Discussion of a Currency Exchange Value Scale to Stabilize Exchange Rates

— From Market Theory to a Macro GDP Equilibrium Parity Theory —

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Introduction

There is no numerical currency exchange value scale in the foreign exchange market under floating exchange rate system. The foreign exchange market is theoretically based on function of market mechanism of microeconomic theory and on the theory of supply and demand. However, because psychological factors exist, such as the type of speculation discussed by Albert Aftalion, exchange rates always overshoot their targets. Once an economic crisis or financial shock hits a nation, the exchange markets vastly overshoot their response, and not only threaten economic activity and everyday living, but have the power to send the entire world economy into chaos.

This article defines an index GDPph that expresses the real economy from GDP statistical values. And discuss GDPpar as currency exchange value by applying the Walrasian General Equilibrium Theory which is the index calculated by macro goods (Japanese GDPph ÷ US GDPph = GDPpar equilibrium value) and when micro exchange rate [GDPpar ≒ exchange rate] moves in tandem.

I. What is a Currency Exchange Value Scale?

1. There is no currency exchange value scale in a floating exchange rate system

i) Under the **fixed exchange rate system**, there was a value scale such as gold-silver or gold-dollar parity. However, when currency values (exchange rates) were fixed under a fixed exchange rate system, the inability of market principles to function created an inequilibrium of goods (GDPpar calculated from the real economy indicator). Since the key currencies were unable to be maintained in a fixed exchange rate system, that system collapsed and the shift was made to a floating exchange rate system.

ii) In a **floating exchange rate system**, using exchange rate as currency exchange value scales of a country's total value hold problem as exchange rate vary minute by minute. Therefore it is time to rethink the theoretical basis of currency value scales.

Exchange rate theory has been an instrument of intellectual money game. The foreign exchange market and the Chicago Mercantile Exchange may seem like massive casinos. But to ensure the stability of exchange rates and the stable growth of the world economy, they must not become instruments of an intellectual game among investors, such as hedge funds.

Fundamentals of exchange rate as currency value scales must be theoretically calculated by country's real economy and total value of goods and currency. Currently, that index has not theoretically converted to numbers. Theoretically converting numbers will facilitate to stabilize the exchange rate.

iii) Since the **current foreign exchange market** is functioning under market theory using market mechanisms based on supply and demand theory derived from the micro price theory, exchange rates vary over very short time frames and are calculated in miniscule units, as a game. In addition to the theory of

supply and demand, because of the intervention of psychological factors, such as speculation, as described by Aftalion, there is no theoretical or numerical basis for a currency exchange value scale, and exchange rates are therefore affected by changes in various economic indicators and by the speculation of investors, and thus tend to irrationally overshoot optimal levels.

This paper uses Walrasian General Equilibrium Theory to show that because the goods of a country (GDP) and the total currency of that country are in equilibrium, the country's currency can be converted into an index of the total value of GDP per capita, and converted into a number that can serve as an indicator of that country's real economy. From the comparative values of the indices of the real economies of two countries [Japanese GDPph ÷ US GDPph = GDP par], a macro mid-term to long-term currency exchange value scale can be determined. That is, exchange rates are not governed by a micro price formation theory that vacillates according to supply and demand, but rather are based on macro income theory, which is fundamentally based on a country's real economy, and this makes it possible to plan for the achievement of the IMF ideal of "stable growth of the world economy through stable exchange rates.".

iv) Exchange rate theories thus far have adopted several approaches: the flow approach which is based on the trade balance and current-account balance; the stock approach which focuses on foreign exchange supply and demand through one-time asset balances; the monetary approach which focuses on the money supply and interest rate differences through purchasing power parity theory; and the asset approach, which rates are determined by the supply and demand for asset stocks denominated in each country's foreign currency. However, these approaches are micro perspectives that only focus on certain aspects of a currency value scale, and can hardly be viewed as sufficient indicators of the fundamentals of the country's economy. That is, those exchange rate theories do not represent as currency value scales as they do not

factor the genuine of currency such as the total value of goods, total value of currency and fundamentals of real economic indicators

This article studies possibility of exchange rate stability under the floating exchange rate system by GDPph and GDPpar. GDPph index, which reflect fundamentals of real economy, is determined by macro income theory. GDPpar is calculated as "real economic indicator which is equal to total value of goods and currency which lead to currency exchange value scale which also reflect as a country's medium and long term fundamentals.

By increase of precision of the 93SNA GDPpar and the exchange rate would be in equilibrium [GDPpar = exchange rate] under the theory, but as GDPpar move in tandem with exchange rate [GDPpar ≒ exchange rate] with minimum divergence derived from interest rate, open monetary operation or intervention policy and time lag in statistics, GDPpar could replace floating exchange rate system and could serve as exchange rate scale by admission of GDP equilibrium value parity theory.

Also as stated afterword, GDPpar would represent real economic figures as the change to monetary and economic policy will converged to GDP after the certain period. The divergence ratio of foreign exchange rate and GDPpar include time lag of statistic figures and certain period of margin error of monetary policy such as interest rate or overshoot of market theory. For the reference, the divergence ratio of dollar yen rate after the big bang 1998 is 12.81%.

2. The GDP and the Currency Exchange Value Scale

This article applies the income theory of macroeconomic theory to establish the following formula for the economic indicator GDPph, which expresses the total value of the real economy from the GDP statistics obtained from the System of National Accounts (93SNA) established by the United Nations (UN):

GDP ÷ total population = GDPph (per head). Next, the article defines the index GDPpar of the currency equilibrium value parity (exchange value scale) from the formula for comparing the real economy index GDPph of countries with different currencies [GDPph of Country B ÷ GDPph of Country A = GDPpar (parity)]. The fact that GDPpar is the currency exchange value scale will be verified in Section II.

Trade and investment, which are outflows of goods and currency (hereafter, also including capital assets) from an exporting country, are in the form of inflows of goods and currency to an importing country, and are factored into GDP. Thus, GDPph, which is an indicator of the real economy in both countries, expresses the exchange value scale of goods and currency, or GDPpar, through the formula above in advanced countries where the principle of competition and market principles are functioning, based on Walrasian General Equilibrium Theory. In other words, when there is a value scale in the inflows and outflows of goods and currency, even when there are different currencies, the value of each country's goods and the value of their currencies are equivalent. Thus, each GDPph index that expresses the total value of both countries' goods and currency is the real economic indicator of each country, and the figure of the currency exchange value scale, which is the GDPpar equilibrium value parity, is determined from the GDPph index formula above.

1). When market principle functioning

With regard to the currency exchange value scale, when both **exchange rate and GDPpar** which is calculated by macro real economy index GDPph are converging and moving in tandem, the exchange rate and GDPpar (GDPph equilibrium value parity) will be admitted as the currency exchange value scale.

However, this is premised on the notion that the market principles and the principle of competition are functioning. The movement in tandem of

[exchange rate ≒ GDPpar] is verified in Section III.

2). When the competition principle and the market principle are not functioning

In this case, exchange rate and GDPpar move apart from one another. Thus, the advanced nations are obligated to reject regulations that impede the functioning of market principles and the principle of competition based on fairness and justice, to support stable growth of the world economy so that exchange rate and GDPpar [exchange rate ≒ GDPpar] can move in tandem. In the developing nations, however, because of the economic gap, efforts should be made to investigate the approval of a certain handicap in GDPpar (currency exchange value scale) to support economic development until economic growth is achieved.

3. Statistical Problems

At the same time we are working under the precondition that the GDP statistics, which are an indicator of the real economy, are precise statistical values (with reduced balancing items) that express the real economy through the constant addition or revision of components so that they can better reflect environmental changes in the real economy. Also it is important that the IMF establish international standards and adopt rules to ensure that the statistics are fair and accurate. Because statistical figure, such as advanced figure, revised figure, final figure and expected figure are used as indicators of the real economy, differences and time lags due to statistical revisions can become a source of disparity.

This article uses the IFS statistics by assuming UN 93SNA would fulfill the above conditions. But because of statistical revisions and time lags, there is divergence in exchange rate and GDPpar as **[exchange rate ≒ GDPpar]**.

To make the Japanese statistics consistent with the statistics of the leading

countries, the decimal point at a place suitable for easy comparison, this article divided all figures by 100. When performing yen calculations, simply multiply by 100 to revert to the yen currency denomination.

4. Exchange rate volatility by CPI and interest rate

The mid and long term interest rate differential of both countries could be the cause of divergence ratio of exchange rate.

Real interest rate is the rate which CPI or deflation rate is subtracted from policy interest rate, and real interest rate differential of two countries become the factor of short term exchange rate volatility. However, it will be factored to final GDP figure after the certain period.

5. The Basis of Microeconomic Exchange Market Theory and Macroeconomic GDP Theory

Exchange market theory is a theory of exchange rate fluctuations caused by the current-account balance, such as trade and service settlements. The strong dollar due to the deficit expansion in the current-account balance in the US in the early 1980s led to the 1985 Plaza Accord, which was implemented to correct the misalignment. Later, as a deficit in the US current-account balance and a surplus in the Japanese current-account balance became constant fact, and excess liquidity expanded, theoretical explanations of exchange rate fluctuations under the current-account balance theory became invalidated. As a result, there was a need to supplement the current-account balance deficit with the capital-account balance, and to find a theoretical basis for the international balance of payments. With the economy becoming more globalized, the priority has tipped from microeconomic movements of goods (including services) to macroeconomic movements in capital assets, and the need has also arisen to change the value scale of currency, or to move from micro goods to macro

capital assets. In other words, there is a need to change from a value scale based on microeconomic theory of supply and demand, to a currency exchange value scale theory that expresses the total value scale of the real economy in a country through macroeconomics, or the value scale of capital assets.

To supplement these theories, macroeconomic theories such as the purchasing power parity (PPP) theory have been introduced, such that the theoretical foundations of exchange rates have been reinforced by PPP according to macroeconomic theory [Y = C + I + (G) + E + M]. However, because PPP does not include investments (I: capital), it cannot account for 100% of national income. Also, because PPP varies due to exchange rates in the base year under exchange market theory, there are problems in utilizing it as a theoretical foundation.

In this paper, because the value of capital assets from investment can be embodied in the formula GDP = Y, a currency exchange value standard based on the total value of good, thus currency will not be dependent on the exchange rate market or exchange rates of base year. Rather, GDPpar calculated based on the macroeconomic income theory. Real economy index GDPph is defined as the currency exchange value scale. GDPph is used as the theoretical basis for the following reason. Because the real economy itself symbolizes the economic strength and capital asset value of a nation, GDPph, an index derived from GDP, is defined as the real economy indicator, and the GDPpar, calculated from the GDPph of both countries, as the currency exchange value scale (see the definitions in Section II, and their validation in Section III).

II. Definition of the Real Economy Indicator

1. Added-Value Production and the Real Economy Indicator

The UN 93SNA is theoretically based on income theory compiled from macroeconomic perspectives shared around the world, and equilibrium is

achieved using the principle of the equivalence of three aspects in a matrix. There is equilibrium between the three aspects of gross domestic product (GDP) = gross national income (GNI) = gross domestic expenditures (GDE), and these express the total value of the real economy in each country. GDP seems to be the only statistic that expresses the real economy of a country. GDPph, which expresses the real economy indicator in this paper, is distinct from the microeconomic labor productivity theory, and must not be confused with concepts of labor population, production, and income.

2. Definition of Terms and Formulas

1) **GDPph:** Per head (per capita) GDP as calculated using the 93SNA.

Formula 1: [GDP ÷ total population = GDPph] However, Japan's GDPph is multiplied by 1/100, to make the units consistent with the unit of GDPph used in the leading nations. To reconvert the figure to yen, multiply it by 100.

2) **$GDPph:** The $GDPph, which is the GDPph converted into US dollars by the exchange rate, poses serious problems and it is wrong to use(see Section V-1). This paper must compare GDP and other figures denominated in each country's own currency, without converting them to dollars.

Formula 2: [GDPph ÷ exchange rate = $GDPph]

3. Definition and Formulas for GDPpar and GDPgap

1) **GDPpar:** GDPpar treats the GDPph as index of the total amount of goods, and expresses the total value of goods of the target country using 1 as the benchmark value of the base country (the US is used as the base country hereafter). However, assuming the basic condition that market principles are functioning, GDPpar X to the base country of 1is defined as the GDPpar equilibrium.

Formula 3: [Target country GDPph ÷ Base country GDPph = GDPpar]

2) **GDPgap:** Because a GDP gap exists in developing nations, this is expressed as GDPgap. However, until GDPgap converges and moves in tandem benchmark of 1, it expresses GDPgap (GDPgap ≦ 1). After that GDPgap reached benchmark of 1, it becomes GDPgap ≧ 1 and GDPpar ≦ 1, there are needs to read GDPgap as GDPpar and GDPpar as GDPgap. Thus inverse of GDPgap is GDPpar and GDPpar express total value of goods.

Formula 4: [Developing country GDPph ÷ Base country GDPph = GDPgap]

Formula 5: [1 ÷ GDPgap = GDPpar]

4. Relationship between the total value of goods and the total value of currency, based on GDPpar

1) **[GDPpar = 1]:** GDPpar1 of the target country to the base country means that the total value of goods is in equilibrium and productivity is equal in theory.

2) **[GDPpar < 1]:** Indicates advanced countries in which the economic structure (income structure) are higher than in the base country (i.e., the UK).

3) **[GDPpar > 1]:** ① Indicates developed countries with a high inflation gap (South Korea) and ② an economic gap in developing countries (China).

① The nation where market principle are difficult to work, even in the developed nations, regulations and other barriers create distortions in money. Thus, as a result of this distortion of exchange rate, GDPpar also diverges from 1, and an inflation trend can be seen in GDPpar. (See Fig. 5, South Korea). But, in cases where market principles are functioning, GDPpar and the exchange rate will converge and move in tandem. (See Fig. 1, Germany and Fig. 3, Japan).

