Chapter 17

Axiom Omega in the Endogenous-Equilibrium:
with the Speed Years for Convergence

Samuelson (1970) proves: The capital-output ratio is constant. This constancy is a core of economic models/systems, beyond space and time. The author proves this constancy empirically by country and by sector (for aggregated total economy disposable income, *Y*, composed of government and private sector just before redistribution of taxes). The whole version of this constancy is designated by 'Axiom Omega.' Axiom Omega circulates so drastic that it constitutes unique core of purely endogenous, algebraically and geometrically.

Axiom Omega march with the author's patent that averaged Omega during applied periods/years equals the initial Omega, which equals the last Year's Omega. As a result, what is most pertinently expressed in the author's database(the KEWT 9.15, 1960/1990-2012, for 65 countries, by country)?

The speed of years for convergence (hereunder, the speed years) does express the essence of Axiom Omega and averaged Omega during applied years. Once the speed years are measured, all the parameters and variables in the *EES* remain unchanged by country and by sector (for total economy, the government (G) and the private (PRI) sector).

As a result, the wage rates, nominal and real, and the rate of inflation/ deflation immediately disappear with un-employees in reality, reinforcing the market principles in the global world. Here, the original data is *International Financial Statistics Yearbook*, IMF, by year and over years.

Any country, regardless of democratic, dictatorial, and/or no market system, needs one condition that any policy must follow the market principles prevailing historically with human life. Even if a country's policies neglect the market principles, the speed years for convergence lead universal results by nature, just like Adam Smith's laissez-faire.

In short, the speed years cannot be controlled by policy decision-makers. Causes quantified in the real assets instantly express dynamic and static balances between the government and private sector.

1. Introduction

This chapter clarifies the essence of a new discovery of 'AXIOM Omega', and deepens its implications, with its evidences from the author's database. AXIOM Omega is designed for constancy of the capital-output ratio, as proved by Paul Samuelson (1970) mathematically. Without AXIOM Omega, any database is finalized so that for key point, Questions and Answers (Q&A) might be helpful to readers' further understanding.

Theory's evidence is The KEWT (Kamiryo Endogenous World Table) database 9.15, LONG 1960-2013 and, Short 1990-2013 shows theories' evidences. Original data are taken from ten real assets and also fifteen financial/market and external data [1] in *International Financial Statistics Yearbook* (*IFSY*), IMF, by years and over years. The database 9.15, for the first time, satisfies requirements of AXIOM Omega by country and by sector (where total amount T=government G+ private PRI).

The *HEU* is geometric-oriented and absorbs algebraic equations in the *EES*, where AXIOM Omega inevitably and ever consistently prevails in the *EES* and the *HEU*.

The capital-output ratio, Omega, must be theoretically constant, as proved by Samuelson but, how is this constancy calculated in a database? One point is how to calculate 'average' with least time or in a minute regardless the number of years/periods. New discovery is that if the initial Omega and the latest Omega are the same value, average is the same. As a result, AXIOM Omega solves it problem, accurately and free from time consuming.

The author naturally pays attention to the future perspectives in Japan. Q&A: How does Axiom Omega face at culture and civilization by country? How about the case of Japan? We recognize peaceful uniqueness of culture and civilization in Japan. AXIOM Omega produces constant capital-output ratio, which is independent of individuals and people since national taste and preferences preserved with consumers.' Therefore, Western and Orient culture and civilization are destined to be harmonious.

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[1] For external data; the market interest rates, short and long, the rate of inflation/deflation (i.e., minus inflation), the rate of unemployment, the ten year market debt yield, money supply (M2 or equivalents), the exchange rate, and a few price and wage indices, as shown in the *IFSY*, IMF.

The KEWT database 9.15 digests all the data of *IFSY*, including external data and, converts them to endogenous data.

2. AXIOM Omega: Core of new discovery

The *EES*, the *HEU*, and KEWT database 9.15 succeeded in evidencing Axiom Omega, supported by copyright as intellectual property.   This patent has been in pending status since July 2014.

'Axiom Omega' indicates 'constant capital-output ratio over years' by country. Origin of Axiom Omega is Samuelson's (1936-37, 1970) mathematical proof.   The author defines Samuelson's proposition by $'\Omega = \Omega^* = \Omega_0 = $ constant$'$.   Axiom Omega, as a fact, actually states that if the capital-output ratio is unstable by year and over years, the endogenous-equilibrium often requires 'endogenous-shocks.'   The author's new discovery of Axiom Omega is such that the *EES* and the *HEU* do not evidence time series of $\Omega \neq \Omega^* \neq \Omega_0 \neq$ constant but, $\Omega_{AVE} = \Omega_{initial\ year} = \Omega_{the\ last\ year}$, where the average is set by $\Omega_{AVE}(\Omega_{initial\ year}, \Omega_{last\ year})$ instantly in the Excel.   Therefore, Samuelson's proof is now concretely replaced by Axiom Omega in this chapter. Axiom Omega generally holds and is evidenced by the KEWT database 9.15, commonly and globally in any country in the world.

A broader question in harmony with the *EES* and *the HEU*:   What discoveries does Axiom Omega find in 'individuals and individuals' systems,' and also in 'culture and civilization'?

Economic activities are endowed with a scope of cyclical business cycle in the real assets.   Cyclical business cycles express an essence of the endogenous-equilibrium and endogenous-shocks.   Policy-makers cannot control business cycles but have to willingly accept all the sorts of endogenous-shocks in business cycle circulation.   Endogenous-policies and endogenous-shocks march together.   Policy-makers must understand that endogenous-shocks significantly differ by country but, produce and actualize the essence of business cycles.

In another way, cyclical business cycle appears under perfect competition with no assumption, simultaneously resulting in causes=results.   Policy-makers must perceive that they never manipulate and control cyclical business cycle for more than half a year.   The oneness of root and trunk presumes and constitutes Axiom Omega.   Axiom Omega is a key/core for the *EES* and the *HEU* smoothly to be a whole system.

Now, individuals and national taste (i.e., preferences, culture, and history, by country) does not influenced by Axiom Omega.   This is because Axiom Omega is completely independent of individuals and national taste.   Or,

movements of or changes in endogenous and actual data are independent of Axiom Omega. Axiom Omega works for the capital-output ratio and the rate of return, without changing the relative share of capital.

Is globalization among countries independent of culture and civilization by country? Yes, it is. Why? This is because Axiom Omega is free from the market principles. Accounting and statistics and also the *EES* and the *HEU* accept the same market principles. Accounting and statistics, however, cannot explain causes of data-results due to vertical characters by goods and services. The *EES* and the *HEU* adversely explain causes of data-results, due to organic or purely endogenous mechanics.

Simply, Axiom Omega is a savior for all the systems of accounting, financing, management, and economics, macro and micro. Axiom Omega makes the *EES* and the *HEU* perfect under the same market principles and using the KEWT database 9.15. Endogenous data and actual statistics data are united and harmonized with each other. There is a friendly world in reality, finding no enemy. Individuals and people stand another side, scientifically (algebraically and geometrically) in the two-dimensions of plane.

3. In the endogenous-equilibrium

After discovering Axiom Omega, the author completely satisfies with relationships between the seven endogenous parameters [2] and resultant fundamental ratios. This section presents resultant fundamental ratios.

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2 These seven parameters are

1. The capital-output ratio, $\Omega = K/Y$ and $\Omega = \Omega^* = \Omega_0$: $\Omega^* = \frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)(1+n)+n(1-\alpha)}$.

2. The technology coefficient: $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$.

3. The DRC (diminishing returns to capital) coefficient: $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$ and $B^* = (1-\beta^*)/\beta^*$.

4. The level of technology (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 KEWT database. In recursive programming for the transitional path by year, $W \cdot L = \Pi \cdot K$ holds at convergence of the speed year time, $t^* = t$.

6. The relative discount rate of consumers goods to producers goods, ρ/r, and $(\rho/r)(c)$.

7. The elasticity of substitutions, $\sigma = \frac{-\Delta k/k}{\left(\Delta\left(\frac{r}{w}\right)\right)/\frac{r}{w}}$ This Note, citing from the *EES* 2nd edition, pp. xxix).

Conclusively, Axiom Omega does not change all the endogenous values and ratios in parameters and variables, independent and dependent, except for two ratios; the capital-output ratio and the rate of return. Repeating, the capital-output ratio and the rate of return both complete, by discovering Axiom Omega.

3.1 With the speed years for convergence

This sub-section summarizes the first half of the author's key ratios.

