I Exchange Rate Policies in East Asian Countries:

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Abstract

In this paper, we examined the exchange rate policies of East Asian countries which mainly pegged their currencies to the U.S. dollar. It was found that the dollar-pegged exchange rate policies played an important role in triggering the currency crisis of East Asia in 1997. In particular, the dollar-pegged exchange rate policies caused the overvaluation of East Asian currencies at times when the Japanese yen depreciates and thus contributed to the marked deterioration of current account balances just before the crisis. We then examined the flexible exchange rate regime from the perspective of policymakers trying to maintain both internal and external balances. Using the Korean data, it was found that the won/dollar exchange rate during the flexible exchange rate regime responds more sensitively to a shock that causes external imbalance than does under the rigid exchange rate regime. It was also found that increased capital mobility exerts greater influence on the domestic monetary and financial variables, suggesting that monetary independence is reduced when capital is freer to move across borders.

1. Introduction

There is by now a large body of literature on the causes of the Asian financial crisis in 1997. Many economists and policymakers agree that the maintenance of a rigid exchange rate system and the wide swings of the yen/dollar exchange rate were two of the main factors responsible for the crisis. For example, the 1998 Annual Report of the IMF notes that "...one of the most important contributors to the sudden shifts in the market sentiments was policy weaknesses such as the maintenance of inflexible exchange rate arrangements for too long—even when fundamentals no longer supported them."

In Korea, the "market average exchange rate system," which limited the daily exchange rate movement within a 2.25 percent band, and the rigid exchange rate policies, through aggressive market interventions, failed to allow the won/dollar exchange rate to reflect growing external imbalances, including widening current account deficits and rapidly-shrinking capital account surpluses, especially after the second half of 1996.

In hindsight, the observed exchange rate deviated significantly from the equilibrium exchange rate that would restore the balance in Korea's external account. However, policymakers, who underestimated the country's vulnerabilities to external shock, kept ignoring the warning signs of depreciation pressures. Moreover, now it is clear that the dollar-pegged exchange rate regime and the dollar-focused exchange rate policies are unsuitable for countries like Korea that have important trading partners other than the

United States.

This paper examines the exchange rate policies of East Asian countries, focusing mainly on the advantages and disadvantages of currencies heavily dependent on the U.S. dollar. The paper then investigates whether the floating exchange rate regime is a better choice for Korea than the fixed exchange rate regime. We examine this issue from the perspective of policymakers who try to maintain both internal and external balances.

2. Dollar-Focused Exchange Rate Policies : Advantages and Disadvantages

(1) *Dollar-focused exchange rate policies did not reflect changing export structures*

All of the crisis-affected Asian economies experienced a sharp appreciation of their currencies in terms of real effective exchange rates following the yen/dollar exchange rate misalignment that arose in the second half of 1996. The real effective exchange rates of Korea, Thailand, Indonesia and other crisis-affected countries have all appreciated by 3-12 percent between the fourth quarter of 1994 and the second quarter of 1997, while the Japanese yen depreciated 22 percent over the same period. Table 1 illustrates that the overvaluation of the currencies contributed to the marked deterioration of current account balances for most of East Asian countries.

The vulnerability index of six Asian currencies is summarized in Chart 1. The index is measured by the deviation of the real effective exchange rate from its 3- year moving average normalized by its standard deviation.[1] Given that the real effective exchange rate is one of the fundamental determinants of the current account, the index provides a fairly reliable early warning signal for the deterioration of the current account and even predicted the currency crises in Korea, Thailand, and Indonesia in 1997. Chart 1 shows that between 1995 and 1997 the index had risen, but then, after the crisis, it had

Table 1: Real Effective Exchange Rate and Current Account Performance

	Real Effective Exchange Rate			Current Account Balance (% of GDP)		
	1994 Q4	1997 Q2	Rate of Appreciation	1992-1994	1995-1997	Difference
Korea	83.63	86.23	3.02%	- 0.67	- 2.82	- 2.15
Thailand	97.93	108.93	10.10%	- 5.44	- 5.96	- 0.52
Indonesia	99.60	107.03	6.94%	- 1.64	- 2.94	- 1.31
Malaysia	106.73	117.93	9.50%	- 4.87	- 6.41	- 1.54
Singapore	110.23	118.43	6.92%	11.83	16.04	4.21
Philippines	109.57	116.83	6.21%	- 4.01	- 4.22	- 0.21
Hong Kong	114.07	130.83	12.81%	- 4.94	- 12.36	- 7.42
Japan	126.40	103.57	- 22.04%	2.96	1.95	- 1.01

Source: J.P. Morgan Web Site, IMF, International Financial Statistics.

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[1] For the construction of broader-based vulnerability index, money-to-foreign exchange reserve ratios and the rate of domestic credit growth can be used.

fallen below its original level, signaling the absence of the same type of risk that had precipitated the Asian crisis in 1997.

