DE FACTO EXCHANGE RATE REGIME IN KOREA: *IS IT STILL A DOLLAR PEG?*

By

Han Geun Moon

THESIS

Submitted to
School of Public Policy and Management, KDI
in partial fulfillment of the requirements
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ABSTRACT

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After the Asian economic crisis in the late 1990s, many East Asian countries including Korea has changed their exchange rate regime from the de facto dollar peg or the managed floating to the free-floating exchange rate regime. However, the common view on the actual exchange rate regime in East Asian countries is that the official labels are different from the actual. Calvo and Reinhart (2000a) expressed this as the "fear of floating", and Mckinnon (2000) as "after the crisis, the East Asian dollar standard resurrected."

The purpose of this paper is to test the common view on the actual exchange rate regime, using very simple but intuitive OLS regression models based on Frankel and Wei's work (1994). My regression results show that, firstly, East Asian countries including Korea have returned to the dollar peg or managed floating after the restoration from the crisis, as they did during the pre-crisis period. Possible interpretations are the preponderance of dollar invoicing, the fear of floating, suffering from nominal anchor fragility, not yet overcoming the original sin and the honeymoon

effect.

The results also show that Korea has substantially changed her exchange rate regime since January 2001, but other countries, even Taiwan and Singapore which had no crisis, are still the same as before. The sensitivity to the dollar has statistically significantly decreased, but sensitivity to the yen is almost twice as much as those in other countries. This result might come from the synchronization of Korean won with Japanese yen from November 2000, changing the monetary policy framework from monetary targeting to the pure inflation targeting, and the full capital and foreign exchange liberalization since the second stage of foreign exchange liberalization (January 2001). However, 6 months (January 2001-June 15, 2001) is not enough to assess policy changes, and, we continuously need to monitor how the exchange rate policy evolves.

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I. INTRODUCTION

The issue on the appropriate exchange rate regime in emerging market economies has been one of the major subjects of reforming the international financial architecture. The choice of exchange rate regime in developing countries is indispensable to strengthen economic fundamentals and financial systems in these countries. That is to say, the appropriate exchange rate regime is essential to prevent massive capital inflows and speculative attacks as well as to achieve a sustainable economic growth through facilitating trades and foreign direct investments. From this point of view, debates on relative merits of alternative exchange rate regime (two polar extremes or intermediate) were revived after the late 1990's crisis.

The 1997 Asian financial crisis provided strong support to a free-floating exchange rate regime. Several crisis-stricken East Asian countries such as Indonesia, Thailand and Philippines have switched their exchange rate regime from a de facto dollar peg or so-called "managed floating" to a free-floating. Korea has also adopted a independently floating exchange rate regime instead of the previous Market Average Rate System since December 1997. On the other hand, China, Malaysia and Hong Kong have now fixed their exchange rates to the dollar. These observations show us that two corner solutions such as fixed or free-floating exchange rate regime seem to be superior to the intermediate exchange regimes such as an adjustable peg or

managed floating.

A major portion of studies on exchange rates since the financial crisis in developing countries are focused on the above-mentioned issue of choosing a appropriate exchange rate regime on the part of emerging market economies, which are connected with reforming the international financial architecture. Especially in Korea, issues on volatility of exchange rates, casual relationship among exchange rates, interest rates and stock price are another main subjects after adopting a free-floating exchange rate regime.

However, there are very few papers on the actual transition in the exchange rate regime: how has the exchange rate regime actually changed after the crisis? This issue asks whether the "official label" provides an adequate representation of the actual country practice. According to the classification of exchange rate regime by the International Monetary Fund (IMF), 49 countries including Brazil, Indonesia, Korea, Mexico, Philippines and Thailand are classified into "independently floating" at the end of March 2000. Nevertheless, it is a common view that the actual exchange rate regimes in developing countries are significantly different from their official labels. Calvo and Reinhart (2000a) call this the "fear of floating." It means that there is no actual change in the exchange rate regime in crisis-stricken East Asian countries including Korea. Like pre-crisis exchange rate regime, the actual post-

crisis regime is still a dollar peg or a managed floating (Mckinnon, 2000; Park, Chung and Wang, 1999, etc.).

This paper aims to test the common view on the actual exchange rate regime, especially in Korea. In this paper, I analyze how the pre-crisis exchange rate regime and post-crisis exchange rate regime differ in East Asian countries including Korea, using very simple but intuitive regression models. My regression results show that Korea has substantially changed her exchange rate regime since January 2001, but other countries, even Taiwan and Singapore which had no crisis, still have a dollar pegged exchange rate regime.

Before introducing the regression analysis, I summarize the flexibility of exchange rate regimes in section II. Section III describes historical development of exchange rate regime in Korea and the reason why Korea need to adopt a free-floating exchange rate regime after the crisis. Such review will be helpful in drawing implications of regression results in this paper. Section IV reports regression results, followed by a conclusion in section V.

II. FLEXIBILITY OF EXCHANGE RATE REGIME

1. Flexibility of Exchange Rate Regime

The way in which exchange rates are determined clearly depends on the exchange rate regimes. Under the true free-floating exchange rate regime, exchange rates adjust quickly to reflect changes in domestic economic performance and international economic circumstances. Under the other extreme, the currency value is fixed to an anchor currency such as the U.S. dollar, and the central bank routinely trades foreign exchange to maintain that value. But the reality is not so simple. As Frankel (1999) said, no single exchange rate regime is appropriate for all countries or at all times. In this section, I summarize the classification of exchange rate regime to help us understand the main issues more concretely. The classification follows Frankel (1999) and IMF (2000b).

(1) The Flexibility-Continuum of Exchange Rate Regime

According to Frankel's classification (1999), there is in fact "the flexibility-continuum" of exchange rate regimes. There are nine, starting with the most rigid arrangement, and becoming increasingly flexible as we go:

1) **Currency Union**: Countries under a currency union use a single or common

currency, i.e., here the domestic currency is literally the same as that circulating in one or more major neighbors or partners. Examples include optimal currency area such as the European Monetary Union (EMU), and a dollarized zone[1] such as the East Caribbean Common Market (ECCM)[2] and Ecuador.

2) **Currency Board**: This system fixes or links its exchange rate to an anchor currency and permits high-powered money to be created only if it is fully backed by holdings of a foreign currency. Argentina, Bulgaria, Estonia, Hong Kong and Lithuania are classified into this category.

3) **"Truly Fixed" Exchange Rate**: The value of domestic currency is fully fixed to that of a specific country. Members of Communauté Financiére Africaine (CFA) Franc Zones such as WAEMU and CAEMC[3] fix to the French franc, while many other countries fix to the U.S. dollar.

4) **Adjustable Peg**: "Fixed but adjustable" is the description of this peg, and most countries in this regime in fact periodically undergo realignments if they do not change regimes altogether. Countries under Bretton Woods System adopted this

[1] See IMF (2000d) for the pros and cons of dollarization.
[2] ECCM is consisted of Antigua & Barbuda, Dominica, Grenada, St. Kitts & Nevis, St. Lucia and St. Vincent & the Grenadines.
[3] West African Economic and Monetary Union (WAEMU) is consisted of 6 countries including Cameroon, Congo, Rep.of, Gabon, and others. And Central African Economic and Monetary Community (CAEMC) is formed by 8 countries including Benin, Mali, Niger, Senegal, and others.

regime.

5) **Crawling Peg**: Under this regime, the exchange rate is adjusted at a rate roughly equal to the inflation differential between the country and its trading partners. The country which tries to avoid a widening current account deficits follows the crawling peg exchange rate policy, and a prominent example was Chile.[4]

6) **Basket Peg**: The value of domestic currency is fixed to a weighted basket of currencies instead of any one major currency, a way that is suitable for countries with trade patterns that are highly diversified geographically. Korea during the 1980s had adopted the Multiple-Basket Pegged Exchange Rate System as many Asian countries.

7) **Target Zone or Band**: Governments can pledge to intervene when the exchange rate hits pre-announced bands on either side of a central parity. Examples include the Exchange Rate Mechanism (ERM) founded in March 1979, or "monitoring bands" named by Williamson (1998, 2000).[5]

8) **Managed Float**: This regime is also known as a "dirty float." Authorities intervene in the foreign exchange market, without defending any particular parity.

[4] The exchange rate arrangement in the major market in Chile is classified into independently floating by IMF at the end of March 2000 (IMF 2000b).

[5] Williamson's "monitoring bands" can be regarded as a (crawling) band regime. But the key difference between the two regimes is that "monitoring bands" do not involve any obligation to defend a publicly announced margin.

Jamaica, Norway, Singapore and many Asian countries before the crisis were classified in this category.

9) **Free Float**: Exchange rates are determined by the demand and supply of foreign currency. The closest to the pure free float is the U.S. dollar.[6]

Among the nine regimes, currency union, currency board and truly fixed exchange rate are normally classified in the fixed exchange rate regime. On the other hand, free float is considered to be a pure free-floating exchange rate regime. The remainder falls into the intermediate regime. The purpose of this paper is to see in which category East Asian countries fall after the crisis: free float, adjustable peg or managed float.

