“Reconsideration on Present Phases of Business Cycles, Comparing Mexico, South Korea and Japan”

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1. Focus of the study

I have tried to understand the historical phases of Business Cycles in Latin America by the models which I have arranged the three-cycle schema of Joseph A. Schumpeter (1883~1950). The historical phases of Business Cycles are the cyclical stages of prosperity, recession, depression and revival in the economic history of every country. Schumpeter wanted to shape the economic history by the three-cycle schema compounding Kitchen Cycle (Short-term Cycle), Juglar Cycle (Middle-term Cycle) and Kondratieff Cycle (Long Wave). His concern was supposed to understand the economic history through the model of Business Cycles, which were called Compound Cycle recently in Japan. Therefore, I would like to define Business Cycles of Schumpeter as Compound Cycle which combines three or four business cycles.

As the indicators of Compound Cycle, I have adopted Investment Level (ratios of gross fixed capital formation to GDP
or ratios of gross investment to GDP) and Import-export Ratios (ratios of imports to exports). Adding to these indicators, I have appreciated the regional integration like NAFTA, MERCOSUR and Andes Community as an ecological innovative framework for the economic recovery, which increases business opportunities and stimulates capital inflows. On the other hand, I have considered the debt crises through capital flight as a momentum into the recession or depression phase. So far I have estimated the influences of external and internal debt crises to Business Cycles by the indicators like the ratios of total balance to foreign reserves or fiscal balance to fiscal revenue.

Analyzing the monetary crises of Mexico in 1982 and 1994, I have concluded her eventual prosperities through the oil exploitation in the early 1980s or the regional integration in the early 1990s had been the bubble economies separating from the standard level of Compound Cycle. Therefore, her economic growth rates were forecast by maintaining the improved three-cycle schema which combined Equipment Cycle (Juglar Cycle), Construction Cycle (Kuznets Cycle) and Infrastructure Cycle (Kondratieff Cycle). The monetary crisis in Mexico in 1994 had sharply lowered the economic growth rates of Mexico and had turned them down to the level of the improved three-cycle schema, though they had continued to rise in the early 1990s getting out from the improved three-cycle schema\(^1\). When I analyzed Business Cycles of Peru and Chile last year, I adopted the four-cycle schema including Stock Cycle (Kitchen Cycle) as the generally applied schema. Because I had adopted the four-cycle schema in the first analysis of Chile and then I had found the similarity between Chile and Peru. By constructing the model of Compound Cycle in Peru through the four-cycle schema, I could have the long-term prospect of the economic growth rates in Peru\(^2\). However, Peru has suffered from the extraordinary climate in the end of 1997 and the early 1998. It is said this extraordinary climate was caused by Meganiño of the 500 year cycle. If el Niño were related with a short-term business
cycle, Meganiño would be related with an over centennial economic cycle beyond the four business cycles.

In the previous paper, I had located the stagnancy of Japanese economy in the 1990s as the depression phase of Compound Cycle in Japan. I had argued only the ecological alternative innovations could recover the stagnation in Japan. Because the global environment problems need the ecological alternative innovations in the economic structure including the financial system, which are called Ecological Industrial Revolution recently in Germany. The flame work of the alternative innovations for Japan would be the ecological regionalism in APEC including Latin America\(^3\). Ecologically, the inter-relationship in the Pacific Basin is not explicit and is not yet recognized generally, but the phenomenon of el Niño has clearly proved it recently. Financially, the inter-dependency in this region has been rapidly developed and clearly recognized when the monetary crisis in Mexico in the end of 1994 gave large impacts on the neighboring countries. Its impact on the United States caused the dollar depreciation with the rapid yen appreciation. On the other hand, the monetary crises in Thailand, Indonesia and South Korea in 1997 gave large impacts on Japan and caused the yen depreciation with the dollar appreciation in the early 1998.

The monetary crises in Mexico and South Korea might have the common feature because they happened just after the both countries joined in OECD. Japanese Yen has been directly influenced by the monetary crises in Mexico and South Korea. While Mexico is recovering to overcome the monetary crisis and coping with the ethnic environment problems, South Korea and Japan are not yet recovering the economic growth rates and have not yet the prospects of the revival phase to overcome the financial and ecological problems. Therefore, I would like to compare Mexico, South Korea and Japan and to reconsider the historical phases of Business Cycles in South Korea and Japan. For this purpose, the four-cycle schema would be useful, because it
combines Kitchen, Juglar, Kuznets and Kondratieff Cycle. And I would try to find the alternative framework to turn the present phases of Compound Cycles in the both countries.

2. Phases of Business Cycles Indicated by Investment Level

At first, I would like to compare Investment Levels (ratios of Gross Investment to GDP) in Mexico, South Korea and Japan according to Figure 1. The time series of the ratios of Gross Investment (Gross Fixed Capital Formation + Stock Investment) to GDP would show the compound movement of Stock Cycle, Equipment Cycle and Construction Cycle and also include the movement of Infrastructure Cycle. Sometimes Long Wave is mainly related with Infrastructure Cycle, but also would have the deep relationship with Equipment Cycle and Construction Cycle for the alternative innovations. That is to say, Investment Level would be composed by the four business cycles and their interrelationship. So, I will hypothesize Investment Level would circulate according to Compound Cycle through the four phases of prosperity (upswing stage), recession (downswing stage), depression (stagnation stage) and revival (recovery stage).

Investment Level in South Korea started the upswing in 1961 under the military government, which was established through the coup d'état lead by a major general, Pak Jong Hi and a colonel, Kim Jong Pil after the student revolution brought down President Ri Sung Man (1948~1960). Investment Level of South Korea ascended very rapidly under the government of Pak Jong Hi who was elected to the president in 1963. It continued to rise fluctuatingly until President Pak was assassinated in 1979. Investment Level of South Korea caught up with that of Mexico and overcome that of Japan in 1979.