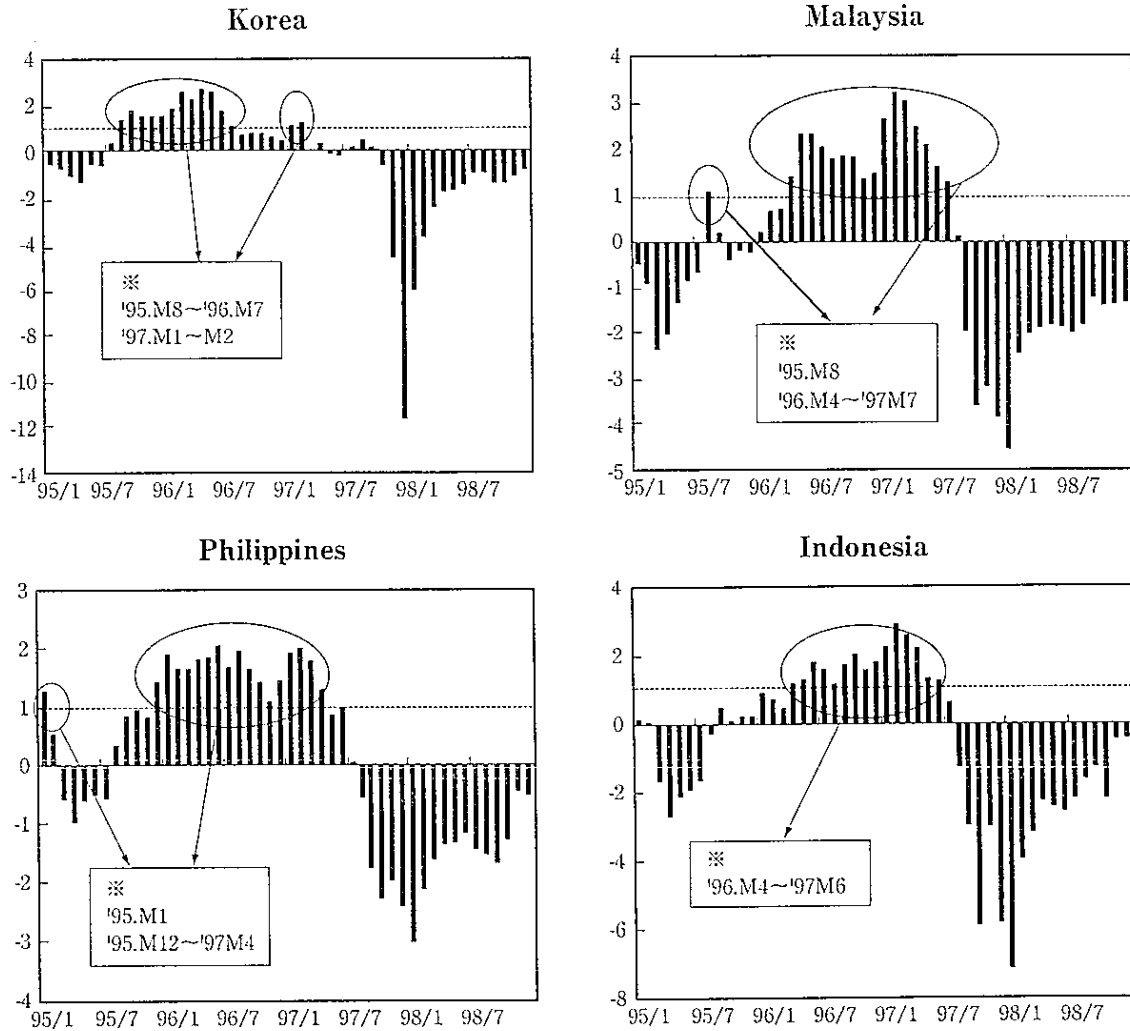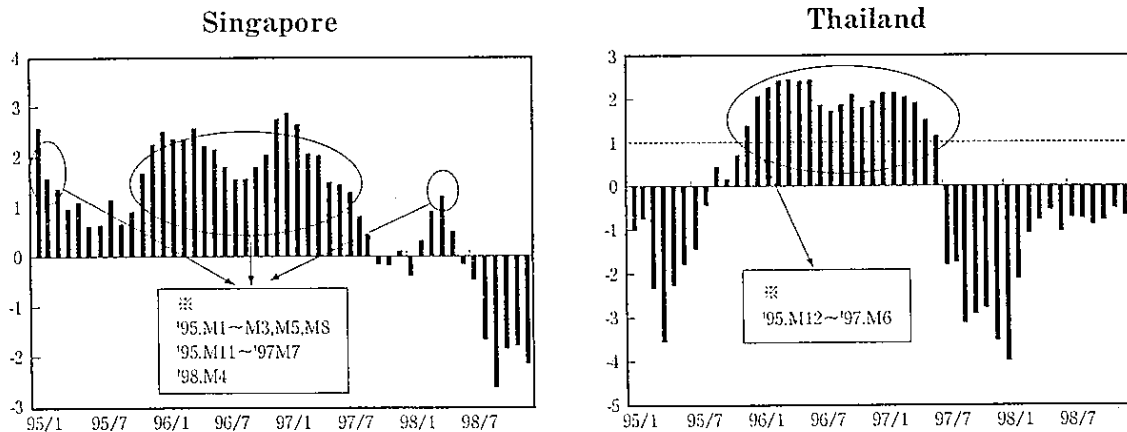## Chart 1: Vulnerability Index: Six Asian Countries

Korea

Malaysia

Philippines

Indonesia

Chart 1 Continued:

Singapore

Thailand

Note: Those portions encircled denote periods in which the index exceeded the value of one.

The overvaluation of the regional currencies, as depicted by Chart 1, was in part due to the relatively fixed exchange rate regimes adopted by Asian countries. It is well known that, in sharp contrast to the official exchange rate regime suggested by the International Monetary Fund (IMF), most Asian countries adopted a *de facto* fixed exchange rate regime (Benassy-Quere (1999)). More importantly, many empirical studies examining exchange rate policies have found that most Asian countries pursued a nominal anchor policy by pegging their currencies loosely to the U.S. dollar from 1974 to 1995, resulting in what can be termed a common implicit dollar peg. This implies that most Asian countries placed small weight on the yen in their implicit basket pegs. In particular, for Korea and Indonesia, the volatility of the nominal exchange rate against the U.S. dollar was found to be much smaller than one half of its volatility against the Japanese yen. The common implicit dollar peg, while acting as a coordination device for stabilizing relative real exchange rates among the Asian countries, had a fatal drawback: it caused excessive volatility of each country's real effective exchange rate *vis-a-vis* its main export markets.

Table 2: Regional Currencies: Correlation With Changes in the Yen/Dollar Rate

	Singapore SGD	Thailand THB	Indonesia IDR	Philippines PHP	Taiwan TWD	Korea KRW
3 May 96-5 May 97 JPY shifts from 105.15 to 126.68	0. 33	0. 41	- 0. 01	- 0. 01	0. 06	- 0. 05
1 Apr 98-7 Aug 98 JPY shifts from 133 to 146	0. 72	0. 47	0. 32	0. 42	0. 57	0. 26
18 Aug 98-31 Dec 98 JPY shifts from 146 to 114	0. 58	0. 35	0. 27	0. 32	0. 47	0. 24

The fact that the nominal anchor policy focusing heavily on the U.S. dollar played a significant role in precipitating the Asian crisis in 1997 is highlighted in Table 2 above. Not only did the regional currencies maintain a low correlation with the yen/dollar exchange rate over the period from May 1996 to May 1997, but some currencies (Korea, Indonesia, and Philippines) also showed a negative correlation with the yen/ dollar rate. This observation suggests that the trends of these three currencies tend to be inversely related to that of the yen.

