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# **Exchange Rate Arrangements in Asia: Do They Matter?**

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## **Abstract**

We examine the difference that various exchange rate arrangements can make toward stabilizing effective nominal and real exchange rates, with special attention to the Asian experience. It concludes that formal basket pegging is unlikely to be sustainable but can easily mimicked with country-specific pegs. Some practical solutions are offered to stabilize regional exchange rates.

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“It is neither possible nor desirable to specify one exchange rate regime to hold sway across Asia. The most that can be contemplated, in the medium run, is a sort of monetary framework for the region. The design of such an arrangement is of interest regardless of whether or not one views it as a possible transition to tighter monetary integration a la EMU.”

Jeffrey A. Frankel (2003)

## 1. Introduction

With few notable exceptions (China and Hong Kong), the Asian countries have long favored soft pegs, whether officially declared or implicit. Yet, the 1997-8 crisis has often been interpreted as vindication of the then-dominating two-corner solution in favor of either hard pegs or fully flexible exchange rates. Indeed, following the crisis, Malaysia has joined the ranks of strict pegs but the other Asian countries have officially moved to the other corner, official free floating. Is it the true story?

The conventional two-corner wisdom has been shattered by two developments. First, the collapse of Argentine’s currency board has shown that hard pegs are not unassailable. Second, the evidence provided by Calvo and Reinhart (2002), Levy-Yeyati and Sturzenegger (2002) and Reinhart and Rogoff (2004) shows that most countries are not willing to adopt extreme exchange rate regimes, especially the hard peg variety. While the continuing success of the three Asian pegs may seem to counter-balance the Argentinean case, are the other countries, the official free-floaters, disproving the fear of floating presumed to affect all but very few developed countries?

The early evidence is that the increase in volatility of the nominal exchange rates, which was expected with the regime shift to free floating, has not been large compared to the experiences of other floating currencies. The nominal exchange rates of the Thai baht and Korean won have been relatively more stable than the yen-dollar exchange rate, although volatility of the Indonesian rupiah has been four times higher than that of the yen. This observation has raised the suspicion that East Asian policymakers, in particular those of Thailand and Korea, have been intervening in the foreign exchange market. Indeed, there is some evidence that the authorities of the crisis countries have been engaged in heavy foreign exchange market operations to reduce volatility of the nominal exchange rate. It is unclear, however, whether they have had clear nominal exchange rate targets.

There is some debate about the exchange rate strategies actually followed by the Asian countries. Frankel (2003) and McKinnon (2000), for instance, consider that they have always been on a “dollar standard”. As they see it, this strategy has been suspended during the crisis years 1997 and 1998, but is now back in place. Another view, presented in Hernandez and Montiel (2001) is that, except for China, Hong Kong and Malaysia, the Asian countries have not resumed their pre-crisis implicit pegs. We revisit this evidence and conclude that both views are partly correct. We find that there has been little change

but that there never has been a generalized dollar standard. Still, the fact that three countries are now pegged to the US currency may prefigure the emergence of a dollar standard.

The next question is whether it matters and, if so, how? Certainly, the adoption of a peg provides an anchor for the conduct of monetary policy. Countries with poor inflation performance may find acceptable to harness monetary policy. In this respect, the harder is the peg the more credibility is earned, with beneficial effects on risk premia. Yet, explicit hard pegs create a risk of moral hazard: domestic borrowers in foreign currency underestimate the risks that they take. This is the implicit guarantee phenomenon. Interestingly, before the crisis, the Asian countries were often perceived as operating implicit pegs. The disadvantage of implicit pegs is that the credibility advantage is somewhat reduced, the advantage is that there should be a lesser perception of an implicit guarantee. This is not what has happened. Their pegs were highly credible almost till the onslaught of the crisis, while huge unhedged foreign currency borrowings have been explained by the misleading perception of the existence of an implicit guarantee. Importantly, most Asian countries did not, and still do not, need an external monetary anchor. Inflation has been generally low, backed by reasonably solid institutions.

Another role of nominal exchange rate pegs is to stabilize real exchange rates, particularly at the regional level. There is now mounting evidence that real exchange rate stability encourages trade (Rose, 2000) and that regional trade is a source of growth. Stabilizing regional nominal and real exchange rates is therefore an important policy objective. Indeed, there is evidence that the Asian countries have an interest in developing such an approach. McKinnon (2000) interprets the dollar standard as one way of stabilizing regional nominal exchange rates. Discussions that followed the Chiang Mai initiative indicate that Asian policymakers consider a deepening of monetary cooperation. Proposals, e.g. by Ito, Ogawa, and Sasaki (1998), Dornbusch and Park (1999) or Williamson (1999), that they consider adopting common basket pegs, testify to the interest in stabilizing nominal exchange rates.

In this paper we examine the difference that various arrangements can make toward stabilizing effective nominal and real exchange rates (Section 2). Section 3 then looks at the Asian experience with foreign exchange market interventions. The following section examines various forms of monetary arrangements, and concludes the formal basket pegging is unlikely to be sustainable. This lays the ground for a number of pragmatic proposals developed in the last section.

## **2. Exchange Rate Reaction Functions**

### **2.1. The Arithmetics of Exchange Rate Behavior**

We consider a region with  $N$  currencies, facing three major currencies, the dollar<sup>1</sup>, the yen and the euro. Using the dollar as the numeraire, we define the log of regional

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<sup>1</sup> In what follows, “dollar” means US dollar.

currency  $i$ 's exchange rate as  $e^i$  and the log of the dollar exchange rates of the yen and the euro as  $e^Y$  and  $e^\epsilon$ , respectively. The evolution of currency  $i$  is presumed to follow the following process:

$$(1) \quad de^i = c_{i1} + c_{i2}de^Y + c_{i3}de^\epsilon + u^i + \varepsilon^i$$

where  $\varepsilon^i$  is a random shock and  $u^i$  is a control “error” interpreted below. Equation (1) is interpreted here as a reaction function, which can take the form of an exchange rate rule or no rule at all if the exchange rate floats freely. When enforcing this rule, the authorities may decide to apply it strictly or not, i.e. a pegging policy may exhibit different degrees of softness. This is what  $u^i$  is meant to capture.

The currency can be pegged to any of the three major currencies, or to a basket, or it can be floating. For example, a dollar peg corresponds to  $c_{i1} = c_{i2} = c_{i3} = 0$  and a low variance of  $u^i$ ; a peg to the yen corresponds to  $c_{i2} = 0$  with  $V(u^i)$  low, while a float corresponds to  $c_{i2} = c_{i3} = 0$  but with a larger variance of  $u^i$ .<sup>2</sup>

Obviously, if we look at the bilateral exchange rate  $e^{ij}$  between two regional currencies  $i$  and  $j$ , we have:

$$(2) \quad de^{ij} = (c_{i1} - c_{j1}) + (c_{i2} - c_{j2})de^Y + (c_{i3} - c_{j3})de^\epsilon + u^i - u^j + \varepsilon^i - \varepsilon^j$$

This formulation makes it clear that the bilateral regional exchange rate can be stabilized if these two currencies adopt the same peg ( $c_{ik} = c_{jk}$ ) or float freely vis a vis the major currencies ( $c_{ik} = 0$  for  $k > 1$  and  $c_{i1} = c_{j1}$ , with  $u^i$  and  $u^j$  highly correlated).

## 2.2. Estimation procedure

Before estimating (1) we need to formalize the tightness of the regime as captured by  $u^i$ . We assume that if the peg is tight, the central bank will promptly move to correct any past discrepancy between the exchange rate change  $de^i$  and its rule  $c_{i2}de^Y + c_{i3}de^\epsilon$ , i.e. we assume:

$$(3) \quad u^i = c_{4i}[(de^i(-1) - c_{i1} - c_{i2}de^Y(-1) + c_{i3}de^\epsilon(-1))]$$

We expect  $c_{4i}$  to be negative. This form of partial adjustment could be reformulated in a number of ways but two observations are in order. First, we cannot adopt an error correction mechanism as long as we deal with nominal exchange rates. Doing so would require a long-run relationship among nominal exchange rates, which would assume that

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<sup>2</sup> For a similar strategy, see McKinnon (2000). Hernandez and Montiel (2001) correctly note that in McKinnon(2000) the coefficient restrictions do not allow to separate out a dollar peg from a free float. This criticism does not apply here. Reinhart and Rogoff (2004) and Levy-Yeyati and Sturzenegger (2002) adopt some very different strategies to classify exchange rate regimes, which is not the purpose of this paper.

the pegs cannot be adjusted in the steady state. The correct error correction formulation requires dealing with real exchange rates, which means dealing with price dynamics, a complexity that we wish to avoid here.