② GDPpar is larger than 1 (**GDPpar > 1**), as GDPpar is inverse of GDPgap which shows economic difference of developing nations.

5. Interpretation of GDPgap, GDPpar and a Currency Exchange Value Scale

GDPph, an index of the real economy, can be viewed as an index of production, income, and expenditures based on the principle of the equivalence of three aspects, and thus, can be defined as an index of the total value of goods and currency. Thus, in the developed nations, the currency exchange value scale GDPpar can be calculated as [target country GDPph ÷ base country GDPph = GDPpar], but in the developing nations, the gap in the real economy is defined as [target country GDPph ÷ base country GDPph = GDPgap]. Also the calculation of GDPpar, the currency exchange value scale, from the GDPgap of the real economy, uses the inverse [1 ÷ GDPgap] as GDPpar.

6. The theorem of Competition principle and【GDPgap ≒ GDPpar ≒ 1】

Just as Japan's economic development had an impact on the NIEIs and the ASEAN nations and enabled the countries of Asia to follow a flying-geese pattern of economic development, movements of goods and currency have promoted economic development, and capital movements due to trade in goods and services, as well as investments, have helped strengthen the economic development of those countries. As a result, the economic gap between these countries has shrunk, and their real economies are approaching the levels of the developed nations. When the real economy approaches parity with that of the developed nations, as in Japan, both the GDPgap and GDPpar cross at 1, converge, and move in tandem [GDPgap ≒ GDPpar]. Japan's GDPgap in 1967 was 1.0237 ≒ GDPpar 0.9768 ≒ 1, and GDPph, the real economy index, was in equilibrium with that of the US.

7. The theorem of Market Principles and [Exchange rate ≒ GDPpar] Tandem Movement

Relationship between exchange rates and GDPpar under a fixed exchange rate system: The GDPgap in the developing nations will lead to rapid economic growth as exchange rate is stable as the country's own currency rate is fixed and asset inflation occur.

During this period because the exchange rate is fixed, the gap with GDPpar will expand, and growth will continue until [GDPgap ≒ GDPpar] crosses 1. If the exchange rate remains fixed after the crossover, a shrinking trend will occur in the gap due to the inflation of goods and market principles.

Financial/economic regulations/management and dollar pegging are other ways to fix a currency. While currency fixing makes it difficult for market principles to function, it also causes a divergence between exchange rates and GDPpar. As evidence of this, we see that during the era of the fixed exchange rate where 1 US dollar was equivalent to 360 yen, the exchange rate and GDPgap diverged from one another. Exchange rates and GDPgap should converge and move in tandem, but in countries that have fixed exchange rate, because it is difficult for market principles to function in those situations, the inflation of goods is more likely to occur, and the regulation and management of goods and currency are likely to distort the real economy.

Relationship between exchange rates and GDPpar under a floating exchange rate system: The ability of exchange rates and GDPpar to move in tandem or to diverge, depend on whether or not market principles are functioning.

When market principles are functioning, the exchange rate and GDPpar tend to converge and move in tandem **[exchange rate≒GDPpar]**. Even if they occasionally diverge and overshoot ideal levels due to a financial shock or other event, they will stabilize within a certain theoretical range within the medium to

long term, and exchange rates will converge toward and start to move in tandem with GDPpar. When policies to regulate and manage goods and currencies are removed, market principles are allowed to function. And when the real economy indicators in both countries are in fair economic conditions, the real economy index as seen from the perspective of goods and currency, which are GDPpar and the exchange rate, will move in tandem as theoretically predicted.

When it is difficult for market principles to function, not only do the exchange rate and GDPpar tend to diverge from one another **[exchange rate ≠ GDPpar]**, but the gap between the two widens due to regulations such as financial and economic policies. Like Korea when they adopted weak won export promotion policies market principle were hard to function (summarized in the table in Appendix 1). Particularly after GDPgap and GDPpar crossed 1 in 1983, the exchange rates to goods did not converge, but rather diverged and continued to overshoot ideal levels, such that currency depreciation increased inflation of goods. Thus, in the developed nations, unfair and unjust financial and economic policies invite distortions in stable growth to the world economy. When goods and currency diverge from 1 and thereby promote inflation, export promote policy tend to sacrifices citizens standards of living.

III. Validation of the Currency Exchange Value Scale GDPpar

1. US-Japan Exchange Rates and Validation of GDPgap and GDPpar

GDP and the fixed exchange rate of 361 dollar yen first appeared in the IMF's IFS statistics in 1952. Major turning points in the exchange rates in Japan, while it was a developing country, occurred in 1967 when GDPgap and GDPpar crossed 1, 1973 when the shift was made to a floating exchange rate system, 1985 with the Plaza Accord, 1990 with the collapse of the bubble, and 1998 with the implementation of the Big Bang. During the period from 1952 to 2009, the exchange rate made several twists and turns from 361 yen while the

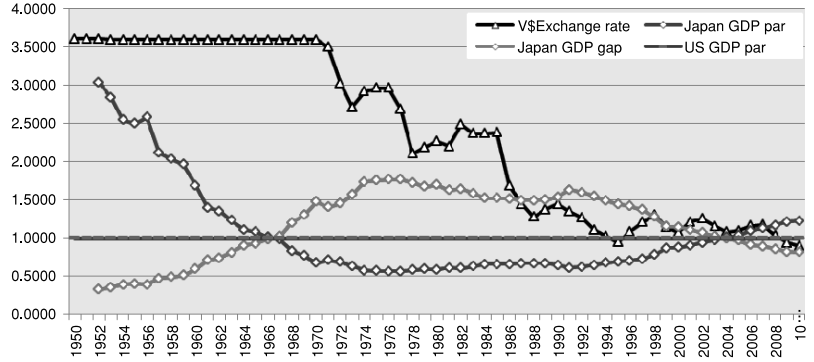
country experienced economic growth, eventually reached 93.57 yen, or a **3.858 times** currency value increase.

GDPpar went from 3.0441 to 0.7992, which means that economic growth increased 3.809 times. While the micro exchange rate and macro GDPpar each went through twists and turns, they elegantly moved in tandem for a long time at a distance of 1.3%, and the definitions of the real economy indicator GDPph and GDPpar functioned as predicted in theory, verifying that theory's validity.

(1) Fixed exchange rate system: In 1953, the fixed exchange rate was revised to 3.6000 (360 yen). In 1971 it was revalued to 3.0800 (308 yen) due to the Nixon Shock and the shift to the Smithsonian system, but in 1973 the shift was made to a floating exchange rate system. Japan, which was still developing at that time, continued to experience economic growth. In 1967, GDPgap and GDPpar crossed 1 and reached equilibrium [GDPgap ≒ GDPpar ≒ 1], bringing Japan onto equal footing with the US. However, because the exchange rate was fixed and market principles could not function properly, the divergence **[exchange rate 3.6000 ≠ GDPpar 1.0237]** grew (inflation was created) 3.5 times.

In 1972, the final year of the fixed exchange rate system, the divergence was

Figure I–2: Trends in the exchange rate, JPGDPgap, JPGDPpar, in Japan and USGDPpar



adjusted toward yen depreciation, such that the exchange rate was 3.0311, GDPpar was 1.4515, and the divergence rate was 108.83%. When market principles were functioning, both the exchange rate and GDPpar converged and moved in tandem toward the theoretical value of 1 **[exchange rate ≒ GDPpar]**. The exchange rate compared to GDPpar which expresses the real economy in Japan, exposed the theoretical problems with the fixed exchange rate system, and highlighted the importance of market principles.

(2) Floating exchange rate system: Japan, which had progressed economically from developing country to equal to the base country, but while it was still difficult for the principle of competition to function, the country moved from a fixed exchange rate system to a floating exchange rate system. In 1973, when the shift was made to the fixed exchange rate system, the exchange rate and GDPpar diverged and shrank in the direction of yen depreciation such that the exchange rate was 2.7170, GDPpar was 1.5717, and the divergence rate was 72.9%. To adjust for inflation caused by the first oil shock in 1973 and the second oil shock in 1979, and to adjust strong dollar caused by Reaganomics in the early 1980s, the Plaza Accord was reached by the G5 in 1985.

① **Plaza Accord**: According to the Plaza Accord, the G5 agreed to adjust the exchange rate in an effort to bring stable growth to the world economy. In 1985, the exchange rate was 2.3854, GDPpar was 1.5262, and the divergence rate was 56.3%, while in 1987, the exchange rate was 1.4464, GDPpar was 1.4924, and the divergence rate was –3%. The yen moved from 240 yen (2.4000) to 140 yen (1.4000), reflecting an **approximately 40% yen** appreciation adjustment. Thus, equilibrium was achieved with the rate of divergence between the exchange rate and GDPpar at –3% (yen appreciation). However, in spite of this rapid yen appreciation, the trade balance continued to remain at a surplus, and since 1987, the current-account balance has remained at a surplus and expanded. This fact verifies

the accuracy of this equilibrium theory [exchange rate ≒ GDPpar]. The 100 yen appreciation adjustment achieved by the Plaza Accord invited foreign direct investment (FDI). As a result, overseas expansion was rapidly promoted, such that FDI for a year reached to equivalent to the total accumulated FDI in the past, forced oversea embarkation and lead to change the domestic industrial structure and bubble was created by the excess liquidity.

② **Collapse of the Bubble**: When the Japanese economic bubble collapsed, the exchange rate went from the 134.71 yen (1.3471) in 1995 level to 94.06 yen (0.9406) in 1995, reflecting 30% yen appreciation that overshot ideal levels. During the same period, by contrast, GDPpar went from 1.6338 to 1.4471, reflecting a steady trend of 11.4%. During this time, the US was demanding more openness in Japanese business practices and financing, and efforts were made to achieve more open markets through the Structural Impediments Initiative and the US-Japan Framework Talks on Bilateral Trade Fred Bergsten, director of the Peter G. Peterson Institute for International Economics, argued that appreciating the yen would solve all the problems. At the time I recall thinking that he was a shrewd man. It was unclear whether his proposal was effective, but the shift was made to appreciate yen, and this led to the Big Bang. During this time, the price of domestic goods fell due to tough price competition with imported goods due to yen appreciation, reforms were made to Japan's industrial, economic, and social structures, and a deflationary period ensued. The best companies were able to respond to yen appreciation by expanding into overseas markets, and this allowed them to grow into truly global companies. As shown in Table 1, the divergence rate between the exchange rate and GDPpar from 1987 to 1997 diverged at an annual average rate of –18.15% and annual divergence rate was –35%. Unable to

withstand this greatest yen appreciation in Japanese history, in 1998, the Japanese market was opened which was named Big Bang.

③ **Big Bang**: In 1998, as a result of the opening of the market, **the principle of competition began to function**, and **changes began to take place in the system of lifetime employment**, the **seniority wage system**, and the **vertical business integration of distribution**. With market principles functioning, the [exchange rate 1.3091 ≒ GDPpar 1.2926] expressing the real economy converged and moved in tandem with the divergence rate of 1.28%, bringing the economy into a genuine state of equilibrium. This fact verifies that, as theorized here, both the exchange rate and GDPpar converge and move in tandem with one another [exchange rate ≒ GDPpar] and reflect the real economy. Since 1998, both components of **[exchange rate ≒ GDPpar]** have trended at an average annual divergence rate of 12.47%.

④ **2009**: The IMF's GDP estimation is 1.7% for Japan and 2.7% for US, and by using this estimation 2009 exchange rate would be **0.9357≒ GDPpar 0.8231**, with an average annual divergence rate since 1998 of 9.79%. Thus, from the formula [Japan's GDPph 37927 × 1.017 / US GDPph 46530 × 1.027], the **1.0979 times of the expected GDPpar 0.8151 is 0.8949 (89.49 dollar yen)**. Thus, yen was undervalued until the exchange rate broke the level of 90 dollar yen. Japanese exporters developed their trading strategies after adjusting the exchange rate of 90–95 yen to appreciated yen level of 85–90 yen in 2010, but if there is a repeat in 2010 of the highest ever appreciation of –35%, which was reached in 1995, although GDP would be uncertain, **–35% yen appreciation on a GDPpar 0.8151 suggests an exchange rate of 52.98 yen/dollar**.

Alternatively, if exchange rates vary around the average 9.79%, the divergence rate since the 1998 Big Bang, an exchange rate of 89.49 dollar yen

could not necessarily be viewed as overvalued. Thus, we need to remember that a rate of 90 dollar yen is not uncomfortable level. For the Japanese economy or exporting companies, making systematic improvements and taking initiatives to encourage new businesses in a way that ensures their survival should the yen appreciate past the over 80 dollar yen mark, is an issue of critical importance given Japan's position as a trade leader.