Investment Level of Japan ascended greatly through the economic liberation and the heavy chemical industry oriented policy adopted by the governments of Premier Ichiro Hatoyama,
Figure 1 Business Cycles indicated by Investment Level: Mexico, South Korea, Japan

Source: International Financial Statistics

Note: GFDF = Gross Fixed Capital Formation
Tanzan Ishibashi, Shinsuke Kishi (1954~1960) and Hayato Ikeda (1960~1964). Therefore, her Investment Level reached the eminent peaks in 1957 during the prosperity called Jinmu Keiki (1954~1958) and in 1961 during the prosperity called Iwato Keiki (1958~1962). Those upswing stages of Japan in the 1950s and 1960s were similar to those of South Korea in the 1970s and 1980s. South Korea revived from the destruction in Korean War and developed her economy in the 1970s and 1980s. Japan also recovered from the collapse in the Pacific War and enlarged her economy in the 1950s and 1960s.

In Japan, Investment Level dropped sharply in 1965 when the temporarily deep recession occurred under the government of Premier Eisaku Sato (1964~1972), which was established after Tokyo Olympiad in 1964. But the business conditions were improved because the public bonds for construction were issued after 1965 and the prosperity called Izanagi Keiki (1965~1971) was realized. Investment Level of Japan reached a peak in 1970, but this peak was lower than the peak in 1961. On the other hand, Investment Level of South Korea showed an eminent peak in 1979 and after that, it moved sideways. In 1981, the accumulated external debt of South Korea become more than 30 billion dollars and the total balance of payment turned red. In the next year 1982, South Korea dropped into a difficulty to pay foreign exchanges as well as Mexico did. The military government of President Cheon Du Fwan (1979~1987) oppressed the public opinions against the economic development oriented policy up to that time. However, the economic inefficiency increased through the over intervention by the bureaucrats(4). South Korea was obliged to increase the emigrant laborers for the construction industry in the middle east countries in order to complement the deficit of foreign exchanges(5).

But, after the Plaza Agreement by the five developed countries in 1985, Yen was greatly appreciated and the prices of the Japanese export products rose very rapidly. As Won of South
Korea was closely linked with the U.S. dollars, the South Korean export products were increasingly substituted for the Japanese middle or low class products. Investment Level of South Korea began to ascend again through the gradual democratization by the government of President No Tae Woo (1987~1992) and Seoul Olympiad in 1988. And it reached a peak in 1991, which was higher than that of 1979.

We can recognize the peaks and bottoms of Investment Level of Mexico coincide almost always with those of South Korea in Figure 1. According to my precedent paper, Investment Level of Mexico exceeded that of the U.S. after the late 1960s and continued to ascend through the boom of the petroleum exploitation in the late 1970s, but that boom collapsed through the downfall of the petroleum price in 1982. After that, Investment Level of Mexico was hanging low and turned to ascend again after the bottom in 1986 as well as that of South Korea. Investment Level of South Korea arrived a peak in 1991 and that of Mexico arrived a peak in 1992. As I mentioned before, the boom in Mexico preceded the inauguration of NAFTA. But her bubble economy collapsed through the monetary crisis.

Equipment Cycle in the postwar Japan has the peaks in 1951, 1961, 1970, 1980 and 1990. Therefore, the one cycle is supposed to have the period of 10 years. Concerning the amplitude, the peak in 1970 during the prosperity called Izanagi Keiki was the highest ratio of equipment investment to GNP(6). This year was also the turning point of Compound Cycle to the downswing stage, which was indicated by the moving averages of the real economic growth rates during seven years. Because the innovative investment in transportation, communication and energy started in the 1950s and reached a peak in 1970(7).

Investment Level of Japan fell suddenly owing to the appreciation of Yen when the dollar to gold exchange was interrupted by U.S. President Richard Nixon in 1971. Under the government of Premier Kakuei Tanaka (1972~1974), the recon-
struction boom of Japanese Peninsula occurred and Investment Level reached a peak in 1973 again. That year was well known as the highest peaks of housing investment cycles and construction investment cycles\(^{8}\). But Investment Level of Japan turned to descend in the end of that year, because the first oil shock occurred suddenly and the reconstruction boom of Japanese Peninsula collapsed consequently.

As the period between the peaks in 1961 and in 1970 of Investment Level in Japan indicated a middle-term cycle, the period between the peaks in 1979 and in 1991 of Investment Level in South Korea was supposed to indicate a middle-term cycle. In South Korea, Investment Level fell down in 1993. President Kim Young Sam (1993~1998) adopted the economic stimulation policy introducing short-term foreign capital. But that policy caused the current account deficit through the increase of imports. In 1997, Won of South Korea fell down following the monetary crisis in Thailand. South Korea dropped into a difficulty to pay foreign exchanges. As Mexico recovered at least during two years since the monetary crisis, South Korea also was expected to recover in two or three years. But it must be examined how South Korea could proceed to recover on a full scale.

The debt crisis in 1982 for Mexico or the monetary crisis in 1997 for South Korea would have the same meaning as the oil shock in 1973 for Japan had been a momentum for the collapse of the boom in the peak of Investment Level. Investment Level of Japan continued to descend since 1974. Around 1980, it recovered once, but it turned to descend in the early 1980s through the second oil shock in 1979. As the oil price fell down in 1986, the Japanese investment level recovered from the recession stage. It reached a peak in 1990. That peak became high not only because of the bubble economy in Japan, but also because her Equipment Cycle ascended to a peak and her Construction Cycle rose again since the peak in 1973. In the early 1990s, Investment Level of Japan was depressed because her Construction Cycle and her
Equipment Cycle descended coincidentally. In the late 1990s, Investment Level of Japan recovered a little bit because her Equipment Cycle recovered, but it was depressed again in 1997. This is mainly because Infrastructure Cycle in Japan would become to the bottom\(^9\).

According to the product life cycle theory by Raymond Vernon\(^{10}\), it could be hypothesized that South Korea would follow the development pattern of Japan. Investment Level of South Korea would be in the downswing phase and later in the depressing phase for the next more than twenty years. If Investment Level of Japan could turn to the regular recovering phase through the ecological alternative innovations, that of South Korea also could turn from the depressing phase to the recovering phase through her own ecological alternative innovations. Such a hypothesis is realistic or not? I would like to examine this question.