Second, the right-hand side variables, the euro and yen exchange rates  $e^Y$  and  $e^\epsilon$ , cannot be considered as exogenous. To that effect we need to use an instrument variable estimation procedure. In addition, the shock variables  $\varepsilon^i$  are not necessarily independent from each other, i.e. we cannot assume  $\text{cov}(\varepsilon^i, \varepsilon^j) = 0$ . This requires that we estimate all exchange rates simultaneously as a system.

The estimation procedure adopted here is 3SLS. The instruments are twelve lags of all the dollar exchange rate changes:  $de^i(t-i)$ ,  $de^Y(t-i)$ ,  $de^\epsilon(t-i)$ , for  $i = 1, 12$ .

### 2.3. The Asian Experience

We estimate (1) using (3) for eight Asian currencies, using monthly data. We start first with the whole period 1973:1-2004:4. In contrast to previous studies, we use the market exchange rates provided by Reinhart and Rogoff (2004). These rates may differ from the official rates usually reported. Unfortunately, these series stop in 2002:12; we extend them to 2004:4 using the exchange rates provided in *International Financial Statistics*. We estimate the eight exchange rate equations as a system in order to take into account cross-section correlations and potential heteroskedasticity in the error terms. The instruments are twelve lags of all the variables.

Table 1 presents the results. For each country we report the estimated coefficients and their marginal significance levels (p-values) underneath. The estimates which are significant at the 5% confidence level are shown in bold. While the coefficient estimates change little with the estimating procedure, the p-values sometimes differ. When in doubt, we rely on the 3SLS results, which instrument the yen and euro exchange rates. Two countries (Malaysia and Singapore) appear to have followed a basket peg, with significantly positive coefficients on both the yen and euro exchange rates ( $c_{2i} > 0$  and  $c_{3i} > 0$ ),  $c_{1i}$  not significantly different from zero and a correctly signed partial adjustment coefficient ( $c_{4i} < 0$ ). Hong Kong is surprisingly found to be on a euro-dollar basket, Thailand pegged to dollar and the Philippines marginally crawling vis a vis the dollar. China, Indonesia and Korea display wrongly signed adjustment coefficients.

Table 1. Exchange rate equations – Whole sample: 1973:1-2004:4

These results cover the whole available sample, including the 1997-8 crisis. Has the crisis affected the situation? There is some controversy as to what happened afterwards. McKinnon claims that the Asian countries have returned to the “dollar standard” while Hernandez and Montiel (2001) find a return to the pre-crisis situation. Figure 1, which reports the residuals of the estimated equations, suggests a more diversified picture. The crisis is very visible in the affected countries (Indonesia, Korea, Malaysia, the Philippines, Thailand) and less so in Singapore. It is not seen in the data for China and Hong Kong: in these countries there are clear, earlier regime shifts: China fixed to the

dollar in 1995 after its currency unification reform, and Hong Kong adopted the currency board arrangement in October 1983. To the naked eye, the post-crisis situation is different for Indonesia and Thailand, where the residuals seem more variable than before the crisis, and maybe for Korea. The situation has also changed in Malaysia where the residual is considerably more stable, reflecting the peg at 4 ringit in September 1998.

Figure 1. Residuals from Table 1

Accordingly, we repeat the procedure for two samples: before the crisis (1973:1 to 1996:12) and after the crisis (1999:1-2004:4). Table 2 shows that the results for the pre-crisis period are nearly identical to those that correspond to the whole sample.<sup>3</sup> They do not fully confirm the view that the Asian countries were all on a dollar standard (see e.g. McKinnon (2000) or Frankel (2003)). For instance, until it adopted the currency board arrangement vis a vis the dollar, Hong Kong is found to have followed a basket peg vis a vis the dollar and the yen.

Table 2. Exchange rate equations – Pre-crisis sample: 1973:1-1996:12

The post crisis results are reported in Table 3. For the sake of comparison, we still include the three fixed exchange rate countries, China, Hong Kong and Malaysia, with unsurprising results. Of the other countries, only Indonesia is found to peg to the dollar, but the adjustment coefficient is only statistically significant at the 10% confidence level and the R<sup>2</sup> is low, suggesting a very soft peg. As before, the results suggest that the Korea won is on managed float – the adjustment coefficient is still wrongly signed and the R<sup>2</sup> is low – with some indication of a dollar-yen basket. The same applies to the case of the Philippines, where the adjustment coefficient is correctly signed but low, except that the reference is the dollar. Only two countries, Singapore and Thailand, seem to be on peg, but to a dollar-yen-yen peg, not just to the dollar.

Table 3. Exchange rate equations – Post-crisis sample: 1999:1-2004:4

Our results largely confirm and complete those of Hernandez and Montiel (2001) in the sense that they disprove McKinnon's (2000) view of a dollar standard. On the other hand, they support McKinnon in the sense that there is little change from the pre-crisis period, the only exception being the tight peg adopted by Malaysia.<sup>4</sup> They also conform to the visual impression gleaned from Figure 1.

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<sup>3</sup> We have experimented with dummy variables to account for the regime changes in China and Hong Kong. The results change little. For these two currencies, as expected, the partial adjustment coefficient rises considerably and the weights on the yen and the euro decline.

<sup>4</sup> Estimating the system for the whole sample period using crisis and post-crisis dummies confirms these results.

### **3. Foreign Exchange Market Intervention**

#### **3.1. Evidence and Degree of Intervention**

Another way of examining the authorities' intention is to look at foreign exchange market interventions. Prima facie evidence of market intervention is, of course, the massive accumulation of foreign exchange reserves. The level of reserves shot up to 36 percent of GDP in Malaysia (highest) and 18 and 17 percent both in Indonesia and the Philippines (lowest), respectively, in 2002 from a 1997 average of 11 percent of the five East Asian countries (see Table 4) and was more than twice as large as the volume of short-term foreign debt in 2001 except for Indonesia (see Table 5). Between 1998 and 2003 all five countries recorded large surpluses in their current accounts. Malaysia leads the group by accumulating a surplus equivalent to 13 percent of its GDP in 2003, followed by Thailand, the Philippines, and 4.4 percent of Korea (see Table 6).

Following the crisis, had the authorities refrained from market intervention, the nominal exchange rates would have appreciated much more than they have, and their export competitiveness would have suffered, possibly choking off the recovery from the crisis. This possibility may have led to reserve accumulation by running current account surpluses, which may have in turn required stabilizing a nominal or real effective exchange rate below an equilibrium level.

Table 4. Gross International Reserves as of GDP (%)

Table 5. Short-Term External Debt as of GIR(Gross International Reserve)

Table 6. Current Account Balance as of GDP

Measures of market intervention developed by Bayoumi and Eichengreen (1998) and Glick and Wihlborg (1997) indicate similar developments. As shown by Park and Song (2001), the two indices of market intervention hardly changed between the two different exchange rate regimes in the four crisis Countries. Park, Chung, and Wang (2001), using intra-day data over the 10 days from September 10 to 20 in 1999, show that large changes in the nominal exchange rate disappeared within a few minutes. Unlike in other free-floating regimes, intra-day exchange rate movements in Korea did not show any volatility clustering, indicating that the Korean authorities were actively smoothing out large changes in the nominal exchange rate.

This paper also follows the method used by Calvo and Reinhart (2000) to examine the extend to which policy authorities of East Asian countries have intervened in the foreign exchange market to stabilize either the nominal or nominal effective exchange rate. For this purpose, this paper estimates the probabilities of staying within a predetermined band of the two variables – the nominal exchange rate and foreign exchange reserves. The band is chosen instead of the standard deviation in order to reduce the effects of the outliers of the two variables.

The sample period runs from January 1994 to January 2004, which is divided into the pre- and post-crisis sub- periods. This study uses the daily exchange rates from the

Bloomberg and the monthly data on the reserves from the IFS. As for the nominal exchange rate, this paper limits the band of fluctuations to  $\pm 0.25$  percent, whereas the band for the level of reserves is somewhat larger at  $\pm 2.5$  percent. In our estimation, the log differences of the nominal exchange rate and the level of reserves are used.

