After the Crisis, The East Asian Dollar Standard Resurrected: An Interpretation of High Frequency Exchange Rate Pegging

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Abstract

For more than a decade before the great crisis of 1997-98, East Asian countries pegged "softly" to the U.S. dollar. In the period of currency chaos from mid 1997 through 1998 with exchange depreciations in eight East Asian countries, massive deflationary pressure in dollar terms which was unleashed in the whole East Asian region. Surprisingly, however, the post-crisis exchange rate regime in 1999 into 2000 again exhibits high frequency pegging to the dollar much like the pre-crisis regime. In 1999-2000, there was (is) a "honeymoon" effect where short-term rates of interest in the crisis economies remained unusually low so that hot money flows were temporarily muted. But this honeymoon will end as the crisis recedes in time. Finally, I explore how the informal "rules of the game" under which the East Asian dollar standard operates might be improved to (1) lengthen the term structure of finance—including exchange rate obligations—to make the system more resilient, and (2) tighten bank regulation so as to reduce moral hazard in international capital flows.

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1 Economics Department, mckinnon@leland.stanford.edu I would like to thank Sumit Khedekar for his enormous input in setting up all the statistical tests, and thank Masahiro Kawai for his own valuable statistical work which parallels that presented here—although some of his conclusions on optimum exchange rate strategies may differ. Rishi Goyal provided invaluable general research assistance.

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1. Introduction

For more than a decade before the crisis of June 1997 to December 1998, East Asian currencies were pegged to the U.S. dollar. With the important exception of Japan, the crisis economies of Indonesia, Korea, Malaysia, Philippines, and Thailand, as well as the non-crisis economies of Hong Kong, Singapore, and Taiwan, organized their domestic monetary policies to keep their dollar exchange rates remarkably stable. In effect, their mutual link to the dollar was the nominal anchor for their domestic price levels—"the East Asian dollar standard" (McKinnon 2000a).

In 1994, as China moved to full current-account but not capital-account convertibility, its government unified its exchange rate regime and then kept the rate virtually unchanged at 8.3 yuan to the dollar through the great crisis to the present. After a net 50 per cent devaluation of the ringgit, the Malaysian government imposed capital controls and announced, in September 1998, a fixed exchange rate of 3.8 ringgits to the dollar—which still maintains.

Of all these countries, only Hong Kong has declared an official exchange rate *parity* against the dollar. (The others remained noncommittal on parity obligations.) Since 1983, Hong Kong's parity of 7.8 HK dollars to the U.S. dollar has been the anchor of domestic monetary policy based on a currency board—the only one in East Asia. And, despite continual attacks during 1997-98, Hong Kong sustained this exchange rate without the aid of capital controls.

In this paper, I first analyze what happened to the East Asian dollar standard ("EADS") during the crisis. In the period of wild exchange rate fluctuations from mid 1997 through 1998, how did the dollar fare as nominal anchor? The collective importance of EADS as a regional monetary anchor was revealed by the massive deflationary pressure in dollar terms that was unleashed in the whole East Asian region.

Second, I consider how the post-crisis exchange rate regime has evolved since 1998. The pre-crisis pegged rate regime had been judged a failure because of its moral hazard in inducing short-term hot money flows. Fischer (1999) suggested that greater exchange rate flexibility would be desirable in the future, while others suggested that a zone of more stable exchange rates against the yen might be preferable (Kwan 2000, Kawai and Akiyama 2000, Ohno 2000). Except for Indonesia, however, EADS seems to be resurrecting itself. Dollar exchange rates, particularly when observed on a high frequency (daily) basis, have become as stable as they were before the crisis. This high-frequency "fear of floating" (Calvo and Reinhart 2000a and 2000b), is shown to be a rational response to capital-market conditions in emerging market economies.

