

# 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.

## Chapter 1

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

<b>Under the price-equilibrium</b>	<b>Under the endogenous-equilibrium</b>
<i>continuous</i> , dynamic, non-linear.	<i>discrete</i> , 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.
<b>Externally/exogenously</b> (from the market)	<b>Purely endogenously</b>
the rate of interest.	the rate of return, $r = \Pi/K$ .
the rate of inflation.	the rate of inflation/deflation, $r^* - HA_{r^*(t)}$ .
the rate of unemployment.	the rate of full/un-employment, $n_E = n$ .
<b>Assumptions</b> , apparently unrealistic	<b>Under no assumptions</b> , 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, $\sigma = -\frac{\Delta k/k}{\Delta(r/w)/(r/w)}$ .	$\sigma=1.000000$ by year in the transitional path.
perfect competition	turns to no assumption, as above.
2. cash flow-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, <i>homogenous</i> .	<i>heterogeneous</i> , 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.	$r^* = g_V^*(\alpha/i \cdot \beta^*)$ , as Phelps' endogenous.
7. maximum, parabolic, topology.	$r_{MAX}$ with $i_{MIN}$ , hyperbolic, measured.
<b>Eventually the literature and the <i>EES</i> 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.</b>	

## Summary of the *EES*, Introduction and Framework

---

**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

## Summary of the *EES*, Introduction and Framework

---

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 2<sup>nd</sup> version, includes database of 32 countries, 1990-2006. KEWT 3.09, the 3<sup>rd</sup> version, 61 countries, 1990-2007; and KEWT 4.10, the 4<sup>th</sup> 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 5<sup>th</sup> 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 6<sup>th</sup> version of KEWT 6.12, 81 countries, 1990-2010, principally holds under full-employment. The current 7<sup>th</sup> 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 (IFS)*, IMF. The *IFS* 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 *IFS*. 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 *IFS* 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  $Y = \text{net income} = \text{expenditures} = \text{output}$  (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

## Chapter 1

---

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.

## Summary of the *EES*, Introduction and Framework

---

(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

## Chapter 1

---

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 exists. Other differences related to final redistribution



## Summary of the *EES*, Introduction and Framework

---

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.

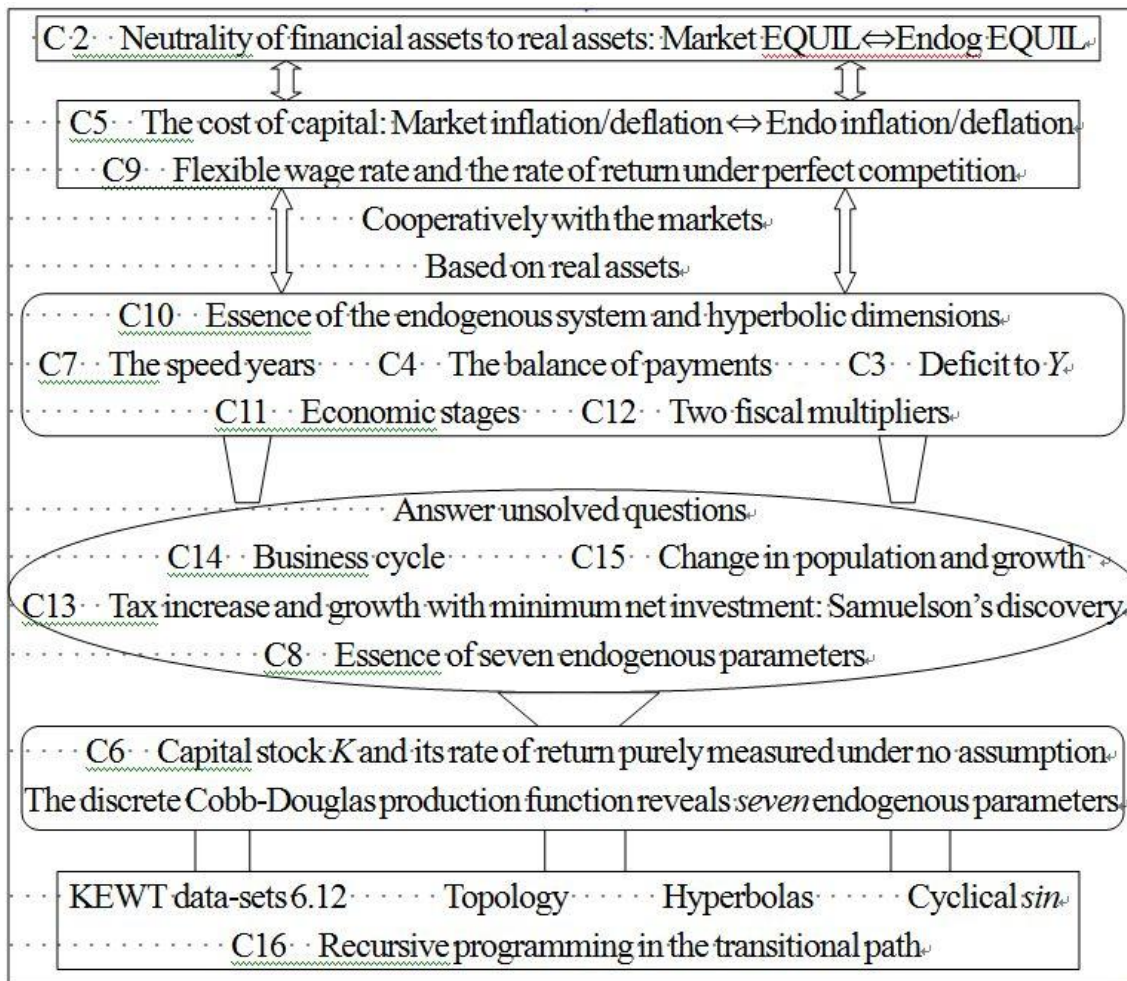
### **BOX 1-1** Order of 16 chapters, with special notes

Chapter 1 Introduction and illustrative framework.
Chapter 2 Money neutrality: data 1990- <b>2005</b> , 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, <b>1960-2010</b>, 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- <b>2009</b> .
<u>Chapter 10 Endogenous system with its dimensions (Hyperbolas by country): data <b>1990-2009</b>.</u>
Chapter 11 Economic stages: data 1990- <b>2009</b> , 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, <b>1960-2010</b>, 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.

## Chapter 1

### 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.

## Summary of the *EES*, Introduction and Framework

---

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.