In general, in countries with a free floating system, it is expected: (i) the probability of the exchange rate staying within the band is relatively low; and (ii) the probability of the level of reserves remaining within the predetermined band, other things being equal, would be high. In East Asia, if policy authorities have not manipulated the exchange rate as much as they did before the crisis, one would expect to observe a decrease in the probability of the exchange rate to go out of the band and an increase in the probability of the reserves to remain within the bands since the crisis.<sup>5</sup>

In the five East Asian countries – Indonesia, Korea, the Philippines, Singapore, and Thailand – the probability of the daily exchange rate to stay within the bound of  $\pm 0.25$  percent declined substantially during the post-crisis period (see Table 7). However, compared to those of Australia, New Zealand, and Japan, the probabilities of the five East Asian countries are still high, suggesting that the authorities have intervened more extensively in the foreign exchange market than those of other free floating economies. This evidence of more extensive intervention is not necessarily supported by their reserve management. In all five countries, the probability of the level of reserves staying within the  $\pm 2.5$  percent increased during the post crisis period as is expected in more flexible exchange rate regimes (see Table 7). This result is not surprising in view of the fact that the five East Asian countries have been sterilizing continuously surpluses from both the current and capital account so that they could avoid real appreciation of their currencies.

Table 7. Foreign Exchange Market Intervention in East Asia

### 3.2. Objectives of Intervention

Park, Chung, and Wang (2001) also examine the extent to which East Asian policy authorities intervened in the foreign exchange market before and after the crisis in terms of the method used by Calvo and Reinhart(2002). These pieces of evidence confirm that like many other emerging market economies, Korea, Thailand, Indonesia, and the Philippines have moved to “the hollow middle” of the exchange rate spectrum – intermediate exchange rate regimes – although they are officially classified as floaters. In general, the objectives of the market intervention are known to be: stabilization of high-frequency exchange rate movements, and stabilization of the nominal or real effective

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<sup>5</sup> Instead of reserve intervention, policy authorities may rely on interest rate policy to achieve objectives of intervention. However, monetary policy is in general reserved for inflation targeting or domestic demand expansion. Furthermore, capital account transactions are still subject to a relatively higher degree of control in our sample countries. This study also estimated the probabilities of monthly short-term interest rates (the 90-day interbank rate) to be within a  $\pm 2.0$  percent band. Our results show that there is little change in the probabilities before and after the crisis.



exchange rates. In what follows, this section attempts to identify the objectives that have led to the intervention in East Asia.

### **3.2.1 Smoothing-out Operation**

Smoothing-out operations for high frequency exchange rate movements may be necessary after a crisis to stabilize market expectations, as they could help market participants establish their expectations on future movements of both the real and nominal exchange rates by minimizing the effect of noise trading (Hernandez and Montiel, 2001).

If moderating volatility of the nominal exchange rate is the main objective, then Hernandez and Montiel (2001) argue that the exchange rate smoothing would lead to substantial fluctuations in the stock of foreign reserves and domestic interest rates. However, they do not find any evidence that the four East Asian countries have used their reserves as an instrument of smoothing-out operations; instead, the stocks of reserves have exhibited a systematic tendency to increase over time in all four countries<sup>6</sup>. According to Hernandez and Montiel, the interest rate volatility decreased in the post crisis relative to the pre-crisis period in Korea and Thailand whereas it rose in Indonesia and the Philippines. The evidence is therefore not conclusive as to whether the authorities of these countries were intervening in domestic securities market to stabilize their nominal exchange rates or for other purposes. If either the reserve or domestic securities market intervention was not for the smoothing-out operations, then the logical conclusion is that capital controls may have been the most frequently used instrument of intervention in these economies.

### **3.2.2 Stabilizing the Nominal Effective Exchange Rate (NEER)**

If trade integration is part of the motivation for exchange market interventions, the concern should be about stabilizing the bilateral dollar exchange rates. This can be achieved indirectly via an external peg, as noted in Section 2.1. Following the formalization in that section, we now examine whether the Asian countries have used their external anchors, when they were actually pegging, in order to stabilize their bilateral nominal rates.

The formal test of whether they adopted a common strategy is:

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<sup>6</sup> Baig (2001) also finds similar evidence. Surprisingly, the volatility of foreign exchange reserves has declined substantially during the post-crisis period in Korea. The Korean authorities, it appears, have not resorted to the use of reserves to moderate the movements of the nominal exchange rate. Instead, they have relied on a few state-owned banks to intervene in the market, using their own holdings of foreign exchange, which are not counted as part of the central bank foreign reserves. If their interventions were not effective, the Korean authorities made it known that they would step in through sterilized intervention to reduce instability in the foreign exchange market. When the yen depreciation recently led to a parallel depreciation of the Korean won, the central bank was able to clamp down the market by simply announcing their intention of conducting sterilized intervention.

$c_{ik} = c_{jk}$  and  $\text{corr}(u_i, u_j)$  high

Table 8 presents the Wald tests corresponding to the first condition, based on the 3SLS estimators. The restriction that all the coefficients are the same (last row) is rejected for both the pre- and post-crisis periods. In the pre-crisis period, the restriction is not rejected for the coefficients corresponding to the yen and the euro, but the hypothesis that the constant terms are equal (either a dollar peg or common float) is strongly rejected. The situation is different for the post-crisis period. The hypothesis that all coefficients are the same is rejected, but this is due to the yen and euro coefficients. The constant terms are not statistically different. Given the previous results shown in Tables 2 and 3, this change suggests that the dollar peg, partly predominating, has contributed to stabilize the bilateral exchange rates after the crisis.

Table 8. Stabilization of bilateral exchange rates: Marginal Significance of Coefficient Equality (3SLS)

Table 9 reports the correlations between the adjustment terms  $u_i$  computed as in (3). For each subperiod we report results obtained using the SUR (lower triangle) and 3SLS (upper triangle) estimates, which are nearly identical. These correlations are meant to capture whether the soft peg or managed float rates have been coordinated among the Asian countries. Over the pre-crisis periods, the correlations are generally low, although positive. The situation is very different over the post-crisis period. Clearly, the correlations concerning strict dollar peggers, China, Hong Kong and Malaysia, are nil, simply because there is no adjustment as the exchange rate is not allowed to wander from the chosen parity. In the case of the other currencies, the correlation coefficients are larger. This suggests that, even though Korea, the Philippines, Singapore and Thailand may have adopted different anchors, they have not been strictly pegging and used the resulting margin of flexibility to stabilize their bilateral rates.

Table 9. Stabilization of bilateral exchange rates: Correlation of adjustment terms

These results broadly confirm the suggestion by Hernandez and Montiel (2001) that Indonesia, Korea, the Philippines and Thailand may have preferred a basket peg to a U.S. dollar peg because, as their trade with the U.S. has declined in importance, they may want to use the nominal effective exchange rate as a nominal anchor.

### 3.2.3 Stabilizing the Real Effective Exchange Rate (REER)

For decades, the East Asia countries have followed export-led development strategies and are likely to continue to do so. This explains why Asian policymakers may have intervened in the foreign exchange market to stabilize their real effective exchange rates. The real effective exchange rates of Korea, Malaysia, the Philippines, and Thailand displayed greater stability in the post-crisis compared to the pre-crisis period, Indonesia being the only exception. Have the authorities of these countries been engaged in managing the NEER to offset variability in the ratio of domestic to weighted trade-

partners' price levels-one of the two component series of the REER- to stabilize the real effective exchange rate?

In five countries there was a substantial decrease in variability of the relative prices (see Table 10), which explains the stability of the REER. Even in Indonesia, given the large size of the pre-crisis covariance between the NEER and the relative prices, it appears that the authorities were able to offset to some extent a high degree of variability of the relative prices by adjusting the NEER in the pre-crisis period, but they have not done so in the subsequent period. Indeed, the sharp decrease in the value of the covariance in the post-crisis period in all five countries suggests that the stability of the relative prices reduced the need to smooth out changes in the nominal effective exchanges, if the objective of intervention were to stabilize the real effective exchange rate.

