The US dollar in the international monetary system after the Asian crisis*

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1. Introduction

We learnt some lessons from the Asian currency crisis that occurred in 1997. One of the lessons is that the *de facto* dollar peg system was dangerous for East Asian countries which trade with diversified countries including Japan and the EU countries as well as the United States (Williamson (2000)). However, linkages of home currencies with the US dollar have returned to the pre-crisis situation for some of East Asian countries in recent years as McKinnon (2000) pointed out.

This paper examines whether the linkages of the home currencies with the US dollar have increased in recent years. Recent movements in the linkages may be related with exchange rate policies that the monetary authorities of these countries have conducted. This paper focuses on inertia of the US dollar as a key currency to consider about one reason why the monetary authorities have returned to a *de facto* dollar peg system.

Ogawa (2001) estimated weights on the US dollar in a possible currency basket for some East Asian countries according to a method of Frankel and Wei (1994). I show an analytical result that some of the countries have increased the linkages of their home currencies with the US dollar in recent years. This result supports the return to their *de facto* dollar peg addressed by McKinnon (2000).

Next we can point out some factors, which include inertia of the US dollar as a key currency in the world economy, the US dollar as a nominal anchor, appreciation of the Japanese yen against the US dollar, and intra-regional trade relation or competitiveness. Among them, I focus on inertia of the US dollar as a key currency in this paper. The present international monetary system is characterized as a Gulliver-type one, where the US dollar has a dominantly large share in uses of international currencies. In the Gulliver-type of international monetary system, the US dollar tends to keep its position of a key currency. Moreover, I explain results of our empirical research (Ogawa and Kawasaki (2001)) on inertia

of the US dollar as a key currency by taking into account utility of holding the US dollar and its holding costs, that is depreciation of the US dollar.

The rest of this paper is organized as follows: In Section 2, it is explained that a *de facto* dollar peg system was one of causes of the Asian currency crisis from viewpoints of effects of the *de facto* dollar peg system on both current accounts and capital inflows before the crisis. Section 3 shows that East Asian currencies have increased linkages with the US dollar in recent year again. In Section 4, we look at current uses of the US dollar. Moreover, the international monetary system is characterized as a Gulliver-type of international monetary system. Section 5 shows a result of the empirical analysis on inertia of a position of the US dollar as a key currency.

2. A *de facto* dollar peg system as a cause of the Asian currency crisis

(1) Exchange rate policies before the crisis

According to the classification by the IMF (1997), the East Asian countries with currencies attacked by speculation in 1997 have in fact adopted exchange rate arrangements other than the dollar peg system before the Asian currency crisis. However, the classification was different from empirical analyses by Frankel and Wei (1994) and Kawai and Akiyama (1998) on the currency to which the monetary authorities of East Asian countries pegged their home currencies. They estimated the weights placed on major foreign currencies in their exchange rate policy before the Asian currency crisis according to a method that Asian currencies (in terms of the Swiss Franc) were regressed on the US dollar (in terms of the Swiss franc) and the Japanese yen (in terms of the Swiss franc).

The result of estimation is summarized in Table 1. According to their results, the weight placed on the US dollar is nearly equal to one for the Hong Kong dollar, the Korean won, the Indonesian rupiah, and the Philippine peso. The weight of the US dollar is 0.91 or 0.789 for the Thai baht. Moreover, Frankel and Wei (1994) showed that the Singapore dollar

and the Malaysian ringgit had a coefficient of about 0.7. Thus, the estimation indicates that the monetary authorities of the countries indeed adopted the *de facto* dollar peg system.

The *de facto* dollar peg system could contribute to the Asian currency crisis through depressing trade balances of the crisis countries and stimulating capital inflows to the crisis countries before the crisis. The movements in the exchange rates have had negative effects on the international trade competitiveness of East Asian countries that adopted the *de facto* dollar peg system. The real effective exchange rates of the Thai baht, the Malaysian ringgit, and the Indonesian rupiah had been fluctuating without any appreciating trends in the early 1990s. However, they had been appreciating since May of 1995. The *de facto* dollar peg system and the depreciation of the yen against the US dollar influenced the movements of the real effective exchange rates.

Private capital inflows to the Thailand, Indonesia, and Korea increased in the 1990s. Especially in 1995 and 1996, there happened an oversurge of capital inflows to all of the three countries. The oversurge of capital inflows to Thailand was mainly caused by other investment, such as international bank loans. Portfolio investments to Korea were larger than international bank loans in 1993 but the opposite was true after 1994. Since the private capital inflows had reached its peak in 1996, the international bank loans prevailed in the capital inflows to these East Asian countries.

(2) The *de facto* dollar peg system fluctuated trade balances

We can consider whether the *de facto* dollar peg system fluctuated trade balances of East Asian countries by looking at results of empirical research by Ito, Ogawa, and Sasaki (1998). We estimated optimal weights of the US dollar and the Japanese yen in a currency basket in order to stabilize fluctuations of trade balances.

Table 2 shows the optimal weights for each country, for Model A (with a constant term in price equation (A-1), and without a constant term (A-2)) and Model B (with a

constant term in price equation (B-1), and without a constant term (B-2))[1]. In general, estimates fall between 0 and 1, except one sub-case of the Philippines. According to our estimates, in all countries, the yen weight should be much higher than the actual weight estimated by Frankel and Wei, cited in Table 1. After we interpreted results of volume regressions, we chose Model B for Thailand, and Model A for all other cases. For Thailand, the optimal yen weight was estimated anywhere between 39 percent (model B-1) and 65 percent (model B-2). For Indonesia, the yen optimal weight was between 52 percent (model A-1) and 60 percent (model A-2). For Korea, both A-1 and A-2 models indicate that the optimal yen weight was 89 percent. The optimal weight of the yen for the Singapore dollar was between 77 percent (Model A-1) and 88 percent (Model A-2).

Thus, Table 2 shows that all of the optimal weights were larger than the actual weights that Frankel and Wei (1994) estimated though the optimal weights varied among the countries. It implies that the monetary authorities of these countries fluctuated their trade balances because they adopted their actual weights that were different from the optimal weights.

(3) The *de facto* dollar peg system stimulated capital inflows

Ogawa and Sun (2001) empirically analyzed how the *de facto* dollar peg system stimulated capital inflows to Thailand, Korea, and Indonesia, by focusing on the relationship between the *de facto* dollar peg system and the capital inflows to these counties. We regressed capital flows on explaining variables which included interest rates, foreign exchange risks, export growth rate, and rate of change in stock prices.

We conducted a simulation analysis by supposing that the monetary authorities had

[1] We set up two competitive situations: the first is that each of the Japanese and U.S. markets is modeled as a duopoly one where the domestic firm competes against the Japanese firm (Model A). The second is that each of the Japanese and U.S. markets is modeled as a duopoly one where the domestic firm competes against each local firm in the markets (Model B).

adopted a currency basket peg system instead of the *de facto* dollar peg system under an assumption that estimated coefficients on the explaining variables in the capital flow equations were unchanged even if the monetary authorities changed their exchange rate policy. We supposed that the monetary authorities of these countries had adopted a currency basket peg system whose currency basket consisted of 50 percent of the US dollar and 50 percent of the yen instead of the actual *de facto* dollar peg system, whose currency basket consisted of 80 percent of the US dollar and 20 percent of the yen. Foreign exchange risks of the home currency against the US dollar would be doubled while foreign exchange risks of the home currency against the yen would be halved under the currency basket peg system.

Table 3 shows that means of simulated values were smaller than those of estimated values in almost of the cases, which excluded the case of portfolio and other investments of Korea during 1986 QI to 1997 QI. Thus, it can be concluded that *de facto* dollar peg system had stimulating effect on capital inflows to the countries.

3. Recent return to *de facto* dollar peg?

(1) Movements of exchange rates for East Asian country currencies

This section shows that East Asian currencies have increased linkages with the US dollar in the recent years. Figures 1a through 1g show the movements of exchange rates of local currencies for ASEAN 4 countries (Thailand, Indonesia, Malaysia, the Philippines) and Asian NIEs (Singapore, Korea, and Taiwan). The figures show movements of exchange rates of their currencies vis-à-vis the US dollar compared with those vis-à-vis the Japanese yen. Exchange rates of their currencies vis-à-vis the US dollar fluctuated more widely during the currency crisis period from July 1997 to the end of 1998. Moreover, some of the countries (Thailand, Indonesia, Malaysian, and Korea) experienced overshooting of their exchange rates during the currency crisis. We can find the same movements in their exchange rates vis-à-vis the Japanese yen during the currency crisis.

Movements of the exchange rates tended to be stabilized in 1999 and 2000. However, we can find differences in fluctuations between exchange rates vis-à-vis the US dollar and the Japanese yen. Their exchange rates vis-à-vis the Japanese yen have fluctuated more widely than those vis-à-vis the US dollar. It seems that some of East Asian countries are returning to such a *de facto* dollar peg system as they adopted before the currency crisis even though they experienced the currency crisis under the *de facto* dollar peg system.

(2) Estimation of weights on the US dollar

Next, Ogawa(2001) empirically analyzed how much weights the monetary authorities placed on the US dollar when they conducted exchange rate policy. McKinnon (2000) and Kawai and Akiyama (2000) used a method of Frankel and Wei (1994) to conduct the similar analysis about the weight on the US dollar. They obtained a common result that Asian countries have returned to the *de facto* dollar peg system. I divided a sample period into sub-sample periods of a half-year when I used daily data in estimation while I divided it into sub-sample periods of one-year when I used weekly data.