3. **Business Cycles indicated by Economic Growth Rates and Import-export Ratios**

Next thing, I would like to compare Compound Cycles in the three countries indicated by the real economic growth rates. Economic Growth Rates are different from Investment Level because they show the short-term cycles clearly. Economic Growth Rates of Mexico, South Korea and Japan are compared in Figure 2. If the interval of 6 or 7 years were the case that two short-term cycles continued jointly, Economic Growth Rates would indicate always the short-term cycles in the three countries\(^{11}\). But the amplitudes of the short-term cycles are largely fluctuating according to Investment Level.

Economic Growth Rates of Japan in the 1960s were so high as to be more than 10%. But, after the dollar shock in 1971 and the oil shock in 1973, they descended down to around 5% and are depressed to around 1% in the 1990s. They coincide with the upswing, downswing and depression phase of Investment Level in
Figure 2  Business Cycles indicated by Economic Growth Rates: Mexico, South Korea, Japan

Source: International Financial Statistics
Japan. Economic Growth Rates of Mexico were 5～10% in the 1960s and 1970s, which coincided with the upswing and downswing phase of Investment Level in Mexico. After the Mexican debt crisis in 1982, they descended to minus 5～plus 5%.

On the other hand, Economic Growth Rates of South Korea continued to be as high as 5～15% in the 1960s and 1970s. Although there was a fall in 1980, they continued to be as high as 5～12% in the 1980s and 1990s. They coincided with Investment Level of South Korea, which was generally in the upswing phase. Even during the period of President Cheon Du Fwan (1979～1987) in which Investment Level was hanging sideways, Economic Growth Rates in South Korea were over 10% three times. But, when we compare the trends of Investment Levels between Japan and South Korea, Economic Growth Rates of South Korea would descend to around 5% in next ten years, even if South Korea could overcome the expected minus growth rate in 1998.

Therefore, Economic Growth Rates can indicate Business Cycles of Schumpeter because they indicate not only the short-term cycles but also Long Wave. On the other hand, in the Latin American NIES like Mexico, Brazil, Argentina, Chile and Peru, the ratios of imports to exports are recognized to indicate Compound Cycles because imports increase than exports during the prosperity phase and the driven exports overcome the diminishing imports during the recession phase. How about the cases of South Korea and Japan?

In Figure 3, I have compared Import-export Ratios of Mexico, South Korea and Japan. The vertical scale is indicated by the logarithmic scale because Import-export Ratios of South Korea were very high in the 1950s and 1960s. Import-export Ratios of Japan indicated the good economic conditions in the peaks in 1957 and 1961, in which they were over 1. The period between the two peaks shows the short-term cycle. After the late 1960s, Import-export Ratios of Japan were under 1 and showed a peak in 1974, in which the business conditions was bad. The peaks in 1980 and
1990 coincided with the good conditions influenced by her Equipment Cycle, though Import-export Ratios of Japan were under 1 in the both years. Import-export Ratios of Mexico were over 1 in the 1960s and 1970s, but they were under 1 in the 1980s of the debt crises. In the early 1990s, they were over 1 again because of the boom of NAFTA, but, in the late 1990s, they become under 1 again because of the monetary crisis.

Import-export Ratios of South Korea continued to descend very rapidly in the 1960s and 1970s. Even in the peak of Investment Level in 1979, Import-export Ratios did not ascend so much. After that, they continued to descend and become under 1 after 1985. They become over 1 in the peak of Investment Level in 1991. As South Korea dropped into the monetary crisis in 1997, Import-export Ratios would become under 1 again. Anyway, Import-export Ratios of South Korea have been rarely under 1, though South Korea continued the export oriented development. Import-export Ratios of South Korea and Japan do not indicate the business cycles clearly different from those of the Latin American NIES. The case of Japan can be explained that the Japanese industrialization is different from the phases of the industrialization in NIES. On the other hand, South Korea has pursued the processing and export oriented development without considering the import substitution policy or the principle of comparative costs since the early phase of the industrialization in the 1960s(13). Even in the recession, the materials for processing have increased in accordance with exports. Therefore, Import-export Ratios in South Korea did not fluctuate largely, which did not descend under 1.

In the Latin American NIES, the primary products like minerals, agricultural and fishery products, timbers, etc. were traditionally exported, but the import of capital goods has increased because the import substitution policy was adopted since the 1950s. Their Import-export Ratios indicated the short-term cycles and ascended in the 1960s. In the 1970s of the oil shock,
Import-export Ratios in the Latin American NIES reached the highest peak. After the 1980s of the debt crises, they has descended because the Latin American NIES sought to export the industrial products in order to get foreign exchanges. Therefore, Import-export Ratios could reflect the short-term cycles and Long Wave in the Latin American NIES. In the cases of Chile and Peru, I have even assumed Import-export Ratios would indicate Compound Cycle itself.

4. Four-cycle Schema: in the case of Japan

Not only in the three-cycle schema of Schumpeter (Short-term Cycle + Middle-term Cycle + Long Wave), but also in the improved three-cycle schema which I adopted in the cases of Brazil and Mexico (Equipment Cycle + Construction Cycle + Infrastructure Cycle), the amplitudes of the sine curves are compounded with the same proportion of the periods of cycles. On the other hand, in the cases of Chile and Peru where Investment Level fluctuated very largely, I found the coincidence between Compound Cycles indicated by Import-export Ratios and the four-cycle schema (Stock Cycle + Equipment Cycle + Construction Cycle + Infrastructure Cycle) with the different proportion of the amplitudes from that of the periods of Cycles. But, in the cases of South Korea and Japan, Import-export Ratios did not indicate necessarily Compound Cycles. Therefore, I would like to return to the hypothesis of Schumpeter in order to apply the four-cycle schema to Compound Cycle indicated by Investment Level in the both countries.