Table 10. Log Variances of the component series of REERs

### **3.2.4 Fear of Depreciation or Appreciation?**

As documented by many authors, the massive exchange rate depreciations in the five Asian crisis countries drove many firms and financial institutions to insolvency because of the currency and maturity mismatches in their balance sheets. Given this traumatic experience, the fear of depreciation may have influenced exchange rate policies of these countries. Since practically all of their foreign liabilities are denominated in U.S. dollars, the fear of depreciation, if indeed there was one, should have called for more exchange rates appreciation vis a vis the dollar in the post-crisis period. This observation is confirmed by the large increases in foreign reserves.<sup>7</sup>

On the contrary, these countries appear to have restrained the appreciation of their real effective exchange rates to speed up the recovery from the 1997-98 crisis and, maybe, to prevent future crises. The sharp nominal and real depreciation immediately after the crisis improved export competitiveness. With depressed domestic demand, the increase in exports resulted in large current account surpluses and foreign reserves in all five countries. The relative prices in these countries have remained relatively stable after the crisis, reducing the need for adjustment of the NEERs to stabilize the REERs.

## **4. Regional Currency Arrangements**

### **4.1. The Departure Point**

The evidence presented above strongly supports the view that many Asian countries do not want to go to the corners. Since the crisis, China and Malaysia have joined Hong Kong in completely stabilizing their dollar exchange rates but they have done so informally and – reasonably – China and Malaysia rely on extensive restrictions to capital mobility while Hong Kong has abandoned the monetary policy instrument. China and

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<sup>7</sup> Monetary policy was tightened in the midst of recession in Thailand in 2000 in order to slow down depreciation of the baht by attracting capital inflows (see Bhanupong 2002).

Malaysia's policies are not sustainable; eventually, these countries are likely to leave the hard peg corner and move to the soft middle where all the other countries in the region stand. Our interpretation is that the general *de facto* rejection of the free float, even though it is the official regime elsewhere, has nothing to do with the objective of adopting a monetary anchor to discipline the monetary authorities, but is driven by the desire to stabilize the real effective exchange rate.

## **4.2. Basket Pegs**

Assuming that these preferences are deeply held, the question is: what is the best way of achieving the objective of stabilizing real effective exchange rate? This question raises a number of interesting issues: what is the effective rate that ought to be stabilized? What should be the anchor? How much coordination is desirable? And, given the answers to the previous questions, what is the appropriate mechanism? In a very general way, the issue is whether the Asian countries should jointly undertake to adopt one variety or another of a basket peg and, if so, how much should they coordinate.

Pegging to a basket may reduce exchange rate volatility in the short-run and prevent misalignment in the long run. For the region as a whole, the system could insulate it from fluctuations in the value of the dollar vis-à-vis other major currencies, in particular from the impact of variability of the dollar/yen exchange rate. It could also lead to stability of regional bilateral nominal and real effective exchange rates, moderating large changes in international price competitiveness.

### **4.2.1 A Dollar Standard**

A special basket assigns a weight of 100% to the U.S. dollar. McKinnon (2000) correctly notes that most exports are invoiced in dollars, which means that trade weights may be misleading. Along with the observation that competition in third markets matter a lot, this leads McKinnon to recommend a dollar link. A dollar link has the merit of providing for full stabilization of regional bilateral rates, in contrast with country-specific basket pegs. It could provide Asian countries with a better chance of maintaining price stability as the peg reduces the degree of pass-through of exchange rate changes into their domestic prices. Pegging to the dollar also lowers the risk involved in foreign payments, which is a non-negligible advantage since the bulk of the region's external borrowings are short-term and denominated in dollars.

Yet, based on the recent experience, many countries are clearly reluctant to adopt a dollar peg, or a yen peg that would have the same regional stabilizing effect. As the European experience suggests, monetary integration is essentially a political process. Whatever the economic merits of using another currency as region's monetary anchor, few countries, in particular Japan and China, will be able to accept the dollar as their currency.

### **4.2.2 Common vs. Own Baskets**

An alternative that is politically less demanding is to adopt a basket peg. The natural candidate currencies for such a basket are the U.S. dollar, the yen and the euro, assuming that Japan is not part of the arrangement, an issue that we consider below. A question that

is sometimes debated is whether the basket should be commonly agreed upon or whether each country should adopt its own basket. As we shall show, this is essentially a non-issue.

Presumably, the weights reflect trading patterns. But there are many ways of defining these patterns. The export-led strategy points to assigning weights according to the share of exports. Concerns with foreign currency liabilities suggest instead to consider the origin of imports. The predominance of invoicing in dollar suggests that the correct measure is the pattern of trade invoicing. Alternatively, concern with currency exposure would look at liability stocks, even though these liabilities could be endogenous to the exchange rate arrangement. In what follows, we use export weights.

A commonly agreed-upon basket would fully stabilize regional bilateral exchange rates as well as limit fluctuations vis a vis the major currencies. Given the importance of intra-regional trade, this is a clear advantage but how important is it in practice? Figure 2 suggests that it does not really matter for the Korean won, but the same applies to the other Asian currencies as well. The top panel shows the counterfactual evolution of the won vis a vis the dollar since 1973 (normalized to the January 1973 starting value) based on two sets of export weights: the common basket simulation attributes weights to the dollar, the yen and the euro according to total joint exports of eight Asian countries, while the country-specific basket uses Korea's own export shares. Since the trade weights are not very different – and the same applies to the other countries – the simulated exchange rates are very close. The effect on the effective exchange rate of the won is even smaller: the lower panel shows that it never exceeds 0.2%. This simply reflects that, when all Asian countries adopt similar baskets, their exchange rates move very much together. As weighted averages of the other Asian countries' exchange rates and of the basket currencies, effective exchange rates are obviously highly correlated. If there is any importance in the choice of a common basket or of home-made baskets, it does not concern the economic aspects.

Figure 2. Counterfactual Simulation of a Korean Basket Peg

#### 4.2.3 Hard vs. Soft Pegs

Two versions of basket pegging have been proposed. The first is a soft version, mostly advocated by Japanese economists. It calls for a loose stabilization of each currency vis a vis currency baskets consisting of the U.S. dollar, the euro, and the yen.<sup>8</sup> The second version is advocated by Williamson (2000); it calls for a common basket of the three same currencies but it aims at a formal peg, including intermediate regimes and a currency board. Furthermore, in this scheme, the participating countries use the basket as a common unit of account in their conduct of exchange rate policy.

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<sup>8</sup> See Kawai (2002) and Ito (2001)

The issue is clearly about the monetary policy implications. In the short run, given that the ratio between domestic and weighted trade-partners' price indices tend to be stable in most of the Asian countries, targeting the nominal exchange rate calls for the monetary authorities to conduct sterilized interventions. This may also require resorting to capital controls if the peg is on the hard side. Indeed, in small economies with an open capital account, it is impossible to simultaneously target the exchange rate and inflation. As a result, exchange rate targeting means that monetary policy cannot be assigned to stabilizing the domestic economy, thereby introducing monetary instability, possibly including a high degree of volatility of the domestic real interest rate. This instability is likely to affect the real sector of the economy, resulting in output volatility.<sup>9</sup> In addition, sterilized interventions can be expensive, because the interest rate on local-currency bonds issued for sterilization is typically higher than that on foreign exchange reserves.

Since, in most Asian countries monetary policy is by far the most reliable instrument for stabilization of the domestic economy, it is difficult to imagine that the monetary authorities would assign monetary policy solely to stabilizing the nominal effective exchange rates. Further liberalization of capital markets and capital account transactions is likely to increase the potential for volatility. As Williamson (2000) points out, neither the sterilized intervention nor monetary policy is powerful enough to assure exchange rate stabilization. Does it mean that capital controls will have to be used? This would open up a new debate on the modality as well as effectiveness of capital control, on which there currently is little agreement in Asia.

In view of these arguments, any commonly agreed shift to a basket peg is likely to be of the soft variety, possibly including no formal move but *de facto* cooperation.

#### **4.2.4 A Regional Monetary System**

From the perspective of laying the foundation for monetary integration in East Asia, the critical defect of the basket system is that the three major currencies, in particular the yen, are not part of the exchange rate arrangement. There is not, and will not be in the future, any commitment on the part of the central banks of the basket three currencies to support East Asian basket pegs. In the absence of such a commitment, the basket approach, even with the CMI financing scheme, would not be able to withstand determined speculation.

