a value but, this value is unknown under the price-equilibrium. Furthermore, as described by Harcourt (ibid., 5) 'Robinson argues that comparisons of equilibrium positions one with another are not the appropriate tools for the analysis of out-of-equilibrium processes or changes.' Under the endogenous-equilibrium, 'out-of-equilibrium processes' are exactly measured using the speed years and seven endogenous parameters in the endogenous system.

16.2 Theory and Practice between Recursive Programming and KEWT Data-sets

16.2.1 Relationship between recursive programming in the transitional path and KEWT data-sets

This section endogenously summarizes the relationship between the recursive programming in the transitional path and KEWT data-sets. Since theory and practice are united at the endogenous system, this relationship means to express the processes in recursive programming consistently with KEWT data-sets. KEWT data-sets hold without the help of recursive programming in the transitional path. Why, then, do we need to measure the recursive programming in the transitional path? KEWT data-sets only show all the parameters and variables at a moderate equilibrium, which is measured by the speed years for convergence in endogenous equilibrium. For example, suppose the speed years of a country are 48 years. KEWT data-sets are unable to show all the parameters and variables by year during 48 years. Recursive programming is solely able to show all the parameters and variables by year during 48 years. At the endogenous system, seven endogenous parameters control the whole system by country and by sector but, here the author presents, for simplicity, the processes at the total economy and also the processes directly related to 1) the quantitative net investment coefficient, β^*, and the diminishing returns to capital coefficient, δ_o.

In a fiscal year, the speed years for convergence in endogenous equilibrium (hereafter, the speed years) are each determined by country and by sector, using the recursive programming in the transitional path (hereafter, recursive programming).

In recursive programming, first of all, two determinants, β^* and δ_o, must be measured. If β^* and δ_0 are measured consistently, then, recursive programming and KEWT data-sets are all consistent each other. What guarantees and justifies this consistency between recursive programming and KEWT data-sets? The author justifies the mutual consistency by maintaining the equal relationship between the productivity of stock and the productivity of flow. The productivity of stock is presented by total factor productivity (*TFP*) as shown in the literature. The productivity of flow is presented by the rate of technological progress as shown in the endogenous system. There is no article that proves that *TFP* is equal to the rate of technological progress. This is natural since the rate of technological progress is not purely endogenous but essentially exogenous in the literature that uses the Cobb-Douglass production function in the constant returns to scale.

The author in this section proves the equal relationship between *TFP* and the rate of technological progress, $g_A^* = i(1 - \beta^*)$, thoroughly limiting to the direct relationship.

Let the author follow the literature as much as possible and compare the discrete case with the continuous case. The discrete case of *TFP* is shown by stock; $g_A(t) = (A(t) - A(t-1))/A(t-1)$, where $TFP = A$. The continuous case of productivity as in growth accounting is shown by flow; $g_A(t) = g_y(t) - \alpha \cdot g_k(t)$, where each per capita. The continuous Cobb-Douglas production function in the literature, however, cannot synthesize discrete and continuous. The discrete Cobb-Douglas production function only synthesizes discrete and continuous. The author here indicates that Samuelson's lifework for welfare economy is full of insights yet based on the continuous Cobb-Douglas production function. Samuelson and Modigliani (see, Figure 1; 323, 1966) tried to get to a common destination with Keynesians such as Pasinetti and Kaldor. Why is it difficult to synthesize discrete and continuous? The author finds the answer from the assertion of Robinson's (157-166, 1959). A model needs the measurement of capital and its rate of return at the same time. The endogenous system simultaneously measures capital (physical/fixed assets or capital stock) and the rate of return at KEWT data-sets and its transitional path by year: K and $r^* = \Pi/K$ (see Chapter 6). As a result, $g_A(t) = (A(t) - A(t-1))/A(t-1) = g_y(t) - \alpha \cdot g_k(t)$ is endogenously synthesized and proved empirically.

At the initial/current year in the transitional path, the diminishing returns to capital coefficient, δ_0, is formulated and holds. At the convergence year at the steady state or the balanced growth state, δ_o reduces to the relative share of capital, α, where $\delta_0 = \alpha$ holds. This is proved using endogenous equations and also using the recursive programming in the transitional path. The ratio of net investment to output, $i = I/Y$, and the ratio of saving to output $s = S/Y$, are fixed in the transitional path. But, the quantitative net investment coefficient, β^* or $1-\beta^*$, changes in the transitional path, similarly to δ_0, as formulated below.

16.2.2 Proofs of relationship between the rate of technological progress and the growth rate per capita output

In this section, the rate of technological progress is measured and proved, starting with the transitional path by time/year, t. The rate of technological progress, $g_{A(t)} = i_t(1-\beta_t)$, presents the primary base for the endogenous model and its data-sets and further leads to related endogenous variables by t.

$\beta(t) = \beta(0)(1+g_\beta)^t$ and $\delta(t) = \delta(0)(1+g_\delta)^t$, where $\beta(t) \to \beta^*$ and $\delta(t) \to \alpha$, each at convergence, $t \to t^*$.

$i(t) = i \cdot y(t)$, where $TFP(0) = \frac{k(0)^{1-\alpha}}{\Omega(0)}$ and $y(0) = TFP(0) \cdot k(0)^\alpha$.

To simplify, notation A is used for total factor productivity, *TFP*. $L(t) = L(0)(1+n)^t$ is set to clarify the capital-labor ratio, $k(t)$, and per capita output, $y(t)$. To simplify, relative statistics population is used at the initial year; $L(0)$=1.0000. The growth rate of statistics population is $n = (L_t - L_{t-1})/L_{t-1}$. The rate of change in population in equilibrium is designated by n_E. KEWT 6.12, 1990-2010, presumably sets a moderate equilibrium under full employment; $n_E = n$ while KEWT 5.11, 1990-2009, under $n_E \neq n$ to save some countries that fall into close-to-disequilibrium. To simplify, n is used in this section.

Using the above three values, basic numerical values by time are arranged.

Setting $i_K(t) = i(t) \cdot \beta(t), k(t) = k(t-1) + i_K(t)$ holds.
Setting $i_A(t) = i(t)(1-\beta(t))/k(t)^{\delta(t)}, A(t) = A(t-1) + i_A(t)$ holds.
$i(t) \neq i_K(t) + i_A(t)$ holds, because of the introduction of $k(t)^{\delta(t)}$ into $i_A(t)$.

Each variable of $g_A(t), g_k(t),$ and $g_y(t)$, is calculated using each difference of $A(t)$ and $A(t-1)$, $k(t)$ and $k(t-1)$, and $y(t)$ and $y(t-1)$: e.g., $g_{A(STOCK)}(t) = (A(t) - A(t-1))/A(t-1)$.

At convergence, the above $i_A(t) = i(t)(1-\beta(t))/k(t)^{\delta(t)}$ reduces to $i_A^* = i(1-\beta^*)$ and $g_A^* = i_A^*$ holds.

As a result, the discrete case is transformed and finalized:

$$g_A(t) = i_A(t) \cdot k(t)^{\alpha-\delta(t)} = \frac{i_A(t) \cdot y(t)}{A(t) \cdot k(t)^{\delta(t)}} = \frac{A(t+1) - A(t)}{A(t)}.$$

Or, $\quad g_A^* = i(1-\beta^*)$ at convergence $\qquad (1)$

At convergence, $g_A(t) = g_A^*$ holds with CRC. Eq.1 reduces to $g_A^* = i_A^*$ since $k^{*\alpha-\alpha} = 1$. This is equivalent to $g_A^* = i(1-\beta^*)$, as shown in 1.1 above. Also, $g_y^* = g_k^*$ holds. Then, $g_A(t) = g_y(t) - \alpha \cdot g_k(t)$ reduces to $g_A^* = (1-\alpha)g_y^*$.

$$g_y^* = g_k^* = \frac{i_A^*}{1-\alpha}. \tag{2}$$

Eq.2 corresponds with Solow's exogenous equation (after correction[1]; 94, in 1.4, 1969). Therefore, regardless of whether the rate of technological progress is exogenous or endogenous, Eq. 2 holds as long as the Cobb-Douglas production is used. Then, how is the quantitative net investment coefficient, β^*, calculated? The following two steps are required to simultaneously formulate the capital-output ratio, Ω^*, and the quantitative coefficient, β^*.

16.2.3 Proof of the capital-output ratio and the quantitative net investment coefficient

The continuous case starts with $\Delta k(t) = \frac{i_K(t)\cdot y(t) - n\cdot k(t)}{1+n}$, from $k(t+1) = \frac{k(t)+i_K(t)\cdot y(t)}{1+n} = \frac{K(t)+i_K(t)\cdot Y(t)}{(1+n)\cdot L(t)} = \frac{K(t)+\Delta K(t)}{(1+n)L(t)} = \frac{K(t+1)}{L(t+1)}$. Then,

$$g_k(t) = \frac{1}{1+n}\left(i_K(t)\cdot A(t)\cdot k(t)^{\alpha-1} - n\right) = \frac{i_K(t)\cdot y(t) - nk(t)}{(1+n)k(t)} \tag{3}$$

Accordingly, at convergence,

$$g_k^* = \frac{1}{1+n}\left(i_K^*\cdot A^*\cdot k^{*\alpha-1} - n\right) \tag{4}$$

Inserting $\frac{1}{\Omega^*} = \frac{k^{*1-\alpha}k^{\alpha-1}}{\Omega^*} = A^* k^{*\alpha-1}$ into Eq.4, we obtain

$$g_k^* = \frac{1}{1+n}\left(\frac{i_K^*}{\Omega^*} - n\right) \tag{5}$$

Since Eq.5 is equivalent to Eq.2 (by connecting these two cases), $\frac{i_A^*}{1-\alpha} = \frac{1}{1+n}\left(\frac{i_K^*}{\Omega^*} - n\right)$ is derived, where $i_A^* = i(1-\beta^*)$ and $i_k^* = i\cdot\beta^*$hold at convergence.

[1] The author is grateful to Dr. Solow, R. M. for his direct reply to my question on 9 March 1998: "The answer to your question is that the statement on page 86 of my 1956 article is a mistake. I do not know how such a simple error of arithmetic occurred; but I discovered it very soon after the article was published. As you say, steady-state *K/Y* is constant. Once in a while someone notices the error and writes to me, as you did. The first person to write, probably in 1957, was T.N. Srinivasan, then a graduate student at Yale, and now a professor there. Thank you for your letter, and good luck with your book."

As a result, $\frac{i(1-\beta^*)}{1-\alpha} = \frac{1}{1+n}\left(\frac{i\cdot\beta^*}{\Omega^*} - n\right)$ or $i(1-\beta^*)(1+n) = (1-\alpha)\left(\frac{i\cdot\beta^*}{\Omega^*} - n\right)$ is derived.

Therefore, the capital-output ratio equation is obtained:

$$\Omega^* = \frac{\beta^*\cdot i(1-\alpha)}{i(1-\beta^*)(1+n)+n(1-\alpha)} \tag{6}$$

Or, differently, the quantitative net investment coefficient equation is obtained, when the capital-output ratio $\Omega^*$is given:

$$\beta^* = \frac{(1+n)\Omega^*\cdot i+(1-\alpha)\Omega^*\cdot n}{i\left((1-\alpha)+\Omega^*(1+n)\right)} \tag{7}$$

It apparently seems that the relationship between Ω^* and β^* brings about tautology. There is no tautology if the condition of $\Omega^* = \Omega_0$ is used to avoid tautology. Avoiding tautology will be fully justified when we wholly step into endogenous equilibrium, as below.

16.2.4 Justify two conditions of $\boldsymbol{\Omega^* = \Omega_0}$ and $\boldsymbol{r^* = r_0}$

$\Omega^* = \Omega_0$ shows that the capital-output ratio in the initial/current situation is equal to that at convergence realized in the transition path. Similarly, $r^* = r_0$ shows that the rate of return at the initial/current situation is equal to that at convergence realized in the transition path. The above two conditions were explained by the author's earlier notion in Feb 2004, but without fully connecting this notion numerically with the endogenous-equilibrium. One of the author's today's excuses is that the author paid attention to the difference between the author's convergence using the transitional path and the exogenous convergence in the literature. The other excuses of the author today are that the transitional path holds after equilibrium holds, regardless of whether the equilibrium is price-oriented or endogenous-oriented. Later, the author succeeded in measuring the endogenous-equilibrium at the real assets (see Chapter 7). This section summarizes the justification of the two conditions of $\Omega^* = \Omega_0$ and $r^* = r_0$, verbally comparing the price-equilibrium in the literature with the endogenous-equilibrium in the endogenous model, since the price-equilibrium does not wholly contradict with the endogenous-equilibrium. The next section numerically clarifies the endogenous-equilibrium.

From the policy-oriented viewpoint, the endogenous model sets a parallel march of the current actual situation and the current endogenous situation at convergence (i.e., at the balanced state in the literature). Both situations are consistent with the condition of $\Omega^* = \Omega_0$ at the transitional path of the endogenous system. The relationship between the current actual situation and the current endogenous situation differs due to the difference of capital stock lying between statistics-data and endogenous-data. Actual capital is estimated based on perpetual inventory method, helped by the market data, while endogenous capital is accurately measured 'by sector' in the endogenous system. The neutrality of the financial/market assets to the real assets was earlier proved in Chapter 2. The neutrality proves, for example, that ten year market debt yield equals the rate of return at convergence when the situation holds in endogenous equilibrium measured by the speed years by country and by sector.

The condition of $\Omega^{*}=\Omega_{0}$ is only justified with the condition of $r^{*}=r_{0}$ and with the assumption of a fixed relative share of capital (or labor) throughout the transitional path.[2] A fixed relative share of capital solely holds in endogenous equilibrium. Upon revealing the mechanics of the endogenous-equilibrium, the endogenous model integrates 'at convergence' with 'in equilibrium' consistently with the price-equilibrium in the literature. The endogenous situation at convergence corresponds with the balanced state in the literature. The difference of the two equilibriums is specified as follows: For the endogenous-equilibrium, 'the situation at convergence' is precisely measured in equilibrium (free from correlation analysis) by country and by sector. For the price-equilibrium, 'the balanced state' is estimated using time-series analysis and/or cross country analysis, based on panel actual-data, as shown by Barro and Sala-i-Martin (36-39, 80-92, 1995) and Ark, Bart, and Nicholas Crafts (1-26; 271-326, 1996).

As a result, the actual long-term market rate is compared with the current rate of return or the rate of return at convergence, in equilibrium. The above notion is traced back to von Neumann's turnpike theory, where turnpike is a short cut of the transitional path. Von Neumann (1-9, 1945-46) estimates the matrix for the price-equilibrium using actual statistics-data while the endogenous system measures endogenous-data in equilibrium. The capital-output ratio is by nature difficult to treat in the Cobb-Douglas production function. Nevertheless, Samuelson (1477-79, 1970) proves the constancy of the capital-output ratio in von Neumann turnpike theory and states that the constant capital-output ratio is the reciprocal of the von Neumann interest rate. Conditions of $\Omega^{*}=\Omega_{0}$ and $r^{*}=r_{0}$ are consistent with Samuelson's Law of Conservation of the Capital-Output Ratio using turnpike theory.

[2] $\alpha=\Omega^{*}\cdot r^{*}$ is a policy-oriented core in the endogenous model. In the transitional path, both the capital-output ratio Ω^{*} and the rate of return r^{*} each in equilibrium change under a fixed relative share of capital. The author presumes that the transitional path between the current/initial and at convergence is a sort of non-turnpike by time/year. Interesting to say, after convergence, Ω^{*} and r^{*} change inversely (from DRC to IRC and rarely from IRC to DRC). This fact is not clarified in the literature due to the use of the capital-labor ratio.

16.2.5 Diminishing returns to capital coefficient, δ_0, and the speed year coefficient, λ^*

This section proves the relationship between the diminishing returns to capital coefficient, δ_0, and the speed year coefficient, λ^*. The endogenous-equilibrium is determined by the two speed year hyperbolas of $i = I/Y$ and n. Interestingly, n and δ_0 are involved in each vertical asymptote (see Appendix at the end of the *EES*.

First, δ_0 is obtained in the transitional path by setting a fact that the initial/ current δ_0 becomes equal to the relative share of capital at convergence, α. The discrete Cobb-Douglas production function holds at convergence with the minimum requirement of δ_0. A decisive idea is that the quantitative net investment coefficient, β^*, is connected with the capital-output ratio, *Omega*. Total productivity factor *A=TPF* as a stock in the C-D production function is, then, replaced by $B^* = (1-\beta^*)/\beta^*$ as a flow. And, define B^*_{TFP} as $B^{*1-\delta_0}$: $B^*_{TFP} \equiv B^{*1-\delta_0}$.

$\Omega = \frac{k^{1-\alpha}}{A}$ is an accounting identity in the C-D production function. This capital-output ratio is expressed as $\Omega = \frac{k^{1-\alpha}}{B_{TFP} \cdot k^{1-\delta_0}}$ using the above $B^*_{TFP} \equiv B^{*1-\delta_0}$. Define $TFP_B \equiv B_{TFP} \cdot k^{1-\delta_0}$. Then, $\Omega = \frac{k^{\delta_0-\alpha}}{B_{TFP}}$ holds. At convergence, $\alpha = \delta_0$ holds with $1 = k^{\delta_0-\alpha}$. Then, $\Omega^* = \frac{1}{B^*_{TFP}}$ or $\Omega^* = \frac{1}{B^{*1-\delta_0}}$ holds, resulting in $B^{*1-\delta_0} = \frac{1}{\Omega^*}$ or $1 = \Omega^* \cdot B^{*1-\delta_0}$. Therefore, for the DRC coefficient, δ_0, the following equation is proved.

$$\delta_0 = 1 - \frac{LN(1/\Omega^*)}{LN(B^*)}, \text{ or } \delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)} \tag{8}$$

$y = A \cdot k^{\alpha}$ is, however, not consistently connected with $B_{TFP} \equiv B^{1-\delta_0}$ in the transitional path, except for ‘at convergence.’ The use of B^*_{TFP} is only justified when the value of δ_0 is measured. The measurement of δ_0 connects Neo-classicists with Keynesians in the C-D production function. [3]

Second, the speed years for convergence in equilibrium are measured using the (endogenous) speed year coefficient, λ^*. The author assumes that the qualitative coefficient, β^*, and the DRC coefficient, δ_0, ‘linearly’ each change in

[3] The form of $y = B_{TFP} \cdot k$ is another expression of *Y=AK* model in Keynesian model (e.g., Thirlwall, A. P., 427-435, 2002). Thirlwall’s model does not use the C-D production function, similarly to all the Keynesians, Neo- and New-. For discussions, see *JES* 11 (Feb, 1), 2008.

the discrete transitional path. As a result, the author does not use the exponential function, e^{-x}, differently of the literature. The convergence coefficient in the literature corresponds with the speed year coefficient. The convergence coefficient in the literature uses two exogenous ratios, instead of δ_0 and $g_A^* = i(1-\delta_0)$, [4] The speed years, *speed*, are the inverse number of the speed year coefficient, λ^*: $speed = 1/\lambda^*$. This equation is an accounting identity.

$$\lambda^* = (1-\alpha)n + (1-\delta_0)g_A^* \tag{9}$$

Then,

$$speed = \frac{1}{(1-\alpha)n+(1-\delta_0)i(1-\beta^*)} = \frac{1}{\lambda^*} \tag{10}$$

The author defines the speed year coefficient as a weighted average growth rate of the population and the endogenous rate of technological progress in equilibrium. This growth rate is per year so that the speed years are the inverse number of the speed year coefficient.[5]

The author happily finds a base common to the equation of the literature and the author's equation. In detail: suppose that 1) δ_0 equals *alpha* and 2) the endogenous rate of technological progress equals the exogenous rate of technological progress. Then, the convergence coefficient in the literature is expressed as $(1-\alpha)(n + g_{EXOGENOUS})$ under the price-equilibrium. In other words, the literature[6] has expressed a similar notion using panel data for an infinite period and exogenously in the price-equilibrium.

In the case of the endogenous model, the speed year coefficient is applied to before and after convergence. For example, if diminishing returns to capital (DRC) prevail before convergence, the DRC turns to increasing returns to capital (IRC) after convergence, and vice versa.

In recursive programming, $\beta(t)$ and $\delta_0(t)$ work each using $\beta(t) = \beta(0)(1+r_\beta)^t$ and, $\delta(t) = \delta(0)(1+r_\delta)^t$ by time/year. Here, r_β and r_{δ_0} are

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[4] The author is grateful to Dr. Toshimi Fujimoto who has advised me in many respects. The author defines the speed year coefficient as the growth rate 'per year' so that the inverse number of λ^* is the speed years as an accounting identity.

[5] Using accounting identity, '1=turnover periods × turnover ratio' holds. The turnover periods correspond with the speed years and the turnover ratio corresponds with the above growth rate.

[6] Barro, Robert, J., and Xavier Sala-i-Martin. (1995). *Economic Growth,* 36-39, 80-92. New York and London: McGraw-Hill (1st ed.). And, Javier, Andres, Rafael, Doménech and César, Molinas, "Growth and convergence in OECD countries: a closer look," pp.347-387, In "*Quantitative Aspects of Post-War European Economic Growth*," edited by van Ark, Bart, and Nicholas Crafts, Cambridge: Cambridge University Press, 442p, 1996.

denoted each as the discount rate. Furthermore, using $LN(1+r_\beta) \fallingdotseq r_\beta$ abbreviated under Maclaurin's series, $\mathrm{LN}(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \cdots$, $r_\beta = \frac{LN(\beta^*) - LN(\beta_0)}{1/\lambda^*}$ and $r_{\delta_o} = \frac{LN(\delta_0) - LN(\alpha)}{1/\lambda^*}$ hold (see 158, *PRSCE*: 49 (Sep, 1), 2008).[7]

Note that the above equations with LN cannot be calculated when any of $\beta^*, \beta_0, \delta_0,$ or α are minus. A minus β^* implies a minus rate of technological progress, since $i > 0$ is a required condition in equilibrium. Disequilibrium occurs when the situation falls into $n_E < 0$ and $\beta^* < 0$. Then, recursive programming does not work.

Without finding the diminishing returns to capital coefficient, δ_0, the mechanics of endogenous equilibrium in the transitional path was not revealed. The transitional path, as von Neumann and Samuelson pursued, is a turnpike and the above devices are accepted for safety in the turnpike. In disequilibrium, the turnpike and the non-turnpike by time/year are shut down.[8]

Recursive programming has its own programming, similarly to KEWT data-sets. When a country is close to disequilibrium or meets an abnormal value, a special device is needed. For example, suppose $\beta^* = 1.05192$. In this case, the diminishing returns to capital (DRC) coefficient δ_0 is not calculated in recursive programming. The operator must be 'ABS' (absolute) in the corresponding Excel equation (see, Philippines 2010).

16.3 Reply to Harcourt, G. C. (1972): Synthesizing Keynesian and Neo-Classical Models

16.3.1 From unsolved to solved

In this section, the author selects four typical diagrams/figures in Harcourt (ibid., 70, 156, 223, 247) and cites four diagrams each as BOXES 16-1, 16-2, 16-3, and 16-4. These four figures show several implicit characteristics common to economics in the literature, in addition to two definite assumptions of perfect

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[7] In the continuous case, for example, the same $r_\beta = (LN(\beta^*) - LN(\beta_0))/1/\lambda^*$ holds; processing from $\beta^* = \beta_0 e^{r_\beta(1/\lambda^*)}$ to $LN(\beta^*) = LN(\beta_0) + r_\beta(1/\lambda^*)$.

[8] Equations are formed without using LN: $(1+r_\beta)^{1/\lambda^*} \fallingdotseq 1 + (1/\lambda^*)r_\beta$ holds using another Maclaurin's series, $(1+x)^a = 1 + ax + \frac{a(a-1)}{2!}x^2 + \cdots$, $\frac{\beta^*}{\beta_0} \fallingdotseq 1 + (1/\lambda^*)r_\beta$. Thus, $r_\beta = \frac{\beta^* - \beta_0}{\beta_0(1/\lambda^*)}$ holds and similarly, $r_{\delta_0} = \frac{\alpha - \delta_0}{\delta_0(1/\lambda^*)}$ holds.

competition and the price-equilibrium. Several implicit characteristics are: i) Heterogeneous capital, 2-3; ii)Micro-oriented, 9; iii) Diminishing returns and, increasing returns or learning by doing, 79 and 249; iv) Maximum per capita consumption, 240-243; v) The relative share of capital and the changes between the rate of return and the wage rate, 158-159; and vi) Double-switching and capital-reversing, 8. These implicit characteristics are interrelated and also explicitly connected with common assumptions.

Let the author briefly interpret these implicit characteristics from the viewpoint of the endogenous system and then, next sub-section, comment the above BOXES 16-1, 16-2, 16-3, and 16-4.

Heterogeneous capital is correct. Similarly, heterogeneous population or labor is correct. Quantity and quality are united at capital and labor by country. For capital, flow of capital is net investment after capital consumption. Capital flow is measured qualitatively. Then, the rate of technological progress is measured first of all. Labor flow is qualitative and measured by the rate of change in population. When the speed years fall in a moderate range of the endogenous-equilibrium, the growth rate of population equals the rate of change in population. This is called no unemployment or such that the rate of unemployment is zero. Thus, full employment is guaranteed in the endogenous system.

Micro-oriented or the use of an aggregated production function (Harcourt, ibid. 50) is a compromised expression. Micro-oriented prevails in any aspect in economics. An original point is Koopmans's diagram (Harcourt, ibid. 241n) for per capita consumption. Pasinetti (Harcourt, ibid. 9) forms an equation of $r = g/s_C$, based on corporate saving and neglecting the government sector. The endogenous system reduces this equation to $g = s_{SP/Y} = \alpha \cdot s_C$. It implies that the ratio of corporate undistributed profits to output equals the growth rate. Utility is individual-oriented and, everywhere from micro to macro is natural. In the endogenous system, macro-oriented and denies micro-oriented; reversely, from macro-oriented to micro-oriented. Otherwise, three equality of income = expenditures=output does not hold in the endogenous system.

For diminishing returns and increasing returns, the endogenous system clarifies dynamic movements at the ratio of net investment to output and the rate of return by using hyperbolic equation and its graph. Increasing returns diagrammed by Harcourt (ibid. 249) belongs to the rate of technological progress in the endogenous system; for example, learning by doing is a strategy and support the qualitative net investment coefficient. The rate of return always expresses diminishing returns to capital (DRC), before the convergence point of time in the transitional path. The endogenous system is unique in that it expresses DRC despite constant returns to scale (CRS). The literature aims at maximum per capita consumption as diagrammed by Harcourt (ibid. 79, 297-307). The endogenous system aims at maximum rate of return with minimum ratio of net investment to output. A goal of maximum per capita consumption is consistent with a goal of minimum ratio of net investment to output. Two goals show the same differently.

For the relative share of capital, Harcourt (ibid. 158-159) indicates the inconsistency between the relative share and MPK. It is natural. In the endogenous system, the relative share of capital is fixed in the transitional path as shown by recursive programming. And, average equals marginal each at capital and labor. Therefore, perfect competition assumption must be deleted, as indicated in the previous sub-section.

Finally, as a result, double-switching and capital-reversing occur at some countries and in some years. These results are shown in recursive programming. These results are explained in the next sub-section, comparing Harcourt's diagram with corresponding figure by country (for 36 countries, 2010, see Figures at the end of this chapter).

16.3.2 Comment to Harcourt's four diagrams

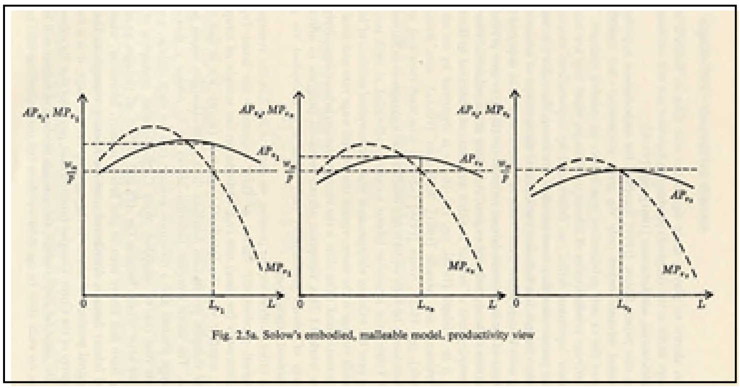
This sub-section takes four diagrams among hundreds of serious diagrams. The author does not deny the market principle under the price-equilibrium. Also, the following comments are not for Harcourt (1972) but for Keynesian and Neo-classical both schools. Or, essentially, comments are against the current economics and macroeconomics. The author, however, is not against Keynesian and Ne-classical researchers. They have executed every effort. Time has come so as to accept 'purely endogenous system.' In fact, the author has widely and historically absorbed the accumulated performances in the literature hitherto and, without these invaluable property and fortune, the endogenous system would not have been born.

The author takes four diagrams up that express Harcourt's scrupulous accumulations in his life, each by each as follows:

1) Harcourt (ibid. 70), see **BOX 16-1**: A reason why do MPL≠APL and MPK≠APK hold in Fig. 2.5a (Solow's embodied, malleable model. productivity view) in Harcourt (ibid., 70) is that the relationship between marginal productivity and average productivity follows Solow's cost view, as shown in Fig. 2.5b. 'Productivity view' and 'cost view' each reversely show the same relationship between marginal and average. Marginal parabolic curve is sharper than average parabolic curve. At the bottom point of average parabolic curve, the marginal parabolic curve crosses. Cost view diagram is shown more commonly than productivity view in textbooks, macro and micro.

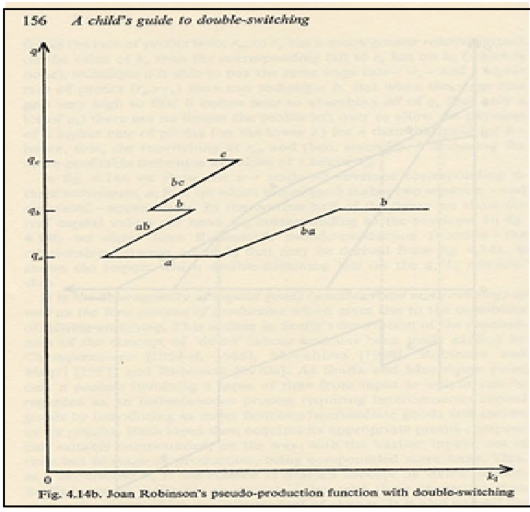
Under both diagrams, it is impossible to have MPL=APL and MPK=APK realized. Or, at the macro level, it is unrealistic to assume MPL=APL and MPK=APK.

BOX 16-1 Harcourt's (70, 1972) diagram to Solow's (1960) embodied, malleable model, productivity view



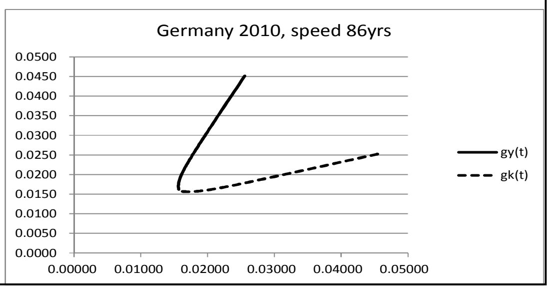
2) Harcourt (ibid. 156), see **BOX 16-2**: Fig. 4.14b shows Joan Robinson's pseudo-production function with double-switching. It is told that double-switching is one of key differences between Keynesian and Neo-classical researchers. Researchers, nevertheless, have not shown empirical proofs. To the author's understanding, double-switching is interpreted as a common phenomenon between two growth rates. The endogenous system presents the empirical proofs as shown in BOX 16-2.

BOX 16-2 Harcourt's (156, 1972) double-switching vs. Author's $g_y(t)$ and $g_k(t)$, using Germany, 1990-2010, speed 86 years



$g_y(t)$, the Y axis, and $g_k(t)$, the X axis: shown by a line.

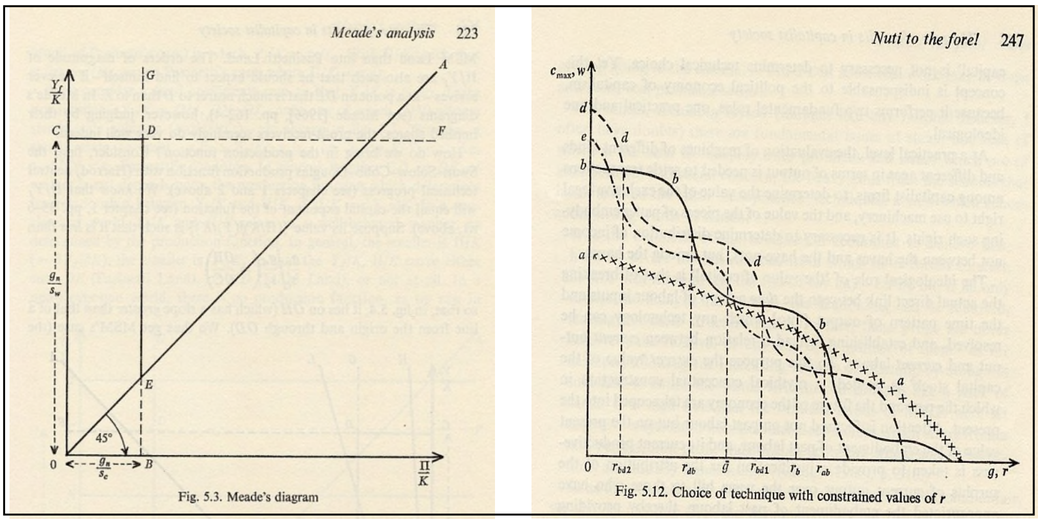
$g_k(t)$ the Y axis, to $g_y(t)$, the X axis: shown by a plotted line.



The LHS of BOX 16-2 is Harcourt's imaginary diagram while the RHS is an endogenous example differently from double-switching at KEWT 6.12 data-sets. On the Y axis, we are able to take $g_y(t)$ or $g_k(t)$, where each sub-figure reversely shows the same relationship between $g_y(t)$ or $g_k(t)$.

3) Harcourt (ibid. 223): Both Keynesian and Neo-classical researchers have used an inverse of the capital-output ratio as shown in **BOX 16-3**. On the Y axis, Y/K is used while on the X axis the rate of return, $r = \Pi/K$, is used. The author is not against the use of $1/\Omega = Y/K$. Yet, the author thinks that the product of the Y axis and the X axis should be meaningful. For example, $\alpha = \Omega \cdot r$ is a meaningful product c=a × b, since without $\alpha = \Omega \cdot r$, the relationship between DRC and IRC is not clarified numerically, as discussed below in iv).

BOX 16-3 Harcourt's (223, 1972) diagram to Meade (162-164, 1966) and Harcourt's (247, 1972) diagram to choice of technique: selected by the author



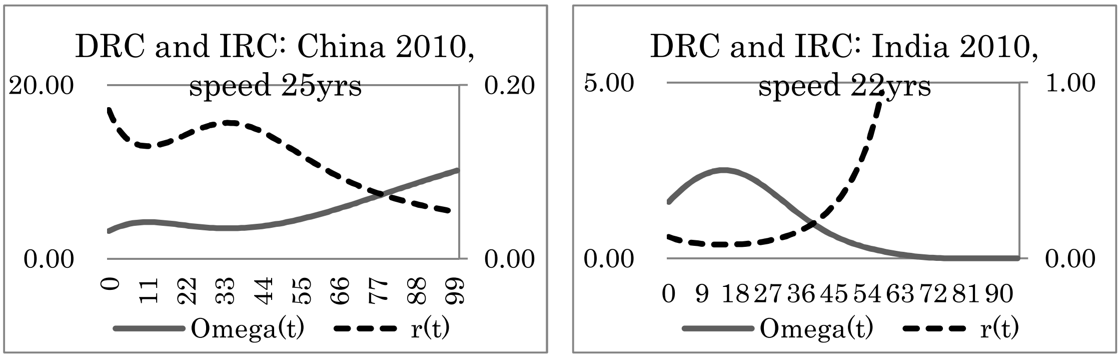
For the diagram use of product　　Double-switching and capital-reversing

4) Harcourt (ibid. 247), see **BOX 16-4**: Double-switching and capital-reversing are differently expressed by the relationship between DRC, IRC, and CRC, reinforced by the above meaningful product, $\alpha = \Omega \cdot r$. Under a fixed capital share α or labor share $1 - \alpha$, the rate of return is expressed by either DRC or IRC.

Harcourt (ibid. 8), defines double-switching such a possibility that the same technique may be the most profitable of all possible techniques at two or more separated values of the rate of profits even though other techniques have been the most profitable at rates of profits in between. Also, capital-reversing is defined as the possibility of a positive relationship between the value of capital and the rate of profits. These notions are against an empirical fact that along with the increase in capital stock, the rate of return decreases.

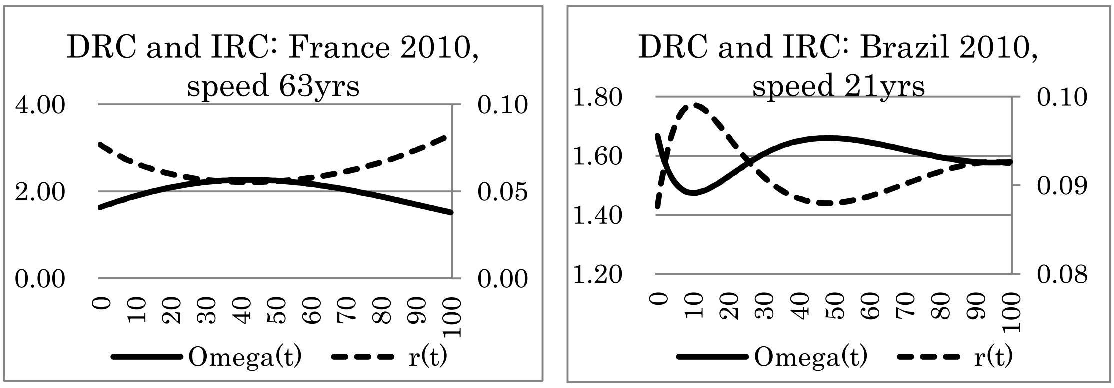
The endogenous system or KEWT data-sets for 36 countries clarify the possibility of double-switching and capital-reversing (see **Figures D4**, D5, and D**6** at the end of this chapter). If the endogenous-equilibrium is unstable due to huge deficit, double-switching and capital-reversing seldom occur, as mostly observed at developed countries. Do developing countries then have more possibility of double-switching and capital-reversing than developed countries? Compare China and India, 2010 at **BOX 16-4**. India is unstable partly due to deficit and as a result, India seldom has the possibility of capital-reversing in the transitional path.

BOX 16-4 DRC and IRC: China versus India



Under these circumstances, the endogenous system does not concretely distinguish one technique with another technique. The rate of technological progress is, rather vaguely and wholly at the macro level, measured by using qualitative net investment coefficient, β^*. In this sense, double-switching and capital-reversing are the same or, double-switching is absorbed into capital-reversing. Capital-reversing indicates that an economy is robust and realizes maximum rate of return, repeatedly as shown by e.g., Brazil (see **BOX 16-5**).

BOX 16-5 DRC and IRC: France versus Brazil



In short, capital reversing indicates that the endogenous-equilibrium recovers in a short run. In a sense, integrated policies are well controlled with accumulation of experiences in the past. Leaning by dong is a strategy to improve seven endogenous parameters at the macro-level. Leaning by dong implicitly works for policy combinations and its integration.

16.4 Results of Recursive Programming

This section examines and clarifies the results of recursive programming and focuses *two points*. *The first point* is the relationship between the rate of technological progress as flow, $g_{A(FLOW)}(t)$, and the growth rate of total factor productivity (*TFP*) as stock, $g_{TFP(STOCK)}(t)$, with the growth rate of $k = K/L$, $g_k(t)$ in the transitional path. *The second point* is the relationship between diminishing returns to capital (DRC), the constant returns to capital (CRC), and the increasing returns to capital (IRC) in the transitional path. Both points are interrelated each other. The author proves two points in recursive programming.

For the above proofs, the author uses KEWT 6.12, 1990-2010, at the total economy level. 36 countries are selected among 81 countries. 36 countries are divided into three groups; i) developed countries versus BRICs, ii) European countries excluding Euro currency countries, and iii) Asian countries. The first group is the same as the author used for hyperbola graphs in Chapters 14 and 15.

i) The US, Japan, Australia, France, Germany, and the UK.
China, India, Brazil, Mexico, Russia, and South Africa.
ii) Denmark, Finland, Netherlands, Norway, Sweden, and Canada.
Greece, Iceland, Ireland, Italy, Portugal, and Spain.
iii) Indonesia, Korea, Malaysia, Philippines, Singapore, and Thailand.
Bangladesh, Pakistan, Saudi Arabia, Sri Lanka, Czech Rep, Poland.

Figures T1, T2, and **T3** each show 12 countries for the rate of technological progress. For *the first point*, the author selects $g_{A(FLOW)}(t)$, $g_{TFP(STOCK)}(t)$, and $g_k(t)$. This is because at convergence time of the transitional path, $t^* = t$, $g^*_{A(FLOW)} = g_{A(FLOW)}(t)$, is equal to $g^*_{A(STOCK)} = g_{A(STOCK)}(t)$, by denoting $A(STOCK) = TFP$. In the endogenous equilibrium, $g^*_{A(FLOW)} = g^*_{A(STOCK)}$, without exception by country (among 81 countries). This fact is one of proper attributes of the endogenous system. Then, why did the author select the growth rate of $g_k(t)$? There are two primary growth rates of output and per capita output, $g_Y(t)$ and $g_y(t)$,which are derived from the rate of technological progress, $g_{A(FLOW)}(t) =$

$i(1-\beta^*(t))$, as shown repeatedly in the *EES*. $g_y(t) = g_A(t)/(1-\alpha(t))$ is common to the equation of the literature and the equation at the endogenous system, where only difference is whether each equation is exogenous or purely endogenous. Then, why didn't the author include the rate of return in the above relationship? This is because the rate of return is more properly related to the second point.

For the second point, the rate of return in equilibrium shows either diminishing returns to capital (DRC) or the increasing returns to capital (IRC). And, at convergence of the transitional path, the constant returns to capital (CRC) are shown. Only if the conditions of the rate of return by time, $r(t) = \Pi(t)/K(t)$, is close to the CRC by time, the DRC or the IRC becomes close to the CRC. When $r(t) = \Pi(t)/K(t)$ by time shows a close-to-parabolic convex curve upwards to the right, the situation indicates the IRC before the convergence and, the DRC after the convergence. Adversely, when $r(t) = \Pi(t)/K(t)$ by time shows a close-to-parabolic concave curve downwards to the right, the situation indicates the DRC before the convergence and, the IRC after the convergence.

For the relationship to connect the rate of return with the growth rate of output, the endogenous Phelps coefficient, $x = (\alpha/i \cdot \beta^*)$, is used. The $x = (\alpha/i \cdot \beta^*)$ influences each of $g_{A(FLOW)}(t)$, $g_{TFP(STOCK)}(t)$, and $g_k(t)$ and reflects the results of the DRC and the IRC at the rate of return in the transitional path. As shown by Figures D4, D5, and D6, most of 36 countries each indicate the DRC before the convergence and, the IRC after the convergence.