I have maintained the following hypotheses for several years. The four-cycle schema is compounded by the four substantial cycles, which are Stock Cycle, Equipment Cycle, Construction Cycle and Infrastructure Cycle. J.A. Schumpeter discerned one Juglar Cycle included three Kitchin Cycles and one Kondratieff Cycle included six Juglar Cycles\(^{(14)}\). According to his discernment
and grounding the standard period of Stock Cycle on the average period of Kitchen Cycle, that was, 40 months, I have hypothesized the standard period of Equipment Cycle was 10 years (40 months × 3) and that of Infrastructure Cycle was 60 years (10 years × 6)\(^{(15)}\). And also, I have hypothesized one Kondratieff Cycle included three Kuznets Cycles and the standard period of Construction Cycle was 20 years (60 years ÷ 3). I have discriminated the variable average periods of Kitchin, Juglar, Kuznets and Kondratieff Cycles and the fixed standard periods of the substantial cycles. Because I have constructed the ideal model with the standard periods of Stock Cycle, Equipment Cycle, Construction Cycle and Infrastructure Cycle. These standard periods of the substantial cycles are nearly in accordance with the average periods of Short-term Cycle (Kitchin Cycle), Middle-term Cycle (Juglar Cycle), Long-term Cycle (Kuznets Cycle) and Long Wave (Kondratieff Cycle). It would be justified by Max Weber's Idealtypus in German expression to construct such an ideal model of the substantial cycles\(^{(16)}\).

Although I have enlarged the schema from the three business cycles to the four business cycles, I have simplified the Schumpeter's ideal model based on monthly data by observing the ratios of Investment to GDP based on yearly data. Even though the model is simply idealized, the kinds of the compound schema would be infinite if the starting points and the amplitudes of the cycles were varied. The compound Business Cycles could be a historical business cycle model close to Kondratieff Cycle, but I would like to call it Compound Cycle which was originated by J. A. Schumpeter. The peaks and bottoms of Compound Cycle are compounded by the three or four business cycles, which have been verified in the cases of the Latin American NIES. In the cases of Chile and Peru, I have more simplified the four-cycle schema by supposing the standard period of Stock Cycle to be four years, but I do not adopt the supposition this time because it would destroy the original hypothesis.
In the case of Japan, I have hypothesized that Stock Cycle, Equipment Cycle, Construction Cycle and Infrastructure Cycle have typically the standard periods of 40 months, 10 years, 20 years and 60 years respectively. Following the theory of Schumpeter, I have assumed the periods of cycles to be the proportion of the amplitudes, which is $3.33: 10: 20: 60 = 0.333: 1: 2: 6$. The proportion is expressed on the base of the amplitude of Equipment Cycle because the proportion of the amplitudes in the improved three-cycle schema without Stock Cycle was assumed to be $10: 20: 60 = 1: 2: 6$ in the previous papers. According to this assumption, the ideal model compounding the sine curves is presented in Figure 4.

I have adopted the following formulas for the sine curves.

- Stock Cycle = $0.333 \sin (360 \frac{n}{3.33})$
- Equipment Cycle = $1 \sin (360 \frac{(n - 3)}{10})$
- Construction Cycle = $2 \sin (360 \frac{(n + 7)}{20})$
- Infrastructure Cycle = $6 \sin (360 \frac{n}{60})$

$(n)$ in the formulas indicates the number of the passed years from the starting point, which is assumed in 1955. I have reckoned backward that the starting point was 1955 because I assumed the peak of Infrastructure Cycle in Japan was in 1970. At that year, the per capita income and consumption of Japan overcome the prewar level and "It is no longer postwar." was declared in the economic white paper. Therefore, it would be suitable that the starting point of the sine curve of Infrastructure Cycle in Japan was supposed to be 1955. I have assumed that the peak of Infrastructure Cycle was on Investment Level of 1970 which was lower than that of 1961, because the ratio of the equipment investment to GNP was the highest in 1970 after the end of the Pacific War. The year of 1970 was the peak of the super boom called Izanagi Keiki, which would have been backed up by the upswing phase of Infrastructure Cycle.

The ratios of the stock investment to GDP in Japan did not necessarily coincide with the turning dates of the business
Figure 4 Business Cycle Model by Sine Curves: In the case of Japan

Stock Cycle = 0.333 \sin\left(360n/3.33\right), Equipment Cycle = 1 \sin\left(360(n-3)/10\right),
Construction Cycle = 2 \sin\left(360(n+7)/20\right), Infrastructure Cycle = 6 \sin\left(360n/60\right)
conditions. The bottoms of the stock investment to GDP ratios were in 1954, 1958, 1962, 1965, 1969, 1972, 1975, 1978, 1983, 1987, 1990 and 1994. Therefore, the period of Stock Cycle in Japan was close to the standard period based on Kitchen Cycle. As the year of 1954 indicated the bottom, it would be suitable that the year of 1955 was supposed to be the starting point of the sine curve of Stock Cycle in Japan. See Additional Figure (Figure 9).

The average period of the ratios of the equipment investment to GDP in Japan is 10 years and coincides with the standard period of Equipment Cycle. The peaks of the ratios were in 1951, 1961, 1970, 1980 and 1990. Therefore, the peaks of the sine curve model of Equipment Cycle with the period of 10 years could coincide with the real peaks if \( n \) were substituted for \((n - 3)\). The average period of the ratios of the construction investment to GDP was \( 17 \sim 20 \) years\(^{17}\), which was close to the standard period of 20 years. As the highest peak of Construction Cycle was in 1973, \( n \) of the sine curve model of Construction Cycle was substituted for \((n + 7)\) in order to make the peaks of the model coincide with the real peaks of Construction Cycle.