I estimated the weights placed on major foreign currencies (the US dollar, the Japanese yen, the Deutsche mark, and British pound) in their possible currency basket during the period between January 1997 and September 2000. East Asian currencies (in terms of the Swiss franc) were regressed on the major currency (in terms of the Swiss franc), for various sub-periods in 1997-2000, with such high frequency data as daily and weekly data. A source of the data was Datastream.

I regressed log differences of exchange rates of a local currency vis-à-vis the Swiss franc on log differences on exchange rates of the major currencies vis-à-vis the Swiss franc.

$$\Delta \log e^{home/SF} = a_0 + a_1 \Delta \log e^{USD/SF} + a_2 \Delta \log e^{JPY/SF} + a_3 \Delta \log e^{DM/SF} + a_4 \Delta \log e^{BP/SF} + \varepsilon_t \quad (3\text{-}1)$$

I omitted variables that were significantly negative when I made regression exchange rates of

a local currency on those of all of the major currency.

Table 4 shows results of estimation of weights in a possible currency basket with log differences by using daily data. In the case of Thailand, the weight on the US dollar was 0.990 during January to June 1997 before the currency crisis. The weight decreased during the currency crisis from July 1997 to June 1998. However, it has increased since July 1998. We can find the similar movements in the cases of Indonesia, Malaysia, the Philippines, Singapore, and Korea.

Table 5 is abstracted results of weights on the US dollar from the same estimations as Table 4. We can interpret standard errors of the coefficient as how precisely the monetary authorities targeted the relevant exchange rate. The standard errors were very small in all of the countries before the currency crisis. The small standard errors correspond to a fact that they adopted the *de facto* dollar peg system. The standard errors have decreased in all of the countries after the currency crisis. Especially in Singapore and Korea, the standard errors have recently returned to the same level as the pre-crisis period.

Table 6 shows results of estimation of weights in a possible currency basket with log differences by using weekly data. The results of estimation with weekly data are somewhat different from those of estimation with daily data. In Thailand, Indonesia, the Philippines, Singapore, the weights on the US dollar have increased after the currency crisis though they did not reach one. In the case of Thailand, the weight on the US dollar has been around 0.7 during July 1999 to September 2000 though that was 0.872 during January to June 1997 before the currency crisis. In contrast, the weights on the US dollar have been over 0.9 in Korea and Taiwan in recent years.

Table 7 shows standard errors of weights on the US dollar with weekly data, which abstracted results of weights on the US dollar from the same estimations as Table 6. In Thailand, Singapore, Korea, and Taiwan, the standard errors have decreased and approached to the pre-crisis levels recently.

From the empirical analysis, we obtained the results that the weights on the US dollar have returned to 1 for daily data while the weights on the US dollar have increased but have approached to 1 for some of the countries for weekly data. In addition, we found that the weights on the US dollar has increased or has been increasing toward 1 in most of the East Asian countries.

Next, we should consider why the monetary authorities have returned to such a *de facto* dollar peg system if it is true that they intended to intervene in foreign exchange markets in order to target (or peg) their home currency to the US dollar. We can point out some factors, which include the US dollar as inertia of the US dollar as a key currency, a nominal anchor, appreciation of the Japanese yen against the US dollar, and intra-regional trade relation or competitiveness. Among them, I focus on inertia of the US dollar as a key currency in the next section.

4. Inertia of the US dollar as the key currency

(1) A current situation

The US dollar has had a steady trend to depreciate against the Japanese yen and the Deutche mark since the international monetary system was changed from the US dollar standard system to a general floating system in 1973. We should recognize that both official authorities and private economic agents in the world have still accepted and used the US dollar as a key currency under the present international monetary system. We look at a position of the US dollar in international financial markets in recent years.

Figure 2 shows shares of denomination currencies in international money market instruments. A share of the US dollar denominated international money market instruments has decreased from 79 percent in 1993 to 43 percent in 2000. A share of the Japanese yen denominated international money market instruments has been small but has increased from 0.3 percent in 1993 to 2.6 percent in 2000. A share of those denominated in terms of the euro

area currencies, that included the EU 11 country currencies and the ECU before the introduction of the euro in January 1999, has increased from 10 percent in 1993 to 32 percent in 2000.

Figure 3 shows shares of denomination currencies in international bond market. A share of the US dollar denominated international bonds and notes has increased from 38 percent in 1993 to 47 percent in 2000. A share of the Japanese yen denominated international bonds and notes has decreased from 14 percent in 1993 to 10 percent in 2000. A share of the euro area currencies denominated international bonds and notes has increased a little from 26 percent in 1993 to 29 percent in 2000. Especially, the share of the euro area currencies has increased much more after the EU countries introduced the euro in 1999.

Figure 4 shows shares of denomination currencies in liabilities in terms of home and foreign currencies of international banks for euro-currency markets during a period from 1983 to 1999. A share of the US dollar denomination decreased from 79 percent in 1984 to 49 percent in 1995. It has been kept around 50 percent since then. A share of the Japanese yen denomination has gradually increased from 2 percent in 1983 to 8 percent in 1999. A share of the euro area currencies denomination increased from 12 percent in 1983 to 30 percent in 1993. Afterward, it has gradually decreased in 1990s. Even after the currency unification, it has been under 30 percent.

Thus, shares of the US dollar in the international bonds and the euro-currency markets have been kept at the same levels as those before the European monetary unification while has decreased in the international money markets.

(2) Network externalities in an international currency

The fact that the depreciating US dollar has kept a position as a key currency is very important when we consider issues on an international monetary system. The issues include what function of an international currency has been regarded to be the most important when

private economic agents choose a key currency. An international currency has three functions of a medium of exchange, a store of value, and a measure of value in an international economic context like a domestic currency in a domestic economic context[2]. The fact that the depreciating US dollar has kept a position as a key currency implies that a function of money as a medium of exchange is in general recognized to be more important than its function as a store of value when we choose an international currency in international economic transactions.

Thus, the US dollar would not change in its position as a key currency as long as it has an advantage in a medium of exchange compared with other currencies. Other currencies such as the Japanese yen might have the power to compete with the US dollar in a function as a store of value. However, a relative advantage in the function as a store of value is not sufficient for other currencies in order to compete effectively with the US dollar. Rather, it is necessary for the other currencies to improve their function as a medium of exchange or convenience in using it as a settlement currency and an invoice currency in international trade transactions. Both a search theoretic model and a random matching model[3] in a context of international currencies tell us that an international currency, volume of that is overwhelmingly large in settlements of international trade, used as a medium of exchange in international transactions.

A function of an international currency as a medium of exchange depends on a degree of its general acceptability among economic agents in the world. A currency is held to use as a medium of exchange although we cannot enjoy direct utility by consuming it in contrast with goods and services in general. The reason is only that the currency is accepted and received as a medium of exchange by trading counterparts. Moreover, the trading counterparts also are willing to purchase ultimately goods and services by passing the currency to any

[2] See Krugman (1984).
[3] Matsuyama, Kiyotaki, and Matsui (1993) and Trejos and Wright (1996) applied a random matching model to a

other economic agents. Therefore, the general acceptability depends on a probability that an economic agent who holds a currency to purchase goods and services can meet another economic agent who is willing to accept the currency to sell goods and services.

Thus, the function of a currency as a medium of exchange depends on whether other economic agents are willing to use it as a medium of exchange, or how many other economic agents are willing to use it as a medium of exchange. In other words, its function as a medium of exchange improves itself as a number of other economic agents that are willing to use it. Thus, it is said the function as a medium of exchange has network externalities[4]. Because such network externalities exist in monetary exchange system, a currency, whose general acceptability has been historically high, might in itself enhance its general acceptability.

This implies that economies of scale work in a medium of exchange. In the case of economies of scale, benefits of holding a key currency with a dominantly large share in uses of the international currencies are clearly larger than those of holding any other currencies with a smaller share. Moreover, the larger share of the key currency enlarges gaps in the benefits between the key currency and other currencies. Therefore, the key currency with a dominantly large share would enhance its own share as long as monetary authorities supply the currency at a relatively low growth rate and control inflation rates at a relatively low level. Once a currency becomes a key currency with a dominantly large share, the currency would keep its position as a key currency unless the monetary authorities bring about a large depreciation of the currency. Thus, a historical fact that a currency became a key currency makes the currency keep its position as a key currency. Thus, inertia works in a position as a key currency.

The US dollar has been in a position as a key currency during this century. All economic agents in the world have not been enforced to approve the US dollar to be a key

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theoretical analysis of international currencies.

[4] See Dowed and Greenaway (1993), Hartmann (1998).

currency after the Bretton Woods system collapsed in 1971. They have freedom to choose another currency as well as the US dollar as a key currency if they wish. They would be able to choose a multi international currency system where there exist more than two international key currencies.

Under the multi international currency system, it is free for private economic agents in the world to choose to use only one currency or more than two currencies as their international key currencies by comparing between both the functions as a medium of exchange and as a store of value. Private economic agents in the world should choose a key currency by taking into account which function they regard to be more important in using as an international currency. The US dollar has taken an advantage of a function as a medium of exchange rather than a function as a store of value. The inertia in a position of the US dollar as a key currency shows that private economic agents in the world have chosen the US dollar as a key currency from a viewpoint of a function as a medium of exchange.