IV. Examining GDPpar and Exchange Rates in the Leading Nations

(1). Examining the Developed Nations Where Market Principles are Functioning

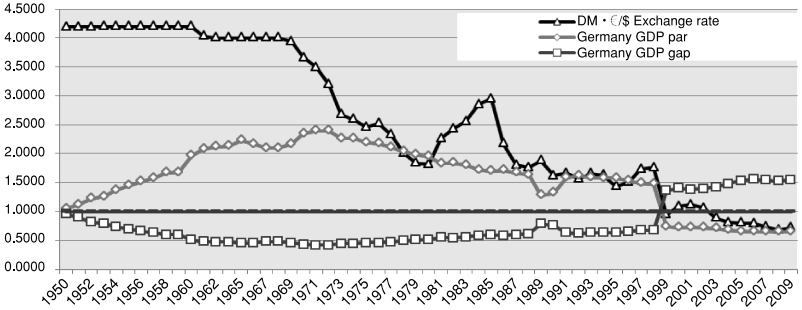
1. Germany

In Germany, whose economy and society were largely destroyed by World War II, the total value of money under the fixed exchange rate system was **evaluated as** 1/4 of GDPpar **and was illogically evaluated. T**hus fixed rate was adjusted in 1953, 1961, and 1969. During this **period**, no adjustments were made to the fixed rate **¥360** in Japan.

a) Under the fixed exchange rate system, character of GDPpar and exchange rate in Germany:

1950：【GDPgap = GDPpar = 1】

Figure II–2: Trends in the exchange rate, GDPgap, GDPpar, in Germany and USGDPpar 1



In 1950 when Germany launched the fixed exchange rate system, judging by the Total Value Theory of Goods and Money presented in this paper, productivity already reached equal to the US [GDPgap = GDPpar = 1]. There was inflation-promoting adjustments, GDPpar rose continuously, as the relative value of goods deemed to root the fixed rate.

b) German character of GDPpar and exchange rate under the floating exchange rate system,:

During the era of floating exchange rates in Germany, when market principles were functioning, the total value of goods and money was converging with and moving in tandem with the exchange rate **[GDPpar ≈ exchange rate]** for all but a certain period of time. As economic growth was achieved, and Germany's economic strength reached equilibrium, GDPpar and the exchange rate converged and moved in tandem around 1 **[GDPpar ≈ exchange rate ≥ 1]**. When the exchange rate and GDPpar converge [exchange rate ≒ GDPpar], the total value of goods and money shows that the exchange rate moves in tandem with the GDPpar equilibrium value, and thus that the total value of goods has become equal to that of the base country. When GDPpar is less than 1 it shows that the total value of goods has exceeded that in the base country.

1973 [**GDPpar ≈ exchange rate**]:

Germany was freed from its fixed rate framework, and under the floating exchange rate system, GDPpar quickly converged with the exchange rate [**GDPpar ≈ exchange rate**], causing the total value of money to trend high. Except for certain periods that included the oil shocks, Reaganomics, and the integration of East and West Germany, the exchange rate moved in tandem with GDPpar [GDPpar≈exchange rate

1999 [GDPpar ≈ exchange rate ≈ 1]:

When the euro was introduced, both GDPpar and the exchange rate were

adjusted to one **[GDPpar ≈ exchange rate ≈ 1]**, but the euro depreciated as a result of chaos related to the euro unification process. Since 2004, when euro stability was achieved in the real economy, the exchange rates converged and began moving in tandem around the axis of GDPpar, such that the total value of goods and total value of money in both countries retained their tendency to move in tandem, supporting the theory of GDPpar parity.

2008: The total value of [GDPpar ≈ exchange rate] was higher than in the base country, **and equilibrium value of the GDPpar was 35% revalued form the standard of exchange parity.**

Both GDPpar and the exchange rate had a rate of divergence of 5%, validating the Total Value Theory.

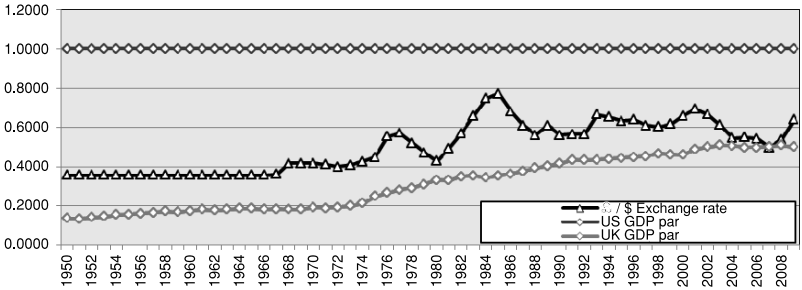
2. UK

Since the industrial revolution, the UK has been a key-currency country that has maintained a more advanced economic structure than that of the US. At the end of World War II, as a result of the Bretton Woods conference, the dollar became the world's key currency.

1950: An analysis using the Total Value Theory of Goods and Money reveals that although the total value of goods GDPpar in the UK had the real value of 0.1366 (7.3 times) to the US baseline of 1, the total value of money was 0.3571 (2.8 times) to the US baseline of 1. Thus, the value of money of the fixed exchange rate as compared with the value of money was set at a pound depreciation rate of more than 2.6 times the rate of divergence. **As a result**, beacuase of fixed rate, inflation of the UK was always a concern as Total Value Theory based exchange rate depreciated against GDPpar **by function** of market principles. But now, since the launch of the euro and especially after 2004, GDPpar has moved in convergence with the exchange rate [GDPpar ≈ exchange rate] under the advanced economic structure of the UK.

The UK has joined the EU, but has not participated in Euro currency unification. When the economies and exchange rate markets of the euro zone stabilized, market principles began to function, and the euro started moving in tandem with the pound rather than the dollar. In 2004, GDPpar converged and began moving in tandem with the exchange rate **[GDPpar ≈ exchange rate]**.

Figure III–2: Trends in the exchange rate, GDPpar, in the UK and USGDPpar 1



2008: UK had a GDPpar of 0.5396 and an exchange rate of 0.5054. The total value of goods and currency, even today, is at levels about twice as high as the US, making it seem like the pound has an almost knightly status.

The fact is that the value of goods and money in the UK remains at high levels, about twice that of the US. Since the industrial revolution, Japan's textile industry has been unable to outrun the advanced clothing material industry of the UK, which even today offers 2–10 times the added value of its Japanese counterpart. Also, the UK has a great deal of financial power. The total daily transaction of London's exchange market[1] is twice that of the US, and large insurers, such as maritime insurers provide reinsurance to companies on the Lloyd's of London insurance market. Because the UK's trade and financial rules have become international rules, the total value of the UK's goods and money can be valued as twice those of the US.

(2) Testing Cases Where Market Principles Do Not Function Freely

1. China

Because there is an economic gap in developing countries, formulas 3 and 4 have developed for GDPpar and GDPgap. As a result, I created graphs for the economic gap [GDPgap < 1] and [GDPpar > 1], but both graphs are trending toward 1, and show that China's GDP is in the process of normal economic growth.

1978: In the year of its market-opening reforms, China had an exchange rate of 1.6836, GDPgap of 0.0365, $GDP of 4.9164, and GDPpar of 27.3951. None of these were correlated, and thus the figures did not support the Total Value Theory of Goods and Money. Although productivity was 0.0365 (US$1 = 27 yuan), because of the desire of the Communist regime to save face and because of the lack of credit, the exchange rate for trade transactions was 1.6836 yuan, forcing trade to be conducted under conditions of yuan appreciation 16 times greater than normal. China's exchange rate control system has evolved as follows:[2]

1981: China had a dual system comprised of an official rate and an internal settlement rate for trade transactions.

1985: China abolished the internal settlement rate.

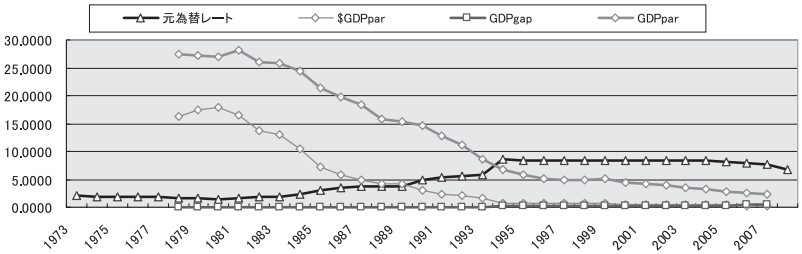
1986: China established the Foreign Exchange Center, and introduced a foreign exchange system that reflected foreign currency demand and supply.

1991: The official exchange rate, which was fixed, was replaced with a managed floating system.

1994: A strictly managed floating system was adopted in the interbank market and foreign exchange market, but the Foreign Exchange Center and official rate system were integrated to create the Exchange Transaction Center. In the same year, GDPpar momentarily crossed 8.3514 and the exchange rate momentarily crossed 5.7943, but because of China's exchange rate management

system, they could neither converge nor move in tandem, so the divergence between them expanded to its current size.

Figure IV–2: Trends in the exchange rate, GDPpar, GDPgap, $GDPpar in China, 1978–2008



1998: When the Asian financial crisis occurred, the yuan was not devalued, allowing international credit to be restored.

1999: The euro was launched on January 1.

2001: After joining the WTO, the GDP growth rate reached double-digits, trade expanded, and foreign currency reserves increased steadily. With an exchange rate of 8.2771, GDPpar of 4.1314, GDPgap of 0.4991, and $GDPpar of 0.2420, the total value of goods and money determined that the exchange rate would be 1/2 of GDPpar.

2008: China had an exchange rate of 6.8343, GDPpar of 2.0653, GDPgap of 0.4842, and $GDPpar of 0.0708.

China achieved GDPpar growth as a result of its high economic growth. However, because the exchange rate is controlled and yuan depreciation adjustments have been required, the gap between GDPpar and the exchange rate has tripled in size. China has enjoyed a greater level of trust in the international community since its accession to the WTO, and its policies to attract foreign companies into the Chinese special economic zone have been successful. Direct investment inflows have increased, as have the values of exports and imports.

China's trade balance and foreign currency reserves have increased dramatically, surpassing even those of Japan.

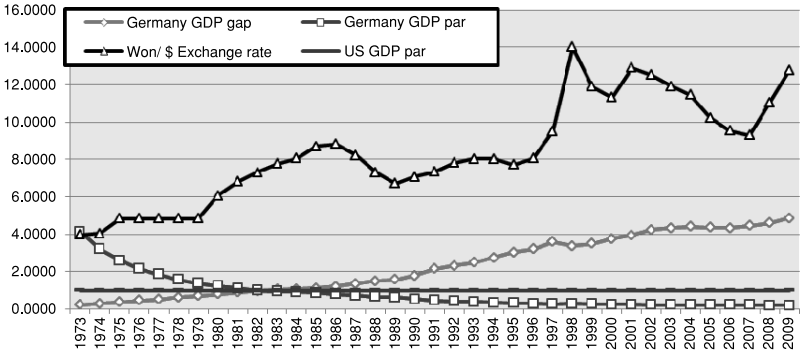
Because China is in a stage of development where market principles do not function freely, there is divergence between GDPpar and the exchange rate, reflecting the regulations imposed by financial and economic policies. However, sudden exchange rate adjustments are expected to cause turmoil in the domestic political world and economic system because of China's domestic GDP gap[3] of about 10-to-1 (Japan's is 2-to-1), making it impossible to make bold adjustments (see Appendix 4: International Finance).

2. South Korea

South Korea is one of the developed countries where market principles do not function freely. As a result of its regulatory structure, South Korea is in unusual situation of having a disparity in its total value of goods and money. Since the transition to a floating exchange rate, the rate of divergence between GDPpar and the exchange rate has exceeded 500% on average, and even since 1998, the economy has had an unusually high rate exceeding 300%.

The impact of regulations imposed by financial and economic policies are

Figure V–2: Trends in the GDPpar, GDPgap, and exchange rate in South Korea and USGDPpar



such that GDPpar does not seem to be converging toward 1, but rather seems to be diverging from it. The graph shows the line rising upward to the right (indicating inflation), highlighting the unusual situation that exists in South Korea's real economy.

On the other hand, the exchange rate has invited inflation due to the dollar peg policy and regulations imposed by financial and economic policies. The exchange rate is diverging from, rather than converging with, GDPpar, and this abnormal won depreciation is creating a line that is rising in an inconsistent pattern. This shows that the country is facing problems both in its financial and economic policies, as well as in the real economy.

1973: When the transition was made to a floating exchange rate, South Korea started from a state of equilibrium versus the US dollar, with the inverse of GDPpar 0.2416 = GDPgap 4.1396 ≈ exchange rate 3.9832 ≈ 4.

1980: Adopting the multi-currency basket peg approach, South Korea recorded a GDPpar of 0.8076, GDPgap of 1.2382, and an exchange rate of 6.0743. The disparity between the GDPgap and the exchange rate was 4.9 times the won depreciation, causing inflation to expand.

1983: South Korea saw its GDPgap and GDPpar cross around 1 [GDPgap 0.9425 ≈ GDPpar 1.0605 ≈ 1], bringing productivity on par with the US. However, due to regulations that pegged the exchange rate to the dollar, this rate diverged considerably from GDPpar, causing the divergence with the real economy to grow.

1990: Transition to a managed floating exchange rate: The consumer rate for the day is set by weighted-average interbank funding rate of previous day. With a GDPpar of 1.7964, an exchange rate of 7.0776, and a 3.9 times disparity between GDPpar and the exchange rate, this indicates abnormal won currency depreciation.

1995: The fluctuation in the exchange rate **band was set** using the market

average expands to 2.25%.

1997: The transition was made to a true floating exchange rate system.

With a GDPpar of 3.2763 and an exchange rate of 9.5129, the disparity between GDPpar and the exchange rate shrank to a 2.9 times difference, continuing the trend of won depreciation.

1998: Affected by the financial shock that started with the Thai Baht, the **outflow** of overseas short-term capital introduction funds at low interest rates was a driving force behind won depreciation. With a GDPpar of 3.0522 and an exchange rate of 14.0144, there was a 4.6 times disparity between GDPpar and the exchange rate as a result of the currency crisis. The exchange rate fell to 47.3% of the previous year's rate, creating unusual won depreciation.

2007: With a GDPpar of 4.1620, an exchange rate of 9.2926, and a 2.23 times disparity between GDPpar and the exchange rate, won depreciation is contracting, but a disparity that exceeds 2 is abnormal, and is typically only found in developing countries. The GDPpar of 4.1620 is about 1/4 the currency value in the US, but the exchange rate is 1/9 that of the US.

2008: The value of the won fell sharply as a result of the October global financial crisis. With GDPpar of 4.5593 and an exchange rate of 11.0205, the 2.4 times disparity reveals won depreciation versus the real economy.