Another option for a collective exchange rate regime for East Asia is a replication of the EMS, which could include Japan. In a counterfactual exercise for the Korean won, for example, Wyplosz (2003) shows that an Asian Monetary system (AMS) is as effective as pegging to a common basket in stabilizing the bilateral exchange rates of the regional currencies. The AMS has some interesting advantages. Its members could manage common dollar and euro exchange rates. The system fosters cooperation in monetary policy and other financial matters. Most importantly, following the EMS example, the AMS members could make commitments to mutual, possibly unlimited, support; this

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<sup>9</sup> Kawai and Takagi (2000) argue that an inflation target defined as a weighted average of inflation rates of the U.S., EU and Japan and pegging to a basket of the dollar, the Euro, and the yen are one and the same, if PPP holds

would strengthen the system's credibility and facilitate realignments of bilateral exchange rates of the participating countries by consensus.

There are some caveats and disadvantages too. The EMS has been prone to currency crises, especially when demand and supply shocks were asymmetric as in the early 1980s and in 1992-93. One should also realize that Europe has gone through various steps and experimented with different exchange rate arrangements, ranging from managed floating vis-a vis the U.S. dollar, to a sequence of collective pegging arrangements, and to the Snake before settling on the EMS. By that time, many of the institutions necessary for a successful pegging arrangement such as the surveillance and financing mechanism were in place. Finally, the EMS was sustainable as long as it was embedded with capital controls in the weak currency countries.

Is the EMS a possible blueprint for Asia? It may appeal to policymakers simply because they could be guided by the evolution and management of the EMS in taking the steps necessary to replicate the system in Asia. Beyond that, for three main reasons, it is quite unlikely to be an attractive option. First, the EMS involved unlimited mutual support. At this stage, the limited amount of financing available through the CMI financing arrangement is far too small. It hardly sends a message to the market that any speculative attempt at any one currency from the others in the region is going to fail. Second, the liberalization of capital flows in Europe occurred after the EMS had been in place for more than a decade. When, due to high capital mobility, it became difficult to maintain exchange rate parities, all that was needed was to accelerate the process toward full monetary integration. Such a process is currently not an option in Asia. Finally, European currencies were pegged bilaterally to each other, but floated jointly vis a vis the rest of the world. Should a significant number of Asian countries adopt this strategy, they would be unlikely to sustain the export-led strategy. Either the exchange rates would jointly float, both up and down or, given the economic weight of the EMS countries, attempts to manage the external parities would quickly meet strong resistance from the G7 and the IMF. This would likely signal the end of the export-led strategy for the region.

For all these reasons, a regional monetary system is not likely to be adopted in Asia.

### **4.3. Institutions for Regional Exchange Rate Arrangements**

#### **4.3.1 Composition of baskets**

We have so far considered that an external basket would include the dollar, the yen and the euro, currently the three most significant world currencies. This should not be a foregone conclusion, though. Should not Japan join the other Asian countries on an equal footing? Should not the renminbi be considered as the next fourth significant world currency?

Japan

Given the fragility of any peg arrangement, and since neither the Federal Reserve nor the ECB will accept any commitment to an Asian arrangement, some Japanese support

would be crucially helpful. But is Japan prepared to intervene to support the other Asian countries' pegs? Japan is expected to play a key role in steering Asian financial and monetary integration, but such a commitment is most unlikely.

In addition, as long as the yen is floating vis-à-vis the currency baskets of other Asian economies, basket pegging could delay monetary integration between Japan and the rest of the region. Japanese advocates of the basket pegging do not indicate under what conditions Japan could fix its bilateral exchange rates vis-à-vis other East Asian currencies without making the yen the dominant currency of the region at the second stage of monetary integration that come after a period of the basket pegging.

## China

Frankel (2003) has suggested that the renminbi could join the three other currencies that constitute the basket(s). There might good political reason to do so. It would make China a counterweight to Japan. It might also recognize the obvious emergence of China as a world economic power, a fact that is already coloring exchange rate policies in Asia. It could also be a way of involving China in a regional monetary arrangement in the likely case that it would not agree to be a basket-pegger.

Yet, against all these – mostly political – reasons, it might be economically dangerous to include the renminbi in a basket. A reasonable assumption is that China is likely to face a number of shocks in the years to come. With a rapidly changing economic structure, the scope for policy mistakes is impressive. Financial liberalization, both internal and external, has yet to happen. The lesson from a large number of financial liberalization experiments is that they systematically tend to be followed by boom and bust cycles (Kaminsky, 1998; Wyplosz, 2002). It would be surprising that China fully escapes this predicament. Introducing a potentially instable currency in the basket is definitely not a good idea. Finally, as a fast growing country, China will have a tendency to see its currency appreciate in real terms. This can be achieved with a stable nominal exchange rate and higher inflation, but high inflation is not a desirable characteristic for a currency used as an anchor by other countries. Alternatively, the renminbi will appreciate in nominal terms. If China sticks to the export-led strategy and slows down the appreciation, it will face strong resistance from the G7. China is simply becoming too big to free-ride. The renminbi could well become the subject of intense controversies, yet another reason not to include it in a basket.

## No Japan, no China

If political sensitivities are important, what difference would it make to adopt a basket including only the dollar and the euro? In the case of Korea, Figure 2 shows, unsurprisingly, that it would stabilize the won relatively to the dollar. But would it destabilize the effective exchange rate. Figure 3 indicates that the difference would be small. This is not really surprising either: if all other countries also adopt a two-currency basket, regional bilateral exchange rates are stabilized. Then, with the exception of the yen exchange rate, all other significant bilateral rates are stabilized. This being said, there



is no reason to believe that a region-wide basket pegging that excludes Japan would be more acceptable to the participating countries.

Figure 3. Effective Exchange Rate: Counterfactual With and Without Japan in the Basket (Index: 2002:1=1.0)

### **4.3.2 Institutions**

If there is one lesson to be drawn from the European experience with regional exchange rate arrangements, it is that institutions are crucial. The EMS succeeded where the European Snake failed because the former was just a gentleman's agreement while the latter embodied specific and binding procedures. The problem with institutions is that they always imply some loss of sovereignty. The loss can be small, but any institutions that is given some power must, almost by definition, be delegated some responsibilities that have so far been vested with the national authorities.

The Asian countries are extremely reluctant to take that step. So far at least, the CMI falls short of institutional-building. The lending agreements represent a form of automatic monetary cooperation, not unlike IMF-membership but it stops short of delegation of power. In contrast, IMF lending is conditional and the conditions "agreed" with the Fund invariably transfer, even if temporarily, some elements of sovereignty. Viewed this way, Asian efforts at achieving regional exchange rate arrangements can be seen as an attempt at squaring a circle.

Without any institutional backing, basket pegging can only occur with the CMI financing arrangement. This would perpetuate Asia's tradition of eschewing institution building. Failure to build regional collective institutions may in the end delay foundation of a currency union in the long run.

### **4.3.3 Limits of Basket Pegs**

Anyway, collective pegging – to a common or to country-specific baskets – is probably unsustainable. Eichengreen and Bayoumi (1999) points out that jointly defending pegs would be much more difficult than introducing it. Success in defense requires an efficient institutional framework which facilitates (1) policy coordination among the participating member countries, (2) a financing mechanism that will provide financial resources to the exchange rates of weak-currency members, and (3) a surveillance mechanism which could impose policy conditionality on the countries receiving the financial support. In the absence of these institutional arrangements, the common pegging could create an East Asian version of the Snake, not the EMS. The Snake lasted a couple of years.

## **5. Conclusions**

As long as the reluctance to abandon any element of monetary sovereignty remains strong, the only way toward monetary integration must be imperfect and highly incomplete. This is in line with another lesson from the European experience: because

agreeing on ambitious long-term objectives is too difficult, the only possibility is to work on simple and pragmatic solutions that aim at solving the problem of the day. If these solutions are well designed, they will help build up confidence and suggest further steps. Jean Monnet, one of the founding fathers of European integration, thus envisioned the way forward:

“Concrete and resolute action on a limited but decisive point, which provokes a fundamental change on this point and progressively modifies the actual terms of the problem as a whole” (Monnet, Memorandum of 3rd May 1950).

Over the last couple of years, the Asian countries, including Japan, have visibly tried to align their currencies with the renminbi. Quite naturally, the budding economic giant is considered as a competitor that is now following the same export-led strategy that has proven to be successful elsewhere in the region. Much as the other Asian economies have benefited from this strategy, they are loath to see China now expand at their disadvantage. This is a long run issue. Over the next two decades, the region will have to agree on a level-playing field. It must absolutely avoid being drawn into beggar-thy-neighbor competition.