(2) The Status Quo of Exchange Rate Arrangements

Similar to Frankel's classification, IMF also classifies exchange rate arrangements into 8 categories in connection with the monetary policy framework: exchange arrangements with no separate legal tender, currency board arrangements, other conventional fixed peg arrangements (including de facto peg arrangements under managed floating), pegged exchange rates within horizontal bands, crawling pegs, exchange rates within crawling bands, managed floating with no preannounced

[6] See Frankel (1999), p. 5.

path for the exchange rate and independently floating.[7]

As of March 2000, 49 countries including Korea, Indonesia, Philippines, Thailand, Mexico and Brazil belong to independently floating along with the United States, Japan and Switzerland. 27 countries including Singapore and Norway belong to managed floating with no preannounced path for exchange rate. On the other side, 8 countries including Hong Kong and Argentina belong to the currency board

Table 1. IMF Classification on Exchange Rate Arrangements

Classification	Number of countries	
	Apr. 4, 1999	Mar. 31, 2000
Exchange Rate with No Separate Legal Tender	37	38
Currency Board Arrangements	8	8
Pegged Arrangements	44	45
Pegged with Bands	8	6
Crawling Peg	6	5
Crawling Bands	9	7
Managed Floating	25	27
Independently Floating	48	49
Total	185	185

Source: IMF (1999b, 2000b).

arrangements, 38 countries including 11 EMU members to the exchange arrangements

[7] See IMF (2000b), p.15 for details. Before 1999, IMF classified exchange rate arrangements into 9 categories: currency pegged to US dollar, French franc, other currency, SDR, and other composite, flexibility limited in terms of a single currency or cooperative arrangement, and more flexibility such as other managed floating and independently floating.

with no separate legal tender, and lastly 45 countries including China and Malaysia to other conventional fixed peg arrangements.

2. Choice of Exchange Rate Regimes

As I mentioned above, there is a flexibility-continuum of exchange rate regimes from the truly fixed to the pure free-floating. If so, which of the two polar extremes or the many intermediates is most appropriate for developing countries? Traditional view was that it depends on the characteristics of a particular economy: size and openness of the economy, output structure, geographical concentration of trade, inflation differential, degree of economic/financial development, labor and capital mobility, foreign and domestic nominal/real shocks, credibility of policy makers, and so on. For example, a fixed exchange rate regime may be desirable for a small open economy more subject to monetary shocks, while a free-floating regime may be desirable for a large open economy more subject to real shocks (IMF, 1997b).

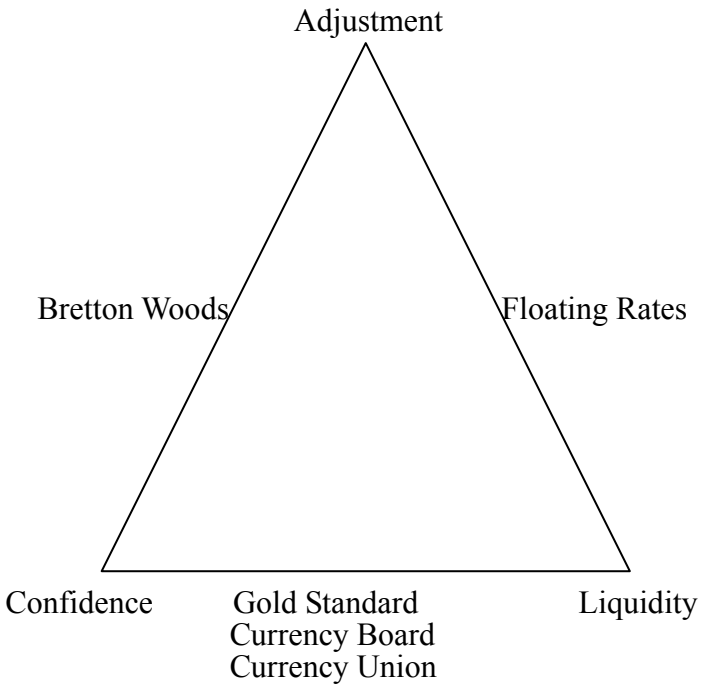
But, it is impossible to consider all the criteria simultaneously, and even worse economic circumstances vary over time. Actually greater capital liberalization and capital market integration provide significant economic changes in developing countries. Current orthodoxy under the circumstances is that independently floating is probably desirable unless the exchange rate is firmly fixed through a currency union

or a currency board, etc (IMF, 2000c). In other word, the intermediate regimes such as the crawling peg or the managed floating between the two extremes are no longer sustainable.

The rationale behind the suggestion comes from the so-called "eternal triangle" or "impossible trinity," which is about the incompatibility of the monetary policy autonomy (adjustment), exchange rate stability (confidence) and free-capital mobility (liquidity).[8] As Krugman (1998) properly pointed out, all three objectives of optimal exchange rate choice – adjustment, confidence and liquidity – cannot be obtained simultaneously. It is possible, at most, to achieve any two of these objectives, making it necessary to sacrifice at least one. Under a liberalized capital account regime, a country adopting a currency board, reflecting its preference toward exchange rate stability, must sacrifice monetary autonomy as in the case of Hong Kong and Argentina. When the ultimate policy objective is to maintain monetary independence, the exchange rate regime should adopt a free-floating as in the case of Korea, Philippines and Thailand. Otherwise, these countries should impose tight capital controls in order to maintain the confidence and autonomy as in the case of China and Malaysia.

Figure 1. The Eternal Triangle (Impossible Trinity)

[8] Refer to Krugman (1998) or Frankel (1999), p.p. 7-9 for details.



Source: Krugman (1998), p. 4.

Based on the "impossible trinity," some scholars such as Jadresic, Masson and Mauro (1999), Mishikin (1999), Fischer (1999) and Ryou and Kim (2001) insist that the developing countries should adopt the free-floating exchange rate regime. Others such as Eichengreen and Hausmann (1999), Goldfajn and Olivares (2000), Mckinnon (2000) and Calvo and Leinhart (2000b) favor the fixed exchange rate regime. On the other hand, to my surprise, Williamson (1998, 2000), and Dooley, Dornbusch and Park (2001) still believe that the intermediate exchange rate regimes such as the BBC (Band, Basket and Crawl) rule are the most viable options for emerging market economies.

Another hot issue on the choice of exchange rate regime is optimal currency area (OCA) started from Mundell (1961). With "fear of floating," regional monetary

arrangements including a currency union such as the Euro area could be an alternative to both fixed and free-floating rate regimes. The backdrop behind the interest toward OCA is that it will be helpful to avoid competitive devaluation by regional currencies, and the stabilization of exchange rates will be helpful for Asian countries to achieve their full growth potential. Ito (1993), Goto and Hamada (1994), Eichengreen and Bayoumi (1996), and Kwan (1994, 1998) argue that East Asia, especially high income countries such as Japan, Korea, Taiwan and Singapore, satisfies the preconditions for a currency bloc. But they thought the absence of political consensus and the region's historical legacy are the main obstacles to form an OCA.[9]

As Frankel (1999) said, there is no single currency regime which is right for all countries or at all times. The realities are as complicated as the theories. According to Table 2, 97 percent of countries in the world were classified as having a pegged exchange rate regime in 1970s. However, in 1999, 45 percent of countries have adopted the independently floating exchange rate regime, while only 11 percent adopted the pegged regime. And 44 percent of the countries still maintain intermediate regimes such as limited flexibility or managed floating (Calvo and Reinhart, 2000a).

[9] Refer to Wang and Yang (2000), p.p. 78-81 for detail summary and references.

Table 2. Exchange Rate Classification over the Years

Year	Percentage of countries which were classified by IMF			
	Pegged	Limited Flexibility	Managed	Flexible
1970	97.2	0	0	2.8
1975	63.9	11.1	13.9	11.1
1980	38.9	5.6	47.2	8.3
1985	33.3	5.6	36.1	25.0
1990	19.4	13.9	30.6	36.1
1995	13.9	8.3	38.9	38.9
1999	11.1	11.1	33.3	44.5

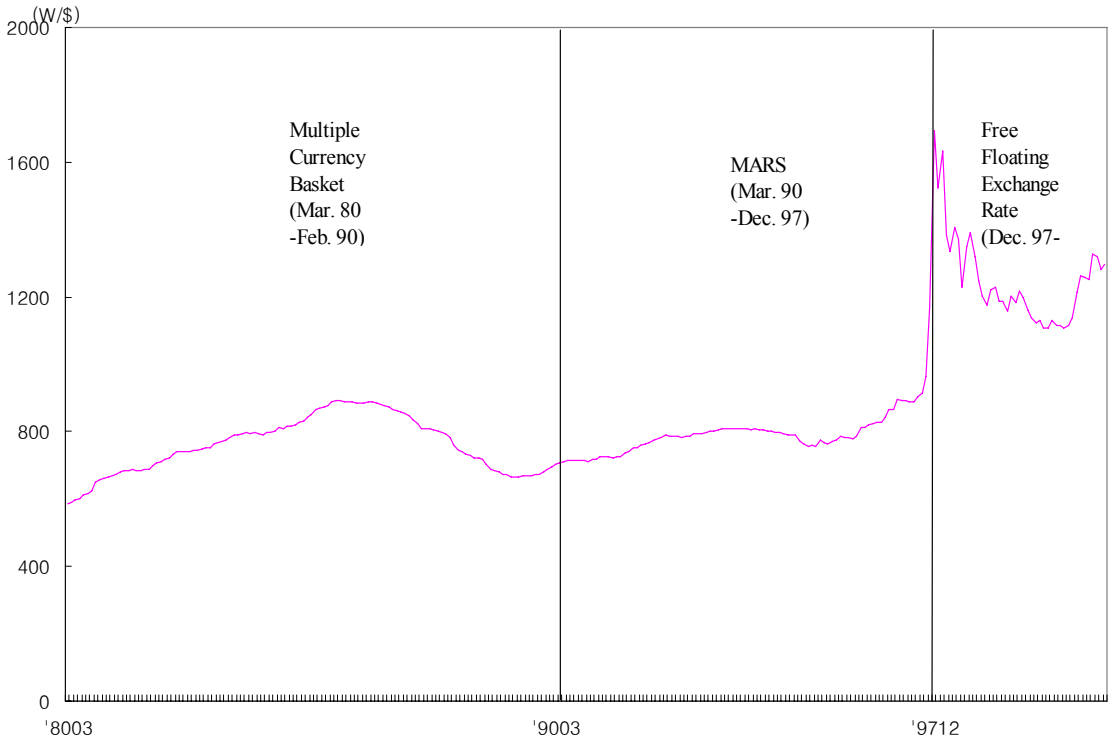
Source: Calvo and Reinhart (2000a), “Fear of Floating”, p. 32, NBER Working Paper.