There has been an average 5.6 **times** disparity between the exchange rate and GDPpar since 1973, a 3.3 **times** disparity since 1983, a 3 **times** disparity since 1998, a 2.4 **times** disparity since 2004, and a 2.4 **times** disparity in 2008, indicating that although the won depreciation disparity is shrinking there is still the unusual situation that the disparity is more than double. The regulations imposed by financial and economic policies have distorted the South Korean economy, and abnormal fluctuations in the GDPpar and exchange rate caused the disparity between them to more than double, which in turn caused abnormal depreciation in the won currency value, and destabilized the currency. South

Korea's export expansion policies have further driven won depreciation, and this has invited increases in the costs of imported materials and parts used in manufacturing. Won depreciation has also led to a negative cycle of high import costs, creating abnormal inflation. South Korea needs to end this negative cycle by investigating policies for promoting won appreciation, and cultivating a manufacturing materials and parts industry through the introduction of foreign capital.

V. Tandem factor of GDPpar Parity and the Exchange Rate

1. Fact of Rate Divergence Between GDPpar Parity and the Exchange Rate

In countries that have achieved high economic growth, GDPpar expresses the total value of goods. However, comparing the rate of divergence between GDPpar and the exchange rate using the 2008 average GDPpar, with the GDPpar for the US at 1.00 and the exchange rate at 1.00, reveals that Japan's figures were 0.85:1.03, for a rate of divergence of 21%. Germany's were 0.65:0.68, for a rate of divergence of 4.3%, and the UK's were 0.5:0.53, for a rate of divergence of 6%. Only Japan had abnormal depreciation of 21%. Due to the financial crisis, the exchange rate in 2009 fluctuated wildly around the 95 yen mark, with an average exchange rate in August of 2009 of 94.84 yen. Major exporters like Hitachi and Toyota finally lowered the expected exchange rates used in their trade calculations for July and beyond from 95 yen to 90 yen. (Nikkei Shimbun, 8/14)

Factor of Rage Divergence Between GDPpar Parity and the Exchange Rate look only at aspects related to money, result in demand and supply theories based on money, the speculative psychological factors and so on.

2. Relationship Between the Expected GDPpar and the Rate of Change in Exchange Fluctuation Risk, Such as Policy Interest Rates

While 2008 average GDPpar was 0.85, 2008 September policy interest rates were 2.0 for the US and 0.5 for Japan that rate difference was 1.5. The country risk (x iv) for Japan was 90.6, versus 93 for the US, yielding a difference of 2.4 points. Since the expected rate of change in exchange fluctuation risk is 1.5 plus 2.4, for a total of 3.9%, exchange parity with the expected GDPpar for 2009 should be 85 yen + 85 yen × 3.9% = 88.32 yen. The US policy rate has fallen every month since March of 2007 (when it was 5.25%), as a result of government economic and financial policy responses to the 2008 economic crisis, reaching 1.5% in August of 2009. Also, the estimated GDPpar value is generally based on the GDP figures published by various research institutions every quarter. If we calculate the estimated value in short-term by adding the rate of change in the exchange fluctuation risk, such as policy interest rate differences and risk premiums, to the average estimated value of GDP, then the estimated GDPpar value will either be equal to the previous year's GDPpar + the inflation difference, or to the estimated GDP value for each quarter + the interest rate difference + the difference in country risk.[4]

Since the exchange rate theories are money based demand and supply theories or either monetary or asset approach theories. The total value of money is equal to the exchange rates, and at this moment analyses presented by look only at aspects of money. This paper, however, presents an analysis by looking at aspects related to goods. According to the Walrasian theory of equilibrium, the total value of goods is the total value of money of the country. Thus, [the total value of goods = GDPpar = Japan's GDPph/US GDPph] and [GDPpar = total value of money] and [GDPpar=the exchange rate]. However, the basic conditions established in this paper are function of market principle and competition principal. Under the current floating exchange rate framework, in

which exchange parity theory is not recognized, illogical factors, such as psychological factors, can destabilize the exchange rate and disrupt the real economy. Thus, a sound parity theory urgently needs to be established to promote the stable growth of the global economy.

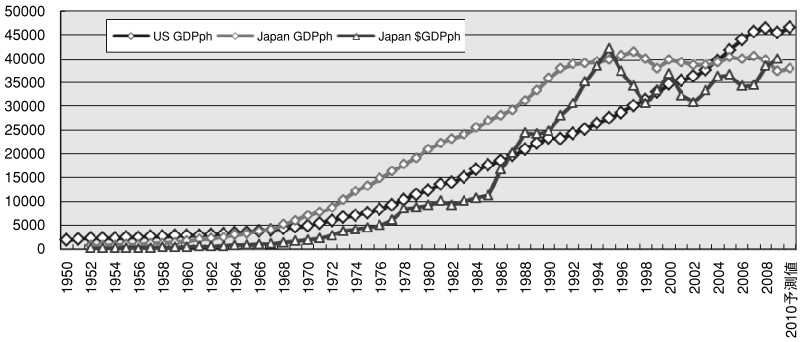
VI. Correct perception of GDPpar and Exchange rate

1. The Illusion of Dollar Conversion

When determining the total value of goods and money, **people** tend to compare the GDPph by converting them into dollars, but this approach can be misleading. Fundamentally, currency must be compared as absolute purchasing power: without converting the currencies to dollars. This paper suggests that the Total Value Equilibrium Theory of Goods and Money must be judged by whether the basic condition of market principles is being met, that is, that exchange rate ≈ GDPpar.

In Figure 3–2, the abnormal trend in the $GDPph shows the adverse effects of performing dollar conversions. The $GDPpar trends in Figures 1–3 all exhibit irrational movements. This fact shows how dollar conversions can result in a distortion of the real economy of the country, indicating the hazards of dollar conversion.

Figure I–1: Trends in the per capita USGDPph, JapanGDPpar,and Japan$GDPph in the US and Japan, 1952–2008

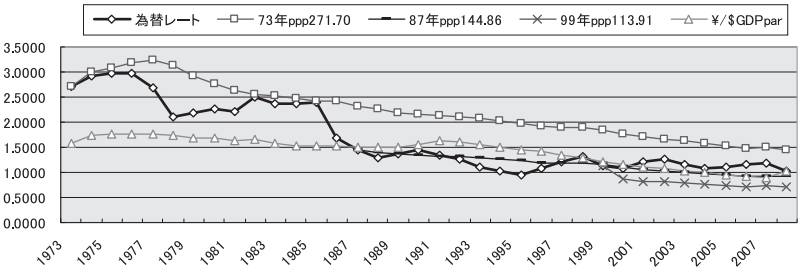


2. Problems with the Floating Exchange Rate Theory and Purchasing Power Parity (PPP) Theory

1) Problems with absolute and relative purchasing power parity theories:

Absolute purchasing power parity (PPP) is a parity theory based on a comparison of the price of goods, and is calculated as follows: [Exchange rate = Japanese price of goods ÷ US price of goods]. However, it is difficult to survey and compare all prices of goods.

Figure VI: Trends in PPP using the CPI in 1973, 1987, and 1989 as 100



The "Big Mac Rate," which is found by comparing the prices of hamburgers at restaurants in various countries, may have a reputation for expressing appropriate market prices, but because it is difficult for these goods to get repriced and it provides only a single product comparison, it would be difficult to suggest that a retail price comparison expresses the real exchange rate. Expressing the total value of goods and money based on a single product is theoretically impossible, and using this to compare PPP presents theoretical problems.

2) Problems with relative purchasing power parity theory[5]

Calculations are performed using the formula [relative PPP = base year exchange rate × Japanese price index ÷ US price index], but since the exchange rate in the base year includes speculation and speculative psychological factors, if the exchange rate in the base year is used as the basis for PPP, as shown in

Fig. VI, PPP can vary widely. If a year in which the exchange rate was stable is used as the base year, then 2009 PPP was ¥139.33 in 1973, ¥86.77 in 1987, 67.48 in 1999, but PPP diverged widely from 2009 average exchange rate and GDPpar of 0.8230 (¥82.3). Also, using 2005 as the base year as is done in the IMF statistics, the CPI-Real Effect Exchange Rate for 2009 is ¥103.2. These facts indicate that there are theoretical problems with PPP.

3) Consumer prices (C) reflect purchasing power. In the developed nations, the SNA calculations [GDP = Y] and [Y = C + I + E] reveal that C is not 100% of Y, but about 60% to 70% of Y. Thus, discussing exchange parity using PPP has theoretical problems in terms of exchange parity theory.

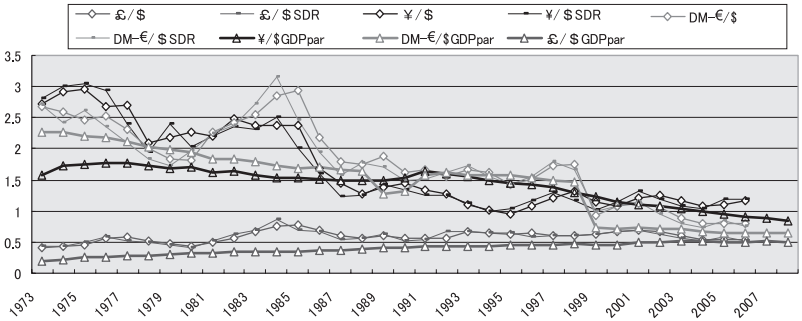
These problems suggest that PPP should not be used in exchange theory.

VII. Adopting GDP Equilibrium Value Theory into SDR

1. Adopting GDPpar into SDR

The IMF's SDR rates are a measure of value of each country's currency. However, if the SDR rate is calculated using a basket method that includes the exchange rates of leading currencies, which contain speculative and psychological factors, then $ converted SDR rate overshoot the exchange rate, as shown in Fig. VII. by contrast, GDPpar in the leading countries moves in a

Fig. VII: Trends in the GDPpar, SDR rate,and exchange rates in the leading countries



more stable pattern. Based on these facts and to achieve the ideal of exchange rate stability, IMF should adopt GDPpar equilibrium value parity instead of basket method which uses the exchange rates of leading countries. Then IMF will be able to achieve exchange rate stability and the stability and growth of the world economy. I suggest IMF to establish an SDR parity theory for a measure of world currency value.

2. The key-currency SDR in the future

The key-currency country has extraordinary advantage. Even though key currency is used worldwide, key-currency country does not have direct impact of exchange rates. Also because the economic zones that use the key currency can essentially be considered as part of their own markets, their national interests are enormous, offering them immeasurable benefits. Accordingly, to introduce a third-party currency which is independent of any national interest is preferable to stabilize exchange rate markets. Using the existing SDR as a key currency and calculating the SDR rate using GDPpar, which is more stable than the basket method using the exchange rates of leading countries' currencies ($, £, €, ¥), will contribute to stability and growth of global economy. The SDR rates provide dynamic parity rates of exchange and have the characteristics of a fair currency that could be used as a unified global currency.

VIII. Conclusions

Exchange rate will fluctuate with exchange rate and monetary policy but GDPpar represent real economy and stable. And when market and competition principle are functioning and also when there are reliable statistic figures we could define as exchange rate and GDPpar will be in equilibrium [Exchange rate = GDPpar]. Even when countries have different ethnicities, histories, cultures, and customs, as well as different currencies, the total value of goods

and currency are in equilibrium according to the Walrasian General Equilibrium Theory. Thus, the GDPpar equilibrium value as calculated from GDPph, the index of the real economy, can be defined as the currency exchange value scale. The currency exchange value scale using GDPpar can ensure exchange rate stability and allow the global economy to achieve stable growth. However, the countries where market and competition of principle are working are the countries of currencies which IMF's SDR use as the basket-method of calculating. Of these, the pound and dollar are both weak, and since the highly anticipated euro is being used in 18 countries, there is the possibility of the currency exchange value scale becoming unstable. Only the yen has a high possibility of appreciating from the perspective of the real economy index.

Countries where market principles and the principle of competition do not function well, even developed countries, have various kinds of regulations, such as dollar pegging, currency management regulations, and other financial/economic policies, such that both the exchange rate and GDPpar do not move in tandem as predicted by the theory **[exchange rate ≠ GDPpar]**, but rather diverge at an increasing rate. Thus, it is crucial that the developed countries eliminate regulations so that market principles and the principle of competition can function.

1. Complexity and diversity of GDP gap and currencies

The US has a population of 305 million, and uses a single currency, the US dollar. In the EU, 16 of the 27 member nations are using the unified euro currency (by way of reference, Germany has a population of 82.6 million). Japan has a population of 127.9 million, and the UK has a population of 60 million, and each country uses its own currency (the yen and pound, respectively). China has a population of 1.3 billion people, uses the yuan, and has a 10-to-1 GDP gap. Guizhou Province has a GDPph on par with a late-

developing nation, while China's average GDPph is on par with a developing nation. Guangdong province has the GDPph of a semi-developed nation, while the cities of Shanghai and Beijing both have the GDPph of a developed nation. Hong Kong, meanwhile, uses a regional currency, the HK$. Thus, China is a single country that uses two currencies and has world economic gap issues within its borders. Thus, there are complexities and diversity by the types of currencies used, GDP gaps within and between countries, and number of countries participating in unified currency zones.

2. Japan problem

As the proper functioning of market principles have basic condition of the value of goods and money, the exchange rate converges and moves in tandem with GDPpar in Japan. But Japanese exchange rate has enormous national bond balance problem, it may breed country risk (by inflation) through raising interest.

In FY 2007, Japan's national bond balance was ¥773 trillion, more than 150% of the country's GDP of ¥513 trillion. Consider the implications of these figures in light of Japan's general expenditures budget of ¥46.9 trillion: a 1% increase in interest rates on the remaining bond balance equates to ¥7.7 3 trillion, and if those bonds are redeemed over the next 10 years then this would mean reissuing ¥77.3 trillion in additional bond redemption payments each year. At an interest rate of 1.5% a reissue of ¥77.3 trillion would create further interest costs of ¥11.6 trillion, forcing repayment or a further reissue of ¥88.9 trillion per year (ignoring the ¥7.7 3trillion resulting from the 1% rise in interest rates). Thus any missteps in the nation's economic or financial policies could result in inflation or yen depreciation. The discussion in this paper is based on the preconditions that Japan's technological development capabilities and added-value competitiveness are translated into creditworthiness, and that its GDPpar remains in equilibrium.