Recently, the relationship between the regional currencies and the yen/dollar exchange rate has displayed a pattern different from that of the past. The second and third rows of Table 2 indicate that the correlation coefficients of all six regional currencies in the post-crisis period are positive and much higher than in the pre-crisis period. This suggests that the weight attached to the yen in their implicit baskets has increased over time and reflects the authorities' renewed interest in a competitive exchange rate.

Another interesting observation from Table 2 is that the correlation is asymmetric in most cases: the coefficient is relatively high when the yen is weakening (April 1-August 7, 1998) and is relatively low when the yen is strengthening (August 18-December 31, 1998). Obviously, this asymmetric behavior reflects the authorities' determination to keep their currencies at competitive levels. The different exchange rate behavior between these two phases is most evident in Thailand and Indonesia where exchange rate policies were more aggressive in the first half of 1998 due to the slowdown in exports and increased uncertainty. The lower correlation coefficients in the second half of 1998 simply reflect governments' efforts to keep their currencies from becoming too strong and hurting exports while the yen was appreciating.

In the case of Korea, however, the correlation remained relatively low and stable. The Bank of Korea (BOK) obviously had a keen interest in keeping the competitiveness of Korean firms in line with other Asian economies. However, the renewed capital inflow and the continuous current account surplus in the second half of 1998 (the surplus exceeded 12% of GDP in 1998) helped cushion the Korean won from the yen's strength. Hence, the need to support a weak won policy was relatively small in Korea

The discussion so far suggests that had the Asian countries given more weight to the Japanese yen and allowed their currencies to be more closely correlated with the yen as it weakened, they could have avoided the sharp erosion in their competitiveness and the marked slowdown in their export performance.

(2) *Dollar-focused exchange rate policies promoted capital inflow, especially on the short end*

The maintenance of a relatively fixed exchange rate regime and U.S.-dollar-focused policies have also encouraged the surge of capital inflow, mainly by reducing the exchange rate risk borne by international lenders and investors. For example, the maintenance of a narrow band system can generally serve the policy purpose of reducing the possibility of destabilizing speculation by providing an anchor for the public's expectations of exchange rate movements during normal times. However, the narrow-band policy has a number of defects in times of tension and uncertainty.

First, the band system restricts the monetary authority from implementing a flexible exchange rate policy in the face of large and persistent capital inflow. For example, if the underlying cause of capital inflow is an undervalued exchange rate, the slow appreciation of the currency, made effective by the narrow band system, can only add to the incentive for more inflow. This is particularly true for those recipient countries with a wide interest rate differential between domestic and international financial markets.[2]

Second, by reducing the risk of exchange rate fluctuations, the narrow band system

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[2] Jang-Yung Lee (1996) found that, using quarterly data from 1982-1993, the measured effect of the changes in the interest rate differential adjusted for exchange rate changes were large and statistically significant for Indonesia and Korea.

may encourage short-term capital flows, which are volatile by nature and thus subject recipient economies to the risk of sudden reversal. The best example is the surge of short-term private capital inflow into Thailand during the 1989-91 and 1993-94 periods, triggered by both the strong macroeconomic performance and the relatively stable exchange rate of the Baht.

Increased capital inflow *per se* does not necessarily disrupt the recipient economies, since it contributes to greater investment and higher economic growth of the recipient countries. However, capital inflow is typically accompanied by certain side effects, which often include a tendency for the local currency to appreciate, the emanation of inflationary pressures from the build-up of foreign exchange reserves, and the resulting expansion of the monetary base. These side effects are often translated into a banking crisis, particularly when the financial intermediation capacity of banks in the recipient countries is limited by poor risk management and inadequate banking supervision or prudential regulation.

(3) *For some debtor countries, smaller weights for the yen in the optimal basket peg may serve the policy purpose of a stable external account.*

Asian countries' need for additional foreign financing is represented by the external current account, which is the sum of the trade balance and the debt services (i.e., interests plus principal payments). Hence, when adjusting the exchange rate policy, the monetary authorities in debtor countries must take into account both the impact on the trade account through the competitiveness effect as well as the valuation effect on debt services. In the extreme case, where the currency breakdown of the external debt fits exactly the country distribution of trade, the optimal reaction of the local currency to the yen/dollar fluctuations will be the weight of Japan as a trade partner. When the yen appreciates by 1 percent against the U.S. dollar, the currency of the small Asian country appreciates by the trade-weight percent, so that its real effective exchange rate remains constant. In some Asian countries, however, we have the case where the country weight of Japan as a trade partner is smaller than the currency weight of the yen as a creditor currency. Under these circumstances, the country's optimal policy would depend on the relative magnitude of the competitiveness effect *vis-a-vis* the valuation effect. In other words, when the exchange rate fluctuations have a greater impact on the external account through trade flows than through the valuation of the external debt service, the optimal reaction of the local currency should be to appreciate against the U.S. dollar by the difference between the competitiveness effect and the valuation effect.

This relationship can be shown using the following simple model. First, the external account is defined as follows:

$$b = b_0 + \eta \delta e - \sigma f \tag{1}$$

where η is the export/GDP ratio; δ measures the impact of depreciation on the trade

account; σ is the debt service/GDP ratio; b_0 represents omitted variables; e is the real effective exchange rate corresponding to the country distribution of the external trade; and f is the real effective exchange rate corresponding to the currency breakdown of the external debt.

Second, the real effective exchange rates are defined as follows:

$$e = \varepsilon_S S_S + \varepsilon_Y S_Y \tag{2}$$

$$f = \tau_S S_S + \tau_Y S_Y \tag{3}$$

where S_S and S_Y are the bilateral real exchange rates against the U.S. dollar and the Japanese yen, respectively; ε_S and ε_Y are the weights of the U.S. and Japan as a trade partner, respectively; τ_S and τ_Y and are the weights of those two countries in the currency denomination of the external debt, respectively.

Third, the monetary authority of this small economy is assumed to minimize the loss function given by:

$$Loss = \frac{1}{2}\left(b - \bar{b}\right)^2 \tag{4}$$

where $\bar{b}$ denotes a target level of the external account.