Third, I shall explore the "honeymoon" effect. After a great crisis with sharp devaluations and some exchange rate overshooting, hot money inflows are naturally somewhat muted. But this calm since 1998 is deceptive. To prevent the cycle of international overborrowing from repeating itself, the banking and foreign exchange authorities must still put proper prudential regulations in place; and these regulations, in turn, affect the nature of the optimal exchange rate regime.

I conclude by discussing how the informal rules of the game, under which EADS operates, could be modified to curb hot money flows. One objective is to lengthen the term to maturity of finance in the smaller East Asian debtor economies. But in order for Japan, the largest creditor, to reduce its destabilizing effect on the others while promoting its own economic recovery, a somewhat different set of rules is appropriate.

2. The Collective Nominal Anchor

Using pre-crisis data, The "East Asian Dollar Standard, Life After Death?" (McKinnon, 2000a), presented evidence that international trade in the region was overwhelmingly invoiced in dollars—and that, in the 1990s, the domestic American price level had been quite stable. This price level of the center country was considered to be the anchor to which any individual East Asian country could attach itself. But this earlier view has turned out to be an oversimplification of how EADS actually works.

First, this nominal anchor argument rests more on low-frequency pegging than on high. For domestic price level stabilization and protection against (inadvertent) beggar-thy-neighbor devaluations, the monetary authorities need only be concerned with exchange rate stabilization on a monthly or quarterly basis. Figures 1 and 2 indicate that monthly exchange rates against the dollar were quite stable before the 1997-98 crisis—albeit with some drift—and, in 1999-2000, showed signs of stabilizing once more. But this nominal anchor argument fails to explain the much tighter pegging on a daily basis that we shall discuss below.

Second, for any one member country of EADS, the stability of this nominal anchor depends more on having all or most East Asian countries jointly stabilizing their dollar exchange rates—and not just on the American price level itself. In this sense, the 1997-98 crisis throws strong light on the issue. The sharp currency devaluations of Indonesia, Korea, Malaysia, Philippines, and Thailand, and the collapse in their demand for imports, imparted severe deflationary pressure on those countries that did not devalue, or which devalued by considerably less than did these crisis economies. This deflationary effect was further aggravated by the earlier fall of the yen from 80 to the dollar in April 1995 to bottom out at 147 to the dollar in June 1998 (Figure 2). For nine of our 10 countries (Indonesia is omitted because of problems with vertical scaling) and the U.S. itself, Figures 3 and 4 plot consumer price indices from January 1995 to April 2000. With the U.S. CPI as the benchmark, two features stand out:

(1) The domestic inflationary impact in each of the four crisis economies from their deep devaluations was surprisingly muted. Their price levels increased by less than one half of whatever devaluation against the dollar had been sustained into the year 2000. Even the earlier substantial fall in the yen did not impart any inflation in Japan's CPI (Figure 4) in part because the yen had been so overvalued in the summer of 1995; and

(2) The deflationary pressure imparted to the non-crisis, non-devaluing economies was quite severe. Figure 4 shows the CPIs of Hong Kong and China falling about 10 per cent relative to the U.S., but also falling absolutely from late 1997 to 2000. Even Singapore and Taiwan, with 10 to 15 per cent devaluations against the dollar, saw modest falls in their internal CPIs from mid-1997 to 2000.

Of course (1) and (2) are related. The sharp devaluations, and falls in aggregate demand in the five crisis economies, imposed strong downward pressure on the *dollar*-invoiced prices of most goods traded in the region. This fall in the general dollar price level then muted the increases in the internal price levels of the devaluing economies, while contributing to the serious absolute deflationary pressure in China and Hong Kong which did not devalue at all. Even the U.S. itself was affected. A broad tradable goods price index, the U.S. PPI (not shown) fell about 5 per cent from mid-1997 to early 1999.