This section is composed of three items: (1) $Y_G/Y = T_{AX}/Y$, (2) the ratio of the balance of payments to output, BOP/Y, and (3) the ratio of deficit to output, Deficit/Y, where *Y* is national disposable net income after capital consumption. Note; the author does not use Italic for ratios while for absolute values, Italic. If static and dynamic balances between BOP/Y and Deficit/Y overrun a certain limit, data results lose robustness and suffer from how to recover moderate balances.

Among others, the speed years for convergence by sector are most smoothly measured.

Let the author explain why and how the speed years are measured most smoothly after the discovery of Axiom Omega. Differences of the speed years between before and after Axiom Omega are the following:

(1) Before Axiom Omega; some values of the speed years show '#NUM!,' due to i) rapidly changing unbalances between the G and PRI sector and ii) technical difficulties to calculate relationships between the DRC coefficient, δ_0, and the qualitative technology coefficient, $B^* = \beta^*/(1 - \beta^*)$, where minus values are often converted to plus values by using 'absolute' (ABS) in the Excel.

(2) After Axiom Omega; similar results occur yet, much more smoothly measured without exceptions. When decision-makers of a developing country execute simultaneous promotions for improving investment and consumption, the situation becomes rather aggravated. Or, when decision-makers of a dictatorship country do not follow the market principles, the situation arbitrarily becomes aggravated. Policy-makers need to perceive that the market principles are next to Nature/God in macro economies.

The speed years are expected to be smooth and stable over years. When sharp up and down of the speed years or sudden 'endogenous-shocks' appear in

a country data, then true causes always exist in the real assets. These endogenous shocks are never deleted, unless leaders of a country quickly take in endogenous policies towards moderation. Correct records are presented by the transitional processes of the speed years by country and by sector (i.e., for the Total economy, the government (G) sector and the private (PRI) sector). Therefore, the speed years for convergence perform reliable surrogate for endogenous-shocks.

Causes of these results are simply traced back to parameter-combinations in the seven endogenous parameters as a core of all the parameters and variables. A discrete Cobb-Douglas production function has its own limit theoretically and, this limit was solved by measuring the seven endogenous parameters, under no assumption on thousands of equations.

3.2 Starting with the relative discount rate of consumers' to producers' goods/services, $(\rho/r) = (rho/r)$

This sub-section summarizes measures and clarifies the mechanics of the most fundamental ratios in the *EES* and the *HEU*: An epitome of the *EES*, *the HEU*, and the KEWT database and, an accent of this chapter and other chapters in the *HEU*.

This sub-section is composed of nine items: (1) the propensity to consume, $c = C/Y$; (2) the relative discount rate of consumers' to producers' goods/services, $(\rho/r) = (rho/r)$; (3) the relative share of capital, $\alpha = \Pi/Y$; (4) the ratio of the rate of return to the wage rate, (r/w); (5) capital stock, *K*; (6) the capital-output ratio, $\Omega = K/Y$; (7) the rate of return, $r = \Pi/K$; (8) the wage rate, $w = W/L$, and (9) the rate of change in the wage rate, $g_w = (W_t - W_{t-1})/W_{t-1}$.

This sub-section reveals key ratios with equations. First of all, $(rho/r)(c)$ converts micro/individual utility to macro utility by using parabola equation, whose correlation R^2 is one, as proved in *Finance India* (XXIII, Sept, 2009: 821-866) by using the 1st KEWT database 1.07.[3] Origin of this thought comes from Samuelson's (1936-37, 1950) unique papers, as the author

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[3] For records of joyful recollection: Without idea of macro utility, the author could not get into the *EES*. In March 2005, the author enjoyed two week trip to snowy Swiss mountains, bringing Samuelson's two (1936-37, 1950) and Jan, Tinbergen's one copy (1960). The author continued to think of how to express utility at the macro level, in the trains and hotels in all over Switzerland and, was given a base of $(rho/r)(c)$. No use of parabola, except for $(rho/r)(c)$, in the *EES*.

summarized its core historically in the *EES* (for related equations, see pp. l - li, Note, 2nd edition, 2014).

Second, the Cobb-Douglas production function generally holds when the relative share of capital, $\alpha = \Pi/Y$, is measured. Nevertheless, the *EES* has the DRC coefficient, δ_0. Thus, δ_0 and $\alpha = \Pi/Y$ is a key for solving a discrete. This is because only if $\delta_0 = \alpha$, a discrete Cobb-Douglas production function generally holds. And, $\Omega = K/Y$ is measured, using $(rho/r)(c)$ and by $\Omega = \alpha/r$ or $\alpha = \Omega * r$. In short, the author's unique discrete C-D production function mechanically holds under the above circulation of equations in the discrete time. As a result, discrete is replaced by continuous consistently by year and over years.

This sub-section, accordingly, clarifies a new function of the wage rate, $w = W/L$. Conclusively, when $w = W/L$ increases over years, it implies that an economy is most robust. Or, the rate of change in $w = W/L$, $g_w = (W_t - W_{t-1})/W_{t-1}$, is plus over years, as evidenced by least deficit countries in the KEWT database 9.15. It is no problem for Sub-section 3.2 to omit eight items, (1) to (8), except for (9) $g_w = (W_t - W_{t-1})/W_{t-1}$. True reason is immediately traced back to (3) the ratio of deficit to output, Deficit/Y, in Sub-section 3.1.

This sub-section, besides, presents Axiom Omega in (6) the capital-output ratio, $\Omega = K/Y$. Accordingly, (7) the rate of return, $r = \Pi/K$, follows Axiom Omega with $\Omega = K/Y$. These two items are, of course, independent of all the values and ratios in the *EES* and *the HEU*, as shown by $\Omega = \Omega^* = \Omega_0$ and $r = r^* = r_0$ in this chapter.

Lastly, let the author close this sub-section by summing up the relationship between parabola and hyperbola. Related literature has conveniently used parabola for maximum profits or returns. Parabola is simply free from the two dimensions of plane and also from the horizontal and vertical asymptotes. The *EES* and the *HEU* conversely advocate hyperbola. This is simply because hyperbola solves maximum and minimum at the same time in the two-dimensions of the plane. The literature supposes that the larger the net investment the larger the profits are. This is not wrong but, does not distinguish qualitative with qualitative net investment.

The *EES* algebraically measures the qualitative technology coefficient, β^*, and also the qualitative technology coefficient, $1 - \beta^*$. As a result, net investment is sum of qualitative and quantitative net investment. Despite, the

author' discovery is: the smaller the qualitative net investment the more robust an economy is. This is an endogenous definition of minimum net investment. Hyperbola, both maximum and minimum, presents optimum-combinations or, the rate of return maximum, r_{MAX}, and net qualitative net investment minimum, $i_{MIN(I/Y)} = i_{I/Y}(1 - \beta^*)$. These two ratios constitute optimum-definition and also, optimum-measure of net investment and returns/profits, r_{MAX} and $i_{MIN(I/Y)}$. The optimum-measure is immediately replaced by geometric mechanics or diagrams, as the author advocates harmonious algebraic equations and geometric diagrams in the two-dimensions of plane.

4. Evidences: Between three scopes

Let the author begin with three scope-questions:

(1) What are data differences between matured and developing countries?

(2) What are data differences between the government and private sector just before redistribution of taxes by country?

(3) What are differences between the balance of payments and deficit by country?

The author answers the above three questions, by using 'the speed years for convergence' as final results, and by generalizing each to some extent.

(1) Between matured and developing countries:

It is a fact that a developing country gets into a matured country by taking long periods. It indicates that net investment-oriented stage smoothly arrives at consumption-oriented stage. The author asserts that no compulsive policy is generally required; so called laissez-faire is the best. Reason comes from the author's philosophy of the negative and positive principle, derived from the two-dimensions of the plane in the *HEU* and, measured initially by algebraic mechanics or equations in the *EES*.

Some non-democratic countries take their own economic policies. These activities are quite all right, similarly to individual's preferences. These activities, however, need one condition that any policy must follow the market principles prevailing historically with human life. If a country's policies neglect the market principles, the speed years for convergence express arbitrary results. In another way, the speed years are natural and inclined to direct towards moderation, whose extremity is no measureable, i.e., the origin. If

policy-makers and leaders neglect the above one condition, they are fruitlessly suffering from endless activities all the time with no hope to recover.   Policy makers and leaders, young and old, should perceive this fact by country.

(2) Between the government and private sector:

 Policy-makers and leaders process their target over years.   Generally, a developing country first invests in infrastructure.   Despite, the private sector later may or may not get initiative leadership.   This is because infrastructure needs other related policies and supporting strategies, with right education for individuals and people.   The whole activities determine the speed years for convergence.   Therefore, there are several resultant patterns in distribution of cash/funds between the government and private sector.   When leaders often changes in a short run, long-policies are not taken so that the speed years for convergence continue to aggravate.   This is simply shown by data trend of the wage rate.