Watch each of sixteen Figures by country. Each country has its own results and reflects policy-oriented causes and effects. It implies that each country maintains its national taste and culture in cooperation with the global standard. When policy-oriented results are not well controlled in the endogenous system in the short run, the situation falls into the close-to-disequilibrium or disequilibrium by year and accordingly, in the transitional path. Each of $g_{A(FLOW)}(t)$, $g_{TFP(STOCK)}(t)$, and $g_k(t)$ shows different curve by country. The closer to disequilibrium in the short run, the more abnormal the situation is. This fact is directly shown by the speed years inserted by country title. If the speed years are more than 100 yrs. or less than five yrs. or minus yrs, as shown in the case of Russia, each graph becomes typically abnormal. Also, we realize much differences between developed and developing countries. Robust sustainable and weak unstable countries similarly show low net investment to output, but we concretely confirm significant differences between robust and weak by each curve.

16.5 Conclusions

This chapter is the last one and basic data are wholly used. These data are KEWT 6.12 and commonly used to other chapters. This chapter focuses on recursive programming (RP) with fundamental RP graphs, as shown at the end (See For readers' convenience: contents of Tables and Figures on the next page). For hyperbolic graphs, Chapter 14 used $i = I/Y$ for business cycle, and Chapter 15 used the rate of change in population for growth and stop-macro inequality. For hyperbolic graphs, earlier step by step, Chapter 5 used the speed years and $r^*(i)$; Chapter 7, the speed years for structural analysis; Chapter 8, hyperbola of $\Omega(\beta^*)$ for policy-potential to widen various real-asset policies; and Chapter 10, the essence of endogenous model and system and its geometrical philosophy, theoretically.

This chapter, by using recursive programming, proves that the rate of technological progress equals the growth rate of total factor productivity, or flow technology equal stock technology. This chapter also proves the relationship between the diminishing returns to capital, the constant returns to capital, and the increasing returns to capital, each in the transitional path. These results and facts were shown using sixteen Figures.

All of these facts or proofs were not realized in the literature. This is because statistic actual researches have not been executed wholly as a system but partially, widely, and independently, and with various assumptions. The endogenous system contrarily is based on the discrete Cobb-Douglas production function and starts with seven endogenous parameters that control all the parameters and variables as a whole and consistently by year and over years. Endogenous equations, related hyperbolas, and related recursive programming graphs are all consistently connected with each other. There is no assumption in these results. The author is grateful to the efforts of researchers, in particular, Meade and Stone for the conceptions and frameworks they established, and for rigid arrangements of nine basic assumptions.

Economics, apart from econometrics, eventually needs a system, where all the values and ratios are consistent over years. Typically Chapter 6 and Chapter 16 prove the essence of a system. As a result, surprisingly scientific discoveries accumulated in the economic literature are all and ever harmonized.

The following Appendix is final explanations. Mathematical proof is most ridged and strict among sciences, natural and social. The author understands mathematical spirit and the *EES* was thankfully written so as to satisfy mathematical proofs. Wait: Any partial holds in mathematics. Mathematics needs no empirical proof while economics needs empirical proofs. When theory and practice are one, proofs hold, as wholly shown in this chapter.

Recursive Programming to Reinforce the KEWT Data-Sets by Country

Acknowledgements: The author got Permission Invoice P12845, 30th Oct 2012, from Svetlana Shadrina, Assistant Permissions Controller; Cambridge University Press, with the postal address of Prof Emeritus G. C. Harcourt. Two conditions were executed happily. The author is grateful to Dr. Harcourt, one of teachers, and Cambridge University Press. On the 22nd to 25th of March, 2012, I attended Royal Economic Society Conference, Cambridge, staying at Robinson College. I recollected past days with Dr. Harcourt and Marshall Library, autumn of 1996.

For readers' convenience: contents of Tables and Figures hereunder

Table 1 Resource data by country 2012: for 36 countries

i)	rho/r	r_{DEBT}	I	C	Y	W	L	K	k=K/L
1. the US	1.1551	0.0279	723	13710	14116	11869	317.51	26926	85
2. Japan	1.0346	0.0084	16766	387427	418764	374469	127.25	3760633	29553
3. Australi	0.9811	0.0338	272	1060	1310	1080	23	3581	155
4. France	1.0345	0.0254	142	1670	1805	1614	64	3152	49
5. Germany	0.9620	0.0150	116	2036	2355	2116	83	4539	55
6. the UK	1.2522	0.0191	39	1354	1356	1081	62.78	1321	21
7. China	0.9666	0.0600	18828	26183	46465	27088	1377	129384	94
8. India	0.9912	0.1060	24645	59974	79702	60505	1241	186055	150
9. Brazil	1.2180	0.3664	0.78	37	37	30	199	55	0.28
10. Mexic	0.9592	0.0560	2452	11841	13953	12344	121	25102	208
11. Russia	1.0456	0.0550	6941	39064	50782	37361	143.17	44482	311
12. S.Afric	1.0258	0.0790	392	2614	2840	2549	52	2718	52
ii)	rho/r	r_{DEBT}	I	C	Y	W	L	K	k=K/L
1. Denmark	0.9682	0.0311	59	1419	1620	1466	5.60	3095	553
2. Finland	1.0101	0.0188	17	158	173	156	5	324	60
3. Netherla	0.9698	0.0193	38	439	534	452	17	1107	66
4. Norway	0.9521	0.0157	2458	1794	2587	1885	5	9099	1823
5. Sweden	0.9597	0.0159	196	2674	3170	2787	10	4929	518
6. Canada	0.9609	0.0321	328	1383	1643	1440	34.84	4594	132
7. Greece	1.3807	0.2250	4	177	172	128	11	370	46
8. Iceland	0.9797	0.0228	321	1352	1520	1380	0	3995	12105
9. Ireland	1.1684	0.0960	30	107	147	91	5	634	138
10. Italy	1.1185	0.0451	51	1271	1394	1136	61	2496	41
11. Portuga	1.1800	0.1055	4	144	147	122	11	381	36
12. Spain	1.1220	0.0585	23	829	935	739	47	1606	34
iii)	rho/r	r_{DEBT}	I	C	Y	W	L	K	k=K/L
1. Indones	1.0538	0.1180	2556	5229	7418	4962	246.86	13008	53
2. Korea	1.0103	0.0343	191	882	1120	873	49	3382	69
3. Malaysi	0.9523	0.0325	370	587	844	616	29	2329	80
4. Philippi	1.0653	0.0568	(430)	8933	9512	8386	97	2663	28
5. Singapo	0.9195	0.0146	62	169	304	184	5	821	155
6. Thailan	0.9711	0.0353	2724	7838	10238	8071	66.79	36968	553
7. Banglad	0.9766	0.1300	993	7376	8324	7553	155	8162	53
8. Pakistan	1.5613	0.1173	(504)	19753	18588	12652	179	6678	37
9. Saudi Ar	0.9511	0.0000	209	861	1258	906	26	2542	99
10. Sri Lan	1.0295	0.1328	1713	6296	6824	6115	21.10	10359	491
11. Czech I	0.9771	0.0389	678	2664	3276	2727	10	10874	1045
12. Poland	0.9823	0.0578	149	1134	1272	1154	38	1714	45

Data source: KEWT 6.12 of 81 countries by sector, 1990-2012, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Table 2 Calculated parameter data by country 2012: for 36 countries

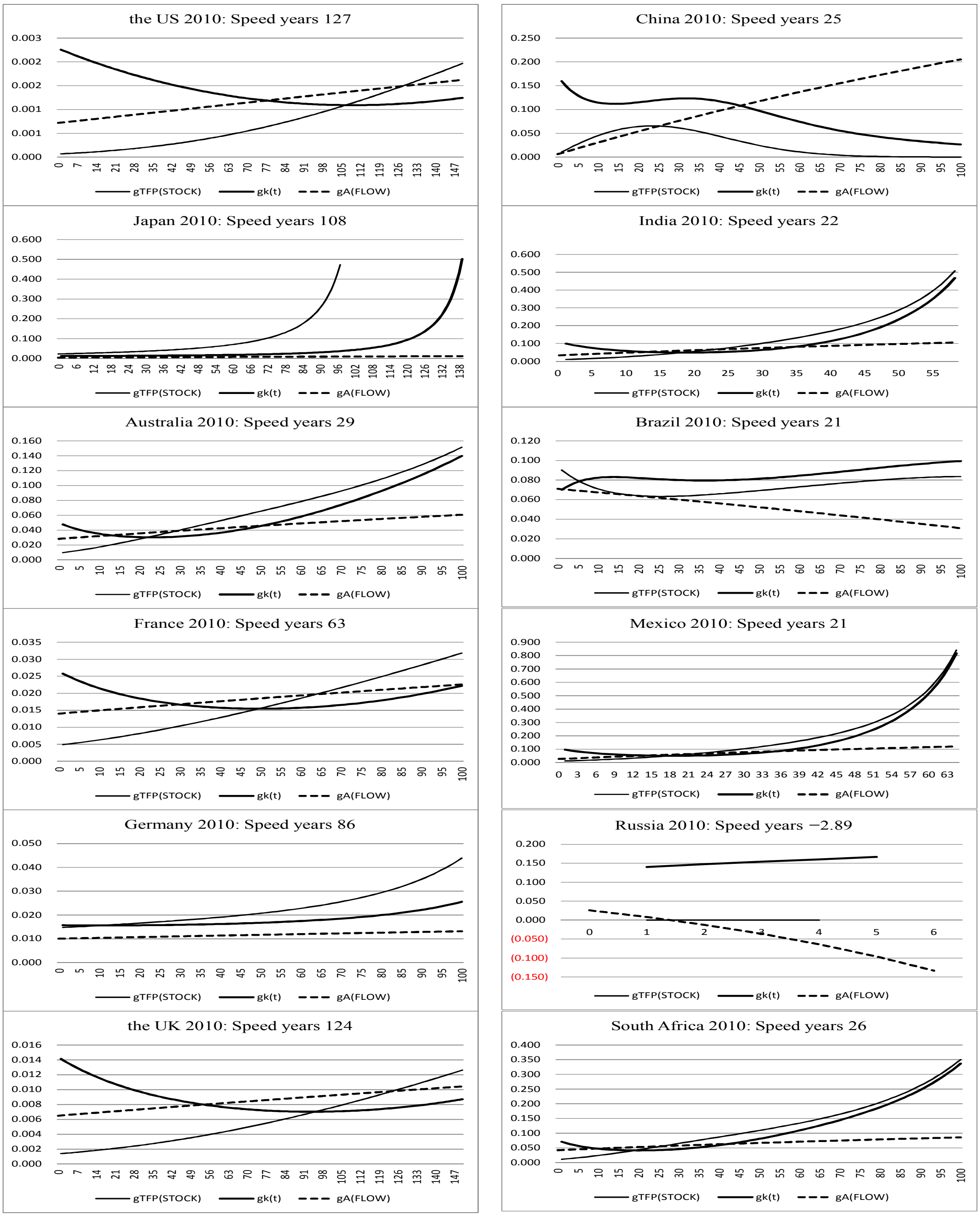
i)	i=I/Y	α	n	k	Ω	β*	B*	δ0
1. the US	0.0512	0.1592	0.01412	84.80	1.9074	0.8563	0.1678	0.6382
2. Japan	0.0400	0.1058	(0.00079)	29553.11	8.9803	0.8934	0.1193	0.1799
3. Australi	0.2079	0.1751	0.01363	155.34	2.7338	0.8117	0.2320	0.3117
4. France	0.0785	0.1057	0.01123	49.29	1.7464	0.7478	0.3373	0.4870
5. Germany	0.0494	0.1014	(0.00265)	54.82	1.9276	0.6485	0.5420	(0.0714)
6. the UK	0.0290	0.2028	0.01144	21.05	0.9741	0.7245	0.3802	1.0271
7. China	0.4052	0.4170	0.00636	93.95	2.7845	0.8353	0.1972	0.3693
8. India	0.3092	0.2409	0.00000	149.86	2.3344	0.7546	0.3252	0.2453
9. Brazil	0.0209	0.1877	0.0267	0.2766	1.4735	1.3081	(0.2355)	0.7319
10. Mexic	0.1757	0.1153	0.01248	207.71	1.7990	0.7149	0.3989	0.3611
11. Russia	0.1367	0.2643	(0.00188)	310.69	0.8759	0.5375	0.8604	1.8809
12. S.Afric	0.1379	0.1025	0.0295	51.8783	0.9571	0.6208	0.6107	1.0889
ii)	i=I/Y	α	n	k	Ω	β*	B*	δ0
1. Denmark	0.0365	0.0953	0.00358	552.60	1.9103	0.7396	0.3521	0.3799
2. Finland	0.0959	0.0974	0.00371	59.83	1.8703	0.6988	0.4310	0.2560
3. Netherla	0.0713	0.1529	0.00240	66.25	2.0741	0.7307	0.3685	0.2692
4. Norway	0.9501	0.2714	0.01012	1823.45	3.5171	0.8362	0.1959	0.2286
5. Sweden	0.0618	0.1209	0.01386	518.27	1.5548	0.7667	0.3042	0.6291
6. Canada	0.1995	0.1236	0.01015	131.86	2.7953	0.7968	0.2550	0.2478
7. Greece	0.0243	0.2555	0.00117	45.73	2.9506	0.8273	0.2088	0.3093
8. Iceland	0.2109	0.0924	0.01227	12105.23	2.6276	0.7845	0.2747	0.2522
9. Ireland	0.2040	0.3800	0.01104	138.35	4.3035	0.9043	0.1058	0.3502
10. Italy	0.0383	0.1423	0.00611	41.00	1.8843	0.7823	0.2783	0.5047
11. Portuga	0.0280	0.1706	0.00046	35.91	2.5892	0.7678	0.3024	0.2047
12. Spain	0.0268	0.1439	0.01234	34.34	1.8603	0.9556	0.0465	0.7977
iii)	i=I/Y	α	n	k	Ω	β*	B*	δ0
1. Indones	0.3446	0.3311	0.01255	52.69	1.7536	0.7438	0.3444	0.4731
2. Korea	0.1708	0.2201	0.00554	69.03	3.0206	0.8157	0.2259	0.2569
3. Malaysi	0.4381	0.2696	0.01669	79.66	2.7604	0.8152	0.2267	0.3158
4. Philippi	(0.0452)	0.1184	0.01746	27.53	0.2799	0.1625	5.1534	0.2235
5. Singapo	0.2055	0.3959	0.02119	154.92	2.7001	0.8703	0.1490	0.4783
6. Thailan	0.2661	0.2117	0.00315	553.50	3.6110	0.8289	0.2064	0.1863
7. Banglad	0.1193	0.0927	0.01204	52.76	0.9804	0.5696	0.7556	1.0706
8. Pakistan	(0.0271)	0.3194	0.0170	37.2759	0.3593	0.2030	3.9256	0.2514
9. Saudi Ar	0.1662	0.2799	0.0000	98.8337	0.0000	0.7373	0.3563	0.3181
10. Sri La	0.2510	0.1039	0.00812	490.93	1.5179	0.6488	0.5413	0.3201
11. Czech I	0.2069	0.1677	0.00000	1044.61	3.3194	0.7995	0.2507	0.1327
12. Poland	0.1171	0.0924	0.00000	45.06	1.3482	0.5976	0.6732	0.2450

Data source: KEWT 6.12 of 81 countries by sector, 1990-2012, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

Table 3 Calculated variable data by country 2012: for 36 countries

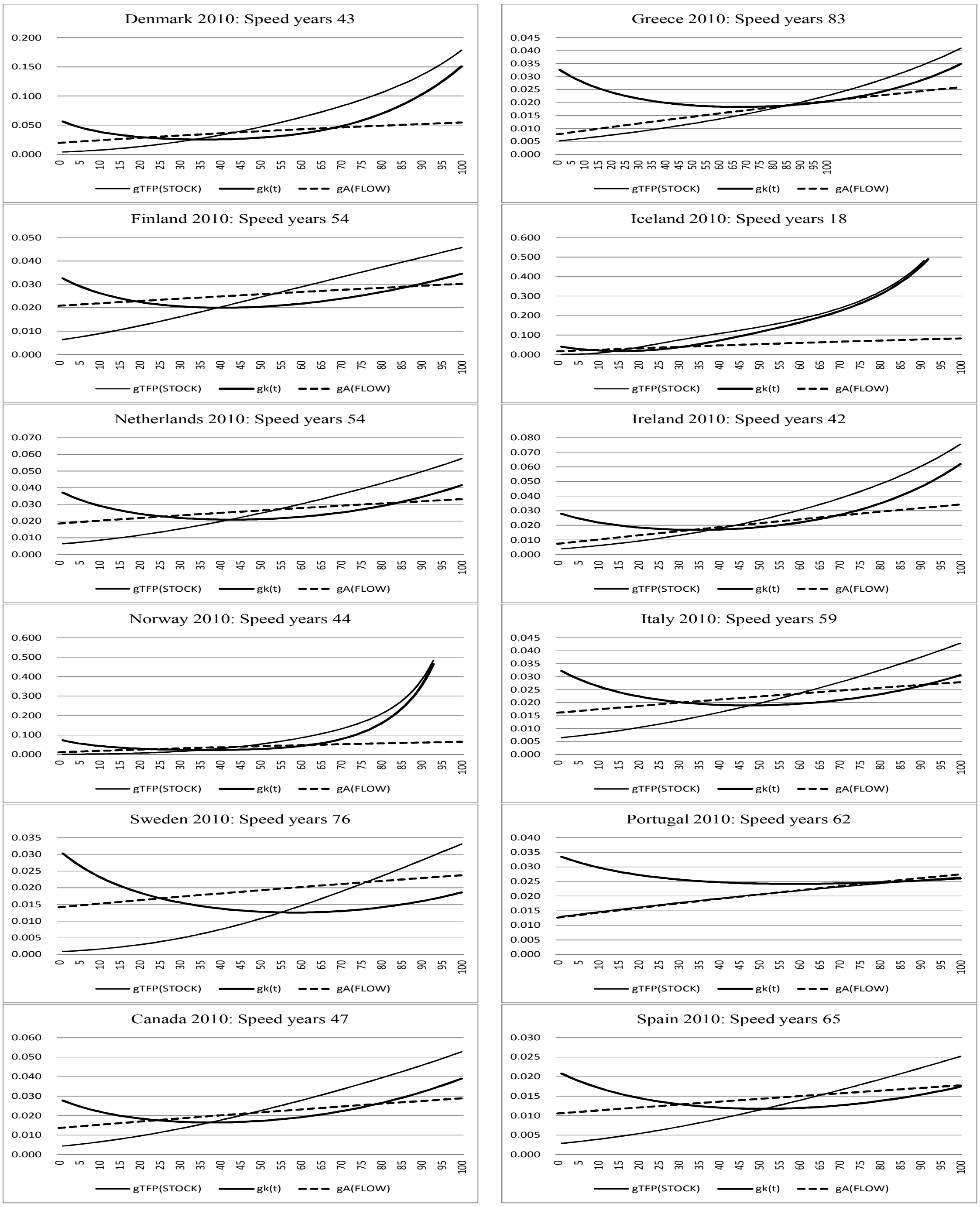
i)	g_A^*	r^*	$x=\alpha/(i\cdot\beta^*)$	g_Y^*	g_y^*	$r^*-g_Y^*$	v^*	speed coeff	speed yrs
1. the US	0.0074	0.0834	3.629	0.0230	0.0088	0.0605	1.380	0.0145	68.805
2. Japan	0.0043	0.0118	2.957	0.0040	0.0048	0.0078	1.511	0.0028	357.470
3. Australi	0.0392	0.0640	1.037	0.0617	0.0475	0.0023	27.848	0.0382	26.183
4. France	0.0198	0.0605	1.800	0.0336	0.0222	0.0269	2.249	0.0202	49.495
5. Germany	0.0174	0.0526	3.166	0.0166	0.0193	0.0360	1.462	0.0162	61.671
6. the UK	0.0080	0.2081	9.646	0.0216	0.0100	0.1866	1.116	0.0089	112.322
7. China	0.0667	0.1498	1.232	0.1216	0.1145	0.0282	5.309	0.0458	21.837
8. India	0.0759	0.1032	1.032	0.1000	0.1000	0.0032	32.015	0.0573	17.462
9. Brazil	0.0072	0.1274	6.859	0.0186	(0.0079)	0.1088	1.171	0.0200	50.060
10. Mexic	0.0501	0.0641	0.918	0.0698	0.0566	(0.0057)	(11.184)	0.0431	23.228
11. Russia	0.0632	0.3017	3.597	0.0839	0.0859	0.2178	1.385	0.0571	17.524
12. S.Afric	0.0523	0.1071	1.197	0.0895	0.0583	0.0176	6.069	0.0218	45.859
ii)	g_A^*	r^*	$x=\alpha/(i\cdot\beta^*)$	g_Y^*	g_y^*	$r^*-g_Y^*$	v^*	speed coeff	speed yrs
1. Denmark	0.0095	0.0499	3.535	0.0141	0.0105	0.0358	1.395	0.0091	109.516
2. Finland	0.0289	0.0521	1.453	0.0358	0.0320	0.0162	3.208	0.0248	40.258
3. Netherla	0.0192	0.0737	2.936	0.0251	0.0227	0.0486	1.517	0.0161	62.284
4. Norway	0.1556	0.0772	0.342	0.2259	0.2136	(0.1487)	(0.519)	0.1274	7.847
5. Sweden	0.0144	0.0778	2.551	0.0305	0.0164	0.0473	1.645	0.0175	57.033
6. Canada	0.0222	0.0442	0.778	0.0569	0.0462	(0.0126)	(3.498)	0.0394	25.396
7. Greece	0.0042	0.0866	12.700	0.0068	0.0056	0.0798	1.085	0.0038	265.066
8. Iceland	0.0325	0.0352	0.559	0.0630	0.0501	(0.0278)	(1.265)	0.0451	22.157
9. Ireland	0.0195	0.0883	2.060	0.0429	0.0315	0.0454	1.944	0.0195	51.214
10. Italy	0.0083	0.0755	4.755	0.0159	0.0097	0.0597	1.266	0.0094	106.719
11. Portuga	0.0065	0.0659	7.939	0.0083	0.0078	0.0576	1.144	0.0056	180.157
12. Spain	0.0012	0.0774	5.627	0.0137	0.0014	0.0636	1.216	0.0360	27.803
iii)	g_A^*	r^*	$x=\alpha/(i\cdot\beta^*)$	g_Y^*	g_y^*	$r^*-g_Y^*$	v^*	speed coeff	speed yrs
1. Indones	0.0883	0.1888	1.291	0.1462	0.1320	0.0426	4.431	0.0549	18.211
2. Korea	0.0315	0.0729	1.580	0.0461	0.0404	0.0268	2.724	0.0277	36.086
3. Malaysi	0.0810	0.0977	0.755	0.1294	0.1108	(0.0317)	(3.078)	0.0676	14.797
4. Philippi	(0.0379)	0.4228	(16.099)	(0.0263)	(0.0430)	0.4491	0.942	0.0140	71.303
5. Singapo	0.0266	0.1466	2.214	0.0662	0.0441	0.0804	1.824	0.0140	71.303
6. Thailan	0.0455	0.0586	0.960	0.0611	0.0577	(0.0025)	(23.789)	0.0395	25.299
7. Banglad	0.0514	0.0946	1.364	0.0693	0.0566	0.0252	3.748	0.0073	137.034
8. Pakistan	(0.0216)	0.8890	(58.002)	(0.0153)	(0.0318)	0.9043	0.983	0.0046	216.016
9. Saudi Ar	0.0437	0.1385	2.284	0.0606	0.0606	0.0778	1.779	0.0298	33.586
10. Sri La	0.0882	0.0684	0.638	0.1073	0.0984	(0.0389)	(1.761)	0.0672	14.878
11. Czech	0.0415	0.0505	1.014	0.0498	0.0498	0.0007	73.217	0.0360	27.800
12. Poland	0.0471	0.0685	1.320	0.0519	0.0519	0.0166	4.124	0.0356	28.115

Data source: KEWT 6.12 of 81 countries by sector, 1990-2012, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure T1 The rate of tech. progress, $g_{A(FLOW)}(\mathrm{t})$, the growth rate of *TFP*, $g_{TFP(STOCK)}(t)$, and the growth rate of $\mathrm{k} = K/L$, $g_k(t)$: i) developed vs. BRICs countries

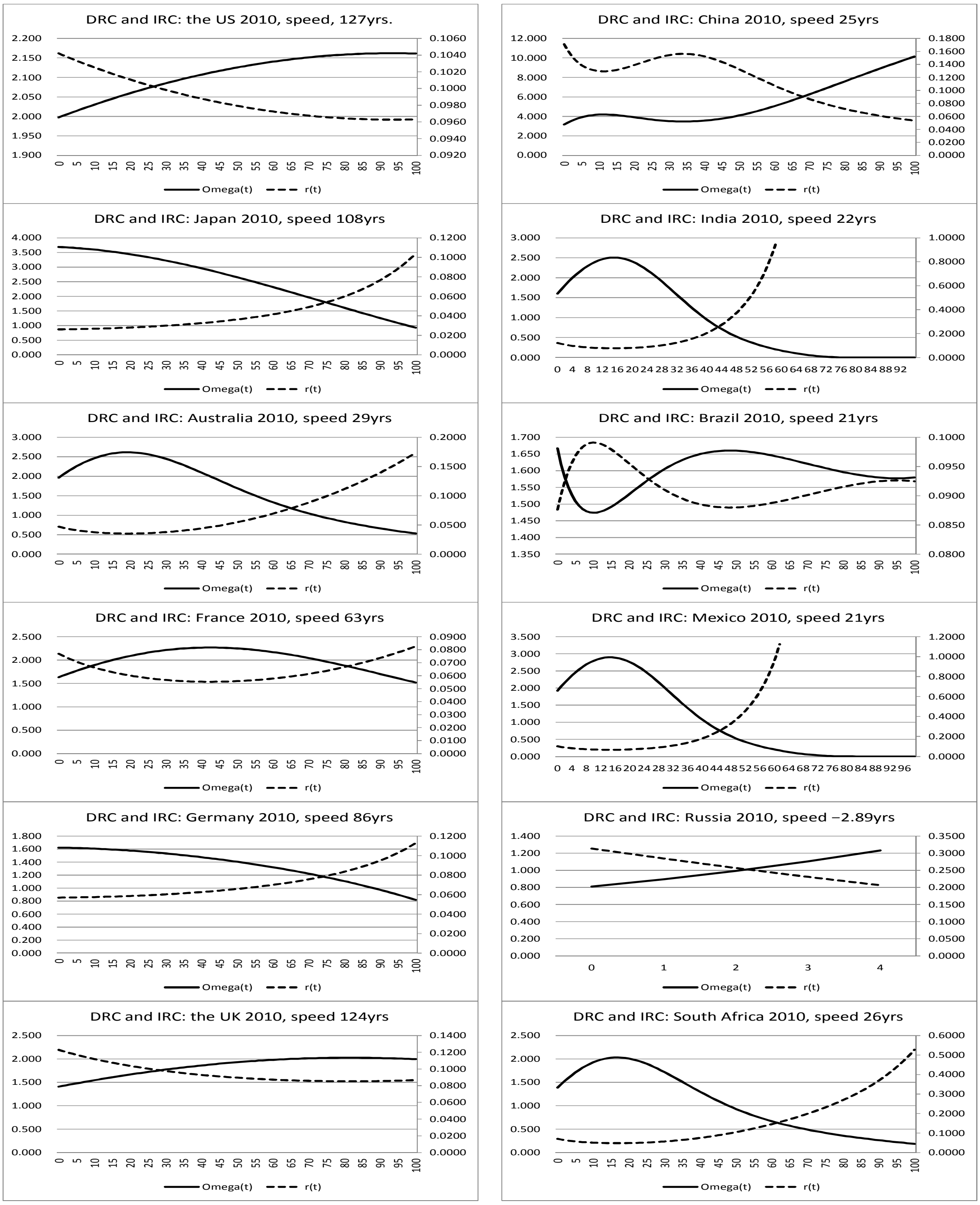


Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure T2 The rate of tech. progress, $g_{A(FLOW)}(t)$, the growth rate of *TFP*, $g_{TFP(STOCK)}(t)$, and the growth rate of $\text{k} = K/L$, $g_k(t)$: ii) 12 European countries

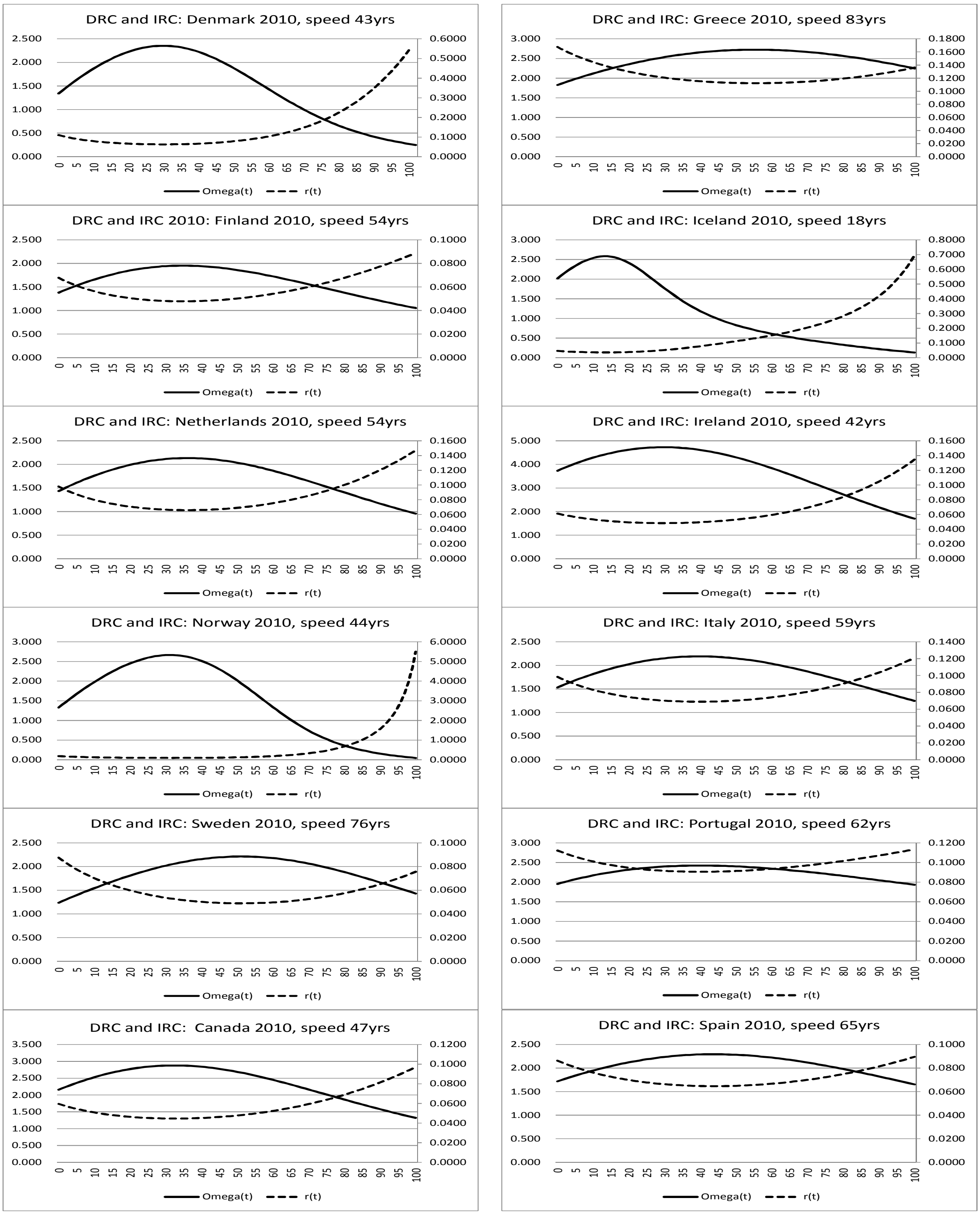
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure T3 The rate of tech. progress, $g_{A(FLOW)}(t)$, the growth rate of *TFP*, $g_{TFP(STOCK)}(t)$, and the growth rate of $k = K/L$, $g_k(t)$: iii) 12 Asian countries



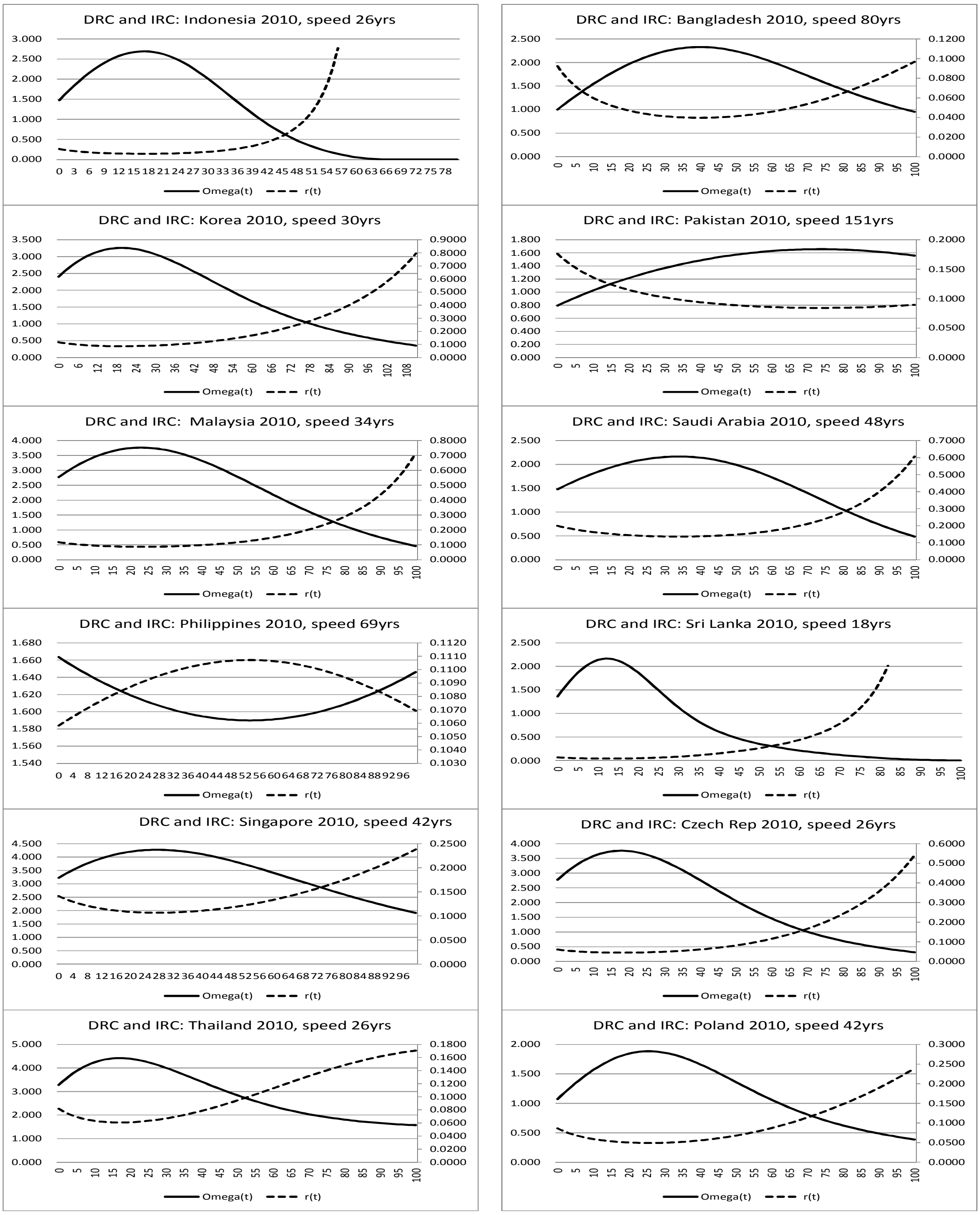
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure D4 The rate of return and the capital-output ratio in equilibrium for DRC and IRC: i) developed vs. BRICs countries



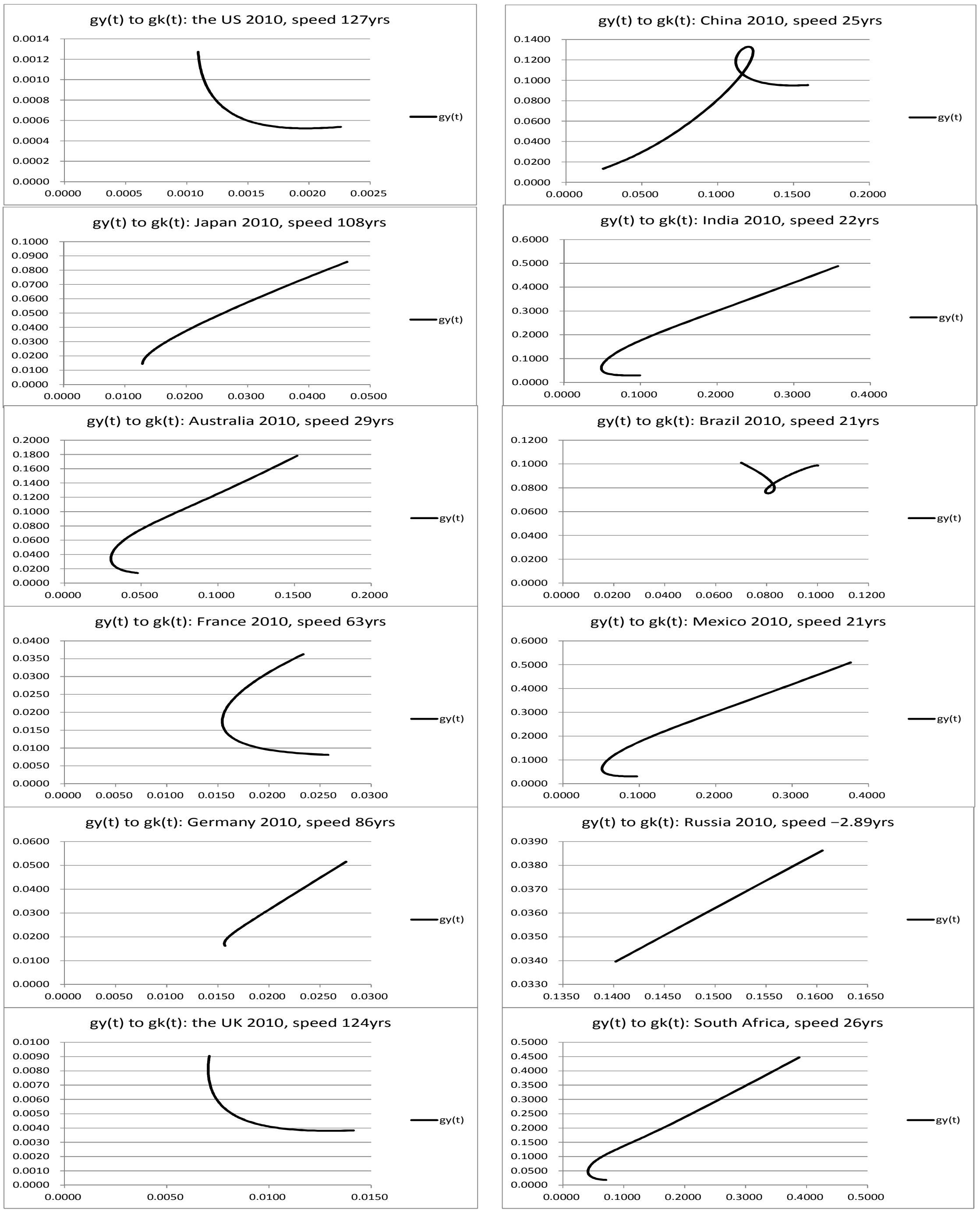
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure D5 The rate of return and the capital-output ratio in equilibrium for DRC and IRC: ii) 12 European countries



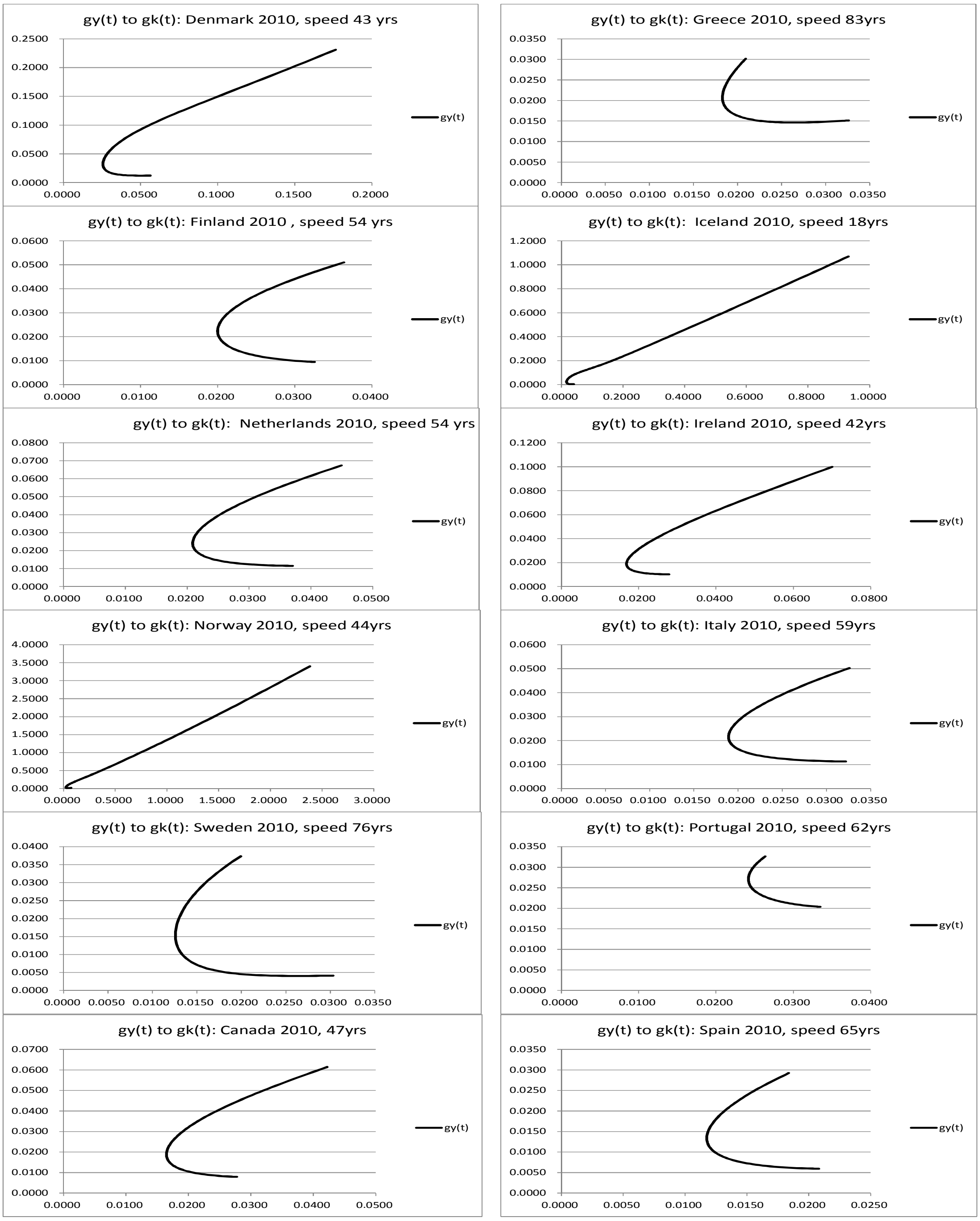
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure D6 The rate of return and the capital-output ratio in equilibrium for DRC and IRC: iii)12 Asian countries