What is the lesson from this regional deflation? East Asian countries are now highly integrated in their trading relationships with each other (Bergsten 2000). Indeed, Kwan (2000) shows that for the last two decades intra-Asian trade (including Japan) has risen much faster than trade with the U.S. Now about 50 per cent of gross East Asian exports go to other East Asian countries and only 25 per cent go to the U.S. The 1997-98 crisis revealed that the success of any one country pegging to the dollar as a nominal anchor also depends heavily on having its trading partners and competitors securely anchored as well. From this collective nominal anchor perspective, East Asia has become a natural currency area over which exchange rates should be stable.

3. Optimum Currency Areas versus the Collective Nominal Anchor

But are there other perspectives? Some might object to the notion that the East Asian countries, with or without Japan, do not constitute an optimum currency area in the sense of Mundell (1961) because they experience macroeconomic shocks asymmetrically. For East Asia, Kwan (2000) states Mundell's 1961 argument this way:

> The major cost associated with monetary integration arises from the abandonment of an independent monetary policy. By fixing its exchange rate to other members of the monetary union, a country joining a union automatically gives up control over its own monetary policy. When its economy is subject to an external shock, it has no choice but to follow the common monetary policy of the monetary union. Countries with similar economic structures can respond to a common shock with a common monetary policy, and the costs of giving up an independent monetary policy are relatively small. In contrast, countries with heterogeneous economic structures require different policy responses to common shocks, and the costs of sharing a common monetary policy are relatively large. For example, Japan and Korea, both oil importers, can respond to a surge in oil prices with same monetary policy. This, however, would not apply to Japan and Indonesia, where the latter is an oil exporter.
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> In view of the diversity among these countries, it is unlikely that Japan, the Asian NIEs, the ASEAN countries, and China have formed an optimum currency area. Higher income countries such as those of the Asian NIEs have trade structures similar to that of Japan while lower income countries such as lower-income members of ASEAN and China have trade structures very different from that of Japan".

Based on Mundell's 1961 analysis, Kwan concludes that East Asian economies collectively don't form an optimal currency area. Kwan's careful analysis is in line with a huge volume of similar literature

showing that pre-euro continental Europe was not an optimum currency area either—see Eichengreen (1997). In his 1961 paper, "A Theory of Optimum Currency Areas, Mundell (1961) illustrated his argument thus:

> If demand shifts from the products of country B to the products of country A, a depreciation by country B or an appreciation by country A would correct the external imbalance and also relieve unemployment in country B and restrain inflation in country A. This is the most favorable case for flexible exchange rates based on national currencies.

But Mundell's narrow interpretation of asymmetric shocks doesn't make much sense for industrially diversified economies, each producing hundreds or thousands of commodities. Private demand would not suddenly shift away from French goods collectively toward German-or even from Thai goods toward Korean.[2]

Thus, to make more empirical sense out of Mundell's traditional analysis, writers like Kwan stress the problems for countries with different industrial structures facing a common external shock. This common shock could be a change in the price of some primary commodity, e.g., a rise in the price of oil. (For the smaller East Asian economies pegged to the dollar, fluctuations in the yen/dollar exchange rate have been the most important common external shock (McKinnon 2000a).) Or national business cycles could simply be out-of-phase. So to better preserve national monetary autonomy, the early Mundell tradition stressed the advantage of keeping currency areas small and separated by flexible exchange rates.

But was the early Mundell right? At a conference in Madrid in 1970 in two little known papers, Mundell (1973a and 1973b) essentially changed his mind (McKinnon 2000b). In these 1973 papers, he showed that heterogeneous economies could share the risks from asymmetric shocks better *within* a common currency area. For this later Mundell, the key was international portfolio diversification in both assets and liabilities. Only if future exchange rates were certain was full diversification and risk sharing possible. Then a country suffering an adverse shock could easily draw down its claims on, or borrow from, the other countries in the common currency area. By not having to devalue, domestic money would be as good as foreign money.