(3) Between the balance of payments and deficits:

 There are several patterns here again.   Are 'Twin Deficits' worst always?   No, never.   For example, watch the US.   Data trend of the wage rate is better than most countries.   Why?   Again, an economy needs a whole set of policies and strategies, with right direction of education.   According to the *EES* and the *HEU*, the level of democracy is measured continuously and accurately, as presented in another chapter in the *HEU*.   Problem is not the relationship between the balance of payments and deficit but a whole system of a country.   Watch the rate of change in the wage rate in the US, with the size of government that is determined by the average calculated during applied periods, $Y_G/Y = T_{AX}/Y$.   The average level of $Y_G/Y = T_{AX}/Y$ in the US is lower, compared with other matured countries.

 Small-sized countries, North European countries have large size of government.   This fact is sustainable since there is no difference tween people and government in small-sized countries.   In another way, small-population countries can take quick and speedy activities by each government, conquering difficulties inevitable in government deficit.   People always watches government and politics, where politics-neutral does not work but real democracy prevails naturally and realizes vote=policies.   There is no room for interest-group oriented.

Do we need the spirit of Joseph Schumpeter's (1928, 1939) 'creative destruction' more softly and wholly as a system?   No, basically.   This is because 'creative destruction' remains some expression of actual results while the speed years tell us causes in the real assets.

Do we need to inspire behavior of policy-makers by using 'Policy-Making Game'?   Let us remind of Peter Drucker's (2002) life-time employment system. The author's (1964) "*Business Game*" is learning by doing, by nature. Learning by doing will answer in reality as well as endogenously.   Utopia economy comes nearer by country and sector, solely by learning by doing.

Broadly, the author's answers are the following: Truth exists closer to Nature.   Individual and family is base for society.   Fortunately Nature and God gives human specified body that differs from all the living things. Typically, body of man has 'Hippocampus' in brain.   Human body has the five senses.   Among the five senses, one sense is smells.   Smells is Nature itself and works by Hippocampus that is separated from the four other senses to 'think of,' given only in human body.   Therefore, individual, family, and society need to have Nature itself somewhere.   This is the *EES* and the *HEU*.   Utopia economy is destined to come when the essence of the *EES* and the *HEU* works just like body's Hippocampus.

5. Conclusions

This chapter discusses the author's Axiom Omega and its implications. Axiom Omega, in the *EES*, does not change any data, except for the capital-output ratio and the rate of return.   Nevertheless, the *EES* and the *HEU* are completely renewed by the use of Axiom Omega.   Axiom Omega discovers a fact that constant capital-output ratio over years is preserved, solely by comparing the last year's one with the period-average for applied periods, and supported by patent, now pending.   Origin of this idea is Paul, Samuelson (1936-37, 1950, 1970).   The author surprisingly records here a fact that mathematical proof of Samuelson (1970) solely determines all the mechanics of all of macroeconomic systems, as well as the *EES* and the *HEU*.

The *EES* of algebraic mechanics or equations and the *HEU* of geometric mechanics or diagrams maintain consistency with Axiom Omega, in spite of a fact that all the parameters and variables remain unchanged, except for the capital-output ratio and the rate of return.   The essence of the *EES* and the *HEU* is cultivated.   As a result, the author is able to answer whatever questions

more harmoniously with the current stream of the literature. Axiom Omega recollected historical accumulations of macroeconomic literature.

For evidences, see **Tables 1, 2,** and **3:** Speed years for convergence, by country & sector; Total, Government, and Private (T, G, and PRI)

Speed years vividly and precisely express cyclical business cycles and static and dynamic balances between the government and private sectors by country, with true causes in the real assets. The author is newly fascinated by the importance of learning by doing, without which the author could not complete the *EES* and the *HEU*. The author feels genius for MS software up-dating, particularly in the Excel.

In Short, macro-utility measure was inspired by Samuelson (1936-37, 1950) and Jan, Tinbergen (1960) and, is the first step for getting into the macro level, free from individuals and the micro level hitherto prevailing in the literature.

Finally, look at the last row of **Tables 4** and **5,** $g_w = (W_t - W_{t-1})/W_{t-1}$, by country. This row shows robustness of each economic policies in the real and financial/market assets, under the market principles. This is a litmus paper for all the policies and strategies executed by policy-makers and leaders. In another way, full-employment with no inflation/deflation is guaranteed by this litmus paper, all mighty, or toss. Evidences show this fact by using 68 country KEWT 9.15, LONG 1960-2013 and of course the same 68 country Short 1990-2013. This is due to a fact that actual statistics data are always each within certain range of endogenous data, by country, sector, and years and over years.

Table 1. The US, the UK, Sweden, and Japan:

The speed years for convergence by country (1)

	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$
	the US			the UK			Sweden			Japan		
1960	47.18	51.84	48.49	48.09	23.77	61.83	26.37	219.94	31.15	3.59	99.63	4.17
1961	47.34	40.86	50.41	49.61	29.03	59.44	27.80	176.06	25.19	0.60	42.54	1.20
1962	43.97	35.20	47.67	61.97	71.17	61.33	27.92	1057.89	26.89	21.53	62.32	9.21
1963	44.73	46.39	46.19	62.26	70.77	63.86	27.48	55.57	27.40	112.55	34.37	860.48
1964	44.97	38.86	48.02	38.91	30.25	42.70	25.47	41.45	24.91	41.01	21.57	46.63
1965	37.87	53.12	37.52	42.34	27.36	48.80	23.98	38.29	24.05	31.54	13.61	40.13
1966	36.02	66.92	34.84	44.16	38.31	47.17	25.53	56.79	23.45	25.61	11.69	32.46
1967	39.11	87.44	36.63	40.23	22.47	47.93	26.61	44.52	25.46	21.15	13.71	25.22
1968	39.03	36.44	42.51	35.77	38.78	36.68	27.37	92.29	22.60	19.96	14.79	22.99
1969	38.54	110.11	35.54	38.52	61.75	34.12	27.06	54.94	24.41	19.20	16.70	21.46
1970	43.79	99.70	42.83	39.50	74.39	34.06	24.27	22.81	27.10	18.56	18.27	19.78
1971	39.92	54.98	43.79	44.15	66.19	42.06	30.93	36.97	30.67	19.99	19.24	21.24
1972	36.66	48.14	40.05	47.65	18.81	62.89	31.12	34.72	31.15	19.49	16.25	21.93
1973	33.59	52.00	35.55	37.23	13.46	54.06	34.25	31.38	36.46	17.94	16.20	19.56
1974	35.50	95.66	33.89	38.01	9.22	63.76	26.36	18.79	29.95	18.01	16.82	19.09
1975	45.52	34.67	50.48	131.10	5.18	49.87	27.02	62.22	25.95	20.74	10.62	29.17
1976	37.29	18.26	42.96	3.03	2	4.48	28.03	2658.56	26.39	21.72	10.80	33.55
1977	31.94	55.03	31.61	3.18	9.26	5.73	38.86	329.30	37.01	23.17	10.71	41.73
1978	28.35	37.84	28.86	4.79	1.84	4.27	59.92	18.28	80.58	23.63	10.62	50.61
1979	27.75	73.21	26.38	5.71	3.58	3.81	40.00	8.22	56.79	22.16	11.50	42.91
1980	32.28	54.81	32.76	9.64	12.95	10.28	38.04	11.86	55.31	29.79	12.17	51.91
1981	29.52	83.76	29.50	19.74	30.81	31.25	98.43	24.43	14.17	30.22	41.91	30.93
1982	37.28	24.19	41.89	22.31	236.92	14.87	1.40	38.40	5.20	33.80	50.99	33.53
1983	37.08	7.09	56.30	15.84	140.93	10.20	8.17	44.42	0.68	40.11	78.51	36.95
1984	27.95	10.53	34.29	9.32	29.62	5.80	8.40	186.65	2.37	39.34	32.09	44.31
1985	30.84	10.61	39.12	7.25	27.78	5.00	2.64	65.15	3.07	39.57	46.05	39.19
1986	36.54	12.92	45.92	1.42	24.44	3.42	0.08	25.24	8.57	33.82	100.23	29.67
1987	37.46	38.30	38.41	5.06	18.07	1.67	22.78	117.48	163.60	31.03	189.23	25.60
1988	40.32	28.85	43.26	4.94	20.59	1.21	58.85	0.84	40.78	27.39	123.67	21.87
1989	41.45	41.34	42.37	1.35	18.01	4.54	149.02	5.45	18.97	25.30	162.04	19.96
1990	81.69	55.88	91.89	2.12	34.59	18.39	49.07	3.38	21.59	25.71	11.78	32.74
1991	73.23	46.57	82.00	27.91	20.37	166.25	46.52	0.52	34.94	27.46	12.37	38.06
1992	76.25	46.47	86.23	110.99	60.42	287.41	37.47	118.42	35.45	34.24	13.95	51.22
1993	62.84	26.27	74.61	127.61	71.93	3058	44.80	2.25	111.97	38.03	15.41	59.68
1994	56.28	26.41	66.20	76.26	116.48	1215	39.47	5.48	76.14	40.73	16.93	63.88
1995	60.42	28.49	71.48	11.59	0.40	38.63	38.25	10.00	59.42	41.03	18.67	59.45
1996	55.24	37.30	59.97	12.25	13.20	11.13	36.03	32.46	37.30	42.76	20.34	60.49
1997	47.62	38.81	50.07	11.94	29.81	2.65	42.68	37.59	48.16	44.73	25.01	57.09
1998	41.14	33.60	44.17	5.94	124.30	3.64	41.11	80.20	35.59	72.89	9.51	233.01
1999	34.23	37.23	33.83	35.77	350.28	15.83	39.82	107.20	35.77	107.50	24.52	218.95
2000	31.79	57.60	27.80	84.78	1966	63.19	38.38	597.17	27.65	83.12	17.93	267.38
2001	41.55	49.15	39.98	388.52	1011	482.35	43.60	182.66	33.65	134.71	45.70	212.96
2002	55.05	34.54	61.05	1619	106.10	627.22	49.93	53.27	53.39	451.76	24.92	165.82
2003	61.99	17.98	87.71	1784	29.98	33804	70.00	53.66	90.43	571.76	18.38	73.51
2004	57.54	17.11	82.32	382.90	33.51	1907	58.64	75.78	57.64	402.45	102.54	352.95
2005	59.56	39.62	66.12	217.80	19.05	406.85	60.45	131.17	49.31	588.73	94.08	59.33
2006	46.57	44.90	47.71	159.31	96.79	308.11	58.77	226.02	43.39	1326.15	114.62	802.43
2007	55.17	50.64	57.47	150.55	55.85	232.48	56.19	214.44	39.48	882.61	560.66	1040.21
2008	74.74	37.36	88.35	162.01	28.92	223.17	64.46	122.39	56.39	292.78	84.69	759.23
2009	137.92	18.08	239.29	186.82	49.94	256.83	89.74	88.84	98.21	205.41	15.47	106.92
2010	133.01	21.40	171.94	153.61	17.41	236.53	64.67	98.89	59.89	129.73	18.31	209.98
2011	74.63	21.02	116.79	94.58	49.97	114.49	53.23	68.31	48.81	146.23	18.82	115.31
2012	72.67	21.75	91.64	103.12	31.99	128.80	56.97	68.61	54.74	311.77	17.61	115.31