(3) A Gulliver-type of international monetary system

Here, we should take into account a competition condition in such a multi international currency system when we consider a possibility of switching from one key currency to another. A condition where private economic agents are able to choose freely a key currency in a multi international currency system does not necessarily imply that the multi international currencies are effectively competing with each other. Both the network externalities and the economies of scale should lead to a natural monopoly condition in international currency competitions. A function of an international currency as a medium of exchange is enhanced as a volume of trade by means of the international currency increases in itself. The volume of trade by means of the international currency tends to be positively related with its volume of supply in the world economy. Thus, an increase in an international currency improves its quality in a function of a medium of exchange.

The quality of an international currency in the function as a medium of exchange depends on a relative volume in circulates of the international currency or a share of the international currency in the world economy. According to the relationship between the quality of an international currency and the share of the international currency in the world economy, international currencies with different shares in the world economy are heterogeneous in the function as a medium of exchange. Thus, the international currencies with different shares are imperfect substitutes.

An international currency with a relatively high share should have a relatively better quality in the function as a medium of exchange. On the other hand, an international currency with a relatively low share should have a relatively worse quality in the function as a medium of exchange. An international currency that has extremely high share in the world economy like the US dollar should have quite a different quality from other currencies. Such a key currency tends to increase a degree of differentiation among the key currency and other currencies. We can call such an international monetary system as a Gulliver-type of international monetary system. It is difficult for the other currencies to compete with the key currency as much as competition in markets of homogeneous goods.

It is unlikely that a continuous depreciation of the US dollar would change the present Gulliver-type of international monetary system into another system with effective currency competition because inertia works in a position of the US dollar as a key currency. However, if there were any competitive international currencies other than the US dollar, the US dollar could not receive monopoly profits that it has received in the present situation of a single key currency.

All the economic agents, who hold a balance of a foreign currency to use the foreign currency as a key currency, are enforced to pay seigniorage to the foreign monetary authorities. If the foreign monetary authorities seek to obtain their seigniorage from all the economic agents who hold a balance of the foreign currency, the authorities might grow the

volume of currency at very high rate. As a result, the currency would depreciate against other currencies.

However, if the currency effectively competed with other international currencies, economic agents in the world economy could switch holdings of international currency from the depreciating currency to an appreciating currency. Moreover, if there is high substitutability among international currencies, it is easier for economic agents to switch holdings of international currency. After they switch holdings of international currency to another currency, the monetary authorities that sought to obtain their seigniorage could in fact obtain a smaller amount of the seigniorage than they expected.

Therefore, the monetary authorities should not grow the volume of currency at too high rate. Rather the monetary authorities should grow it at an optimal rate to maximize their seigniorage. The optimal growth rate depends on a competition condition among international currencies. That is, the monetary authorities should grow it at a lower rate, as a competition condition becomes more severe. Thus, if a key currency effectively competed with other currencies, the effective currency competition could prevent the monetary authorities of the key currency from growing its volume at too high rate and, in tern, depreciating it against other currencies.

Under the Gulliver-type of international currency system, it is difficult for the other currencies to compete effectively with the US dollar because the US dollar and the other currencies, which have included the euro and the Japanese yen, have been considerably heterogeneous.

However, it is unlikely that a share of the US dollar naturally decreases and shares of the other currencies increase under the present Gulliver-type of international monetary system, as showed by the simulation analysis of Ogawa and Sasaki (1998). If we experienced some large shocks in the Gulliver-type of international currency system, the shares of the international currencies would change by themselves.

5. Empirical analysis on inertia of the US dollar

(1) Model

Ogawa and Sasaki (1998) and Ogawa and Kawasaki (2001) empirically analyzed how much inertia the US dollar has in its position as a key currency by taking account of both the function as a medium of exchange and a store of value in a context of international currency competition. We supposed that we could enjoy benefits of a medium of exchange function by holding real balances of international currencies while we expensed costs of holding depreciating international currencies.

Suppose that private economic agents in the third country A hold the home currency A, the US dollar as an international currency, other international currencies, US dollar denominated bonds, and other international currencies denominated bonds. The private economic agents face in the following budget constraints in real terms at time t:

$$\begin{aligned} \dot{w}_t^P &= \bar{r}\left(b_t^D + b_t^Y\right) + y_t - c_t - tax_t - \pi_t{}^A m_t^A - \pi_t{}^D m_t^D - \pi_t{}^Y m_t^Y \\ &= \bar{r} w_t^P + y_t - c_t - tax_t - i_t^A m_t^A - i_t^D m_t^D - i_t^Y m_t^Y \end{aligned} \tag{5.1}$$

$$w_t^P \equiv b_t^D + b_t^Y + m_t^A + m_t^D + m_t^Y \tag{5.2}$$

where w^P: real financial assets held by private sector, m^A: real balances of home currency held by private sector, m^D: real balances of the US dollar as an international currency held by private sector, m^Y: real balances of other international currencies held by private sector, b^D: real balances of the US dollar denominated bonds held by private sector, b^Y: real balances of other international currency denominated bonds held by private sector, $\bar{r}$: real interest rate (the real interest rates are equal among the countries under assumptions of purchasing power parity and uncovered interest rate parity), y: real domestic products, c: real consumption, tax: real tax, i^A: nominal interest rates in terms of home currency A, i^D: nominal interest rates in terms of the US dollar, i^Y: nominal interest rates in terms of other

international currencies, π^A: expected inflation rate in the third country A, π^D: expected inflation rate in the United States, π^Y: expected inflation rate in other international currency counties. A dot over variables means that changes in the relevant variables. We assume no-Ponzi game condition for real financial assets held by private sector:

$$\lim_{t\to\infty} w_t^P \exp(-\bar{r}t) \geq 0 \tag{5.3}$$

We assumed a money-in-the-utility model where real balances of international currencies were introduced to a utility function $U(\square)$ of private economic agents. We specified a Cobb-Douglas type of utility function:

$$\int_0^\infty U\left(c_t, m_t^A, m_t^D, m_t^Y\right) e^{-\delta t} dt$$

$$U\left(c_t, m_t^A, m_t^D, m_t^Y\right) \equiv \frac{\left[c_t^\alpha \left\{m_t^{A\beta}\left(m_t^{D\gamma} m_t^{Y1-\gamma}\right)^{1-\beta}\right\}^{1-\alpha}\right]^{1-R}}{1-R} \tag{5.4}$$

$$0<\alpha<1, 0<\beta<1, 0<\gamma<1, 0<R<1$$

From the first-order conditions for utility-maximization subject to inter-temporal budget constraints that include payments of seigniorage to foreign monetary authorities, we derive optimal real balances of international currencies. An optimal share of the US dollar ϕ is derived:

$$\phi_t = \frac{m_t^D}{m_t^D + m_t^Y} = \frac{1}{1+\frac{1-\gamma}{\gamma}\frac{i_t^D}{i_t^Y}} = \frac{1}{1+\frac{1-\gamma}{\gamma}\frac{\pi_t^D+\bar{r}}{\pi_t^Y+\bar{r}}}$$

(5.5)

where

Parameter γ is rewritten:

$$\gamma = \frac{1}{1+\left(\frac{1}{\phi_t}-1\right)\frac{i_t^Y}{i_t^D}}$$

(5.6)

$$\gamma = \frac{1}{1+\left(\frac{1}{\phi_t}-1\right)\frac{\pi_t^Y + \bar{r}}{\pi_t^D + \bar{r}}}$$

(5.7)

In equation (5.6), parameter γ is represented in terms of nominal interest rates. In equation (5.7), it is represented in terms of the real interest rate and expected inflation rates.

(2) Methodology and data

We estimated parameter γ on the basis of both equations (5.6) and (5.7). First, we used the data on nominal interest rates to estimate parameter γ by supposing that the real interest rate is constant during the analytical period. However, it is difficult to suppose that the real interest rates will be constant during the period.

Next, we divided the nominal interest rate into the real interest rate and an expected inflation rate. The latter is calculated by forecasting expected price levels for the next period according to the ARIMA process. We estimated parameter γ by assuming a plausible range of real interest rates between 3 and 8 percent. We conducted interval estimates of parameter γ for real interest rates of 3, 5, and 8 percent. We estimated confidence intervals at a significant level of 99 percent.

We used data on the share of the US dollar, nominal interest rates, and inflation rates in our empirical analysis. The relevant data were for the United States, Japan, and EU countries as we regard the US dollar, the yen, and the euro as international currencies. We used quarterly data during the period from 1986 QI to 2000 QI.

We should have used data on balances of international currencies held by private sectors in the rest of the world to calculate the share of the US dollar. However, it was difficult for us directly to collect the data. We used data on liabilities in home and foreign currencies for Eurocurrency markets as proxy for the balances of international currencies. The data were classified by currencies of cross-border liabilities in home and foreign currencies

that were published in *International Banking and Financial Market Development*, BIS.

We used 3-month Eurocurrency interest rates as nominal interest rates. We used a Euro-dollar interest rate as the nominal interest rate of the key currency and a weighted average of Euro-yen and Euro-euro or ECU interest rates as the nominal interest rate of the other currencies. The weights were calculated on the basis of the share of liabilities in Eurocurrency markets.