The CMI is the only game in town and, despite its limitations, it must be considered as the starting point for any further step. It is essential to recognize that agreements on limited mutual support can, at best, discourage moderate speculative attacks. Serious, determined attacks can mobilize virtually infinite amounts of speculative capital, certainly a multiple of the current stockpiles of foreign exchange reserves. The implication is clear: dirty float or soft pegging is the only possibility. In practice, this means unofficial pegging within reasonably wide margins of fluctuation.

Soft pegging does not rule out close cooperation. The question is what should be the content of this cooperative effort. The overarching objective should be institution-building, starting with very modest initiatives that entail a minimum loss of sovereignty.

We have observed that the distinction between a common basket and country-specific pegs, with or without the yen included in the basket, is economically irrelevant. It may be symbolically useful, though, that all Asian countries, including Japan, jointly adopt baskets. This means limiting these baskets to just two currencies, the dollar and the euro. As pegging would not be tight, the cost of dropping the yen from the baskets is limited as far as effective exchange rate stabilization is concerned. We have seen that any basket – again whether it is a common one or whether each country designs its own – delivers a considerable degree on stabilization of the nominal effective exchange rates.

Once this step is taken, the next one is to start building an institution. The place to start is to have the national monetary authorities meet very frequently, say once a month, to agree on the following:

- The implicit margins of fluctuations. With dirty floating, these margins are not be adhered to every day under every circumstance. The main advantage of such an

agreement is to reassure all member countries that no one will purposefully attempt to gain a significant competitive advantage. This calls for margins of some 10-15% around the unofficial basket peg.

- Realignments. Stabilizing nominal effective exchange rates is useful if it results into stable real effective exchange rates. Implicit collective basket pegging will allow avoiding short-run volatility in both the nominal and real effective exchange rates, but it does not allow dealing with misalignments that may result from lasting inflation differentials or from the Balassa-Samuelson effect. There is a need for a procedure to occasionally agree to realign some unofficial pegs. Within the EMS, the European member countries accepted that any realignment would have to be decided by consensus. At this stage, consensus may be unacceptable in Asia, but serious consultations aiming at a collective agreement may allow establishing the kind of mutual confidence that would eventually make consensus decision-making quite natural.

- Crisis management. Unfortunately, further crises cannot be ruled out. In that respect, the current massively large foreign exchange reserves seem to instill of false sense of security. Rather than attempting to decree the end of crises, the Asian countries should develop crisis management tools. Loan agreements are part of the toolkit, but this is not enough. An emergency consultation procedure must be worked out: who will meet where and when, and with what authority? Within the EMS, at any point in time one country held the European Union presidency. It was the responsibility of the corresponding Finance Minister to call for a meeting, normally on the first weekend to take advantage of the fact that the markets were closed. Beyond agreeing on a diagnosis, these consultations should cover mutual support, intervention strategies, margins of fluctuations and possible realignments. Early on, these consultations may just be an exchange of information; eventually, they could become decision-making, which would mark the start of some sovereignty transfer.

This approach preserves quite a lot of freedom to conduct national monetary policies while providing for a high degree of real effective exchange rate stabilization. It becomes binding only when the limits of the implicit fluctuation margins are reached, but this does not really represent an additional constraint. In the current situation, any sharp exchange rate movement in one or more countries of the region is likely to trigger alarm bells in all the other countries. Furthermore any use of the CMI credit lines will implicitly put some pressure on the affected country. Anything short of free floating occasionally limits monetary policy independence. All that needs to be done is to explicit and to formalize how this limit will be applied to serve the common good.

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**Table 1. Exchange rate equations – Whole sample: 1973:1-2004:4**

	China		Hong Kong		Indonesia		Korea		Malaysia		Philippines		Singapore		Thailand	
	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS
constant	0.00	0.00	0.00	0.00	<b>0.00</b>	<b>0.00</b>	0.00	0.00	0.00	0.00	<b>0.00</b>	<b>0.00</b>	0.00	0.00	0.00	0.00
	0.08	0.08	0.16	0.14	<b>0.02</b>	<b>0.02</b>	0.18	0.15	0.25	0.17	<b>0.01</b>	<b>0.01</b>	0.44	0.33	0.13	0.18
deY	0.08	0.17	<b>0.08</b>	0.04	<b>0.39</b>	<b>0.50</b>	<b>0.17</b>	0.13	<b>0.17</b>	<b>0.14</b>	0.00	-0.04	<b>0.21</b>	<b>0.16</b>	<b>0.25</b>	0.09
	0.25	0.15	<b>0.01</b>	0.46	<b>0.00</b>	<b>0.02</b>	<b>0.01</b>	0.21	<b>0.00</b>	<b>0.04</b>	0.99	0.72	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	0.32
de€	0.02	-0.02	<b>0.11</b>	<b>0.11</b>	0.11	0.10	0.04	0.01	<b>0.16</b>	<b>0.17</b>	0.15	0.14	<b>0.19</b>	<b>0.16</b>	<b>0.13</b>	0.12
	0.75	0.90	<b>0.00</b>	<b>0.03</b>	0.41	0.66	0.55	0.90	<b>0.00</b>	<b>0.02</b>	0.06	0.28	<b>0.00</b>	<b>0.00</b>	<b>0.03</b>	0.21
Adjustment	<b>0.10</b>	<b>0.13</b>	<b>-0.11</b>	<b>-0.15</b>	0.06	0.05	<b>0.14</b>	<b>0.15</b>	-0.01	-0.06	<b>-0.16</b>	<b>-0.17</b>	-0.03	<b>-0.29</b>	<b>-0.13</b>	<b>-0.15</b>
	<b>0.03</b>	<b>0.01</b>	<b>0.01</b>	<b>0.00</b>	0.22	0.27	<b>0.00</b>	<b>0.00</b>	0.78	0.19	<b>0.00</b>	<b>0.00</b>	0.07	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
Adj. R2	0.01	0.00	0.10	0.11	0.04	0.04	0.05	0.05	0.13	0.12	0.03	0.03	0.29	0.34	0.10	0.07

**Table 2. Exchange rate equations – Pre-crisis sample: 1973:1-1996:12**

	China		Hong Kong		Indonesia		Korea		Malaysia		Philippines		Singapore		Thailand	
	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS
constant	0.00	0.00	0.00	0.00	<b>0.00</b>	<b>0.00</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.08	0.08	0.16	0.09	<b>0.02</b>	<b>0.02</b>	0.26	0.22	0.94	0.54	0.07	0.07	0.11	0.05	0.31	0.33
deY	0.12	0.19	<b>0.10</b>	<b>0.13</b>	<b>0.00</b>	0.26	<b>0.15</b>	0.10	<b>0.14</b>	<b>0.16</b>	-0.06	-0.12	<b>0.18</b>	<b>0.18</b>	<b>0.23</b>	0.16
	0.22	0.20	<b>0.01</b>	<b>0.03</b>	<b>0.02</b>	0.08	<b>0.04</b>	0.35	<b>0.00</b>	<b>0.00</b>	0.56	0.40	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	0.06
de€	0.01	0.02	<b>0.12</b>	0.10	<b>0.31</b>	0.02	0.05	0.02	<b>0.21</b>	<b>0.16</b>	0.16	0.16	<b>0.21</b>	<b>0.15</b>	<b>0.10</b>	0.04
	0.91	0.90	<b>0.00</b>	0.08	<b>0.00</b>	0.88	0.45	0.88	<b>0.00</b>	<b>0.00</b>	0.09	0.24	<b>0.00</b>	<b>0.00</b>	<b>0.09</b>	0.59
Adjustment	<b>0.11</b>	<b>0.14</b>	<b>-0.11</b>	<b>-0.13</b>	0.02	0.01	0.09	0.11	-0.17	<b>-0.25</b>	<b>-0.16</b>	<b>-0.16</b>	-0.03	<b>-0.34</b>	<b>-0.22</b>	<b>-0.24</b>
	<b>0.04</b>	<b>0.02</b>	<b>0.02</b>	<b>0.01</b>	0.74	0.88	0.11	0.06	0.00	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>	0.10	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
Adj. R2	0.00	0.00	0.12	0.12	0.05	0.05	0.03	0.03	0.24	0.25	0.03	0.03	0.28	0.37	0.17	0.17