Data source: The KEWT database, 1960/90 to 2013/2014, for 68 countries, whose original statistics data (10 real assets and 15 financial assets) are from *International Financial Statistics Yearbook*, IMF.

Table 2. France, Germany, Italy, and Spain:
The speed years for convergence by country (2)

	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$
	France			**Germany**			**Italy**			**Spain**		
1960	56.91	17.56	73.53	51.85	28.84	56.82	24.04	15.16	32.70	9.60	1.50	216.10
1961	58.87	18.26	82.61	50.81	57.89	51.35	22.87	15.90	29.13	7.69	82.62	21.75
1962	49.08	17.71	61.15	47.84	37.11	50.34	22.68	14.99	30.23	6.80	22.14	14.31
1963	49.13	17.03	63.46	49.63	48.83	51.19	22.21	15.62	27.36	6.64	18.23	11.96
1964	48.75	23.83	59.45	46.70	44.08	48.45	26.77	16.77	35.35	6.79	18.55	27.98
1965	40.13	25.85	44.71	40.48	46.51	41.24	35.30	13.30	72.15	5.38	18.87	18.88
1966	37.74	22.93	43.27	37.85	43.41	38.90	37.09	15.89	69.63	3.84	18.82	18.32
1967	36.79	19.85	44.80	42.16	36.07	44.28	33.24	16.47	60.39	0.23	19.61	17.97
1968	35.58	19.48	43.00	37.56	28.33	39.91	34.24	13.52	89.01	8.13	20.27	20.28
1969	33.69	20.28	42.04	35.26	35.93	36.22	30.37	14.74	84.07	45.68	22.48	16.28
1970	31.11	29.11	31.66	34.03	49.67	33.60	28.20	12.04	148.45	83.67	24.93	16.29
1971	29.52	23.90	31.27	32.76	35.04	33.97	25.96	10.71	2742.13	61.18	23.26	24.02
1972	27.96	46.54	25.62	31.10	29.87	33.11	27.03	10.50	1319.20	63.17	25.74	19.12
1973	27.96	34.43	27.08	31.60	44.82	31.45	21.83	9.73	15.22	65.31	25.85	13.90
1974	26.83	40.90	25.31	31.14	27.27	33.16	18.83	10.42	3.61	47.35	22.79	9.93
1975	30.24	27.60	31.21	39.78	13.29	50.24	25.36	7.43	209.98	35.41	20.90	8.50
1976	26.31	24.67	26.88	30.30	14.61	33.15	22.61	9.41	8.65	42.00	22.94	9.03
1977	24.59	25.71	24.62	29.44	27.52	30.01	29.42	7.74	20.31	253.25	24.61	9.83
1978	24.17	26.39	24.06	28.39	28.84	28.76	32.79	6.42	367.12	52.99	16.60	17.03
1979	24.31	24.87	24.49	29.55	26.74	30.83	38.42	8.42	21.29	34.13	14.31	21.56
1980	26.45	116.90	23.30	32.31	37.19	32.73	39.74	8.27	13.28	220.17	13.75	8.92
1981	30.38	26.52	31.85	36.06	35.45	37.30	43.24	6.84	19.50	12147	12.13	14.27
1982	32.23	18.79	37.01	33.45	30.90	34.13	47.76	6.06	43.88	229.87	11.56	14.96
1983	30.31	17.72	34.43	27.35	19.26	28.20	67.35	6.05	1122.04	141.56	10.76	18.87
1984	27.39	21.27	29.40	22.56	18.36	23.10	49.28	6.66	48.92	164.00	8.86	3068
1985	27.39	24.76	28.23	22.65	26.24	22.38	37.04	6.64	222.31	137.14	10.79	25.60
1986	26.99	17.77	29.83	22.51	36.94	21.97	35.26	8.67	133.46	189.64	16.07	15.92
1987	28.24	60.81	26.11	23.45	36.94	23.01	36.01	9.79	74.50	84.97	16.99	11.68
1988	28.14	26.01	28.92	23.76	19.27	24.89	31.52	10.27	40.97	37.65	16.88	9.10
1989	28.38	42.35	26.75	7.35	5.82	7.51	28.31	10.60	31.09	21.89	17.60	3.40
1990	40.61	20.02	54.91	37.80	23.51	42.82	27.98	24.57	7.90	21.39	21.55	2.13
1991	48.03	29.35	57.05	34.08	26.74	36.65	4.27	6.45	11.60	19.51	21.08	17.89
1992	63.05	24.81	81.98	35.66	29.95	37.94	34.02	28.55	10.08	24.98	23.74	60.78
1993	118.41	15.13	295.41	42.40	28.14	47.26	49.24	59.58	10.63	36.29	28.52	81.48
1994	94.23	14.49	254.58	36.69	38.06	37.31	45.80	49.68	9.71	40.09	28.81	79.81
1995	105.51	18.59	228.41	35.65	31.70	37.16	31.04	30.83	4.05	34.10	27.39	57.29
1996	168.14	21.72	187.08	40.72	31.91	43.42	39.58	21.79	2.47	35.88	28.51	55.21
1997	188.26	30.44	243.69	40.69	41.13	41.46	26.71	39.37	17.83	34.71	42.43	40.02
1998	106.57	33.81	205.78	38.11	30.79	40.40	36.15	44.38	7.47	32.93	94.68	31.10
1999	91.97	40.69	180.23	27.15	93.80	27.44	49.44	216.32	48.52	34.18	56.64	32.78
2000	62.22	57.42	78.78	21.56	31.97	21.00	42.73	9.47	50.40	34.98	560.36	30.78
2001	47.88	84.33	53.95	32.17	22.96	35.12	46.84	11.41	64.56	41.35	136.17	36.84
2002	56.72	42.02	73.05	37.91	19.69	43.47	46.58	31.71	52.69	40.42	78.96	33.41
2003	57.61	32.27	78.29	40.69	18.71	48.00	49.78	59.08	51.06	41.31	97.82	36.76
2004	76.91	52.39	93.55	60.27	25.55	72.67	11.27	22.03	7.18	37.70	194.12	33.43
2005	74.73	54.16	91.63	63.48	32.18	73.19	25.76	19.22	28.11	30.76	94.86	23.47
2006	56.48	55.20	63.05	59.15	37.17	64.87	42.15	40.23	43.79	24.99	110.56	17.76
2007	41.80	34.69	48.72	48.72	39.43	51.00	43.28	28.20	50.13	24.21	91.88	17.39
2008	42.05	31.66	50.48	45.26	33.87	48.47	47.72	22.39	61.63	32.62	107.44	31.93
2009	72.01	19.88	147.66	82.06	29.20	98.81	82.93	15.48	193.97	53.34	4.15	82.15
2010	69.44	30.83	104.92	67.88	23.89	85.03	60.46	18.00	99.50	68.24	13.65	95.45
2011	52.02	32.55	104.92	49.55	29.80	85.03	69.24	18.69	120.96	65.01	7.72	191.49
2012	57.37	39.23	69.64	60.52	42.62	63.23	106.72	23.64	207.20	92.53	4.14	40.47