III. EVOLUTION OF THE EXCHANGE RATE REGIME IN KOREA

1. Evolution of the Exchange Rate Regime

It was not until February 1980 that Korea changed its fixed exchange rate regime to a Multiple-Basket Pegged Exchange Rate System (MBPS). In March 1990, the MBPS was itself replaced by a Market Average Exchange Rate System (MARS). Seven years later in December 1997, MARS was abandoned and Korea shifted to a free-floating exchange rate system.[10]

Figure 2. Evolution of the KRW/USD Exchange Rate



[10] The sources of this chapter are BOK (1999), Park, et al. (1999) and BOK's website.

(1) The Multiple-Basket Pegged System: Mar. 1980 – Feb. 1990

A Multiple-Basket Pegged Exchange Rate System permitted the exchange rate to fluctuate against major currencies. Under this system, the basic exchange rate of won against the U.S. dollar was determined as a weighted average of two baskets, the SDR basket and the trade-weighted basket composed of major trading currencies, with the addition of an adjustment factor which was termed the "policy variable."

$$\text{Exchange Rate} = \alpha * \text{SDR basket} + \beta * \text{TWB} + \text{P}$$

[$\alpha+\beta=1$, TWB: trade weighted basket, P: policy variable]

The policy factor [P] was to provide the inputs which were necessary to have the exchange rate reflect reality. This factor, however, turned out to cause a problem as the US government blamed the Korean government of manipulating this variable to its advantage. In response, Korea had to adopt a new exchange rate system called the Market Average Exchange Rate System (MARS) in March 1990.

(2) The Market Average Exchange Rate System: Mar. 1990 – Dec. 1997

In March 1990, the MBPS was itself replaced by a Market Average Exchange Rate System (MARS) in which the exchange rates were, in principle, determined by the interplay of foreign exchange supply and demand in domestic foreign exchange market. Under this system, the interbank spot rate was allowed to move within an

upper and a lower limit around each day's basic exchange rate.[11]

Under MARS, the basic exchange rate of the Korean won against the U.S. dollar was the market average rate in the previous business day. The market average rate was determined by computing a volume-weighted average of the rates that took place in the previous business day's interbank foreign exchange market. Exchange rate with other countries are derived by arbitraging between U.S. dollar rates against foreign currencies and the basic exchange rate of won against the U.S. dollar.

Exchange rates under this system were determined on the basis of demand and supply in the foreign exchange market. However, even though the exchange rate was open to the market force, the volatility of won-dollar spot rate was limited within a narrow band through various policy tools. This kind of "managed floating,"[12] combined with massive capital inflow and hasty deregulation on short-term capital movements, could be regarded as one of the major contributing factors triggering the currency crisis of 1997.

(3) The Free-Floating Exchange Rate System: Dec. 1997 - present

[11] The daily trading band under MARS changed as below:

90.3	91.9	92.7	93.10	94.11	95.12	97.11.20	97.12.26
±0.4%	±0.6%	±0.8%	±1.0	±1.5	±2.25%	±10.0%	Abolition of the band

[12] Korea's exchange rate arrangement before the crisis was classified into "managed floating" by the IMF (1997a).

In the midst of the crisis, Thailand, Philippines and Indonesia abolished their managed floating system, and this forced the Korean won to depreciate rapidly. On December 16, 1997, the daily fluctuation limits were finally abolished. That is, Korea's exchange rate regime was shifted from the MARS to a free-floating system. Except the abolition of a band and renaming the basic exchange rate in Korean, the mechanism of exchange rate determination under the free-floating system is same as before.[13]

With the free-floating exchange rate regime in place, the Korean government also substantially accelerated its ongoing financial and foreign exchange liberalization. Remarkable examples include the complete abolition of foreign ownership limits on domestic stocks, and the revamping of the Foreign Exchange Management Law. The new Foreign Exchange Transaction Law which replaced the Foreign Exchange Management Law took effect on April 1, 1999, allowing full capital account liberalization with minor exceptions.

The liberalization was implemented in two stages: first stage by April 1, 1999 and second stage by January 1, 2001. The first stage includes the expansion of foreign exchange business institutions, streamlining procedures for current account transactions by corporates and financial institutions and changing from a Positive List

[13] Basic rate and cross rates in Korean have changed from "기준환율" and "재정환율" to "매매기준율" and "재정된 매매기준율" since April 1, 1999.

System to a Negative List System for regulating capital account transactions. Having spent sufficient time to improve prudential, regulatory and accounting standards, the second stage of liberalization took effect from the beginning of 2001. The remaining restrictions on foreign exchange transactions were eliminated, with a few exceptions such as those related to national security and prevention of criminal activities.[14] The second stage liberalization was also supplemented by various safeguard measures: Foreign Exchange Information Network, Early Warning System, National Debt Management system and emergency measures such as the variable deposit requirement, that can be adopted in times of crisis.[15]

2. The Rationale behind the Free-Floating Exchange Rate Regime

After the crisis, many Asian countries including Korea have adopted the free-floating exchange rate regime, and this was one of the key elements of the IMF's austerity program for these countries. A series of crises from Mexico to Asia in the 1990s provided strong support to the free-floating exchange rate regime. The basic rationale behind this regime comes from the so-called principle of the "impossible trinity." As I mentioned before, no country obtains all three objectives simultaneously: exchange rate stability, capital mobility and independent monetary

[14] See BOK (1999), p.p. 33-35 for details.
[15] Refer to Kim, Hyeon-Wook and Han Geun Moon, "External Debt and Asset Management: Int'l Experiences and Application to Korea (in Korean), *The Journal of Economic Policy*, Volume 3, Number 1 (2001), The Research Institute for International Affairs.

policy. As many emerging market economies try to have more access to international financial markets, they cannot help but choose one of two polar extremes: a perfect free-floating or a hard fix such as a currency board or even a dollarization. But, according to Eichengreen (1999), the pegged (or fixed) exchange rate regimes are inherently crisis-prone for the developing countries, and these countries should be encouraged to adopt the free-floating exchange rate regime. The basis of this argument is the speculative attacks in a highly integrated international financial market.[16] Under the free-floating exchange rate regime, developing countries can more easily absorb large adverse shocks than a pegged (or fixed) exchange rate regime.

Another important rationale is that this regime can provide the country in global financial market with a better economic environment which can help economic agents to recognize foreign exchange risks and develop the prudential management of financial institution. This leads the whole financial system including the foreign exchange market to develop more efficiently.

Despite these rationales, there are some worries about choosing a pure free-floating exchange rate regime as Calvo and Reinhart (2000a) mentioned in the article of "Fear of Floating." For example, this regime may exacerbate misalignment of exchange rate from economic fundamentals under the circumstance of large interest

[16] Refer to Eichengreen (1999) for first, second, and third generation model of the currency crisis

rate differential. And, the free floating can lead to less investment and growth by reducing unhedged foreign borrowing. This is due to limitation for emerging market economies to hedge the foreign borrowing. And also emerging market economy may suffer from its nominal anchor fragility, because they should make a choice an appropriate nominal anchor except for exchange rate.

IV. EMPIRICAL ANALYSIS

1. Literature Review

Improving exchange rate regime in developing countries is one of the major issues for reforming the international financial architecture.[17] Then, it is no surprise that we can see a bulk of papers on the choice of exchange rate regime: what is the most appropriate exchange rate regime among two polar extremes and intermediates in developing countries? Some scholars prefer free-floating, another fixed, and the others still insist on intermediate regimes to prevent crisis recurring.[18] In Korea, however, a major portion of the research on exchange rates focused on the casual relationship among exchange rates, interest rates and stock prices, and volatility of exchange rates. The examples include J. Oh (2000), Kim and Moon (1998), Park and Hwang (1998), J.S. Kim (2001) and S. Ryoo (2000).

However, the studies on the actual exchange rate regime itself are scant. The basic question here is how the post-crisis exchange rate regime in emerging economies has actually changed. There are two ways to see whether the "official

[17] Report of G7 Finance Ministers to the Köln Economic Summit, June 18-20, 1999 recommends specific reforms in six priority areas: strengthening and reforming the international financial institutions and arrangements; enhancing transparency and promoting best practices; strengthening financial regulation in industrialized countries; strengthening macroeconomic policies and financial systems in emerging markets; improving crisis prevention and management, and involving the private sector; and lastly promoting social policies to protect the poor and most vulnerable. Exchange rate regime in emerging economies, financial systems, capital flows and debt management are sub-items of 4th category.

[18] See section II.2, or Wang and Yang (2000) and Ryou and Kim (2001) for the detailed review of previous studies on the appropriate exchange rate regime.

label" provides an adequate representation of the actual country practice. One is to test if developing countries have any evidence of a dollar bloc, using a simple regression model. The other is to see whether volatility of exchange rates or intervention in the foreign exchange market is different before and after the crisis.