3. The condition of exchange rate stability is tandem move of GDPpar

To stabilize exchange rates, Japan needs to replace its floating exchange rate theory with the GDPpar equilibrium value parity theory, which eliminates the speculative psychological factors described in Aftalion's Psychological Theory of Exchange Rates. As is shown in Fig. 7, exchange rates and dollar-converted SDR rates overshoot their targets. Since the Plaza Accord in Germany, the Big Bang in Japan, and 2004 in UK, GDPpar has fluctuated in a consistent and stable manner, commensurate with parity. Thus, when GDPpar in the leading currencies converges and moves in tandem with the exchange rate **[GDPpar ≈ exchange rate]**, it confirms that GDPpar has exchange parity. When market principles do not function freely, GDPpar will diverge from the exchange rate. To achieve the national interests, countries must make efforts to adopt economic and financial policies that shrink this gap.

There are GDP gaps in nations and regions of the world, ranging from developing nations to developed nations, and some countries use a number of currencies based on inconsistent standards. Even under such kind of situation, GDPpar indicates the total value of goods and money for key-currency country and other countries, and **for** countries of where market principles are theoretically functioning **[GDPpar ≈ exchange rate] correlation have been verified.**

When **[GDPpar ≈ exchange rate ≦ 1]**, target countries where GDPpar ≦ 1 are those countries where the total value of goods and money is equal to or greater than that of the base country. These countries must shed their own national currency depreciation policies and adopt currency appreciation policies instead. It is in the national interest to achieve cost competitiveness and high-added-value competitiveness through currency appreciation, as this increases the wealth of companies and individuals. Yen depreciation policies may produce temporary profits from exports, but will delay the country's competitiveness and

will weaken the nation and its companies moving into the future.

4. Function of market principles

To stabilize the exchange market, Japan should not return to a dollar-gold standard or to a fixed exchange rate framework, but should develop the basic conditions that allow market principles to function well, and should adopt the Total Value Theory of Goods and Money, a parity theory that dynamically expresses the real economy. This paper confirms that GDPpar, as an index that dynamically represents the total value of goods and money in the real economy, reflects equilibrium value parity.

5. Importance of international rules

It is important to have international rules, to address the risks and regulation of negative asset problems such as financial derivative products under the excess liquidity and the national debt, and to address exchange rate stabilization measures to prevent credit creation and contraction.

6. Using GDPpar instead of SDR's basket methods

To stabilize exchange rates, IMF must adopt the SDR rate using GDPpar instead of basket methods[6] that consist of the four leading currencies (dollar, euro, pound, yen). Each nation's SDR rates calculated by this SDR rate will be each nation's parity rate of exchange.

7. Using SDR for key currency

To achieve global economic stability, the time has come to establish a strong and fair key currency, and to unify all currencies around this standard. However, because this will entangle the national interests of all countries, the leading candidate for a key currency is the IMF's proposed currency, which

exists outside the national interests of each country: the SDR rate. I propose that the SDR rate of each country be set as the exchange value standard for currency exchange.

8. SDR as unified world currency

Because the IMF is committed to achieving stable growth of the global economy through exchange rate stabilization, it must examine a GDPpar exchange parity that establishes the SDR as the key currency and is based on GDPpar equilibrium value parity, which dynamically represents the real economy of each country. IMF should aim to have new born unified world currency in the near future, using existing SDR as a basic condition, and enact SDR parity as a practical measure for stabilizing the exchange rate market.

Notes:

1. Yoshihiro Kanda, "Shuudou shougaku" [Papers of the Research Society of Commerce and Economics], Vol. 48, No. 2, Table 2: Daily average transaction trends in the world's leading foreign exchange rate markets. The transactions on the London market in 2007 were valued at US$1,359 billion, or 34.1% of the total, as compared with US$664 billion on the New York market, or 16.6% of the total.
2. For more on fluctuations in the exchange rate systems of South Korea and China, see Teruyuki Miyake, "*Gaikoku kawase ga wakaru jiten"* [Encyclopedia for Understanding Foreign Exchange Rates], Nippon Jitsugyo Publishing, 1998.
3. For more on the economic disparity in China, see "GDP kara chuugoku jinmingen heika to sono mondaiten o bunseki suru" [Analysis of the Parity of the Chinese Yuan and Related Problems Using GDP], *Kokusai Kinyuu* [International Finance], Institute of Foreign Exchange and Trade Research, No. 1167, August 1, 2006.

   For more on the economic disparity in China, see "GDP kara chuugoku jinmingen heika to sono mondaiten o bunseki suru" [Analysis of the Parity of the Chinese Yuan and Related Problems Using GDP], *Kokusai Kinyuu* [International Finance], Institute of Foreign Exchange and Trade Research, No. 1167, August 1, 2006.
4. The country risk (credit rating) is used as the exchange fluctuation risk, based on figures in the September 2008 issue of *Institutional Investor.* When the country risk

is 90.6 for Japan and 93.0 for the US, the difference reflects a 2.4 point discount.

The country risk (credit rating) is used as the exchange fluctuation risk, based on figures in the September 2008 issue of *Institutional Investor.* When the country risk is 90.6 for Japan and 93.0 for the US, the difference reflects a 2.4 point discount.

5. For more on relative PPP, see Appendix 1, Section 3. Work cited: Yoshihiro Kanda, GDP ni yoru kawase heika riron to kawase re-to bunseki no kousatsu –souba riron kara heika riron e– [Exchange Parity Theory and Exchange Rate Analysis Using GDP: From Market Rate Theory to Parity Theory], "Shuudou shougaku" [Papers of the Research Society of Commerce and Economics], Vol. 49, No. 1, Hiroshima Shudo University, September 2008.
6. Yoshihiro Kanda, "Shuudou shougaku" [Papers of the Research Society of Commerce and Economics], Vol. 48, No. 2, Table 12: Daily average transaction trends in the world's leading foreign exchange rate markets. The transactions on the London market in 2007 were valued at US$1,359 billion, or 34.1% of the total, as compared with US$664 billion on the New York market, or 16.6% of the total.

We determined that 1SDR = US$ = 0.888671g of gold, but figures for 1974 were calculated with the basket method using a weighted average of currencies in 16 countries, while figures for 1981 were calculated using the basket method based on five currencies: the US dollar, German mark, French franc, UK pound, and Japanese yen. Figures for 2000 were calculated using a basket method based on the dollar, euro, pound, and yen. Thus, the SDR serves as a measure of international currency in place of the dollar-gold standard. Yoshihiro Kanda, "IMF no SDR ni yoru kawase antei no kiso jouken o kenshou suru ¥ basuketto houshiki ni GDP heika dounyuu no kousatsu" [The Introduction of GDP Parity to the Yen Basket Method to Examine the Basic Conditions of Exchange Rate Stability using the IMF's SDR Valuation], *Kokusai Kinyuu* [International Finance], Institute of Foreign Exchange and Trade Research, No. 1186, March 1, 2008.

Reference:

Yoshihiro Kanda, 「Discussion of exchange rate stability and currency exchange value scale – Real economic figure by GDP will define currency exchange value scale」 *Kokusai Kinyuu* [International Finance], Institute of Foreign Exchange and Trade Research, No. 11218, August Nov. 1, 2010.

Table I–1. Trends in the Population and GDP in Japan and US

Japan GDP	Population	US GDP	Population		US GDPph	Japan GDPph	Japan $GDPph
	0.8359	2848	1.5227	1950	1870		
	0.8496	3287	1.5488	1951	2122		
62170	0.8625	3457	1.5755	1952	2194	721	200
70160	0.8745	3646	1.6018	1953	2276	802	223
77970	0.8876	3645	1.6303	1954	2236	878	244
85960	0.8982	3973	1.6593	1955	2394	957	266
87060	0.9076	4185	1.6890	1956	2478	959	266
110740	0.9156	4405	1.7198	1957	2561	1209	336
115810	0.9236	4466	1.7488	1958	2554	1254	348
129330	0.9329	4840	1.7783	1959	2722	1386	385
155040	0.9410	5035	1.8068	1960	2787	1648	458
191610	0.9495	5202	1.8369	1961	2832	2018	561
212520	0.9583	5602	1.8654	1962	3003	2218	616
245410	0.9681	5911	1.8924	1963	3124	2535	704
290140	0.9783	6314	1.9189	1964	3290	2966	824
321630	0.9888	6834	1.9430	1965	3517	3253	904
374630	0.9979	7488	1.9656	1966	3810	3754	1043
441790	**1.0830**	**7918**	**1.9871**	**1967**	**3985**	**4079**	**1133**
527530	1.0196	8637	2.0071	1968	4303	5174	1437
617790	1.0317	9311	2.0268	1969	4594	5988	1663
736590	1.0434	9778	2.0488	1970	4773	7060	1961
810240	1.0569	11286	2.0705	1971	5451	7666	2191
923940	1.0718	12404	2.0885	1972	5939	8620	2844
1124980	**1.0870**	**13855**	**2.1041**	**1973**	**6585**	**10349**	**3809**
1342440	1.1016	15010	2.1385	1974	7019	12186	4172
1483270	1.1157	16352	2.1597	1975	7571	13295	4479
1667530	1.1277	18239	2.1804	1976	8365	14787	4986
1856220	1.1386	20314	2.2024	1977	9224	16303	6072
2044040	1.1490	22959	2.2259	1978	10314	17790	8454
2215470	1.1587	25664	2.2506	1979	11403	19120	8725
2432350	1.1681	27956	2.2776	1980	12274	20823	9184
2610280	1.1766	31313	2.2994	1981	13618	22185	10059
2740500	1.1848	32592	2.3217	1982	14038	23130	9286
2855790	1.1931	35349	2.3430	1983	15087	23936	10078
3048590	1.2008	39327	2.3637	1984	16638	25388	10689
3257920	**1.2084**	**42130**	**2.3849**	**1985**	**17665**	**26961**	**11302**
3409480	1.2149	44529	2.4068	1986	18501	28064	16653
3558370	1.2209	47425	2.4284	1987	19529	29145	20150
3815790	1.2258	51083	2.4506	1988	20845	31129	24291
4096020	1.2307	54891	2.4734	1989	22193	33282	24124
4419150	1.2348	58032	2.4995	1990	23217	35788	24717
4692300	1.2397	59862	2.5840	1991	23166	37850	28098

4815820	1.2437	63189	2.6119	1992	24193	38722	30574
4865190	1.2475	66423	2.6407	1993	25154	39000	35072
4918350	1.2512	70543	2.6699	1994	26422	39309	38459
4977390	1.2547	74005	2.6995	1995	27414	39670	42175
5108020	1.2582	78132	2.7292	1996	28628	40598	37321
5218620	1.2615	83008	2.7593	1997	30083	41368	34192
5049050	**1.2629**	**87935**	**2.8108**	**1998**	**31285**	**39980**	**30540**
4796290	1.2650	93535	2.8453	1999	32874	37915	33285
5029900	1.2671	99515	2.8784	2000	34573	39696	36834
4977200	1.2691	102862	2.9100	2001	35348	39218	32271
4913120	1.2710	106423	2.9401	2002	36197	38656	30828
4902940	1.2726	111422	2.9693	2003	37525	38527	33233
4983280	1.2738	118679	2.9982	2004	39583	39121	36160
5017340	1.2450	126380	3.0274	2005	41745	40300	36563
5073650	1.2745	133989	3.0570	2006	43830	39809	34230
5155200	1.2740	140777	3.0867	2007	45608	40465	34365
5051140	1.2729	144414	3.1167	2008	46336	39682	38392
4742190	1.2716	142563	3.1466	2009	45307	37293	39856
4822807	**1.2716**	**146412**	**3.1466**	**2010 予測値**	**46530**	**37927**	

Source: Original Statistics of GDP, Population and Exchange rate are from “International Financial Statistics yearbook 1979, 2001 and 2010”, International Monetary Fund

notes: ① Yen per US Dollr used Series ref.: rf shows Period Averages National Currency Units per U.S.

② A Monetary Unit of GDP: 100millions

③ Unit of Population: 100 Millions of Midyear Estimates

④ GDPph = GDP ÷ Population

⑤ $ GDPph=GDPph ÷ Exchange rate

⑥ Expected value=GDP × Expected value of Growth rate.