Given that S_{YS} denotes the real exchange rate of the yen against the U.S. dollar, the minimization of the loss function will produce the optimal reaction function to the yen /dollar fluctuations as follows:

$$\frac{\partial S_S}{\partial S_{Y\$}} = \frac{\eta_Y^{\delta\varepsilon} - \sigma^{\tau_Y}}{\eta^\delta - \sigma} \tag{5}$$

Assuming that the country has no external debt ($\sigma = 0$), equation (5) suggests that, ε_Y the weight of Japan as a trading partner is the optimal reaction of the local currency. The optimal reaction of the local currency will also become ε_Y when the currency breakdown of the external debt is exactly the same as the country distribution of trade ($\tau_Y = \varepsilon_Y$).

There are some studies that empirically tested this on some Asian newly industrialized countries (NICs). For example, Mimosa (1996) discusses the optimal exchange rate policy for the NICs and estimated the reaction coefficient. According to this study, when the yen appreciates by 1 percent against the U.S. dollar, the local currency should appreciate by 0.14 percent against the U.S. dollar in order to keep the external account constant. This estimate is based on the key parameter values given by

$$\eta = 0.25; \quad \varepsilon_Y = 0.2; \quad \sigma = 0.08; \quad \tau_Y = 0.4; \quad \delta = 1.4.$$

The main implication of this exercise is that the Asian countries may find it optimal to assign a smaller weight to the yen, when (i) Japan plays a smaller role as a trade partner than as a creditor country ($\varepsilon_Y < \tau_Y$), and when (ii) the effect of exchange rate changes on the trade balance is larger than the effect on the external debt service ($\eta^\delta > \sigma$).

(4) *If the policy objective is the price stability instead of the current account stability, the optimal exchange rate policy may point to a larger weight to the U.S. dollar.*

Having discussed the current account stability as a policy objective, it is necessary to consider an alternative policy objective, namely price stability. The monetary authorities in small open economies do not always prefer competitive exchange rates due to the powerful impact of exchange rate depreciation on domestic inflation. In general, confidence in the value of a currency is determined by low and stable inflation rates internally and stable exchange rates externally.

As shown in Table 3, the inflation record of the 1990s suggests that both the U.S. and Japan have been successful in maintaining inflation rates below the average of the other Group of Ten countries. Therefore, if measured solely in terms of domestic price stability, the Japanese yen seems to be a good candidate for international money as a store of value.

However, if we consider the external stability of a currency in terms of the relative

### Table 3: Inflation Performance of Selected Industrial Countries

(Annual averages, in percent)

	1971-1980	1981-1989	1990-1997
Average of rate of change of consumer prices			
United States	7.8	4.7	3.29
Japan	9.1	2.0	1.48
Germany	5.1	2.6	2.96
Other G-10 [1]	10.5	6.7	3.29
Standard deviation of rate of change of consumer prices			
United States	3.1	2.3	1.0
Japan	5.4	1.4	1.25
Germany	1.3	2.0	1.3
Other G-10 [1]	3.0	3.1	1.69

Note: Weighted by three-year centered moving averages of GNP. Other Group of Ten countries are France, Italy, the United Kingdom, Canada, Sweden, the Netherlands, Belgium, and Switzerland.
Source: IMF, International Financial Statistics.

Chart 2: Real Effective Exchange Rates of Major Currencies, 1978-1998 [2]
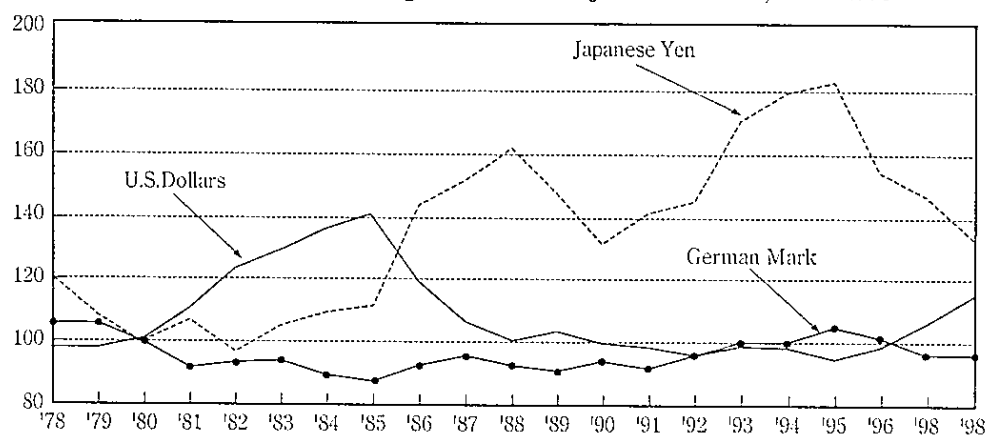
Note: Through July 1998. Based on Relative Consumer Price.
Source: IMF, International Financial Statistics, various issues.

volatility of the exchange rates, then the yen does not seem to guarantee a stable basket of consumer or producer goods. As highlighted in Chart 2, during the last two decades, the Japanese yen exhibited more volatility than other major currencies in terms of real effective exchange rates.

Moreover, as shown in Table 4, the yen's variations turned out to be more pronounced when the real effective exchange rate is measured by consumer prices than when it is measured by wholesale prices. This represents a more serious risk for those monetary authorities that wish to stabilize the purchasing power of local currencies in terms of consumer goods.

Table 4: Volatility of Major Currencies: 1978-1998 [2]

		REER1	REER2
Standard deviation of the first difference	U.S.	8.894	8.178
	Japan	9.995	14.497
	Germany	3.733	3.757

Note: REER1 is calculated based on relative wholesale price through 3rd quarter 1997.
    REER2 calculated based on relative consumer price through July 1998.
Source: IMF, International Financial Statistics, various issues.

The discussion so far suggests that any successful exchange rate system needs some mechanism for avoiding both inflationary pressures and large external current account imbalances.

3. Optimal Exchange Rate Regime for Asia

The recent financial turmoil in both Asia and Latin America have rekindled international interest in the optimal exchange rate regime, an issue that has long been the subject of debate among academics and policymakers. While views vary widely, the world economy seems to have emerged from the recent crisis with a rather strong consensus that only two extreme exchange rate regimes are robust: a freely floating exchange rate regime or a strictly fixed regime such as a currency board system (CBS). In other words, many seem to hold the view that an intermediate regime, such as a loosely crawling band system or a target zone system, is not a viable option. In this section, we briefly go through the pros and cons of these two extreme cases and then judge them from the viewpoint of policymakers, using data from Korea.