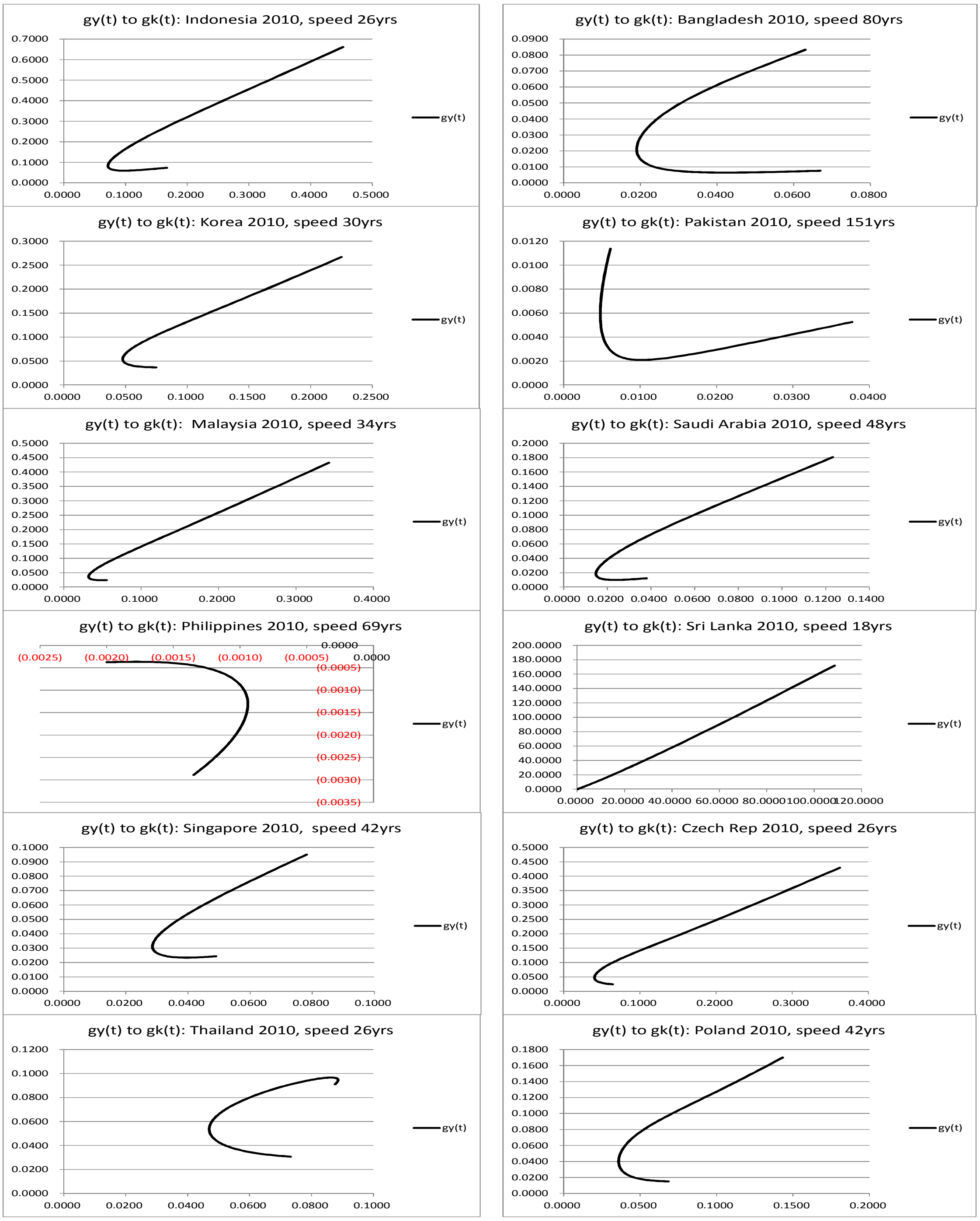
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure G7 The growth rate of output per capita to the growth rate of capital per capita: i) developed vs. BRICs countries



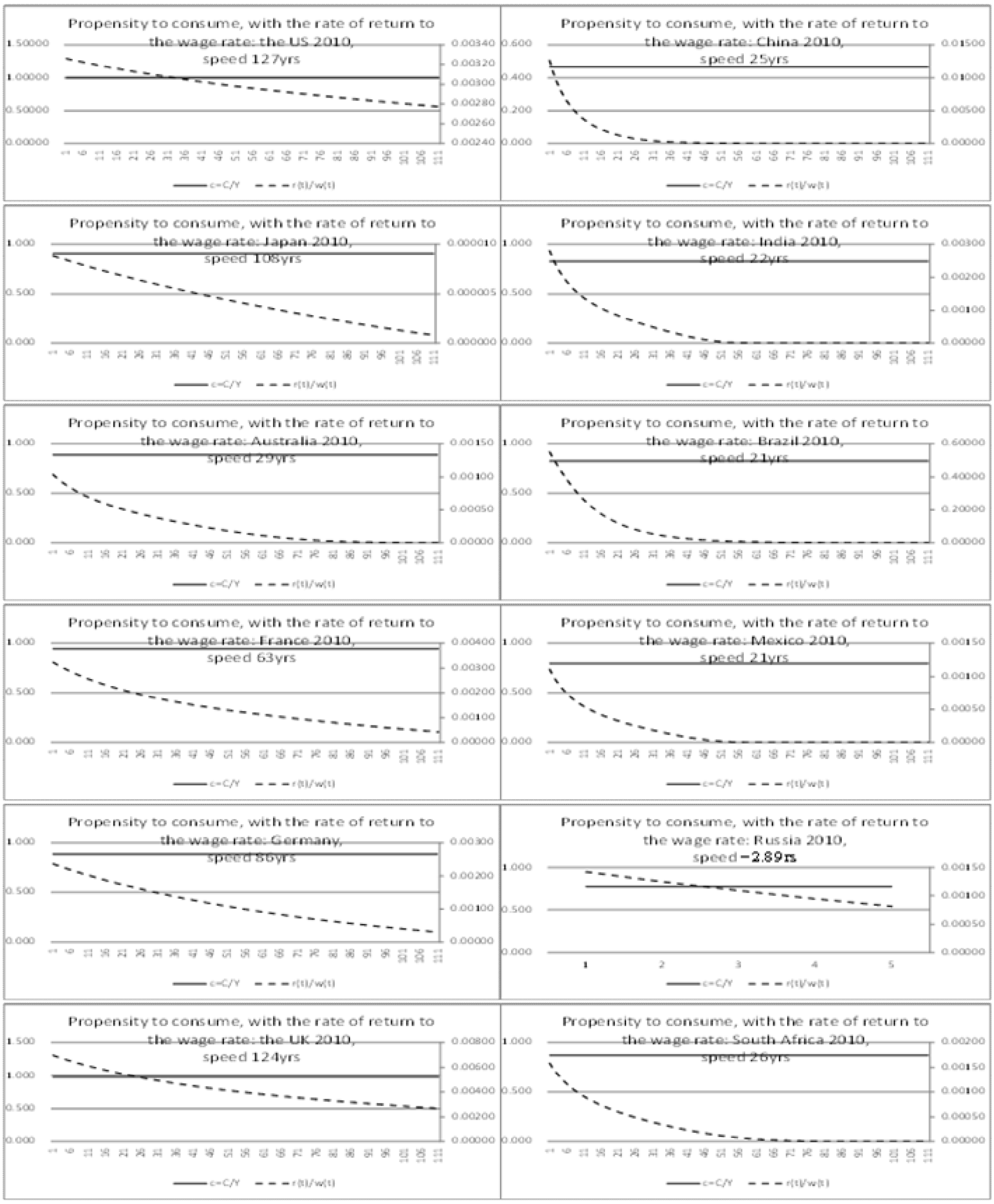
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure G8 The growth rate of output per capita to the growth rate of capital per capita: ii) 12 European countries



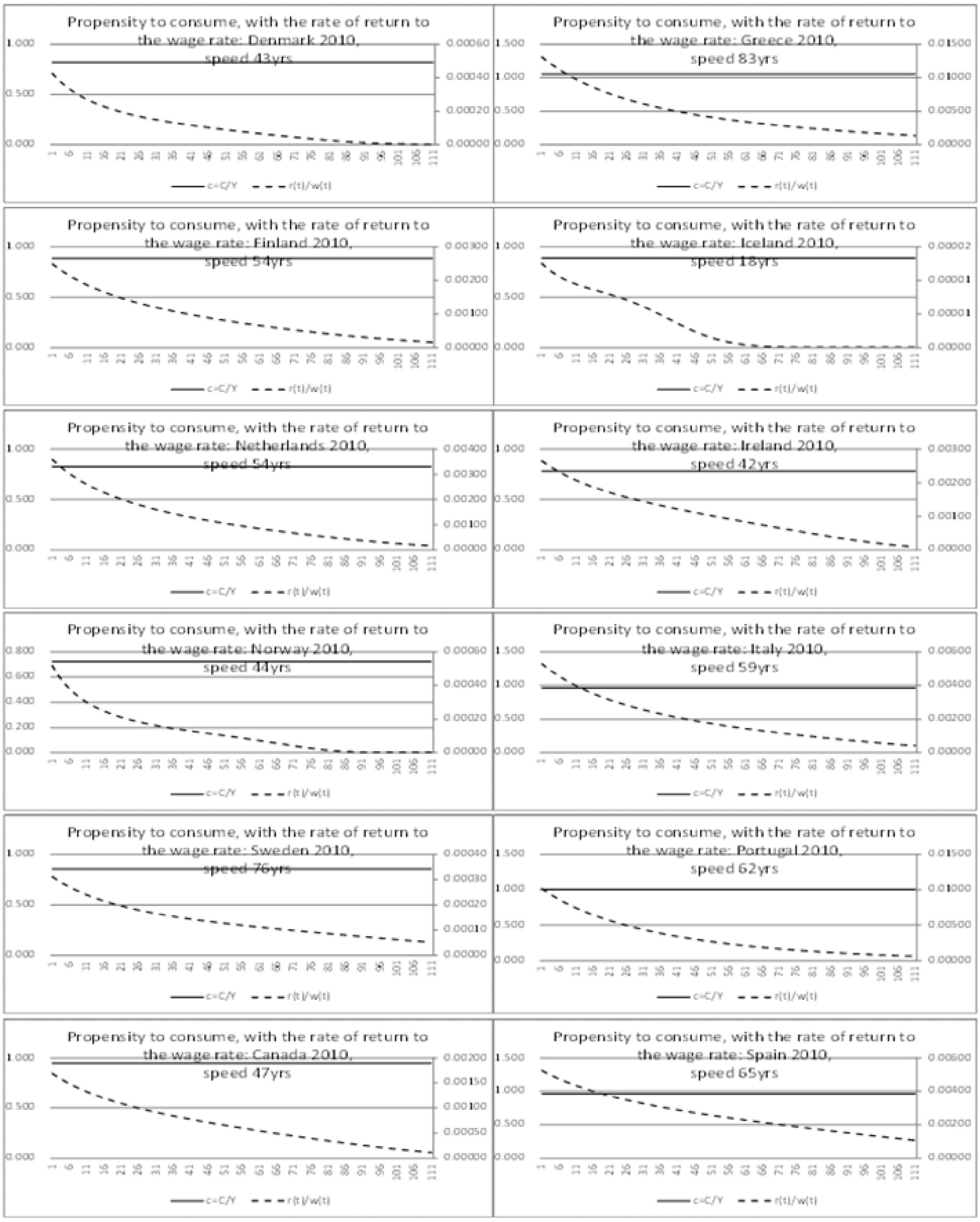
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure G9 The growth rate of output per capita to the growth rate of capital per capita: iii) 12 Asian countries



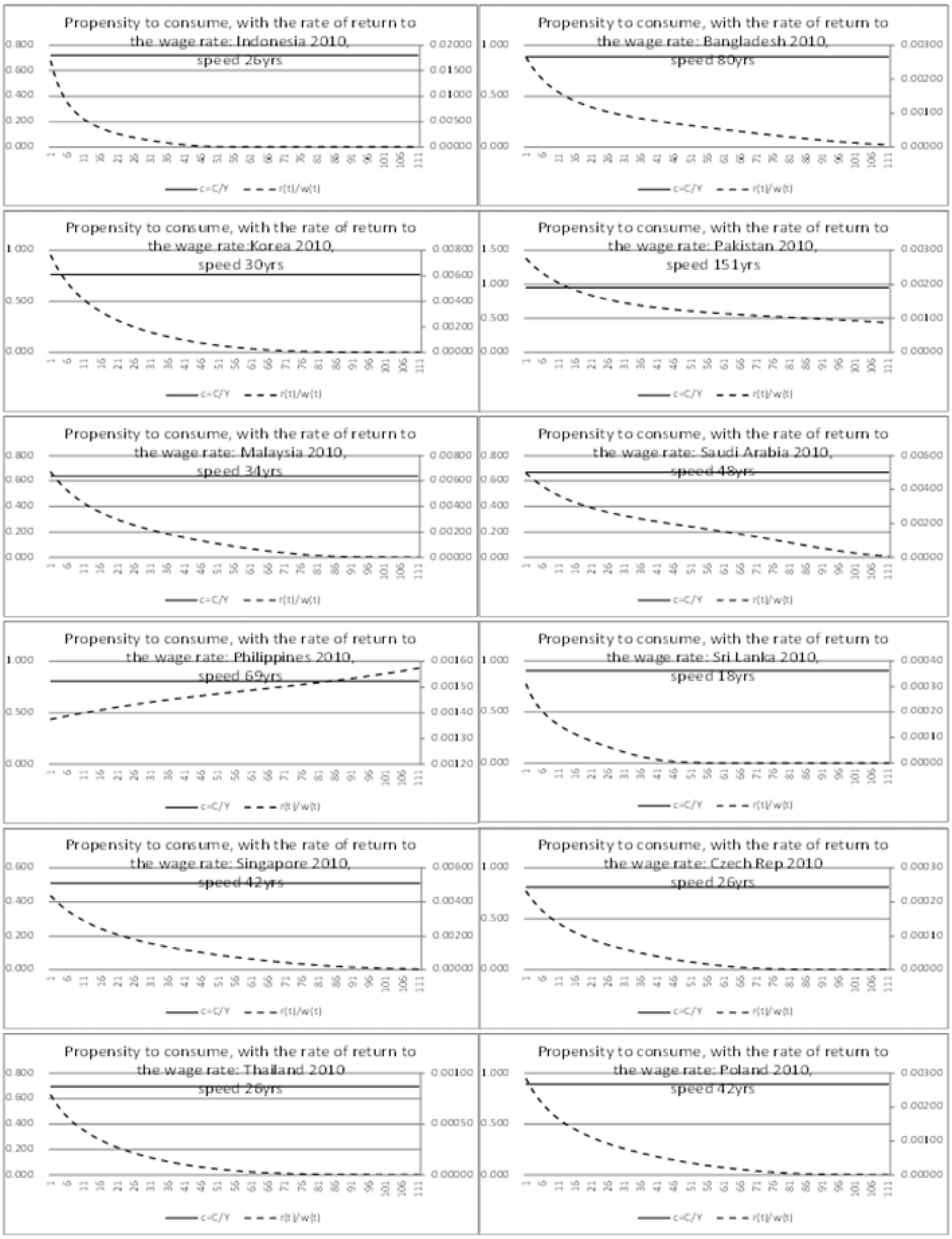
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure P10 Propensity to consume, c $= C/Y$, with the rate of return divided by the wage rate in equilibrium: i) developed vs. BRICs countries



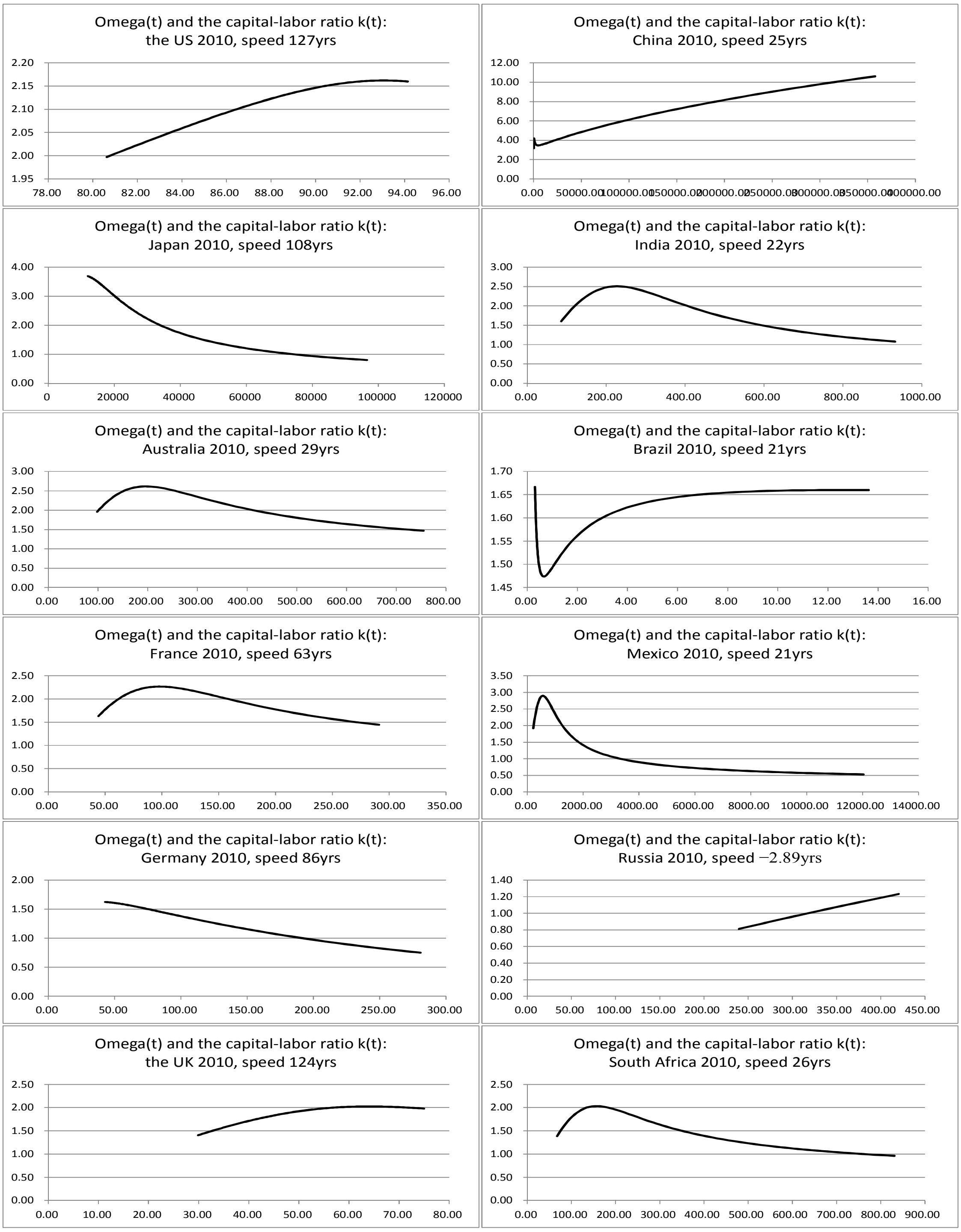
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure P11 Propensity to consume, c $= C/Y$, with the rate of return divided by the wage rate in equilibrium: ii) 12 European countries



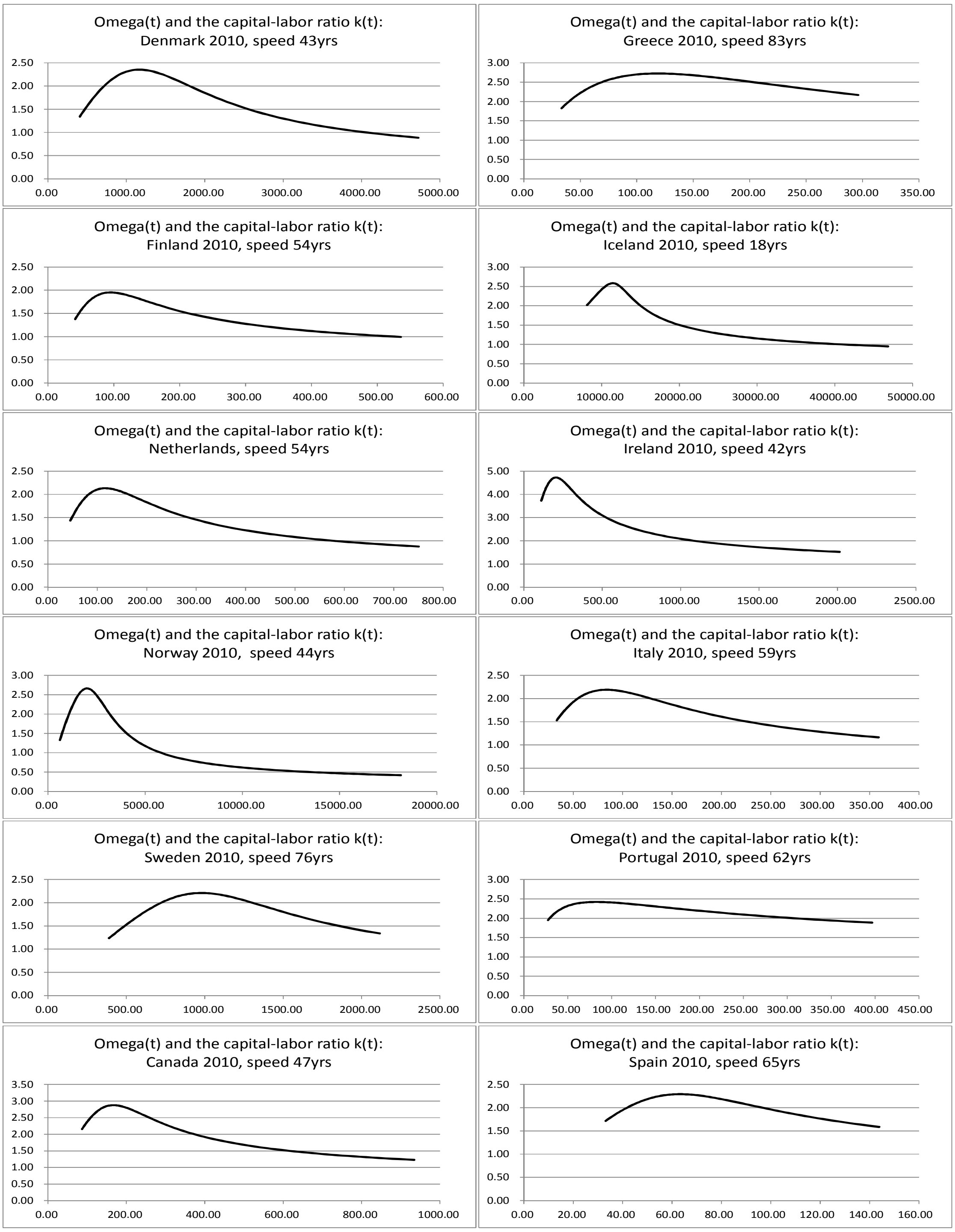
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure P12 Propensity to consume, c = C/Y, with the rate of return divided by the wage rate in equilibrium: iii) 12 Asian countries



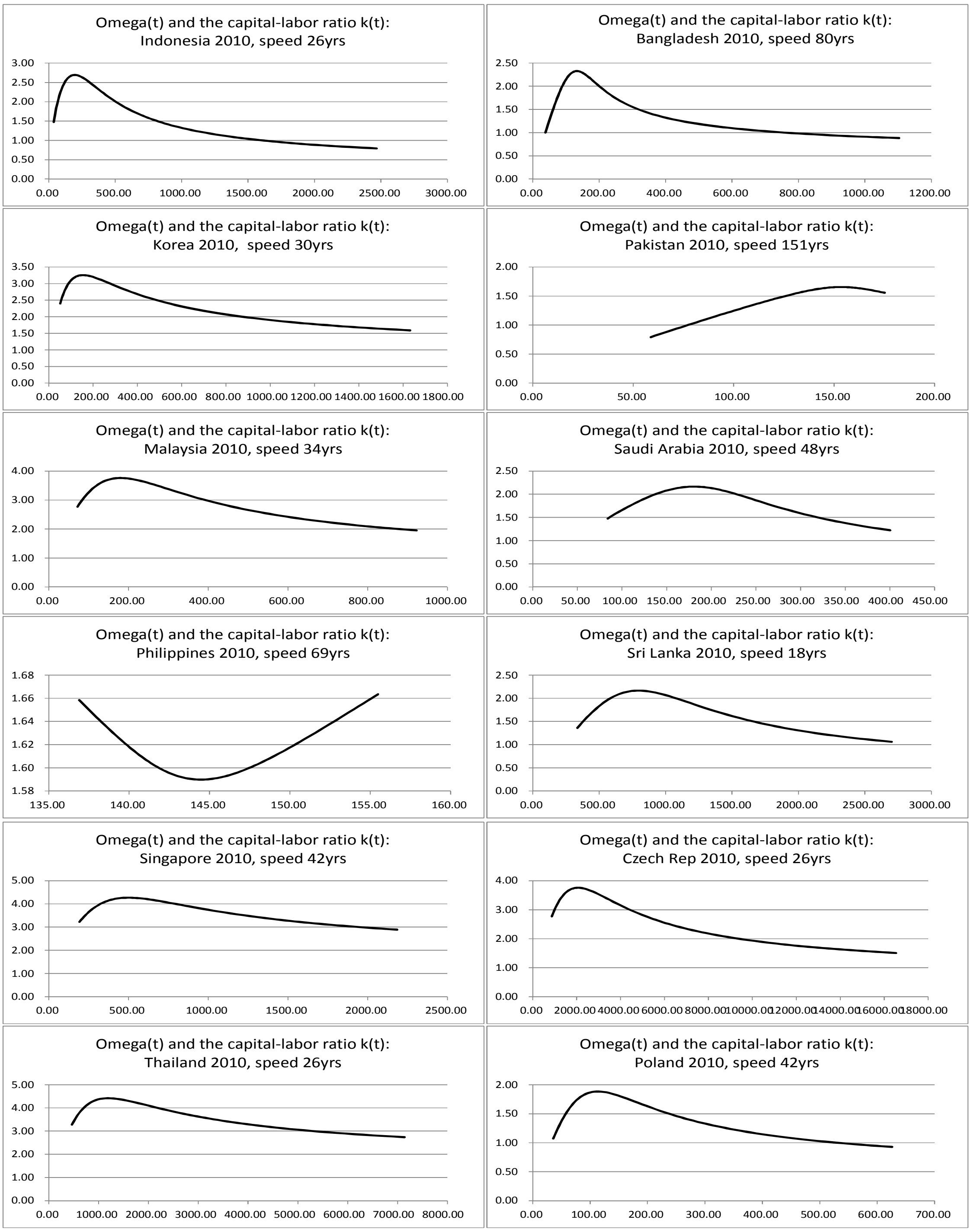
Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure C13 Capital-output ratio, $\Omega(t)$, to capital-labor ratio, $k(t)$: i) developed vs. BRICs countries



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure C14 Capital-output ratio, $\Omega(t)$, to capital-labor ratio, $k(t)$: ii) 12 European countries



Data source: KEWT 6.12 of 81 countries by sector, 1990-2010, whose 10 original data from the real assets and 15 original data from the financial/market assets, each at *International Financial Statistics Yearbook*, IMF.

Figure C15 Capital-output ratio, $\Omega(t)$, to capital-labor ratio, $k(t)$: iii) 12 Asian countries

Chapter 16

Appendix Problems to be examined in recursive programming

This Appendix first shows basic framework of recursive programming, secondly, procedure of recursive programming, and thirdly, revisits mechanics of the data-sets: endogenous versus actual. The basic framework is shown using nine endogenous parameters, $\lambda^*, \Omega^*, \alpha, \beta^*, \delta_0$ and, n, n_G, i, i_G, and several variables of growth rates and rates of return in equilibrium. The basic framework is summarized as follows:

1. Constant endogenous parameters in transitional path are: the ratio of net investment to output, $i = I/Y$, the growth rate of population, n, the relative share of capital, *alpha.*, and the speed years for convergence, $1/\lambda^*$.
2. Endogenous parameters that change by time/year are: the capital-output ratio, *Omega=K/Y*, the capital-labor ratio, *k=K/L*.
3. Two endogenous parameters, *beta*(*t*) and *delta*(*t*), by assumption, each change 'linearly' by time/year, using each constant discount rate of *beta* and *delta*.
4. Endogenous variables are: the level of technology or total factor productivity as stock, *A*(*t*)=*TFP*(*t*), the rate of technological progress, $g_A(t)$, the growth rate of per capita capital, $g_k(t)$, the growth rate of per capita output, $g_y(t)$, the growth rate of capital, $g_K(t)$, and the growth rate of output, $g_Y(t)$, the rate of return, *r*(*t*), and the wage rate, *w*(*t*).
5. The elasticity of substitution, *sigma*, and the relative price level, *p*, each maintain 1.0 by time/year in transitional path (note that KEWT shows *sigma*≠1 but *p*=1).

Secondly, procedure of recursive programming is shown step by step as follows:

1. $\beta(t) = \beta(0)(1 + r_\beta)^t$ and $\delta(t) = \delta(0)(1 + r_\delta)^t$, where r_β and r_{δ_0} are respectively the discount rate.[9] These discount rates are assumed to change compound by time/year during speed years for convergence in the discrete case; $\beta(t) \to \beta^*$ and $\delta(t) \to \alpha$.
2. $i(t) = i \cdot y(t)$, where $TFP(0) = \frac{k(0)^{1-\alpha}}{\Omega(0)}$ and $y(0) = TFP(0) \cdot k(0)^\alpha$. For convenience, A is used for *TFP*.
3. $L(t) = L(0)(1 + n)^t$ holds. However, (1) for the first following approach to clarify *k* and *y*, *L*(0)=1.0000 is used and (2) for the following second approach to clarify absolute values such as *K* and *Y*, $L_{POPU}(0)$, is used as actual population at the initial time/year.

[9] These discount rates are shown as: $r_\beta = \frac{LN(\beta^*) - LN(\beta_0)}{1/\lambda^*}$ and $r_{\delta_o} = \frac{LN(\alpha) - LN(\delta_0)}{1/\lambda^*}$ (see 158, *PRSCE*: 49 (Sep, 1), 2008), where $LN(1 + r_\beta) \fallingdotseq r_\beta$ holds using Maclaurin's series. The speed of convergence is derived using the growth rate in equilibrium: $speed = \frac{1}{(1-\alpha)n + (1-\delta_0)i(1-\beta^*)} = \frac{1}{\lambda^*}$.

For the first approach to clarify k and y:

1. Using $i_K(t) = i(t) \cdot \beta(t)$, $k(t) = k(t-1) + i_K(t)$ holds.
2. Using $i_A(t) = i(t)(1-\beta(t))/k(t)^{\delta(t)}$, $A(t) = A(t-1) + i_A(t)$ holds. Note that $i(t) \neq i_K(t) + i_A(t)$ holds, due to the introduction of $k(t)^{\delta(t)}$ into $i_A(t)$.
3. Each variable of $g_A(t), g_k(t),$ and $g_y(t)$ is calculated using each difference of $A(t)$ and $A(t\text{-}1)$, $k(t)$ and $k(t-1)$, and $y(t)$ and $y(t-1)$: e.g., $g_{A(STOCK)}(t) = (A(t) - A(t-1))/A(t-1)$.
4. $\Omega(t) = k(t)/y(t)$ is derived as an endogenous parameter.
5. $r(t) = \alpha/\Omega(t)$ is derived as an endogenous variable. $r(t) = \alpha/\Omega(t)$ reduces to $r(t) = \alpha \cdot A(t) \cdot k(t)^{\alpha-1}$.
6. $w(t) = (1-\alpha)y(t)$ is derived as an endogenous variable.
7. The growth rate of A as stock, $g_{A\,STOCK}(t)$, equals the growth rate of A as flow, $g_{A(FLOW)}(t)$. There are two methods to measure $g_{A\,FLOW}(t)$ in the transitional path: (1) Using $y(t) = A(t)k(t)^{\alpha}$ and $g_y(t) = g_A(t) + \alpha \cdot g_k(t)$, $g_{A\,FLOW}(t) = g_y(t) - \alpha \cdot g_k(t)$ is derived. (2) Using the weighted average of $r(t)$ and $w(t)$, $g_{A\,FLOW}(t) = \alpha \cdot g_r(t) + (1-\alpha)g_w(t)$ is derived.

For the second approach to clarify absolute values such as K and Y:

1. $Y(t)=y(t)\cdot L_{POPUL}(t)$, where $L_{POPUL}(t) = L_{POPUL}(0) \cdot L(t)$.
2. $K(t)=L_{POPUL}(t)\cdot k(t)$.
3. $Y(t) = A(t) \cdot K(t)^{\alpha} \cdot L_{POPUL}(t)^{1-\alpha}$, where $A(t)$ remain unchanged.
4. $W(t) = w(t) \cdot L_{POPUL}(t)$.
5. $\Pi(t) = Y(t) - W(t)$.
6. Elasticity of substitution, *sigma*:

$$\sigma = 1.0000 \text{ by time/year holds: } \sigma = \frac{-\Delta k/\left(\frac{k_0+k_1}{2}\right)}{\Delta(r/w)/\left(\frac{r_0+r_1}{2}/\frac{w_0+w_1}{2}\right)}.$$

7. Relative price level, p=1.0000 by time/year holds:

$$p(t) = (r(t)K(t) + w(t)L_{POPUL}(t))/Y(t).$$

For the approach to clarify absolute values at convergence such as K^* and Y^*:

1. $A^* = A_0(1+g_A^*)^{1/\lambda^*}$, where $1/\lambda^*$ is the speed years for convergence. The assumption of a constant rate of technological progress is required during the speed years for convergence.
2. $L^* = L_0(1+n)^{1/\lambda^*}$, where the rate of change in population, $n_E = n$, is constant.
3. $k^* = (A^* \cdot \Omega^*)^{\frac{1}{1-\alpha}}$, where the assumption of $\Omega^* = \Omega_0$ is required, as stated already above.
4. $y^* = A^* \cdot {k^*}^{\alpha}$.

5. $K^* = k^* \cdot L^*$.
6. $Y^* = A^* \cdot K^{*\alpha} \cdot L^{*1-\alpha}$.

The above whole approach was realized by connecting the capital-labor ratio with the capital-output ratio. Up to date, there is no way to measure 'values at convergence,' except for the above approach.

A few problems hidden in recursive programming are reviewed in this Appendix. These are shown using Figures in Appendix at the end: (1) Time-series analysis of main variables, (2) the relationship between the capital-output ratio, $\Omega(t)$, and $1 = \Omega(t) \cdot B(t)^{1-\delta(t)}$, where $B(t) = (1-\beta(t))/\beta(t)$, (3) the relationship between the capital-output ratio, $\Omega(t)$, and the growth rate of output per capita, $g_y(t)$, and (4) the capital-output ratio, $\Omega(t)$, and the capital-labor ratio, $k(t)$. There is no empirical research of the capital-output ratio in the literature. Neo-classicists have used the capital-labor ratio but no empirical work for capital after 1995, due to some problems, which the author confirmed directly from PWT researchers. The author clarifies the four problems as follows:

First, for time series analysis, the author erased the assumption of diminishing returns to capital (DRC) perceived in the literature. When the transitional path shows increasing returns to capital (IRC) at the initial time/year, the capital-output ratio first increases, and hits the maximum. This point of time corresponds with the capital-output ratio at convergence theoretically. In recursive programming by country, this matching does not precisely occur due to the assumption of $\Omega^* = \Omega_0$. When the transitional path shows DRC at the initial time/year, the capital-output ratio first decreases, and hits the minimum. This point of time corresponds with the capital-output ratio at convergence theoretically. In recursive programming by country, this matching does not precisely occur due to the assumption of $\Omega^* = \Omega_0$.[10] After convergence, DRC turns to IRC or the capital-output ratio turns towards zero in infinite time/year while IRC turns to DRC or the capital-output ratio rises up/diverges towards infinity.

Second, for $1 = \Omega(t) \cdot B(t)^{1-\delta(t)}$, there is some problem to be examined. In recursive programming, this condition does not hold by time/year. It is theoretically true that this condition holds only at convergence. The purpose of the condition is traced back to the endogenous measurement of $delta_0$ at the initial time/year.

Instead of using A as a stock, using $B^* = (1-\beta^*)/\beta^*$ as a flow, first define B as $B^*_{TFP} \equiv (B^*)^{1-\delta_0}$. Since $\Omega = \frac{k^{1-\alpha}}{A}$ holds (as first proved in the author's PhD thesis (Note 19, 38, 2003)) using the C-D production function, this capital-output ratio is expressed as

[10] This assumption corresponds with the law of conservation of the capital-output ratio applied to von Neumann (1945-46) turnpike theory and proved by Samuelson (1477-79, 1970). 'The constant capital-output ratio was the reciprocal of the von Neumann interest rate or of the equivalent maximal rate of balanced growth.'

$\Omega = \frac{k^{1-\alpha}}{B_{TFP} \cdot k^{1-\delta_0}}$ or $\Omega = \frac{k^{\delta_0-\alpha}}{B_{TFP}}$.

At convergence, $\alpha = \delta_0$ holds under constant returns to capital (CRC), resulting in $1 = k^{\delta_0-\alpha}$. Then, $\Omega^* = \frac{1}{B^*_{TFP}}$ or $\Omega^* = \frac{1}{(B^*)^{1-\delta_0}}$ holds, resulting in $(B^*)^{1-\delta_0} = \frac{1}{\Omega^*}$. Therefore, $1 = \Omega^* \cdot B^{*1-\delta_0}$ holds at convergence and $\delta_0 = 1 - \frac{LN(1/\Omega^*)}{LN(B^*)}$, or $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$ are derived. In other words, if $\Omega^* = 1/B(t)^{1-\delta(t)}$ holds, there is no problem at all.

In short, $y = A \cdot k^{\alpha}$ is not consistently connected with $B_{TFP} \equiv B^{1-\delta_0}$ in the transitional path over years, except for one point of time/year at convergence. The purpose of B_{TFP}: $TFP_B \equiv B_{TFP} \cdot k^{1-\delta_0}$ is to derive the value of $delta_0$. The capital-output ratio and, $delta_0$ or *beta* are tightly related. For this reason, the author (151, *JES*, Sep 2006, after revise) assumes that $\Omega^* = \Omega_0$ holds. Without $delta_0$, DRC, IRC, and CRC are not specified.

Third, for the relationship between $\Omega(t)$ and $g_y(t)$, the patterns differ by country. Nevertheless, it is true that the lower the $\Omega(t)$ the higher the $g_y(t)$. This evidence is important to interpret the results of deficit since the higher the deficit to government output the higher the $\Omega_G(t)$.

Fourth, for the relationship between $\Omega(t)$ and $k(t)$, the patterns differ by country. It is true that the capital-labor ratio cannot directly be connected with technology. The author finds that beyond some level of $k(t)$ remains roughly unchanged. This implies that we can take either $\Omega(t)$ or $k(t)$ after $\Omega(t)$ reaches a constant. Yet, when we observe more precisely, the relationship between $\Omega(t)$ or $k(t)$ is complicated. This implies that it may be impossible to directly formulate the equation of the capital-labor ratio. A fact remains unchanged that we cannot formulate the endogenous model without using the capital-output ratio.

Thirdly, for revisit mechanics of the data-sets: endogenous *vs*. actual

KEWT data-sets differ from one year recursive programming so that direct comparison is inappropriate, although both have 1.0 for the relative price level; *p*=1.0. KEWT measures variables at convergence by using the endogenous speed years between the initial/current period and at convergence. As a result, the current growth rate of the level of technology as a stock fluctuate over years in 1990-2011 while the endogenous rate of technology as a flow is measured steadily over years. In statistics, actual variables are published yet unstably by year. Endogenous theoretical variables are stable in recursive programming and accordingly in KEWT by year.

Over years (not by year), actual data and endogenous data march in parallel. As a result, actual data cannot be far apart from theoretical data over years. This is another reason why actual current data fluctuate by year. The fluctuation of actual data comes from the change in net investment by year while endogenous data are based on smooth change in net investment in endogenous equilibrium. Actual data result in business cycle. Endogenous data show sustainable robustness by year, smoothening business cycle. And, nine endogenous parameters change by year inconspicuously. Policy-makers must watch these changes underlying in actual data. If policy-makers do not pay attention to these changes of endogenous parameters, some of endogenous parameters such as $delta_0$ suddenly change and the current situation gets into disequilibrium.

For example, each range of g^*_A/g^*_Y, $g^*_{A(G)}/g^*_{Y(G)}$, and $g^*_{A(PRI)}/g^*_{Y(PRI)}$ by country and sector change over years. Yet, for a certain short periods, g^*_A/g^*_Y, $g^*_{A(G)}/g^*_{Y(G)}$, and $g^*_{A(PRI)}/g^*_{Y(PRI)}$ show abnormal values, reflecting sudden unstable speed years for convergence, and this is a signal to disequilibrium. Unstable speed years often occur due to fiscal policy failure. Fiscal policy exists as a core of real, financial, and market policies. (see www@riee.tv, www.megaegg.ne.jp/˜kamiryo/, and http://ci.nii.ac.jp/).

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The author separated Harcourt's (1972) references in this chapter to 2-1 of 'Specific References' on page 541 as follows:

1. Author's, including the first appearances;
2-1. Referring to Harcourt, G. C. (1972) at Chapter 16, numbering 1 to 22;
2-2.Translator, Kamiya Denzo's supplement to Keynesians, Neo- and New-, and Neo-classicists, numbering 1 to 20;
3. Historical References influential to author's endogenous system and discoveries.

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Appendices

Hyperbolas: Formulations, Types, Attributes, Calculations, and Graphs

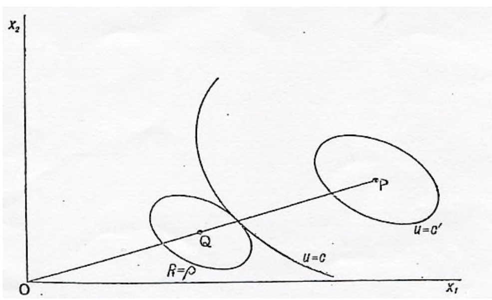
Appendices at the end of this book here include whole explanations of hyperbolas and twelve hyperbola graphs to 36 countries, KEWT 6.12, 1990/1960-2010. Short period data sources by country, sector, and year and, over years, 1990-2010, were presented at the end of related chapters to meet each aspect. Long period basic data sources such as seven endogenous parameters and structural ratios, 1960-2010, were presented in a few related chapters; data and figures (Chapter 6, using KEWT 7.13, 1960-2011). KEWT 1.07, 1960-2005, is the first KEWT series. When readers need to investigate basic data resources of KEWT 1.07, see *Papers of the Research Society of Commerce and Economics* (*PRSCE*) 48 (Sep, 1): 139-235, 2007, and/or enter ‘Hideyuki Kamiryo’ at http://ci.nii.ac.jp/ .

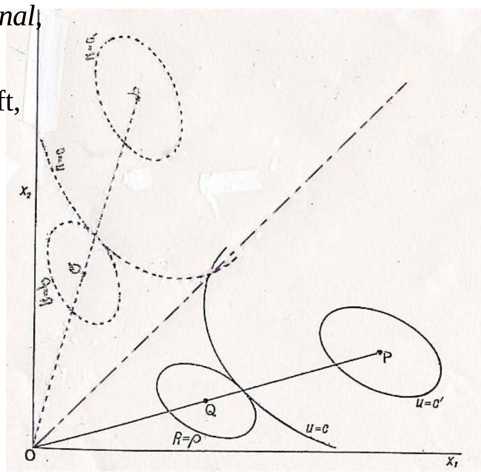
Recursive programming by country, 2010, was presented at the end of Chapter 16. Hyperbolas and recursive programming each show 36 countries so that readers are able to compare respective characteristics by country in the global economies. These Appendices are composed of four parts, **A**, **B**, **C**, and **D**: A. Circle behind hyperbola versus ellipse; B. 12 hyperbolas by type, with 5 attributes defined and calculated; C. Hyperbola graphs by country; and D. Endogenous equations and hyperbolas.