Figure 4 presents the ideal sine curve models of the four business cycles in Japan. The bottoms of Infrastructure Cycle were supposed to be in 1940 and 2000. Figure 5 presents the four combined ideal sine curve models simultaneously, which are for Infrastructure Cycle, Infrastructure Cycle + Construction Cycle, Infrastructure Cycle + Construction Cycle + Equipment Cycle (the improved three-cycle schema), Infrastructure Cycle + Construction Cycle + Equipment Cycle + Stock Cycle (the four-cycle schema). Even if it were not avoidable for the four-cycle schema to separate from the actual peaks and bottoms of the business cycles, I would like to compare the four-cycle schema and the actual values of Compound Cycle. Although the four-cycle schema is an ideal model, I suppose the four-cycle schema can be a scale of the historical Business Cycles, which we call Compound Cycle.

In Figure 6, I compared the four-cycle schema and the actual
Figure 5  Business Cycle Model of Japan: Four-cycle Schema

Stock Cycle = 0.333 \sin \left( \frac{360n}{3.33} \right)
Equipment Cycle = 1 \sin \left( \frac{360(n-3)}{10} \right)
Construction Cycle = 2 \sin \left( \frac{360(n+7)}{20} \right)
Infrastructure Cycle = 6 \sin \left( \frac{360n}{60} \right)
Figure 6  Business Cycles in Japan: Investment Level and Four-cycle Schema

Standard Value = \(0.333 \sin \left(\frac{360n}{3.33}\right) + 1 \sin \left(\frac{360(n-3)}{10}\right) + 2 \sin \left(\frac{360(n+7)}{20}\right) + 6 \sin \left(\frac{360n}{80}\right) + 31.6\)
values of Investment Level in Japan presented in Figure 2. I put the four-cycle schema in Figure 5 on the actual values of Investment Level and added to the four-cycle schema by 31.6%, which was the average ratios of the gross investment to GDP. According to Figure 6, Investment Level in the 1950s and the early 1960s were separated from the added four-cycle schema. This could be explained that Japan had been in the reconstruction and enlargement processes after the Pacific War. The downfalls of Investment Level in 1971 and 1972 could be explained by the appreciation of Yen. The decline of Investment Level in the late 1970s would be understood that the boom of the Japanese Peninsula Reform collapsed through the oil shock. The upswing in the late 1980s could be explained by the bubble economy after the Plaza Agreement in 1985. In the early 1990s, the big economic recovering policy for the Heisei Depression has pushed Investment Level over the four-cycle schema.

The four-cycle schema is the ideal model which combined the sine curves with the standard periods of the four business cycles. The adjusted pattern of the four-cycle schema was arranged the peaks of the ideal model to coincide with those of the actual values of Investment Level. The adjusted pattern would present the standard values of Investment Level. According to the pattern in Figure 6, the standard values of Investment Level in Japan would present 24~40% of GDP. As Investment Level could be swayed by the environment of trade and the fiscal and financial policy, the separation from the standard values would be unavoidable. But it would be meaningful to assume the standard values of Investment Level in order to measure the influences of factors explaining the separation. If the four-cycle schema of Japan in Figure 6 could present the standard values, Investment Level of Japan in the late 1990s would be hanging low, even though Equipment Cycle would recover. The bottom of the four-cycle schema is presented in 2004 in Figure 6. Therefore, the revival phase of Compound Cycle in Japan would begin after 2004.
Investment Level of South Korea, which has been ascending over twenty years later than Japan, could be expected to turn to the downswing phase by the momentum of the monetary crisis in 1997 and 1998. Therefore, the Japanese pattern of the four-cycle schema after the oil shock in 1973 would be useful in order to forecast Investment Level of South Korea in the next twenty years.

5. Four-cycle Schema and Economic Growth Rates

If the four-cycle schema of Japan presented in Figure 5 were adjusted like Figure 6, the standard values of Compound Cycle could coincide greatly with Investment Level. It can be generally assumed that the four-cycle schema would indicate not only the standard period but also the standard amplitude of Compound Cycle. On the other hand, Schumpeter presented the differential curve of the three-cycle schema, which was considered to present the standard amplitude of the growth rate Business Cycles. If we compared Figure 2 and Additional Figure (Figure 9), we could find Economic Growth Rates did not necessarily coincide with Stock Cycle. They are considered to present the amplitudes of the growth rates of Compound Cycle (Business Cycles), which coincide with the feeling of the real business conditions. If the four-cycle schema could present Compound Cycle, it would be significant not only to compare Investment Level with the four-cycle schema, but also to compare the real economic growth rates with the differential rates of the four-cycle schema.

In Figure 7, I compared the growth rate Compound Cycle of Japan indicated by Economic Growth Rates with the differential rates of the four-cycle schema. However, the curve of the differential rates of the four-cycle schema is adjusted by the formula (the difference with the previous year $\times 3.9 + 6.1$), in order to compare them with Economic Growth Rates directly. The difference with the previous year of the four-cycle schema is
Figure 7 Differential Rates of Four-cycle Schema and Economic Growth Rates in Japan

Real Economic Growth Rates

Their Standard Amplitudes

Standard Amplitudes = Differences of Four-cycle Schema against Previous Year * 3.9 + 6.1
multiplied by 3.9 in order to adjust the standard amplitude in 1974 to 0%, which is close to the actual value. Thereafter, the average of Economic Growth Rates, that is 6.1%, is added to it.

The amplitudes of Economic Growth Rates in Japan are very large, but rarely become minus. They are between 0% and 15%. After the early 1970s, Economic Growth Rates turned from the high level over 10% to the low level below 5%. This is related to the fact that the four-cycle schema turned from the upswing phase to the downswing phase in this period. The upswing of Economic Growth Rates during the late 1980s could not be explained only because of the bubble economy, because the differential rates of the four-cycle schema were rising in the same period. In the 1990s, the four-cycle schema turned into the depression phase and Economic Growth Rates are lowered to the nearly 0% level because of the internal debt crisis in Japan. But the differential rates of the four-cycle schema during the depression phase is recovering in the late 1990s as you see in Figure 7. If the four-cycle schema had a substantial meaning, the separation between the differential model and the actual economic growth rates might be adjusted sometime. As mentioned above, Economic Growth Rates and the standard amplitudes of the growth rate Compound Cycle could be directly compared by the simple adjustment.

