# Chapter 10

## Essence of the Endogenous System and Its Geometrical Philosophy

<u>Signpost to Chapter 10</u>

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 Monograph 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 <u>Appendix A</u> at the end of this Chapter). Hyperbolas in Monograph stay at 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. This is 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.

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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 principle 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, as summed up in Appendix B at the end of this chapter. Yet Monograph follows most strict proofs of mathematicians.

Philosophy of Kant Immanuel (1724-1804) does not contradict religion. The 21 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 5.11 and 6.12 each remain unchanged. Original data come from *International Financial Statistics Yearbook*, IMF. KEWT 5.11 sets the rate of unemployment as the last means for adjusting the moderate level of the endogenous-equilibrium. KEWT 6.12 settles all the data under full employment, where the actual growth rate of population always equals the rate of change in population (see Appendix C at the end of this chapter).

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 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 with 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.

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This chapter philosophically deepens what the endogenous system appeals and incorporates it with (1) 't Hooft's (2000) conception of the holographic principle and (2) Iyonoishi's (1998; 2009, 2011, 2012) unique conception of 'the zero point,' that integrates spiritual and physical zones and even holds at scientific discovery dimensions without taking spiritual zone into consideration. It is the time when natural science and social science realize the same discoveries, although each empirical proof is still difficult.

Endogenous data for national accounts created at the endogenous system wholly exercises the above two conceptions. Precisely all the data of the author's two-dimension endogenous equations and hyperbolas at the physical zone prove the following three phenomena: i) Space and time constitutes one dimension and, physical zone accepts 'one dimension reduced.' I.e., one-dimensional space-time is well involved in the two-dimension; ii) Partial expresses the whole; iii) All the data at one specified year are consistent with before and after that specified year consistently over years. Accordingly there are no sequential calibration and no initialization problem.

These three phenomena, according to Iyonoishi, universally hold at five-dimensional zone or the spiritual zone and simultaneously, at six-dimensional zone or the physical/real zone by adding one-dimensional, strain and vibration, swing, and idle; over five-dimensional. Ishida Shizuko (Iyonoishi, at least for the last forty years) has discovered and proved the current unsolved problems in physics and element chemistry by using visible materials (see Appendix B at the end of this chapter). In this respect, 't Hooft (2000) and Randall (2005) stay at the physical/scientific zone. The boundary of two zones is called the black hole or D-brane of the string theory. Iyonoishi's (Summaries 216 & 217, page, 312-314; 2012) boundary is called the zero point. This zero point exists spirally from 1.0 to zero and is small and numerous much more than the current black holes in the literature, when the point infinitely approaches zero.

This chapter presents a sort of base-chapter for the author's final endogenous system (Jan., 2011). First, the author explains fundamental features involved in the endogenous system. Second, the author summarizes interpretations about dimensional concepts, clarifying each concept differences in relation to the endogenous system. Third, the author presents evidences of the holographic principle at the endogenous system, geometrically each by each arranging what are proved by the endogenous system. Fourth, the author picks up three favorable articles in reference to the endogenous system and interprets each contents: (1) Carmen M. Reinhart and Kenneth S. Rogoff (2011), in such that actual and endogenous data are closely related and the differences often extinguish in the long run; (2) Franco Modigliani (1961), in such that the structure of his modeling is related to the endogenous system, starting with 'discrete' illustrations but constructing a 'continuous' market modeling; (3) Robert E. Hall (2011), based on his long experiences/insights with evidences. Fifth, 'concluding remarks,' broadly referring to the current aspects in the literature, convinces how important policy-methodology is, suggests

what actual data should be first added to the current data-sets of KEWT 5.11 and 6.12; thankfulness for ceaseless IMF's efforts towards the spirit of Keynes (1944).