Appendix A. Circle behind hyperbola versus ellipse

BOX A-1 First appearance of ellipses by Ramsey, A. C.(53, 1927)

Left: Ramsey, A. C., page 53, *Economic Journal* 37, 1927.
Right: The author’s frame idea is added to Left, symmetrical to the diagonal of hyperbola.





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Hyperbolas:
Formulations, Types, Attributes, Calculations, and Graphs

The author has investigated hyperbolas at libraries abroad for many years. The author even today finds no hyperbola in natural and social sciences, except for transmitting networks[1] in natural sciences and a partial use of hyperbola as a discount rate in social sciences (see several; References at the end). In Chapter 10 of EES, the author compared hyperbola with parabola. The author here introduces a unique article[2] that expresses ellipse intuitively and verbally, as shown on the LHS of the above Box. "*A Contribution to the Theory of Taxation*" by Ramsey, A. C. is similar to F. P. Ramsey's (1928) *A Mathematical Theory of Saving*. Both are based on demand and supply under the price-equilibrium.

The author gets a good inspiration from his image of ellipse drawn on the two dimensions. Hyperbola implicitly has its diagonal of 45^0 up to the right. If this line shifts up (e.g., a line of 65^0, through the origin) or down (e.g., a line of 25^0, through the origin), the circle behind its hyperbola will become the corresponding ellipse, as shown on the RHS of the above Box. Accordingly, the hyperbolic curve will be transformed to a different shape. Hyperbola or ellipse holds in two dimensions. The consistency between the above two dimensions and four dimensions including space and time simultaneously, was already discussed in Chapter 10.

Note: Topology between the circle and the ellipse: a supplement within scientific proofs.

There is a circle behind the hyperbola. On a point of 45^0 of the diagonal that crosses the origin, a point of hyperbola crosses a point of the circle. These points form an equilateral rectangular triangle. Contrarily, the ellipse differs from the hyperbola. Topologically, the ellipse locates above and below the 45^0 of the diagonal. The connector is a rectangular that forms the golden ratio, 3, 4, and 5, related to Einstein's great discovery. The golden rectangular prevails and is involved in imaginary and real numbers. Physics and element chemistry have already accepted both numbers within scientific proofs and try to prove theoretical proofs, further empirically in this world/zone. The imaginary numbers are indispensable to the spiritual zone coexisting behind the physical zone.

The author's Earth Endogenous System (EES) holds without introducing imaginary numbers. A reason is that the hyperbola, the circle, and the equilateral rectangular triangle exist, simultaneously with 'space and time' dimensionally as one. Ramsey, A. C (1927) correctly expressed his topology of ellipse, below the 45^0 of diagonal. To leave

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[1] Nukiyama Heiichi and Nagai Kenzo. (March, 1928). A Hyperbolic theory of Transmitting Networks. *Journal of the Institute of Electrical Engineers of Japan*, Tohoku University, reprinted, 18p. The author found this article at National Library of Greece, Athens, on 24 March 2011.

[2] Ramsey, A. C. (1927). A Contribution to the Theory of Taxation. *Economic Journal* 37 (Mar., 145): 47-61.

this fact for the future, the author here clarified the relationship between the circle and the ellipse on the topology. The ellipse is now more definitely defined as a series of wave that presents one real number cycle and following half a cycle of imaginary number (abbreviate its empirical proof herein).

Appendix B. *12 hyperbolas by type, with 5 attributes defined and calculated*

It is essential for policy-oriented endogenous parameters in the endogenous model to use the rectangular hyperbola. Let the author start with the rectangular hyperbola *y*=*h*(*x*), by setting *h*(*x*)=(*cx*+*d*)/(*ax*+*b*). *y*=*h*(*x*) is now shown by $y=\frac{c}{a}+\frac{d-\frac{b\cdot c}{a}}{ax+b}=\frac{c}{a}+\frac{f}{ax+b}$, $f=d-\frac{b\cdot c}{a}$, and $\left(y-\frac{c}{a}\right)\left(x+\frac{b}{a}\right)=\frac{f}{a}$. There are six types in this form, starting with the standard type that elements *a b c d* are all not zero. When *a*=0, the hyperbola reduces to a linear exceptionally, as shown at $r^*(n)$ in Chapter 15. Six types are classified, using the rate of net investment to output, $i=I/Y$, and the rate of change in population, *n*, each as an independent variable. And, thirteen functions are distributed to each respective type as follows:

BOX B-1 Cases when each of elements, *a*, *b*, *c*, *d*, is zero

i) *a*=0, the linear type: $\mathrm{y}=\frac{\mathrm{cx+d}}{\mathrm{b}}$ or $\mathrm{y}=\frac{\mathrm{c}}{\mathrm{b}}\mathrm{x}+\frac{\mathrm{d}}{\mathrm{b}}$. To $r^*(n)$.

ii) *b*=0: $\mathrm{y}=\frac{\mathrm{cx+d}}{\mathrm{ax}}$ and $\mathrm{y}=\frac{\mathrm{c}}{\mathrm{a}}+\frac{\mathrm{d}}{\mathrm{ax}}$. To $r^*(i)$; $\beta^*(i)$.

iii) *c*=0 and d=1: $\mathrm{y}=\frac{1}{\mathrm{ax+b}}$. To $speed(i)$ and $speed(n)$.

iv) *d*=0: $\mathrm{y}=\frac{\mathrm{cx}}{\mathrm{ax+b}}$ and $\mathrm{y}=\frac{\mathrm{c}}{\mathrm{a}}+\frac{-\frac{\mathrm{b\cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$. To $n(i)$ or $i(n)$; $\Omega^*(i)$ and $\Omega^*(n)$; $\Omega^*(\beta^*)$.

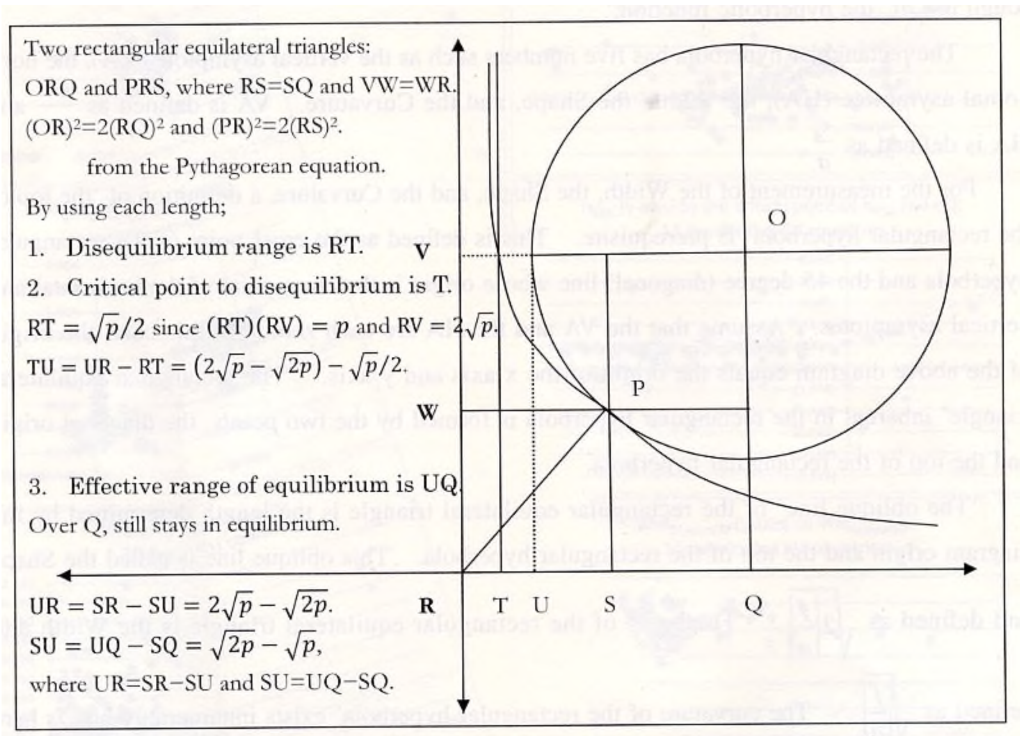
v) *c*=0: $\mathrm{y}=\frac{\mathrm{d}}{\mathrm{ax+b}}$. To $\Omega^*(n)$.

vi) No zero, the standard type: $\mathrm{y}=\frac{\mathrm{cx+d}}{\mathrm{ax+b}}$ and $\mathrm{y}=\frac{\mathrm{c}}{\mathrm{a}}+\frac{\mathrm{d}-\frac{\mathrm{b\cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$. To $\beta^*(n)$; $\alpha(i)$ and $\alpha(n)$.

Hyperbolas are each shown as a function of an independent parameter or variable to dependent parameter or variable assuming all the others are fixed.

The rectangular hyperbola has *five attributes* such as the vertical asymptote (VA), the horizontal asymptote (HA), the Width, the Shape, and the Curvature. VA is defined as $\frac{-\mathrm{b}}{\mathrm{a}}$ and, HA is defined as $\frac{\mathrm{c}}{\mathrm{a}}$. For the measurement of the Width, the Shape, and the Curvature, a definition of ‘the top of the rectangular hyperbola’ is prerequisite. This is defined as the cross point of the rectangular hyperbola and the 45 degree (diagonal) line whose origin is the cross point of the horizontal and vertical asymptotes. Assume that the VA and the HA are each zero. In this case, the origin of the above diagram equals the origin of the *x* axis and *y* axis. *The rectangular equilateral triangle* inherent in the rectangular hyperbola is formed by the two points, the diagonal origin and the top of the rectangular hyperbola.

'The oblique line' of the rectangular equilateral triangle is the length determined by the diagram origin and the top of the rectangular hyperbola. This oblique line is called the Shape and defined as $\sqrt{2\left|\frac{f}{a}\right|}$. 'The base' of the rectangular equilateral triangle is the Width and defined as $\sqrt{\left|\frac{f}{a}\right|}$. 'The curvature of the rectangular hyperbola' exists innumerably but, is here measured at 'the top of the rectangular hyperbola,' and accordingly, as the inverse number of the square root of the Shape: $1/\sqrt{2\left|\frac{f}{a}\right|}$. The Shape is upward to the right when $\frac{f}{a} > 0$, and the hyperbola spreads in the 1st and 2nd quadrants. The Shape is downward to the right when $\frac{f}{a} < 0$, and the hyperbola spreads in the 3rd and 4th quadrants. Main quadrants of the various hyperbolas locate in the 1st and, exceptionally in the 4th quadrants. Regardless of the sign of *a/f*, the Width, the Shape, and the Curvature remain each unchanged; when *a/f* is minus, its absolute value is used.



Note: The three hyperbolas and respective quadrant (A reduced linear in $(r^*)(i)$ is excluded here.)

Appendices

$(1/\lambda^*)(i)$ stays in the 1st quadrant but, $(1/\lambda^*)(n_E)$ in the 1st and 2nd quadrants. Each vertical asymptote shifts to the 2nd quadrant yet, the ranges of equilibrium are measured in the 1st quadrant in the case of $(1/\lambda^*)(i)$. This is because $i = I/Y$ on the x axis only shows a plus value in the case of equilibrium.

$(r^*)(i)$ has its horizontal asymptote and stays at the 1st quadrant in the case of inflation and at the 4th quadrant in the case of deflation. Mathematically, $\sqrt{|p|}$ holds in the 4th quadrant, instead of $\sqrt{p}$.

$speed(i)$ and $speed(n_E)$ are measured as a base for equilibrium. Here, 'speed' years is $1/\lambda^*$ but n_E is shown by n, as a case of full-employment in equilibrium, where $n = n_E$.

1-1 $\boldsymbol{speed(i)}$:

$speed\ (i) = \frac{1}{(1-\beta^*)(1-\delta_0)i+n(1-\alpha)}$.

$y = \frac{1}{ax+b}$, where $y = \frac{1}{\lambda^*}$, $x = i$, c=0, d=1, a $= (1-\beta^*)(1-\delta_0)$, and b $= n(1-\alpha)$.

$VA_{speed(i)} = -\frac{n(1-\alpha)}{(1-\beta^*)(1-\delta_0)}$. $HA_{speed(i)} = 0$.

$Width_{speed(i)} = \sqrt{\frac{1}{(1-\beta^*)(1-\delta_0)}}$. $Shape_{speed(i)} = \sqrt{\frac{2}{(1-\beta^*)(1-\delta_0)}}$.

$Curvature_{speed(i)} = 1/\sqrt{\frac{2}{(1-\beta^*)(1-\delta_0)}}$.

$\left(\mathrm{y}-\frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x}+\frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $speed(i)$: $(\mathrm{y}-0)(\mathrm{x}+0.05557852) = 6.56530$.

1.2 $\boldsymbol{i(speed)}$:

$i(speed) = \frac{-n(1-\alpha)}{(1-\beta^*)(1-\delta_0)} + \frac{1}{(1-\beta^*)(1-\delta_0)speed}$.

$y = \frac{Cx+1}{Ax}$. $y = \frac{C}{A} + \frac{1}{Ax}$, where A $= (1-\beta^*)(1-\delta_0)$, B $= -n(1-\alpha)$, D =1.0.

$VA_{i(speed)} = 0$. $HA_{i(speed)} = \frac{-n(1-\alpha)}{(1-\beta^*)(1-\delta_0)}$. $Width_{i(speed)} = \sqrt{\frac{1}{(1-\beta^*)(1-\delta_0)}}$.

$Shape_{i(speed)} = \sqrt{\frac{2}{(1-\beta^*)(1-\delta_0)}}$. $Curvature_{i(speed)} = 1/\sqrt{\frac{2}{(1-\beta^*)(1-\delta_0)}}$.

$\left(\mathrm{y}-\frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x}+\frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $i(speed)$: $(\mathrm{y}+0.05557852)(\mathrm{x}+0) = 6.56530$.

1.3 $\boldsymbol{speed(n)}$:

$speed(n) = \frac{1}{(1-\alpha)n+i(1-\beta^*)(1-\delta_0)}$. $y = \frac{1}{ax+b}$.

$VA_{speed\ (n)} = -\frac{i(1-\beta^*)(1-\delta_0)}{(1-\alpha)}$. $HA_{speed\ (n)} = 0$. $Width_{speed\ (n)} = \sqrt{\frac{1}{1-\alpha}}$.

$Shape_{speed\ (n)} = \sqrt{\frac{2}{1-\alpha}}$. $Curvature_{speed\ (n)} = 1/\sqrt{\frac{2}{1-\alpha}}$.

$\left(\mathrm{y}-\frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x}+\frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $speed(n)$: $(\mathrm{y}-0)(\mathrm{x}+0.017366348) = 1.1481903$.

1.4 $\boldsymbol{n(speed)}$:

$n(speed) = \frac{-i(1-\beta^*)(1-\delta_0)speed+1.0}{(1-\alpha)speed}$.

$\mathrm{y} = \frac{\mathrm{Cx}+1}{\mathrm{Ax}}$ and $\mathrm{y} = \frac{\mathrm{C}}{\mathrm{A}} + \frac{1}{\mathrm{Ax}}$, where $\mathrm{A} = 1-\alpha$, $\mathrm{C} = -i(1-\beta^*)(1-\delta_0)$, and F=D=1.0.

$VA_{n(speed)} = 0$. $HA_{n(speed)} = \frac{-i(1-\beta^*)(1-\delta_0)}{1-\alpha}$.

$Width_{n(speed)} = \sqrt{\frac{1}{1-\alpha}}$. $Shape_{n(speed)} = \sqrt{\frac{2}{1-\alpha}}$. $Curvature_{\ n(speed)} = 1/\sqrt{\frac{2}{1-\alpha}}$.

$\left(\mathrm{y}-\frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x}+\frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $n(speed)$: $(\mathrm{y}+0.0173663480)(\mathrm{x}+0) = 1.1481903$.

2-1 $\boldsymbol{r^*(i)}$:

$r^*(i) = \frac{\alpha\cdot i\ (1-\beta^*)(1+n)+\alpha\cdot n(1-\alpha)}{\beta^*(1-\alpha)i}$, which is derived from

$r^* = \frac{\alpha}{\Omega^*}$ and $\Omega^* = \left(\frac{i\cdot\beta^*(1-\alpha)}{i\ (1-\beta^*)(1+n)+n(1-\alpha)}\right)$.

$y = \frac{c}{a} + \frac{d}{ax} = \frac{cx+d}{ax}$, where $a = \beta^*(1-\alpha)$, $b = 0$, $\mathrm{c} = \alpha(1-\beta^*)(1+n)$, $\mathrm{f} = \mathrm{d} = \alpha\cdot n(1-\alpha)$, $\mathrm{e} = \frac{\mathrm{c}}{\mathrm{a}}$, and $\frac{\mathrm{f}}{\mathrm{a}} = \frac{\alpha\cdot n}{\beta^*} = \frac{\alpha\cdot n(1-\alpha)}{\beta^*(1-\alpha)}$.

$r^*(i) = \frac{\alpha(1-\beta^*)(1+n)}{\beta^*(1-\alpha)} + \frac{\alpha\cdot n(1-\alpha)}{\beta^*(1-\alpha)\cdot i}$: $VA_{r^*(i)} = 0 = -\frac{b}{a}$. $HA_{r^*(i)} = \frac{\alpha(1-\beta^*)(1+n)}{\beta^*(1-\alpha)}$.

$Width_{r^*(i)} = \sqrt{\left|\frac{\alpha\cdot n}{\beta^*}\right|} = \sqrt{\left|\frac{f}{a}\right|}$. $Shape_{r^*(i)} = \sqrt{2\left|\frac{\alpha\cdot n}{\beta^*}\right|}$. $Curvature_{r^*(i)} = 1/\sqrt{2\left|\frac{\alpha\cdot n}{\beta^*}\right|}$.

$\left(y-\frac{c}{a}\right)\left(x+\frac{b}{a}\right) = \frac{f}{a}$. For $r^*(i)$, $(y-0.0516375)(x+0) = 0.00168776$.

2-2 $\boldsymbol{i(r^*)}$:

$i(r^*) = \frac{\alpha\cdot n(1-\alpha)}{\beta^*(1-\alpha)r^*-\alpha(1-\beta^*)(1+n)}$.

$\mathrm{y} = \frac{\mathrm{D}}{\mathrm{Ax}+\mathrm{B}}$, where $r^*_{VA(i)} = \frac{\mathrm{B}}{\mathrm{A}}$, $r^*_{Width(i)} = \sqrt{\left|\frac{F}{A}\right|}$, and $\frac{F}{A} = \frac{\alpha\cdot n}{\beta^*}$.

$VA_{i(r^*)} = \frac{\alpha(1-\beta^*)(1+n)}{\beta^*(1-\alpha)}$. $HA_{i(r^*)} = 0$.

$Width_{i(r^*)} = \sqrt{\left|\frac{\alpha\cdot n}{\beta^*}\right|}$. $Shape_{i(r^*)} = \sqrt{2\left|\frac{\alpha\cdot n}{\beta^*}\right|}$. $Curvature_{i(r^*)} = 1/\sqrt{2\left|\frac{\alpha\cdot n}{\beta^*}\right|}$.

$\left(\mathrm{y}-\frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x}+\frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $i(r^*)$, $(\mathrm{y}-0)(\mathrm{x}-0.051647739) = 0.00168776$.

2-3 $\boldsymbol{r^*(n)}$: from hyperbola to linear

$r^*(n) = \frac{\{i\cdot\alpha(1-\beta^*)+\alpha(1-\alpha)\}n+i\cdot\alpha(1-\beta^*)}{i\cdot\beta^*(1-\alpha)}$.

$\mathrm{y} = \frac{\mathrm{C}}{\mathrm{B}}\mathrm{x}+\frac{\mathrm{D}}{\mathrm{B}} = \frac{\mathrm{Cx+D}}{\mathrm{B}}$. $\mathrm{B} = i\cdot\beta^*(1-\alpha)$. $\mathrm{C} = i\cdot\alpha(1-\beta^*)+\alpha(1-\alpha)$.

$\mathrm{D} = i\cdot\alpha(1-\beta^*)$. $\frac{\mathrm{C}}{\mathrm{B}} = \frac{i\cdot\alpha(1-\beta^*)+\alpha(1-\alpha)}{i\cdot\beta^*(1-\alpha)}$. $\frac{\mathrm{D}}{\mathrm{B}} = \frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)}$.

$r^*(n) = \left(\frac{i\cdot\alpha(1-\beta^*)+\alpha(1-\alpha)}{i\cdot\beta^*(1-\alpha)}\right)n+\frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)}$.

$Gradient_{r^*(n)} = \frac{\alpha\{i(1-\beta^*)+(1-\alpha)\}}{i\cdot\beta^*(1-\alpha)}$. $Intercept_{r^*(n)} = \frac{\alpha(1-\beta^*)}{\beta^*(1-\alpha)}$.

B=0.064298155. C=0.115721425. D=0.003288235.

For $r^*(n)$: $\mathrm{y} = 1.79976276\mathrm{x}+0.051140425$, where y=0.0686 when x=0.00972.

2-4 $\boldsymbol{n(r^*)}$:

$n(r^*) = \frac{i\cdot\beta^*(1-\alpha)r^*-i\cdot\alpha(1-\beta^*)}{\alpha(1-\alpha)+i\cdot\alpha(1-\beta^*)}$.

$y = \frac{C}{B}x+\frac{D}{B} = \frac{Cx+D}{B}$. $B = \alpha(1-\alpha)+i\cdot\alpha(1-\beta^*)$. $\mathrm{C} = i\cdot\beta^*(1-\alpha)$.

$D = -i\cdot\alpha(1-\beta^*)$. $\frac{C}{B} = \frac{i\cdot\beta^*(1-\alpha)}{\alpha(1-\alpha)+i\cdot\alpha(1-\beta^*)}$. $\frac{D}{B} = \frac{-i\cdot\alpha(1-\beta^*)}{\alpha(1-\alpha)+i\cdot\alpha(1-\beta^*)}$.

$Gradient_{n(r^*)} = \frac{i\cdot\beta^*(1-\alpha)}{\alpha\{i\cdot(1-\beta^*)+(1-\alpha)\}}$.

$\mathrm{Intercept}_{n(r^*)} = \frac{-i\cdot\alpha(1-\beta^*)}{\alpha\{i\cdot(1-\beta^*)+(1-\alpha)\}}$.

B=0.115721425. C=0.064298155. D=−0.003288235.

For $n(r^*)$: $\mathrm{y} = 0.555628786\mathrm{x}-0.028415092$, where y=0.00972 when x=0.0686.

3-1 $\boldsymbol{\Omega^*(i)}$:

$\Omega^*(i) = \left(\frac{\beta^*(1-\alpha)\cdot i}{(1-\beta^*)(1+n)\cdot i+n(1-\alpha)}\right)$.

$\mathrm{y} = \frac{\mathrm{cx}}{\mathrm{ax+b}}$. $\mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}}+\frac{-\frac{\mathrm{b\cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$. $\mathrm{f} = -\frac{\mathrm{b\cdot c}}{\mathrm{a}}$. $\mathrm{f} = \frac{-\beta^*(1-\alpha)n(1-\alpha)}{(1-\beta^*)(1+n)}$.

$VA_{\Omega^*(i)} = \frac{-\mathrm{b}}{\mathrm{a}} = \frac{-n(1-\alpha)}{(1-\beta^*)(1+n)}$. $HA_{\Omega^*(i)} = \beta^*(1-\alpha)/(1-\beta^*)(1+n) = {}^{c}/_{a}$.

$Width_{\Omega^*(i)} = \sqrt{\left|\frac{-\beta^* \cdot n(1-\alpha)^2}{(1-\beta^*)^2(1+n)^2}\right|}$. $Shape_{\Omega^*(i)} = \sqrt{2\left|\frac{-\beta^* \cdot n(1-\alpha)^2}{(1-\beta^*)^2(1+n)^2}\right|}$.

$Curvature_{\Omega^*(i)} = 1/\sqrt{2|\{-\beta^* \cdot n(1-\alpha)^2\}/\{(1-\beta^*)^2(1+n)^2\}|}$.

f=–0.0211633888. f/a=–0.081716.

$\left(y - \frac{c}{a}\right)\left(x + \frac{b}{a}\right) = \frac{f}{a}$. For $\Omega^*(i)$: $(y - 2.50012)(x + 0.0327231) = -0.081716$.

3-2 $\boldsymbol{i(\Omega^*)}$:

$i(\Omega^*) = \frac{-n(1-\alpha)\Omega^*}{(1-\beta^*)(1+n)\Omega^* - \beta^*(1-\alpha)}$.

$y = \frac{Cx}{Ax+B}$ and $y = \frac{C}{A} + \frac{-\frac{B \cdot C}{A}}{Ax+B}$, where $i_{HA(\Omega^*)} = -\frac{C}{A}$, $\Omega^*_{VA(i)} = \frac{B}{A}$, and

$F = \frac{-\beta^*(1-\alpha) \cdot n(1-\alpha)}{(1-\beta^*)(1+n)} = \frac{-B \cdot C}{A}$.

$i = \frac{-n(1-\alpha)}{(1-\beta^*)(1+n)} + \frac{-\beta^*(1-\alpha) \cdot n(1-\alpha)/(1-\beta^*)(1+n)}{(1-\beta^*)(1+n)\Omega^* - \beta^*(1-\alpha)}$.

$VA_{i(\Omega^*)} = \frac{\beta^*(1-\alpha)}{(1-\beta^*)(1+n)} = \frac{-B}{A}$. $HA_{i(\Omega^*)} = \frac{-n(1-\alpha)}{(1-\beta^*)(1+n)} = \frac{C}{A}$. $Width_{i(\Omega^*)} = \sqrt{\left|\frac{F}{A}\right|}$.

$Width_{i(\Omega^*)} = \sqrt{\left|\frac{-\beta^* \cdot n(1-\alpha)^2}{(1-\beta^*)^2(1+n)^2}\right|}$. $Shape_{i(\Omega^*)} = \sqrt{2\left|\frac{-\beta^* \cdot n(1-\alpha)^2}{(1-\beta^*)^2(1+n)^2}\right|}$.

$Curvature_{i(\Omega^*)} = 1/\sqrt{2\left|\frac{-\beta^* \cdot n(1-\alpha)^2}{(1-\beta^*)^2(1+n)^2}\right|}$.

F=–0.0211633888. F/A=–0.081716.

$\left(y - \frac{C}{A}\right)\left(x + \frac{B}{A}\right) = \frac{F}{A}$. For $i(\Omega^*)$: $(y + 0.0327231)(x - 2.50012) = -0.081716$.

3-3 $\boldsymbol{\Omega^*(n)}$:

$\Omega^*(n) = \frac{\beta^* \cdot i(1-\alpha)}{\{i(1-\beta^*)+(1-\alpha)\}n + i \cdot (1-\beta^*)}$. $y = \frac{d}{ax+b}$, where $c = 0$ and $e = 0$.

$a = i(1-\beta^*) + (1-\alpha)$. $b = i \cdot (1-\beta^*)$. $d = \beta^* \cdot i(1-\alpha)$. $f = d$.

$\frac{f}{a} = \frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)+(1-\alpha)}$. $Width_{\Omega^*(n)} = \sqrt{\left|\frac{f}{a}\right|}$ $\Omega^*(n = 0) = \frac{\beta^*(1-\alpha)}{(1-\beta^*)}$

$VA_{\Omega^*(n)} = \frac{-i \cdot (1-\beta^*)}{i(1-\beta^*)+(1-\alpha)} = \frac{-b}{a}$. $HA_{\Omega^*(n)} = 0$.

$Width_{\Omega^*(n)} = \sqrt{\left|\frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)+(1-\alpha)}\right|}$. $Shape_{\Omega^*(n)} = \sqrt{2\left|\frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)+(1-\alpha)}\right|}$.

$Curvature_{\Omega^*(n)} = 1/\sqrt{2\left|\frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)+(1-\alpha)}\right|}$.

$\left(y - \frac{c}{a}\right)\left(x + \frac{b}{a}\right) = \frac{f}{a}$. For $\Omega^*(n)$: $(y - 0)(x + 0.028415093) = 0.071735923$.

Appendices

3-4 $\boldsymbol{n(\Omega^*)}$:

$n(\Omega^*) = \frac{-i(1-\beta^*)\Omega^*+\beta^*\cdot i(1-\alpha)}{\{i(1-\beta^*)+(1-\alpha)\}\Omega^*}$: $\quad y = \frac{Cx+D}{Ax}$. $\quad y = \frac{C}{A} + \frac{D}{Ax}$.

$\mathrm{A} = i(1-\beta^*) + (1-\alpha)$. $\ B = 0$. $\ C = -i(1-\beta^*)$. $\ D = \beta^* \cdot i(1-\alpha)$.

$\mathrm{E} = \frac{\mathrm{C}}{\mathrm{A}}$. $\ \mathrm{F} = \mathrm{D}$. $\quad \frac{\mathrm{F}}{\mathrm{A}} = \frac{\beta^*\cdot i(1-\alpha)}{i(1-\beta^*)+(1-\alpha)} \quad Width_{n(\Omega^*)} = \sqrt{\left|\frac{\mathrm{F}}{\mathrm{A}}\right|}$.

$VA_{n(\Omega^*)} = 0 = \frac{-B}{A}$. $\quad HA_{n(\Omega^*)} = \frac{-i(1-\beta^*)}{i(1-\beta^*)+(1-\alpha)}$.

$Width_{n(\Omega^*)} = \sqrt{\left|\frac{\beta^*\cdot i(1-\alpha)}{i(1-\beta^*)+(1-\alpha)}\right|}$. $\ Shape_{n(\Omega^*)} = \sqrt{2\left|\frac{\beta^*\cdot i(1-\alpha)}{i(1-\beta^*)+(1-\alpha)}\right|}$

$Curvature_{n(\Omega^*)} = 1/\sqrt{2\left|\frac{\beta^*\cdot i(1-\alpha)}{i(1-\beta^*)+(1-\alpha)}\right|}$.

$\left(\mathrm{y} - \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. $\quad$ For $n(\Omega^*)$: $(\mathrm{y} + 0.028415093)(\mathrm{x} + 0) = 0.071735923$.

4-1 $\boldsymbol{i(n)}$:

$i(n) = \frac{-(1-\alpha)\Omega^*\cdot n}{(1-\beta^*)\Omega^*\cdot n+\beta^*(1-\alpha)-(1-\beta^*)\Omega^*}$.

Here starting with $\beta^* = \frac{(1+n)\Omega^*\cdot i+(1-\alpha)\Omega^*\cdot n}{i((1-\alpha)+\Omega^*(1+n))}$ and using $\beta^* i\big((1-\alpha)+\Omega^*(1+n)\big) = (1+n)\Omega^*\cdot i + (1-\alpha)\Omega^*\cdot n$.

$\mathrm{y} = \frac{\mathrm{cx}}{\mathrm{ax+b}}$ and $\mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{-\frac{\mathrm{b\cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$.

$\mathrm{a} = (1-\beta^*)\Omega^*$, $\mathrm{b} = (1-\beta^*)\Omega^* - \beta^*(1-\alpha)$, and $\mathrm{c} = -(1-\alpha)\Omega^*$.

$\mathrm{f} = \frac{-(\beta^*(1-\alpha)-(1-\beta^*)\Omega^*)\cdot(1-\alpha)\Omega^*}{(1-\beta^*)\Omega^*} = \frac{\mathrm{b\cdot c}}{\mathrm{a}}$. $\quad \frac{\mathrm{f}}{\mathrm{a}} = \frac{-(\beta^*(1-\alpha)-(1-\beta^*)\Omega^*)\cdot(1-\alpha)\Omega^*}{((1-\beta^*)\Omega^*)^2} = \frac{\mathrm{b\cdot c}}{\mathrm{a}^2}$.

$VA_{i(n)} = \frac{(1-\beta^*)\Omega^*-\beta^*(1-\alpha)}{(1-\beta^*)\Omega^*} = \frac{-\mathrm{b}}{\mathrm{a}}$. $\ HA_{i(n)} = \frac{-(1-\alpha)}{(1-\beta^*)} = -\frac{\mathrm{c}}{\mathrm{a}}$.

$Width_{i(n)} = \sqrt{\left|\frac{(\beta^*(1-\alpha)-(1-\beta^*)\Omega^*)\cdot(1-\alpha)\Omega^*}{-((1-\beta^*)\Omega^*)^2}\right|}$.

$Shape_{i(n)} = \sqrt{2\left|\frac{(\beta^*(1-\alpha)-(1-\beta^*)\Omega^*)\cdot(1-\alpha)\Omega^*}{-((1-\beta^*)\Omega^*)^2}\right|}$.

$Curvature_{i(n)} = 1/\sqrt{2\left|\frac{(\beta^*(1-\alpha)-(1-\beta^*)\Omega^*)\cdot(1-\alpha)\Omega^*}{((1-\beta^*)\Omega^*)^2}\right|}$.

$i(n) = \frac{-1.63825n}{0.48250215n+0.165012}$, where a=0.48250215, b=0.165012, c=−1.63825,

b·c=−0.270330909. $\ \mathrm{f} = -0.560268817 = \frac{-\mathrm{bc}}{\mathrm{a}}$, and $\frac{\mathrm{f}}{\mathrm{a}} = -1.16117372$.

$VA_{i(n)} = -0.3419923 = \frac{-\mathrm{b}}{\mathrm{a}}$. $\quad HA_{i(n)} = -3.395322 = \frac{\mathrm{c}}{\mathrm{a}}$.

$Width_{i(n)} = 1.0775777 = \sqrt{1.16117372}$. $\ Shape_{i(n)} = 1.523925 = \sqrt{2.32234744}$.

$Curvature_{i(n)} = 0.6562 = 1/\sqrt{2.32234744}$.

$\left(\mathrm{y} - \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $i(n)$: $(y + 3.395322)(x - 0.3419923) = -1.161174$.

4-2 $\boldsymbol{n(i)}$:

$n(i) = \frac{-((1-\beta^*)\Omega^* - \beta^*(1-\alpha))i}{(1-\beta^*)\Omega^* \cdot i + \Omega^*(1-\alpha)}$.

Here starting with $\beta^* = \frac{(1+n)\Omega^* \cdot i + (1-\alpha)\Omega^* \cdot n}{i((1-\alpha)+\Omega^*(1+n))}$ and using $\beta^* i\big((1-\alpha) + \Omega^*(1+n)\big) = (1+n)\Omega^* \cdot i + (1-\alpha)\Omega^* \cdot n$.

$\mathrm{y} = \frac{\mathrm{cx}}{\mathrm{ax+b}}$ and $\mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{-\frac{\mathrm{b \cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$.

$\mathrm{a} = (1-\beta^*)\Omega^*$, $\mathrm{b} = \Omega^*(1-\alpha)$, $\mathrm{c} = -((1-\beta^*)\Omega^* - \beta^*(1-\alpha))$, $\frac{\mathrm{f}}{\mathrm{a}} = \frac{-\Omega^*(1-\alpha)\{(1-\beta^*)\Omega^* - \beta^*(1-\alpha)\}}{((1-\beta^*)\Omega^*)^2}$.

$VA_{n(i)} = \frac{-\Omega^*(1-\alpha)}{(1-\beta^*)\Omega^*} = \frac{-b}{a}$. $HA_{n(i)} = \frac{-((1-\beta^*)\Omega^* - \beta^*(1-\alpha))}{(1-\beta^*)\Omega^*} = \frac{c}{a}$.

$Width_{n(i)} = \sqrt{\left|\frac{-\Omega^*(1-\alpha)\{(1-\beta^*)\Omega^* - \beta^*(1-\alpha)\}}{((1-\beta^*)\Omega^*)^2}\right|}$.

$Shape_{n(i)} = \sqrt{2\left|\frac{-\Omega^*(1-\alpha)\{(1-\beta^*)\Omega^* - \beta^*(1-\alpha)\}}{((1-\beta^*)\Omega^*)^2}\right|}$.

$Curvature_{n(i)} = 1/\sqrt{2\left|\frac{-\Omega^*(1-\alpha)\{(1-\beta^*)\Omega^* - \beta^*(1-\alpha)\}}{((1-\beta^*)\Omega^*)^2}\right|}$.

$n(i) = \frac{-0.165012i}{0.48250215i + 1.63825}$, where a=0.48250215, b=1.63825, c=−0.165012,

b·c=−0.270330909. $\mathrm{f} = -0.560268817 = \frac{-\mathrm{bc}}{\mathrm{a}}$, and $\frac{\mathrm{f}}{\mathrm{a}} = -1.16117372$.

$VA_{n(i)} = -3.395322 = \frac{-\mathrm{b}}{\mathrm{a}}$. $HA_{n(i)} = -0.341992258 = \frac{\mathrm{c}}{\mathrm{a}}$.

$Width_{n(i)} = 1.0775777 = \sqrt{|-1.16117372|}$. $Shape_{n(i)} = 1.523925 = \sqrt{|-2.32234744|}$.

$Curvature_{n(i)} = 0.6562 = 1/\sqrt{|-2.32234744|}$.

$\left(\mathrm{y} + \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$.

For $n(i)$: $(y - 0.3419923)(x + 3.395322) = -1.161174$.

Appendices

4-3 $\boldsymbol{\Omega^*(\beta^*)}$:

$\Omega^*(\beta^*) = \frac{-i(1-\alpha)\beta^*}{i(1+n)\beta^* - (i(1+n)+n(1-\alpha))}$, using. $\Omega^* = \frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)(1+n)+n(1-\alpha)}$.

$\mathrm{y} = \frac{\mathrm{cx}}{\mathrm{ax+b}}$ and $\mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{-\frac{\mathrm{b \cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$. $\mathrm{a} = i(1+n)$. $\mathrm{b} = -(i(1+n)+n(1-\alpha))$. $\mathrm{c} = -i(1-\alpha)$.

$\mathrm{VA}_{\Omega^*(\beta^*)} = \frac{i(1+n)+n(1-\alpha)}{i(1+n)}$. $\mathrm{HA}_{\Omega^*(\beta^*)} = \frac{-i(1-\alpha)}{i(1+n)}$. $\frac{\mathrm{f}}{\mathrm{a}} = \frac{-(i(1+n)+n(1-\alpha))\cdot i(1-\alpha)}{(i(1+n))^2} = \frac{-\mathrm{bc}}{\mathrm{a}^2}$.

$\Omega^* = \frac{-0.08648037\beta^*}{0.100265196\beta^* - 0.108730344}$. $\frac{\mathrm{f}}{\mathrm{a}} = -0.935336465$.

$VA_{\Omega^*(\beta^*)} = 1.084427581 = \frac{-\mathrm{b}}{\mathrm{a}}$. $HA_{\Omega^*(\beta^*)} = -0.862516341 = \frac{\mathrm{c}}{\mathrm{a}}$.

$Width_{\Omega^*(\beta^*)} = 0.967127946 = \sqrt{|-0.935336465|}$.

$Shape_{\Omega^*(\beta^*)} = 1.367725458 = \sqrt{|-1.87067293|}$.

$Curvature_{\Omega^*(\beta^*)} = 0.731140883 = 1/\sqrt{|1.87067293|}$.

$\left(\mathrm{y} - \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $\Omega^*(\beta^*)$: $(y + 0.862516341)(x - 1.084427581) = -0.935336465$.

4-4 $\boldsymbol{\beta^*(\Omega^*)}$:

$\beta^*(\Omega^*) = \frac{(i(1+n)+n(1-\alpha))\Omega^*}{i(1+n)\Omega^* + i(1-\alpha)}$, using $\beta^* = \frac{\Omega^*(i+i\cdot n+n(1-\alpha))}{i((1-\alpha)+\Omega^*(1+n))}$.

$\mathrm{y} = \frac{\mathrm{cx}}{\mathrm{ax+b}}$ and $\mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{-\frac{\mathrm{b \cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$. $\mathrm{a} = i(1+n)$. $\mathrm{b} = i(1-\alpha)$. $\mathrm{c} = i(1+n)+n(1-\alpha)$.

$\frac{\mathrm{f}}{\mathrm{a}} = \frac{i(1-\alpha)(i(1+n)+n(1-\alpha))}{(i(1+n))^2} = \frac{-\mathrm{bc}}{\mathrm{a}^2}$.

$\beta^* = \frac{0.108730344\Omega^*}{0.100265196\Omega^* + 0.08648037}$. $\frac{\mathrm{f}}{\mathrm{a}} = -0.935336465$.

$VA_{\beta^*(\Omega^*)} = -0.862516341 = \frac{-\mathrm{b}}{\mathrm{a}}$. $HA_{\beta^*(\Omega^*)} = 1.084427581 = \frac{\mathrm{c}}{\mathrm{a}}$.

$Width_{\beta^*(\Omega^*)} = 0.967127946 = \sqrt{|-0.935336465|}$.

$Shape_{\beta^*(\Omega^*)} = 1.367725458 = \sqrt{|-1.87067293|}$.

$Curvature_{\beta^*(\Omega^*)} = 0.731140883 = 1/\sqrt{|-1.87067293|}$.

$\left(\mathrm{y} - \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$ For $\beta^*(\Omega^*)$: $(\mathrm{y} - 1.084427581)(\mathrm{x} + 0.862516341) = -0.935336465$.

5-1 $\boldsymbol{\beta^*(n)}$:

$\beta^*(n) = \frac{\Omega^*\cdot n(i+(1-\alpha))+\Omega^*\cdot i}{\Omega^*\cdot i\cdot n+i(1-\alpha+\Omega^*)}$ from $\beta^* = \frac{\Omega^*(i+i\cdot n+n(1-\alpha))}{i((1-\alpha)+\Omega^*(1+n))}$.

$\mathrm{y} = \frac{\mathrm{cx+d}}{\mathrm{ax+b}}$ and $\mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{\mathrm{d}-\frac{\mathrm{b\cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$,

where $\mathrm{a} = \Omega^* \cdot i$, $\mathrm{b} = i(1-\alpha+\Omega^*)$, $\mathrm{c} = \Omega^*(i+(1-\alpha))$, $\mathrm{d} = \Omega^* \cdot i$,

$\mathrm{e} = \frac{\Omega^*(i+(1-\alpha))}{\Omega^*\cdot i}$, and $\frac{\mathrm{f}}{\mathrm{a}} = \frac{1-\Omega^*(1-\alpha+i)i(1-\alpha+\Omega^*)}{(\Omega^*\cdot i)^2} = \frac{1-\mathrm{bc}}{\mathrm{a}^2}$,

where the Width as a base of the rectangle equilateral triangle is $\sqrt{\left|\frac{\mathrm{f}}{\mathrm{a}}\right|}$.

$VA_{\beta^*(n)} = \frac{-\mathrm{b}}{\mathrm{a}} = \frac{-i(1-\alpha+\Omega^*)}{\Omega^*\cdot i}$. $\quad HA_{\beta^*(n)} = \frac{\mathrm{c}}{\mathrm{a}} = \frac{\Omega^*(i+(1-\alpha))}{\Omega^*\cdot i}$.

$Width_{\beta^*(n)} = \sqrt{|(\Omega^* \cdot i)(\Omega^* \cdot \alpha + i \cdot \alpha - (1+\Omega^*+i))|}$.

$Shape_{\beta^*(n)} = \sqrt{2|(\Omega^* \cdot i)(\Omega^* \cdot \alpha + i \cdot \alpha - (1+\Omega^*+i))|}$.