The South Korean Economic Growth Rates shown jointly in Figure 2 were very high during the 1960s and 1970s. They were also high during the 1980s, but they become hanging sideways in the 1990s. As we compared Investment Levels between South Korea and Japan in Figure 1, we can consider the South Korean four-cycle schema would follow the pattern of the over 20 years behind Japan. The stagnancy of the South Korean Economic Growth Rates in the late 1990s would be compared with the stagnancy of the Japanese Economic Growth Rates after the oil crisis in 1973. If the differential rates of the Japanese four-cycle schema after the oil crisis were assumed for the future of the
differential rates of the South Korean four-cycle schema, the South Korean Economic Growth Rates would be under 5% in the next 20 years, even if South Korea could overcome the expected minus growth rate in 1998. After that, they would be hanging low for a while. In order to overcome the economic difficulty of the downswing and depression phases, it would be necessary to build the alternative framework for the ecological innovations. Mexico needed the framework of NAFTA in order to overcome the stagnation in the 1980s. It is necessary to enlarge the interrelationship between Japan and South Korea in order to turn Investment Level of South Korea to the recovery stage through the ecological regional integration. If the new ecological vision between Japan and South Korea were formed by President Kim Dae Jung and Premier Keizo Obuchi, it would be useful not only for the recovery of the South Korean Investment Level, but also for the revival phase of the Japanese Investment Level.


Hitherto, I have forecast the stagnancy of Investment Level and Economic Growth Rates in Japan and South Korea in near future on the ground of the four-cycle schema. However, the debt crises were the big causes to turn down and to lower Compound Cycle including Long Wave, as we saw in the cases of Brazil, Argentina, Mexico and Peru. It is also necessary to examine the relation between Compound Cycle and the debt crises in the cases of Japan and South Korea. So far I indicated the years of the external debt crises by the ratios of total balance of payment to foreign reserves. And the years of the internal debt crises were indicated by the ratios of fiscal balance to fiscal revenue. But these indicators are not appropriate for Japan, which has not the external debt but the large internal debt and also has large foreign reserves with the surplus of total balance. Therefore, I adopted the ratios of government debt balance to GDP in this
time according to the international indicator of the debt crises.

In Figure 8, we compare the ratios of government debt balance to GDP between South Korea and Japan. The balance of the Japanese government debt was 368 trillion yen at the end of 1997, which was 72.4% of GDP. We should not overlook that not only the bad loans of the Japanese banks, but also the large government debt in Japan are pushing the depression phase of Japan in the 1990s. Ratios of Government Debt Balance to GDP were over 100% during the Pacific War, which reached 144% in 1944. After the war, they were rapidly lowered by the policies of General Headquarters of the allied occupation army. The Japanese government was ordered to abolish the compensation for the wartime government expenditure, to prohibit Bank of Japan from buying the national bonds, to abolish the continuous fiscal budget and to balance the budget according to the nine principles for the economic stabilization. Therefore, Ratios of Government Debt Balance to GDP in Japan became under 10% in the 1950s.

But, after the temporary deep recession in 1965, the Japanese government turned the balanced budget policy and issued the construction bonds. Nevertheless, the prosperity called Izanagi Keiki continued from 1965 to 1970 and the fiscal balance improved rapidly. Therefore, Ratios of Government Debt Balance to GDP did not deteriorate so much. The Japanese economy dropped into the minus growth after the first oil shock. The revenue of the government decreased and the exceptional bond, that was, the red-ink bond was issued again after 1975. Then the fiscal deficit reached to 7.5% of GDP and the balance of government debt become over 30% of GDP.

Premier Masayoshi Ohhira (1978~1980) declared to get rid of the red-ink bond in 1984. Nevertheless, the fiscal reconstruction could not be achieved because of the recession after the second oil shock in 1979 and Investment Level descended under 30% of GDP in 1982. Premier Yasuhiro Nakasone (1982~1987) declared to realize the zero issue of the red-ink bond in 1990. This was
Figure 8 Business Cycles indicated by Ratios of Government Debt Balance to GDP: South Korea and Japan

Source: International Financial Statistics
realized in the budget of 1990 because the red-ink bond did not be issued in that year owing to the bubble economy. It was for the first time in 16 years. But the balance of government debt in 1991 become 224 trillion yen and the ratio of government debt balance to GDP reached 48.4%. Then, the red-ink bond was issued again in the depression phase called Heisei Stagnation after 1992. Ratio of Government Debt Balance to GDP deteriorated again to become 72.4% in 1997.

The process of the Japanese debt crises coincides with the downswing phase and depression phase of Investment Level and Economic Growth Rates after 1973 as you already look in Figure 6 and 7. It is ironical that the government debt has been accumulated by the expenditure for the economic recovery policy. The accumulated government debt is disturbing to recover Economic Growth Rates. If the fiscal reconstruction were delayed because of the economic recovery policy, Economic Growth Rates could not rise easily. It would be postponed for Investment Level to turn to the revival phase. As the zero issue of the red-ink bond was postponed until 2003 or 2005 by the liberal-democrat government of Japan, it would be difficult for Investment Level of Japan to turn to the revival phase until around 2004. The bottoms of the four-cycle schema in Japan were assumed to be in 1944 and 2004 as indicated in Figure 6. Therefore, the bottoms of Ratios of Government Debt Balance to GDP would coincide with those of the four-cycle schema of Japan.

In contrast with Japan, the balance of the South Korean government debt was 33.6 trillion Won in the end of 1996, which was only 8.6% of GDP. It has a little bit deteriorated from 7.5 % of GDP in 1991 when the South Korean Investment Level was in a peak. This level of the government debt balance in South Korea could be understood when we saw the Japanese level of 1970 in the prosperity stage called Izanagi Keiki was 8.3%. As Japan fell into the debt crisis after the first oil crisis in 1973, South Korea fell into the debt crisis after the monetary crisis in 1997. In the
case of Mexico, the government issued the short-term bond to gather the foreign capital in large quantities. In the case of South Korea, the private sector introduced directly the short-term capital from abroad to enlarge their activities, which stimulated the economic growth rates indirectly.