Table I–2. Trends in the exchange rate, GDPgap, GDPpar, in Japan and USGDPpar

	¥/$ Exchange rate	Japan GDPpar	Japan GDPgap	US GDPpar	fx/GDPpar divergence rate
1950	3.6100			1.0000	
1951	3.6100			1.0000	
1952	3.6110	3.0441	0.3285	1.0000	1.1862
1953	**3.6000**	**2.8371**	**0.3525**	**1.0000**	**1.2689**
1954	3.6000	2.5452	0.3929	1.0000	1.4144
1955	3.6000	2.5019	0.3997	1.0000	1.4389
1956	3.6000	2.5831	0.3871	1.0000	1.3937
1957	3.6000	2.1177	0.4722	1.0000	1.6999
1958	3.6000	2.0367	0.4910	1.0000	1.7676
1959	3.6000	1.9633	0.5094	1.0000	1.8337
1960	3.6000	1.6914	0.5912	1.0000	2.1285
1961	3.6000	1.4033	0.7126	1.0000	2.5653
1962	3.6000	1.3542	0.7385	1.0000	2.6585
1963	3.6000	1.2322	0.8116	1.0000	2.9216
1964	3.6000	1.1095	0.9013	1.0000	3.2448
1965	3.6000	1.0813	0.9248	1.0000	3.3293
1966	3.6000	1.0147	0.9855	1.0000	3.5477
1967	**3.6000**	**0.9768**	**1.0237**	**1.0000**	**3.5165**
1968	3.6000	0.8317	1.2023	1.0000	2.9942
1969	3.6000	0.7672	1.3035	1.0000	2.7619
1970	3.6000	0.6760	1.4792	1.0000	2.4338
1971	3.4983	0.7110	1.4064	1.0000	2.4874
1972	3.0311	0.6890	1.4515	1.0000	2.0883
1973	**2.7170**	**0.6362**	**1.5717**	**1.0000**	**1.7287**
1974	2.9208	0.5760	1.7362	1.0000	1.6823
1975	2.9679	0.5695	1.7559	1.0000	1.6903
1976	2.9655	0.5657	1.7677	1.0000	1.6776
1977	2.6851	0.5658	1.7675	1.0000	1.5192
1978	2.1044	0.5798	1.7247	1.0000	1.2201
1979	2.1914	0.5964	1.6768	1.0000	1.3069
1980	2.2674	0.5895	1.6965	1.0000	1.3365
1981	2.2054	0.6138	1.6291	1.0000	1.3538
1982	2.4908	0.6069	1.6477	1.0000	1.5117
1983	2.3751	0.6303	1.5865	1.0000	1.4971
1984	2.3752	0.6553	1.5259	1.0000	1.5566
1985	**2.3854**	**0.6552**	**1.5262**	**1.0000**	**1.5630**
1986	1.6852	0.6593	1.5169	1.0000	1.1110
1987	1.4464	0.6701	1.4924	1.0000	0.9692
1988	1.2815	0.6696	1.4933	1.0000	0.8581
1989	1.3796	0.6668	1.4997	1.0000	0.9199
1990	1.4479	0.6487	1.5414	1.0000	0.9393
1991	1.3471	0.6121	1.6338	1.0000	0.8245
1992	1.2665	0.6248	1.6006	1.0000	0.7913
1993	1.1120	0.6450	1.5505	1.0000	0.7172

1994	1.0221	0.6722	1.4878	1.0000	0.6870
1995	0.9406	0.6911	1.4471	1.0000	0.6500
1996	1.0878	0.7052	1.4181	1.0000	0.7671
1997	1.2099	0.7272	1.3751	1.0000	0.8798
1998	**1.3091**	**0.7825**	**1.2779**	**1.0000**	**1.0244**
1999	1.1391	0.8670	1.1534	1.0000	0.9876
2000	1.0777	0.8709	1.1482	1.0000	0.9386
2001	1.2153	0.9013	1.1095	1.0000	1.0954
2002	1.2539	0.9364	1.0679	1.0000	1.1742
2003	1.1593	0.9740	1.0267	1.0000	1.1291
2004	1.0819	1.0118	0.9883	1.0000	1.0947
2005	1.1022	1.0359	0.9654	1.0000	1.1417
2006	1.1630	1.1010	0.9083	1.0000	1.2805
2007	1.1775	1.1271	0.8872	1.0000	1.3272
2008	1.0336	1.1677	0.8564	1.0000	1.2069
2009	0.9357	1.2149	0.8231	1.0000	1.1368
10 予測値	**0.8949**	**1.2268**	**0.8151**	**1.0000**	**1.0979**

notes: ① GDPgap = GDPph of Object country ÷ GDPph of basic country, until GDPgap crossed GDPpar

② After GDPgap crossed GDPpar, GDPgap = GDPpar, ∴ GDPpar = GDPph of an Object country ÷ GDPph of the basic country

③ As GDPgap crossed GDPpar in 1967, the word GDPgap is changed to GDPpar from 1967 in Japan.

④ Till 1966 GDPpar = 1 ÷ GDPgap, from 1967 GDPgap wording is changed to GDPpar (GDPgap =GDPpar)

⑤ Divergence rate=Exchange rate ÷ GDPpar

Table I–3. The average and the maximum divergence rate of both exchange rate and GDPpar in Japan

Ave diverg. rate	52 to 72	2.3181	Max diverg. Rate	in 66	3.5477
- do -	73 to 09	1.1701	- do -	in 73	1.7287
- do -	87 to 97	0.8185	- do -	in 95	0.6500
- do -	86 to 09	0.9855	- do -	in 07	1.3272
- do -	08 to 09	1.1281	- do -	in 07	1.3272

Notes: ① Average divergence rate from 1952 to 1972：Ave diverg. Rate 52 to 72

② Max divergence rate in 1998：Max diverg. Rate 1998

Table II–1. Trends in the Population and GDP in Germany

Germany GDP	Population		US GDPph	Germany GDPpH	Germany $GDPph
978	0.4999	1950	1870	1956	466
1195	0.5053	1951	2122	2365	564
1365	0.5084	1952	2194	2685	640
1470	0.5138	1953	2276	2861	681
1582	0.5187	1954	2236	3050	726
1808	0.5237	1955	2394	3452	822
1990	0.5300	1956	2478	3755	894
2164	0.5365	1957	2561	4034	960
2312	0.5428	1958	2554	4259	1014
2504	0.5488	1959	2722	4563	1086
3028	0.5542	1960	2787	5464	1301
3318	0.5623	1961	2832	5901	1463
3609	0.5684	1962	3003	6349	1587
3825	0.5744	1963	3124	6659	1665
4593	0.5863	1965	3517	7834	1958
4883	0.5915	1966	3810	8255	2064
4945	0.5928	1967	3985	8342	2085
5349	0.5945	1968	4303	8997	2249
5970	0.6001	1969	4594	9948	2523
6788	0.6071	1970	4773	11181	3055
7491	0.6129	1971	5104	12222	3501
8229	0.6167	1972	5574	13344	4185
9174	**0.6197**	**1973**	**6538**	**14804**	**5539**
9851	0.6204	1974	7019	15878	6136
10277	0.6183	1975	7571	16621	6756
11175	0.6151	1976	8365	18168	7215
11942	0.6140	1977	9224	19450	8375
12830	0.6131	1978	10314	20926	10418
13884	0.6144	1979	11403	22598	12329
14710	0.6154	1980	12274	23903	13150
15355	0.6166	1981	13620	24903	11019
15869	0.6160	1982	14038	25761	10616
16671	0.6138	1983	15087	27160	10637
17495	0.6113	1984	16638	28619	10056
18260	0.6097	1985	17665	29949	10173
19279	0.6101	1986	18501	31600	14552
19912	0.6109	1987	19529	32595	18134
20943	0.6142	1988	20845	34098	19416
22235	0.7868	1989	22193	28260	15032
24312	0.7936	1990	23217	30635	18961
29380	0.7998	1991	23166	36734	22136
31552	0.8057	1992	24193	39161	25076

32354	0.8119	1993	25154	39850	24103
33944	0.8142	1994	26422	41690	25690
35230	0.8166	1995	27414	43142	30104
35860	0.8190	1996	28628	43785	29097
36666	0.8206	1997	30096	44682	25767
37842	0.8202	1998	31285	46138	26219
19823	**0.8209**	**1999**	**32874**	**24148**	**25728**
20323	0.8231	2000	34573	24691	22748
21132	0.8240	2001	35348	25646	22949
21432	0.8249	2002	36197	25981	24451
21667	0.8232	2003	37525	26320	29707
22036	0.8238	2004	39583	26749	33212
22384	0.8241	2005	41745	27162	33779
23256	0.8239	2006	43830	28227	35412
24317	0.8234	2007	45608	29532	40422
24923	0.8226	2008	46336	30298	44379
24067	**0.8217**	**2009**	**45307**	**29289**	**40691**
24428	**0.8217**	**2010 予測値**	**46530**	**29729**	

Source: the same as Table I

Figure II–1. Trends in Germany GDPph, USGDPph and Germany $GDPph 1950–2009

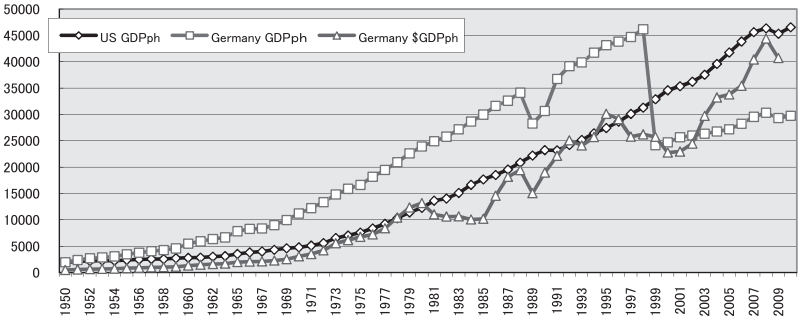


Table II–2. Trends in the exchange rate, GDPgap, GDPpar, and USGDPpar in Germany

DM・€/$ Exchange Rate		Germany GDPpar	Germany GDPgap	US GDPpar	fx/GDPpar divergence rate
1950	**4.1950**	**1.0460**	**0.9560**	**1.0000**	4.0105
1951	4.1950	1.1143	0.8974	1.0000	3.7646
1952	4.1950	1.2236	0.8172	1.0000	3.4284
1953	**4.2000**	1.2569	0.7956	1.0000	3.3414
1954	4.2000	1.3641	0.7331	1.0000	3.0789
1955	4.2000	1.4419	0.6936	1.0000	2.9129
1956	4.2000	1.5153	0.6599	1.0000	2.7716
1957	4.2000	1.5748	0.6350	1.0000	2.6670
1958	4.2000	1.6679	0.5996	1.0000	2.5181
1959	4.2000	1.6764	0.5965	1.0000	2.5054
1960	4.2000	1.9606	0.5100	1.0000	2.1421
1961	**4.0333**	2.0836	0.4799	1.0000	1.9357
1962	**4.0000**	2.1143	0.4730	1.0000	1.8919
1963	4.0000	2.1319	0.4691	1.0000	1.8763
1965	4.0000	2.2273	0.4490	1.0000	1.7959
1966	4.0000	2.1670	0.4615	1.0000	1.8459
1967	4.0000	2.0934	0.4777	1.0000	1.9107
1968	4.0000	2.0909	0.4783	1.0000	1.9131
1969	**3.9433**	2.1655	0.4618	1.0000	1.8209
1970	**3.6600**	2.3428	0.4268	1.0000	1.5622
1971	**3.4908**	2.3946	0.4176	1.0000	1.4578
1972	**3.1886**	2.3940	0.4177	1.0000	1.3319
1973	**2.6726**	**2.2643**	**0.4416**	**1.0000**	1.1803
1974	2.5878	2.2622	0.4420	1.0000	1.1439
1975	2.4603	2.1954	0.4555	1.0000	1.1207
1976	2.5180	2.1719	0.4604	1.0000	1.1594
1977	2.3222	2.1086	0.4743	1.0000	1.1013
1978	**2.0086**	**2.0289**	**0.4929**	1.0000	0.9900
1979	1.8329	1.9817	0.5046	1.0000	0.9249
1980	1.8177	1.9475	0.5135	1.0000	0.9334
1981	2.2600	1.8284	0.5469	1.0000	1.2361
1982	2.4266	1.8351	0.5449	1.0000	1.3223
1983	2.5533	1.8002	0.5555	1.0000	1.4183
1984	2.8459	1.7201	0.5814	1.0000	1.6545
1985	**2.9440**	**1.6954**	**0.5898**	**1.0000**	**1.7365**
1986	2.1715	1.7080	0.5855	1.0000	1.2714
1987	1.7974	1.6690	0.5991	1.0000	1.0769
1988	1.7562	1.6358	0.6113	1.0000	1.0736
1989	1.8800	1.2734	0.7853	1.0000	1.4764
1990	1.6157	1.3195	0.7579	1.0000	1.2245
1991	1.6595	1.5857	0.6306	1.0000	1.0465
1992	1.5617	1.6187	0.6178	1.0000	0.9648
1993	1.6533	1.5842	0.6312	1.0000	1.0436
1994	1.6228	1.5779	0.6338	1.0000	1.0285

1995	1.4331	1.5737	0.6354	1.0000	0.9106
1996	1.5048	1.5295	0.6538	1.0000	0.9839
1997	1.7341	1.4846	0.6736	1.0000	1.1680
1998	1.7597	1.4748	0.6781	1.0000	1.1932
1999	**0.9386**	**0.7346**	**1.3613**	**1.0000**	**1.2778**
2000	1.0854	0.7142	1.4002	1.0000	1.5198
2001	1.1175	0.7255	1.3783	1.0000	1.5403
2002	1.0626	0.7178	1.3932	1.0000	1.4804
2003	0.8860	0.7014	1.4257	1.0000	1.2632
2004	0.8054	0.6758	1.4798	1.0000	1.1918
2005	0.8041	0.6507	1.5369	1.0000	1.2358
2006	0.7971	0.6440	1.5528	1.0000	1.2377
2007	0.7306	0.6475	1.5443	1.0000	1.1283
2008	0.6827	0.6539	1.5293	1.0000	1.0441
2009	**0.7198**	**0.6465**	**1.5469**	**1.0000**	**1.1134**
2010 予測値		0.6389	1.5652	1.0000	

Source: the same as Table I

Table II–3. The average divergence rate of both exchange rate and GDPpar in Germany.

Ave diverg. rate	50 to 72	2.3856
- do -	73 to 09	1.2028
- do -	86 to 09	1.1905
- do -	99 to 09	1.2919
- do -	04 to 09	1.1676

Note：the same as Table I–3

Table III–1. Trends in the Population and GDP in U. K.