$Curvature_{\beta^*(n)} = 1/\sqrt{2|(\Omega^* \cdot i)(\Omega^* \cdot \alpha + i \cdot \alpha - (1+\Omega^*+i))|}$.

$\beta^*(n) = \frac{1.8251n+0.18679}{0.18679n+0.27327}$.

E.g., a=0.18679323=1.8811×0.0993, b=0.2732736=0.0993×2.752, c=1.8251=1.8811×(0.0993+0.8709), d=0.18679323=1.8811×0.0993, where *x*=*n*=0.00972,

$\mathrm{f} = -2.48328 = 0.18679323 - \frac{0.2732736\times1.8251}{0.18679323} = \mathrm{d} - \frac{\mathrm{b\cdot c}}{\mathrm{a}}$.

$\frac{\mathrm{f}}{\mathrm{a}} = -13.2938285 = \frac{-2.483197165}{0.18679323}$.

c·n+d=0.2045332=1.8251×0.00972+0.18679323 and

a·n+b=0.27508923=0.18679323×0.00972+0.2732736, and thus,

$beta^*$=y=0.7435=0.2045332÷0.27508923.

−2.483197=0.18679323×(1.8811×0.1291+0.0993×0.1291−(2.8811+0.0993)) when

$\mathrm{f} = (\Omega^* \cdot i)(\Omega^* \cdot \alpha + i \cdot \alpha - (1+\Omega^*+i))$ is used.

$VA_{\beta^*(n)} = -1.46297379 = \frac{-0.2732736}{0.18679323} = \frac{-\mathrm{b}}{\mathrm{a}}$. $\quad HA_{\beta^*(n)} = 9.77039275 = \frac{1.8251}{0.18679323} = \frac{\mathrm{c}}{\mathrm{a}}$.

$Width_{\beta^*(n)} = 3.64607 = \sqrt{|-13.2942732|}$.

$\left(\mathrm{y} - \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $\beta^*(n)$: $(y - 9.77039275)(x + 1.46297379) = -13.2938285$.

Appendices

5-2 $\boldsymbol{n(\beta^*)}$:

$n(\beta^*) = \frac{-i(1-\alpha+\Omega^*)\beta^*+\Omega^*\cdot i}{\Omega^*\cdot i\cdot\beta^*-\Omega^*(1-\alpha+i)}$ from $n = \frac{\beta^*\cdot i(1-\alpha+\Omega^*)-\Omega^*\cdot i}{\Omega^*(1-\alpha+i-\beta^*\cdot i)}$.

$\mathrm{y} = \frac{\mathrm{Cx+D}}{\mathrm{Ax+B}}$ and $\mathrm{y} = \frac{\mathrm{C}}{\mathrm{A}} + \frac{\mathrm{D}-\frac{\mathrm{B\cdot C}}{\mathrm{A}}}{\mathrm{Ax+B}}$,

where $\mathrm{A} = \Omega^* \cdot i$, $\mathrm{B} = -\Omega^*(1-\alpha+i)$, $\mathrm{C} = -i(1-\alpha+\Omega^*)$, $\mathrm{D} = \Omega^* \cdot i$,

$\frac{\mathrm{C}}{\mathrm{A}} = \frac{-i(1-\alpha+\Omega^*)}{\Omega^*\cdot i}$, and $\frac{\mathrm{F}}{\mathrm{A}} = \frac{-\Omega^*\cdot i-\frac{\Omega^*(1-\alpha+i)i(1-\alpha+\Omega^*)}{\Omega^*\cdot i}}{\Omega^*\cdot i}$, $\quad Width_{n(\beta^*)} = \sqrt{\left|\frac{\mathrm{F}}{\mathrm{A}}\right|}$.

$VA_{n(\beta^*)} = \frac{\Omega^*(1-\alpha+i)}{\Omega^*\cdot i} = \frac{-\mathrm{B}}{\mathrm{A}}$. $\quad HA_{n(\beta^*)} = \frac{-i(1-\alpha+\Omega^*)}{\Omega^*\cdot i} = \frac{\mathrm{C}}{\mathrm{A}}$.

$$Width_{n(\beta^*)} = \sqrt{|(\Omega^* \cdot i)(\Omega^* \cdot \alpha + i \cdot \alpha - (1 + \Omega^* + i))|}.$$

$$Shape_{n(\beta^*)} = \sqrt{2|(\Omega^* \cdot i)(\Omega^* \cdot \alpha + i \cdot \alpha - (1 + \Omega^* + i))|}.$$

$$Curvature_{n(\beta^*)} = 1/\sqrt{2|(\Omega^* \cdot i)(\Omega^* \cdot \alpha + i \cdot \alpha - (1 + \Omega^* + i))|}.$$

$\mathrm{A} = 0.18679323$. $\mathrm{B} = -1.82504322$. $\mathrm{C} = -0.2732736$. $\mathrm{D} = 0.18679323$.
C/A=−1.46297379.

−B/A=9.77039275. $\mathrm{F} = -2.483197165 = 0.18679323 - \frac{0.49873613}{0.18679323} = \mathrm{D} - \frac{\mathrm{BC}}{\mathrm{A}}$.

$\left(\mathrm{y} - \frac{\mathrm{C}}{\mathrm{A}}\right)\left(\mathrm{x} + \frac{\mathrm{B}}{\mathrm{A}}\right) = \frac{\mathrm{F}}{\mathrm{A}}$. For $n(\beta^*)$: $(y + 1.46297379)(x - 9.77039275) = -13.2938285$.

5-3 $\boldsymbol{\widetilde{\beta^*}(n)}$:

$\widetilde{\beta^*}(n) = \frac{(\Omega^*\cdot i-\Omega^*(i-(1-\alpha)))\cdot n + i(1-\alpha)}{\Omega^*\cdot i\cdot n+i(1-\alpha+\Omega^*)}$ from $\widetilde{\beta^*}(n) = 1 - \frac{\Omega^*\cdot n(i+(1-\alpha))+\Omega^*\cdot i}{\Omega^*\cdot i\cdot n+i(1-\alpha+\Omega^*)}$,

setting $\widetilde{\beta^*} = 1 - \beta^*$ and starting with $\beta^*(n) = \frac{\Omega^*\cdot n(i+(1-\alpha))+\Omega^*\cdot i}{\Omega^*\cdot i\cdot n+i(1-\alpha+\Omega^*)}$.

$f = i(1-\alpha) - \frac{i(1-\alpha+\Omega^*)(\Omega^* i-\Omega^*(i-(1-\alpha))}{\Omega^* i}$.

And, $f = i(1-\alpha) - \frac{i(1-\alpha+\Omega^*)(\Omega^*(-(1-\alpha))}{\Omega^* i} = (1-\alpha)(i + (1-\alpha+\Omega^*)$.

$\mathrm{y} = \frac{\mathrm{cx+d}}{\mathrm{ax+b}}$. $\quad \mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{\mathrm{d}-\frac{\mathrm{b\cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$.

$\mathrm{a} = \Omega^* \cdot i$, $\mathrm{b} = i(1-\alpha+\Omega^*)$, $\mathrm{c} = \Omega^* \cdot i - \Omega^*(i + (1-\alpha))$, $\mathrm{d} = i(1-\alpha)$, $\mathrm{e} = \frac{\Omega^*\cdot i-\Omega^*(i+(1-\alpha))}{\Omega^*\cdot i}$, and $\mathrm{f} = i(1-\alpha) - \frac{i(1-\alpha+\Omega^*)\{\Omega^*\cdot i-\Omega^*(i-(1-\alpha))\}}{\Omega^*\cdot i} = \mathrm{d} - \frac{\mathrm{b\cdot c}}{\mathrm{a}}$,

$\mathrm{f} = 2.4832 = 0.8709 \times (0.0993 + 0.8709 + 1.8811)$.

And, using $\mathrm{f} = (1-\alpha)\{i + (1-\alpha+\Omega^*)\}$, $\frac{\mathrm{f}}{\mathrm{a}} = \frac{(1-\alpha)\{i+(1-\alpha+\Omega^*)\}}{\Omega^*\cdot i}$, where $Width_{\widetilde{\beta^*}(n)} = \sqrt{\left|\frac{\mathrm{f}}{\mathrm{a}}\right|}$.

$VA_{\widetilde{\beta^*}(n)} = \frac{-i(1-\alpha+\Omega^*)}{\Omega^* \cdot i} = \frac{-\mathrm{b}}{\mathrm{a}}$. $HA_{\widetilde{\beta^*}(n)} = \frac{\Omega^* \cdot i - \Omega^*(i+(1-\alpha))}{\Omega^* \cdot i} = \frac{\mathrm{c}}{\mathrm{a}}$.

$Width_{\widetilde{\beta^*}(n)} = \sqrt{\left|\frac{(1-\alpha)\{i+(1-\alpha+\Omega^*)\}}{\Omega^* \cdot i}\right|}$. $Shape_{\widetilde{\beta^*}(n)} = \sqrt{2\left|\frac{(1-\alpha)\{i+(1-\alpha+\Omega^*)\}}{\Omega^* \cdot i}\right|}$.

$Curvature_{\widetilde{\beta^*}(n)} = 1/\sqrt{2\left|\frac{(1-\alpha)\{i+(1-\alpha+\Omega^*)\}}{\Omega^* \cdot i}\right|}$.

E.g., a=0.18679323=1.8811×0.0993, b=0.2732736=0.0993×2.752,
c=−1.63825=0.18679323−1.8811×(0.0993+0.8709), d=0.08648=0.0993×0.8709, where
x=*n*=0.00972, then,
c·*n*+d=0.070505=−1.63825×0.00972+0.08648 and
a·*n*+b=0.27508923=0.18679323×0.00972+0.2732736, and thus,
$\widetilde{\beta^*}$=0.2565=0.070556÷0.27508923.

$\mathrm{f} = \left(\mathrm{d} - \frac{\mathrm{bc}}{\mathrm{a}}\right) = 2.48319681 = 0.08648 - \frac{0.2732736 \times -1.63825}{0.18679323}$. $\frac{\mathrm{f}}{\mathrm{a}} = 13.2938266 = \frac{2.48319681}{0.18679323}$

And, using $\mathrm{f} = (1-\alpha)\{i + (1-\alpha+\Omega^*)\}$, $\frac{\mathrm{f}}{\mathrm{a}} = 13.26585428 = \frac{2.47797177}{0.18679323}$ (no error in the Excel).

$\widetilde{\beta^*} = 0.2565 = \frac{-1.63825}{0.18679323} + \frac{2.48319681}{0.27508923} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{\mathrm{d} - \frac{\mathrm{b \cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$.

$VA_{\widetilde{\beta^*}(n)} = -1.46297379 = \frac{-0.2732736}{0.18679323} = \frac{-\mathrm{b}}{\mathrm{a}}$. $HA_{\widetilde{\beta^*}(n)} = -8.77039 = \frac{-1.63825}{0.18679323} = \frac{\mathrm{c}}{\mathrm{a}}$.

$Width_{\widetilde{\beta^*}(n)} = 3.64607 = \sqrt{13.2938266}$.

$\left(\mathrm{y} - \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $\widetilde{\beta^*}(n)$: $(y + 8.77039)(x + 1.46297379) = 13.2938266$.

5-4 $\boldsymbol{n(\widetilde{\beta^*})}$:

$n(\widetilde{\beta^*}) = \frac{\{i(1-\alpha+\Omega^*)\}(1-\beta^*) - i(1-\alpha)}{\Omega^* \cdot i(1-\beta^*) + \Omega^*(1-\alpha)}$.

Here starting with $\beta^*(n) = \frac{\Omega^* \cdot n(i+(1-\alpha)) + \Omega^* \cdot i}{\Omega^* \cdot i \cdot n + i(1-\alpha+\Omega^*)}$ and using $n(\beta^*) = \frac{i(1-\alpha+\Omega^*)\beta^* - \Omega^* \cdot i}{-\Omega^* \cdot i \cdot \beta^* + \Omega^*(1-\alpha+i)}$, where

$n(\widetilde{\beta^*}) = \frac{\Omega^* \cdot i(1-\beta^*) + \Omega^*(1-\alpha) - i(1-\alpha+\Omega^*)\beta^*}{-\Omega^* \cdot i \cdot \beta^* + \Omega^*(1-\alpha+i)} = 1 - \frac{i(1-\alpha+\Omega^*)\beta^* - \Omega^* \cdot i}{-\Omega^* \cdot i \cdot \beta^* + \Omega^*(1-\alpha+i)}$.

$\mathrm{y} = \frac{\mathrm{cx+d}}{\mathrm{ax+b}}$ and $\mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{\mathrm{d} - \frac{\mathrm{b \cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$.

Appendices

$\mathrm{a} = \Omega^* \cdot i$. $\mathrm{b} = \Omega^*(1-\alpha)$. $\mathrm{c} = i(1-\alpha+\Omega^*)$. $\mathrm{d} = -i(1-\alpha)$.

a=0.18679323. b=1.63825. c=0.2732736=0.0993×2.752. d=−0.08648.

c/a=1.46297379. −b/a=−8.7703928. $\mathrm{f} = -2.48319681 = -0.08648 - \frac{0.447690475}{0.18679323} = \mathrm{d} - \frac{\mathrm{bc}}{\mathrm{a}}$. f/a=−13.2938266.

$\left(\mathrm{y} - \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $n(\widetilde{\beta^*})$: $(y - 1.46297379)(x + 8.77039) = -13.2938266$.

Special cases: $\boldsymbol{\beta^*}$ versus $\widetilde{\boldsymbol{\beta^*}} = \mathbf{1} - \boldsymbol{\beta^*}$, and $\boldsymbol{\alpha}$ versus $\widetilde{\boldsymbol{\alpha}} = \mathbf{1} - \boldsymbol{\alpha}$

6-1 $\boldsymbol{\beta^*(i)}$:

$\beta^*(i) = \frac{(1+n)\Omega^* \cdot i + (1-\alpha)\Omega^* \cdot n}{\{(1-\alpha)+\Omega^*(1+n)\}i}$.

Here using $\beta^* = \frac{\Omega^*(i + i \cdot n + n(1-\alpha))}{i((1-\alpha)+\Omega^*(1+n))}$.

$\mathrm{y} = \frac{\mathrm{cx+d}}{\mathrm{ax}}$ and $\mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{\mathrm{d}}{\mathrm{ax}}$.

$\mathrm{a} = (1-\alpha) + \Omega^*(1+n)$. b=0. $\mathrm{c} = (1+n)\Omega^*$. $\mathrm{d} = (1-\alpha)\Omega^* \cdot n$. $\frac{\mathrm{f}}{\mathrm{a}} = \frac{(1-\alpha)\Omega^* \cdot n}{(1-\alpha)+\Omega^*(1+n)}$.

$VA_{\beta^*(i)} = 0 = \frac{-\mathrm{b}}{\mathrm{a}}$. $HA_{\beta^*(i)} = \frac{(1+n)\Omega^*}{(1-\alpha)+\Omega^*(1+n)} = \frac{\mathrm{c}}{\mathrm{a}}$.

a=2.7702843=0.8709+1.8811×1.00972, b=0 c=1.899384292,
f=d=0.015923789=0.8709×1.8811×0.00972. f/a=0.00574807=0.015923789÷2.7702843.

$VA_{\beta^*(i)} = 0 = \frac{-\mathrm{b}}{\mathrm{a}}$. $HA_{\beta^*(i)} = 0.68562793 = \frac{\mathrm{c}}{\mathrm{a}}$. $Width_{\beta^*(i)} = \sqrt{\frac{(1-\alpha)\Omega^* \cdot n}{(1-\alpha)+\Omega^*(1+n)}}$.

$Shape_{\beta^*(i)} = \sqrt{2\frac{(1-\alpha)\Omega^* \cdot n}{(1-\alpha)+\Omega^*(1+n)}}$. $Curvature_{\beta^*(i)} = 1/\sqrt{2\frac{(1-\alpha)\Omega^* \cdot n}{(1-\alpha)+\Omega^*(1+n)}}$.

$\left(\mathrm{y} - \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $\beta^*(i)$: $(y - 0.68562793)(x + 0) = 0.00574807$.

6-2 $\widetilde{\beta^*}(i)$:

$\widetilde{\beta^*}(i) = \frac{(1-\alpha)i-(1-\alpha)\Omega^*\cdot n}{((1-\alpha)+\Omega^*(1+n))i}$, where $\widetilde{\beta^*} = 1 - \beta^*$.

Here starting with $\beta^*(i) = \frac{(1+n)\Omega^*\cdot i+(1-\alpha)\Omega^*\cdot n}{\{(1-\alpha)+\Omega^*(1+n)\}i}$ and, using

$\widetilde{\beta^*}(i) = \frac{((1-\alpha)+\Omega^*(1+n))i-(1+n)\Omega^*\cdot i-(1-\alpha)\Omega^*\cdot n}{((1-\alpha)+\Omega^*(1+n))i} = 1 - \frac{(1+n)\Omega^*\cdot i+(1-\alpha)\Omega^*\cdot n}{((1-\alpha)+\Omega^*(1+n))i}$.

$\mathrm{y} = \frac{\mathrm{cx+d}}{\mathrm{ax}}$ and $\mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{\mathrm{d}}{\mathrm{ax}}$, where f=d.

$VA_{\widetilde{\beta^*}(i)} = 0 = \frac{-\mathrm{b}}{\mathrm{a}}$. $HA_{\widetilde{\beta^*}(i)} = \frac{1-\alpha}{(1-\alpha)+\Omega^*(1+n)} = \frac{\mathrm{c}}{\mathrm{a}}$.

$Width_{\widetilde{\beta^*}(i)} = \sqrt{\left|\frac{-(1-\alpha)\Omega^*\cdot n}{(1-\alpha)+\Omega^*(1+n)}\right|}$. $Shape_{\widetilde{\beta^*}(i)} = \sqrt{2\left|\frac{-(1-\alpha)\Omega^*\cdot n}{(1-\alpha)+\Omega^*(1+n)}\right|}$.

$Curvature_{\widetilde{\beta^*}(i)} = 1/\sqrt{2\left|\frac{-(1-\alpha)\Omega^*\cdot n}{(1-\alpha)+\Omega^*(1+n)}\right|}$.

a=2.7702843=0.8709+1.8811×1.00972, b=0 c=0.8709,
f=d=−0.015923789=−0.8709×1.8811×0.00972. c/a=0.31432938.
f/a=−0.00574807=0.015923789÷2.7702843.

$Width_{\widetilde{\beta^*}(n)} = 0.0758160 = \sqrt{\left|\frac{\mathrm{f}}{\mathrm{a}}\right|}$.

$\left(\mathrm{y} - \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}$. For $\widetilde{\beta^*}(i)$: $(y - 0.31432938)(x + 0) = -0.00574807$.

6-3 $\alpha(i)$:

$\alpha(i) = \frac{\{(1+n)\Omega^*-\beta^*-\beta^*\Omega^*(1+n)\}i+\Omega^*\cdot n}{-\beta^*\cdot i+\Omega^*\cdot n}$, starting with $\beta^* = \frac{(1+n)\Omega^*\cdot i+(1-\alpha)\Omega^*\cdot n}{i((1-\alpha)+\Omega^*(1+n))}$.

$\mathrm{y} = \frac{\mathrm{cx+d}}{\mathrm{ax+b}}$ and $\mathrm{y} = \frac{\mathrm{c}}{\mathrm{a}} + \frac{\mathrm{d}-\frac{\mathrm{b\cdot c}}{\mathrm{a}}}{\mathrm{ax+b}}$.

$\mathrm{a} = \beta^*$, $\mathrm{b} = -\Omega^*\cdot n$, $\mathrm{c} = -\{(1+n)(1-\beta^*)\Omega^* - \beta^*\}$, $\mathrm{d} = -\Omega^*\cdot n$.

$\mathrm{f} = -\Omega^*\cdot n - \frac{\Omega^*\cdot n\{(1+n)(1-\beta^*)\Omega^*-\beta^*\}}{\beta^*} = -\left(\mathrm{d} + \frac{\mathrm{b\cdot c}}{\mathrm{a}}\right)$. $\frac{\mathrm{f}}{\mathrm{a}} = \frac{-\Omega^*\cdot n\{(1+n)(1-\beta^*)\Omega^*\}}{\beta^{*2}}$.

$VA_{\alpha(i)} = \frac{\Omega^*\cdot n}{\beta^*} = \frac{-\mathrm{b}}{\mathrm{a}}$. $HA_{\alpha(i)} = \frac{-\{(1+n)(1-\beta^*)\Omega^*-\beta^*\}}{\beta^*} = \frac{\mathrm{c}}{\mathrm{a}}$.

$Width_{\alpha(i)} = \sqrt{\left|\frac{-\Omega^*\cdot n\{(1+n)(1-\beta^*)\Omega^*\}}{\beta^{*2}}\right|}$. $Shape_{\alpha(i)} = \sqrt{2\left|\frac{-\Omega^*\cdot n\{(1+n)(1-\beta^*)\Omega^*\}}{\beta^{*2}}\right|}$.

$Curvature_{\alpha(i)} = 1/\sqrt{2\left|\frac{-\Omega^*\cdot n\{(1+n)(1-\beta^*)\Omega^*\}}{\beta^{*2}}\right|}$.

$\alpha(i) = \frac{-0.25630793i-0.018284292}{0.7435i-0.018284292}$.

$\mathrm{a} = 0.7435 = \beta^*$. $\mathrm{b} = -0.018284292$. $\mathrm{c} = -0.25630793$. $\mathrm{d} = -0.018284292$.

Appendices

$f = -0.011981118 = -0.01828429 - \frac{-0.004686409}{0.7435}$.

$\frac{f}{a} = -0.0161145 = \frac{-0.011981118}{0.7435}$.

$VA_{\alpha(i)} = 0.024592 = \frac{-b}{a}$ $HA_{\alpha(i)} = 0.34473158 = \frac{-0.25630793}{-0.7435} = \frac{c}{a}$.

$Width_{\alpha(i)} = 0.126942928 = \sqrt{|-0.0161145|}$. $Shape_{\alpha(i)} = 0.17952437 =$

$\sqrt{2|-0.0161145|}$.

$Curvature_{\alpha(i)} = 5.570274386 = 1/\sqrt{2|-0.0161145|}$.

$\left(y - \frac{c}{a}\right)\left(x + \frac{b}{a}\right) = \frac{f}{a}$. For $\alpha(i)$: $(y - 0.34473158)(x - 0.024592) = -0.016114484$.

6-3-2 $\alpha(n)$, newly added, to cope with stop-macro inequality:

$y = \frac{cx+d}{ax+b}$ and $y = \frac{c}{a} + \frac{d - \frac{b \cdot c}{a}}{ax+b}$; the same as $\alpha(n)$.

$a = -\Omega^*,\ b = -\beta^* \cdot i,\ c = -\Omega^*(1 - i(1 - \beta^*)),\ d = i \cdot \Omega^* - \beta^* \cdot i(1 + \Omega^*)$.

6-4 $\tilde{\alpha}(i)$:

$\tilde{\alpha}(i) = \frac{(1+n)(1-\beta^*)\Omega^* \cdot i}{\beta^* \cdot i - \Omega^* \cdot n}$,

setting $\tilde{\alpha} = 1 - \alpha$, and starting with $\beta^* = \frac{(1+n)\Omega^* \cdot i + (1-\alpha)\Omega^* \cdot n}{i\left((1-\alpha) + \Omega^*(1+n)\right)}$.

$y = \frac{cx}{ax+b}$ and $y = \frac{c}{a} + \frac{-\frac{b \cdot c}{a}}{ax+b}$.

$a = \beta^*,\ b = -\Omega^* \cdot n,\ c = (1+n)(1-\beta^*)\Omega^*,\ \frac{f}{a} = \frac{\Omega^* \cdot n\{(1+n)(1-\beta^*)\Omega^*\}}{(\beta^*)^2}$.

$VA_{\tilde{\alpha}(i)} = \frac{\Omega^* \cdot n}{\beta^*} = \frac{-b}{a}$. $HA_{\tilde{\alpha}(i)} = \frac{(1+n)(1-\beta^*)\Omega^*}{\beta^*} = \frac{c}{a}$.

$Width_{\tilde{\alpha}(i)} = \sqrt{\left|\frac{\Omega^* \cdot n\{(1+n)(1-\beta^*)\Omega^*\}}{(\beta^*)^2}\right|}$. $Shape_{\tilde{\alpha}(i)} = \sqrt{2\left|\frac{\Omega^* \cdot n\{(1+n)(1-\beta^*)\Omega^*\}}{(\beta^*)^2}\right|}$.

$Curvature_{\tilde{\alpha}(i)} = 1/\sqrt{2\left|\frac{\Omega^* \cdot n\{(1+n)(1-\beta^*)\Omega^*\}}{(\beta^*)^2}\right|}$.

$\tilde{\alpha}(i) = \frac{0.48719207i}{0.7435i - 0.018284292}$.

a=0.7435. $b = -0.018284292 = -\Omega^* \cdot n$. $c = 0.48719207 = (1+n)(1-\beta^*)\Omega^*$.

$f = 0.011981116 = \frac{0.00890796}{0.7435} = \frac{\Omega^* \cdot n\{(1+n)(1-\beta^*)\Omega^*\}}{\beta^*}$.

$\frac{\mathrm{f}}{\mathrm{a}} = 0.016114484 = \frac{0.00890796}{0.7435^2} = \frac{-\mathrm{bc}}{\mathrm{a}^2}.$

$VA_{\tilde{\alpha}(i)} = 0.024592 = \frac{-\mathrm{b}}{\mathrm{a}}.$ $HA_{\tilde{\alpha}(i)} = 0.655268338 = \frac{0.48719201}{0.7435} = \frac{\mathrm{c}}{\mathrm{a}}.$

$Width_{\tilde{\alpha}(i)} = 0.12694284 = \sqrt{0.016114484}.$ $Shape_{\tilde{\alpha}(i)} = 0.179524282 = \sqrt{2 \times 0.016114484}.$

$Curvature_{\tilde{\alpha}(i)} = 5.570277117 = 1/\sqrt{2 \times 0.016114484}.$

$\left(\mathrm{y} - \frac{\mathrm{c}}{\mathrm{a}}\right)\left(\mathrm{x} + \frac{\mathrm{b}}{\mathrm{a}}\right) = \frac{\mathrm{f}}{\mathrm{a}}.$ For $\tilde{\alpha}(i)$: $(y - 0.655268338)(x - 0.024592) = 0.016114484.$

Philosophy Hidden in 'Circle + Hyperbola' and Implication of Ellipse: from the Viewpoint of KEWT Database 6.12 & 7.13

Let us (with readers) geometrically consider the essence of the KEWT database as a purely endogenous system. The author presents the philosophy of hyperbola properly but related to universal nature. The philosophy springs out from the KEWT database (for the comparison of Kamiryo Endogenous World Table (KEWT) with the current representative several databases in the literature, see Chapter 6).

The KEWT database stays at two dimensions or Plane. Circle is most fitted for Plane while ellipse is drawn at any dimensional above two. The literature prefers linear vs. non-linear rather than circle vs. ellipse. This is because no economist uses the circle possibly related to hyperbola and non-linear. Mathematically, circle is related to *sin* and *cosin* and also exponent, e^x. Also e^x is lucky to be familiar with imaginary numbers that prevail everywhere academically today. Nevertheless hyperbola, most clearly compared with the case of ellipse, expresses philosophy of Positive and Negative Principle discovered thousands of years ago in old China, with a zero point.

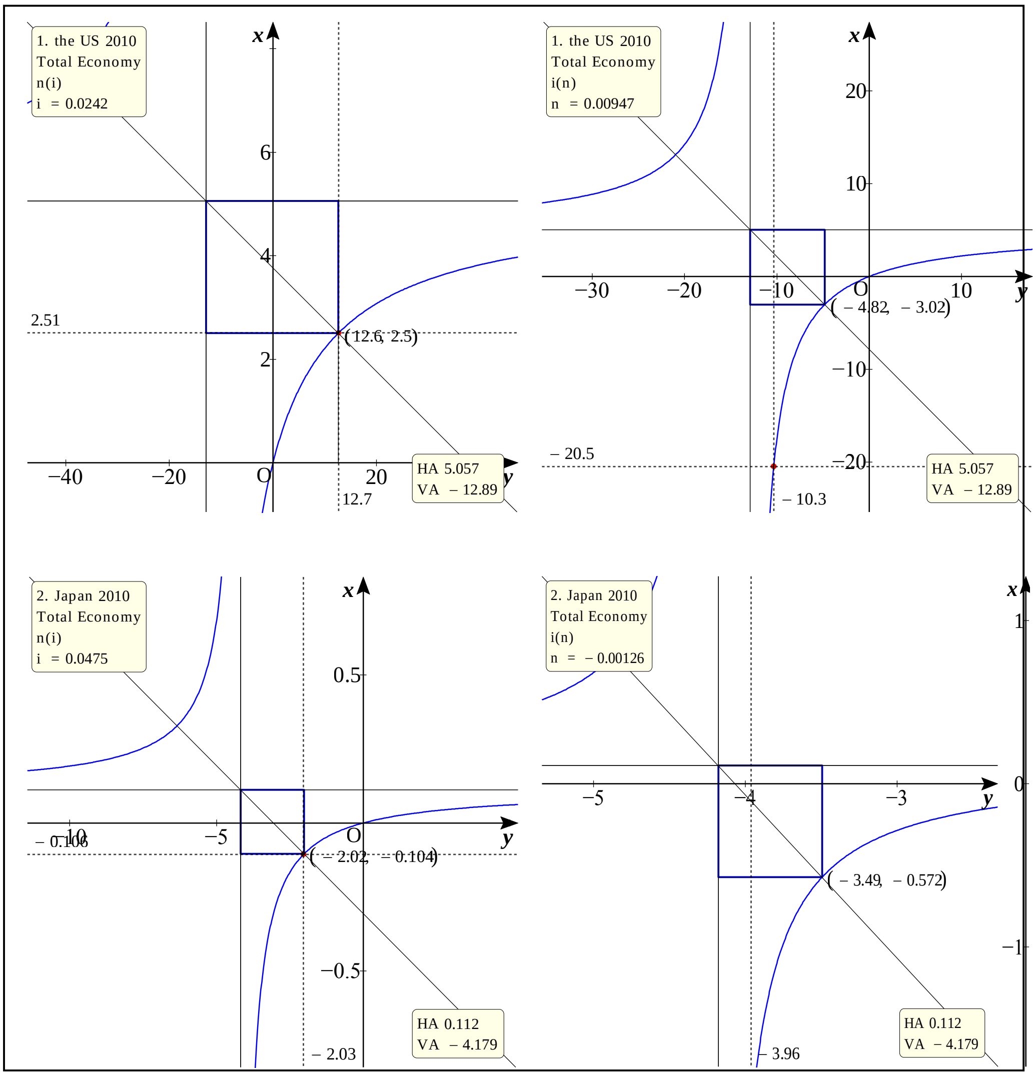
Why does KEWT database stick to two-dimensional Plane? The KEWT database realizes causes and effects simultaneously by discrete-year and under no assumption. All the parameters and variables are measured accurately with seven primary endogenous parameters which determine the speed years by country, sector, year, and over years; beyond space and time. Also, endogenous equations are each reduced to hyperbola in the KEWT database. Even the rate of inflation or deflation is measured using the rate of return hyperbola function to the ratio of net investment to disposable endogenous income. This endogenous fact shows that Plane implicitly includes space and time as one dimension. Iyonoishi (2012) proves theoretically and empirically (using familiar goods such as *Japanese Sudare/bamboo blind* and *banana's rind*) the existence of 'elusive Higgs bosom' (see Chapter 10). Her discovery implies that the real world expresses six dimensions regardless of number of dimensions, i.e., even in two-dimensional Plane.

Appendices

Appendix C. Hyperbola graphs

Appendix C. shows hyperbola graphs each by each by country, using KEWT 6.12, 1990-2010. Each graph shows endogenous results of 2010. Yet, each is suggestive in the current situation, broadly covering from the past to the future, similarly to Graphic Dynamics (GD) by sector simulated in Chapter 8.

BOX C-1 No difference between i(n) and n(i): examples 2010



Appendix C. shows 13 hyperbola cases of 12 selected countries, each case on two pages, after **Table C1** as follows:

C1: Speed (i), speed (n), and Omega(beta); Totally six pages

C2: n(i), beta*(i), r*(i), Omega(i), and alpha(i); Totally ten pages

C3: i(n), beta*(n), r*(n), Omega(n), and alpha(n); Totally ten pages

Table C1 Data needed for elements *a b c d* of hyperbolas

TOTAL	i=I/Y	n	α	Ω	β^*	δ_0	gradient=c/b; intercept=d/b		
1. US	0.0242	0.00947	0.2081	1.9974	0.9386	0.7462	r*(n)	9.18669	0.01721
2. Japan	0.0475	(0.00126)	0.0962	3.6885	0.7837	(0.0138)	reduces to	2.61417	0.02936
3. Australia	0.1428	0.01033	0.0925	1.9613	0.7305	0.3244	linear.	0.92455	0.03761
4. France	0.0642	0.00481	0.1255	1.6336	0.6950	0.4040	Others	2.87523	0.06296
5. Germany	0.0333	(0.00134)	0.0924	1.6231	0.6177	(0.0097)	make all	4.54981	0.06303
6. the UK	0.0340	0.00536	0.1729	1.4073	0.7128	0.6242	hyperbolas.	7.21029	0.08419
7. China	0.5341	0.00617	0.5428	3.1712	0.8793	0.4187		1.31879	0.16303
8. Inidia	0.2163	0.01374	0.1953	1.6014	0.7023	0.4513		1.38819	0.10285
9. Brazil	0.2033	0.00872	0.1461	1.6668	0.6873	0.3511		1.12319	0.07783
10. Mexico	0.2334	0.00949	0.1942	1.9201	0.7293	0.3417		1.23056	0.08949
11. Russia	0.1364	(0.00355)	0.2545	0.8114	0.5101	6.1484		3.98600	0.32785
12. S.Africa	0.1518	0.00758	0.0971	1.3871	0.6347	0.4078		1.06971	0.06190
G	$i_G=I_G/Y_G$	n_G	α_G	$\Omega_G=K_G/Y_G$	β^*_G	δ_{0G}	gradient=c/b; intercept=d/b		
1. US	0.5966	0.0095	0.1734	2.7319	0.7794	0.2037	r*(n)	0.4323	0.05938
2. Japan	0.3202	(0.0013)	(0.2739)	7.2225	0.8456	(0.1625)	reduces to	(1.0506)	(0.03924)
3. Australia	0.1656	0.0103	0.0224	0.9693	0.5307	1.2535	linear.	0.2749	0.02024
4. France	0.1571	0.0048	(0.1315)	1.1962	0.5329	(0.3611)	Others	(1.6728)	(0.10190)
5. Germany	0.0874	(0.0013)	(0.1172)	1.1430	0.4967	11.1867	make all	(2.8064)	(0.10626)
6. the UK	0.0458	0.0054	(0.5415)	2.3285	0.7112	0.0623	hyperbolas.	(16.777)	(0.14263)
7. China	0.3328	0.0062	0.2364	1.8028	0.7136	0.3546		1.1194	0.12421
8. Inidia	0.4692	0.0137	0.2079	3.2909	0.8266	0.2373		0.5912	0.05506
9. Brazil	0.1784	0.0087	0.1614	2.0024	0.7354	0.3206		1.2998	0.06926
10. Mexico	0.4488	0.0095	0.3037	3.3115	0.8397	0.2769		0.8894	0.08329
11. Russia	0.2932	(0.0035)	0.0836	0.9738	0.5086	1.7727		0.6485	0.08812
12. S. Africa	0.0791	0.0076	(0.1614)	1.1370	0.5515	0.3788		(3.8140)	(0.11300)
PRI	$i_{PRI}=I_{PRI}/Y_{PRI}$	n_{PRI}	α_{PRI}	$\Omega_{PRI}=K_{PRI}/Y_{PRI}$	β^*_{PRI}	δ_{0PRI}	gradient=c/b; intercept=d/b		
1. US	(0.1517)	0.00947	0.2188	1.7718	0.6624	0.1512	r*(n)	(2.0356)	0.14278
2. Japan	(0.0132)	(0.00126)	0.1785	2.9022	0.8402	0.3580	reduces to	(16.035)	0.04133
3. Australia	0.1360	0.01033	0.1135	2.2575	0.7681	0.3202	linear.	1.1249	0.03863
4. France	0.0332	0.00481	0.2111	1.7793	0.7728	0.5293	Others	8.3046	0.07869
5. Germany	0.0198	(0.00134)	0.1448	1.7432	0.6318	(0.0288)	make all	11.6462	0.09867
6. the UK	0.0317	0.00536	0.3140	1.2253	0.7164	0.7807	hyperbolas.	14.0049	0.18122
7. China	0.5768	0.00617	0.6078	3.4615	0.9025	0.4421		1.3348	0.16735
8. Inidia	0.1627	0.01374	0.1926	1.2430	0.6505	0.6497		1.9481	0.12815
9. Brazil	0.2119	0.00872	0.1408	1.5520	0.6683	0.3725		1.0760	0.08135
10. Mexico	0.1877	0.00949	0.1710	1.6249	0.6919	0.3998		1.4085	0.09188
11. Russia	0.0895	(0.00355)	0.3056	0.7628	0.5082	9.2943		7.1422	0.42595
12. S. Africa	0.1700	0.00758	0.1617	1.4496	0.6589	0.4362		1.5436	0.09987

Notes:

1. Unit by axis do not change VA and HA.
2. beta and 1-beta are shown by using beta 1-beta is expressed in each graph; similarly, alpha and 1-alpha.
3. $r^*(n)$ exceptionally reduces to linear due to a=0, where gradient=c/d and intercept=d/b.