As for expected rates of inflation, we forecasted expected price of the next period from the data of the last five years according to the ARIMA (p, d, q) process. We used data on consumer price indexes. We used weighted averages of inflation rates in Japan and EU countries in the same way as the nominal interest rates. Data on both Eurocurrency interest rates and price levels were taken from the *International Financial Statistics*, IMF (CD-ROM).

(3) Analytical results

Ogawa and Kawasaki (2001) analyzed how the parameter γ has changed after the introduction of the euro in January 1999, which corresponds to a time when East Asian currencies have been stabilized after the Asian currency crisis as explained in Section 3. We estimated the parameter γ both for a whole sample period from 1986 QI to 2000 QI and two sub-periods from 1986 QI to 1998 QIV and from 1999 QI to 2000 QI. Table 8 shows estimation results that include means, standard deviations, and 99 percent confidence intervals of the parameter γ both for the whole period and for the two sub-periods.

For the whole period, means of the parameter γ was 0.63 and its 99% confidence interval was during 0.59 and 0.68 when we used data on nominal interest rates and estimated the parameter γ according to equation (5.6). Means of the parameter γ was from 0.61 to 0.63 and its 99% confidence interval was during 0.59 to 0.64 when we used data on expected inflation rates and supposed real interest rates and estimated the parameter γ according to equation (5.7).

We divided the sample period into two sub-sample periods: a first sub-period was from 1986 Q1 to 1998 QIV and a latter sub-period was from 1999 QI to 2000 Q1. We obtained the following results: in the case when we estimated equation (5.6) using data on nominal interest rates, means of the parameter γ was 0.62 and its 99 percent confidence interval was during 0.57 and 0.67 for the first sub-period while means of the parameter γ was 0.76 and its 99% of confidence interval was during 0.73 to 0.78 for the latter sub-period. Thus, we found that the parameter γ has increased after the introduction of the euro in the case of estimating equation (5.6) with nominal interest rates. This estimation was based on the assumption that real interest rates are kept at a constant level over time. However, it might be true that the real interest rates vary over time. We conduct another estimation that is based on equation (5.7) with expected inflation and a plausible range of real interest rates.

In the case when we used data on expected inflation rates and supposed real interest rates to estimate the parameter γ according to equation (5.7), means of the parameter γ was 0.62 and its 99% confidence interval was during 0.59 and 0.64 for the first sub-period. For the latter sub-period, means of the parameter γ was 0.58 and its 99% confidence interval was during 0.55 and 0.61. In this case, the parameter γ decreased after the introduction of the euro though the changes were not statistically significant because standard deviations were larger than the changes.

Thus, we found that the parameter γ has little changed between the two sub-sample periods in the case when we estimated the parameter γ according to equation (5.7) with expected inflation and a plausible range of real interest rates. It implies that there have been little changes in the position of the US dollar in international monetary system after both the introduction of the euro and stabilization of East Asian currency.

6. Conclusion

It is often pointed out that the *de facto* dollar peg system is dangerous for the East Asian countries with diversified trade with Japan, the EU countries, and the intra-region as well as the United States. Under the *de facto* dollar peg system, the movements of exchange rate of the US dollar against the Japanese yen worsened trade balances. Moreover, the *de facto* dollar peg system stimulated capital inflows to the crisis countries before the crisis. When we look at movements of the exchange rates of some East Asian currency during a post-crisis period from 1999 to present day, we can find that the exchange rates against the US dollar have been stabilized while the exchange rates against the Japanese yen have been fluctuating during the post-crisis. It seems that the monetary authorities of some countries have been returning to the *de facto* dollar peg system that they adopted before the currency crisis.

One of the factors that make the monetary authorities return to the *de facto* dollar peg system is the US dollar as a key currency. The monetary authorities seem to care about exchange rate risks against the US dollar because private sectors use the US dollar as an international settlement and invoice currency. We found that inertia is still working in a position of the US dollar as a key currency even after the euro was introduced to the EU 11 countries in January 1999. Therefore, the monetary authorities would keep placing the important weight on the US dollar as long as they have an objective of linking their home currency to the key currency.

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Table 1: Weights on the US dollar and the yen in exchange rate policies of the Asian countries

	Frankel and Wei (1994) Sample period: 1979-1992		Kawai and Akiyama (1998) Sample period: 1990-96	
	Coefficient on the US dollar	Coefficient on the yen	Coefficient on the US dollar	Coefficient on the yen
Singapore dollar	0.75	0.13	0.420*	0.021
Hong Kong dollar	0.92	-0.00	1.002	-0.002
Korean won	0.96	-0.10	0.941	0.088
Malaysia ringgit	0.78	0.07	0.589	0.044
Thai baht	0.91	0.05	0.789	0.104
Philippine peso	1.07	-0.01	1.087	-0.094
Indonesian rupiah	0.95	0.16	0.966	0.014

Source: Ogawa and Sun (2001)

*A coefficient on the SDR is 0.600.

Table 2: Optimal weights in a currency basket

	Actual weights		Optimal weights							
			Model A-1		Model A-2		Model B-1		Model B-2	
	US$ (%)	yen (%)	US$ (%)	yen (%)	US$ (%)	yen (%)	US$ (%)	yen (%)	US$ (%)	yen (%)
Thai baht	91	5	42.9	57.1	4.3	95.7	61.3	38.7	35.3	64.7
Indonesia rupiah	95	16	40.5	59.5	47.7	52.3	71.2	28.8	77.9	22.1
Korean won	96	-10	10.5	89.5	10.9	89.1	47.4	52.6	45.7	54.3
Singapore dollar	75	13	22.6	77.4	12.4	87.6	57.4	42.6	51.0	49.0
Philippine peso	107	-1	-2.9	102.9	27.6	72.4	67.3	32.7	72.8	27.2

Source: Ito, Ogawa, and Sasaki (1998)

Notes: Actual weights came from Frankel and Wei (1994). Model A-1 uses the coefficients estimated in the case of export price equations (model A) with constant and the coefficients estimated in the export volume equations. Model A-2 uses those in export price equations (model A) without constant and those in the export volume equations. Model B-1 uses those in the export price equations (model B) with constant and those in the export volume equations. Model B-2 uses those in the export price equations without constant and those in the export volume equations.

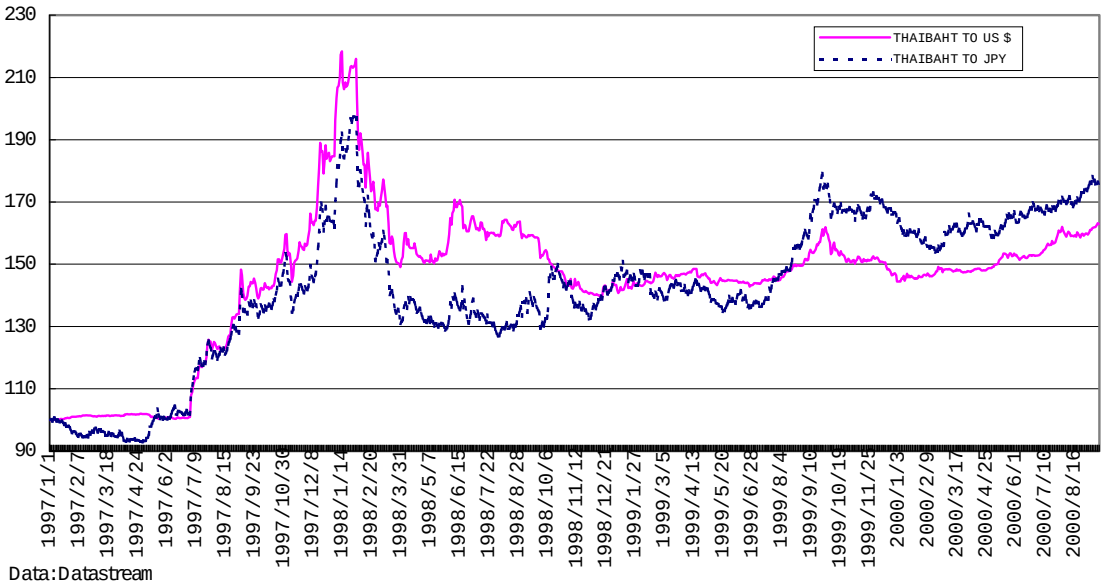
Table 3: Means and Standard Errors of Estimated and Simulated Values

		Thailand		**Korea**		**Indonesia**
Capital flows		Other Investments	Portfolio and Other Investments	Other Investments	Portfolio and Other Investments	Other Investments
1986QI-1997QI	Estimated value	0.0528 (0.0318)	0.0646 (0.0332)	-0.0025 (0.0182)	0.0116 (0.0264)	0.0195 (0.0060)
	Simulated value	0.0178 (0.0558)	0.0237 (0.0633)	-0.0164 (0.0251)	0.0140 (0.0393)	0.0175 (0.0053)
1990QI-1997QI	Estimated value	0.0720 (0.0118)	0.0856 (0.0086)	0.0089 (0.0095)	0.0272 (0.0178)	0.0158 (0.0036)
	Simulated value	0.0544 (0.0113)	0.0653 (0.0109)	-0.0017 (0.0166)	0.0050 (0.0316)	0.0141 (0.0028)