	UK GDP	Population		US GDPph	UK GDPph	UK $GDPph
1950	129.3	0.5062	1950	1870	255	715
1951	144.7	0.5056	1951	2122	286	801
1952	156.9	0.5072	1952	2194	309	866
1953	169.0	0.5086	1953	2276	332	931
1954	178.2	0.5105	1954	2236	349	978
1955	191.8	0.5120	1955	2394	375	1049
1956	207.4	0.5141	1956	2478	403	1130
1957	219.3	0.5163	1957	2561	425	1189
1958	228.4	0.5184	1958	2554	441	1234
1959	240.5	0.5213	1959	2722	461	1292
1960	255.0	0.5235	1960	2787	487	1364
1961	272.4	0.5281	1961	2832	516	1444
1962	285.2	0.5327	1962	3003	535	1499
1963	303.4	0.5354	1963	3124	567	1587
1964	331.3	0.5385	1964	3290	615	1723
1965	356.1	0.5418	1965	3517	657	1841
1966	379.8	0.5450	1966	3810	697	1952
1967	401.2	0.5480	1967	3985	732	2026
1968	433.2	0.5505	1968	4303	787	1888
1969	463.9	0.5527	1969	4594	839	2014
1970	509.8	0.5542	1970	4773	920	2208
1971	573.7	0.5561	1971	5451	1032	2511
1972	642.6	0.5579	1972	5939	1152	2882
1973	**739.9**	**0.5591**	**1973**	**6585**	**1323**	**3245**
1974	836.1	0.5592	1974	7019	1495	3497
1975	1055.0	0.5590	1975	7571	1887	4193
1976	1249.2	0.5589	1976	8365	2235	4037
1977	1454.8	0.5585	1977	9224	2605	4547
1978	1678.1	0.5584	1978	10314	3005	5768
1979	1974.2	0.5588	1979	11403	3533	7495
1980	2305.3	0.5633	1980	12274	4092	9520
1981	2532.5	0.5635	1981	13618	4494	9114
1982	2769.4	0.5631	1982	14038	4918	8609
1983	3026.2	0.5635	1983	15087	5370	8147
1984	3241.5	0.5651	1984	16638	5736	7665
1985	**3553.5**	**0.5668**	**1985**	**17665**	**6269**	**8127**
1986	3818.2	0.5685	1986	18501	6716	9853
1987	4194.6	0.5701	1987	19529	7358	12058
1988	4677.6	0.5716	1988	20845	8183	14578
1989	5132.8	0.5736	1989	22193	8948	14673
1990	5562.2	0.5756	1990	23217	9663	17246
1991	5845.4	0.5781	1991	23166	10111	17891
1992	6081.7	0.5801	1992	24193	10484	18509

1993	6393.6	0.5819	1993	25154	10987	16503
1994	6775.9	0.5839	1994	26422	11605	17774
1995	7139.8	0.5861	1995	27414	12182	19229
1996	7560.6	0.5880	1996	28628	12858	20081
1997	8054.0	0.5901	1997	30083	13649	22352
1998	8516.5	0.5830	1998	31285	14608	24197
1999	**8910.0**	**0.5849**	**1999**	**32874**	**15233**	**24651**
2000	9349.2	0.5887	2000	34573	15881	24077
2001	10218.3	0.5912	2001	35348	17284	24889
2002	10755.6	0.5939	2002	36197	18110	27189
2003	11397.5	0.5967	2003	37525	19101	31218
2004	12029.6	0.5996	2004	39583	20063	36751
2005	12540.6	0.6026	2005	41745	20811	37886
2006	13258.0	0.6058	2006	43830	21885	40326
2007	13988.8	0.6090	2007	45608	22970	45977
2008	14483.9	0.6123	2008	46336	23655	43838
2009	**13958.7**	**0.6152**	**2009**	**45307**	**22690**	**35497**

Source: the same as Table I

Figure III–1. Treands in UKGDPph, USGDPph, UK $GDPph, 1959–2009

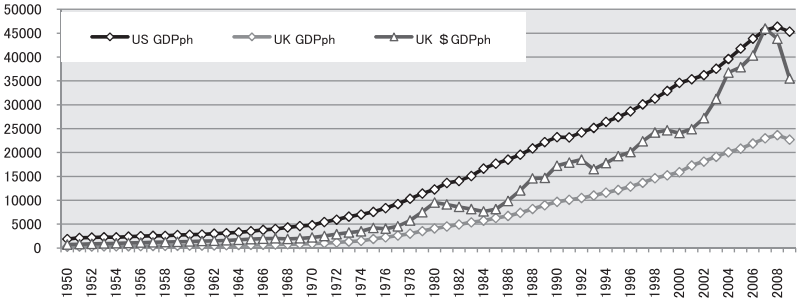


Table III–2. Trends in the exchange rate, GDPpar, in UK and USGDPpar

	£/$ Exchange rate	US GDPpar	UK GDPpar	UK GDPgap	fx/GDPpar divergence rate
1950	0.3571	1.0000	0.1366	7.3223	2.6148
1951	0.3571	1.0000	0.1349	7.4155	2.6481
1952	0.3571	1.0000	0.1410	7.0931	2.5330
1953	0.3571	1.0000	0.1460	6.8501	2.4462
1954	0.3571	1.0000	0.1561	6.4050	2.2872
1955	0.3571	1.0000	0.1565	6.3917	2.2825
1956	0.3571	1.0000	0.1628	6.1419	2.1933
1957	0.3571	1.0000	0.1658	6.0302	2.1534
1958	0.3571	1.0000	0.1725	5.7963	2.0698
1959	0.3571	1.0000	0.1695	5.8995	2.1067
1960	0.3571	1.0000	0.1748	5.7209	2.0429
1961	0.3571	1.0000	0.1821	5.4903	1.9606
1962	0.3571	1.0000	0.1783	5.6092	2.0031
1963	0.3571	1.0000	0.1814	5.5120	1.9683
1964	0.3571	1.0000	0.1870	5.3483	1.9099
1965	0.3571	1.0000	0.1869	5.3514	1.9110
1966	0.3571	1.0000	0.1829	5.4665	1.9521
1967	0.3614	1.0000	0.1837	5.4427	1.9670
1968	0.4167	1.0000	0.1829	5.4684	2.2787
1969	0.4167	1.0000	0.1827	5.4733	2.2807
1970	0.4167	1.0000	0.1927	5.1882	2.1619
1971	0.4108	1.0000	0.1893	5.2836	2.1705
1972	0.3997	1.0000	0.1939	5.1564	2.0610
1973	**0.4078**	**1.0000**	**0.2010**	**4.9757**	**2.0291**
1974	0.4275	1.0000	0.2130	4.6944	2.0070
1975	0.4501	1.0000	0.2493	4.0118	1.8056
1976	0.5536	1.0000	0.2672	3.7425	2.0721
1977	0.5729	1.0000	0.2824	3.5409	2.0286
1978	0.5210	1.0000	0.2914	3.4322	1.7881
1979	0.4713	1.0000	0.3098	3.2277	1.5213
1980	0.4299	1.0000	0.3334	2.9992	1.2893
1981	0.4931	1.0000	0.3300	3.0301	1.4942
1982	0.5713	1.0000	0.3503	2.8543	1.6306
1983	0.6592	1.0000	0.3560	2.8093	1.8519
1984	0.7483	1.0000	0.3448	2.9005	2.1706
1985	**0.7714**	**1.0000**	**0.3549**	**2.8177**	**2.1736**
1986	0.6817	1.0000	0.3630	2.7547	1.8778
1987	0.6102	1.0000	0.3767	2.6543	1.6196
1988	0.5614	1.0000	0.3926	2.5473	1.4299
1989	0.6099	1.0000	0.4032	2.4801	1.5125
1990	0.5603	1.0000	0.4162	2.4026	1.3462
1991	0.5652	1.0000	0.4365	2.2911	1.2949

1992	0.5664	1.0000	0.4333	2.3076	1.3071
1993	0.6658	1.0000	0.4368	2.2893	1.5242
1994	0.6529	1.0000	0.4392	2.2768	1.4866
1995	0.6335	1.0000	0.4444	2.2504	1.4257
1996	0.6403	1.0000	0.4491	2.2265	1.4257
1997	0.6106	1.0000	0.4537	2.2041	1.3459
1998	0.6037	1.0000	0.4669	2.1416	1.2929
1999	**0.6180**	**1.0000**	**0.4634**	**2.1580**	**1.3336**
2000	0.6596	1.0000	0.4593	2.1770	1.4359
2001	0.6944	1.0000	0.4890	2.0451	1.4202
2002	0.6661	1.0000	0.5003	1.9987	1.3313
2003	0.6118	1.0000	0.5090	1.9646	1.2020
2004	0.5459	1.0000	0.5068	1.9730	1.0771
2005	0.5493	1.0000	0.4985	2.0059	1.1019
2006	0.5427	1.0000	0.4993	2.0027	1.0869
2007	0.4996	1.0000	0.5036	1.9855	0.9920
2008	0.5396	1.0000	0.5105	1.9588	1.0570
2009	**0.6392**	**1.0000**	**0.5008**	**1.9968**	**1.2764**

Source: the same as Table I

Table IV–1. Trends in the Population and GDP in China

単位：GDP 億元，人口億人

China GDP	Population		China GDPph	US GDPph	China $GDPph
3,624	**9.6260**	**1978**	**376**	**10,314**	**224**
4,074	9.7540	1979	418	11,403	269
4,551	9.9610	1980	457	12,274	305
4,901	10.0840	1981	486	13,620	285
5,489	10.2060	1982	538	14,038	284
6,076	10.3960	1983	584	15,087	296
7,164	10.5490	1984	679	16,638	293
8,792	**10.7020**	**1985**	**822**	**17,665**	**280**
10,133	10.8670	1986	932	18,501	270
11,784	11.0420	1987	1067	19,529	287
14,704	11.2190	1988	1311	20,845	352
16,466	11.3920	1989	1445	22,193	384
18,320	11.5530	1990	1586	23,217	332
21,280	11.7010	1991	1819	23,166	342
25,846	11.8330	1992	2184	24,193	396
34,501	11.9570	1993	2885	25,154	501
46,691	12.0760	1994	3866	26,422	449
58,511	12.3670	1995	4731	27,414	567
68,330	12.4620	1996	5483	28,628	662
74,895	12.4280	1997	6026	30,096	728
79,003	12.5390	1998	6301	31,357	761
82,673	12.6480	1999	6536	32,869	790
98,749	12.6700	2000	7794	34,463	941
109,655	**12.7670**	**2001**	**8589**	**35,186**	**1,038**
120,333	12.8600	2002	9357	35,999	1,131
135,823	12.9490	2003	10489	37525	1,267
159,878	13.0370	2004	12263	39583	1,482
183,217	13.1230	2005	13962	41745	1,704
211,924	13.2070	2006	16046	43830	2,012
257,306	13.2910	2007	19359	45608	2,545
300,670	13.3740	2008	22482	46336	3,235
335,353	**13.4580**	**2009**	**24918**	**45307**	**3,648**

Source: the same as Table Ⅰ

Figure IV–1. Treands in China GDPph, USGDPph, China $GDPph, 1978–2009

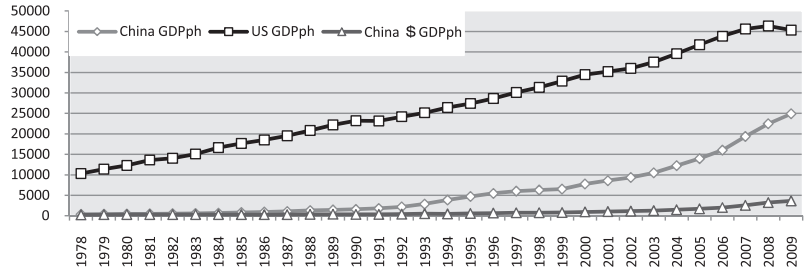


Table IV−2. Trends in the exchange rate, GDPpar,and USGDPpar in China

	China GDPgap	China GDPpar	Yuan Exchange rate	US GDPph	fx/GDPpar 乖離率
1978	**0.0365**	**27.3959**	**1.6836**	**1.0000**	**0.0615**
1979	0.0366	27.3011	1.5550	1.0000	0.0570
1980	0.0372	26.8647	1.4987	1.0000	0.0558
1981	0.0357	28.0237	1.7045	1.0000	0.0608
1982	0.0383	26.1016	1.8925	1.0000	0.0725
1983	0.0387	25.8138	1.9757	1.0000	0.0765
1984	0.0408	24.4995	2.3200	1.0000	0.0947
1985	**0.0465**	**21.5026**	**2.9367**	**1.0000**	**0.1366**
1986	0.0504	19.8411	3.4528	1.0000	0.1740
1987	0.0546	18.2993	3.7221	1.0000	0.2034
1988	0.0629	15.9045	3.7221	1.0000	0.2340
1989	0.0651	15.3542	3.7651	1.0000	0.2452
1990	0.0683	14.6412	4.7832	1.0000	0.3267
1991	0.0785	12.7380	5.3234	1.0000	0.4179
1992	0.0903	11.0762	5.5146	1.0000	0.4979
1993	0.1147	8.7176	5.7620	1.0000	0.6610
1994	0.1463	6.8337	8.6187	1.0000	1.2612
1995	0.1726	5.7943	8.3514	1.0000	1.4413
1996	0.1915	5.2212	8.2784	1.0000	1.5855
1997	0.2002	4.9941	8.2771	1.0000	1.6574
1998	0.2009	4.9768	8.2790	1.0000	1.6635
1999	0.1989	5.0286	8.2783	1.0000	1.6463
2000	0.2262	4.4217	8.2785	1.0000	1.8722
2001	**0.2441**	**4.0967**	**8.2771**	**1.0000**	**2.0204**
2002	0.2599	3.8472	8.2770	1.0000	2.1514
2003	0.2795	3.5775	8.2770	1.0000	2.3136
2004	0.3098	3.2278	8.2768	1.0000	2.5642
2005	0.3344	2.9900	8.1943	1.0000	2.7405
2006	0.3661	2.7315	7.9734	1.0000	2.9191
2007	0.4245	2.3558	7.6075	1.0000	3.2292
2008	0.4852	2.0610	6.9487	1.0000	3.3715
2009	**0.5500**	**2.8239**	**6.8314**	**1.0000**	2.4191