One of the classic arguments in favor of the free floating exchange rate regime is that the immediate adjustment of the exchange rate helps the country maintain its external balance in the face of various shocks. The definition of external balance depends on a number of factors, but it basically means the level of current account that is neither excessively so negative that the country may be unable to repay its foreign debts nor excessively so positive that foreigners are put in that position. In today's world of greater capital mobility, the external imbalance has begun to take on added

significance. As emphasized by Obstfeld (1996), a country with large and persistent external imbalances, for example, are often suspected of being trapped in "unsustainable" fundamental disequilibrium and are thus ripe for immediate exchange rate adjustments. This suspicion could, in turn, invite speculative attacks against the currency in question.

The second argument in support of the free floating regime is that it helps discourage surges of short-term capital inflow through the increase in exchange rate risk borne by speculators. However, some critics point out that asset prices in general, and the exchange rate in particular, are driven by herd behavior rather than rational expectations. Frankel and Froot (1986), for example, showed how the speculative dollar bubble in the mid-1980s was a result of portfolio managers who placed overwhelming weight on the "technical" analysis of chartists rather than the "fundamental" analysis of fundamentalists, due to the repeated errors made by the latter in forecasting future dollar movements.

The third argument is that the government would be able to use monetary policy to achieve both internal (full employment and a stable price level) and external balances, because the central bank is no longer obliged to intervene in the foreign exchange market to maintain the parity exchange rate. However, some critics suggest that, under the free floating regime, the central bank may embark on the inflationary policy. Indeed, an empirical study conducted by Ghosh et al. (1995) found that, on the basis of annual observations of a large number of countries over the period of 1964-89, the fixed exchange rate regime has a better record in curbing inflation than the floating exchange rate regime.[3]

The currency board system (CBS) is a strict form of the fixed exchange rate system. Under this system, the central bank is unnecessary because domestic money supply is entirely backed by foreign exchange reserves. Accordingly, when the foreign exchange reserve of the country subject to the CBS increases (decreases), money supply of this country increases (decreases) automatically. The nominal anchor currency picked by the CBS is usually the dominant unit of account in the country's trade and financial transactions. It should also have a very strong inflation performance. Thus, if a proper anchor currency is chosen and the confidence in the currency convertibility is maintained, the CBS would be a very effective mean of curbing inflation. The experience of Hong Kong (since 1983) and Argentina (since 1991) indicates that the CBS offers a viable option to countries seeking both exchange rate and price stability.

In addition, the successful track record of Hong Kong and Argentina, particularly in their ability to survive the contagious effects of the recent currency crisis, gave support to the view that the CBS is a robust and effective policy instrument for fending off speculative attacks. This is one of the reasons why the Indonesia government attempted to introduce the CBS in the middle of the crisis. However, the Indonesian

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[3] A recent study by Williamson (1996) reaches a different conclusion about the exchange rate regime and deflation. On the basis of a large sample of countries over the 1992-95 period, he concludes that the crawling band system scores best on various measures of changes in inflation.

proposal was not quite so innocent. By fixing the plunging value of the rupiah currency at artificially high levels, the Indonesian authority was suspected of attempting to reduce its mounting external debt burden.

Critics of the CBS also exist. In particular, the IMF and other observers point out that if the CBS is poorly prepared, it is likely to create higher risks than other regimes. The frequently mentioned requirements for the successful operation of the CBS, among others, are as follows. First, in order to instill confidence in the pledge of convertibility, money in circulation must be fully backed by foreign currency reserves. Second, the system must be transparent regardless of different institutional arrangements for individual countries. All arrangements, regulation, and conduct must be explicable and open to scrutiny. Third, strict compliance with the law must be guaranteed to implement the CBS successfully. There should be no political intervention.

As for the operational issues of the CBS, the country's commercial banking system should be financially sound, because the CBS regime severely constrains the scope of the monetary authority to act as a lender of last resort for the ailing banking system. The scale of assistance that may be offered to a weak bank as a guarantor of the banking system should be confined to the foreign exchange reserve surplus to meet the requirements of the currency board. Therefore, it is very important to ensure that there are such reserves available and that such resources are used only in circumstances where the stability of the banking system as a whole is at risk. As a result, the idea of a CBS arrangement in Indonesia was somewhat premature.