Source: Ogawa and Sun (2001)

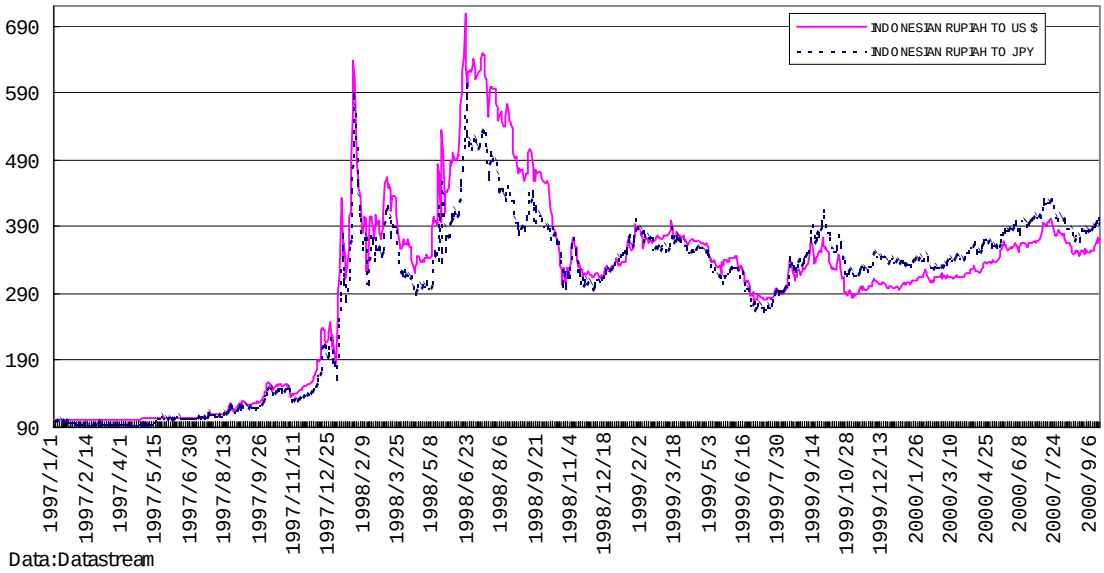
A value in ( ) is standard errors.