> A harvest failure, strikes, or war in one of the countries causes a loss of real income, but the use of a common currency (or foreign exchange reserves) allows the country to run down its currency holdings and cushion the impact of the loss, drawing on the resources of the other country until the cost of the adjustment has been efficiently spread over the future. If, on the other hand, the two countries use separate monies with flexible exchange rates, the whole loss has to be borne alone; the common currency cannot serve as a shock absorber for the nation as a whole except insofar as the dumping of inconvertible currencies on foreign markets attracts a speculative capital inflow in favor of the depreciating currency.
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> (Mundell, 1973a)

2 Although shocks imposed by national governments would be quite asymmetric, and this issue of disciplining governments is taken up below.

Even before the 1997-98 crisis, however, the East Asian economies were a long way from establishing a truly diversified capital market among themselves. Exchange rates were insufficiently pinned down *in the longer run* for insurance companies, well-behaved banks, trust funds, and other fiduciaries in any one country to hold claims on the other countries denominated in their currencies. It is true that Japan was the largest net creditor, but even in the absence of crises, there was insignificant diversification of gross assets and liabilities within the East Asian region. Indeed, substantial portfolio diversification within Europe had to wait for the advent of the euro on January 1, 1999 (McKinnon 2000b). The possibility of complete monetary unification in East Asia, with the introduction of an "Asian euro", is certainly not imminent.

4. A Common Monetary Standard versus a Common Currency

Although not as good as common currency, a common monetary standard among close trading partners is still preferable to (unrestricted) exchange rate flexibility. For our purposes, a common monetary standard is one where participating countries keep, with some success, their exchange rates fixed against a common nominal anchor—possibly provided externally. Although exchange rates may remain fixed for many years (as in some East Asian countries before the crisis), longer term exchange rate uncertainty remains. By comparison, a common currency provides an independent anchor and full long-run exchange rate certainty.

However, a common monetary standard among countries who trade extensively with each other is still better than floating exchange rates for mitigating asymmetric shocks. Indeed, the common nominal anchor itself becomes more stable if business cycles across member countries are *not* synchronized. If country A experiences a cyclical downturn, then the common price level provided by the nominal anchor will be more stable as long as B is not affected by the same shock. With a series of such random shocks affecting each country differentially, there will be a natural tendency toward business cycle smoothing for the region as whole.

Whereas, if A and B have synchronized business cycles with upturns and downturns experienced in unison, this amplifies the common business cycle. The extreme case was the East Asian crisis, with devaluations and downturns in several member economies simultaneously imposing a deflationary slump on other members. Each crisis economy's own downturn was thereby aggravated.

Why then did interpreters of the early Mundell (1961) lean towards grouping similar countries or regions together, (i.e., those with synchronous business cycles) in defining an optimum currency area, as in Kwan's analysis quoted above? Like most macroeconomists in the early 1960s, Mundell still had a post-war Keynesian mindset in believing that national governments could successfully fine-tune aggregate demand to offset private sector shocks on the supply or demand sides. As a modeling strategy, he assumed stationary expectations: people acted as if the current domestic price level, interest rate, and exchange rate (even when the exchange rate was floating) would hold indefinitely. Not only his theory of optimum currency areas (1961), but also the standard textbook Mundell-Fleming model of how monetary and fiscal policy work themselves out in an open economy, depend on stationary expectations.

However, we now realize that expectations are not stationary. Asset markets in general, and the foreign exchange market in particular, are forward-looking—a fact appreciated by the later Mundell (1973a). They become very volatile if the government takes discretionary action to fine-tune the domestic macroeconomy: the well-known time-consistency problem (Kydland and Prescott, 1977). Risk premia in bond markets would increase. Thus modern macroeconomic thinking leans toward constraining and limiting what governments might try. If the inflation tax is not needed for revenue (which has been true of East Asia except for Indonesia), central banks everywhere are more narrowly mandated to stabilize the domestic price level.

In industrial economies, this mandate is interpreted as direct inflation targeting. With a well developed long-term domestic bond market, the central bank can use open market operations to control the monetary base. Continual adjustments in short-term interest rates for controlling domestic inflation become feasible—as per Taylor's rule (Taylor, 1993). In a rules-based environment, industrial economies can credibly fashion their own nominal anchor. This then limits the moral hazard involved of governments trying to take markets by surprise.