Data source: The KEWT database, 1960/90 to 2013/2014, for 68 countries, whose original statistics data (10 real assets and 15 financial assets) are from *International Financial Statistics Yearbook*, IMF.

Table 3. Greece, Ireland, Russia, and Turkey:
The speed years for convergence by country (3)

	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$	$1/\lambda^*$	$1/\lambda_G^*$	$1/\lambda_{PRI}^*$
	Greece			**Ireland**			**Russia**			**Turkey**		
1960	23.15	11.56	15.81	106.50	10.37	177.24				74.68	29.24	61.87
1961	12.06	5.12	22.24	59.32	6.50	96.30				122.92	19.50	601.85
1962	12.29	26.64	28.88	53.31	7.28	81.08				84.87	18.44	78.27
1963	9.80	18.44	25.13	46.40	10.09	60.33				140.01	18.25	306.74
1964	7.50	14.76	16.55	37.22	8.01	61.75				78.23	20.94	140.40
1965	5.61	14.64	11.06	33.14	6.49	46.68				46.67	22.15	78.12
1966	3.50	15.97	15.11	42.20	9.63	71.96				55.22	19.75	900.55
1967	13.53	16.55	11.48	47.27	18.03	59.86				16.44	15.24	43.89
1968	3.49	15.62	15.31	36.84	11.00	50.31				17.26	15.11	122.42
1969	17.51	15.74	12.76	25.10	7.34	35.30				33.48	14.39	94.72
1970	274.47	16.23	14.47	27.54	8.77	37.71				14.76	15.43	91.82
1971	35.36	16.69	11.23	28.92	9.57	39.75				46.72	13.61	98.66
1972	24.23	15.73	8.03	26.92	8.48	42.28				8.03	15.69	104.49
1973	19.74	15.88	5.15	22.29	8.10	35.17				0.39	15.70	191.29
1974	26.12	14.40	10.02	19.42	4.51	29.66				6.92	15.06	114.60
1975	32.54	13.82	3.23	30.39	2.81	237.70				5.83	16.89	10.17
1976	38.01	14.31	2.88	27.35	4.79	646.59				6.39	16.24	9.59
1977	42.97	15.34	2.78	21.41	5.45	331.90				5.41	8.40	10.68
1978	58.76	14.85	4.15	16.86	4.41	1331.82				5.78	10.45	8.80
1979	84.30	15.86	3.44	13.84	4.71	45.16				5.52	7.57	9.20
1980	72.10	18.38	6.74	17.14	4.61	73.51				11.42	12.07	32.39
1981	85.82	8.39	0.25	16.56	3.77	90.87				7.88	20.55	9.62
1982	6.40	8.89	5.19	13.61	4.40	44.10				8.92	11.97	25.84
1983	6.96	5.79	3.64	14.78	5.99	32.99				8.81	10.21	25.37
1984	2.32	5.56	3.62	14.78	7.31	24.68				9.29	6.25	11.58
1985	8.48	34.09	8.68	15.29	8.04	26.71				7.37	7.39	79.63
1986	3.78	0.60	2.73	18.56	99.02	9.30				4.54	11.38	8.62
1987	1.37	1.95	1.16	19.37	150.30	10.79				5.17	13.44	10.79
1988	1.01	0.48	0.35	20.02	29.30	19.49				5.59	13.86	12.10
1989	0.06	0.33	7.96	15.26	35.02	14.24				4.33	11.48	8.50
1990	4.30	0.97	0.23	16.66	30.34	15.49				81.69	10.18	56.71
1991	6.99	0.20	3.14	20.40	43.14	18.02				51.85	8.61	27.32
1992	10.72	3.63	6.41	24.08	49.95	22.16				88.22	10.72	48.95
1993	8.10	1.53	7.11	26.00	47.90	23.74				2747	91.90	286.13
1994	11.94	0.26	13.44	25.79	39.30	24.06				311.11	17.80	111.91
1995	11.42	4.68	17.21	24.61	29.74	23.89	8.59	6.55	9.47	75.74	6.84	128.08
1996	14.10	5.64	22.94	24.64	34	23.48	9.76	9.22	10.05	44.66	2.49	60.42
1997	5.77	8.15	8.16	25.45	31.94	24.99	14.03	17.15	13.39	32.07	5.32	53.66
1998	4.69	10.38	7.09	24.26	36.04	22.99	57.84	56.39	59.52	31.82	24.09	86.79
1999	3.86	12.37	5.83	24.19	91.46	20.56	70.93	42.04	84.16	74.22	17.00	143.23
2000	6.15	8.78	8.85	26.25	103.54	22.60	14.58	28.01	12.85	3.37	16.80	10.86
2001	13.22	16.52	13.08	25.93	59.19	24.78	10.67	15.11	9.84	11.67	10.04	214.00
2002	15.49	51.68	15.13	26.47	49.52	26.87	12.44	17.49	11.43	11.93	11.29	199.25
2003	14.21	12.81	14.55	28.05	55.09	28.44	9.72	10.24	9.57	11.46	7.14	21.12
2004	40.71	9.44	53.29	27.95	61.50	28.01	9.29	16.43	8.31	9.64	19.37	16.01
2005	44.50	184.61	46.97	26.94	73.38	27.43	10.16	16.50	9.57	8.09	20.12	13.59
2006	31.14	10.50	38.69	26.20	82.68	25.84	8.57	21.63	8.29	6.61	15.59	11.55
2007	25.97	10.12	31.30	23.83	102.43	23.52	6.75	5.74	9.79	5.21	14.44	13.35
2008	32.37	5.94	51.44	23.93	20.28	26.51	5.66	28.07	6.16	4.21	10.31	20.47
2009	53.78	3.20	273.80	30.98	27.38	38.17	9.57	21.27	0.66	18.62	16.23	92.57
2010	56.49	6.27	65.31	40.77	0.00	109.75	1.92	45.03	18.98	1.63	25.19	10.00
2011	69.29	7.79	116.48	37.29	8.60	49.78	1.58	7.22	16.02	89.22	1432.37	11.02
2012	265.07	7.80	945.84	44.61	24.07	55.24	2.89	6.86	23.16	64.30	24.15	13.35

Data source: The KEWT database, 1960/90 to 2013/2014, for 68 countries, whose original statistics data (10 real assets and 15 financial assets) are from *International Financial Statistics Yearbook*, IMF.