Figure 1a: Exchange Rates of Thaibaht



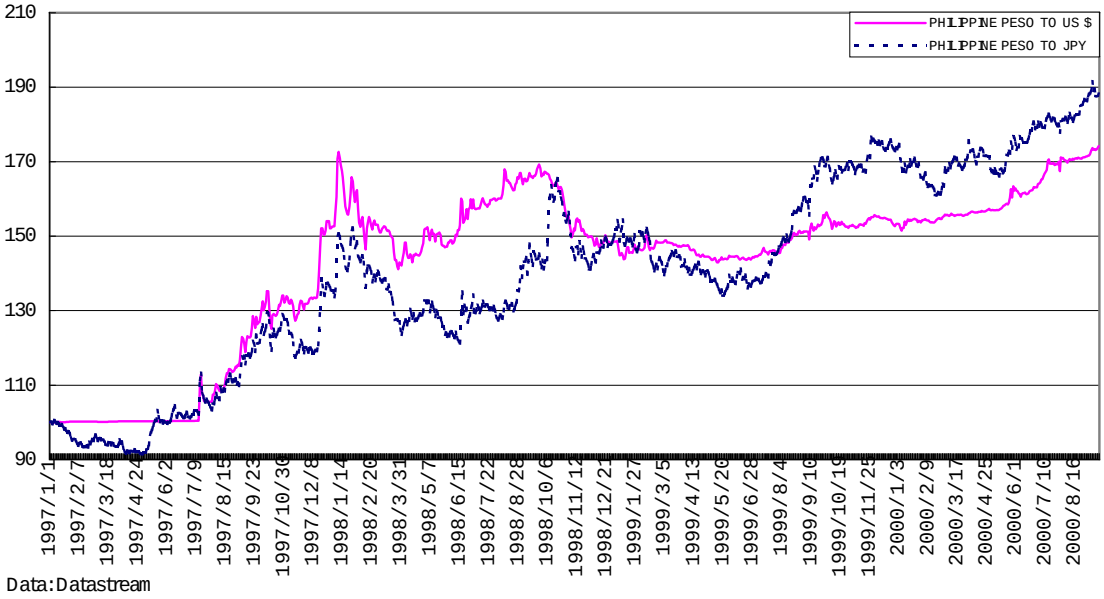
Data: Datastream

Figure 1b: Exchange Rates of Indonesia rupiah



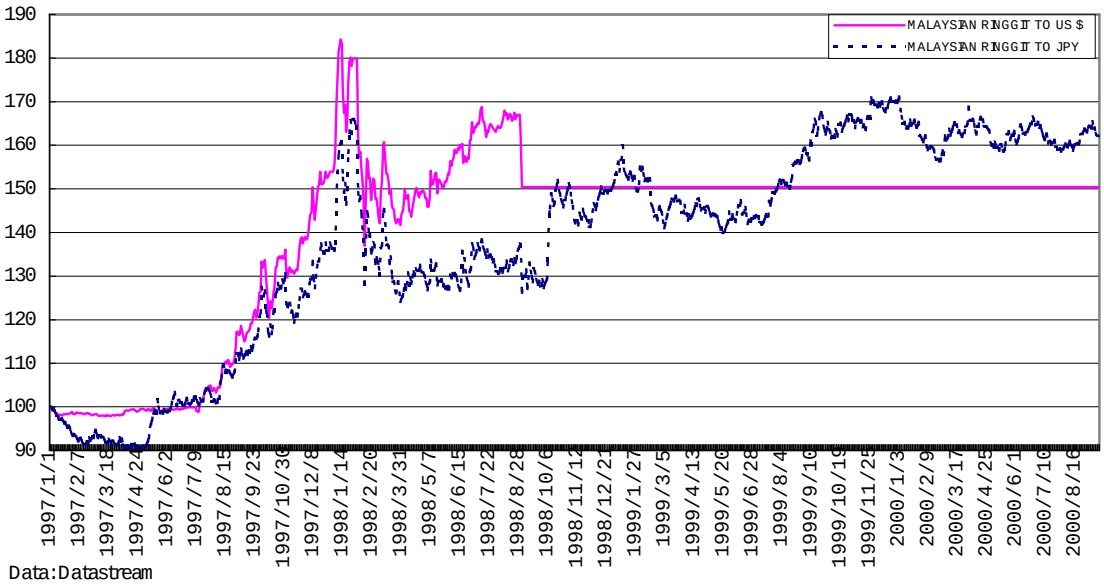
Data: Datastream

Figure 1c: Exchange Rates of Philippine peso



Data: Datastream

Figure 1d: Exchange Rates of Malaysian ringgit



Data: Datastream

Figure 1e: Exchange Rates of Singapore dollar

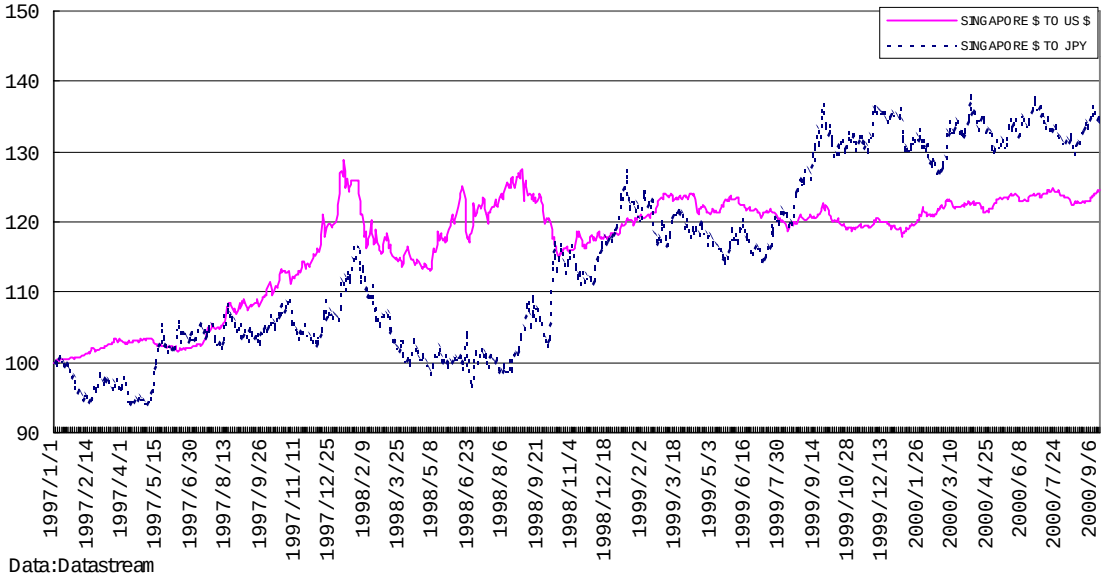


Figure 1f: Exchange Rates of Korean won

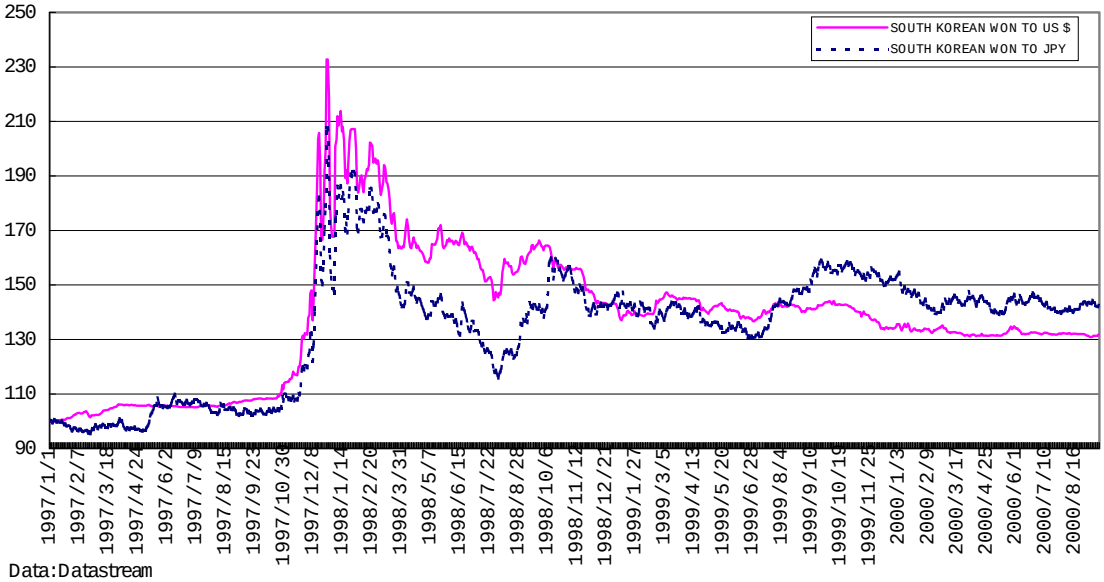
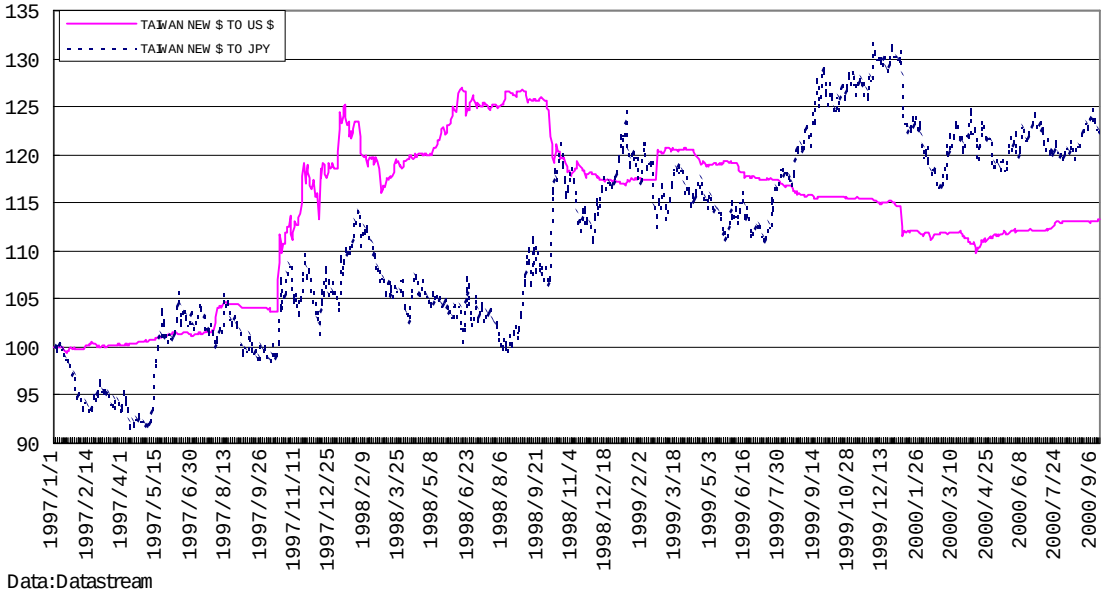


Figure 1g: Exchange Rates of Taiwan $



Data: Datastream

Table 4: Estimation of weights in a currency basket (daily data; log differences)

Currency	period	US dollar	yen	DM	B pound
Thailand	Jan-Jun 1997	0.990***	0.049***	-	-0.001
	Jul-Dec 1997	0.932**	0.020	0.550	-0.268
	Jan-Jun 1998	0.471	0.148	0.727	0.311
	Jul-Dec 1998	1.004***	0.082	0.146	-0.039
	Jan-Jun 1999	0.998***	0.043	-0.079	-0.088
	Jul-Dec 1999	1.145***	-0.040	0.032	-0.147
	Jan-Jun 2000	0.908***	0.027	-0.116	0.090
	Jan-Sep 2000	0.896***	0.035	-0.121	0.119**
Indonesia	Jan-Jun 1997	0.999***	0.014	0.024	0.025
	Jul-Dec 1997	0.843	-0.152	-0.390	0.458
	Jan-Jun 1998	-0.203	1.974**	2.071	-0.890
	Jul-Dec 1998	0.841*	0.277	0.244	0.063
	Jan-Jun 1999	1.159***	0.298*	-0.144	-
	Jul-Dec 1999	0.477	0.411**	0.660	-
	Jan-Jun 2000	0.942***	0.129	0.266	-0.009
	Jan-Sep 2000	1.012***	0.118	0.890***	0.165
Philippines	Jan-Jun 1997	0.999***	-0.001	-0.002	0.000
	Jul-Dec 1997	1.232***	-0.137	0.094	-0.08
	Jan-Jun 1998	0.656**	0.082	-0.346	0.403
	Jul-Dec 1998	1.127***	-0.026	-0.001	-0.040
	Jan-Jun 1999	0.996***	-0.027	-0.030	0.060
	Jul-Dec 1999	1.046***	-0.073	-0.244	-0.166
	Jan-Jun 2000	0.938***	-0.043	-0.096	0.064
	Jan-Sep 2000	0.872***	-0.005	-0.100	0.055
Malaysia	Jan-Jun 1997	1.030***	0.023	-0.070	-0.071
	Jul-Dec 1997	0.650**	0.303*	0.602*	-0.026
	Jan-Jun 1998	0.867*	0.341	-0.654	0.976
	Jul-Dec 1998	1.027***	0.050	0.136	-0.078
	Jan-Jun 1999	1.000***	0.000	0.000	0.000
	Jul-Dec 1999	1.000***	0.000	0.000	0.000
	Jan-Jun 2000	1.000***	0.000	0.000	0.000
	Jan-Sep 2000	1.000***	0.000	0.000	0.000
Singapore	Jan-Jun 1997	0.902***	0.095***	-0.030	0.015
	Jul-Dec 1997	0.833***	0.050	-0.040	0.145*
	Jan-Jun 1998	0.747***	0.209**	0.318	0.115
	Jul-Dec 1998	0.903***	0.232***	-0.088	0.012
	Jan-Jun 1999	0.915***	0.072***	0.303***	-0.091
	Jul-Dec 1999	0.997***	0.021	-0.049	-0.052
	Jan-Jun 2000	0.929***	0.005	-0.108	0.052
	Jan-Sep 2000	0.948***	0.001	-0.038	0.051
Korea	Jan-Jun 1997	1.009***	0.049*	-0.042	0.012
	Jul-Dec 1997	0.590	1.104**	0.256	0.391
	Jan-Jun 1998	0.536	0.045	1.228	0.122
	Jul-Dec 1998	1.015***	0.063	0.083	-
	Jan-Jun 1999	1.008***	-0.012	-0.250	0.043
	Jul-Dec 1999	0.951***	0.043	-0.146	-0.002
	Jan-Jun 2000	1.027***	-0.061	-0.061	0.016
	Jan-Sep 2000	0.975***	-	-0.009	0.015

Taiwan	Jan-Jun 1997	0.990***	0.013	-0.037	-0.000
	Jul-Dec 1997	1.020***	-0.026	0.178	-0.084
	Jan-Jun 1998	0.895***	0.082	0.087	-0.001
	Jul-Dec 1998	0.957***	0.099***	-0.060	-0.008
	Jan-Jun 1999	0.974***	0.021	0.095	-
	Jul-Dec 1999	1.000***	0.008	0.041	-0.015
	Jan-Jun 2000	0.971***	-	0.038	-0.006
	Jan-Sep 2000	0.981***	-	0.022	-0.013

Source: Ogawa(2001)
***: significant level of 1%, **: significant level of 5%, *: significant level of 10%
Period [Jan-Jun 1997]: 01:02:1997 To 06:30:1997
Period [Jul-Dec 1997]: 07:02:1997 To 12:31:1997
Period [Jan-Jun 1998]: 01:02:1998 To 06:30:1998
Period [Jul-Dec 1998]: 07:02:1998 To 12:31:1998
Period [Jan-Jun 1999]: 01:04:1999 To 06:30:1999
Period [Jul-Dec 1999]: 07:02:1999 To 12:31:1999
Period [Jan-Jun 2000]: 01:04:2000 To 06:30:2000
Period [Jan-Sep 2000]: 01:04:2000 To 09:15:2000

$$\Delta \log e^{home/SF} = a_0 + a_1 \Delta \log e^{USD/SF} + a_2 \Delta \log e^{JPY/SF} + a_3 \Delta \log e^{DM/SF} + a_4 \Delta \log e^{BP/SF} + \varepsilon_t$$