But in emerging markets, and those in East Asia in particular, finance is too short term for something like Taylor's rule to be operational. Increases in short-term interest carry much more of a bankruptcy threat because banks and firms have such short-term liquid liabilities relative to their longer-term less liquid assets. Hence the importance of targeting the exchange rate as (1) an instrument of monetary policy for stabilizing the domestic price level in an area where most trade is invoiced in dollars, and (2) providing a highly visible rule which, if followed in a consistent fashion by subordinating domestic monetary policy to the international standard, constrains erratic behavior by the government itself.

However, the East Asian crisis has shown that even if the time-consistency problem is solved for any one country, monetary stability itself is not assured unless trading partners and competitors are also pegged to the dollar. Indeed, relying on an outside country to provide the nominal anchor has risks of its own should that center country's monetary authority misbehave.

5. Exchange Rate Targeting: Yen vs. Dollar

Why not choose the yen rather than the dollar as the central currency around which the common monetary standard is organized? In East Asia, Japan is, by some measures, a slightly bigger trader, and certainly a more important source of capital than is the U.S. Kwan (2000) has estimated that intra-Asian exports (including Japan) have risen from about 30 per cent of total Asian exports in 1986 to 50 per cent by the late 1990s. Similarly, Asian exports to the U.S. have fallen from about 35 per cent to 25 per cent of all Asian exports. When the smaller East Asian economies are pegged to the dollar, as the yen/dollar rate fluctuates, Japan's real exchange rate varies not only against the U.S. but against all her East Asian trading partners as well.

Thus it is not surprising that the Japanese government has long sought to create a yen zone in Asia. Japan's exchange risk would be greatly reduced if the other East Asian nations pegged collectively to the yen instead of the dollar. Less drastic would be for each of the smaller economies simply to

weigh the yen more heavily in pegging to a currency basket. This basket would be trade-weighted to reflect the importance of that country's exports to, or its imports from, Japan relative to the importance of its trade with the U.S., EU, other East Asian economies, and so on. For variants on this latter alternative, see Williamson (2000), Kwan (2000), Kawai and Akiyama (2000), and Ito, Ogawa, and Sasaki (1998).

If the trade weights in any one country's currency basket are picked appropriately, this basket approach also minimizes the variance in that country's similarly trade-weighted real exchange rate arising from external sources, as with fluctuations in the yen/dollar or euro/dollar exchange rates. (One still has to adjust separately for the effect of internal inflation on the real exchange rate.) So, the welfare criterion underlying currency-basket approach is one of minimizing variance in the effective real exchange rate of the country in question. But should this welfare criterion, advocated by so many authors, be the dominant one for the smaller East Asian countries?

First, targeting the real exchange rate, however measured, by continually moving the nominal rate means that the exchange rate cannot anchor the domestic price level. An increase in domestic inflation would require an offsetting devaluation that accommodates the ongoing inflation. And before the 1997-98 crisis, the smaller East Asian economies—with the possible exception of Indonesia—had good fiscal balance so that revenue from the inflation tax was unnecessary. China had ongoing fiscal deficits but could finance these in a non-inflationary manner by the government borrowing from China's huge banking system (McKinnon 1993). In countries such as these, in contrast to countries with chronic inflation as in Latin America, targeting the real exchange rate introduces monetary instability when none need exist.

Second, because the trade weights in each country's basket would differ from its neighbors, the commonality of the East Asian monetary standard would be lost. Country A would be continually moving its exchange rate differently from country B, thus requiring further exchange rate adjustment in B. Worse, if a calamitous devaluation in any one Asian economy occurred (as in Thailand in June 1997), the rules of the currency-basket game would require neighboring countries also to devalue. So, contagious devaluations would actually be built into the rules of the currency-basket game.