Table 4. The rate of change in the wage rate

	17 Asian	14 Euro A	15 Europ	1. Argenti	3. Austral	3. Finlan	3. Norway	4. Chile	6. Bangla	6. Greece	6. the UK	7. Peru
1990												
1991	0.0536		0.1713	1.2585	0.0547	0.0040	0.0633	0.3366	0.1038		0.0244	25.9423
1992	0.0700		(0.1158)	0.2094	0.0257	(0.0149)	0.0833	0.2573	0.0424	0.4144	0.0156	0.6341
1993	0.0510		0.1794	0.5493	0.0380	0.0105	0.0275	0.1510	(0.0062)	0.2517	0.0467	0.5452
1994	0.0445		(0.2708)	0.0707	0.0403	0.0452	0.0348	0.0604	0.0681	0.2430	0.0771	0.4390
1995	0.0175		1.4365	(0.0037)	0.0731	0.0640	0.0854	0.3493	0.0997	0.2634	0.1042	0.1894
1996	0.0158		0.4429	0.0453	0.0442	0.0502	0.0381	0.1713	0.0947	0.2345	0.0592	0.1095
1997	(0.0203)		0.9972	0.0628	0.0404	0.0318	0.0143	0.0979	0.0864	0.4668	0.0829	0.1296
1998	0.0375		0.6552	0.0077	0.0519	0.0313	0.1298	0.0736	0.1130	0.4461	0.0550	0.0338
1999	0.0236		0.3539	(0.0796)	0.0526	(0.8297)	0.0183	0.0097	0.0882	0.1355	0.0448	0.0337
2000	0.0107	0.0482	0.4577	(0.0009)	0.0577	0.0306	0.1581	0.0716	0.0196	0.0026	0.0391	0.0483
2001	0.0203	0.0444	0.3958	(0.0638)	0.0486	0.0517	0.0529	0.0446	(0.1117)	2.4204	0.0327	(0.0066)
2002	0.0012	(0.0010)	0.3574	0.0941	0.0551	0.0869	0.0347	0.0387	0.1282	2.8408	0.0385	0.0479
2003	(0.0036)	0.0580	0.2512	0.2042	0.0477	0.0890	0.0482	0.0738	0.2768	0.1519	0.0547	0.0545
2004	0.0027	0.0295	0.2280	0.1635	0.0546	0.0430	0.0592	(0.0219)	0.0939	0.1040	0.0490	0.1069
2005	0.0160	0.0331	0.1474	0.1578	0.0314	0.0449	0.0507	0.0526	0.0986	0.0538	0.0249	0.0628
2006	0.0107	0.0375	0.1852	0.1592	0.0526	0.0460	0.0579	(0.0782)	0.1077	0.1362	0.0674	0.0216
2007	0.0085	0.0352	0.1399	0.2322	0.0593	0.0278	0.0659	0.1276	0.1240	0.1538	0.0639	0.0755
2008	0.0189	0.0332	0.1733	0.2555	0.0198	0.0772	0.0599	0.2836	0.1435	0.0211	(0.0006)	0.1716
2009	(0.0031)	(0.0116)	(0.0296)	0.1678	0.0417	(0.0106)	0.0188	0.2342	0.1152	(0.0870)	(0.0664)	0.0802
2010	0.0284	0.0281	0.1116	0.7736	0.0265	0.0321	0.0488	0.1127	0.1172	(0.0756)	0.0571	0.0368
2011	0.0184	0.0260	0.1199	0.7528	0.0031	0.0555	0.0392	0.1439	0.1342	(0.0767)	0.0966	0.0352
2012	0.0218	0.0051	0.0661	0.8508	0.0438	0.0214	0.0327	0.0993	0.1347	(0.1238)	0.0229	0.0714

	1. the US	E1. Austri	1. Denma	2. Bolivi	4. New Ze	4. France	4. Swede	5. Colomb	7. China	7. Ireland	1. Bulgar	8. Iran
1990												
1991	0.0346	0.0608	0.0361	0.2083	(0.0376)	0.0400	0.0633	0.2888	0.1422	0.0677		0.2690
1992	0.0324	0.0719	0.0332	0.1185	0.0231	0.0322	(0.0137)	0.2955	0.1998	0.0629		0.3435
1993	0.0652	0.0560	0.0243	0.0835	0.0487	0.0083	(0.0120)	0.2926	0.2496	0.0381		0.3181
1994	0.0523	0.0477	0.0592	0.1063	0.0489	0.0398	0.0610	0.5246	0.3102	0.0845		0.3443
1995	0.0767	0.1220	0.0687	0.1419	0.0448	0.0565	0.1390	0.2083	0.3597	0.0685		0.3184
1996	0.0473	0.0385	0.0399	0.1375	0.0477	0.0223	0.0307	0.1854	0.1809	0.0498	1.0032	0.2528
1997	0.0544	0.0004	0.0397	0.0836	0.0389	0.0292	0.0438	0.1704	0.0866	0.0142	9.1420	0.1849
1998	0.0403	0.0201	0.0429	0.0943	0.0192	0.0379	0.0413	0.1192	0.0612	0.0974	0.3394	0.2270
1999	0.0537	(0.9245)	0.0170	0.0043	0.0446	(0.8430)	0.0541	0.0542	0.0694	0.5169	(0.0060)	0.2391
2000	0.0457	0.0361	0.0090	0.0574	0.0326	0.0514	0.0445	0.1761	0.0951	(0.0234)	0.1508	0.2581
2001	0.0082	0.0227	0.0360	(0.0050)	0.0258	0.0340	0.0344	0.0270	0.0819	0.1260	0.1208	0.1666
2002	0.0103	0.0096	0.0428	0.0338	0.0538	0.0292	0.0502	0.0637	0.0678	0.0739	0.0483	0.2718
2003	0.0289	0.0286	0.0265	0.0727	0.0569	0.0211	0.0388	0.1476	0.0749	0.0594	0.0725	0.1889
2004	0.0594	(0.0102)	0.0568	0.1015	0.0768	0.0308	0.0190	0.2823	0.1164	0.0306	0.1666	0.2841
2005	0.0560	0.0437	0.0395	0.0824	0.0602	0.0321	0.0269	0.1147	0.1225	(0.0027)	0.0644	0.2232
2006	0.0537	0.0252	0.0485	0.1486	0.0431	0.0360	0.0288	0.1374	0.1279	0.1197	0.1440	0.1885
2007	0.0346	0.0086	0.0413	0.1050	0.0528	0.0419	0.0296	0.1101	0.1628	0.1547	0.0796	0.1718
2008	(0.0141)	0.0444	0.0435	0.1429	0.0224	0.0184	0.0383	0.0902	0.1423	0.1558	0.3492	0.2040
2009	(0.0560)	0.0537	(0.0140)	(0.9990)	0.0127	(0.0397)	0.0350	0.0408	0.0780	(0.1030)	0.0858	0.0864
2010	0.0409	0.0235	0.0422	0.0940	0.0227	0.0202	0.0371	0.0652	0.1545	(0.0384)	0.0343	0.1074
2011	0.0255	0.0248	0.0072	0.1765	(0.0160)	0.0517	0.0603	0.1072	0.1748	(0.0977)	0.0000	0.0000
2012	0.0356	0.0283	0.0197	0.0917	(0.0217)	0.0407	0.0522	0.0612	0.1340	(0.0665)	0.0000	(0.0000)

	2. Canada	E2. Belgi	2. Iceland	3. Brazil	5. Mexico	5. Germa	5. Switzer	6. Paragu	8. India	8. Italy	2. Czech R	9. Kazakh
1990												
1991	0.0117	0.0509	0.0690	4.1550	0.2423	0.2631	0.0970	0.2462	0.1259	0.1120		
1992	0.0031	0.0437	(0.0114)	0.0438	0.0971	0.0762	0.0452	0.1406	0.1158	0.1074		
1993	0.0308	0.0219	0.0322	(0.7847)	0.3077	0.0276	0.0098	0.2074	0.1265	0.0499		
1994	0.0548	0.0453	0.0454	1.4370	0.1124	0.0355	0.0138	0.1995	0.1327	0.0291		
1995	0.0336	0.0638	0.0129	(0.8057)	0.2696	0.0922	(0.0521)	0.1586	0.1286	0.0543		
1996	0.0204	0.0257	0.0612	0.1760	0.2997	0.0181	0.0248	0.0956	0.1376	0.0642	0.1589	0.2868
1997	0.0406	0.0249	0.0895	0.0954	0.2230	0.0148	0.0388	0.0363	0.0642	0.0553	0.1359	0.1605
1998	0.0287	0.0206	0.1032	0.0247	0.2559	0.0174	0.0017	0.0160	0.1397	0.0755	0.0545	0.0093
1999	0.0399	(0.9766)	0.0516	0.0716	0.1789	(0.4745)	0.0250	0.0326	0.0958	0.0369	0.0795	0.4080
2000	0.0359	0.0901	0.0598	0.0781	0.1735	0.0128	0.0134	0.0604	0.0482	(0.4817)	0.0427	0.1693
2001	0.0529	0.0964	0.1429	0.0906	0.0085	0.0209	0.0450	0.0499	0.0671	0.0546	0.0611	0.2288
2002	0.0467	0.0312	0.0472	0.1287	0.0648	0.0096	0.0071	0.0803	0.0287	0.0568	0.0634	0.0673
2003	0.0415	0.0378	0.0013	0.1365	0.1879	0.0130	0.0143	0.1989	0.0736	0.0238	0.0820	0.2191
2004	0.0408	0.0167	0.0982	0.1321	0.1050	0.0113	0.0066	0.1397	0.0585	0.0172	0.0273	0.2607
2005	0.0434	0.0333	0.0740	0.0964	0.0673	0.0157	0.0106	0.0950	0.1299	0.0743	0.0192	0.2094
2006	0.0496	0.0333	0.1385	0.0916	0.0783	0.0269	(0.0178)	0.1102	0.1320	(0.0216)	0.0286	0.2139
2007	0.0495	0.0310	0.1124	0.1120	0.0765	0.0035	(0.0154)	0.1559	0.1352	0.0355	0.0213	0.2526
2008	0.0333	0.0663	0.1157	0.1264	0.0675	0.0361	0.0266	0.1763	0.1314	0.0299	0.1249	0.1722
2009	(0.0145)	0.0073	(0.0032)	0.0535	(0.0041)	0.0157	0.0632	0.0431	0.1379	(0.0053)	0.0579	0.2498
2010	0.0492	0.0345	0.0075	0.1613	0.0778	0.0392	0.0109	0.2629	0.1602	(0.0798)	0.0061	0.1226
2011	0.0450	0.0298	0.0374	0.3319	0.0741	0.0774	(0.0028)	0.1077	0.1301	0.0261	0.0000	0.1837
2012	0.0105	0.0186	0.0517	0.3065	0.0663	0.0632	(0.0000)	(0.2184)	(0.0000)	0.0254	0.0000	0.0876