At this point, it is difficult to judge which regime is better for East Asian countries. Most of the East Asian countries have already experienced the fixed exchange rate regime, although not so strict as the CBS, and it is only recently that they have adopted the floating exchange rate regime. The fixed exchange rate regime appears to have failed in the East Asian countries due to the financial crisis. However, given the strong economic performance of the East Asian countries before the crisis, if the shock that triggered the crisis was a rare and extraordinary event, it is still too early to conclude that the floating exchange rate regime is a better choice for East Asian countries. The floating exchange rate regime might also be susceptible to financial crisis unless sound economic fundamentals and financial systems are maintained. Accordingly, judging which regime dominates over the other would be an empirical issue that requires a long sample period.
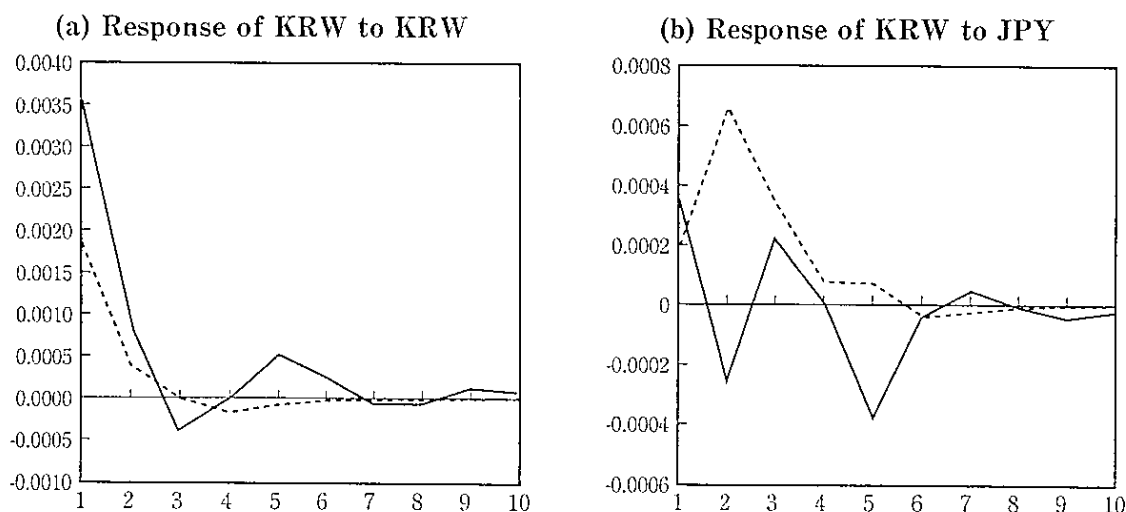
Nonetheless, with the data at hand, it is possible to gauge empirically which regime is more appropriate from the perspective of policymakers who trying to maintain both internal and external balances. Using the Korean data, we show below that the conflict between maintaining internal and external balances can be more easily alleviated under the floating exchange rate regime than under the fixed exchange rate regime. For this purpose, we show evidence that the won/dollar exchange rate under the floating regime more closely moves with the yen/dollar exchange rate than under the fixed regime.
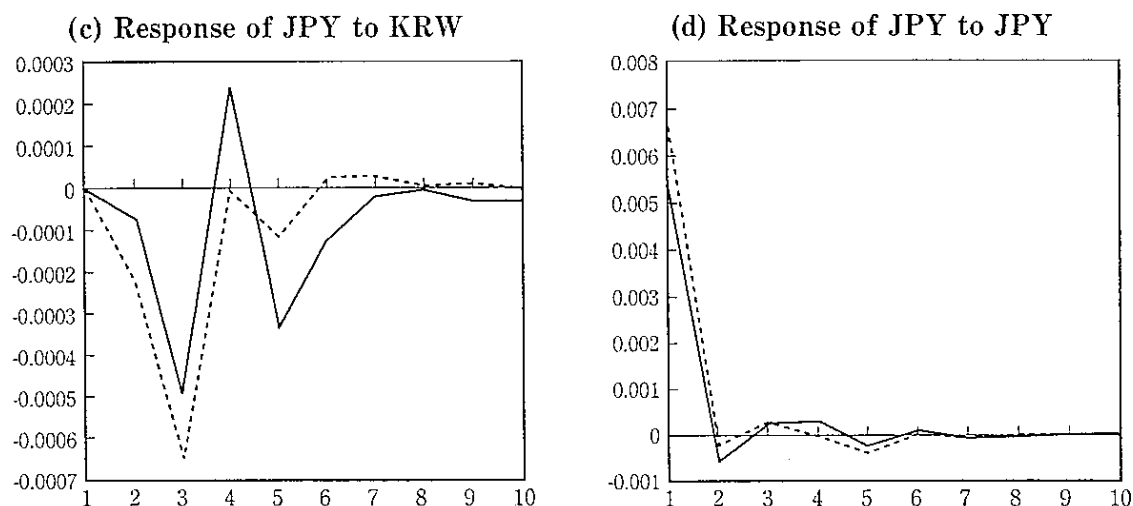
We then show that regardless of the exchange rate regime, cross-border capital movements exert greater influence on the domestic monetary and financial variables when capital is free to move across borders than when capital flow is restricted.

One of the frequently cited advantages of the floating exchange rate regime is that the external imbalance is corrected immediately through changes in exchange rates. Accordingly, the monetary authority would be able to use monetary policy solely for the purpose of maintaining internal balance. We examine this issue by estimating the impulse response functions derived from a bivariate vector consisting of daily won /dollar and yen/dollar exchange rates. The yen/dollar exchange rate is used as a proxy variable for an external shock that causes an imbalance in Korea's external account, reflecting the past experience that it has been one of the most important factors influencing Korea's current account. Data are divided into two sub-sample periods: January-December 1996 and January-December 1999. The first sub-sample belongs to the period when the won/dollar exchange rate movement was restricted by the band imposed under the market average exchange rate system. The won/dollar exchange rate was free to move in the second sub-sample period. A bivariate VAR is estimated for both periods using the lag length of 4 selected by Akaike Information Criterion. Before estimating the VAR, raw data are converted into logarithmic first differences due to the presence of unit root.

The impulse response functions derived from the estimated VAR are provided in Chart 3. The heavy line represents the impulse response function during the first sub-sample period. The impulse response function during the second sub-sample period is drawn with the dotted line. Of the four impulse response functions depicted in Chart 3, the figure in panel (b) is of our interest, which traces the effect on current and future values of the won/dollar exchange rate of a one standard deviation shock to the yen /dollar exchange rate. In both sub-sample periods, a one standard deviation increase

Chart 3: Impulse Response Functions

(a) Response of KRW to KRW

(b) Response of KRW to JPY

(c) Response of JPY to KRW

(d) Response of JPY to JPY

Note: The heavy line represents the impulse response function for the period between January and December 1999 and the dotted line for the period between January and December 1996.

in the yen/dollar exchange rate today raises the won/dollar exchange rate tomorrow, and its effect dies out gradually over time. However, the very initial effect on the won /dollar exchange rate during the second sub-sample period almost doubles the effect observed during the first sub-sample period. This finding is consistent with the earlier finding in Table 2, where the correlation between the won/dollar and yen/dollar exchange rates is found to be stronger in the floating exchange rate regime than in the rigid market average exchange rate regime.

We have just shown that during the floating exchange rate regime, the won/dollar exchange rate responds more sensitively to a shock that may cause imbalance in the external account of Korea. We now turn to the issue of whether monetary independence is restricted by capital mobility. It has long been argued that monetary independence, capital mobility, and the fixed exchange rate cannot co-exist. We show below that this so-called "Impossible Trinity" holds true, at least in Korea, by presenting evidence that liberalization of capital and financial account transactions has increased the effect of net capital inflow on the domestic monetary and financial variables. Given that the floating exchange rate regime allows the monetary authority more room to focus monetary policy to maintain internal balance, this finding implies that, for countries like Korea that experience rapid capital liberalization, it is more appropriate to let the exchange rate balance the external account while the internal balance is maintained through independent monetary policy.