Source: the same as Table Ⅰ

Table V–1. Trends in the Population and GDP in South Korea

Korea GDP	Population		Korea GDPph	US GDPph	Korea $ GDPph
53780	0.3410	1973	1577	6538	396
75970	0.3469	1974	2190	7019	541
102280	0.3528	1975	2899	7571	599
139980	0.3585	1976	3905	8365	807
179460	0.3641	1977	4929	9224	1018
242330	0.3697	1978	6555	10314	1354
310360	0.3753	1979	8270	11403	1709
377890	0.3812	1980	9913	12274	1632
473830	0.3872	1981	12237	13618	1797
544310	0.3933	1982	13840	14038	1893
638580	0.3991	1983	16001	15087	2063
730040	0.4041	1984	18066	16638	2241
813120	0.4081	1985	19925	17665	2290
948620	0.4121	1986	23019	18819	2612
1111980	0.4162	1987	26717	19529	3248
1321120	0.4203	1988	31433	20845	4297
1481970	0.4245	1989	34911	22193	5199
1787970	0.4287	1990	41707	23217	5893
2165110	0.4330	1991	50003	23166	6818
2457000	0.4375	1992	56160	24193	7194
2774970	0.4419	1993	62796	25154	7823
3234070	0.4464	1994	72448	26422	9017
3773500	0.4509	1995	83688	27414	10851
4184790	0.4554	1996	91893	28628	11423
4911350	**0.4538**	**1997**	**108227**	**30083**	11377
4841030	**0.4576**	**1998**	**105792**	**31285**	**7549**
5295000	0.4611	1999	114834	32874	9660
6032360	0.4643	2000	129924	34573	11488
6514150	0.4671	2001	139459	35348	10803
7205390	0.4695	2002	153469	36197	12267
7671140	0.4716	2003	162662	37525	13651
8268930	0.4737	2004	174560	39583	15241
8652410	0.4757	2005	181888	41745	17760
9087440	0.4777	2006	190233	43830	19924
9750130	0.4796	2007	203297	45608	21877
10264520	0.4815	2,008	213178	46336	19345
10630590	**0.4833**	**2,009**	**219958**	**45307**	**17226**

Source: The same as Table I

Table V–2. Trends in the exchange rate, GDPgap, GDPpar, and USGDPpar in South Korea

	Korea GDPgap	Korea GDPpar	Won/$ Exchange rate	US GDPpar	fx/GDPpar divergence rate
1973	**0.2412**	**4.1456**	**3.9832**	**1.0000**	**0.9608**
1974	0.3120	3.2050	4.0447	1.0000	1.2620
1975	0.3829	2.6117	4.8400	1.0000	1.8532
1976	0.4668	2.1423	4.8400	1.0000	2.2592
1977	0.5344	1.8713	4.8400	1.0000	2.5864
1978	0.6355	1.5736	4.8400	1.0000	3.0758
1979	0.7252	1.3789	4.8400	1.0000	3.5100
1980	0.8076	1.2382	6.0743	1.0000	4.9058
1981	0.8986	1.1128	6.8103	1.0000	6.1199
1982	0.9859	1.0143	7.3108	1.0000	7.2075
1983	**1.0605**	**0.9429**	**7.7575**	**1.0000**	**7.3146**
1984	1.0858	0.9210	8.0598	1.0000	7.4228
1985	1.1279	0.8866	8.7002	1.0000	7.7137
1986	1.2232	0.8175	8.8145	1.0000	7.2062
1987	1.3681	0.7310	8.2257	1.0000	6.0126
1988	1.5079	0.6632	7.3147	1.0000	4.8508
1989	1.5731	0.6357	6.7146	1.0000	4.2684
1990	1.7964	0.5567	7.0776	1.0000	3.9400
1991	2.1584	0.4633	7.3335	1.0000	3.3976
1992	2.3214	0.4308	7.8065	1.0000	3.3629
1993	2.4965	0.4006	8.0267	1.0000	3.2152
1994	2.7420	0.3647	8.0345	1.0000	2.9302
1995	3.0527	0.3276	7.7127	1.0000	2.5265
1996	3.2099	0.3115	8.0445	1.0000	2.5062
1997	**3.5976**	**0.2780**	**9.5129**	**1.0000**	**2.6442**
1998	**3.3816**	**0.2957**	**14.0144**	**1.0000**	**4.1443**
1999	3.4932	0.2863	11.8882	1.0000	3.4032
2000	3.7580	0.2661	11.3096	1.0000	3.0095
2001	3.9454	0.2535	**12.9099**	1.0000	3.2722
2002	4.2398	0.2359	12.5109	1.0000	2.9508
2003	4.3348	0.2307	11.9161	1.0000	2.7489
2004	4.4099	0.2268	11.4532	1.0000	2.5971
2005	4.3571	0.2295	10.2412	1.0000	2.3505
2006	4.3402	0.2304	9.5479	1.0000	2.1999
2007	4.4575	0.2243	**9.2926**	1.0000	2.0847
2008	4.6007	0.2174	11.0200	1.0000	2.3953
2009	**4.8548**	**0.2060**	**12.7690**	**1.0000**	**2.6302**

Source: The same as Table I

Table V–3. The average and the maximum divergence rate of both exchange rate and GDPpar in Korea

Ave diverg. rate	87 to 97	3.6050	Max diverg. Rate	in 87	6.0126
- do -	86 to 09	3.3603	- do -	in 85	7.7137
- do -	97 to 09	2.8024	- do -	in 98	4.1443

Note: the same as Table I–3

Figure V–1. Trends Korea GDPph, USGDPph, Korea $GDPph, 1973–2009

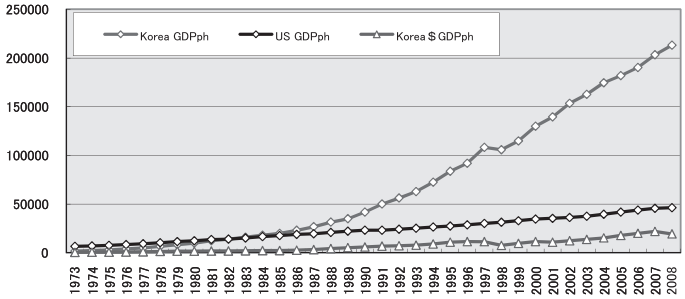


Table VI. Trends in ppp by the CPI in Japan and US

	73 年 日本 Cpi	73 年 米国 Cpi	73 年 ppp	87年 日本 Cpi	87年 米国 Cpi	87 年 ppp	99 年 日本 Cpi	99 年 米国 Cpi	99 年 ppp
1973	100.00	100.00	271.70						
1974	123.30	111.20	301.26						
1975	137.70	121.20	308.69						
7196	150.70	128.20	319.39						
1977	163.00	136.50	324.45						
1978	169.80	146.80	314.27						
1979	176.00	163.40	292.65						
1980	189.30	185.60	277.12						
1981	199.10	204.70	264.27						
1982	204.70	217.40	255.83						
1983	208.60	224.10	252.91						
1984	213.30	233.80	247.88						
1985	217.40	244.70	241.39						
1986	218.80	246.80	240.88						
1987	219.10	255.90	232.63	100.00	100.00	144.86			
1988	220.70	266.20	225.26	100.73	104.03	140.27			
1989	225.50	279.10	219.52	102.92	109.07	136.70			
1990	232.60	294.10	214.88	106.16	114.93	133.81			
1991	240.20	306.50	212.93	109.63	119.77	132.59			
1992	244.40	315.90	210.20	111.55	123.45	130.90			
1993	247.40	325.30	206.64	112.92	127.12	128.67			
1994	249.10	333.50	202.94	113.69	130.32	126.37			
1995	248.80	342.90	197.14	113.56	134.00	122.76			
1996	249.00	352.80	191.76	113.65	137.87	119.41			
1997	253.50	361.10	190.74	115.70	141.11	118.78			
1998	255.00	366.90	188.83	116.39	143.38	117.59			
1999	254.30	374.80	184.35	116.07	146.46	114.80	100.00	100.00	113.91
2000	252.50	387.50	177.04	115.24	151.43	110.25	99.29	131.90	85.74
2001	250.70	398.40	170.97	114.42	155.69	106.47	98.58	135.61	82.80
2002	248.50	404.90	166.75	113.42	158.23	103.84	97.72	137.83	80.76
2003	247.70	413.90	162.60	113.05	161.74	101.25	97.40	140.89	78.75
2004	247.70	425.10	158.32	113.05	166.12	98.59	97.40	144.70	76.67
2005	246.90	439.40	152.67	112.69	171.71	95.02	97.09	149.57	73.94
2006	247.39	440.81	152.48	112.92	176.65	92.60	97.28	154.35	67.42
2007	**247.64**	**466.64**	**143.77**	**113.03**	**181.78**	**90.07**	**97.38**	**158.84**	**69.83**
2008	**251.10**	**484.24**	**140.89**	**114.61**	**188.63**	**88.02**	**98.74**	**164.83**	**68.24**
2009	**247.64**	**482.90**	**139.33**	**113.03**	**188.71**	**86.77**	**97.38**	**164.38**	**67.48**

Source: Original Statistics; CPI, and Exchange rate used “International Financial Statistics, 2002 and, 2010 yearbook”

Table VII. Trends in the GDPpar, SDR rate and exchange rate, in leading countries

	£/$	£/$ SDR	¥/$	¥/$ SDR	M-€/$	DM-€/ $SDR	¥/ $GDPpar	M-€/ $GDPpar	£/ $GDPpar
1973	0.4078	2.7170	2.7170	0.0000	2.6726	1.0000	1.5717	2.2643	0.2024
1974	0.4275	2.4433	2.9200	0.0000	2.5878	0.9019	1.7362	2.2622	0.2130
1975	0.4501	2.2417	2.9700	0.0000	2.4603	0.8802	1.7559	2.1954	0.2493
1976	0.5536	2.1193	2.6800	0.0000	2.5180	0.8507	1.7677	2.1719	0.2672
1977	0.5729	1.9905	2.6900	0.0000	2.3222	0.8374	1.7675	2.1086	0.2824
1978	0.5210	1.8508	2.1044	0.0000	2.0086	0.8645	1.7247	2.0289	0.2914
1979	0.4713	1.6628	2.1914	0.0000	1.8329	0.9284	1.6768	1.9817	0.3098
1980	0.4299	1.4639	2.2674	0.0000	**1.8177**	0.9805	1.6965	1.9475	0.3334
1981	0.4931	1.3273	2.2054	0.0000	2.2600	1.0281	1.6291	1.8284	0.3300
1982	0.5713	1.2498	2.4908	0.0000	2.4266	1.0620	1.6477	1.8351	0.3503
1983	0.6592	1.2124	2.3751	0.0000	2.5533	1.0743	1.5865	1.8002	0.3560
1984	0.7483	1.1621	2.3752	0.0000	2.8459	1.0961	1.5259	1.7201	0.3448
1985	0.7714	1.1103	2.3854	0.0000	2.9440	1.1256	1.5262	1.6954	0.3549
1986	0.6817	1.1009	1.6852	0.0000	2.1715	1.1280	1.5169	1.7080	0.3569
1987	0.6102	1.0617	1.4464	0.5652	1.7974	1.1680	1.4924	1.6690	0.3767
1988	0.5614	1.0207	1.2815	0.5434	1.7562	1.2062	1.4933	1.6358	0.3926
1989	0.6099	0.9735	1.3796	0.5182	1.8800	1.2377	1.4997	1.2734	0.4032
1990	0.5603	0.9238	1.4479	0.4918	1.6157	1.2644	1.5414	1.3195	0.4162
1991	0.5652	0.8865	1.3471	0.4719	1.6595	1.2760	1.6338	1.5857	0.4365
1992	0.5664	0.8601	1.2665	0.4579	1.5617	1.2926	1.6006	1.6187	0.4333
1993	0.6658	0.8352	1.1120	0.4446	1.6533	1.3149	1.5505	1.5842	0.4368
1994	0.6529	0.8147	1.0221	0.4337	1.6228	1.3388	1.4878	1.5779	0.4392
1995	0.6335	0.7924	0.9406	0.4218	1.4331	1.3782	1.4471	1.5737	0.4444
1996	0.6403	0.7701	1.0878	0.4100	1.5048	1.4169	1.4181	1.5295	0.4491
1997	0.6106	0.7524	1.2099	0.4006	1.7341	1.4245	1.3751	1.4846	0.4537
1998	0.6037	0.7405	1.3091	0.3942	1.7597	1.4388	1.2943	1.4714	0.4659
1999	0.6180	0.7249	1.1391	0.3859	0.9386	1.4738	1.2243	0.7347	0.4635
2000	0.6596	0.7012	1.0777	0.3733	1.0854	1.5347	1.1558	0.7165	0.4608
2001	0.6944	0.6820	1.2135	0.3631	1.1175	1.5892	1.1114	0.7289	0.4912
2002	0.6661	0.6710	1.2500	0.3572	1.0626	1.6294	1.0706	0.7217	0.5031
2003	0.6118	0.6564	1.1600	0.3495	0.8860	1.6710	1.0296	0.7025	0.5120
2004	0.5459	0.6391	1.0819	0.3402	0.8054	1.7162	0.9905	0.6797	0.5086
2005	0.5493	0.6183	1.1022	0.3292	0.8041	1.7797	0.9469	0.6552	0.5019
2006	0.5427	0.5987	1.1630	0.3187	0.7971	1.8321	0.9112	0.6455	0.5020
2007	0.4996	0.5799	1.1775	0.3087	0.7306	1.8899	0.8928	0.6497	0.5111
2008	0.5396	#DIV/0!	1.0336	#DIV/0!	0.6827	#DIV/0!	0.8500	0.6458	0.5054

Source: the same as Table I