Table 5: Estimates of weights on the US dollar (daily data, log differences)

currency	period	Coefficient	Standard error
Thailand	Jan-Jun 1997	0.990***	0.022
	Jul-Dec 1997	0.932**	0.344
	Jan-Jun 1998	0.471	0.385
	Jul-Dec 1998	1.004***	0.129
	Jan-Jun 1999	0.998***	0.101
	Jul-Dec 1999	1.145***	0.126
	Jan-Jun 2000	0.908***	0.066
	Jan-Sep 2000	0.896***	0.063
Indonesia	Jan-Jun 1997	0.999***	0.026
	Jul-Dec 1997	0.843	0.742
	Jan-Jun 1998	-0.203	1.711
	Jul-Dec 1998	0.841*	0.503
	Jan-Jun 1999	1.159***	0.296
	Jul-Dec 1999	0.477	0.345
	Jan-Jun 2000	0.942***	0.194
	Jan-Sep 2000	1.012***	0.192
Philippines	Jan-Jun 1997	0.999***	0.003
	Jul-Dec 1997	1.232***	0.310
	Jan-Jun 1998	0.656**	0.296
	Jul-Dec 1998	1.127***	0.119
	Jan-Jun 1999	0.996***	0.092
	Jul-Dec 1999	1.046***	0.091
	Jan-Jun 2000	0.938***	0.070
	Jan-Sep 2000	0.872***	0.068
Malaysia	Jan-Jun 1997	1.030***	0.042
	Jul-Dec 1997	0.650**	0.278
	Jan-Jun 1998	0.867*	0.483
	Jul-Dec 1998	1.027***	0.143
	Jan-Jun 1999	1.000***	0.000
	Jul-Dec 1999	1.000***	0.000
	Jan-Jun 2000	1.000***	0.000
	Jan-Sep 2000	1.000***	0.000
Singapore	Jan-Jun 1997	0.902***	0.031
	Jul-Dec 1997	0.833***	0.106
	Jan-Jun 1998	0.747***	0.185
	Jul-Dec 1998	0.903***	0.101
	Jan-Jun 1999	0.915***	0.060
	Jul-Dec 1999	0.997***	0.056
	Jan-Jun 2000	0.929***	0.054
	Jan-Sep 2000	0.948***	0.045
Korea	Jan-Jun 1997	1.009***	0.040
	Jul-Dec 1997	0.590	0.713
	Jan-Jun 1998	0.536	0.519
	Jul-Dec 1998	1.015***	0.135
	Jan-Jun 1999	1.008***	0.104
	Jul-Dec 1999	0.951***	0.078
	Jan-Jun 2000	1.027***	0.068
	Jan-Sep 2000	0.975***	0.044

Taiwan	Jan-Jun 1997	0.990***	0.018
	Jul-Dec 1997	1.020***	0.164
	Jan-Jun 1998	0.895***	0.116
	Jul-Dec 1998	0.957***	0.052
	Jan-Jun 1999	0.974***	0.043
	Jul-Dec 1999	1.000***	0.016
	Jan-Jun 2000	0.971***	0.040
	Jan-Sep 2000	0.981***	0.030

Source: Ogawa(2001)
Table 5 is abstracted results of weights on the US dollar from the same estimation as Table 4.

Table 6: Estimation of weights in a currency basket (weekly data; log differences)

Currency	period	US dollar	yen	DM	B pound
Thailand	Jan1997-Jun 1997	0.872***	0.123	0.234	-0.445
	Jul 1997-Jun 1998	0.547	-0.252	0.738	0.158
	Jul 1998-Jun 1999	0.593***	0.003	0.661	0.092
	Jul 1999-Jun 2000	0.760***	0.099	-0.161	0.251
	Jan2000-Sep 2000	0.694***	0.249**	-0.017	0.109
Indonesia	Jan1997-Jun 1997	1.074***	0.018	-0.045	0.006
	Jul 1997-Jun 1998	0.507	-0.770	1.487	1.144
	Jul 1998-Jun 1999	-0.628	0.700*	1.022	1.262
	Jul 1999-Jun 2000	0.321	0.637	0.200	0.318
	Jan2000-Sep 2000	0.683	0.232	0.766	0.517
Philippines	Jan1997-Jun 1997	1.002***	0.002	-0.002	-0.007
	Jul 1997-Jun 1998	0.850	0.078	0.522	0.062
	Jul 1998-Jun 1999	1.065***	0.077	0.280	-0.153
	Jul 1999-Jun 2000	0.939***	-0.069	-0.308	0.086
	Jan2000-Sep 2000	0.874***	0.106	-	-0.048
Malaysia	Jan1997-Jun 1997	0.947***	0.047	-0.052	-0.054
	Jul 1997-Jun 1998	0.170	0.051	0.492	0.288
	Jul 1998-Jun 1999	0.179	0.010	0.218	0.430
	Jul 1999-Jun 2000	1.000***	0.000	0.000	0.000
	Jan2000-Sep 2000	1.000***	0.000	0.000	0.000
Singapore	Jan1997-Jun 1997	0.878***	0.108***	-0.132	0.030
	Jul 1997-Jun 1998	0.605**	-0.166	0.366	0.398
	Jul 1998-Jun 1999	0.462***	0.129**	0.228	0.329*
	Jul 1999-Jun 2000	0.750***	0.058	-0.033	0.178*
	Jan2000-Sep 2000	0.731***	0.119*	0.059	0.155*
Korea	Jan1997-Jun 1997	1.019***	0.131**	-0.019	0.026
	Jul 1997-Jun 1998	0.342	1.086	1.441	0.235
	Jul 1998-Jun 1999	1.221***	0.060	0.305	-0.119
	Jul 1999-Jun 2000	0.996***	0.014	-0.078	0.119
	Jan2000-Sep 2000	0.918***	0.048	0.012	0.083
Taiwan	Jan1997-Jun 1997	0.931***	-0.008	-0.001	0.050
	Jul 1997-Jun 1998	0.814***	0.013	0.535	0.001
	Jul 1998-Jun 1999	0.759***	0.192***	0.132	-0.064
	Jul 1999-Jun 2000	0.862***	0.004	0.012	0.080
	Jan2000-Sep 2000	0.932***	0.029	-0.017	-0.010

Source: Ogawa(2001)
***: significant level of 1%, **: significant level of 5%, *: significant level of 10%
Period [Jan 1997-Jun 1997]: 1997:01:08 To 1997:07:02
Period [Jul 1997-Jun 1998]: 1997:07:02 To 1998:07:01
Period [Jul 1998-Jun 1999]: 1998:07:01 To 1999:06:30
Period [Jul 1999-Jun 2000]: 1999:07:07 To 2000:07:05
Period [Jan 2000-Sep 2000]: 2000:01:12 To 2000:09:20

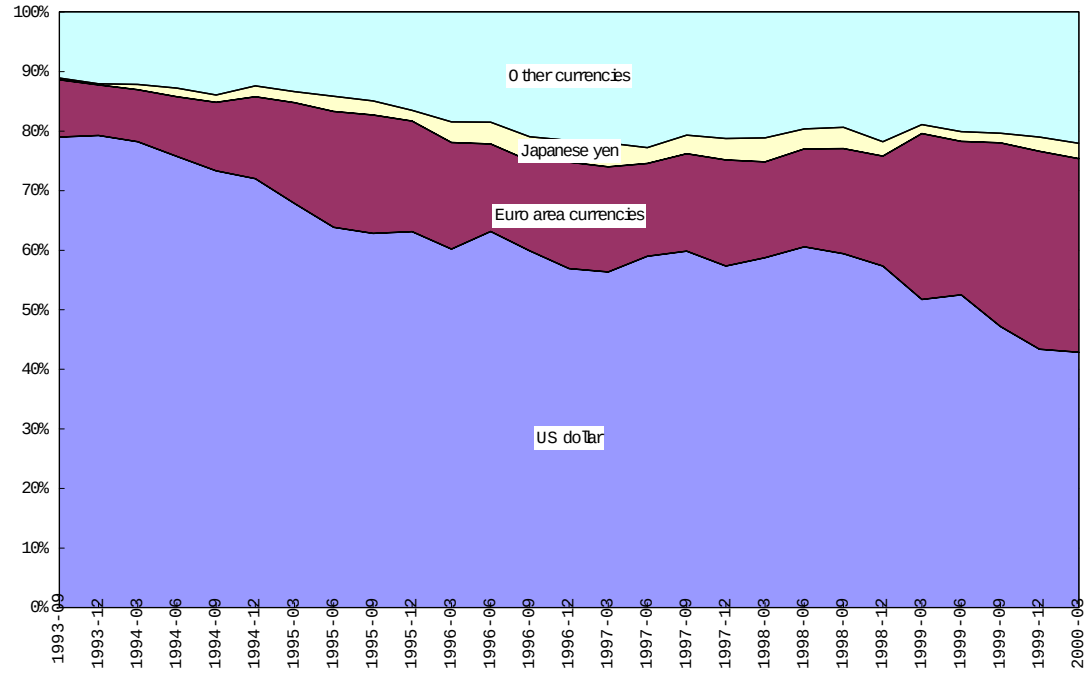
$$\Delta \log e^{home/SF} = a_0 + a_1 \Delta \log e^{USD/SF} + a_2 \Delta \log e^{JPY/SF} + a_3 \Delta \log e^{DM/SF} + a_4 \Delta \log e^{BP/SF} + \varepsilon_t$$