Therefore, when the short-term capital began to flee from South Korea, there was no way to prevent the capital flight and the government was obliged to guarantee the debt of the private sector. The state of South Korea was exposed to the debt crisis at once. Hitherto, Ratios of Government Debt Balance to GDP have not been so high. But, as South Korea accepted the support of IMF, Ratios of Government Debt Balance to GDP would ascend rapidly. Therefore, the South Korean Investment Level could not recover easily. This is the main conclusion when we observed Figure 8.

7. Conclusion

In December of 1997, Kim Dae Jung was elected to be President of South Korea and Korea entered into a new era. South Korea succeeded to develop her economy by the export oriented policy and was recognized as one of the emerging economies in the 1990s. In the same decade, Japan entered into the depression phase of the compound Business Cycles named Compound Cycle. The South Korean economic structure has been lead by the conglomerates called Chaebols and developed by the heavy chemical industries and exports. But South Korea has lost the international competitiveness through the rising wages and the overvaluation of the foreign exchange, that is, Won. At last, South Korea has fallen into the difficulties to pay the foreign exchanges in 1997.

Ex-president Carlos Salinas of Mexico could come out from the debt crisis in the 1980s by following the economic policies of South Korea. Those policies aimed to enlarge the export industries
by introducing short-term capital. But the flight of short-term capital began in Mexico and followed in Thailand, Malaysia, Indonesia, South Korea and Russia. The monetary crises in Russia extended to the critical situations in Latin America. The external debt of South Korea reached to 153 billion dollars at the end of December, 1997. The short-term foreign debt due within one year reached 80.2 billion dollars, which occupied 52.4% of the total foreign debt of South Korea. The 24 billion dollars of the short-term foreign debt was directed to the South Korean private banks. As a result of the negotiation with IMF on debt rescheduling, those 24 billion dollars were converted to the government guaranteed finance and rescheduled by a maximum of three years. The South Korean monetary crisis ceased for a while. But the government debt in South Korea doubled in a moment and the interest payment of the $153 billion external debt increased over $10 billion annually. Therefore, the difficulties to pay the foreign exchanges would continue in South Korea. Ex-president Kim Young San had promoted the South Korean financial Big Ban to gather short-term capital from abroad. But, as the laws related with Big Ban had been rejected by South Korean Diet, the short-term foreign capital fled rapidly from South Korea.

As dropped into the financial crisis, South Korea was forced to accept the IMF conditionality. IMF required the liberalization of finance and security and the reform of the conglomerates, which President Kim Dae Jung was obliged to accept before he took office. Although the financial Big Ban in Japan was started under the pressure from abroad, South Korea was forced to start the financial Big Ban without preparation. Investment Level of South Korea which has been supported by the inflows of short-term capital would descend for a while by the momentum of the forced Big Ban. If the Japanese four-cycle schema of twenty years ago could be applied to South Korea, the South Korean four-cycle schema would be forecast to descend with a temporary
recovery and to recover on a full scale after the long depression phase.

According to the case of Mexico, the regional integration would be necessary for South Korea as a momentum for the temporary or full scale recoveries. The new market integration between Japan and South Korea would be useful not only for the depression phase in South Korea but also for the revival phase in Japan. The economic interchange between South Korea and North Korea is very difficult, but it would be very useful to turn the South Korean Compound Cycle to the revival phase. In South Korea, Kondratieff Cycle has been discussed and the regional integration between South and North Korea has been sought as a vital solution for the national development. As a matter of fact, Compound Cycle is not different from what Nicolai Kondratieff himself defined as Long Wave. The matter in hand is whether the South Korean and Japanese governments can manage the ecological alternative innovations with the self-adjusting political power. In order to turn the depression phases in the both countries, the ecological regional integration between South Korea and Japan would become the alternative framework to absorb Ecological Industrial Revolution from Europe and to extend the ecological alternative innovations to the Pacific and Japan Sea Basin.

End

Notes
(1) Osamu Ozeki "Monetary Crisis and Long-term Prospect of Economic Growth in Mexico", Business and Cycle (Journal of the learned Society on Business Cycles) No. 22, November 1996. In 1995, the real economic growth rate of Mexico fell into minus 6.9%, but the trade balance registered 7.8 billion dollars surplus and the current account improved very much. In the early 1997, Mexico repaid the debt of 15 billion dollars advancing the due date. But the structural reform in Mexico has not yet been realized. It will be necessary the ecological alternative innovations cause the real
economic recovery in the traditional Mexican society. See Vision "Busúcan consolidar el crecimiento" on December 15, 1997.

(2) : Osamu Ozeki "Business Cycles in Peru, Compared with Mexico and Chile" Latin America Journal (The academic journal of the association on the political economy in Latin America) No. 31, December 1997. Business Cycles in Peru which suffered the hyperinflation in the end of 1980s could be analyzed by the same type of the four-cycle schema as in the analysis of Chile which achieved the high economic growth rates in the 1980s. That is proving the common feature in the historical fluctuations between Peru and Chile.

(3) : Osamu Ozeki "The Development of Latin America and Pacific Basin", The Journal of Yokohama College of Commerce, Vol.27, No. 2, March 1994. In the 52nd conference of the learned society of International Economics, the common thesis was 'Pacific Basin Economies'. So I presented the above paper to emphasize the role of Latin America because the concept of the Pacific Basin was centered to Asia and Oceania disregarding Latin America until then. In the autumn of 1993, the ratification of NAFTA was the focus in the international affairs and the economic conditions in Mexico were especially mentioned in the journals. From the end of 1994 to the early 1995, the monetary crisis in Mexico forced Mexico to reform the economic structure. In the long view, the most important thing would be the structural reform based on the democracy and the environmental policy in that country. See Vision "Ya no es como antes" on December 15, 1997.