Appendices

C1: Speed (i), speed (n), and Omega(beta)

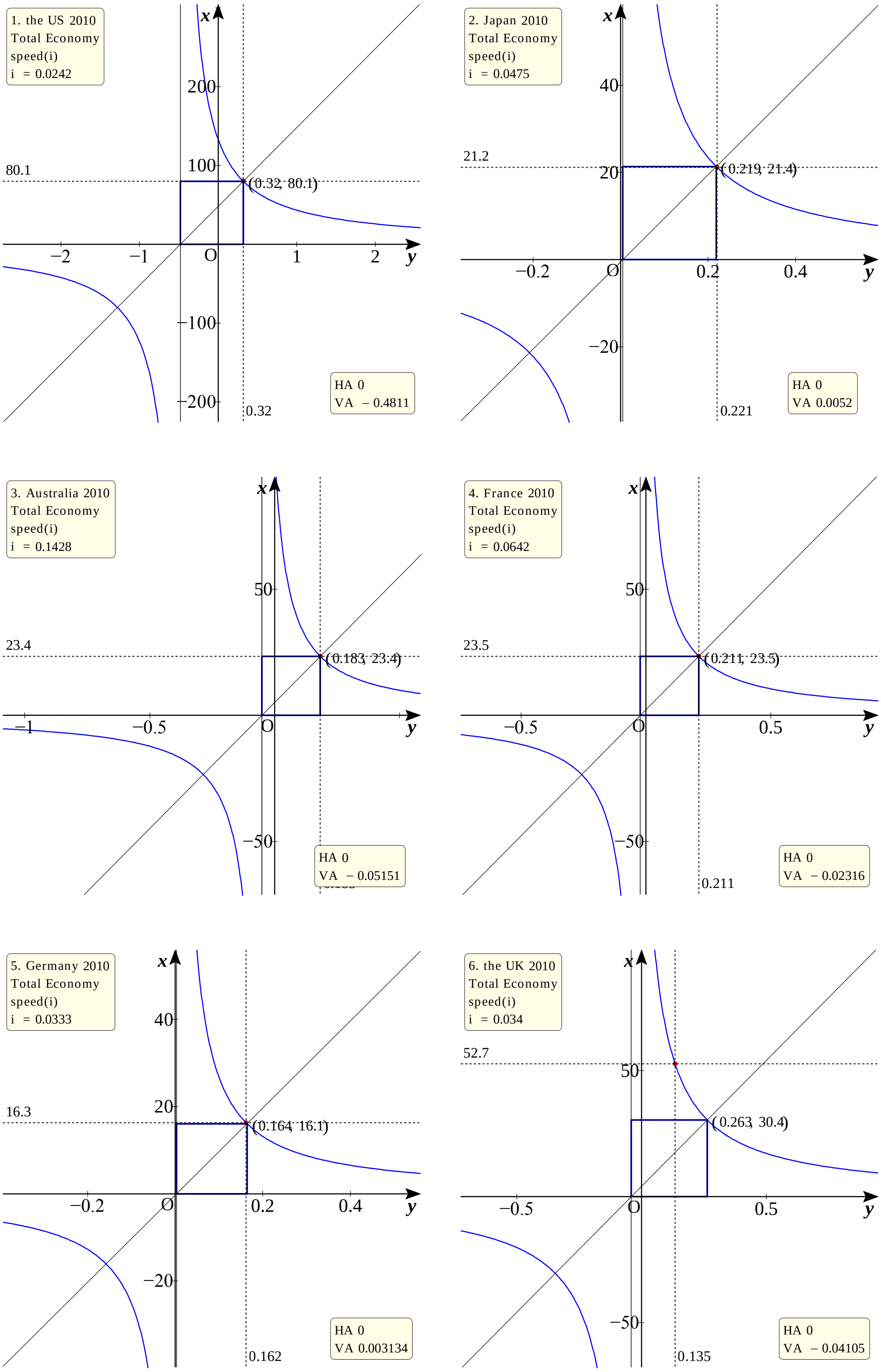


Figure 1-1 speed(*i*) by country, 2010

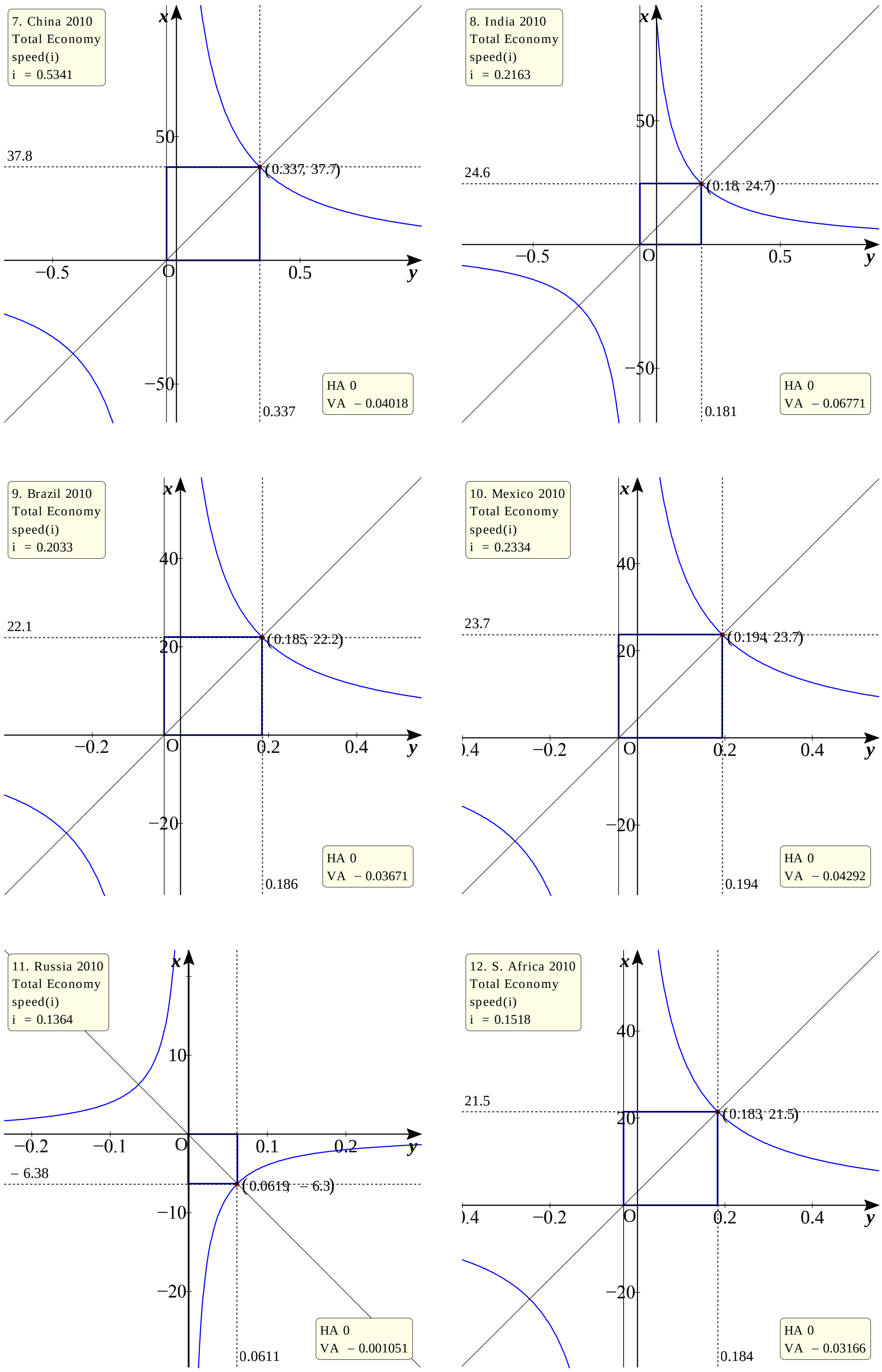


Figure 1-2 speed(*i*) by country, 2010

Appendices

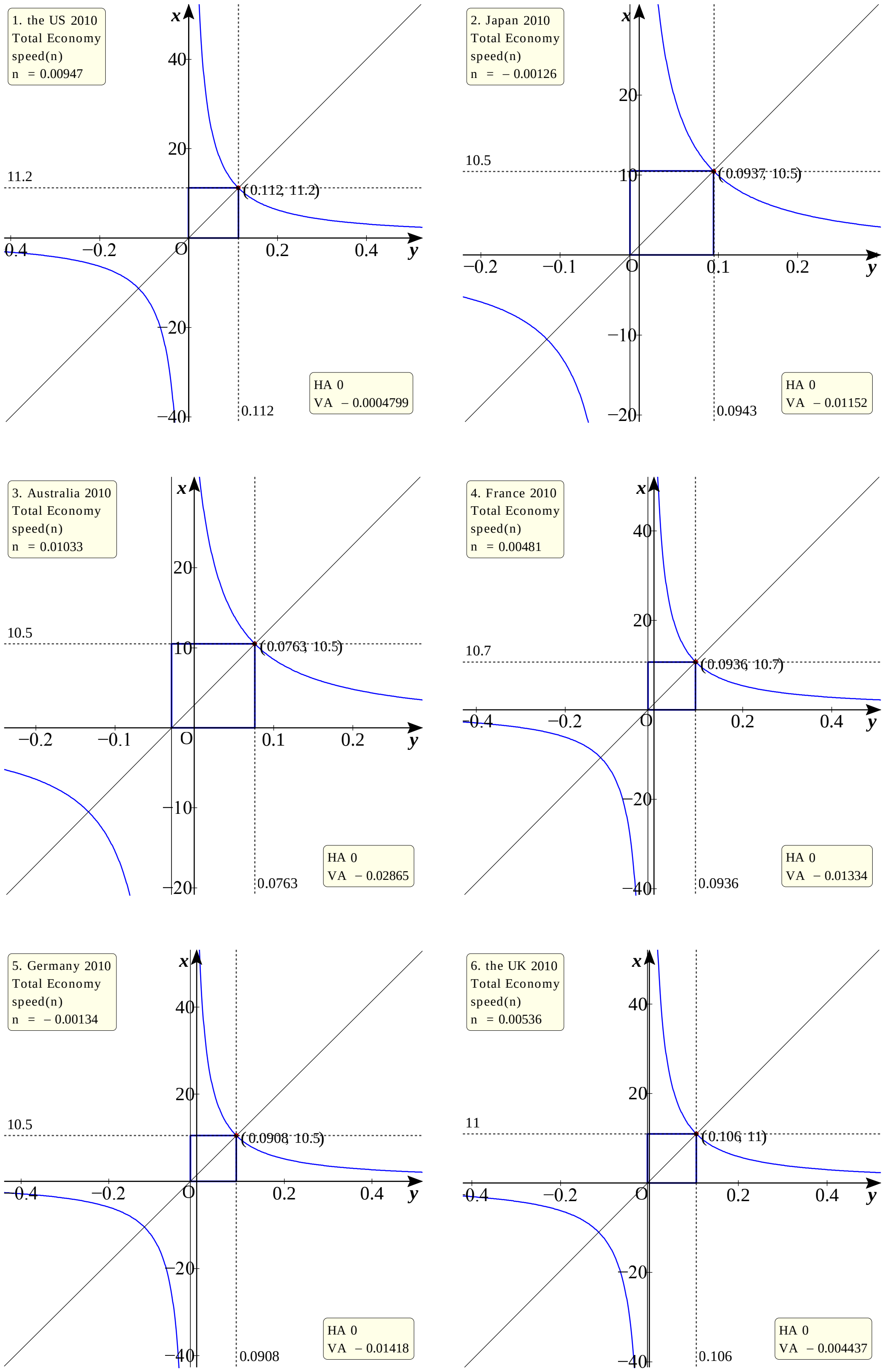


Figure 2-1 speed(n) by country, 2010

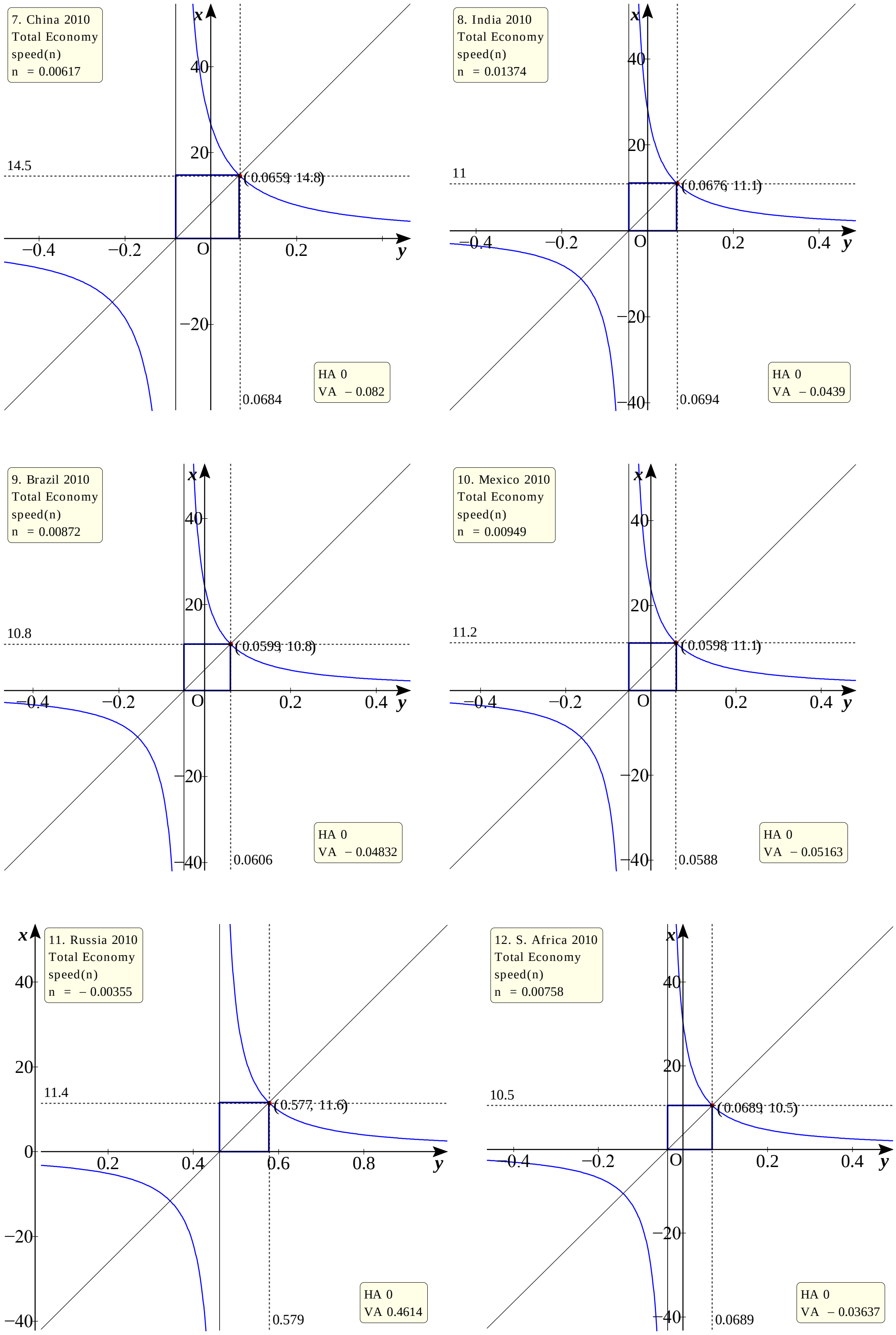


Figure 2-2 speed(n) by country, 2010

Appendices

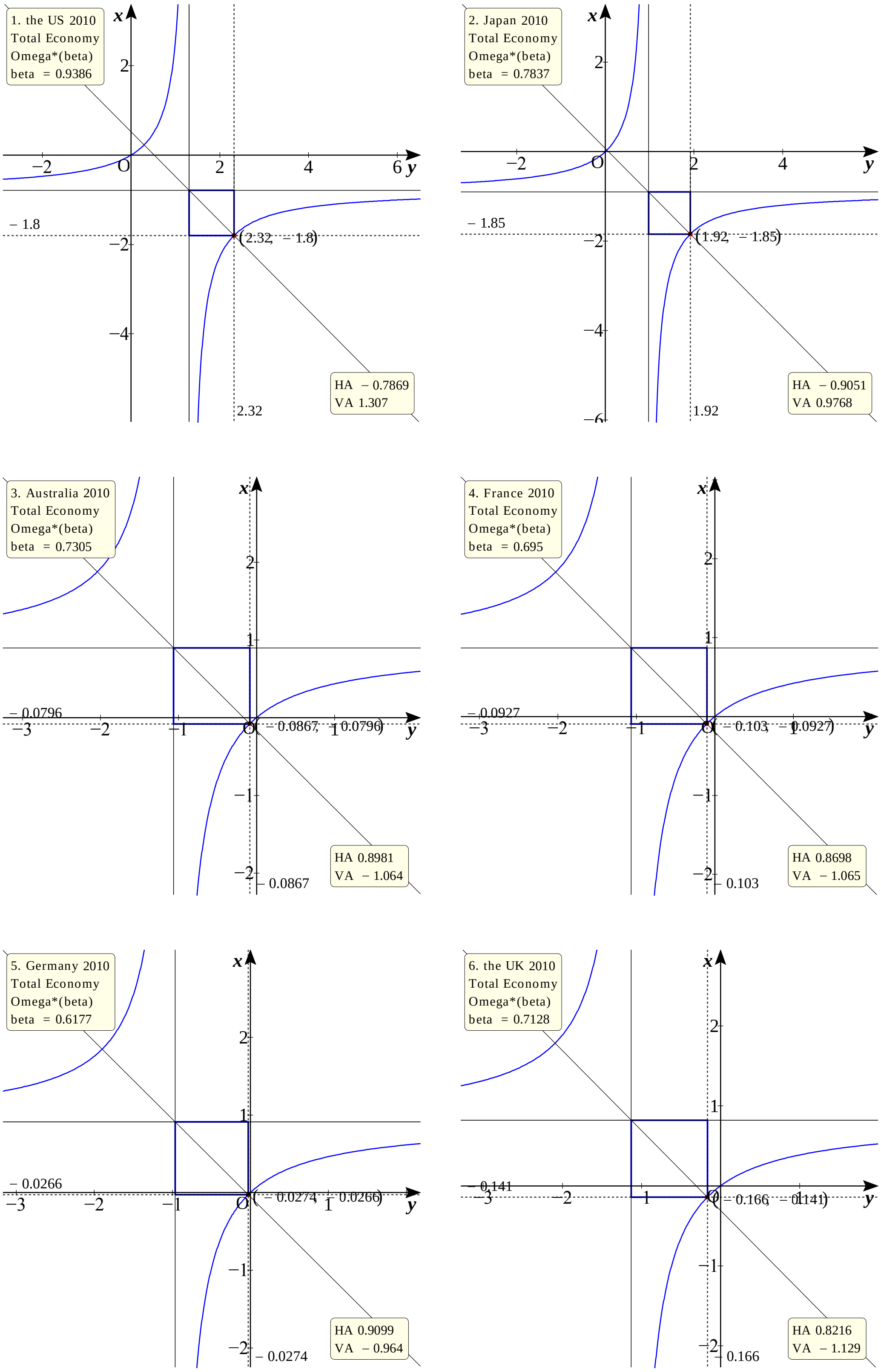


Figure 3-1 Omega(beta*) by country, 2010

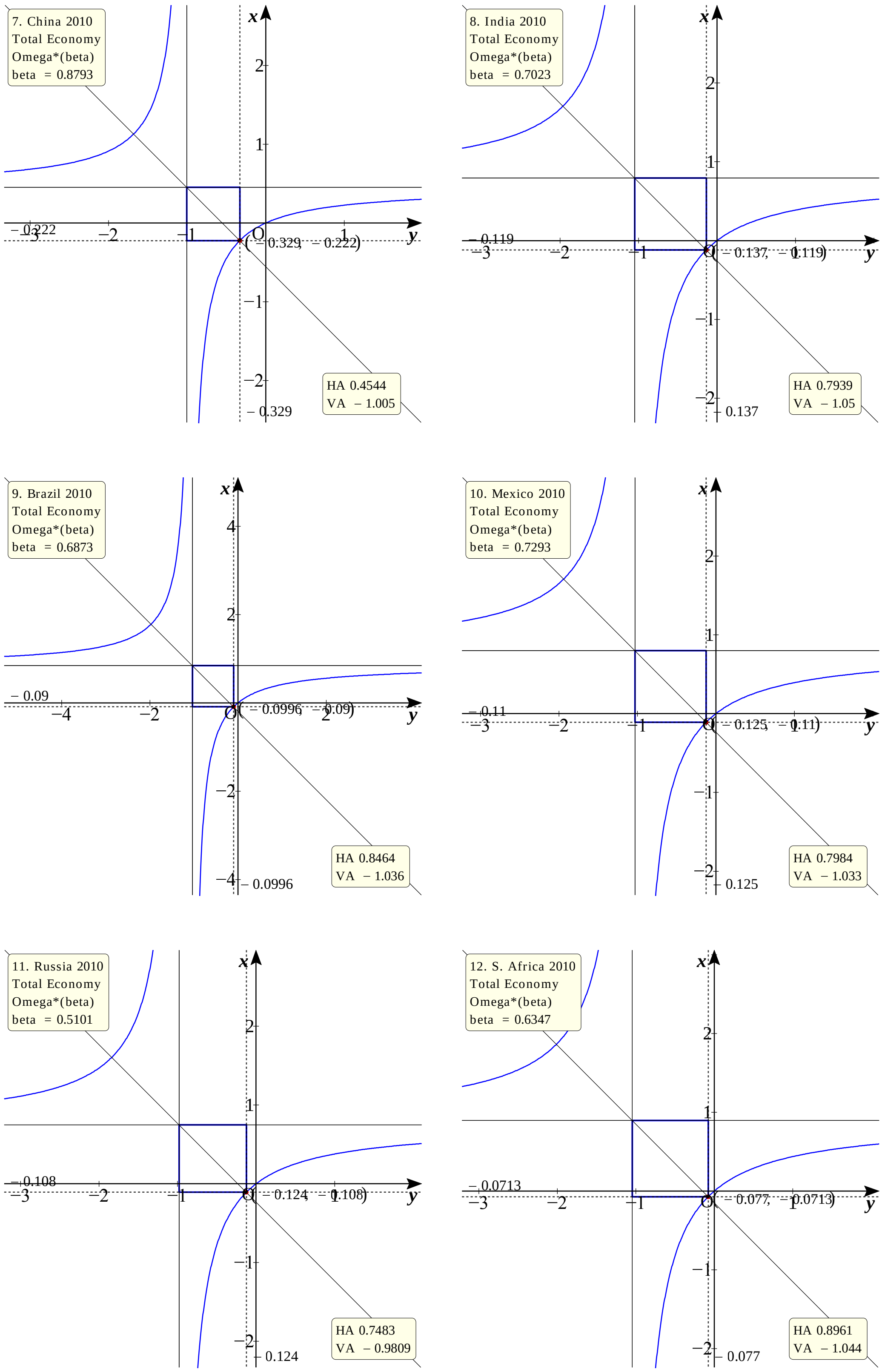


Figure 3-2 Omega(beta*) by country, 2010

Appendices

C2: n(i), beta*(i), r*(i), Omega(i), and alpha(i)

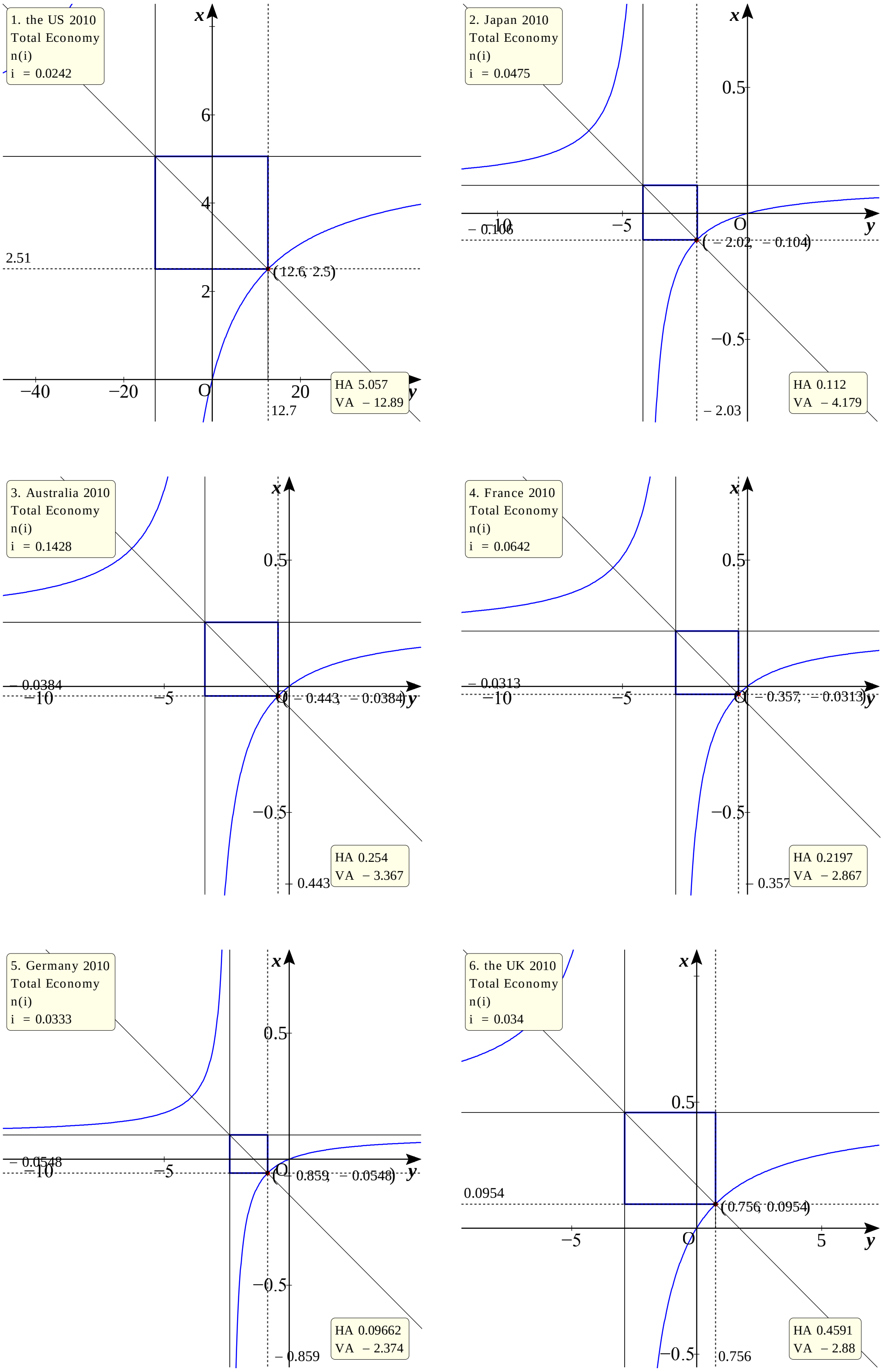


Figure 4-1 *n*(*i*) by country, 2010

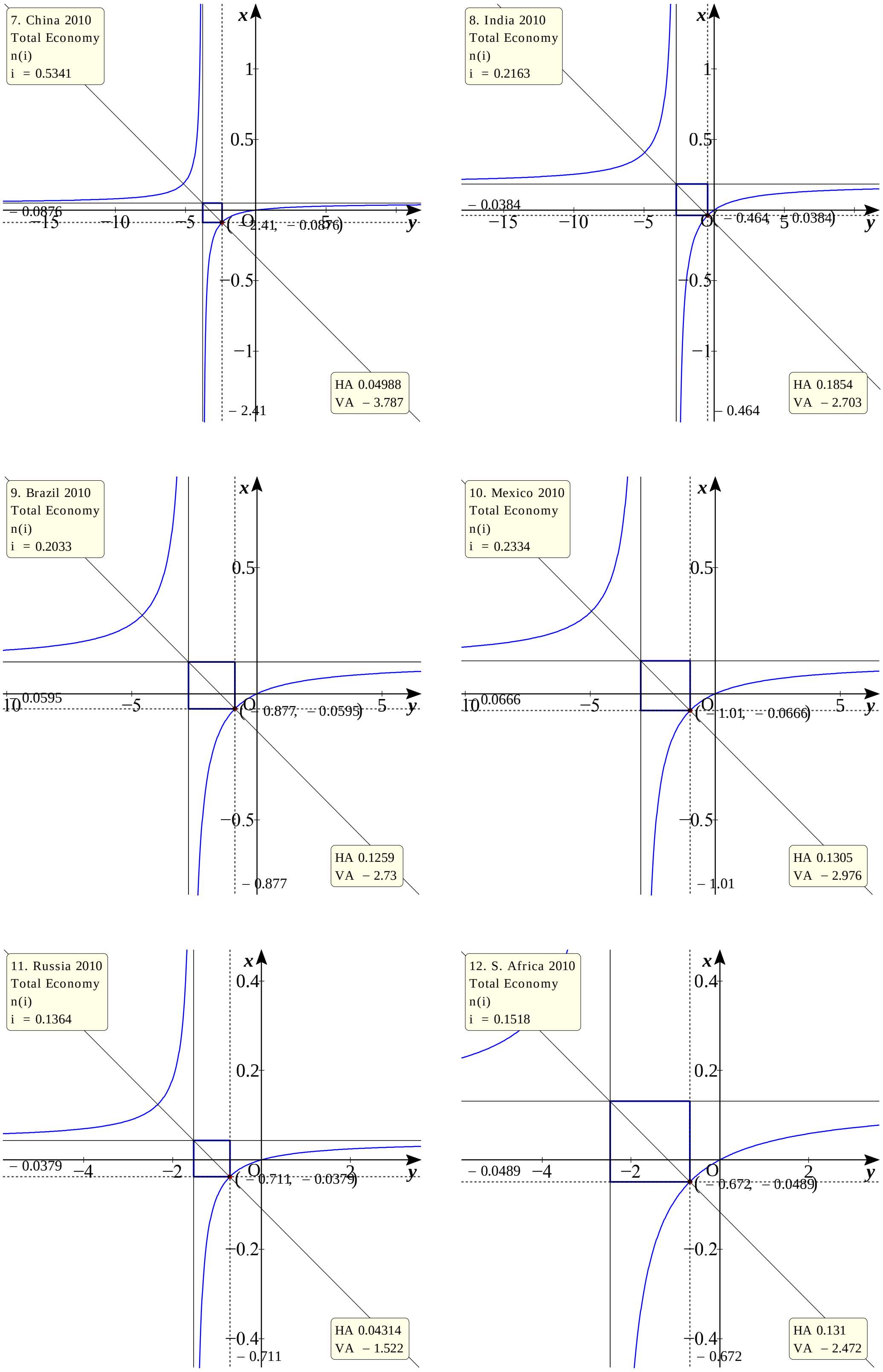


Figure 4-2 *n*(*i*) by country, 2010

Appendices

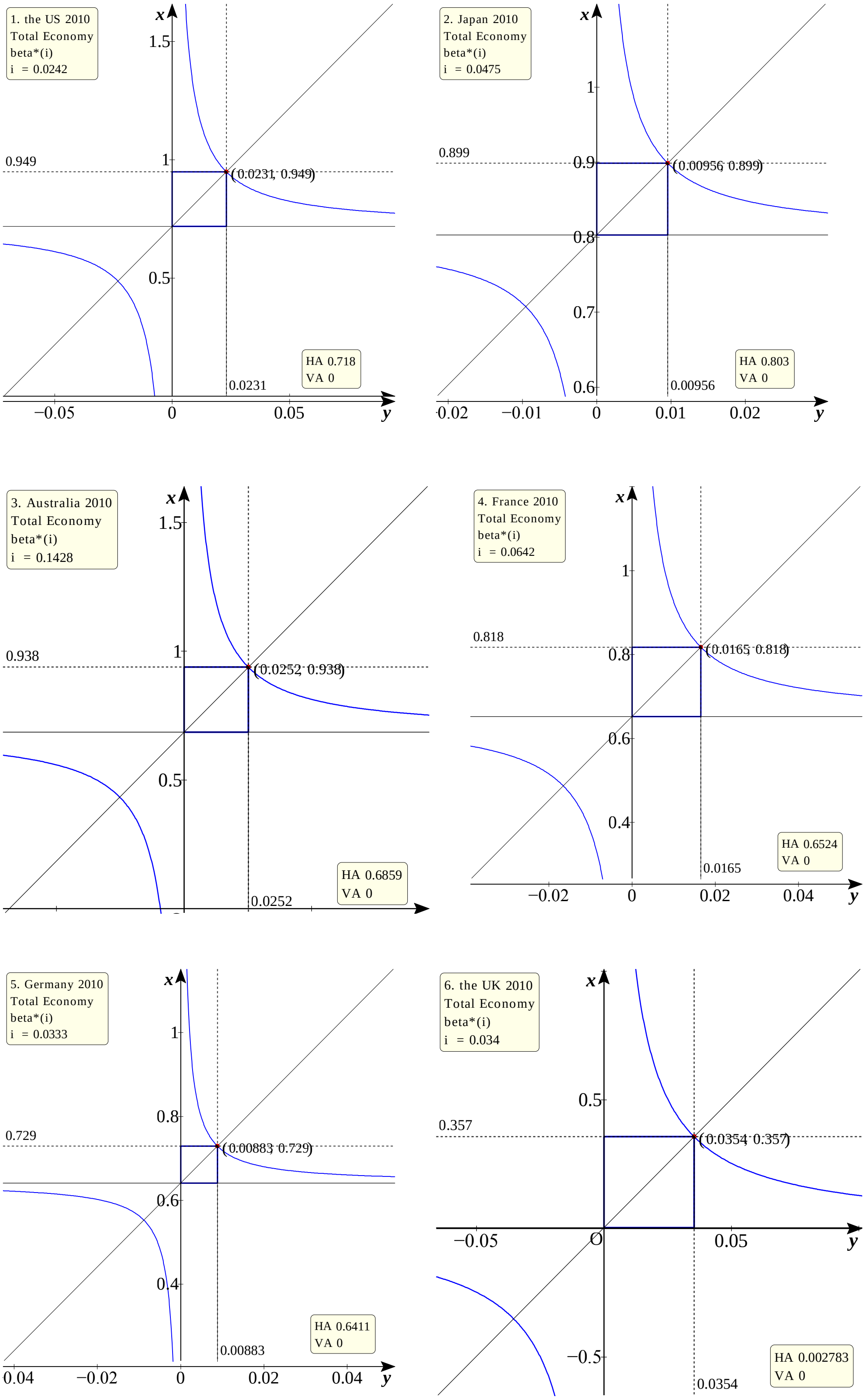


Figure 5-1 beta*(*i*) by country, 2010

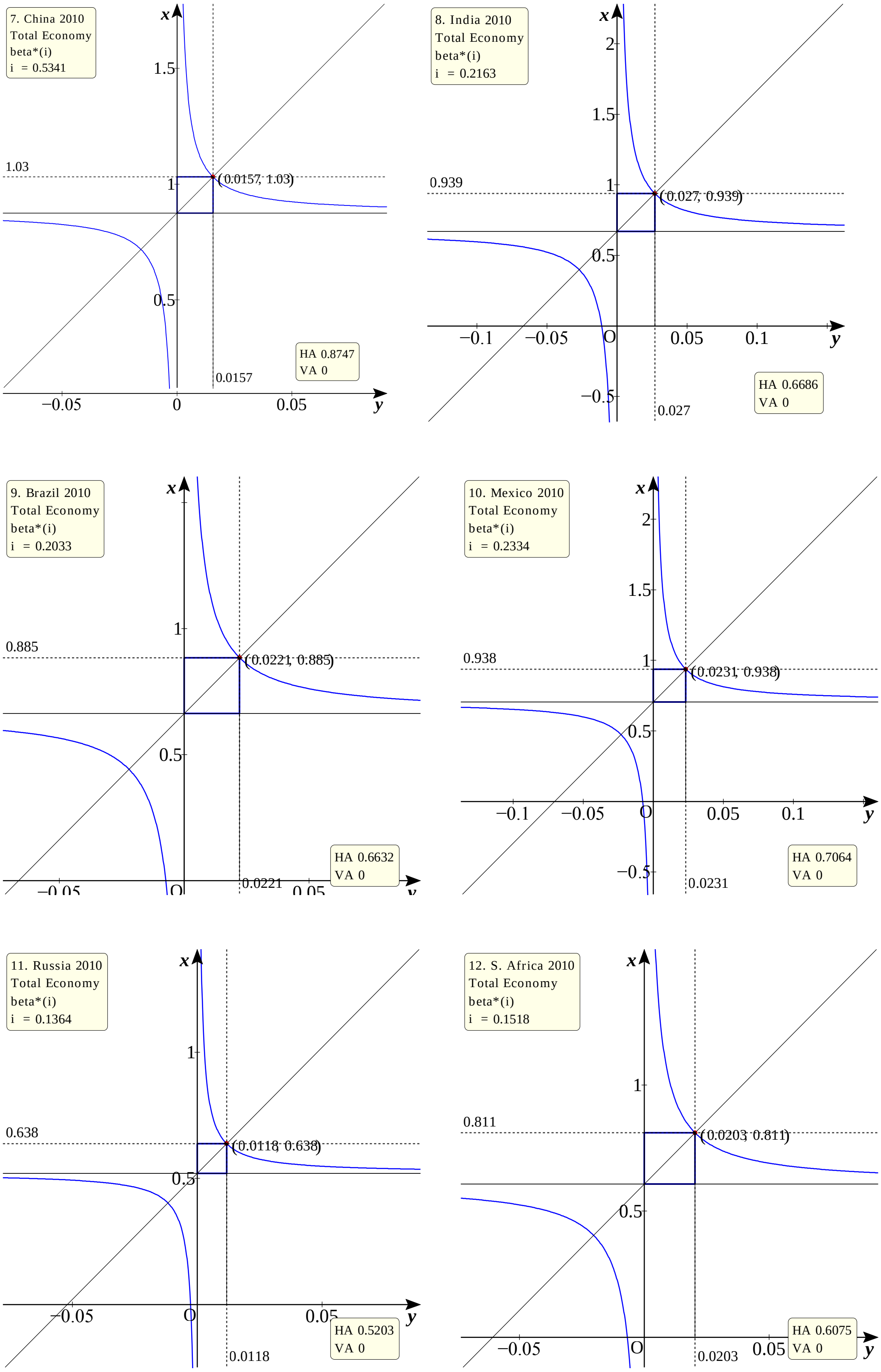


Figure 5-2 beta*(i) by country, 2010

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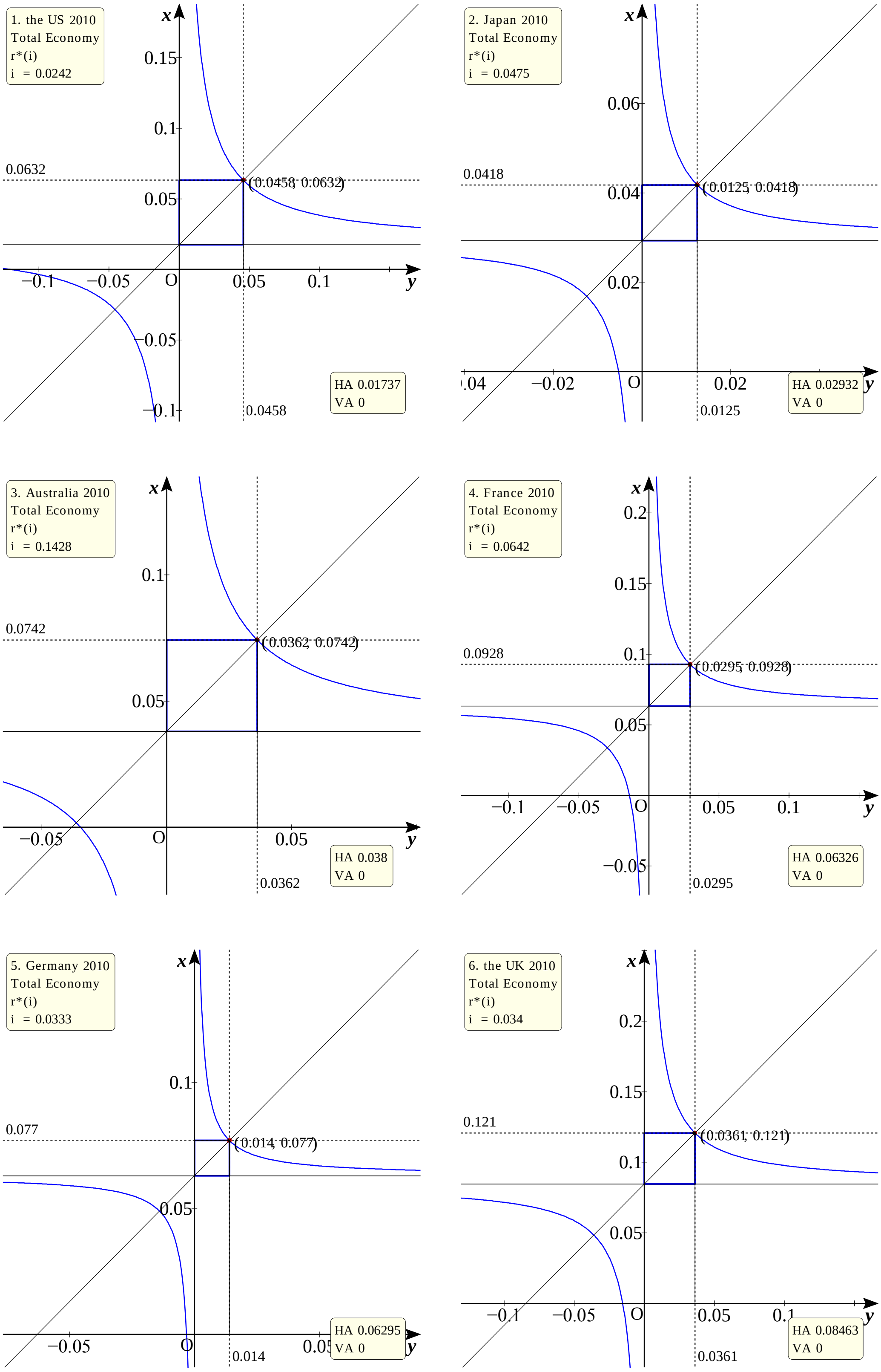

Figure 6-1 *r**(*i*) by country, 2010

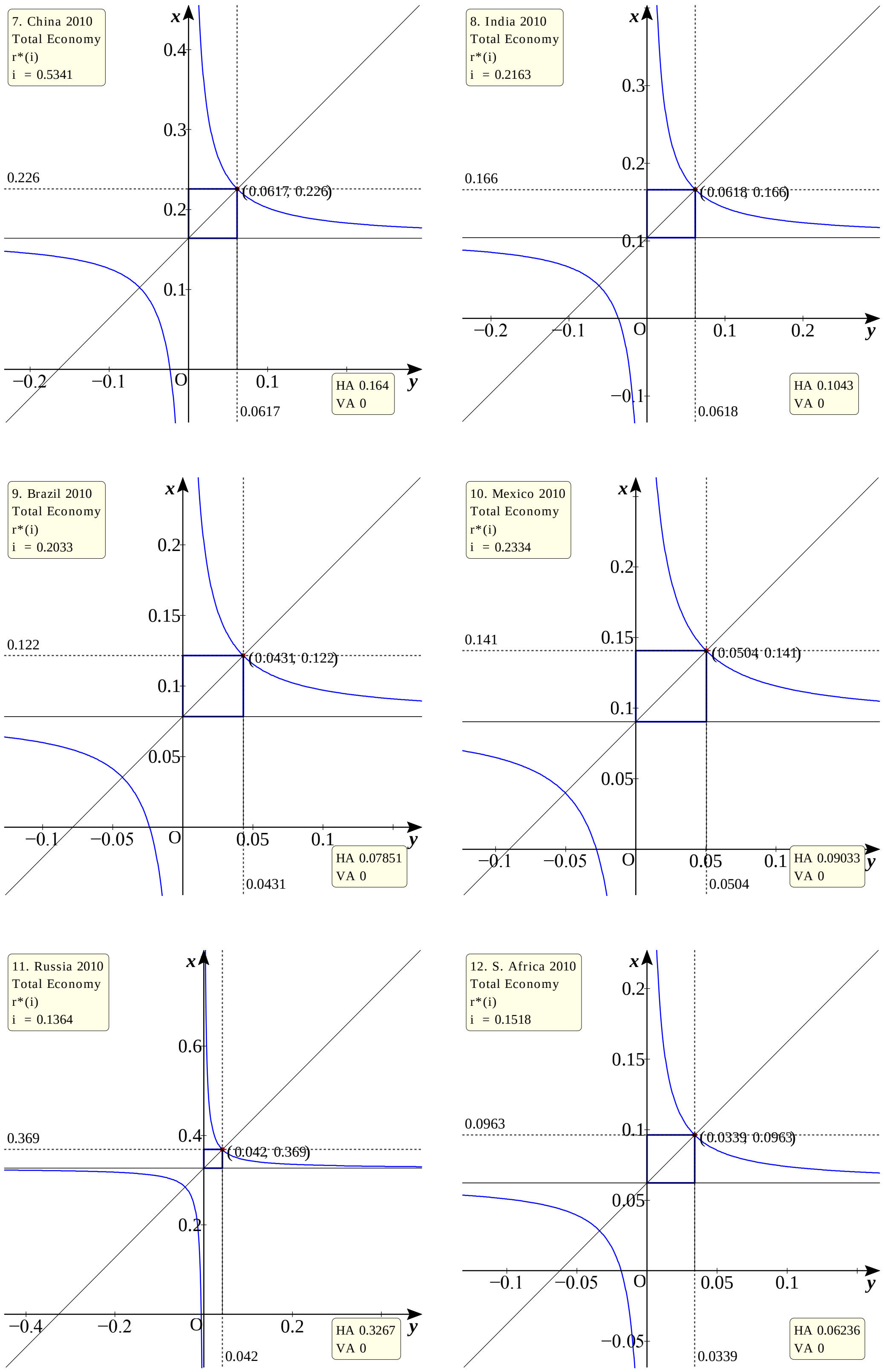

Figure 6-2 beta*(i) by country, 2010

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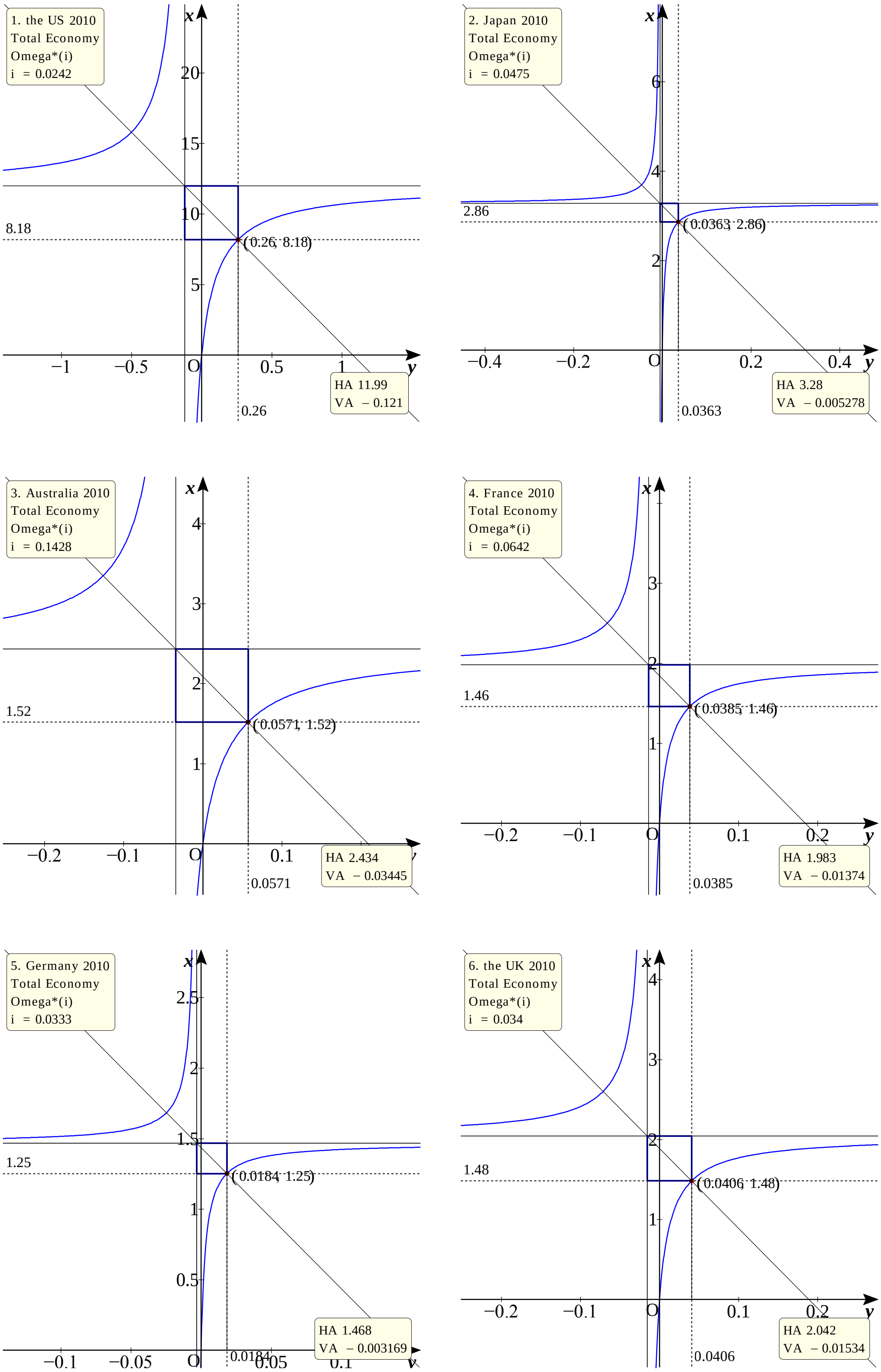