Frankel and Wei's work (1994) can be regarded as the first instance of the former. They tried to find if East Asia remains part of a U.S. dollar bloc. They run an OLS (ordinary least squares) regression to test the changes in the value of domestic currency (Swiss franc as the numeraire) against the changes in the value of foreign currencies, using weekly data from the beginning of 1979 to the second week of May 1992. The results of the regression on nine East Asian countries showed that the U.S. dollar continued to be the dominant international currency in East Asian. All 9 countries had assigned heavy weight on the dollar, and many of them on U.S. dollar alone.[19] The main reason for this phenomenon, although trading with Japan had become increasingly important for these countries, was that they invoiced trade in dollars, rather than in their own or trading partner's currencies. Ryou and Kim (2000) also tried to test the same issue using a similar model (SDR as numeraire). Using monthly data from 1990 to 1996 of 8 countries except China, they found out the same results in Frankel and Wei's work.

[19] Only Singapore among 9 countries (Korea, Hong Kong, Singapore, Taiwan, Malaysia, Indonesia, Philippines, Thailand and China) had assigned weight to the yen in addition to dollar.

Another prominent study was done by Mckinnon (2000). He examined how the post-crisis exchange rate regime has evolved since 1998. He used the simple regression model similar to Frankel and Wei (1994), but used a high frequency data such as daily exchange rate data. His finding was that:

> … However, these low frequency, i.e., monthly, plots, which the eye can easily follow, are deceptive. … At the high frequencies, the peg to the dollar is remarkably robust in non-crisis periods: [p.p. 9 and 14]
>
> In the year 2000, both the crisis and non-crisis countries of East Asia (with Japan remaining the important exception) have returned to formal or informal dollar pegging, which is statistically indistinguishable from what they were doing before the crisis. [p. 9]

The second approach which uses VAR (vector auto regression), etc., is more complicate than the first. This approach is to test whether there are close empirical relationships in either level or volatility among exchange rates, interest rates, stock prices and international reserves. If there is no foreign exchange market intervention in emerging markets, that is to say, under the free-floating exchange rate regime, there should be close relationships between the results of these countries and the U.S. or Japan already adopting a free-floating. Or the results during pre- and post-crisis periods in the East Asian countries must be different.

Calvo and Reinhart (2000a) examined discrepancy between the “official label” and the actual exchange rate regime by examining the changes in exchange rates,

foreign reserves, money supply, interest rates and commodity prices, using monthly observations of 39 countries during the Jan. 1970 – Nov. 1999 period. They found that the volatility of exchange rates or the intervention in the foreign exchange market of developing countries adopting a free-floating exchange rate regime is similar to those of the countries adopting a fixed, rather than those of the United States or Japan. The "fear of floating" has led to intervention in the foreign exchange market. Wang and Yang (2000) measures the average index of market intervention on a monthly basis (Jan. 1997 – Dec. 1999) among 31 countries. They found that the index did not change much between pre-crisis and post-crisis period, and concluded that the degree of intervention of East Asian countries which shifted to a free-floating exchange rate regime after the crisis did not change much. This implies that the regime seems to be closer to the managed floating or the dollar peg as before the crisis, even though they officially claim to have adopted an independently floating regime. Park, Chung and Wang (1999) investigated empirical relationship among exchange rates, stock prices and interest rates to see if there had been any active foreign exchange market intervention after the crisis. During the post-crisis, they found no Granger causality among volatilities of the three variables, implying that the change from the managed floating to the free-floating did not lead to any close relationship among these variables (that is, no actual changes in the exchange rate regime).

Regardless of approaches, the common view is that developing countries including Korea still maintain a managed floating or a dollar peg. Except during the crisis, the actual exchange rate regime in non-crisis period is the same, even though emerging market countries officially insist that they have adopted the free-floating exchange rate regime. Mckinnon (2000) expressed this phenomenon as "after the crisis, the East Asian dollar standard resurrected."

2. Model

The purpose of this paper is to verify the common view on the actual foreign exchange rate regime after the crisis in East Asian countries, especially in Korea. That is to say, I examine whether the actual exchange rate regime is still the dollar peg (or the managed floating) even after officially adopting the free-floating exchange rate regime, and if not, how the degree of the dollar peg has changed. To test the common view, I set up very simple but intuitive OLS regression models based on Frankel and Wei (1994).

There are two basic regression models. The first multivariable OLS regression model is to test the first hypothesis: the actual post-crisis exchange rate regime is still a dollar peg.

$$\%\Delta(CHF/KRW) = \beta_0 + \beta_1\%\Delta(CHF/USD) + \beta_2\%\Delta(CHF/JPY) + \beta_3\%\Delta(CHF/EUR) + \varepsilon \quad \ldots\ldots\ldots \quad (1)$$

where CHF: Swiss franc, KRW: Korean won, USD: U.S. dollar,
JPY: Japanese yen, EUR: Euro dollar, and
ε: a well-behaved error term, following $N(0, \sigma^2)$.

The choice of numeraire used to measure the value of currencies (assuming only that the list of currencies used to try to explain the exchange rate includes all relevant candidates), affects the interpretation of the error term. To interpret changes in the value of currencies as the changes in the purchasing power of the currency, Frankel (1992) chose the inverse of domestic CPI as the numeraire, but the CPI data are only available on a monthly basis. As such, I choose a relatively independent currency, i.e., the Swiss franc, as an arbitrary numeraire for measuring exchange rate variations.[20] And I include EUR as additional independent variable, rather than DEM. All previous studies included DEM as independent variable, but I believe that the Euro dollar is more important than DEM to the exchange rate policy in emerging market after the launch of the European Economic and Monetary Union (EMU).[21]

In the first model, if the value of the domestic currency is tightly fixed to the dollar, the regression coefficient β_1 in equation (1) should be approximately unity while β_2 and β_3 are close to zero. So, if $\beta_2=0$, $\beta_3=0$, β_1 is close to unity and lastly adjusted R^2 is significantly high, the actual exchange rate regime of the country is the

[20] Ryou and Kim (2000) used SDR (the Special Drawing Right) as numeraire. Frankel and Wei (1994) also used SDR as well as CHF as numeraire, but both results were the same as those with the CHF. Under such assumption, I do not try to measure the value of currency in terms of SDR.

[21] I have tried the same tests using DEM, and find very similar results. (The results are not reported here.)

fixed regime, i.e., the dollar peg. If it is fixed to Japanese yen, then β_2 should be close to one, and the others close to zero. That is to say, if β_1=0, β_3=0 and β_2 is close to one with high adjusted R^2, we conclude that it is a yen bloc. Under the free-floating exchange rate regime, we can foretell that all the coefficients are not statistically significant because the exchange rates are determined by the demand and supply of foreign exchange market. In addition, β_0 represents any trend appreciation or depreciation of the local currency.

The second multivariable regression model is to test the second hypothesis: the degree of fixity to the dollar is the same during post- as during pre-crisis period. To verify this hypothesis, I use two dummy variables based on time periods.

$$\begin{aligned}\%(\Delta CHF/KRW) = \beta_0 &+ (\alpha_1 + \beta_1 D_1 + \gamma_1 D_2)\%(\Delta CHF/USD) \\ &+ (\alpha_2 + \beta_2 D_1 + \gamma_2 D_2)\%(\Delta CHF/JPY) \\ &+ (\alpha_3 + \beta_3 D_1 + \gamma_3 D_2)\%(\Delta CHF/EUR) + \varepsilon \quad \ldots\ldots \quad (2)\end{aligned}$$

where D_1 = 1 if post-crisis I, 0 otherwise.
D_2 = 1 if post-crisis II, 0 otherwise.

In this model, if β_1 (γ_1) is significant, the degree of dollar peg during the post-crisis I (post-crisis II) is different from other periods. We can also examine the importance of Japanese yen in the foreign exchange rate policy in East Asian countries. If β_2 and γ_2 is statistically different from zero, Japanese yen plays more important role since the crisis. If there were no changes in actual exchange rate regime, the results of this model may equal to those of Model I.

3. Data

Daily exchange rates which cover the period of March 2, 1990 to June 15, 2001 are used as samples. The daily closed values of KRW/USD, JPY/USD, CHF/USD, USD/EUR[22] are taken from the FRB web site, and the exchange rates in terms of Swiss franc i.e., the cross rates, are computed by equation (3).[23]

$$S(i/j) = S(i/\$) / S(j/\$) \qquad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where $S(\cdot)$: spot exchange rate, i: CHF, j: other currency.

Those high frequency data are broken up into four periods. The pre-crisis period covers from March 1990 to September 1997, and the crisis period from October 1997 to June 1999.[24] The post crisis period (July 1999 - June 15, 20001) are divided into two sub-periods: post-crisis period I from July 1999 to December 2000, and post-crisis period II from January 2001 to June 15, 2001. One of the reasons for the latter division is to test the changes in actual exchange rate regime after the second stage of foreign exchange liberalization.

For comparative analysis, I also run the regression analysis for other East Asian

[22] I use spot exchange rates of USD/ECU from Mar. 1990 to Dec. 1998.

[23] The cross rate of CHF/KRW by the equation (3) is slightly different from the published rate by the BOK, but I ignore the difference.