In the 1990s, the world economy has witnessed rapid liberalization of capital and financial account transactions. Korea is no exception to this international trend. In Korea, liberalization of capital markets started in 1992 when the Korean government allowed foreign investors to participate in the stock market. Since then liberalization has continued apace, especially in the post-crisis period. For example, in 1998, the Korean government implemented liberalization measures that allow foreign investors to have

access to all domestic capital markets including stock, bond, and money markets. In April 1999, the Korean government further liberalized cross border movements of capital by introducing the new Foreign Exchange Act, which replaced the existing Foreign Exchange Control Act. Under this new law, almost all capital and financial account transactions, except for those related to the transactions of the individuals, are permitted.

Table 5: Net Capital Inflow in Korea

(U.S.$ 100 million)

|	86-89	90-93	94-97	98	99. 1-8
Capital & Financial Account	-56. 3	45. 8	129. 3	-32. 5	-20. 4
Financial Account	-6. 1	47. 4	118. 0	-18. 8	33. 2
Direct Investment	0. 6	-4. 4	-18. 4	6. 2	35. 8
Others	-48. 4	6. 6	35. 1	-21. 6	-87. 3

Note: Values above (below) zero indicate that capital inflow is greater (less) than capital outflow. Except for the last column, annual averages of net capital inflow are used. Values in the last column are net capital inflow accumulated between January and August 1999.
Source: The Bank of Korea.

As can be seen from Table 5, which reports net capital inflow in Korea, foreigners have increasingly invested in Korea since the stock market opening in 1992. In particular, financial account transactions, which include foreigners' investments in stock and bond markets, experienced the largest increase in the four-year period of 1994-97. In 1998, the balance of capital and financial account reversed into deficit mainly due to the economic instability stemming from the financial crisis in 1997. However, with the economic recovery proceeding faster than expected and the stock market boom supported by the low interest rate policy of the Korean monetary authority, the capital and financial account balance showed signs of improvement in 1999.

In Chart 4, the quarterly movement of net capital inflow is depicted along with the

Chart 4: Net Capital Inflow and Domestic Part of Reserve Money in Korea
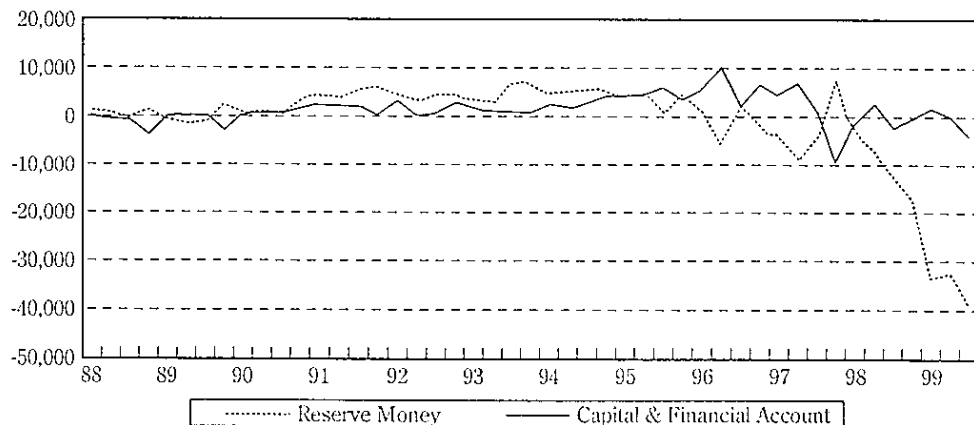
Source: The Bank of Korea.

domestic part of reserve money over the period between the first quarter of 1987 and the third quarter of 1999. It appears that, especially in the later period of the sample, the two variables are inversely related to each other. This implies that when capital inflow increases the monetary authority absorbs it by reducing reserve money supplied through the domestic channel.[1] Chart 4 therefore suggests that the increase in capital mobility tends to reduce the scope of the monetary authority to exercise monetary policy aimed at maintaining the internal balance.

To test more formally the effect of capital mobility on the domestic monetary and financial variables, we run the following regression using the pairing of net capital inflow with the won/dollar exchange rate, the call money market rate, and the M2 growth rate, respectively:

$$y_t = \alpha = \sum_{i=1}^{n} \beta_i y_{t-i} + \sum_{i=1}^{n} \gamma_i x_{t-i} + u_t \tag{6}$$

For all three regressions using equation (6), net capital inflow belongs to x_t. For each regression, equation (6) is estimated over the period between December 1989 and December 1991 and the period between January 1992 and November 1999. Based on the estimation results of equation (6), the test of exclusion for each regression is performed on the null given by:

$$H_0 : \gamma_j = 0 \quad \forall j \tag{7}$$

The null in equation (7) is tested using the lag lengths of 3 and 6. The observations used in the estimation are monthly data spanning from December 1989 through

Table 6: Regression and Test Results Using Lag Length of Three

	Dec. 1989-Dec. 1991			Jan. 1992-Nov. 1999		
	M2	Call	KRW	M2	Call	KRW
α	14.360	2.465	0.924	1.936	0.871	-0.459
	(6.371)	(1.705)	(0.371)	(1.215)	(0.519)	(0.271)
β_1	0.329	0.895	1.391	0.859	1.237	1.179
	(0.278)	(0.277)	(0.234)	(0.105)	(0.108)	(0.132)
β_2	0.153	-0.049	-0.323	-0.035	-0.328	-0.204
	(0.264)	(0.352)	(0.386)	(0.134)	(0.170)	(0.203)
β_3	-0.149	-0.016	-0.255	0.072	0.011	0.044
	(0.207)	(0.243)	(0.200)	(0.105)	(0.108)	(0.147)
γ_1	-9.2E-04	8.1E-04	-2.1E-04	3.5E-04	-1.9E-04	5.3E-04
	(9.0E-04)	(5.4E-04)	(2.3E-04)	(1.9E-04)	(1.1E-04)	(1.2E-04)
γ_2	-1.0E-03	8.6E-05	-1.6E-04	-5.8E-04	5.9E-05	1.8E-04
	(8.3E-04)	(5.4E-04)	(2.1E-04)	(2.0E-04)	(1.1E-04)	(1.3E-04)
γ_3	-9.5E-07	2.1E-05	1.8E-04	3.2E-04	1.3E-04	-2.2E-04
	(6.5E-04)	(3.4E-04)	(1.4E-04)	(2.0E-04)	(1.1E-04)	(1.3E-04)
F-Stat.	0.696	0.806	1.037	3.512**	1.259	7.621*

Note: Values in parentheses are standard errors. *, **, and *** indicate the rejection of the null at 1, 5 and 10% significance levels, respectively.