Figure 7-1 Omega(*i*) by country, 2010

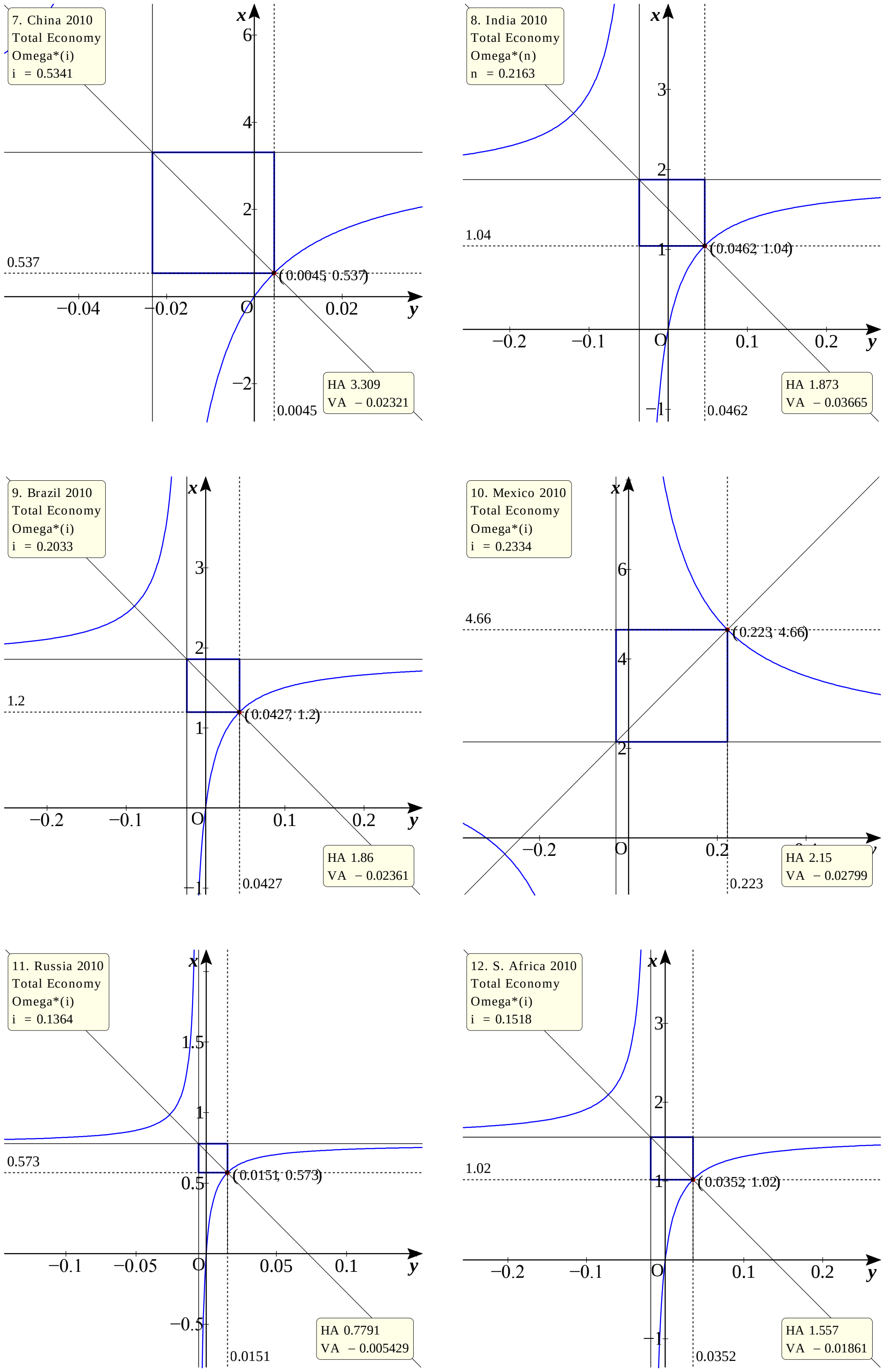

Figure 7-2 Omega(*i*) by country, 2010

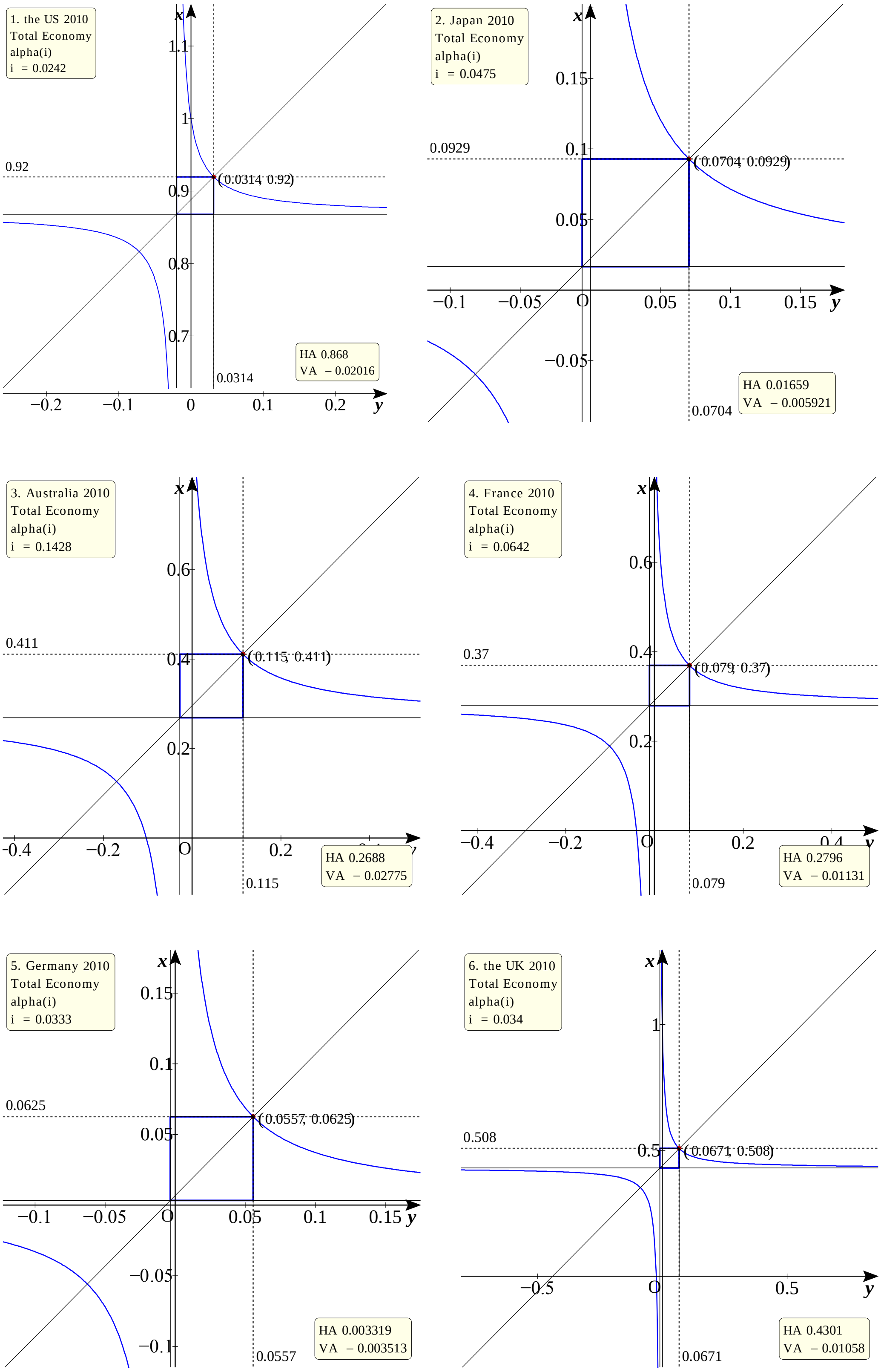

Figure 8-1 alpha(i) by country, 2010

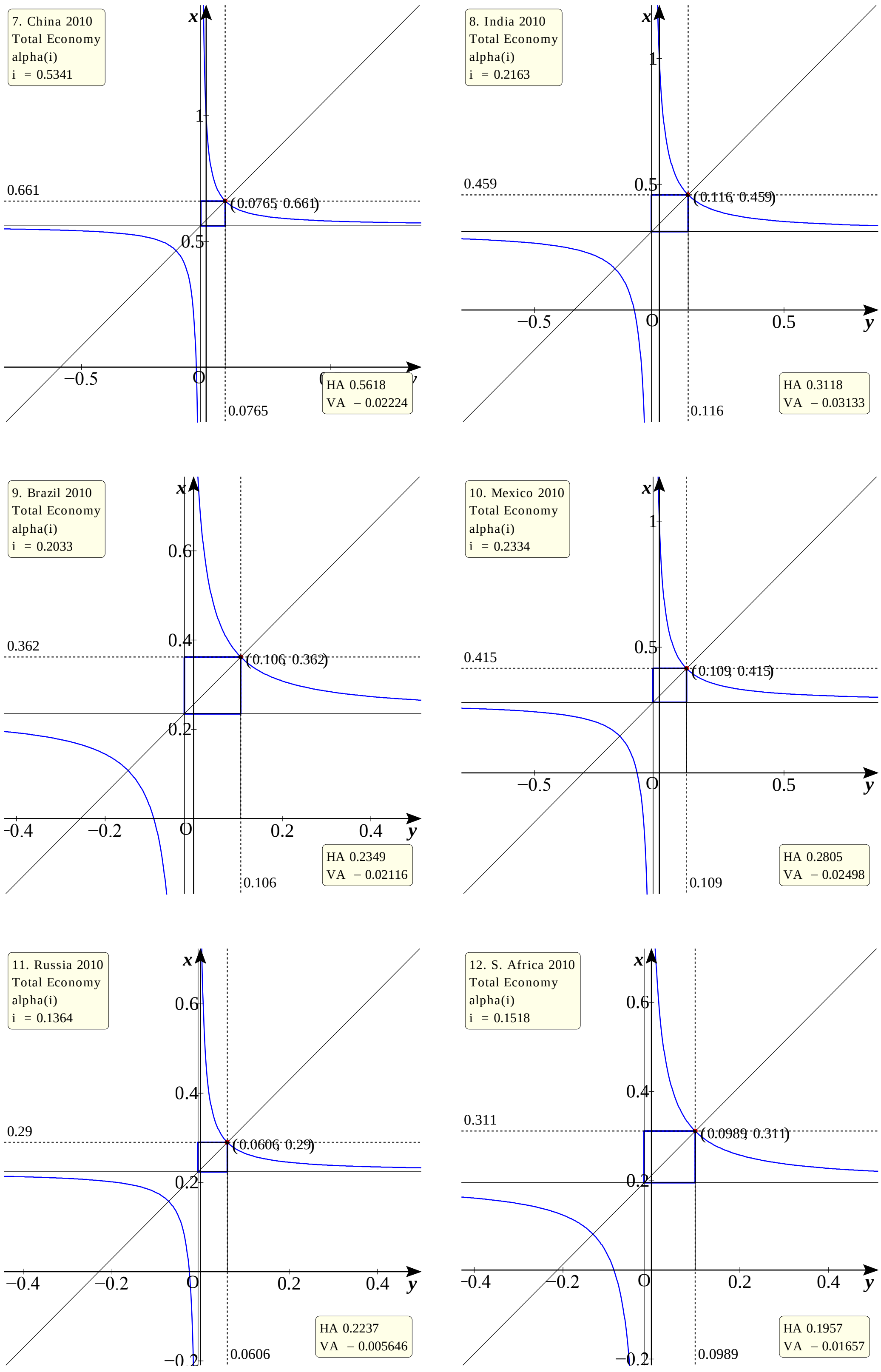

Figure 8-2 alpha(*i*) by country, 2010

C3: i(n), beta*(n), r*(n), Omega(n), and alpha(n)

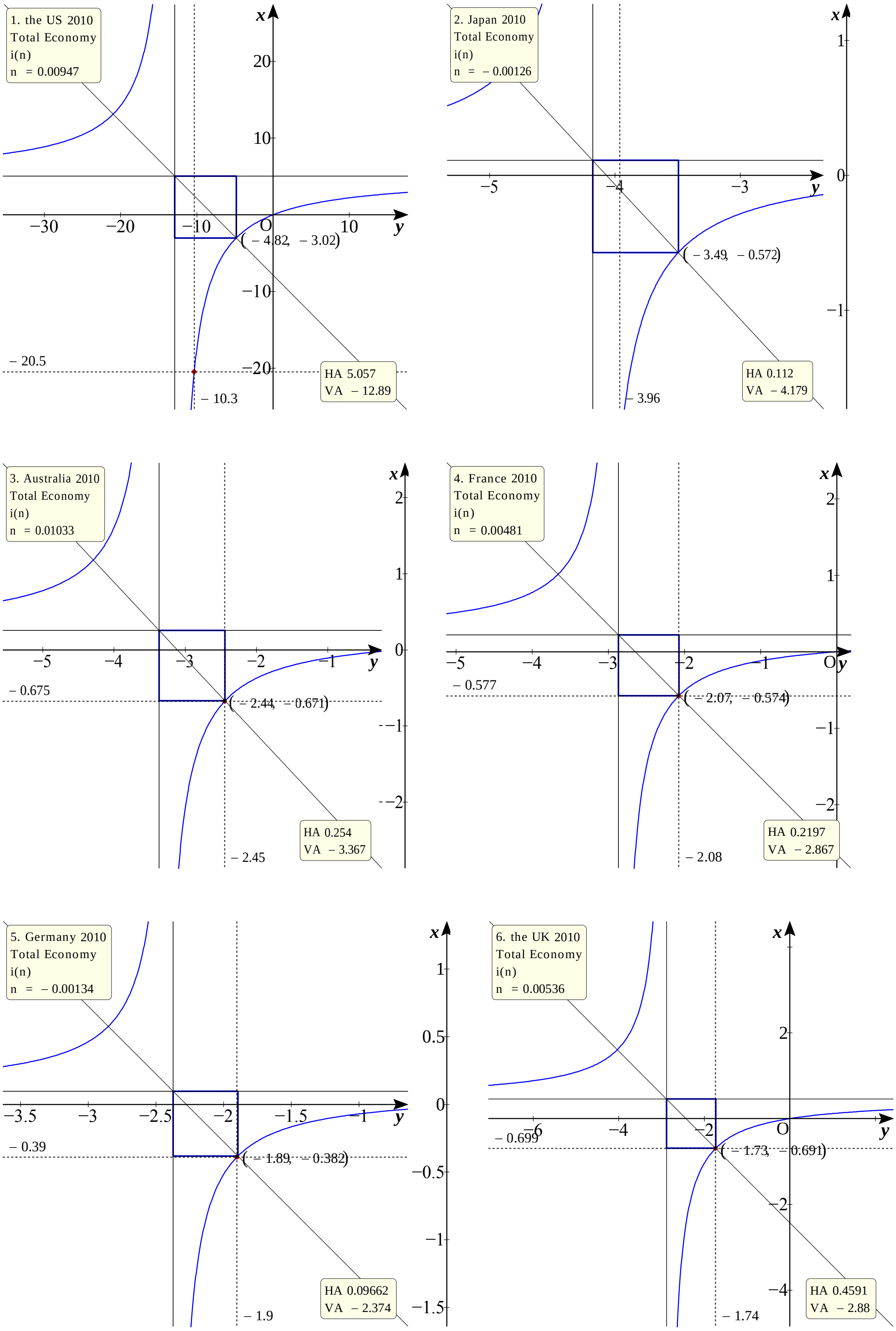

Figure 9-1 *i*(*n*) by country, 2010

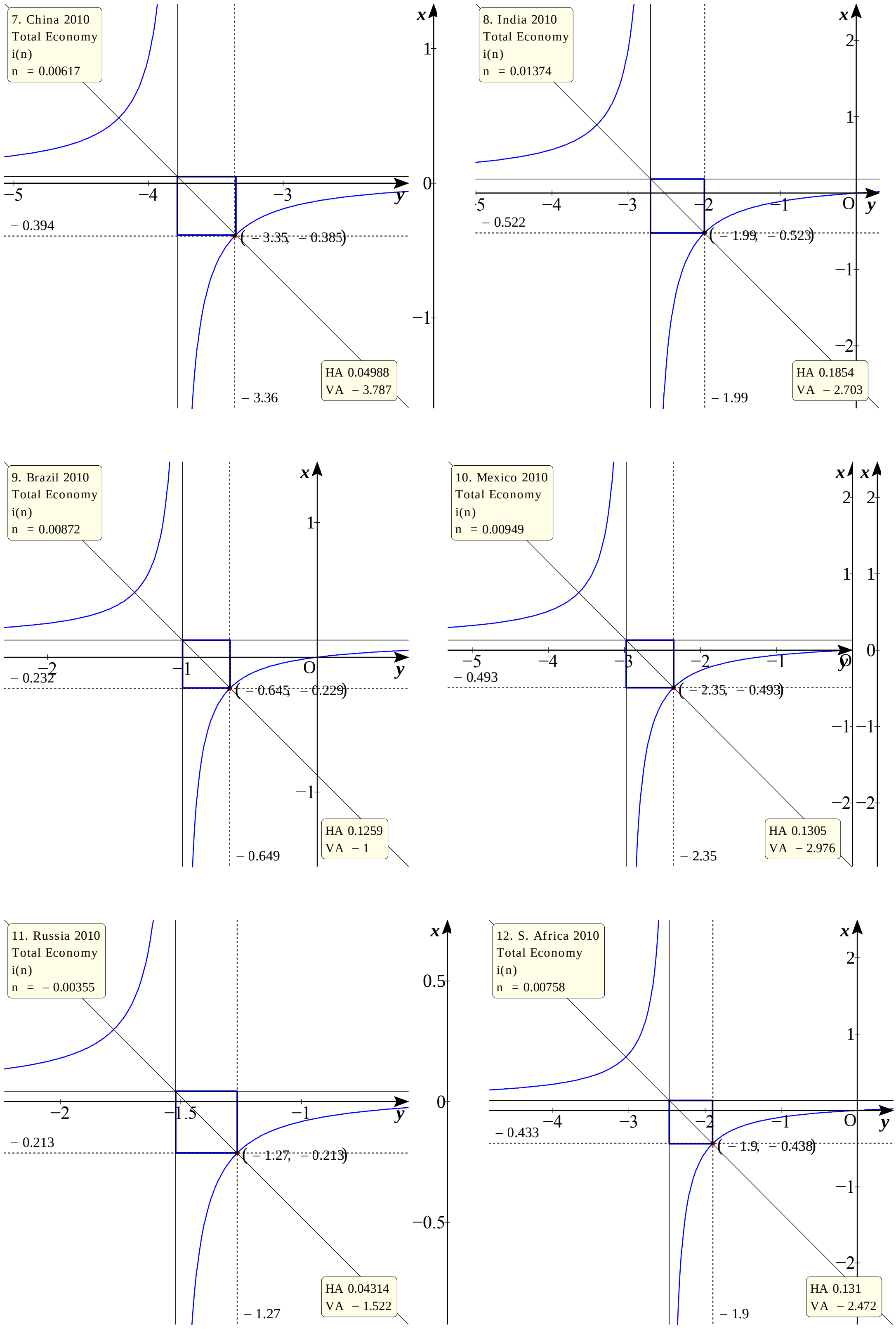

Figure 9-2 *i*(*n*) by country, 2010

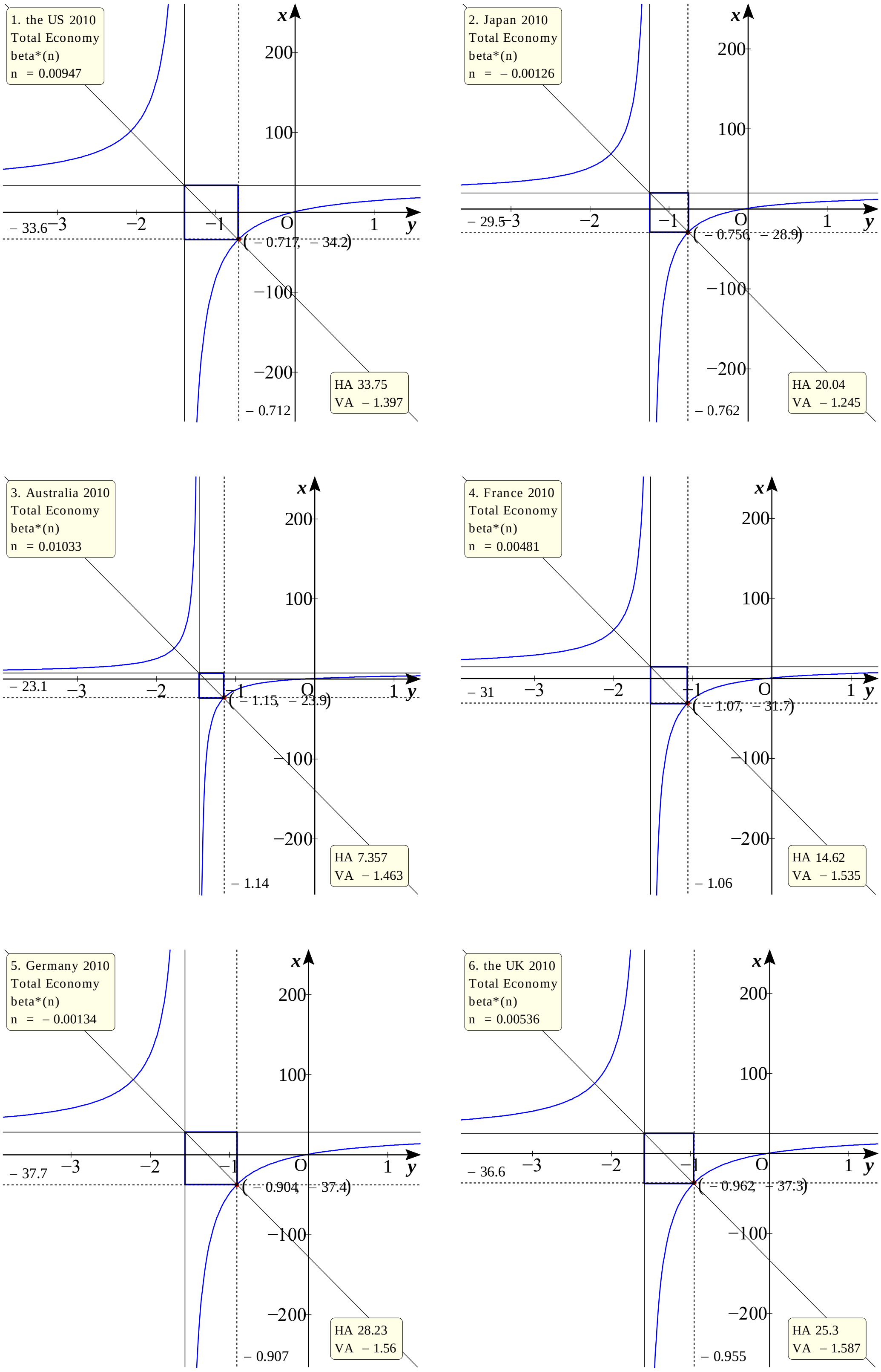

Figure 10-1 beta*(*n*) by country, 2010

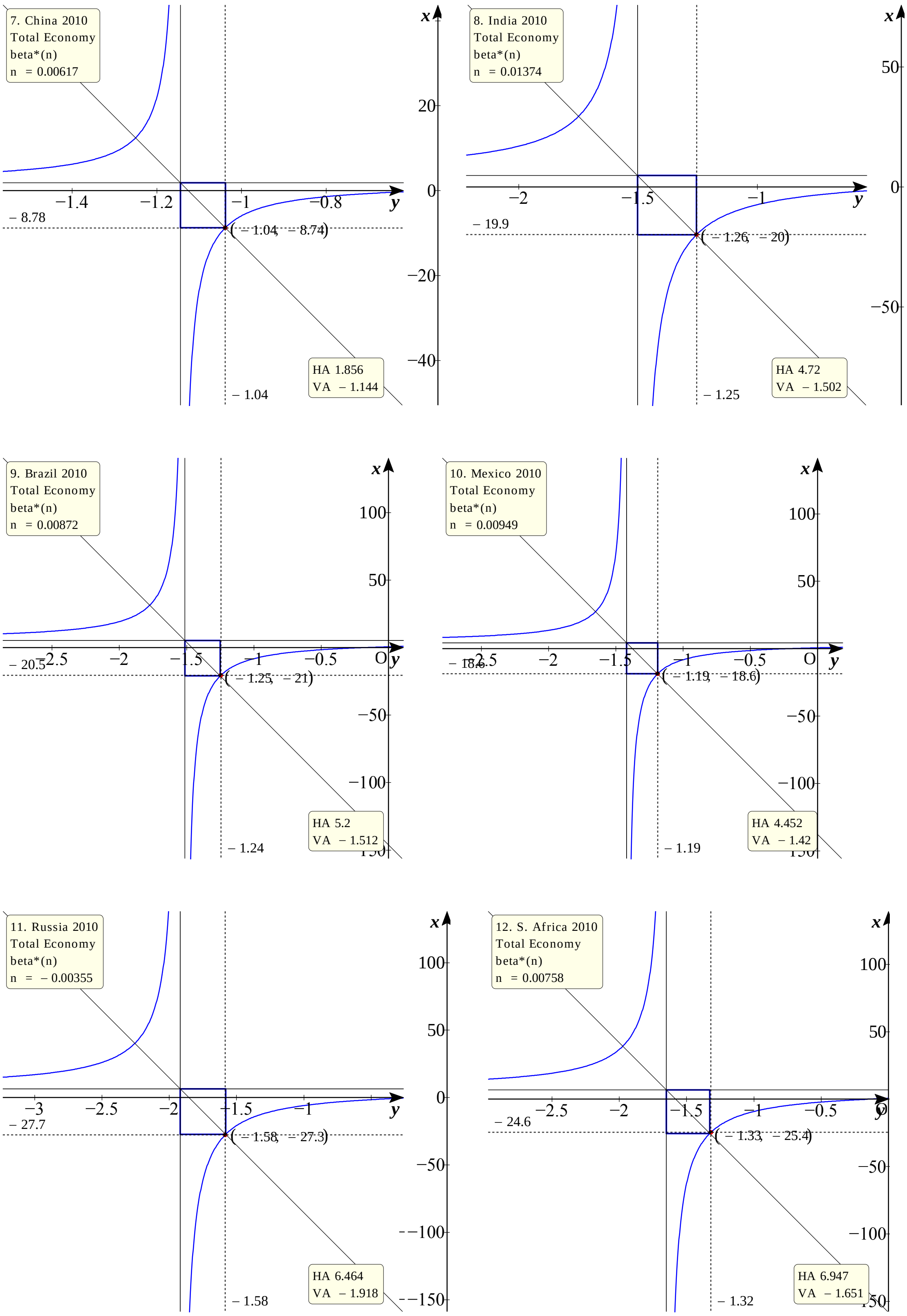

Figure 10-2 beta*(n) by country, 2010

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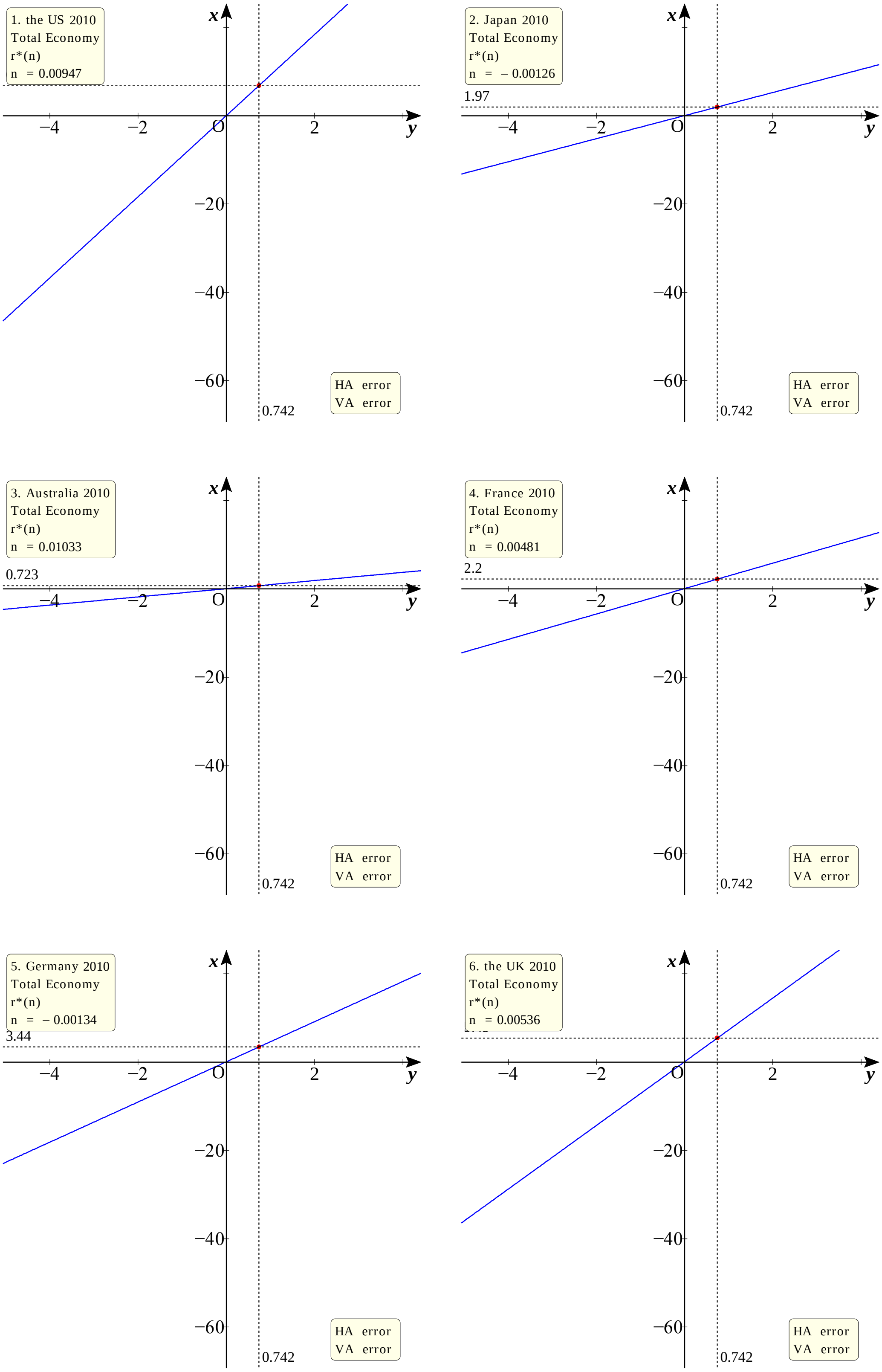