[24] There might be some debates on the crisis period. Although the free-floating exchange rate regime was adopted in Dec. 1997, I presume that the crisis period stared from the fourth quarter of 1997 on the grounds of sudden capital outflow and rapid depreciation of Korean won after speculative attacks on the Hong Kong dollar in Oct.1997. I also suppose that the period ended in Jun. 1999, because economic growth accelerated sharply from the second quarter of this year, and the President Kim publicly announced overcoming the economic crisis within one and a half year (see "International Conference on Economic Crisis and Restructuring in Korea" sponsored by MOFE and KDI in Dec. 1999.)

countries: Indonesia, Philippines, Singapore, Thailand and Taiwan. Except for the Philippines and Thailand, the data of which are taken from Bloomberg, the exchange rates of these countries are obtained from the FRB. Contrary to the case of Korea, pre-crisis period covers from January 1994 to May 1997, crisis period from June 1997 to December 1998, and the whole post-crisis from January 1999 to June 15, 2001 (but same post-crisis period II).[25] This division is to compare with Mckinnon's results (2000). Since China, Hong Kong and Malaysia have fixed the currency value to the dollar, I do not make a separate analysis for these countries.

4. Results and Findings

Basic statistics on exchange rates reported in Table 3 show that the standard deviation during the post-crisis period (0.4655) became higher more than twice than that of the pre-crisis period (0.1889). This means that the volatility of exchange rates after the crisis increased significantly. Solely basing our judgment on such basic statistics, we might conclude that the exchange rate regime has substantially changed since the crisis.

However, the conclusion based on basic statistics may be too hasty. The accurate conclusion should be drawn from a more elaborate model. Now, let us

[25] I also run the regression with same time periods for Korea, and results are almost same with former one (see Table 6 and 7).

examine the first hypothesis using equation (1): the null hypothesis of $\beta_1 = 0$. The results of Model I during each period are summarized in Table 4. As we can see in

Table 3. Basic Statistics[1] on Exchange Rates

Period	Mean	Max	Min	Standard Deviation	Skewness	Kurtosis
Pre-crisis	-0.0145	1.2995	-1.4273	0.1889	-0.4128	11.8978
Crisis	-0.0294	21.8460	-12.7551	2.2232	1.4685	28.6742
Post-crisis	-0.0213	1.3986	-1.7632	0.4655	-0.2791	1.2131
• Post crisis I	-0.0230	1.3289	-1.7632	0.4091	-0.4419	1.7647
• Post-crisis II	-0.0156	1.3986	-1.5873	0.6171	-0.1090	-0.1066

Note: 1) Statistics on percentage changes of KRW/USD.

Table 4. Results of Model I (Korea)

Period	Pre-crisis	Crisis	Post-crisis		
				Post crisis I	Post-crisis II
β_0(Constant)	-0.01417 (-2.59)***	-0.03509 (-0.33)	-0.02275 (-1.12)	-0.02596 (-1.25)	0.00492 (0.10)
β_1(USD)	1.01994 (102.98)***	1.04562 (4.87)***	0.98163 (23.99)***	1.05304 (25.51)***	0.70313 (6.49)***
β_2(JPY)	0.00664 (0.67)	0.10762 (0.94)	0.13977 (4.72)***	0.05392 (1.80)*	0.45752 (5.97)***
β_3(EUR)	-0.05378 (-3.05)***	0.17670 (0.38)	-0.02592 (-0.28)	-0.08057 (-0.86)	0.16429 (0.67)
Adjusted R^2	0.912	0.096	0.738	0.775	0.694

Note: Values in parenthesis denote *t*-value.
*** Statistically significant at the 99 percent level.
** Statistically significant at the 95 percent level.
* Statistically significant at the 90 percent level.

the table, the β_1 coefficients during the pre- and the whole post-crisis periods are all

close to unity, and always statistically significant at the 99 percent level. The coefficients for the other two currencies are close to zero and not statistically significant. This result implies, as already known, that the actual exchange rate regime in Korea is a dollar peg during the post-crisis as well as during the pre-crisis period. Although β_2 during the post-crisis (JPY) is statistically significant, it is low (0.13977). The main result that the actual exchange rate regime after adopting a free-floating is still the dollar peg is the same as Mckinnon (2000).

However, if we divide the whole post-crisis period into two sub-periods, and then run the regression on each period, the results change. The regression results during the post-crisis I are very similar to those of the pre-crisis. But the results during post-crisis II are somewhat different. Although the β_1 coefficient of post-crisis II is still significant and the value seems to be close to unity, the value of β_1 (0.70313) is quite lower than before (1.01994 for pre-crisis, 1.05304 for post-crisis I). And β_2 for JPY is not only significant at the 99 percent level, but the magnitude (0.45752) is also considerably higher than that during the whole post-crisis or post-crisis I. The results indicate that even though the dollar is still a strong anchor currency, the exchange rate policy or regime after January 2001 is probably not what the exchange rate regime used to be.

Lastly, the won systematically and significantly depreciated against the

numeraire currency during the pre-crisis period, but the systematic depreciation is not significant any more after the crisis (see β_0 in the Model I).[26]

The second hypothesis test will show us whether the degree of dollar peg has changed or not. Using equation (2), I verify the second hypothesis: the degree of fixity to the dollar is the same during the post-crisis I and II as during the pre-crisis (H_0: $\beta_1 = 0$ or H_0: $\gamma_1 = 0$ in Model II). The coefficients on dummy variables and adjusted R^2 are provided in Table 5. The dollar coefficient β_1 and yen coefficient β_2 for the post-crisis I are not statistically significant, but γ_1 and γ_2 for the post-crisis II are statistically significant at the 99 percent level. Compared to other periods, the degree of fixity to the dollar value since January 2001 has statistically significantly decreased by 31.0 percent point. On the other hand, the fixity toward the yen has increased by a surprising 44.8 percent point.

Based on the results, I conclude that the dollar pegged exchange rate regime before January 2001 was just the same dollar standard that prevailed during the pre-crisis period. However, even though the dollar value is still important, the dollar bloc since January 2001 is not what is used to be. While the degree of fixity to the dollar is becoming lower, the degree of the yen peg is rising rapidly. This implies there may be a growing tendency toward a pure free-floating in exchange rate regime

[26] In the crisis period, β_2 coefficient is still close to one, but the adjusted R^2 (0.096) fall apart completely. It shows that exchange rates during the period were quite volatile.

since 2001.

Table 5. Results of Model II (Korea)

Coefficients	Value
β_0	-0.01515(-2.54)
α_1(USD)	1.01994(84.27)***
β_1(USD, D_1)	0.03300(1.03)
γ_1(USD, D_2)	-0.31002(-5.23)***
α_2(JPY)	0.00666(0.55)
β_2(JPY, D_1)	0.04691(1.90)*

Coefficients	Value
γ_2(JPY, D_2)	0.44820(10.39)***
α_3(EUR)	-0.05383(-2.50)**
β_3(EUR, D_1)	-0.02369(-0.34)
γ_3(EUR, D_2)	0.22165(1.64)
Adjusted R^2	0.874

Note: Values in parenthesis denote *t*-value.
D_1 is a dummy variable for the post-crisis I (Jul. 1999 – Dec. 2000), and D_2 for the post-crisis II (Jan. 2001 – June 15, 2001).
*** Statistically significant at the 99 percent level.
** Statistically significant at the 95 percent level.
* Statistically significant at the 90 percent level.

To compare those results with other East Asian countries, I run the same regression models for other countries: Indonesia, Philippines, Singapore, Taiwan, and Thailand. The results are provided in Table 6 and 7.[27] Although some countries have a significant β_2, USD coefficients (β_1) of pre- and whole post-crisis periods are strongly significant and close to unity for most countries. And all countries except Korea have statistically significant β_1 which exceeds 0.8 since January 2001. As we

[27] Refer to Appendix A C for results during the crisis period.

Table 6. Results of Model I (All Countries)

• Pre-crisis period: January 1994 – May 1997.

	Indonesia (IDR)	Korea (KRW)	Philippines (PHP)	Singapore (SGD)	Taiwan (TWD)	Thailand (THB)
β_0(Constant)	-0.01207 (-1.95)*	-0.01807 (-1.36)	0.00959 (0.89)	0.01376 (2.07)**	-0.00452 (-0.62)	0.00482 (0.45)
β_1 (USD)	1.01203 (74.9)***	0.99172 (57.0)***	0.95664 (40.9)***	0.81469 (56.3)***	0.95319 (60.3)***	0.87122 (37.7)***
β_2 (JPY)	-0.00763 (-0.63)	0.02208 (1.42)	-0.01341 (-0.64)	0.12115 (9.35)***	0.05820 (4.10)***	0.09838 (4.75)***
β_3 (EUR)	-0.04040 (-1.49)	-0.01695 (-0.48)	0.03976 (0.85)	0.02032 (0.70)	-0.01373 (-0.43)	-0.01825 (-0.39)
R^2	0.936	0.898	0.822	0.908	0.911	0.806

• Post-crisis period: January 1999 – June 15, 2001.

	Indonesia (IDR)	Korea (KRW)	Philippines (PHP)	Singapore (SGD)	Taiwan (TWD)	Thailand (THB)
β_0(Constant)	-0.04713 (-0.79)	-0.01167 (-0.63)	-0.04448 (-1.51)	-0.01086 (-1.12)	-0.00749 (-0.50)	-0.03088 (-1.50)
β_1 (USD)	0.96262 (8.24)***	0.96254 (26.6)***	0.95848 (16.7)***	0.82164 (43.4)***	0.94449 (32.6)***	0.81242 (20.3)***
β_2 (JPY)	0.26365 (3.19)***	0.13496 (5.26)***	0.09896 (2.44)**	0.12992 (9.73)***	0.01721 (0.84)	0.16267 (5.74)***
β_3 (EUR)	0.31633 (1.15)	0.02066 (0.24)	-0.08048 (-0.60)	0.10236 (2.31)**	0.09896 (1.45)	-0.01208 (-0.13)
R^2	0.231	0.709	0.47	0.872	0.748	0.61

• Post-crisis period II: January 2001 – June 15, 2001.