Data source: KEWT database 8.14.

Note: The more stable under +, the more robust, by country.

Axiom Omega in the Endogenous-Equilibrium:
with the Speed Years for Convergence

Table 5 The rate of change in the wage rate

	9. Indone	9. Luxem	3. Hunga	10. Kuwa	12. Malay	12. Sloval	6. Roman	13. Alger	15. Sri L	16. Thail	9. Ukrain	16. Moroco
1990												
1991	0.2175		0.3413	0.2224	0.1109			0.3756	0.1094	0.1102		0.1272
1992	(0.0089)		0.1410	0.3986	0.0507			0.2882	0.1754	0.1258		(0.0156)
1993	0.5116		0.1289	0.2433	0.0743			0.1295	0.1750	0.1099		0.0074
1994	0.1537		0.3222	(0.1223)	0.0951			0.2302	0.0850	0.1224	32.3391	0.0999
1995	0.2470		0.3107	0.0274	0.1098			0.3072	0.1420	0.1281	5.3482	(0.0042)
1996	0.1793	0.0338	0.1660	0.0666	0.0522	0.1851	0.5108	0.2043	0.1387	0.1001	0.8665	0.1155
1997	0.1060	0.0454	0.1912	(0.0376)	0.0622	0.0704	1.2845	0.0669	0.2224	0.0110	0.1427	(0.0208)
1998	0.7577	0.0444	0.1903	(0.2111)	(0.1143)	0.1250	0.4409	0.0415	0.1803	(0.0226)	0.6802	0.1486
1999	0.2289	24.0447	0.1725	0.1247	0.0662	0.0653	0.4860	0.0849	0.0519	0.0220	0.2649	0.0039
2000	(0.0664)	0.0485	0.1658	0.0312	0.1201	0.1064	0.4320	0.0284	0.1206	0.0526	0.2833	0.0026
2001	0.2337	0.1000	0.1656	(0.0424)	0.1125	0.1058	0.4597	0.0357	0.0852	0.0435	0.2314	0.0606
2002	0.2715	0.0531	0.1672	0.0790	0.0618	0.0805	0.3021	0.0741	0.1525	0.0465	0.0962	0.0332
2003	0.1279	(0.0100)	0.1283	0.0927	0.0636	0.0933	0.3115	0.0615	0.1000	0.0710	0.1935	0.0566
2004	0.1051	0.0666	0.0814	0.0427	0.0908	0.1014	0.2531	0.0845	0.1388	0.0859	0.1720	0.0512
2005	0.1225	0.0127	0.0723	0.0363	0.0944	0.0796	0.1732	0.0106	0.1749	0.0950	0.4533	0.0410
2006	0.1465	0.0009	0.0758	0.1064	0.0735	0.1214	0.2021	0.0337	0.1787	0.0866	0.2593	0.0801
2007	0.1876	0.0004	0.0440	0.0999	0.1124	0.0555	0.2098	0.0947	0.2138	0.0589	0.3240	0.0611
2008	0.1227	0.0377	0.0652	0.0855	0.1243	0.1182	0.2400	0.1614	0.1695	0.0857	0.3378	0.0992
2009	0.0852	0.0449	(0.0329)	(0.0005)	(0.0035)	(0.9670)	(0.0310)	0.1648	0.1413	0.0070	(0.0615)	0.0520
2010	0.1011	(0.0115)	0.0232	(0.1194)	0.0842	0.0487	0.0510	(0.4311)	0.1559	0.0923	0.1937	0.0729
2011	0.1070	0.0130	(0.0000)	0.0551	0.1063	0.0319	(0.0000)	1.4703	0.1245	0.0521	0.2302	0.0072
2012	0.0939	0.0379	0.0000	0.0700	0.0802	(0.0007)	0.0000		0.1693	0.0891	(0.0193)	(0.0214)

	10. Japan	10. Nether	4. Latvia	11. Pakist	13. Philip	13. Slover	7. Russia	14. Egypt	17. Vietnam		18. S.Afri	17. Nigeria
1990												
1991	0.0541	0.0637		0.2153	0.1031			0.1332	1.1844		0.1089	
1992	(0.0863)	0.0694		0.1479	0.0341			0.2261	0.5183		0.0888	
1993	0.0642	0.0260		0.0439	0.0494			0.1054	0.2911		0.1378	
1994	0.0568	0.0188		0.1680	0.1433			0.0701	0.2503		0.1091	
1995	0.0234	0.0110		0.1524	0.1073			0.0807	0.2775		0.1148	
1996	0.0236	0.0472	0.1889	0.0856	0.1142	0.1436	0.4095	0.0617	0.1610		0.1012	0.2782
1997	(0.0136)	0.0397	0.2251	0.0891	0.0880	0.1414	0.1931	0.1473	0.1471		0.0904	0.0118
1998	0.0453	(0.0480)	0.0976	0.1279	0.0266	0.0976	0.1019	(0.0152)	0.1272		0.0694	(0.3637)
1999	0.0275	(0.4102)	0.0673	0.0315	0.1325	0.1313	0.8004	0.0783	0.0052		0.0823	0.3817
2000	0.0176	0.0614	0.1822	0.2984	0.1388	0.0943	0.2303	0.0766	0.0702		0.1218	(0.2520)
2001	0.0237	0.0600	0.1123	0.1172	0.0645	0.1127	0.3088	0.1109	0.0596		0.0883	1.5296
2002	0.0035	0.0602	0.1111	0.0439	0.0807	0.0985	0.2521	0.0436	0.0983		0.1317	0.4095
2003	(0.0064)	0.0337	0.1113	0.0837	0.0681	0.0831	0.2241	0.0958	0.1397		0.0580	0.1737
2004	0.0013	0.0069	0.1831	0.1387	0.1030	0.0488	0.2772	0.1644	0.1393		0.0932	0.3626
2005	0.0078	0.0084	0.2386	0.1039	0.0969	0.0463	0.2626	0.0930	0.1517		0.1016	0.2242
2006	0.0033	0.0424	0.2338	0.1334	0.1133	0.0345	0.2363	0.1446	0.1435		0.1065	(0.0176)
2007	0.0014	0.0261	0.3336	0.1370	0.0713	(0.9957)	0.2371	0.1763	0.1755		0.1342	0.2958
2008	(0.0036)	0.0334	0.0945	0.0711	0.1158	0.1061	0.2583	0.1883	0.3113		0.1163	0.3469
2009	(0.0414)	0.0434	(0.1851)	0.2098	0.0083	0.0759	0.0169	0.0745	0.0984		0.0361	(0.0790)
2010	0.0213	0.0134	(0.0206)	0.1169	0.1337	0.0208	0.0254	0.1739	0.1119		0.1045	0.1717
2011	(0.0017)	(0.0183)	0.0000	0.1461	0.0490	(0.0088)	0.0911	#DIV/0!			0.2615	(0.4730)
2012	(0.0125)	0.0116	0.0000	0.0155	0.0521	0.0016	0.0882	#DIV/0!			0.2706	(0.0275)