**Table 3. Exchange rate equations – Post-crisis sample: 1999:1-2004:4**

	China		Hong Kong		Indonesia		Korea		Malaysia		Philippines		Singapore		Thailand	
	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS	SUR	3SLS
constant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<b>0.00</b>	<b>0.00</b>	0.00	0.00	0.00	0.00
	0.70	0.75	0.34	0.37	0.79	0.79	0.97	0.95	1.00	0.98	<b>0.02</b>	<b>0.02</b>	0.52	0.55	0.48	0.48
deY	0.00	0.00	0.01	0.00	0.00	0.27	<b>0.41</b>	<b>0.27</b>	0.00	0.00	0.06	0.13	<b>0.26</b>	<b>0.20</b>	<b>0.18</b>	<b>0.18</b>
	0.93	0.15	0.08	0.65	0.79	0.38	<b>0.00</b>	<b>0.05</b>	0.99	0.66	0.54	0.24	<b>0.00</b>	<b>0.00</b>	<b>0.03</b>	<b>0.05</b>
de€	0.00	0.00	0.00	0.00	0.29	0.35	0.01	0.09	0.00	0.00	0.18	0.15	<b>0.13</b>	<b>0.16</b>	<b>0.22</b>	<b>0.24</b>
	0.91	0.14	0.98	0.49	0.28	0.28	0.93	0.57	0.97	0.53	0.06	0.22	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>	<b>0.02</b>
Adjustment	<b>-0.36</b>	<b>-0.32</b>	-0.22	-0.21	-0.16	-0.17	0.05	0.05	0.00	0.00	-0.09	-0.07	-0.17	-0.19	-0.04	-0.04
	<b>0.00</b>	<b>0.01</b>	0.07	0.09	0.10	0.09	0.66	0.68	0.97	0.80	0.36	0.52	0.09	0.07	0.62	0.68
Adj. R2	0.00	0.00	0.12	0.12	0.05	0.05	0.03	0.03	0.24	0.25	0.03	0.03	0.28	0.37	0.17	0.17



**Table 4. Gross International Reserves as of GDP (%)**

	Indonesia	Malaysia	Philippines	Korea	Thailand
1990	6.52	22.12	2.09	5.86	15.59
1991	7.22	22.15	7.16	4.64	17.83
1992	7.51	29.15	8.31	5.44	18.27
1993	7.13	<b>40.67</b>	8.6	5.85	19.55
1994	6.86	34.08	9.39	6.37	20.3
1995	6.78	26.72	8.59	6.68	21.39
1996	8.03	26.83	12.11	6.55	20.68
1997	7.69	20.72	8.86	4.27	17.32
1998	23.8	35.22	14.17	16.36	25.76
1999	18.71	38.79	17.38	18.23	27.91
2000	18.6	33.05	17.46	21.02	26.21
2001	18.75	34.81	18.82	24.34	28.2
2002	17.91	36.06	16.84	25.45	30.67
2004		42.91	16.98	25.64	28.68
2004.1		48.02	16.18	26.33	28.00

Source: Asia Recovery Information Center (<http://aric.adb.org/>)

**Table 5. Short-Term External Debt as of GIR(Gross International Reserve)**

	Indonesia	Malaysia	Philippines	Korea	Thailand
1995		26.90		167.87	145.62
1996	233.96	37.01	54.15	228.57	126.53
1997	218.24	59.77	86.98	313.02	146.27
1998	110.51	36.88	63.40	74.95	98.66
1999	67.31	19.30	37.37	57.39	57.36
2000		15.69	42.10	51.40	45.90
2001	92.34	20.79	44.64	40.76	41.37
2002		24.65	42.32	41.25	31.32
2003		19.77	45.91	35.63	26.42
2004.1		17.98	57.49	35.79	28.17

Source: Asia Recovery Information Center(<http://aric.adb.org/>)

**Table 6. Current Account Balance as of GDP**

	Indonesia	Malaysia	Philippines	Korea	Thailand
1991		-8.51			
1992		-3.66			
1993		-4.47			-4.90
1994		-6.05			-5.41
1995		-9.78		-1.67	-7.88
1996		-4.80		-4.14	-7.89
1997		-5.18		-1.59	-1.97
1998	4.29	13.53	11.08	11.54	12.66
1999	4.13	15.92	9.49	5.50	10.17
2000	4.82	9.40	8.26	2.40	7.60
2001	4.19	8.28	1.84	1.67	5.40
2002	3.83	8.43	5.72	0.98	5.89
2003	3.05	12.90	4.40	2.03	5.57

Source: Asia Recovery Information Center (<http://aric.adb.org/>)

**Table 7. Foreign Exchange Market Intervention in East Asia**

	Daily nominal exchange rate (+/- 0.25%)		Monthly foreign exchange reserves (+/- 2.5%)		Monthly nominal effective exchange rate (+/- 2.5%)		Monthly real effective exchange rate (+/- 2.5%)	
	pre-crisis (1/4/1994- 12/30/1996)	post-crisis (1/4/1998- 1/30/2004)	pre-crisis (1/4/1994- 12/30/1996)	post-crisis (1/4/1998- 1/30/2004)	pre-crisis (1/4/1994- 12/30/1996)	post-crisis (1/4/1998- 1/30/2004)	pre-crisis (1/4/1994- 12/30/1996)	post-crisis (1/4/1998- 1/30/2004)
Japan	0.3854	0.3293	0.8286	0.7671	0.6957	0.6849	0.7391	0.7945
Hong Kong	0.9974	0.9975		0.8219	0.9565	0.9863	1.0000	0.9306
Indonesia	0.9305	0.3348	0.6286	0.6986			0.9583	0.4444
Korea	0.8231	0.4883	0.5429	0.6164	0.7826	0.9286	1.0000	0.8056
Malaysia	0.8113	0.8998	0.6571	0.6712	0.9565	0.9178	0.9565	0.9315
Philippine	0.8098	0.6129	0.3714	0.5890	0.9130	0.7808	0.7826	0.7534
Singapore	0.8164	0.6246	0.8571	0.8904	1.0000	0.9726	1.0000	0.9167
China	0.9987	1.0000	0.2857	0.9863	0.9583	0.9726	0.9167	0.9315
Thailand	0.9769	0.5593	0.7429	0.7671			1.0000	0.9028
India	0.7964	0.9193	0.5714	0.5972			0.8696	0.9722
Canada	0.7106	0.5088	0.3714	0.7083	1.0000	0.9583	1.0000	0.9444
Australia	0.5083	0.3146	0.6000	0.6438	0.7429	0.7167	0.7826	0.7083
New Zealand	0.5269	0.2888	0.3143	0.5890	1.0000	0.7167	0.9565	0.7222
Mexico	0.5406	0.4453	0.2857	0.6667	0.7391	0.6786	0.4783	0.8056
Argentina	0.9974	0.7360	0.2571	0.3750			1.0000	0.8056
Brazil	0.6503	0.4093	0.5143	0.4306			0.9130	0.5694
Chile	0.6619	0.4971	0.6857	0.8194	0.9130	0.8261	0.8261	0.8056
EU		0.3162 <sup>1)</sup>						

Source: JP Morgan, Bloomberg, and IFS,

<sup>1)</sup> period: 1999.1.1 - 2004.1.30

**Table 8. Stabilization of bilateral exchange rates: Marginal Significance of Coefficient Equality (3SLS)**

	Pre-crisis 1973:1-1996:12	Post-crisis 1999:1-2004:4
$c_{i1}=c_{j1}$	0.003	0.385
$c_{i2}=c_{j2}$	0.613	0.002
$c_{i3}=c_{j3}$	0.827	0.061
$c_{ik}=c_{jk}$	0.019	0.000

**Table 9. Stabilization of bilateral exchange rates: Correlation of adjustment terms (SUR in lower triangle, 3SLS in upper triangle)**

<b>Pre-crisis period - 1973:1-1996:12</b>								
	China	Hong Kong	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
China	1.00	0.12	0.06	0.04	0.02	-0.05	-0.02	0.14
Hong Kong	0.12	1.00	0.18	0.21	0.45	0.11	0.14	0.45
Indonesia	0.06	0.20	1.00	0.11	0.19	-0.02	0.02	0.15
Korea	0.04	0.21	0.12	1.00	0.12	0.13	0.05	0.19
Malaysia	0.03	0.46	0.21	0.13	1.00	0.12	0.21	0.26
Philippines	-0.06	0.11	-0.01	0.13	0.12	1.00	0.11	0.00
Singapore	-0.01	0.15	0.03	0.05	0.22	0.11	1.00	0.19
Thailand	0.15	0.46	0.17	0.20	0.28	0.00	0.20	1.00