	Indonesia (IDR)	Korea (KRW)	Philippines (PHP)	Singapore (SGD)	Taiwan (TWD)	Thailand (THB)
β_0(Constant)	-0.14667 (-1.32)	0.00492 (0.10)	-0.02659 (-0.22)	-0.03050 (-1.57)	-0.03006 (-1.11)	-0.02502 (-0.82)
β_1 (USD)	1.24590 (5.19)***	0.70313 (6.49)***	1.09210 (4.17)***	0.81698 (19.6)***	0.94847 (16.3)***	0.81749 (12.5)***
β_2 (JPY)	0.24334 (1.43)	0.45752 (5.97)***	0.15235 (0.82)	0.19164 (6.48)***	0.03490 (0.84)	0.24133 (5.21)***
β_3 (EUR)	0.23456 (0.43)	0.16429 (0.67)	0.42205 (0.71)	0.12736 (1.34)	0.08337 (0.63)	-0.06202 (-0.42)
R^2	0.399	0.694	0.271	0.913	0.832	0.829

Note: Values in parenthesis denote *t*-value.
*** Statistically significant at the 99 percent level.
** Statistically significant at the 95 percent level.
* Statistically significant at the 90 percent level.

can see in Table 7, the degree of fixity to dollar value is the same during the post- as during the pre-crisis periods except Korea. Therefore, we cannot reject the null hypothesis II for other countries: H_0: $\beta_1 = 0$, or H_0: $\gamma_1 = 0$ in the Model II. It implies that although the value of yen is more important in exchange rate policy, the dollar pegged exchange rate regime in other East Asian countries is brought back to life after the crisis, and the degree of dollar bloc is the same even since January 2001.

Table 7. Results of Model II (All Countries)

• Period: January 1994 – June 15, 2001

	Indonesia	Korea	Philippines	Singapore	Taiwan	Thailand
β_0	-0.02724 (-1.07)	-0.01002 (-1.13)	-0.01402 (-1.01)	0.00365 (0.65)	-0.00567 (-0.75)	-0.00984 (-0.93)
α_1(USD)	1.01217 (13.97)***	0.99171 (39.11)***	0.95691 (24.25)***	0.81479 (51.02)***	0.95321 (44.26)***	0.87134 (28.80)***
β_1(USD, D_1)	-0.10819 (-0.98)	0.00901 (0.23)	-0.02513 (-1.42)	0.00409 (0.17)	-0.00991 (-0.30)	-0.06859 (-1.48)
γ_1(USD, D_2)	0.19448 (0.94)	-0.28352 (-3.89)***	0.13105 (1.16)	-0.00904 (-0.20)	-0.01275 (-0.21)	-0.05883 (-0.68)
α_2(JPY)	-0.00805 (-0.12)	0.02210 (0.97)	-0.01396 (-0.39)	0.12088 (8.45)***	0.05817 (3.02)***	0.09798 (3.62)***
β_2(JPY, D_1)	0.26665 (3.04)***	0.05394 (1.76)*	0.09928 (2.08)**	-0.00386 (-0.20)	-0.04512 (-1.73)*	0.04853 (1.33)
γ_2(JPY, D_2)	0.26807 (1.78)*	0.43344 (8.05)***	0.16806 (2.01)**	0.07553 (2.23)**	-0.01986 (-0.44)	0.14547 (2.27)**
α_3(EUR)	-0.04079 (-0.28)	-0.01693 (-0.33)	0.03901 (0.49)	0.02014 (0.63)	-0.01375 (-0.32)	-0.01846 (-0.30)
β_3(EUR, D_1)	0.43194 (1.76)*	0.02075 (0.24)	-0.17331 (-1.30)	0.09261 (1.71)*	0.12057 (1.65)*	0.03898 (0.38)
γ_3(EUR, D_2)	0.25434 (0.54)	0.18385 (1.11)	0.38083 (1.48)	0.10121 (0.97)	0.09283 (0.66)	-0.04623 (-0.23)
Adjusted R^2	0.371	0.811	0.623	0.892	0.84	0.709

Note: Values in parenthesis denote *t*-value.
D_1 is dummy variable for the post-crisis I (Jan. 1999 – Dec. 2000),
and D_2 for the post-crisis II (Jan. 2001 – June 15, 2001).
*** Statistically significant at the 99 percent level.
** Statistically significant at the 95 percent level.
* Statistically significant at the 90 percent level.

In summary, the dollar pegged exchange rate regime in East Asian countries has resurrected. However, the dollar peg in Korea has substantially changed since January 2001. Contrary to other East Asian countries, the effect of 1 percent change in the CHF/USD on the CHF/KRW decreases sharply from 1.02 percent to 0.70 percent (see Table 4). The degree of anchor to the dollar value has become statistically significantly different from other periods, and an influence of Japanese yen on exchange rate policy became more important. The very results are quite different from the previous studies including Mckinnon (2000). This signifies that the common view on the actual exchange rate regime in Korea is not reasonable any more since January 2001.

(1) Why Has the Dollar Pegged Exchange Rate Regime Resumed?

Then, although the pre-crisis dollar pegged exchange rate regime had been judged a failure (Jadresic, Masson and Mauro, 1999; Fisher, 1999; Ito, et al., 1998, etc.), why has the dollar peg resumed in Asian countries including Korea before January 2001? I will summarize several possible explanations for the status quo.

First, the conventional explanation for the dollar peg, not yen bloc, in this region is that, in spite of high linkage between Asian countries and Japan in trade and finance, the preponderance of dollar invoicing and dollar-denominated external assets and liabilities have not changed since the crisis (see Table 8 in the case of Korea). To

compete in the third market, they should give the dollar much higher weight than implied by simple bilateral trade with the U.S. (Frankel and Wei, 1994; Ryou and Kim, 2000; Mckinnon, 2000).

Table 8. Share (%) of the Yen-Denominated Transactions for Korea

		1996	1997	1998	1999	2000[1]
Region	Japan	16.9	15.2	12.9	15.2	15.7
	U.S.	19.6	18.4	19.2	20.6	20.1
Currency	JPY	8.0	7.6	7.3	9.4	9.2
	USD	84.9	85.5	86.0	83.2	82.4

Note: 1) Jan. 2000 – Aug. 2000 for currency.
Source: The Bank of Korea, *Monthly Bulletin*, May 2000.

Second, it may be a general tendency that many emerging market countries are sensitive to exchange rate fluctuation because the cost of the free-floating may be greater than the benefit. For example, the huge external liabilities denominated in foreign currencies, especially in the dollar, would raise the solvency problem if the value of domestic currency depreciates substantially. Therefore, the considerable external debt will hinder the adoption of the free-floating exchange rate regime. Calvo and Reinhart (2000a) called the phenomenon as the "fear of floating," and later Reinhart (2000) expressed the reasons as below:

> The root causes of the marked reluctance of emerging markets to float their exchange rates are multiple. … The fear of a collapse in exchange rate comes from pervasive liability dollarization, as in most emerging markets the debt of both the government and the private sector are largely denominated in hard currency. For this reason and others, devaluations in developing countries have a history of being associated with recessions, not export-led booms. …
>
> [Reinhart (2000), III. "Fear of Floating", p.69]

Third, it must be considered that the linkage to the dollar provides a common nominal anchor for domestic price levels in East Asia. Many emerging market countries may feel pains of a nominal anchor fragility during the transition period into a free-floating, and may strengthen exchange rate stability by direct and indirect interventions in foreign exchange market. An appropriate nominal anchor for the economy under the free-floating is to be chosen except for exchange rate, but the credibility of other macroeconomic policy objectives still remains questionable. In that case, the misalignments and/or short-term volatility of exchange rates are exacerbated by the market dynamics. (Chung and Yang, 2000; Mckinnon, 2000).[28]

Forth, the adoption of the free-floating exchange rate regime and active liberalization of capital and foreign exchange markets since the crisis has exposed the emerging market economies to external shock to a greater degree. This means the environment of their financial markets is rapidly integrating and globalizing. But as long as companies continue to act as they have done in the past with the fixed

[28] But, Mckinnon (2000) insisted that this nominal anchor argument is not suitable to explain high-frequency pegging, i.e., pegging on a daily exchange rates.

exchange rate regime, the free-floating exchange rate regime is not viable and appropriate. (Chung and Yang, 2000; Park, Chung and Wang, 1999). This is so because the external shocks under integrated international financial markets may immediately give rise to the volatility of domestic financial markets, and such volatility will cause losses from foreign exchange for companies (see Table 9). This will be exacerbated if there is a limited accessibility to the currency hedging markets, which is normal in the emerging markets.

Table 9. Foreign Exchange Gains and Losses of Korean Companies

(Unit: billion, Korean Won)

	1996	1997	1998	1999	2000
Profits from Exchange	2,133.3	17,781.1	27,102.2	11,959.3	9,430.8
Losses from Exchange	4,049.5	27,659.4	24,533.1	9,223.5	15,011.3
Profits & Losses	-1,916.2	-9,878.3	2,569.1	2,735.8	-5,580.5

Source: Bank of Korea, *Financial Statement Analyses*.