Table 7: Estimates of weights on the US dollar (weekly data, log differences)

currency	Period	Coefficient	Standard error
Thailand	Jan1997-Jun 1997	0.872***	0.248
	Jul 1997-Jun 1998	0.547	0.676
	Jul 1998-Jun 1999	0.593***	0.210
	Jul 1999-Jun 2000	0.760***	0.195
	Jan2000-Sep 2000	0.694***	0.150
Indonesia	Jan1997-Jun 1997	1.074***	0.049
	Jul 1997-Jun 1998	0.507	2.237
	Jul 1998-Jun 1999	-0.628	1.022
	Jul 1999-Jun 2000	0.321	0.666
	Jan2000-Sep 2000	0.683	0.553
Philippines	Jan1997-Jun 1997	1.002***	0.005
	Jul 1997-Jun 1998	0.850	0.581
	Jul 1998-Jun 1999	1.065***	0.260
	Jul 1999-Jun 2000	0.939***	0.132
	Jan2000-Sep 2000	0.874***	0.156
Malaysia	Jan1997-Jun 1997	0.947***	0.083
	Jul 1997-Jun 1998	0.170	0.711
	Jul 1998-Jun 1999	0.179	0.249
	Jul 1999-Jun 2000	1.000***	0.000
	Jan2000-Sep 2000	1.000***	0.000
Singapore	Jan1997-Jun 1997	0.878***	0.052
	Jul 1997-Jun 1998	0.605**	0.258
	Jul 1998-Jun 1999	0.462***	0.147
	Jul 1999-Jun 2000	0.750***	0.088
	Jan2000-Sep 2000	0.731***	0.095
Korea	Jan1997-Jun 1997	1.019***	0.084
	Jul 1997-Jun 1998	0.342	1.299
	Jul 1998-Jun 1999	1.221***	0.353
	Jul 1999-Jun 2000	0.996***	0.119
	Jan2000-Sep 2000	0.918***	0.134
Taiwan	Jan1997-Jun 1997	0.931***	0.035
	Jul 1997-Jun 1998	0.814***	0.269
	Jul 1998-Jun 1999	0.759***	0.088
	Jul 1999-Jun 2000	0.862***	0.069
	Jan2000-Sep 2000	0.932***	0.058

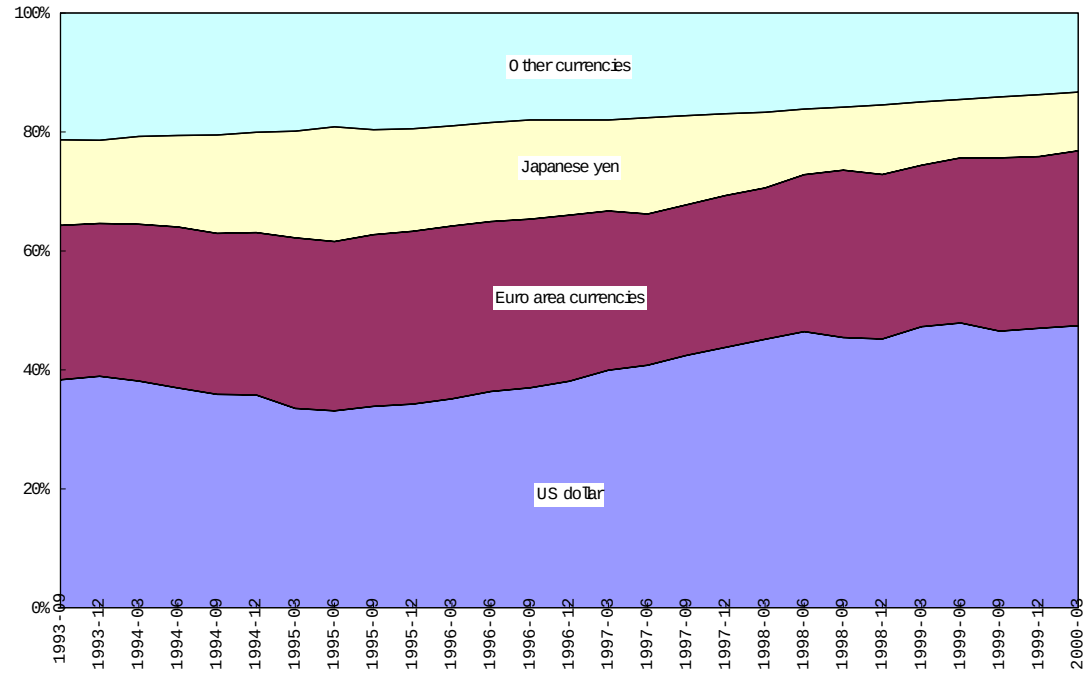
Source: Ogawa(2001)
Table 7 is abstracted results of weights on the US dollar from the same estimation as Table 6.

Figure 2: International Money Market Instruments
(shares of amounts outstanding)



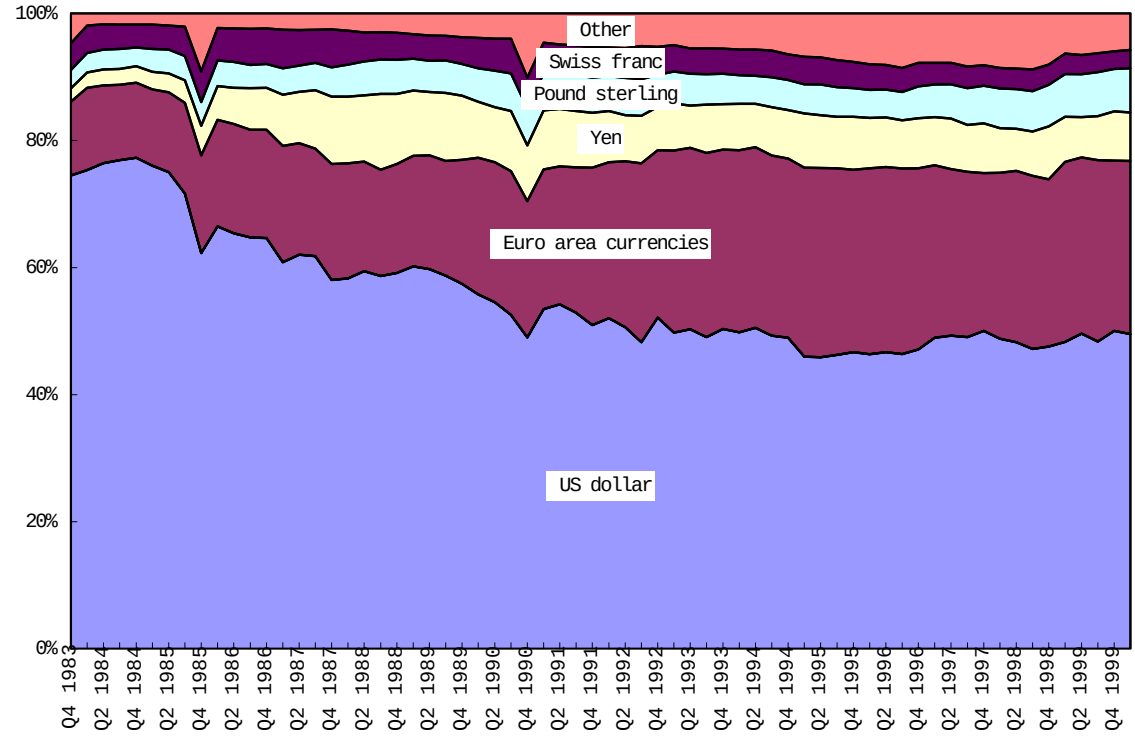
Source: BIS (2000)

Figure 3: International Bonds and Notes
(shares of amounts outstanding)



Source: BIS (2000)

Figure 4:Liability in Home and Foreign Currencies of International Banks
(shares of amounts outstanding)



Data: BIS(2000)

Table 8: Estimation of γ

	Mean	Standard deviation	99% confidence interval
Based on Inflation rate of CPI			
	1986Q1-2000Q1		
Real interest rate = 3%	0.61	0.06	0.59-0.63
Real interest rate = 5%	0.62	0.06	0.60-0.64
Real interest rate = 8%	0.63	0.06	0.60-0.64
	1986Q1-1998Q4		
Real interest rate = 3%	0.62	0.06	0.59-0.64
Real interest rate = 5%	0.62	0.06	0.60-0.64
Real interest rate = 8%	0.62	0.06	0.60-0.64
	1999Q1-2000Q1		
Real interest rate = 3%	0.58	0.03	0.55-0.61
Real interest rate = 5%	0.58	0.02	0.56-0.60
Real interest rate = 8%	0.58	0.01	0.57-0.60
Based on Eurocurrency interest rate			
	1986Q1-2000Q1		
3 months	0.63	0.13	0.59-0.68
6 months	0.63	0.13	0.59-0.68
	1986Q1-1998Q4		
3 months	0.62	0.13	0.57-0.67
6 months	0.62	0.13	0.58-0.67
	1999Q1-2000Q1		
3 months	0.76	0.02	0.73-0.78
6 months	0.76	0.02	0.74-0.78

Ogawa and Kawasaki (2001)