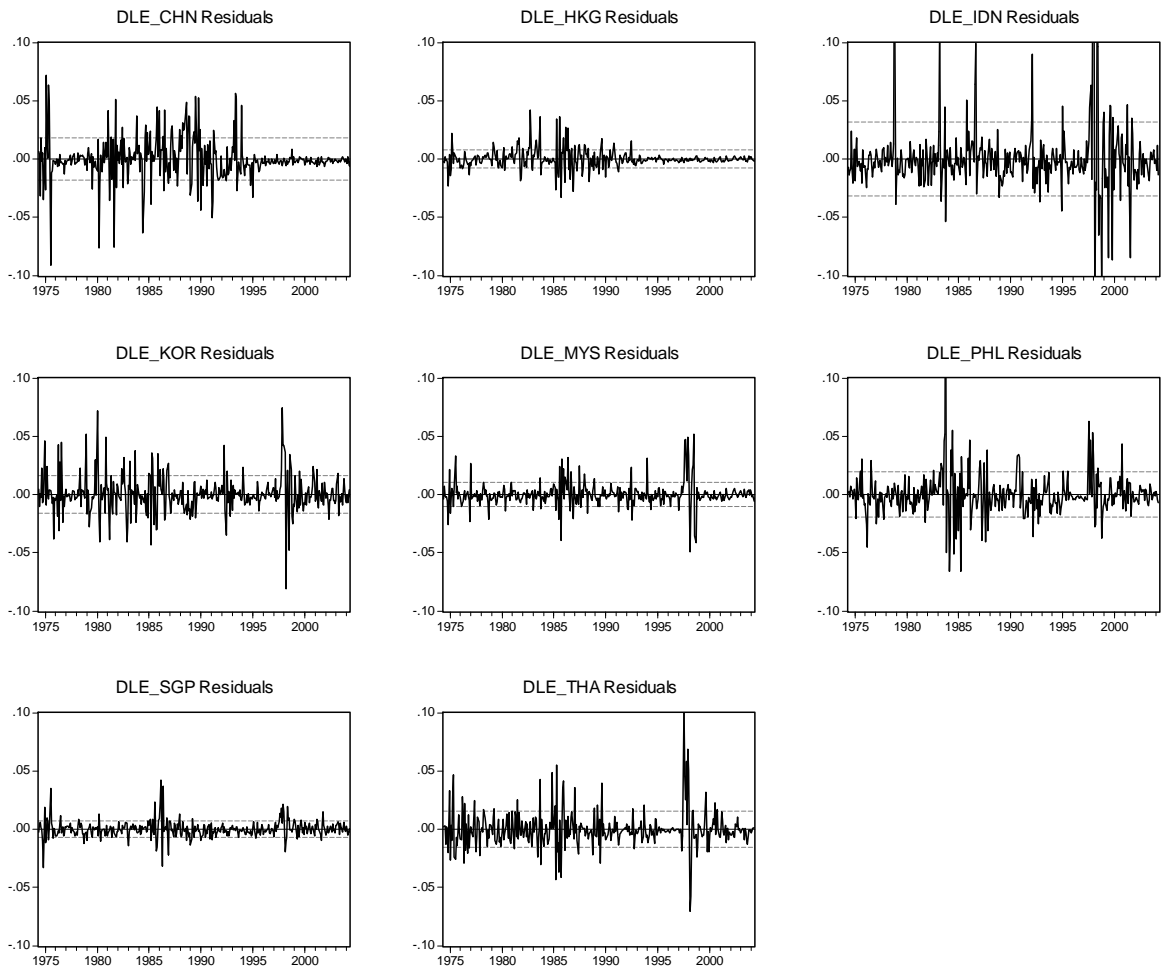
<b>Post-crisis period - 1999:1-2004:4</b>								
	China	Hong Kong	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
China	1.00	0.04	-0.12	-0.12	0.26	-0.17	-0.11	0.00
Hong Kong	0.02	1.00	0.27	0.05	0.09	0.05	0.05	0.02
Indonesia	-0.14	0.27	1.00	0.24	0.01	0.44	0.57	0.59
Korea	-0.05	0.05	0.24	1.00	-0.29	0.18	0.40	0.41
Malaysia	-0.03	0.09	-0.22	-0.34	1.00	0.08	-0.17	0.04
Philippines	-0.21	0.05	0.44	0.18	-0.25	1.00	0.37	0.65
Singapore	-0.08	0.06	0.57	0.40	-0.60	0.37	1.00	0.58
Thailand	-0.02	0.02	0.59	0.41	-0.44	0.65	0.58	1.00

**Table 10. Log Variances of the component series of REERs**

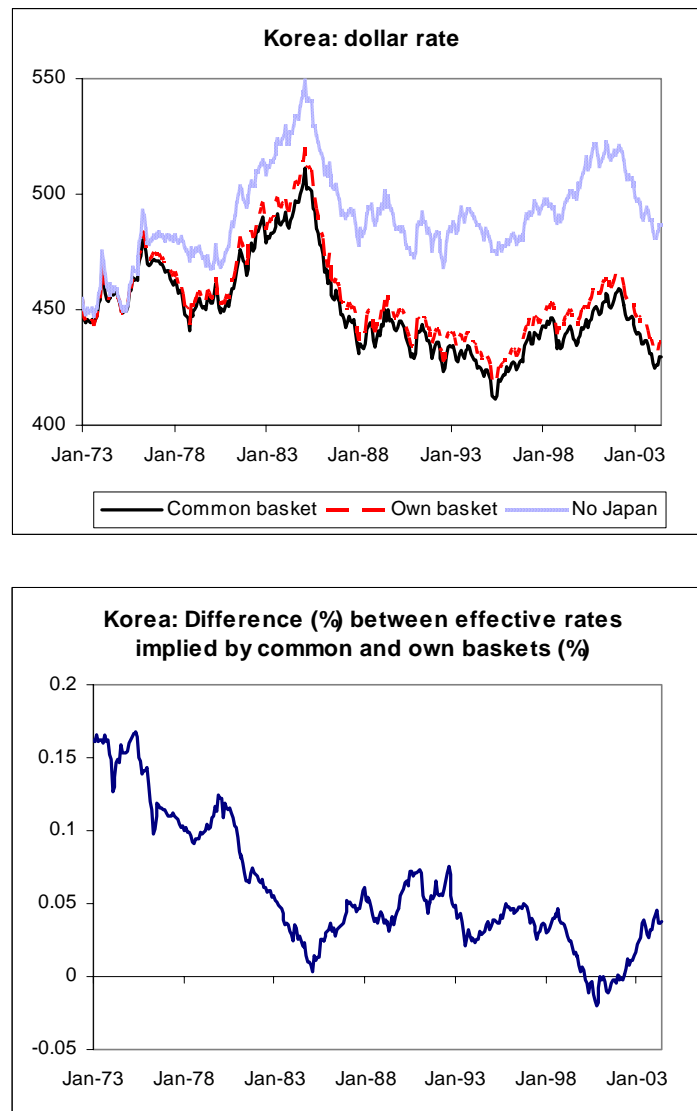
Before : 1990:0 1- 1997:0 4 After: 1999:0 1- 2002:0 6	variance			Relative Price (RP)
	REER	NEER		
before	0.002	0.020		
after	0.013	0.010		
before	0.004	0.001		
after	0.002	0.001		
before	0.001	0.009		
after	0.000	0.008		
before	0.015	0.007		
after	0.004	0.008		
before	0.002	0.004		
after	0.003	0.002		

Source: ARIC (Asia Recovery Information Center)  
(<http://aric.adb.org>).

**Figure 1. Residuals from Table 1**



**Figure 2. Counterfactual Simulation of a Korean Basket Peg**



*Notes:* The basket includes the dollar, the yen and the euro. The common basket is based on the joint exports of China, Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand. The own basket uses weights based on Korea's own exports. The effective exchange rate is computed as a weighted average of the other seven Asian countries and of the three basket currencies, using weights determined by Korea's exports. The paths of the dollar, yen and euro are historical (using the ECU to backcast the euro). The paths of the Asian currencies are the corresponding counterfactuals. Baskets based on 1999 trade from IMF's *Direction of Trade*.

**Figure 3. Effective Exchange Rate: Counterfactual With and Without Japan in the Basket (Index: 2002:1=1.0)**