Finally, the author adds the spirit of the endogenous system to this signpost. Theory and practice march together with simultaneous causes and effects. Actual statistics date 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. Also, as shown by the SNA 2008 of EU, IMF, OECD, and World Bank. 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 and 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 reveal 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

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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 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 data 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 is dynamic and balanced in equilibrium and, each data 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

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[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.

that Keynesians have not used the continuous Cobb-Douglas production function while 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 by the time limit, 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 5.12 in Jan 2012, for 81 countries, 1990-2010. 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 6.12 to Dr. Paul; if KEWT 6.12 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

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[2]  Miyako Udatsu (2008) "Introduction of the Positive and Negative Principles," p. 7.

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world; (3) No change eternally.    No one justifies the existence of the endogenous system 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

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[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.

principle expresses 'one-dimensional reduction' in quantum gravity.   Suppose that four-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.   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 the 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 at daily life.   The spiritual zone is composed of five-dimensions; two-dimensions for the plane (the x and y axis), 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

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[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.

vicinity of a black hole.    The two-dimensional function is really a marvelous concept, yet 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 the 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 constitutes one-dimension inseparably and, Iyonoishi proved it at the physical zone and 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 the 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 of at the end of Monograph).    The author's two-dimensional 'hyperbolic' enjoys the circle (instead

of the ellipse) and avoids the relationship/difference between the 5th-dimensions and the 6th-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 axis.   The author proposes, in the case of macroeconomics, that dialectic holds comfortably at the physical zone when the above hybrid is taken into consideration.   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 much 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 at models or over years at 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

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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 23rd 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.

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geographically related to all the hyperbolas that support the whole endogenous system.

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 $5^{th}$ 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, the two applications are justified by the evidences of the endogenous equation and its hyperbola at 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 *v.s.* 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 (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 to 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 human 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 human 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 at 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 the 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 axis.    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 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 but 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 axis) 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 in 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 at 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. At the 4th quadrant, nominal rate=real rate+(−inflation

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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 plus. If net investment approaches depreciation, the growth rate shrinks closer to zero (until just before zero) at the $4^{th}$ quadrant. The endogenous Phelps coefficient is 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 $1^{st}$ from the $4^{th}$ 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 at 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 (1939 a, b) 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 consumption. 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 to 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 6.12, are measured between 1960-2010 and 1990-2010. 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) indicates 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 interpret 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 compared actual data with endogenous data at KEWT 5.11 and 6.12 and proved facts: When the difference rises up beyond a certain level, the room for selectable polices becomes narrowed 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 answer to 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 conditions necessary 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 conditions necessary 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 at the reverse and against the above conditions.   Nevertheless, the literature mostly formulates continuous models, starting the sketch at 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 = endogenous population growth, and the endogenous-equilibrium stays at 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 plus in the price-equilibrium.   His conclusion differs from endogenous results that the balance of payments should be plus and minus 3 percent 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.

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## 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 at 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 at 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 to 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, using the KEWT 5.11 and 6.12, 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

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[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.

equilibrium.    However, 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 at 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 at 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 at 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.    This is because the positive and the negative principle exists with mankind history for thousands 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 selected 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 6.12, 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.

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[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.

# Essence of the Endogenous System and Its Geometrical Philosophy

## 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, 1990-2010, 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

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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 $g_A^* = i(1 - \beta^*)$, $\delta_0$ is diminishing returns to capital coefficient, $i$ is $I/Y$, and $\beta^*$ 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 $Rij - 1/2gijR = KTij$.    The LHS of non-Euclid geometry shows bent space and time and, the

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[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.

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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 $\mu$ 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 do we 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.[13]  Here the exponential, $e^x$, broadly connects Iyonoishi's with Furuta's proofs.

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 Sato's (1981) discoveries based on the Lie Theory (see Notes at the beginning of Monograph).

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 Conservation Laws of Sato's (1981), which in turn justifies the endogenous system itself.

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.

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[13] The author is grateful to Yoshiomi Furuta's confirmations/explanations with graphs to the above relationships by email dated on 15 Sep 2012.    Yoshiomi is my teacher and EmProf. Dr. of mathematics to integer, Kanazawa University.

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