Figure 11-1 *r**(*n*) by country, 2010

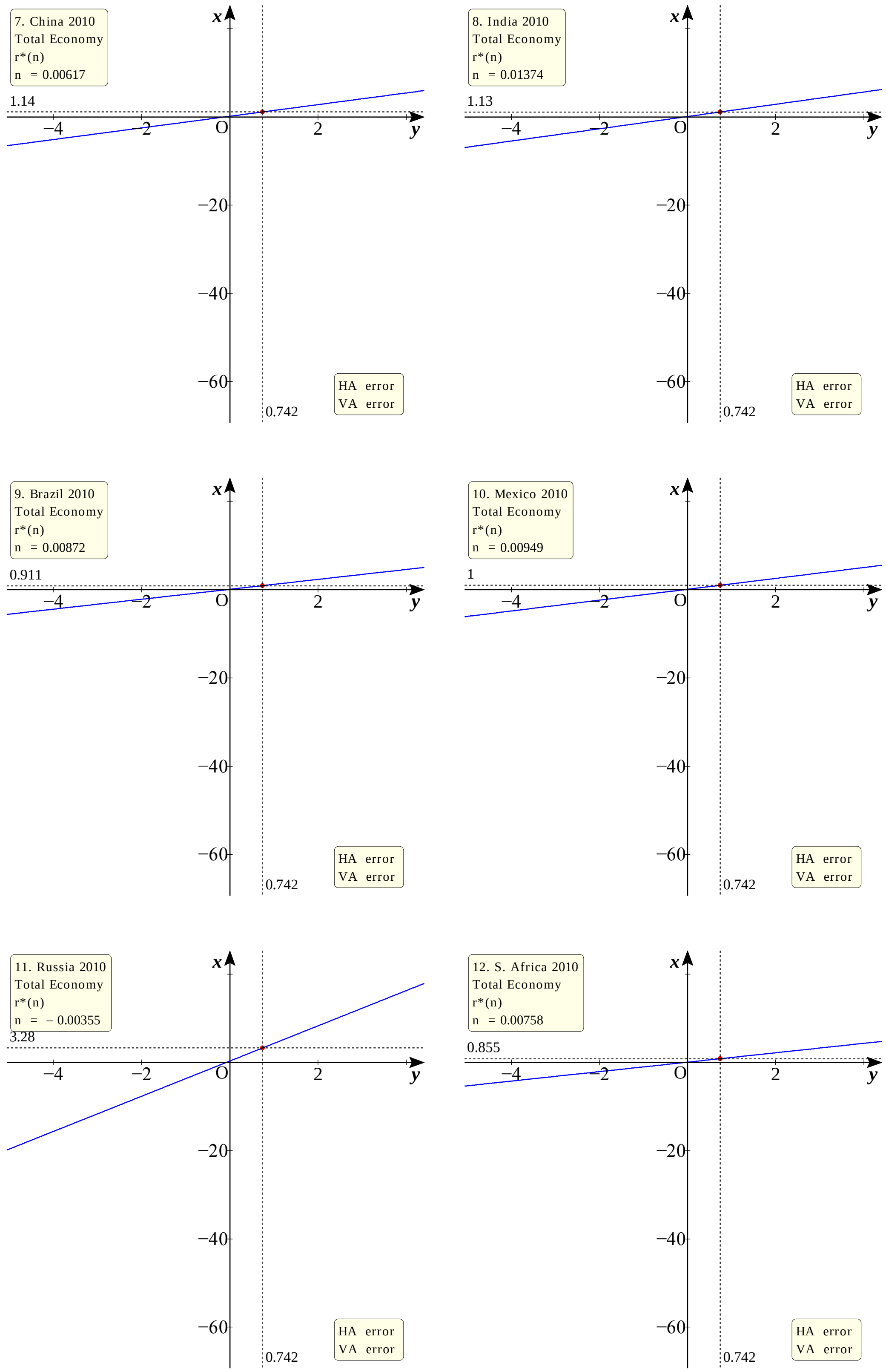


Figure 11-2 $r*(n)$ by country, 2010

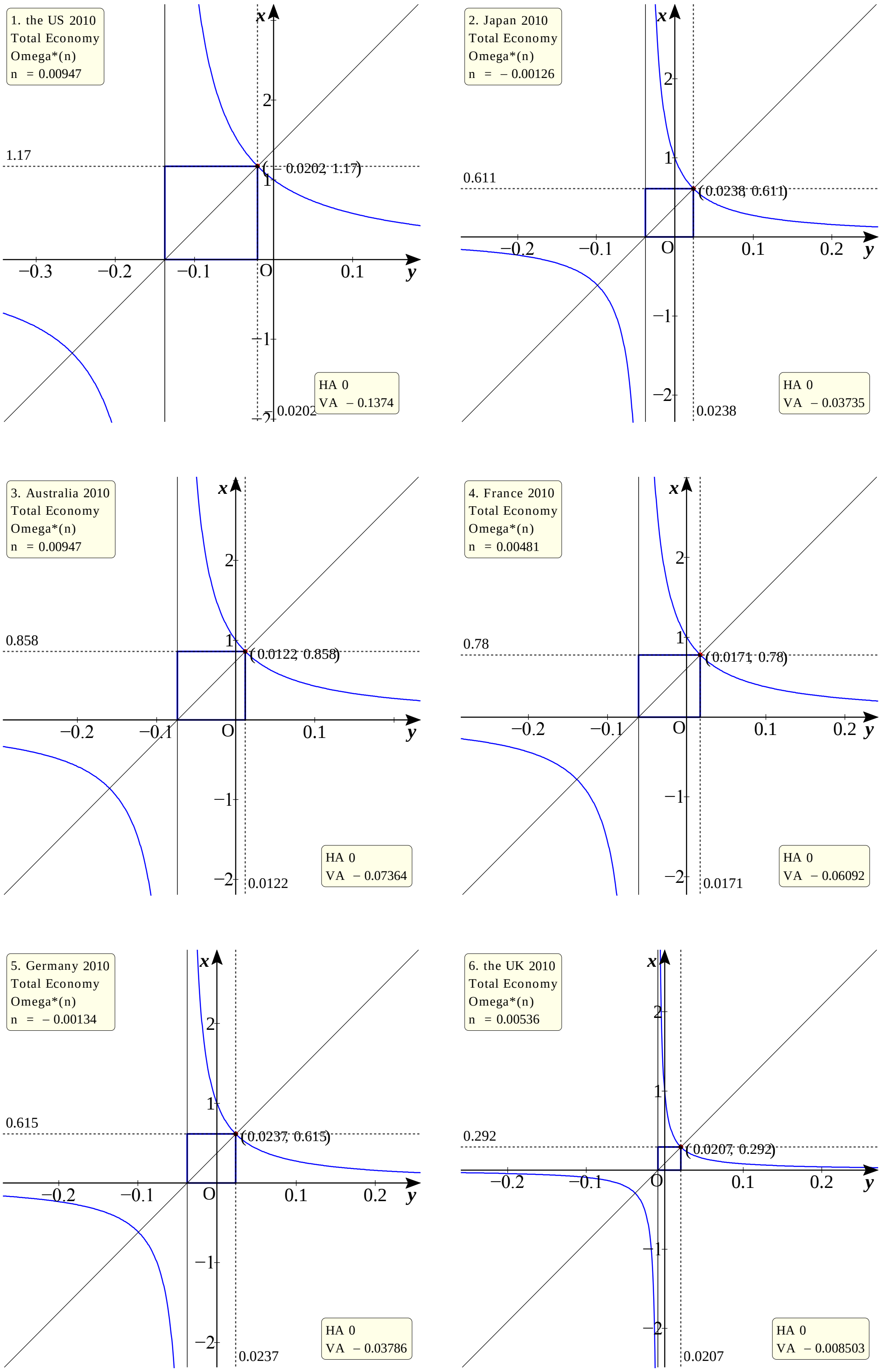


Figure 12-1 Omega(*n*) by country, 2010

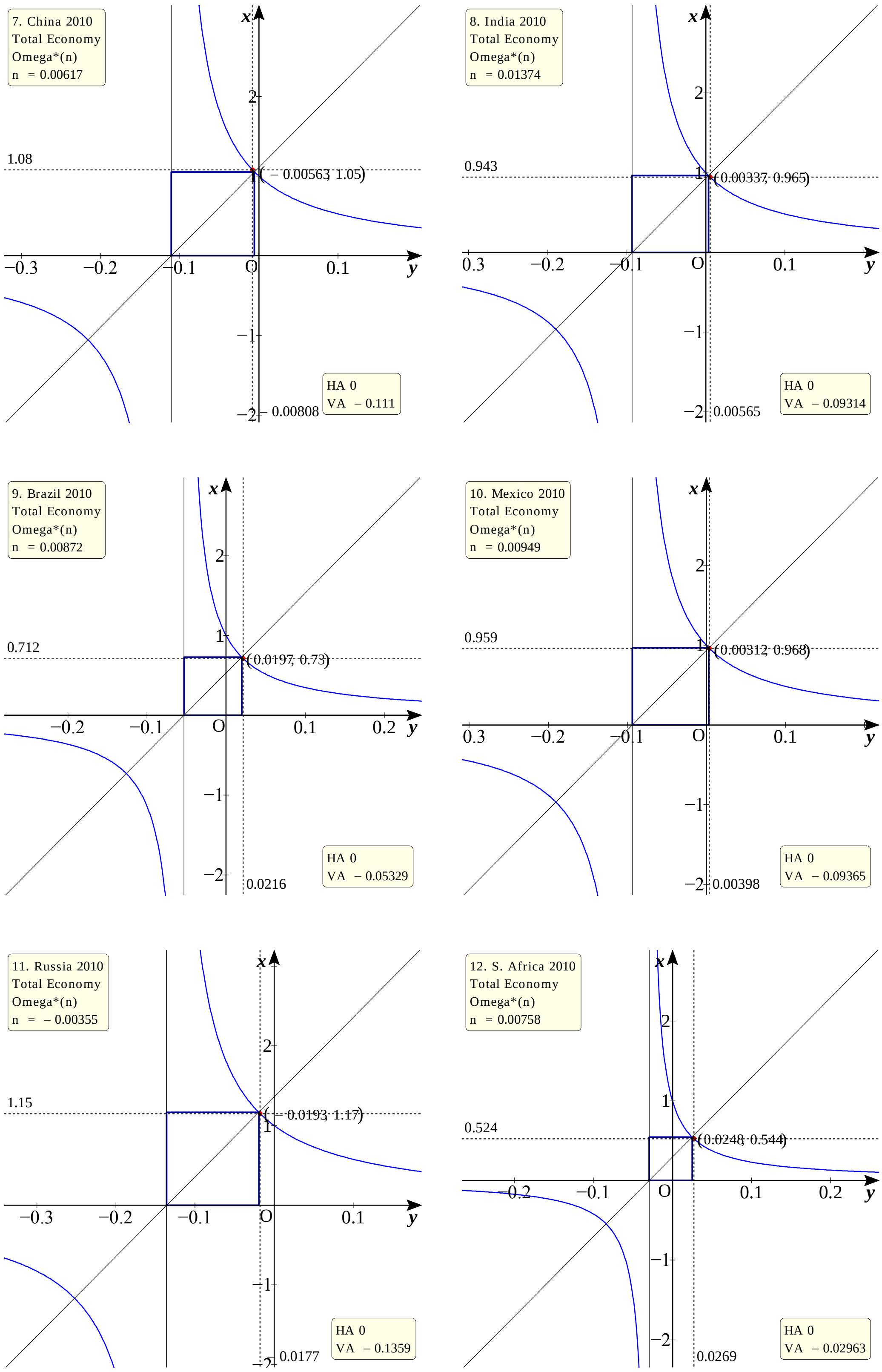


Figure 12-2 Omega(n) by country, 2010

Appendices

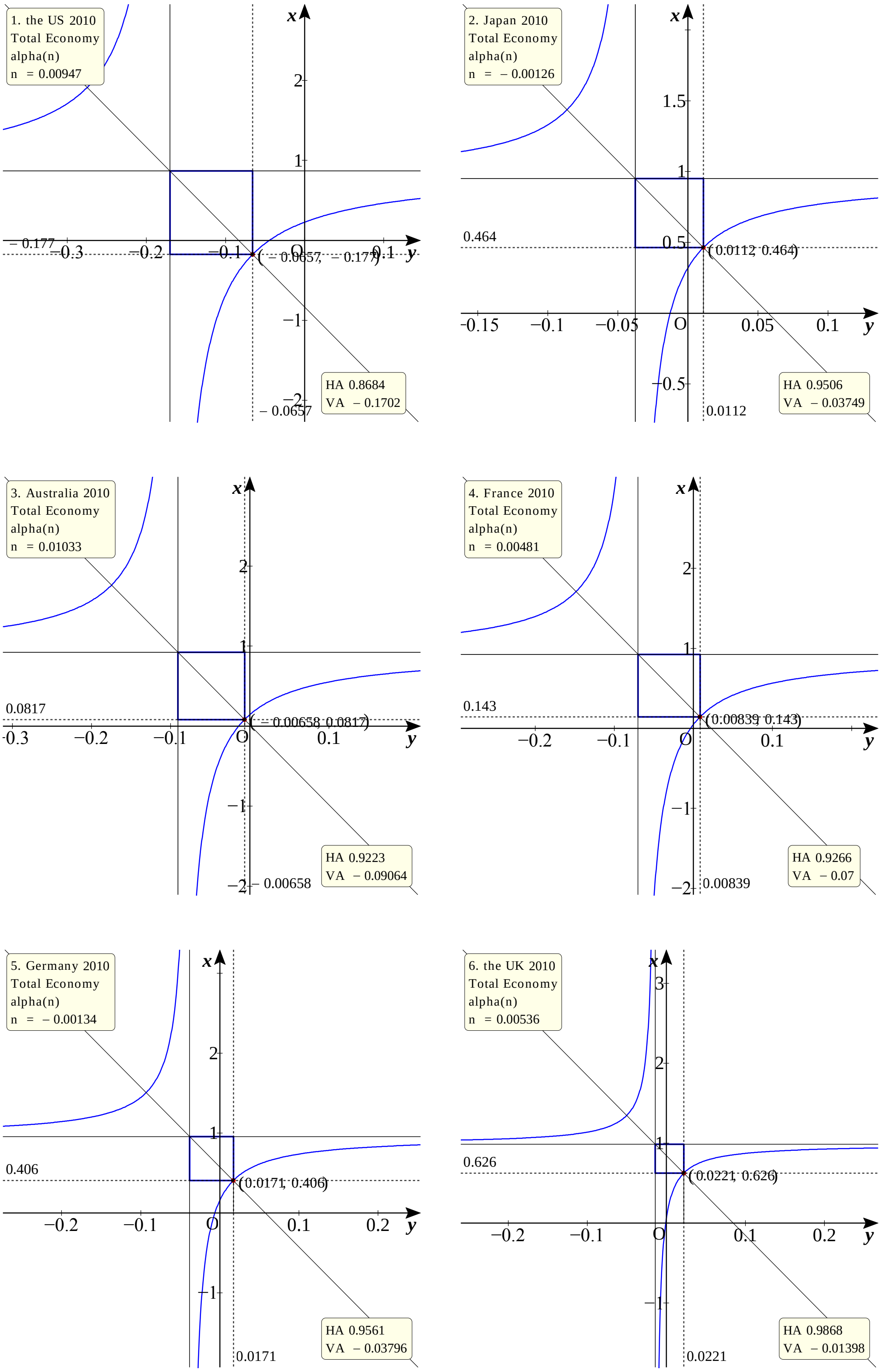


Figure 13-1 Alpha(n) by country, 2010

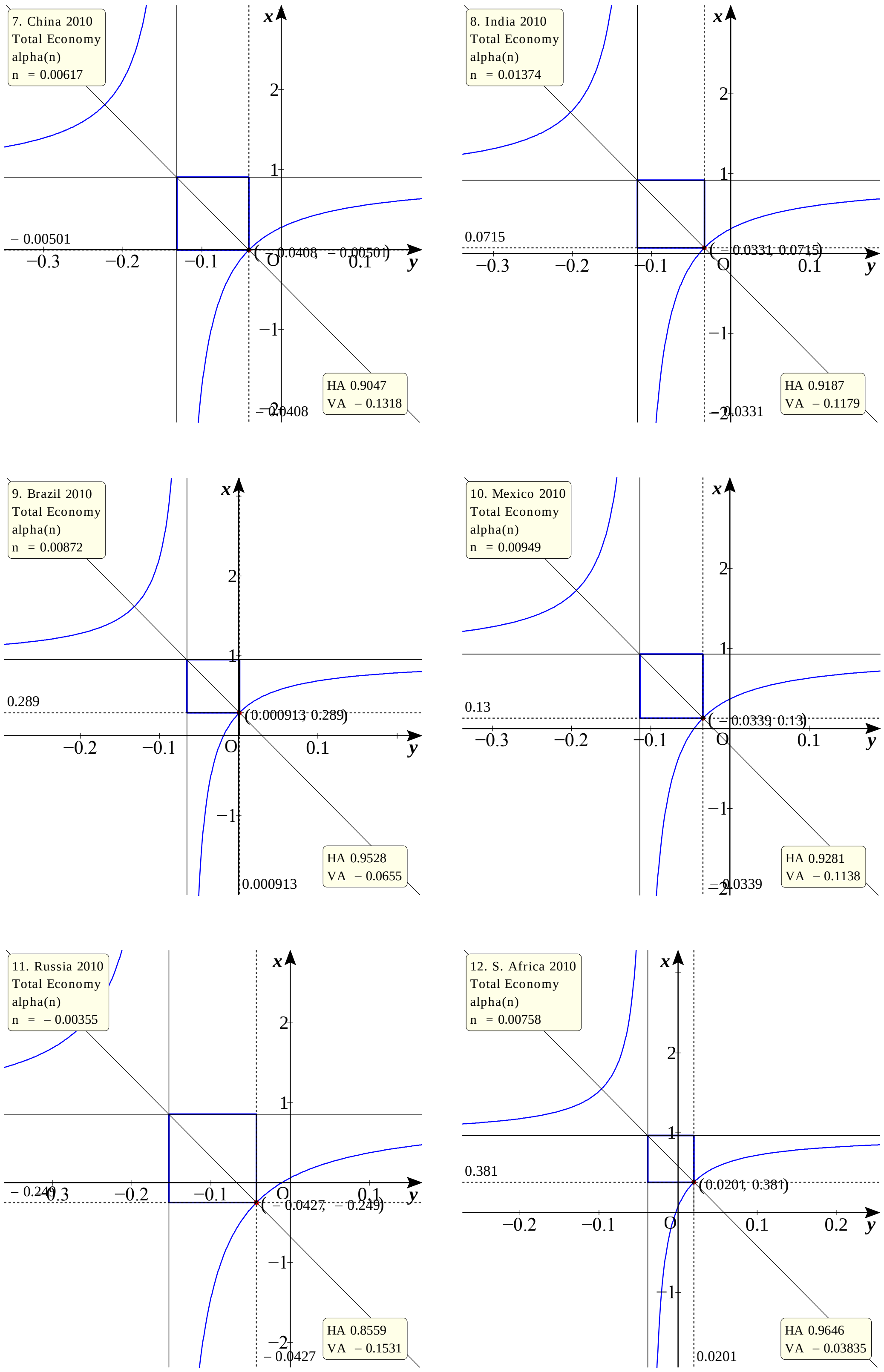


Figure 13-2 Alpha(n) by country, 2010

Appendix D. *Endogenous equations and hyperbolas*

Eight basic equations[3] (Eq.1 to Eq.8) in the endogenous-equilibrium are shown as follows:

(1) The rate of technological progress, $g_A^* = i(1-\beta^*)$: The ratio of net investment to output, $i = I/Y$, and the quantitative net investment coefficient, β^*, or the qualitative net investment coefficient, $1-\beta^*$, where $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$ and the relative share of capital $\alpha = \Pi/Y$.

(2) The growth rate of output, $g_Y^* = g_K^* = \frac{g_A^*(1+n)}{1-\alpha} + n$: The growth rate of population, *n*, and the rate of change in population in equilibrium, n_E. If $n = n_E$, it means full-employment.

(3) $r^* = g_Y^* \left(\frac{\alpha}{i \cdot \beta^*}\right)$: The endogenous golden rule coefficient is $\frac{\alpha}{i \cdot \beta^*}$, which solves the Petersburg paradox (see below). This is an extension of the (exogenous) Phelps (1961, 65) golden rule.

(4) The capital-output ratio, $\Omega^* = \frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)(1+n)+n(1-\alpha)}$.

(5) The rate of return, $r^* = \frac{\alpha}{\Omega^*} = \alpha \left(\frac{i(1-\beta^*)(1+n)+n(1-\alpha)}{\beta^* \cdot i(1-\alpha)}\right)$.

(6) The valuation value, $V = \frac{\Pi}{r^*-g_Y^*}$ and the valuation ratio, $v = r^*/(r^*-g_Y^*) = V/K$: The cost of capital is $r^* - g_Y^*$.

(7) The diminishing returns to capital (DRC) coefficient, $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$: the qualitative to quantitative coefficient, $B^* = \frac{(1-\beta^*)}{\beta^*}$.

(8) The speed years for convergence, $\frac{1}{\lambda^*} = \frac{1}{(1-\alpha)n+i(1-\delta_0)(1-\beta^*)}$.

The above equations are used for hyperbolic equations: For example, by using Eq. 8, $speed\ (i) = \frac{1}{(1-\beta^*)(1-\delta_0)i+(1-\alpha)n} = \frac{1}{ax+b}$ is derived (for other hyperbolas, see Appendices B and C above).

[3] For each proof of endogenous equations, see a synthesized separate paper (2010).

BOX D-1 Mechanics of main hyperbola equations using *rectangular equilateral triangle*

Fig.1.1 the Width for robustness

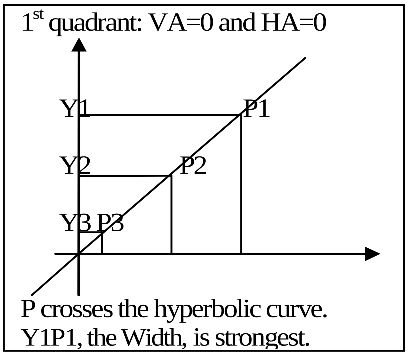


Fig.1.2 Plus and minus quadrants

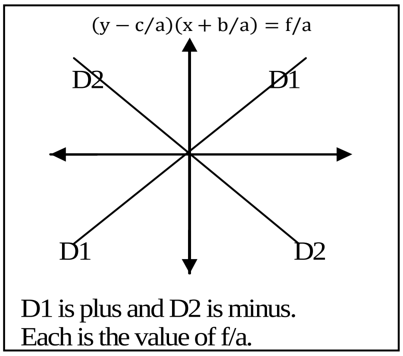


Fig.1.3 $r^*(i)$, where f/a>0

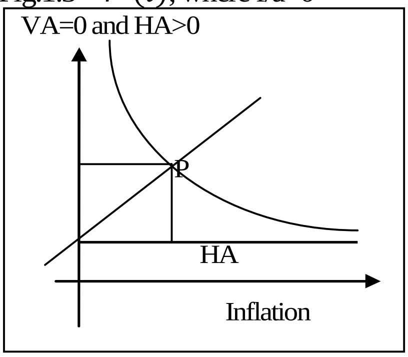


Fig.1.4 $r^*(i)$, where f/a<0

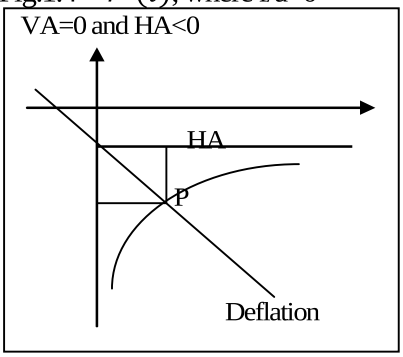


Fig.1-5 $speed\ (n)$

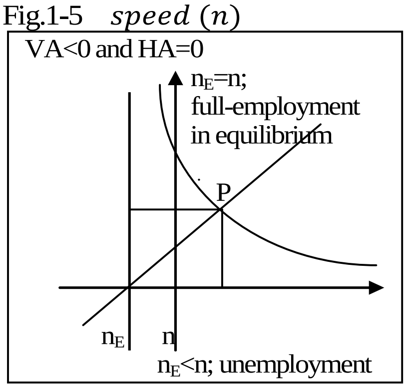
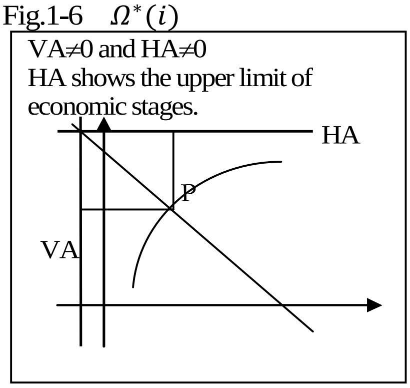


Fig.1-6 $\Omega^*(i)$



Note: Each sub-figure is useful for interpreting hyperbola graphs shown in Figures A1 to A6 below, as a good cut end. In particular, Fig.1-2 determines fundamental characteristic of each hyperbola graph, with respects of the rate of inflation/deflation and the upper limit of economic stages.

A new message on 31 Oct 2013:

The author is happy to be able to confirm that the author's hyperbola function in geometrical topology appears for the first time historically in the literature. During trip to the US in Oct 2013, the author could thankfully investigate this fact at several libraries.

Postscript

Q & A: Readers' Alternatives as a Surrogate Postscript

The 2nd edition tries to entertain both readers and the author together. Readers can enjoy their answers and look for key Chapters in the 2nd edition. New discoveries/facts after the 1st edition are all absorbed into the 2nd edition. Essence of these discoveries is wholly represented by six nature-neutrals: Money, Consumption, the Relative share of capital, Deficit, Politics, and Spirituality, where a constant capital-output ratio endogenously prevails as a unique axiom.

Questions and Answers (Q & A) are related to concrete empirics led by six nature-neutrals. Q & A is composed of the following eight topics:

1. What are obstacles/barriers for measuring capital stock?
2. Is there any difference between market principle countries and no financial market countries?
3. How to cope with differences between macro and micro, endogenously?

   With review of N. Gregory Mankiw's (*JEP* Summer 2013: 21-34) "Defending the One Per Cent."
4. Why politics-neutral and spirituality-neutral? And how to measure the level of democracy? With review of G. John Ikenberry's interview with Yoichi Kato, Asahi Newspaper dated on 13 Sep 2013.
5. What are differences of robustness between Japan and the US?

   With review of Kenneth Rogoff's statements; structured by Kazuki Yamakawa, G-10, the Asahi Shimbun Glove, Sep 15-Oct 5, 2013. The heading is: 'Calmly warn against huge national debt and essential to future growth investment.
6. Is vector a saver of econometrics?

   With $\boldsymbol{AB} \neq \boldsymbol{BA}$, proved mathematically by Ramanujan Srinivasa, whose teacher was Godfrey Harold Hardy, Trinity College, Cambridge.
7. What are key cores for integrating LONG data (1960-2012) with Short data (1990-2012) in KEWT database 8.14?
8. How to solve wages between micro and macro?

   With review of Paul Hettler's "Firm Size, Wages and the Business Cycle – draft, 12 Oct 2013, at *IAES* Conference, Philadelphia.

Q & A: Readers' Alternatives as a Surrogate Postscript

Readers are able to flexibly replace the above examples by interesting papers or books, taking into consideration the opposite sides. The true results remain the same.

(1) <u>What are obstacles/barriers for measuring capital stock?</u>

Q1: Accounting is true by year in that the final difference of cash flow-in and flow-out corresponds with that of real assets-in and real assets-out or that profits and losses. Then, does the SNA (1993, 2008) follows the same principle? If not, why?

A1: The SNA is statistical so that it follows the accounting principle. Nevertheless, the SNA assumes that final difference of cash flow-in and flow-out is zero. Or, the SNA holds under an assumption that cash flows and real assets are consistent with each other. This assumption is correct when the SNA shows the situation just after the redistribution of taxes so that enterprises and households absorb all the taxes. Then, why is it wrong? The rate of return of the SNA shows final returns/profits at enterprises and households so that the rate of return at the government sector is hidden or assumed to be zero.

Q2: Why is the final stage of national net income redistribution *inaccurate* from the viewpoint of taxes? From the viewpoint of economic policies by sector, the government sector works most vital role for the total economy by country. Regardless of 'the share of budgeting or deficit to the total economy' (i.e., the size of government), the government sector manages a key core of economic policies.

A2: The SNA is records-orientation and the *EES* (Earth Endogenous System) is always policy-orientation. One system cannot have both roles. Then, how to cope with this obstacle? The *EES* absorbs actual statistics data of the SNA into the *EES* or its KEWT database. The *EES* as a result, is qualified with cooperative work, where the SNA and KEWT focus on its own role.

Q3: Why does Jorgenson's revolutionary proposal not work enough? Why does capital stock at a macro level differ from the aggregated capital stock at enterprises? (The above **A2** is an answer to this question so that avoids repeating).

A3: Jorgenson's theory not wholly (towards the total economy) but partially (individually) equals the practice for stocks and flows. This is because capital stock and capital flow/net investment are not consistent by year and over years, at a macro level. At the macro level, capital stock is difficult to estimate/measure due to a dynamic fact of never repeating steady data under changing circumstances by year and over years. For example, the capital-output ratio is stable, the *EES* holds modestly but, how to settle a constant capital-output ratio, apart from stylized facts? Stylized facts remain results, never approach causes or the essence. Consistency of stocks and flows ultimately holds when all the parables and variables are consistent each other by country, by sector, and year and over years, where even 'initial' data turn to endogenous at a instance (see KEWT database).

Q4: What is a starting point for measuring capital stock and flow?

A4: This is an endogenous rate of technological progress, where the corresponding rate of total factor productivity (*TFP*) is simultaneously measured. The rate of technological progress is independent of national taste/preferences, culture, and history by country (preferences, hereafter). In other words, consumption is independent of technology. With these facts/discoveries, an economy maintains sustainability. Note enterprises cannot distinguish technology and marketing in this respect. The range of enterprises is much less than an economy by country.

Q5: Why does macroeconomics set the capital-labor ratio as a base (even in Solow's exogenous model to a given rate of technological progress)?

A5: A thesis of mine at the University of Auckland (PhD in economics, Nov 2003) had investigated this question. A fact is that there is no relationship between the capital-labor ratio and the capital-output ratio. Why? There is no measurement of the rate of technological progress, back again. $TFP = A_{STOCK} = k^{1-\alpha}/\Omega$, see Note 19 of 3.6 Conclusion in The Model and Its Properties. The thesis differs from the *EES*, which was produced after ten years later: (1) Based on the role of corporate finance in economic growth, as shown by its thesis title. (2) I had to express all the parameters and variables not using endogenous equations but using recursive programming after thousands of experiments.

Q6: Then, how can we approach capital stock and flow so as to match those of KEWT?

A6: *Seven endogenous parameters* are made of the following parameters so that by measuring these values we know the difference between statistical and endogenous data under national disposable net income $Y = C + S = W + \Pi$.

$n_E = n$. $i = I/Y$. $\alpha = \Pi/Y$. These three are fixed by year in KEWT;
β^*, δ_0, $\Omega = \Omega^* = \Omega_0 = K/Y$, $r = r^* = r_0 = \Pi/K$, and $\alpha = \Omega \cdot r$ for confirmation.

***Seven endogenous parameters*:**

1. Endogenous net investment to endogenous income, $i = I/Y$.
2. The rate of change in population, $n_E = n$.
3. The relative share of capital, $\alpha = \Pi/Y$, where $\alpha = \Omega^*/r^*$.
4. The capital-output ratio, $\Omega^* = K/Y$, (or, $\Omega^* = \frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)(1+n)+n(1-\alpha)}$).

5. The technology coefficient (or the quantitative net investment coefficient), β^*, (or, $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$).
6. The coefficient of diminishing returns to capital (DRC). $\delta_0 = 1 + LN(\Omega^*)/LN((1-\beta^*)/\beta^*)$.
7. Speed years for convergence, $1/\lambda^*$, the speed coefficient, $\lambda^* = (1-\alpha)n + (1-\delta_0) * g_A^*$, and $g_A^* = i(1-\beta^*)$.

(2) Is there any difference between market principle countries and countries without financial market?

Q1: Why are no financial market countries able to execute economic policies, similarly to countries under the market principles?

A1: An economy works based on the real assets so that the financial/market assets represent the same results s those of the real assets.

Q2: What guarantees the equal results lying between the real assets and the financial assets?

A2: Money-neutral guarantees the equal results/causes. The author's money-neutral is defined as the neutrality of the financial/market assets to the real assets. Money-neutral holds since money is surprisingly characterized by a fact of quantity=quality by country. As a result, money-neutral never ends by country, regardless of whether or not the financial market exists.

Q3: How are the real assets measured by country?

A3: The real assets, solely using endogenous equations, can be robustly measured under the endogenous-equilibrium and with no assumption within a national system and accordingly, under perfect competition. In other words, if a national system does not work, the system is far from endogenous perfect competition. As a result, the endogenous-equilibrium does not work.

Q4: What parameters/variables do these facts prove?

A4: Directly, the speed years for convergence by country and indirectly the diminishing returns to capital (DRC) coefficient, δ_0. For example, China seems to be well managed by policy-makers yet, actually money-neutral does not work well under arbitrary operation of the markets, even if the market principles apparently work similarly to other financial market countries.

Q5: What is measured in the real assets instead of absolute price levels by goods and services?

A5: The endogenous system shows the relative price level p=1.0000000 and also the absolute price level P=1.0000000: $p = P = 1.0000000$. However, this fact remains a sufficient condition of the function of the real assets. A necessary condition is shown by the elasticity of substitution, $\sigma = \frac{\Delta k/k}{\Delta\left(\frac{r}{w}\right)/\left(\frac{r}{w}\right)}$, where *MRS*=*r*/*w* (see, xxxiii, Notations, pp. xxxi-xlii, *Earth Endogenous System*, 15 May 2013). Under perfect competition, $\sigma = 1.0000000$ holds, as seen in many democratic countries while $\sigma \neq 1.0000000$, as shown in China. In China, δ_0 exactly expresses unusual values, which unexpectedly influences on sustainable growth and stop-macro inequality.

Q6: What is an ultimate conclusion on the market principle?

A6: The endogenous system reinforces the market principles so that the spirit of market principles must be respected as much as possible, since the principles have results close to God, although the principles do not clarify any true cause due to vertical role.

(3) How to cope with differences of macro and micro, endogenously? With review of N. Gregory Mankiw's (*JEP* Summer 2013: 21-34) "Defending the One Per Cent."

Q1: Do you think which base realizes stop-macro inequality most effectively, macro or micro?

A1: The literature must be based on micro while the *EES* ("*Earth Endogenous System*," 15 May 2013, lxviii+568) is fully based on macro. It is a fact that so fundamental strategies are useful to stop individual inequalities as the differences of the real wage rate by country. The *EES* is policy-orientation and measures an averaged real wage rate, where nominal growth rate of national disposable income equals the rate of inflation/deflation, under the real rate of return=zero (the *RRR*=0). The averaged real wage rate differs from individual real wage rates and, a variety of strategies decreases the differences of the real wage rates. In short, the macro-base cannot step into strategies, which reinforce economic policies of the *EES* and, the micro-base uses policies and strategies freely.

Q2: Do you think that strategies in the micro-base are integrated?

A2: Generally it is difficult for economists to integrate strategies within the micro-base. Strategies may spread to a few related aspects but never to all the aspects that constitute a whole national system. The *EES* is a complete system that totally integrates strategies available in the micro-base. Or, results of individual strategies are totally absorbed into economic policies in the macro-base.

Q3: What cause distinguishes tax strategies in the micro-base with fiscal policy in the macro-base?

A3: The literature and the SNA (A System for National Accounts, 1993, 2008) are record-orientation and estimate national disposable income just after redistribution of taxes, where households and enterprises have each income. The *EES*, however, is policy-orientation and accurately measures national disposable income, *Y*, just before redistribution of taxes, where $Y = C + S = W + \Pi$ holds accurately and consumption is connected with wages endogenously for the first time and reminds of the original idea of Meade and Stone.

Q4: What is a typical case of tax strategies and fiscal policy?

A4: The progressive tax rate is a typical case of tax strategies while an averaged ratio of government income to *Y* as the size of government (the G size), $Y_G/Y = T_{AX}/Y$, is a typical case of fiscal policy. Economists know that the progressive tax rate is effective and efficient but there is no authority to approve it as a national system since it remains a strategy. Contrarily the G size determines the framework of national economy. $Y_G/Y = T_{AX}/Y$ or the G size shows 15-30 % of *Y*. Despite of small share of *Y*, the G size is deeply connected with fundamentals of the total economy, most effectively=efficiently and, as the most influential core of national economy. Further fiscal policy easily absorbs the progressive tax rate under a fact that actual taxes are within a narrow range of endogenous taxes.

Q5: What is a conclusion?

A5: Macro and micro cooperate and never contradict in the statistics and endogenous data.

(4) Why politics-neutral and how to measure the level of democracy? With review of G. John Ikenberry's interview with Yoichi Kato, Asahi Newspaper dated on 13 Sep 2013

Q1: Why is politics-neutrality the fourth that follows the author's three neutralities to money, technology, and the relative share of capital in the *EES*?

A1: The *EES* harmonizes macro and micro, consumption and technology, sustainable growth and returns, and cyclical economy with stop macro-inequality; not fighting but give first and get last spirit. Philosophy behind hyperbolas (each as a reduced form of endogenous equations) is '*the negative and positive principle*' as expressed by vertical and horizontal asymptotes, whose origin is the origin of two-dimension plain hyperbola (2DPH). The author, as the first appearance, topologically proves that the author's Silver Ratio overlaps the Greece Golden Ratio. 2DPH is identical to Shizuko Ishida's Super Universe Integration Theory (SUIT), which is most advanced in math, physics and element chemistry fields and supported by empirical family-like proofs. As a result, human and the level of democracy are naturally involved in politics-neutral. The author approves the existence of good and bad in the actual six-dimension world. One-side is right and another-side is also right and, the true-side is the same, dynamically and balanced.

Q2: What is most vital in human and economies?

A2: No anxiety is most vital. Theory=practice. This is measured in the *EES*. Experiments and 'learning by doing' are ever-lasting way for human and economies. This century is the era of people, by people, and for people, by country; based on each country's preferences, culture, and history and, with happy consumption under no unemployment, no war, and no assets bubbles. Any national system holds, beyond capitalism and socialism, as long as money-neutral works by country.

Q3: What is the role of Japan?

A3: Japan is able to maintain authority for peaceful role in the world since Japan is the only country to have experienced atomic bombs. Mind and decision are the first and results are the second so that leaders who have not experienced wars are apt to be involved in repeating wars, as history always clarifies. Decision-making is the first and results follow.

Q4: What is the essence of democracy?

A4: Democracy reflects people's level of money-making. When people wake up from endless dream, good and bad, the level of democracy improves over years. The level of democracy does not depend on the differences of systems but righteous education towards human culture by country and civilization by area. Global economy and cheaper costs reflect lower level of democracy. Note that when the market principles are controlled arbitrarily, the economy expresses flying on one engine and apart from money-neutral. In this sense, democracy is tightly connected with the market principles and the author's money-neutral.

Q5: What is the essence of politics-neutral?

A5: The *EES* is based on the real assets. Economic situation reflects the level of politics since leader decides economic policies. The optimum situation is realized when the level of politics is another expression of the real assets. This is called politics-neutral. When leader's decision-making is far from politics-neutral, the situation becomes ineffective and inefficient.

(5) What are differences of robustness between Japan and the US? With review of Kenneth Rogoff's statements; structured by Kazuki Yamakawa, G-10, the Asahi Shimbun Glove, Sep 15-Oct 5, 2013. The heading is: 'Calmly warn against huge national debt and essential to future growth investment.'

Q1: What are essential differences between Japan and the US economically?

A1: It is true that i) Japan is the largest creditor country in the world while the US is the reversed and ii) data show that a debtor country is slow in growth. Data are actual statistics data and always within a certain range of endogenous data. Despite of the above facts, Japan is huge deficit country, the ratio of deficit is over 200 % to GDP, by year, much higher than those of other developed countries. It implies once deficit cannot be repaid, ten-year debt yield immediately rise up and default is inevitable. The *EES* warns this fact earlier since the market principles work like God although the principles work vertically by good and services and free from serious causes.

Q2: What are typical differences between Japan and the US more concretely?

A2: Japan spends government consumption and public net investment as much as leaders and decision-makers like, shortly and in the long-run, and irresponsibly without thinking of next generations. Some part of this irresponsibility comes from unstable politics yet, politics do less costly spending and always put off doing for people. The US spends much money for world order at the sacrifice of public net investment and within a strict range of deficit to GDP. As a result, the US economy is much robust compared with Japan from the viewpoint of the endogenous- equilibrium.

Q3: What is a common contradiction inherent in politics?

A3: Any country has its vision for future far ahead, at least several decades. Politics cannot execute such future vision as far ahead. Therefore, the author proposes politics-neutral as a yardstick for people, where the real assets are always a vital base.

Q4: Why does structural reform put off?

A4: This fact is related to the number of votes so that the level of democracy varies by country. Generally, the smaller the population the effective the country is. Naturally people want local governments and central government wants more central power. People realize this fact. When people think of others, people take actions and gradually politics march together. Participation from family to community and region spread, with eyes and ears. This is the process/path of democracy.

Postscript

Q5: How to decide public net investment (after capital consumption)?

A5: Profit principle does not contradict the macro level based on the real assets. Profits are maximized with minimum net investment in the long run. The rate of return is optimum at minimum net investment. Topology proves this fact. The x axis is net investment and the y axis is the rate of return, where vertical asymptote overlaps the y axis so that the optimum rate of return must be closer to the vertical asymptote. Profit principle is expressed by parabola while hyperbola needs two-dimension plane hyperbola (2DPH). Profit principle is given its original position in 2DPH. Further, the author's RRR=0 implies that the nominal growth rate of output equals the rate of inflation/deflation so that GDP competition among countries is non-sense.

(6) Is vector a saver of econometrics? With $\boldsymbol{AB} \neq \boldsymbol{BA}$ proved mathematically by Ramanujan Srinivasa, whose teacher was Godfrey Harold Hardy, Trinity College, Cambridge.

To conquer the difficulties of microeconomics and macroeconomics, econometrics was born, I understand. Further today E-Views is developed by Quantitative Micro Software and, generally used for data estimation and data analyses. This software has four assumptions. Key cores have no assumption based on the real assets of the *EES* (Earth Endogenous System).

Q1: Is there any difference between economics and mathematics?

A1: Yes, definite differences are. Mathematics is simple and short.

Mathematics. No proof and no assumption are required. The partial is consistent with the whole.

Economics. Theory does not mean Practice. Empirical proof differs by the length and timing of chosen data, which change over years, never repeating the same result while theory demands equations and rules or Kaldor's stylized facts.

Q2: Does the *EES* stand for mathematics or economics?

A2: The *EES* stands for mathematics. Why? The *EES* matches mathematics completely, where endogenous equations measure all the parameters and variables, with no assumption and theory results equal endogenous results. As a result, the partial is always consistent with the whole in the *EES*.

Q3: Why is the *EES* able to prove macroeconomic hypotheses and/or rules while endogenous data change by country, sector, and year and over years?

A3: The *EES* has few hypotheses and/or rules. For example, the capital-output ratio remains unchanged over years, by country and by sector (the G and PRI sectors, just before tax redistribution). However, the *EES* finds many aspects between values and ratios. For example, six neutralities are empirically proved: Money-neutral of real assets to financial/market assets, consumption-neutral to growth and returns, the relative share of capital-neutral to macro inequality, deficit-neutral to most effective=most efficient , politics-neutral to optimum results, and spirituality-neutral.

Q4: Endogenous data in KEWT database-series are all endogenous: There is no initial data given in endogenous data. Why?

A4: The *EES* has no exogenous and no externalities. First, a given capital stock is input but, at once the capita-output ratio is adjusted so that the capital-output ratio is constant over years (e.g., 50 years). As a result, the initial capital stock immediately turns to endogenous. A reason comes from a fact of consumption-neutral that the consumption, individual preferences, culture, and national history are independent of technological progress and technology by country.

Q5: What is the relationship between E-Views and the *EES* and its KEWT database?

A5: Conclusively, the four assumptions indispensable in E-Views disappear in KEWT database. It implies that KEWT perfectly works as E-Views itself. The *EES* and its KEWT database, as a whole, unite macroeconomics and econometrics and others cooperatively, never against.

(7) What are key cores to integrate LONG (1960-2012) with Short (1990-2012) in KEWT database 8.14?

Q1: What is a crucial connector of the Key Cores of LONG and Short in KEWT database?

A1: The crucial connector is the capita-output ratio. The LONG and Short 1990 respective values must be the same and be equal to the initial 1960 value. This fact constitutes a unique Axiom and called the capital-output ratio-constant.

Q2: What determines the capital-output ratio-constant?

A2: *Directly* the speed years for convergence determine the capital-output ratio-constant. This fact shows an optimum endogenous-equilibrium. *Indirectly* some of seven endogenous parameters determine the capital-output ratio-constant and accordingly one of vital variables such as the growth rate of per capita national disposable net income. Results of *Indirect* determinants always match the result of the speed years for convergence.

Postscript

Q3: What are values/ratios vital commonly to any country?

A3: First of all, population and its growth rate, n, where the rate of change in population, n_E, is distinguished with n. Under $n = n_E$, the rate of unemployment is zero. Second, an endogenous ratio of net investment to output but, the higher this ratio the higher nominal growth is. This is because net investment is independent of technological progress and remains quantitative enlargement.

Q4: What is the difference between dynamic growth and steady/natural growth?

A4: No, essentially there is no difference between dynamic and natural growth. The difference appears when statistics data are used. Nevertheless, statistics data are always within a certain range of endogenous data, as proved in the *EES* and its KEWT database.

Q5: Does mathematics fully connect statistics data with endogenous data?

A5: No. Mathematics holds without assumption and does not distinguish partial from whole. Statistics holds with assumptions, as historically shown by David Salsburg (2001, 340p.).

(8) Wages between micro and macro

With review of Paul Hettler's "Firm Size, Wages and the Business Cycle – draft, 12 Oct 2013, at IAES Conference, Philadelphia.

Q1: Is micro consistent with macro? If it is consistent, how does each essence differ respectively?

A1: Yes, always consistent with each other. Macro holds; with endogenous equations under no assumption and solely policy-orientation. Micro, households and enterprises, each holds; with tools of economic and econometrics under assumptions, strategies, unknown parameters, and externals, and wholly based on macro endogenous data.

Q2: What is the difference between strategies and policies economically?

A2: Micro and strategies are individual-oriented and never separated. Macro and polices are unity-oriented and never separated. Nevertheless, macro-policies always require micro-strategies. This fact is similar to results of the market principles. The market principles do not clarify true causes, due to vertical characteristics of the market principles by goods and services. As a result, strategies and policies are integrated or micro and macro are united.

Q3: What causes essential differences between micro and macro? What expressions are endogenously suited for macroeconomics when firm size, wage level, and business cycle in micro are integrated?

A3: A unique cause of essential differences between micro and macro is whether *just after* redistribution of taxes to national disposable net income, or *just before*: size $= Y_G/Y = T_{AX}/Y$. In the *EES* and its database, corresponding definitions are size $= Y_G/Y = T_{AX}/Y$ *just before*, and macro-wage level W in $Y = C + S = W + \Pi$. And business cycle is the same, although macro-business cycle is measured accurately using Hicks' (65-82, 170-191, 1950) sin function, which is derived from hyperbola function endogenously. Most easily, Norway has business cycle as it likes. Contrarily, Philippines is most severely located between consumption and net investment and hardly control business cycle level among 86 countries, 1990-2012.

Q4: What are the macro level results of workers' endowment and returns of investment at firm level?

A4: Profit maximum principle in firm level is always consistent with stop macro- inequality. Behind of this proof, the relative share of capital-neutral and also, politics-neutral exist and reinforce both at the micro and macro levels. Profit maximum is united as return max with net investment min, as shown by two-dimension plane hyperbola, 2DPH (see Home page of www.megaegg.ne.jp/ kamiryo/).

Q5: What is your answer to the micro level when the real rate of return=zero (*RRR*=0) at the macro level?

A5: It implies that the nominal rate of return corresponds with the rate of inflation/ deflation. At the macro level, global competition turns to the qualitative net investment improvement from *GDP* competition. Further, when *RRR*=0, policy-makers by country attains the rate of unemployment=0 under no inflation/deflation if requirements are executed. As a result, firm level competition directs real basis from nominal competition by country, supported by money-neutral.

Postscript

More data sources for readers:

http://www.megaegg.ne.jp/~kamiryo/

For the author's papers after 1980, enter *Hideyuki Kamiryo* on the Navigator of National Institute of Informatics, Scholarly and Academic Information: http://ci.nii.ac.jp/
The *EES* is indexed by RePEc: http://ideas.repec.org/i/b.html
And, BAP website: http://www.bapress.ca/ees.php

Acknowledgments to the publisher, *Better Advances Press*, *Toronto*, and to Dr. Yisheng Huang, the Editor: Yisheng and Hide identify the task one can venture only at the risk of one's life. We thank God and the Nature everlasting.

More fundamental Q & A: Q&A based on James Tobin1980

The author sincerely respects life-time behavior of James Tobin (3 March 1918-11 March 2013), full of politics-neutral and spirituality-neutral. The author summarized Q & A file, using the following book (1980): *Asset Accumulation and Economic Activity*. Chicago: The University of Chicago Press and Oxford: Basil Blackwell. 99p.

The above book is composed of four sections;

I Real Balance Effects Reconsidered. 1-19.

II Policies, Expectations, and Stabilization, 20-48.

III Government Deficits and Capital Accumulation, 49-72.

IV. Portfolio Choice and Asset Accumulation, 73- 96.

For each section, the author set up 9, 12, 9, and 10 Q & A number, whose total number is 40. Besides, the author cites eleven equations, 68-68 in section III, and 86-87 in section IV, Tobin stated in each section.

The author has no intention to criticize in the above Q & A, with approval or disapproval. Keynesians, neo, post, and new, and neoclassicists, each has its own aspect and design modeling, with assumptions. The truth is the same, regardless of whether or not each is apparently against. Both schools and any other are harmoniously united as a whole. This is the truth, consistently with the *EES*. In this respect, Tobin's analysis is most wide and deep and, satisfies six nature-neutrals (see Essence of the *EES* in the 2nd edition).

The author is afraid that in the 2nd edition there is no space for special Q&A based on James Tobin1980 (18 pages). Readers, in this case, are able to get Q&A based on James Tobin 1980 by contacting Better Advances Press, Toronto.

Finally, let us imagine some typical difficult countries such as Luxemburg (matured), Philippines (emerging), and Kuwait (without the market principle). Any country has its own non-zero technological progress, independently from preferences (national taste, culture, and history), regardless of the level of population and its changes (increasing or decreasing) and also the level of net investment and its smooth or sudden changes.

Let us start with the speed years for convergence by country and by sector (Total, Government, and Private sectors).

(1) Consumption and the propensity to consume are smooth in the long run. When consumption is rapidly moving in the short run, net investment naturally supplements its unstableness. But, net investment and returns march in parallel.
(2) The balance of payments determines the difference between saving and net investment. Total taxes determine G net investment, which must be plus and minimum: the smaller taxes the smaller G net investment is and, vice versa.
(3) If the balance of net investment between G and PRI is unstable, the speed years fluctuate under the endogenous-equilibrium or with six neutralities, where Adam Smith's no artificial policy is ideal. Philippines simultaneously aims at consumption and net investment, similarly to some other emerging countries.
(4) When the capital-output ratio in the initial year (1990) equals that in the last year (2012), the speed years are most sustainable. This is Axiom we find as ultimate endogenous. When it is most difficult, there are peculiar reasons by country.
(5) A common reason is how we can easily minimize net investment by country, and year and over years. The size of government is the ratio of taxes to G output, which determines every result regardless of several % or triple dozens %.
(6) Minimized net investment is most easily in reality when deficit equals zero. Zero-deficit is one of six neutrals but most simple and effective=efficient. Zero- deficit holds regardless of the market principle. Saudi Arabia is typical.
(7) When technology does not progress steadily, the speed years repeat up and down unexpectedly and suddenly. Luxemburg and Kuwait is typical. Net investment remains an emergency treatment. The market principle is still beyond technology.
(8) The above fact-findings remind me the past date, 14 Oct 2005 when I could visit and meet policy-makers and researchers at Finance Canada and Statistics Canada, helped by Andrew Sharpe, IARIW, Ottawa. My questions were: i) What is the first priority of economic policies? ii) What is the second priority? iii) What is the third priority? Their answers were the same: only for the next generations we follow no deficit in the long run. This is the way how to recover blessed prosperity in the 1960s. Empirically, their unique answer overlaps Samuelson's (1938, 1939, 1940) earlier statements.

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(1) Tobin, James. (1981). The Monetarist Counter-Revolution Today—An Appraisal: 29-42.
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(4) Netzer , Dick, State-Local Finance and Inter-governmental Fiscal Relations.

Keywords for *Earth Endogenous System*

17 Couples of Contrasting Keywords		
Assumption *vs*. Equation	Discrete *vs*. Continuous	Endogenous *vs*. Exogenous
GDP *vs*. NDI	Hyperbolas *vs*. Parabolas	Maximize *vs*. Minimize
Optimum point *vs*. Its range	Symmetry *vs*. Asymmetry	Theory *vs*. Practice

Database *vs*. Recursive programming	Government sector *vs*. Private sector
Heterogeneous *vs*. Homogeneous (in capital stock)	Policies *vs*. Strategies and tactics
Price-equilibrium *vs*. Endogenous-equilibrium	Real assets *vs*. Market/financial assets

Cobb-Douglas (C-D) production function *vs*. Non C-D equation
Constant returns to scale *vs*. Increasing and diminishing returns

22 Independent Keywords				
Expectations	Money flows	Perfect competition	Phillips curve	Scientific discoveries

Actual and endogenous taxes	Balance of payments and deficit	Elasticity of substitution, sigma
Flows and stocks by item	Marginal productivity of capital	Marginal productivity of labor
Marginal productivity theory	Monopoly, duopoly, and oligopoly	Under no assumption

Speed years by country and by sector	The endogenous Phelps coefficient
The endogenous valuation ratio	Three equality of income=expenditures=output

Distribution of income before and after taxes to government (G) and private (PRI) sectors
Rate of return & the growth rate of output in equilibrium
Rate of technological progress (FLOW) and the growth rate of total factor productivity (STOCK)
Redistribution of income to households and enterprises

On March 14-17th, 2013 the author joined the 10th Biennial Pacific Rim Conference, Western Economic Association International (WEAI), Keio-Kyoto, Tokyo. The number of total Sessions was 140 and, 40 researchers joined from countries beyond Pacific and Asia area. The author's Session was 87 but, the author participated as many sessions as possible. In the related sessions, the author replaced, in his mind, discussants' statistical analyses from the Endogenous System point of view. The author himself confirmed that their statistics and external data were within a certain range of endogenous data and that the sub-title of this book, "To answer the Current Unsolved Economic Problems," was not exaggerated, after listening to discussants' basic points. And, the author was grateful to a universe speech at the Dinner Reception, American Club, by Darwin C. Hall, Managing Director, WEAI.

In particular, Fuess' discussion empirically but differently proves a base of the EES. Scott Fuess denies two Laws, Gibrat's and Zipf's, empirically and up-dated. The author understands that there exist similar results between central, local, cities, and areas, regardless of the difference of each *size*.

Subject Index for Part N, Part I and Part II
(Indexed by chapter, separated)

Subject Index for Part N (Notations & Notes)

Notations

Notes

Subject Index for Part I (Chapters 1 to 10)

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Chapter 16

Appendices