Third, the appropriate trade weights are necessarily ambiguous. For a group of countries who are competitors in third markets as the East Asian countries are, conventional trade weights based on the size of bilateral trade between any pair might seriously understate the importance of movements in either country's exchange rate for the other. Also, trade weighting does not reflect the preponderance of dollar invoicing of trade in East Asia. In normal times, these dollar prices may be quite sticky, reflecting the pricing-to-market competition among firms in the area. For primary commodities, where producers have no market power, dollar prices are given in world markets independently (McKinnon 1979). Thus, even using this basket technique, the dollar should receive a much higher weight than suggested by simple bilateral trade with the U.S.

Fourth, the simplest conceptual solution is to fix the yen to the dollar. Being part of the dollar zone would dramatically reduce the variance in real exchange rates that Japanese producers and overseas investors now face, and reduce residual exchange risk in the other East Asian economies as well.

Such a drastic change in Japan's foreign exchange policy—and necessarily in its monetary policy—would have to be argued on domestic grounds as well. Fortunately, no conflict between internal and external balance exists. Kenichi Ohno and I have shown (1997 and forthcoming) that a long-term fix of the yen against the dollar (requiring American cooperation to be credible) is the key for Japan to escape from the low-interest liquidity trap and deflationary expectations in which its economy is now mired.

6. Resurrection: The Return of High Frequency Pegging

A priori, one can rehash indefinitely the debate on fixed versus flexible exchange rates, or whether East Asia is a natural yen zone or dollar zone. However, the outcome has already been decided by a natural experiment. In 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.

Except for Indonesia, Figures 1 and 2 plot the dollar exchange rates of the East Asian countries on a monthly basis. Figure 1 shows the crisis economies—Korea, Malaysia, Philippines, and Thailand—stabilizing their dollar rates after about a 25 to 50 per cent net devaluation against the dollar from mid-1997 to 2000. Figure 2 shows the non-crisis economies of Taiwan and Singapore stabilizing their exchange rates after about a 10 per cent devaluation, whereas China and Hong Kong show no change in their dollar exchange rates throughout the crisis. It also shows the greater fluctuations of the yen against the dollar and the marked (if temporary) depreciation of the yen from July 1995,when the rate was 80 yen per dollar, to June 1998 when the yen bottomed out at 147 to the dollar.

However, these low frequency, i.e., monthly, plots, which the eye can easily follow, are deceptive. In some important sense, they understate the degree to which the East dollar standard has been, or is on its way to being, resurrected. To understand better what is going on, one must consider higher frequency, i.e., weekly and daily, data. Then the hypothesis that the East Asian countries from January 1999 to May 2000 have returned to a dollar standard like the pre-1997 regime cannot be rejected.

Weekly and daily exchange rate data were taken from Bloomberg Analytics for nine East Asian countries: China, Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand and Taiwan. The data were broken up into three periods: pre-crisis from January 1994 to the last week of May in 1997, the crisis from June 1997 to December 1998, and post-crisis from January 1999 to May 2000.

The basic regression model again draws from the work of Frankel and Wei (1993). A relatively independent currency, i.e., the Swiss franc, was chosen as an arbitrary numéraire for measuring exchange rate variations. The simple regression model is multivariable ordinary least squares (OLS) for each country and time period.

$$(\%\Delta \frac{\text{Local Currency}}{\text{SWF}}) = \beta_1 + \beta_2 (\%\Delta \frac{\text{USD}}{\text{SWF}}) + \beta_3 (\%\Delta \frac{\text{JPY}}{\text{SWF}}) + \beta_4 (\%\Delta \frac{\text{DEM}}{\text{SWF}}) + \varepsilon \quad (1)$$

where SWF is the Swiss franc, USD is the U.S. dollar, JPY is the Japanese yen and DEM is the Deutschmark. ε is assumed to be a well-behaved error term, following $N(0,\sigma^2)$.

If the local currency is tightly fixed to some particular value of the dollar, then the regression coefficient β_2 in equation (1) should approximate unity while β_3 and β_4 are close to zero. If it tracked the Japanese yen, then β_3 should be close to one and the others close to zero. Let us run the regression with weekly data first and then with daily data.