Fifth, according to Mckinnon's analysis (2000), no matter whether developing countries have imposed capital control (China or Malaysia) or not (Korea, Taiwan), high-frequency pegging is optimal when there is "original sin." [29] The incompleteness of financial markets is at the root of financial fragility. If the original sin is not fully overcome yet, and when capital controls are absent, an informal hedge

[29] The "original sin" implies the impossibility of the domestic currency to be used to borrow abroad or to borrow long term, even domestically, as well as the impossibility for domestic banks and firms to hedge their foreign exchange rate risk. See Eichengreen and Hausmann (1999) for details.

should be supplied by keeping the exchange rate stable in the short-term. The short-term maturity of foreign currency debts (mainly in dollars) and rapid roll-over on a high-frequency basis define the same time frame over which the dollar exchange rate should be kept steady in normal periods. With the rule of no net foreign exchange exposure, the government should determinate the exchange rate by acting as a stabilizing speculator. In that case, it is self-evident that the government keeps it steady.

Lastly, one of the several motivations for pegging is to reduce the risk premium in domestic short-term interest rates. The differential in short-term interest rates between developing countries and the U.S. has been much narrower than normal, and consequently "margin of temptation" not to hedge exchange rate risks has almost vanished. Mckinnon (2000) expressed this as the "honeymoon effect." The degree of the "margin of temptation" depends on the currency risk premium ($\rho_{currency}$) as normally defined. $\rho_{currency}$ during the pre-crisis period in emerging market economies was ordinary greater than zero, however it can be reduced toward zero if the value of domestic currency against the dollar has been credibly stabilized so that the volatility of interest rate also approach the U.S. level. Indeed, one reason why emerging market economies do not adopt the pure free-floating exchange rate regime since the crisis is to reduce the risk premium in domestic short-term interest rates, i.e.,

reduce $\rho_{currency}$ to minimize the "margin of temptation" to gamble and accept foreign currency deposits unhedged.[30]

(2) Why Has Korea Changed the De Facto Exchange Rate Regime Since Jan. 2001?

While other Asian countries (even Singapore and Taiwan) have kept the dollar pegged exchange rate regime since the crisis, why has Korea changed its operation of exchange rate policy since January 2001? β_1 for the East Asian countries in Model I during the post-crisis II is greater than 0.80 with the exception of Korea, and the sensitivity to yen (β_2) in Korea is almost twice as much as β_2 in other countries. On the assumption that the economic structure of Korea, especially the competitiveness with Japan, is not very different from those of other East Asian countries, I make three possible answers to the question.

First, these results may arise from the synchronization of Korean won with Japanese yen since November 2000. The synchronization has been obvious since November 2000, and is higher than that of other East Asian countries (see Table 10, and Figure 3). The phenomenon can be explained by three causes. First, the influence of changes in market expectation and external factors such as yen-dollar rate into won-dollar exchange rates is higher since adopting a free-floating and full

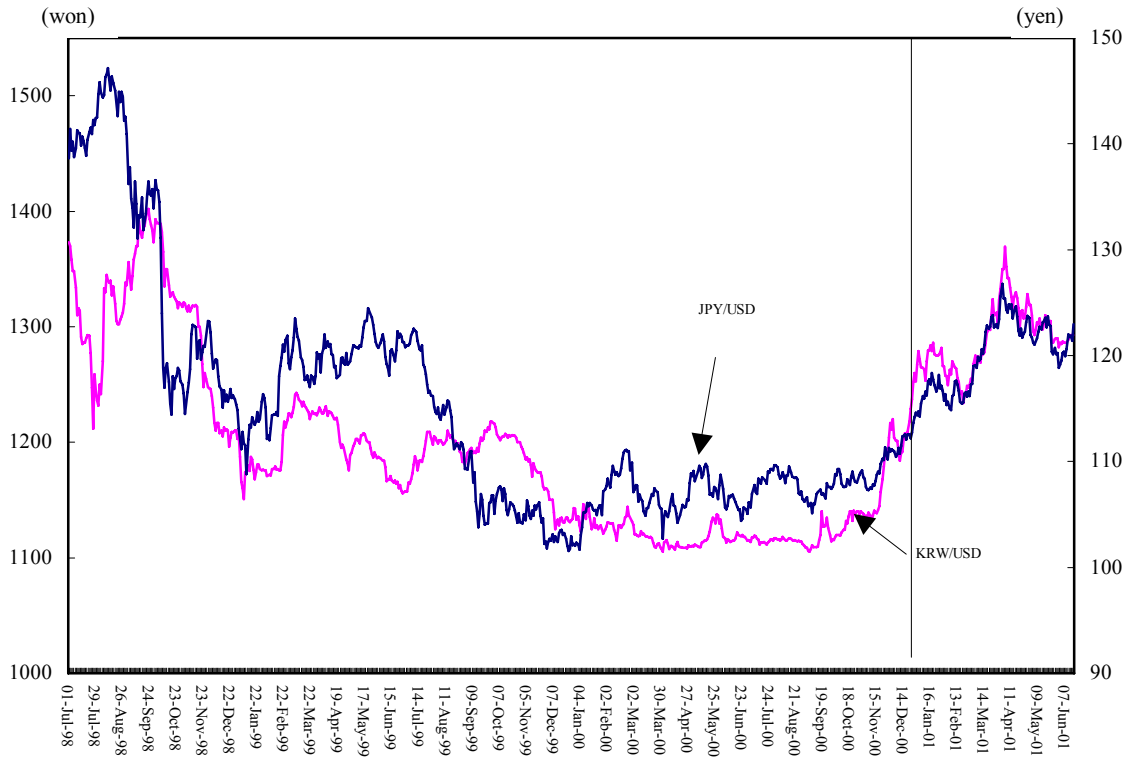
[30] Refer to Mckinnon (2000), p.p. 19-22 for details.

Table 10. The Synchronization of Local Currency with the Japanese Yen

	Nov. 6, 2000-Jan.15, 2001[1]		Jan. 15, 2001-Feb. 27, 2001[1]		Feb. 27, 2001-Mar. 30, 2001[1]	
	Sensitivity[2]	Correlation[3]	Sensitivity[2]	Correlation[3]	Sensitivity[2]	Correlation[3]
KRW	1.2	0.95	1.3	0.70	0.8	0.97
TWD	0.2	0.52	0.5	0.72	0.2	0.94
PHP	0.8	0.74	3.6	0.60	0.3	0.71
SGD	0.02	-0.48	-0.1	-0.15	0.5	0.92
THB	0.03	-0.39	0.6	0.69	0.7	0.94
IDR	0.3	0.57	-1.6	-0.40	0.8	0.87

Note: 1) The first period is depreciation of yen, the second stability, the third depreciation.
2) The depreciation (appreciation) rate of local currency ÷ dep. (app.) rate of yen.
3) The correlation coefficients between local currency and Japanese yen.
Source: Bank of Korea (2001b).

Figure 3. The Synchronization of Korean Won with Japanese Yen



liberalization.[31] Second, the differential between the Korean and the Japanese economy has decreased after the forth quarter of 2000, due to the rapid slowdown of the Korean economy. Lastly, the utilization of yen-dollar rates as a trading reference, instead of the index of Nasdaq, in foreign exchange market has started since Nov. 2000. (see BOK, 2001b). This synchronization might be the strongest factor to lead coefficient γ_2 on yen (γ_1 for dollar) in Model II to increase (decrease) sharply since January 2001.[32]

Then, what is the basic motivation to synchronization? Is it to keep the competition with Japanese products? In such a case, the exchange rate policy during the period of yen depreciation should be different from that during the period of yen appreciation. If the value of yen against the dollar goes down, the value of won against the dollar should go down. On the other hand, there should be no correlation between the won and the yen movement. That is, there must exist policy asymmetry in reaction to the yen-dollar exchange rate movements. I set another regression model (Model IV) to address the last question.

$$\%\Delta(\text{KRW/USD}) = \beta_0 + (\beta_1 + \gamma_1 D)\%\Delta(\text{JPY/USD}) + \varepsilon \quad \ldots\ldots. \qquad (4)$$

[31] For example, the market participants instantly expect to depreciate (appreciate) of won-dollar rate when the yen-dollar rate depreciated (appreciated).

[32] I also set the regression model to test how much the fluctuation of won-dollar exchange rate can be explained by the fluctuation of yen-dollar rate during the post-crisis II. The Model III is as below:

$$\%\Delta(\text{KRW/USD}) = \beta_0 + \beta_1\%\Delta(\text{JPY/USD}) + \varepsilon.$$

The results show that a 45.9 percent of the volatility of won-dollar rates (β_1) can be explained by the volatility of yen-dollar rates since Jan. 2001. And the adjusted R^2 rapidly increased to 0.227, compared with 0.004 during the post-crisis I (see the Appendix B for details).

where D = 1 if JPY depreciated against USD,
0 otherwise.

In this model, the coefficient (γ_1) on dummy variable D is 0.08115, and its t-value is only 0.88 (see the Appendix C). So, I cannot reject the null hypothesis that there is no policy asymmetry.[33] Thus, there is no evidence to argue that the recent co-movement of won and yen comes from the effort to maintain price competitiveness. Interestingly, it might imply that there was no artificial intervention to mange the value of Korean won against the Japanese yen. Furthermore, it may be considered as evidence that the actual exchange rate regime become closer to the pure free-floating.