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[1] In Jang-Yung Lee (1996), the offset coefficients, which measure the extent to which domestic monetary measures are offset by capital flow, are found to be significantly below zero for Korea, Thailand, Indonesia, and Spain.

November 1999.

Table 6 reports the regression results based on the lag length of 3 along with F-statistics for the null given by equation (7). During the period when capital market liberalization was not implemented (December 1989 through December 1991), we fail to reject the null given by equation (7) at the conventional significance level. On the other hand, during the period of capital market liberalization (January 1992 through November 1999), the null that capital mobility has no effect on the domestic monetary and financial variables is rejected at the conventional significance level for two of the three cases (when the won/dollar exchange rate and the M2 growth rate are used as dependent variables).

Similar results are obtained from Table 7, which summarizes the regression and test results using the lag length of 6. In particular, during the period of no capital market liberalization, it is difficult to reject the null for all three cases. However, the null is easily rejected for all three cases when the sample is shifted to the period of capital market liberalization. The results in Table 7,

Table 7: Regression and Test Results Using Lag Length of Six

	Dec. 1989-Dec. 1991			Jan. 1992-Nov. 1999		
	M2	Call	KRW	M2	Call	KRW
α	14.459	4.508	4.404	2.354	1.142	-0.348
	(21.479)	(2.081)	(1.896)	(1.392)	(0.584)	(0.306)
β_1	0.130	0.593	1.309	0.823	1.199	1.232
	(0.452)	(0.261)	(0.386)	(0.108)	(0.110)	(0.146)
β_2	0.313	0.291	-0.543	-0.015	-0.459	-0.341
	(0.472)	(0.335)	(0.656)	(0.141)	(0.173)	(0.238)
β_3	-0.186	-0.194	-0.254	0.083	0.409	0.423
	(0.414)	(0.285)	(0.607)	(0.144)	(0.176)	(0.256)
β_4	-0.362	-0.242	0.238	-0.037	-0.287	-0.422
	(0.443)	(0.277)	(0.513)	(0.142)	(0.176)	(0.248)
β_5	0.119	-0.185	-0.472	0.056	0.227	0.184
	(0.422)	(0.289)	(0.515)	(0.136)	(0.172)	(0.242)
β_6	0.274	0.316	0.204	-0.022	-0.198	-0.087
	(0.385)	(0.211)	(0.295)	(0.108)	(0.109)	(0.157)
γ_1	-1.8E-03	4.0E-04	-7.2E-04	3.0E-04	-2.2E-04	4.7E-04
	(1.8E-03)	(5.5E-04)	(4.4E-04)	(2.0E-04)	(1.1E-04)	(1.2E-05)
γ_2	-7.1E-04	5.7E-04	-1.4E-03	-4.8E-04	-2.0E-05	1.2E-05
	(2.1E-03)	(6.1E-04)	(6.4E-04)	(2.1E-04)	(1.1E-04)	(1.4E-04)
γ_3	7.8E-04	1.1E-03	-1.2E-03	4.2E-04	7.7E-05	-2.6E-04
	(2.3E-03)	(6.3E-04)	(7.5E-04)	(2.2E-04)	(1.2E-04)	(1.4E-04)
γ_4	1.4E-03	1.7E-03	-1.0E-03	1.4E-05	9.6E-05	2.3E-05
	(2.2E-03)	(6.2E-04)	(4.9E-04)	(2.2E-04)	(1.2E-04)	(1.5E-04)
γ_5	4.5E-04	1.4E-03	-3.7E-05	-1.2E-04	4.1E-05	1.9E-04
	(1.5E-03)	(5.5E-04)	(2.9E-04)	(2.2E-04)	(1.2E-04)	(1.4E-04)
γ_6	-1.3E-03	4.6E-05	1.7E-04	-4.3E-04	2.2E-04	-8.8E-06
	(9.4E-04)	(3.2E-04)	(2.1E-04)	(2.1E-04)	(1.1E-04)	(1.4E-04)
F-Stat.	0.592	2.548	1.391	2.826**	1.961***	3.901*

Note: Values in parentheses are standard errors. *, **, and *** indicate the rejection of the null at 1, 5 and 10% significance levels, respectively.

together with those in Table 6, suggest that free capital mobility made it difficult for the Korean monetary authority to adjust its monetary policy in response to a shock affecting internal balance.

In this section, we have examined the floating exchange rate regime from the perspective of policymakers who try to maintain both internal and external balances. Using the Korean data, we have found that the won/dollar exchange rate under the floating exchange rate regime responds more sensitively to a shock that may cause external imbalance than does under the fixed exchange rate regime. We have also found that increased capital mobility due to capital market liberalization exerts greater effect on the domestic monetary and financial variables, which in turn suggests that the flexibility of monetary policy is reduced when capital is free to move across borders.

4. Conclusion

Conflict always exists between maintaining internal and external balance, regardless of the exchange rate regime chosen by the monetary authority. Under the fixed exchange rate regime, the monetary authority would have to intervene frequently in the foreign exchange market to defend the parity. In doing so, domestic monetary and financial variables, such as money supply and interest rate, may deviate from the direction intended by the authority. On the other hand, under the floating exchange rate regime, the external imbalance is automatically corrected through changes in exchange rates. Thus, monetary independence can be more easily achieved under the floating exchange rate regime as opposed to the fixed exchange rate regime.

When capital is free to move across borders, conflict between maintaining internal and external balance is more likely to intensify than when capital movements are restricted. Accordingly, for East Asian countries, which have experienced the rapid liberalization of capital markets, it would be more appropriate to let the exchange rate move freely with market forces than to restrict exchange rate movement through artificial measures. In this paper, we present evidence from Korean data that supports the floating exchange rate regime. In particular, the won/dollar exchange rate under the floating exchange rate regime is found to respond more sensitively to a shock that causes external imbalance. Moreover, during periods of capital market liberalization, net capital inflow is found to have a greater effect on domestic monetary and financial variables.

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