(4) : Dobus Higins "Asia Pacific Age" 1993, translated by Tomomitu Ohba and published by the Japan Times. See page 339 of the Japanese edition. In the early 1980s, South Korea was suffering from the macro economic disequilibrium with the over and double investment. The background for this economic policy was the existence of the planning officers delegated from the ministry of commerce and industry. Hattori Tamio "The mechanism of the economic development in South Korea and Taiwan" 1996, The Institute for Developing Countries, See page 85.

1982, which was well known to be the year of the debt crisis in Mexico, South Korea also dropped into a difficulty to pay foreign exchanges.

(6) : Miyohei Shinohara "The business cycles during the 50 years of the postwar Japan "1994, Nikkei Shinbun Co. Ltd., See Figure 6 in page 28. As Prof. Shinohara used the indicator of investment to GNP ratio in Japan, the indicator of investment to GDP ratio was effective as a measurement of business cycles for Latin American countries with hyperinflation, because its ratio could omit the influence of hyperinflation fairly well. However, when I studied about Brazil and Argentina at first, I was obliged to neglect Stock Cycle because the figures of the stock investment in the both countries could not be obtained in the IMF statistics.

(7) : ibid. See page 20. Prof. Shinohara pointed out that Kuznets Cycle meant not only Construction Cycle, but also played a big role as the wave of innovations. The peaks of the real economic growth rates averaged moving during seven years were in 1950, 1969 and 1987, which expressed the growth cycle of Construction Cycle but the levels of the peaks lowered after 1970. See ibid. page 7, Figure 1.

(8) : ibid. See page 161. The peak of the ratios of construction investment to GDP would be near to the peak of Infrastructure Cycle. The argument that the peaks of Kondratieff Cycle coincide with the bottoms of Kuznets Cycle might have been introduced by the particular indicator and the statistical processing. I think this argument is misleading. See ibid. page 254. And see Braian Belly "The Long Wave and the political action" 1995, translated by Tomohiro Ogawa, Akishobo, page 107.

(9) : Yuji Shimanaka "Compound Cycle" 1995, Toyokeizai Shinposha, page 146. Here Long Wave of Japan is detected by the indicator of the official interest rates. He judged the bottom of Long Wave (Kondratieff Cycle) was in 1995 when the official rate was cut to 0.5%. But this level of the official rate is continuing for three years. I think the bottom of Long Wave would be in several years later if the official rates were averaged moving in nine years. The latest bottom of Long Wave in Japan was judged to be in 1940 by the indicator of the official interest rates. This judgment coincide
with the assumption in the four-cycle schema which I have formulated.

(10): Raymond Vernon "International Investment and International Trade" The Quarterly Journal of Economics, 1966, page 199. The goose flying pattern of the domestic production in the U.S., the other advanced countries and the newly industrializing countries would cause the same goose flying pattern of the investment levels in the developed and developing countries.

(11): The prosperity called Izanagi Keiki in Japan was supposed to include two short-term cycles. See Miyohei Shinohara ibid. page 83.

(12): Osamu Ozeki "The Study on Long Wave and Debt Problem: in the cases of Brazil, Mexico and Chile", Business and Cycle No. 19 November 1994. According to the product life cycle theory of Raymond Vernon, I explained that the import-export ratios indicated the business cycles. But, when we examined the case of Korea, it could not be necessarily generalized. It is better to say the import-export ratios would indicate the business cycles especially in the Latin American NIES.

(13): Frank B. Gibney "The Pacific century" 1992, translated by Taichi Sakaiya and published by TBS Britanica, page 286. Gibney pointed out that the technocrats in Seoul, Singapore and Taipei almost neglected the traditional economic law like the principle of comparative costs of David Richard when they planned the economic development of their own countries.


(15): Schumpeter presented the model which compounded Short-term Cycle of 38 months, Middle-term Cycle of 9 years and a half, Long Wave of 57 years with the proportion of the amplitudes of 1 : 3 : 18. See ibid. "Business Cycles" page 137, Japanese translated edition "On Business Cycles V" page 1577. I can not find a reason that Schumpeter adopted 38 months, not 40 months, as the period of Kitchen Cycle. I think Schumpeter adopted 57 Years as the
period of Long Wave according to the case of the U.S. But there is a study that the average period of Long Wave of the U.S. is 60 years. See Ravi Batra "Regular Cycles of Money, Inflation Regulation & Depressions" 1985, The Japanese edition translated by Miyohei Shinhara and published by Toyokeizai Shinposha "Money, Inflation, Depression".

(16) : Toyokeizai Shinposha "Dictionary of Economics" 1984, page 271. Max Weber said the abstract economic theory was the special example of the ideal concept formation, which was peculiar to the social science and indispensable to the concept formation to some extent. However, it is not peculiar to the social science to construct the ideal type model because the law of Boil and Charles in aerology was found experimentally by assuming the ideal type of a gaseous body.

(17) : ibid. Miyohei Shinhara "The business cycles during the 50 years of the postwar Japan" 1994, Nikkei Shinbun Co. Ltd., See page 165. The construction investment is easily swayed by the public investment. In Japan, the large amount of the public investment is the construction investment for infrastructure. Although Infrastructure does not mean the public construction, it is better to discriminate the public construction from the private construction.

(18) : Pak Hyn Chu "The direction of the self-sustainable national economy from the viewpoint of the unification" the fourth chapter of "The disputes on the South Korean capitalism" edited by Kenkichi Honda and published by Sekaishoin in 1990, page 139. Here he indicated in South Korea "Recently the Kondratieff cycle is appreciated over again. At this moment, the tentative and conservative policies for the deepening dependency on abroad would terminate in the critical consequence. The national and capitalistic needs in South Korea would require the market integration with North Korea as a national community."

(19) : Takashi Shiraishi "The politics in Asia has lost the function of the self-adjustment." May 4, 1998, Nikkei Shinbun. Here he mentioned about Thailand, Malaysia and Indonesia. But North and South Korea, Russia and Japan might not be exceptional.
Additional Figure (Figure 9) Business Cycles indicated by Ratios of Stock Investment to GDP: In the case of Japan

Source: International Financial Statistics