	11. Korea	11. Portu	5. Poland	12. Saudi	14. Singa	14. Spain	8. Turkey	15. Kenya
1990								
1991	0.1992	0.1015	0.9120	0.2073	0.0428	0.0966	0.6176	0.0503
1992	0.1378	0.1531	0.4092	(0.0493)	0.0424	0.0787	0.6872	0.1920
1993	0.1221	(0.0635)	0.3432	(0.0461)	0.1294	0.0281	0.8085	0.1525
1994	0.1639	0.1612	0.3527	(0.1509)	0.0648	0.0416	0.9154	0.1523
1995	0.2061	0.1534	0.6189	0.2483	0.0735	0.1568	0.9048	0.2284
1996	0.1314	0.0590	0.2546	(0.0186)	0.0661	0.0536	0.8752	0.2484
1997	0.0887	0.0669	0.2207	(0.0001)	0.0474	0.0537	0.9326	0.0483
1998	(0.0465)	0.0561	0.1670	0.0293	(0.0586)	0.0398	1.3444	0.0338
1999	(0.1115)	(0.9938)	0.1093	(0.0256)	0.0498	(0.9934)	0.4531	0.0247
2000	0.2728	0.0101	0.1169	0.0728	0.1690	0.0824	0.6061	0.0612
2001	0.1649	0.0591	0.0397	0.0041	0.0323	0.0575	0.5036	(0.0233)
2002	0.1302	0.0386	0.0163	(0.0448)	0.0245	0.0448	0.4384	(0.0285)
2003	(0.0016)	0.0158	0.0559	0.0082	(0.0023)	0.0481	0.2590	0.0922
2004	(0.0107)	0.0150	0.1143	0.0489	0.0131	0.0709	0.2149	0.1570
2005	0.1227	0.0871	0.0693	0.0714	0.0105	0.0651	0.1426	0.0998
2006	0.1005	0.0435	0.0815	0.1275	0.0323	0.0623	0.1605	0.1112
2007	0.0707	0.0672	0.1055	0.0936	0.0695	0.0577	0.0843	0.5049
2008	0.0820	(0.0143)	0.0899	0.1035	0.0834	0.0343	0.1294	0.1080
2009	0.0337	(0.0263)	0.0548	0.1304	(0.0307)	(0.0356)	(0.0530)	0.1278
2010	0.0040	0.0186	0.0526	0.0658	0.0735	(0.0000)	0.1419	0.0549
2011	0.0730	0.0057	(0.0000)	0.0682	0.0562	0.0058	0.2087	0.1733
2012	0.0614	(0.0433)	(0.0000)	0.0572	0.0239	(0.0186)	0.0930	0.0440

Data source: KEWT database 8.14.

Note: The more stable under +, the more robust, by country.

Appendix of Chapter 17
     Interpretation of two economic analyses, Tokyo (in Japanese)

Selectively the author picks up two books among thousands of books written in Japanese for the last two decades.   Essence of severe deflation in Japan has continuously been a core of thousands of books published since 1990. The author cites two thoughtful books and preliminarily interprets the whole background, at the beginning of this chapter.

1. Yoshikawa, Hiroshi. (Jan 18, 2013). Tokyo: Nikkei Newspaper. 236p.

Yoshikawa's "*Deflation: to clarify full picture of Japanese chronic disease*" is the first order.   This literature is abbreviated, the Yoshikawa, hereunder.

The Yoshikawa (2013) is composed of seven chapters, where Chapter 5 'Determining prices,' Chapter 6 'Wages as a key for deflation,' and Chapter 7 'Conclusions with losing-way economics' are full of most essentials holding under the market principles.   In particular, the Yoshikawa (217-220. ibid.) stresses that the current macroeconomics broadly and respectively extends the optimum profit maximization in enterprises and in households for optimum utility maximization and also, declares that this stream is attributed to wrong *similarity-extension* of micro-economics.   The KEWT database empirically solved Yoshikawa's wrong *similarity-extension*, by digesting Samuelson's (1950) micro-based utility problem, and uniquely by formulating the relative discount rate for the author's macro-based utility.

2. Hidaka, Masahiro. (Feb 10, 2003). Tokyo: Chuokoron-New Co. 256p.

Hidaka's "*Controversies over deflation: Proposals by 31 economists*" is the second order.   Hidaka is a Bloomberg News journalist.   This literature is abbreviated, the Hidaka, hereunder.

The Hidaka (2003) was published ten years earlier than the Yoshikawa. Despite, the essentials described by his 31 interviews are never stale and enough vivid even today.   Interestingly, the Hidaka is fully consistent with the Yoshikawa. This fact tells us that the truth is the same even statistics-economics has its indispensable limit under the market principles, where absolute prices must be vertically inserted into data researches.

For the Hidaka, let the author select three interviews among Hidaka's 31 interviews summarized in his book.   The author understands, three interviews

are mostly connected with the essentials of the *EES* and the *HEU*, with the KEWT 9.15 database.   Among others, the author cites three interviews and adds 'three ranks' to these interviews.

(1) <u>The first rank</u> (195-201, <u>the Hidaka</u>)

The 21st interview among 31 interviews: Paul A. Samuelson, 'Prescription to Keynesian.'

The author of this book understands that Samuelson expresses the essence of macroeconomics most accurately and, is one of a few experts in analyzing the Japanese economy with her uniqueness.   Samuelson stresses that zero% of short interest rate is liquidity gap by itself and that financial policy does not work at all.   Samuelson did not expect zero% in his life time.   Samuelson proposed real interest rates less than zero % to stimulate real investments including subsidies.   Also, Samuelson adds that democracy works in America so that people will be saved (see, Kamiryo, 'Qualitative levels of democracy geometrically measured', accepted by *the Review of Economic Studies*).

(2) <u>The second rank</u> (148-154, <u>the Hidaka</u>)

The 15th interview among 31 interviews: Hirofumi Uzawa, 'Rebirth of cities and natural world stopping arbitrary use of power by bureaucracy.'

Uzawa's future insight is the truth itself but, Uzawa watches negative side so sensitively that Uzawa suffers from impatience.   Body and mind need balances under the negative and positive principle, as static and dynamic balances are illustrated geometrically in the *HEU*.   Also all the systems organically need the endogenous-equilibrium, as the *EES*, the *HEU*, and the KEWT database 9.15 have revealed.   The closer to extreme negative the more close to positive, beyond space and time, even staying at the two-dimensional plane, scientifically.   Further, for example, bureaucracy as a system has two sides, negative and positive and, is always balanced as a result.   Human and systems are destined to be cooperative, never against or fighting each other in the truth, as evidenced in the KEWT database, 1960/90-2010/13, by sector.

(3) <u>The third rank</u> (178-186, <u>the Hidaka</u>)

The 19th interview among 31 interviews: Galbraith, John Kenneth, 'Japan leads the world again.'

It seems that Galbraith lives in another world yet, it is in reality.   Human has had two Western and Oriental civilizations for several thousand years in this world.   Geometrically, the golden ratio completely overlaps the silver ration, as proved and evidenced in Kamiryo (earlier presented to *Royal Economic Society* Conference, Manchester, April, 2014).   This implies that two civilizations are compatible and merged into one, cooperating mutually, respecting national taste, preferences, history, and culture, by country.   Concretely, expressed by the relative discount rate of consumers' to producers' goods/services, (ρ/r), connected with the propensity to consume, $c = C/Y$, in a unique macro level.

Japan has her own characters as an agriculture race in isolated inlands. Good points are diligent, precise, no telling lies, think of others, and many able persons.   These are balanced with bad points.   Thankfully, Galbraith respects these good points and expects Japan's moderate contribution to the world societies and countries, once more in coming future.   Yes, the Japanese must practice thankfulness diligently but not leading other countries.   This must be a hidden repayment to the world societies and countries.

In short, wholly, the above three interviews perceive united 'human and human's systems.'   Nature and/or God watches human suffering from money and organic.   Social/economic science is not separated from mind and behavior and thus, indispensably behind of mathematics, physics, and element chemistry, commonly to universe and tiny units.

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1. Drucker, Peter, F. (2002). *Managing in the Next Society*. New York: St. Martin's Press. 321p.

2. Hidaka, Masahiro (2003, in Japanese). *Controversies over deflation: Proposals by 31 economists*. Tokyo: Chuokoron-shinsha. 256p.

3. Kamiryo, Hideyuki (1964, in Japanese). *Corporate Analysis and Business Game*. Tokyo: Kinzai. 512p.

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