Second, the results can be drawn from the change in monetary policy. Korea has changed her monetary policy framework from monetary targeting to inflation targeting since 1998. However, the policy has been closer to pure inflation targeting since the monetary aggregates changed from the intermediate targets to monitoring range, i.e., since January 2001[34] (BOK, 2001c). Mishkin (1999) classifies the monetary policy framework into 4 categories: exchange rate targeting, monetary targeting, inflation targeting and just-do-it approach. We can learn from his classification that the type of monetary policy has a large influence on the fluctuation of exchange rate. Inflation targeting is a framework of monetary policy

[33] I try to explain the asymmetry using the Model I equipped with same dummy variable, and using the Model IV with same time periods as the Table 13. The both results are the same as the above Model IV, except for γ_1 in the last model is statistically significant at the 90 percent level. (I do not report the results here.)

[34] IMF classified Korea's monetary policy framework into "Fund-supported or other monetary program", not inflation targeting framework, as of March 31, 2000 (IMF, 2000b).

characterized by an explicit commitment to conduct policies to meet a publicly announced numerical inflation targets (or target ranges) within a particular time horizon. And this policy implies the country do not need to be concerned about exchange rates as a nominal anchor, and can allow the flexibility of exchange rate movement.[35,36]

Lastly, the full capital and foreign exchange liberalization may be one of the driving forces for the change of the exchange rate regime. In the process of overcoming the economic crisis, the Korean government has eliminated almost all kinds of controls on capital and foreign exchange transactions. By January 2001, the government abolished all the remaining controls. Such full liberalization measure has forced the Korean government to be closed to the pure free-floating exchange rate regime, based on the "impossible trinity" argument. The development of foreign exchange market and the improvement of the national balance sheet can be considered as factors by which government may have been encouraged to adopt the full liberalization. As one indicator of the former, the daily turnover of foreign exchange markets increased rapidly. The daily turnover during the first and second quarter of

[35] Murray Sherwin (2000) insisted that the prerequisites for inflation targeting in small-open economy are a newly-opened capital account, a newly-floated exchange rate and newly-deregulated financial markets.

[36] In the case of Korea, excessive depreciation of won may give a negative effect on price stabilization under the inflation targeting. Therefore, the BOK is more concerned on the depreciation of the Korean won in time of the synchronization with the Japanese yen (see BOK, 2001b).

2001 increased by 12 percent and 33 percent respectively, compared to the corresponding periods in year 2000 (see Table 11). It was caused by not only the increasing demand for foreign exchange risk hedging and the transactions to cover NDF (non-delivery-forwards) positions, but also the active participation of domestic financial institutions as speculators in foreign exchange market (see BOK, 2001a). The net external assets since September 1999, which mounted up USD 34.8 billion at the end of June 2001, is indicating the improvement of the national balance sheet.[37] In summary, the full liberalization in capital and foreign exchange market as well as dealing successfully with the "original sin"[38] contributed to overcoming the "fear of floating."

Table 11. Trend of Daily Interbank Foreign Exchange Turnovers

(Unit: USD million)

1996	1997	1998	1999	2000	2001.1/4	2001.2/4
1,683	1,967	1,095	2,355	3,195	3,571	4,242

Source: Bank of Korea (2001a).

[37] Even though net external liabilities of private sector mounted up USD 43.3 billion may hinder from relaxing the degree of the dollar peg (see Mckinnon, 2000, p.18), this interference is based on the fact that a major portion of the liabilities is composed of trade-related credits guaranteed by real transactions.

[38] There may be debates on overcoming the original sin. If the sin is truly "original", then of course there is no escape (Mckinnon, 2000). However, I believe that compared with other East Asian countries, the large part of the sin in Korea might be overcome on the basis of the development of capital and foreign exchange markets, the success in restructuring, solving the maturity & currency mismatch and huge net external assets including foreign reserves.

V. CONCLUSION

After the Asian economic crisis in the late 1990s, the issue of choosing an appropriate exchange rate regime has been a matter of grave concern as the key to preventing the recurrence of the crisis, as well as to achieve sustainable economic growth. According to the "impossible trinity" and recommendation of the IMF, many East Asian countries including Korea has changed their exchange rate regime from the de facto dollar peg or the managed floating to the free-floating exchange rate regime. It was not until December 1997 that a Market Average Exchange Rate System (MARS) was shifted to the free-floating system in Korea. And almost all remaining restrictions on foreign exchange transactions was eliminated after the second stage of liberalization was took effect by the beginning of 2001.

However, the common view on actual exchange rate regime in East Asian countries is that the official labels are different from the actual. All studies on this issue from Park, Chung and Wang (1999) to Calvo and Reinhart (2000a) show us that the actual is still a managed floating or a dollar peg as in the pre-crisis period. Calvo and Reinhart (2000a) expressed this as the "fear of floating", and to use Mckinnon's words, after the crisis, the East Asian dollar standard resurrected.

This paper aims to test the common view on the actual exchange rate regime, especially since the second stage of foreign exchange liberalization in Korea (January

2001), using very simple but intuitive OLS regression models based on Frankel and Wei's work (1994). My regression results show that, firstly, East Asian countries including Korea have returned to the dollar peg or managed floating after the restoration from the crisis, as they did during the pre-crisis period. Possible interpretations are the preponderance of dollar invoicing, the fear of floating, suffering from nominal anchor fragility, not yet overcoming the original sin and the honeymoon effect.

Secondly, the results show that Korea has substantially changed her exchange rate regime since January 2001, but other countries, even Taiwan and Singapore, are still the same as before. The sensitivity to the dollar has statistically significantly decreased, but sensitivity to the yen is almost twice as much as those in other countries. This result might come from the synchronization of Korean won with Japanese yen from November 2000, changing the monetary policy framework from monetary targeting to the pure inflation targeting, and the full capital and foreign exchange liberalization.

But, this paper has some limitations in studying the issue of actual exchange rate regime. First, my strong support toward the free-floating might be invalid. If the free-floating is not an appropriate or a viable exchange rate regime for Korea, then the implications of the regression results might be different. The second limitation is

that I am not sure whether β_2 of post-crisis period II in Model I (0.45472) is optimal or not, that is to say, whether β_2 is decided by the market. Many scholars recommended that the ratio of Japanese yen must be increased in Asian countries' currency basket, and Korea has rapidly increasing the ratio. Therefore I think that it is a suitable time to study on optimal basket ratio of Japanese yen. The third limitation is that there might be a possibility of autocorrelation in the exchange rate data. If that's the case, we should pay special attention to the regression results and their implication.[39] Lastly, 6 months (January 2001-June 15, 2001) is not enough to assess policy changes, and, we continuously need to monitor how the exchange rate policy evolves.

[39] According to Ryoo (2000), and Ryou and Kim (2000), there might be a possibility of autocorrelation. To test first-order autocorrelation, I figure out the Durbin-Watson (DW) statistics, using the equation.

$$d = \sum_{t=2}^{t=n} (\hat{u}_t - \hat{u}_{t-1})^2 / \sum_{t=1}^{t=n} \hat{u}_t^2$$

The DW statistics for the model I during the pre-crisis, crisis, post-crisis period I & II in Korea are 2.10, 1,67, 1,84, 2.33, respectively. The statistics imply that we can not reject the null hypothesis ($H_0 : \rho = 0$), or sometimes the test is inconclusive. But there is still possible to be an autocorrelation in other countries.

APPENDIX A

Results of Model I During Crisis Period (All Countries).

• Crisis period: June 1997 – December 1998

	Indonesia (IDR)	Korea (KRW)	Philippines (PHP)	Singapore (SGD)	Taiwan (TWD)	Thailand (THB)
β_0(Constant)	-0.20992 (-0.95)	-0.05197 (-0.44)	-0.08862 (-1.30)	-0.03783 (-1.17)	-0.03654 (-1.23)	-0.08410 (-0.92)
β_1 (USD)	0.45365 (1.11)	1.10075 (5.06)***	0.80927 (6.39)***	0.60325 (10.0)***	0.82928 (14.9)***	0.57468 (3.34)***
β_2 (JPY)	0.59685 (2.49)**	0.10349 (0.82)	0.36363 (4.93)***	0.40386 (11.5)***	0.11512 (3.55)***	0.39006 (3.90)***
β_3 (EUR)	0.75941 (0.93)	0.07571 (0.17)	0.17372 (0.69)	0.27446 (2.30)**	0.24312 (2.21)**	0.64228 (1.89)*
R^2	0.027	0.095	0.224	0.514	0.532	0.126

Note: Values in parenthesis denote *t*-value.
R^2 denotes the adjusted R square.
*** Statistically significant at the 99 percent level.
** Statistically significant at the 95 percent level.
* Statistically significant at the 90 percent level.

APPENDIX B

Results of Model III (Korea).

• **Post-crisis period I: July 1999 - December 2000.**
Post-crisis period II: January 2001 - June 15, 2001.

Period	Post crisis I	Post-crisis II
β_0(Constant)	-0.02383 (-1.14)	0.01218 (0.24)
β_1(JPY/USD)	0.04756 (1.57)	0.45913 (5.90)***
Adjusted R^2	0.004	0.227

Note: Values in parenthesis denote *t*-value.
*** Statistically significant at the 99 percent level.
** Statistically significant at the 95 percent level.
* Statistically significant at the 90 percent level.

APPENDIX C

Results of Model IV (Korea).

• **Period: July 1999 - June 15, 2001.**

Coefficients	Value
β_0(Constant)	-0.000019(-0.01)
β_1(JPY/USD)	0.09634(1.86)*
γ_1(D*JPY/USD)	0.08115(0.88)
Adjusted R^2	0.036

Note: Values in parenthesis denote *t*-value.
D is dummy variable for the depreciation (D=1) or
appreciation (D=0) of Japanese yen against the U.S. dollar.
*** Statistically significant at the 99 percent level.
** Statistically significant at the 95 percent level.
* Statistically significant at the 90 percent level.

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