Weekly data: Tables 1, 2, and 3 below summarize the regression results pre-crisis, crisis, and post-crisis respectively. The dollar coefficients, the β_2, and R Squares are provided; but the β_3 and β_4 are omitted because they were insignificant.

Table 1. Pre-Crisis Period: January 1994 to May 1997

(weekly exchange rates)

Country	**USD coefficient: β_2 (standard error)**	**R - square**
China	1.006 (0.006)	0.997
Hong Kong	0.993 (0.003)	0.999
Indonesia	0.988 (0.016)	0.974
Korea	0.934 (0.035)	0.879
Malaysia	0.924 (0.033)	0.888
Philippines	1.005 (0.044)	0.822
Singapore	0.852 (0.021)	0.946
Thailand	0.893 (0.013)	0.977
Taiwan	0.929 (0.022)	0.945

Table 1 summarizes the tightness of the exchange rate band around the U.S. dollar during the pre-crisis time period. The β_2 coefficients are all very close to one, and always statistically significant. The coefficients for the other two potential anchor currencies (the yen and the Deutschmark) are typically close to zero and not statistically significant—as shown in the appendix (Table A-1). Judging from the high R squares, the statistical model is capturing most of the exchange rate variance of each East Asian country. These pre-crisis data suggest that East Asian countries kept their dollar exchange rates remarkably stable week-to-week.

More specifically, China and Hong Kong have β_2 coefficients and R squares of almost exactly one. Their extremely small standard errors suggest that the authorities ensured that the exchange rate fluctuated very little. Although Hong Kong had an official exchange parity, China did not. But, they were statistically indistinguishable.

Next, Indonesia and Philippines had β_2 coefficients very close to one but with somewhat larger standard errors, suggesting that their authorities allowed some exchange movements on a weekly basis. Singapore and Thailand pegged most loosely to the dollar with β_2 coefficients of 0.85 and 0.89 respectively. Even these coefficients are remarkably high: a one per cent change in the USD/SWF exchange rate implies a 0.85 per cent change in the SGD/SWF exchange rate).

Table 2. Crisis Period: June 1997 to December 1998

(weekly exchange rates)

Country	**USD coefficient: β_2 (standard error)**	**R - square**
China	0.998 (0.000)	1.000
Hong Kong	1.001 (0.004)	0.999
Indonesia	0.485 (1.016)	0.043
Korea	1.064 (0.548)	0.116
Malaysia	0.361 (0.371)	0.159
Philippines	0.757 (0.279)	0.359
Singapore	0.531 (0.142)	0.463
Thailand	0.262 (0.336)	0.179
Taiwan	0.721 (0.104)	0.648

In the crisis period, only China and Hong Kong continued with unwavering dollar pegs while the others gave up (Table 2). The β_2 coefficients for Indonesia, Malaysia, Philippines, Singapore and Thailand differ from one with large standard errors. While the Korean β_2 coefficient remained slightly more than one, its standard error was very high. The goodness-of-fit (R square) for these regressions fell apart completely.

Table 2 also shows that Taiwan and Singapore pegged more weakly to the dollar during the crisis than they did before mid-1997. But these two creditor economies maintained their dollar pegs somewhat more strongly than the neighboring debtor economies in crisis—but of course not as strongly as China and Hong Kong.

Interestingly, the β coefficients of the Japanese yen increased a bit in the crisis (see appendix Table A-2 for daily data). The yen became significant for Malaysia, Philippines, Singapore, and Thailand. But goodness-of-fit of these equations was poor.

Table 3. Post-Crisis Period: January 1999 to May 2000

(weekly exchange rates)

Country	**USD coefficient: β_2 (standard error)**	**R - square**
China	1.000 (0.001)	0.999
Hong Kong	1.000 (0.002)	0.999
Indonesia	0.456 (0.356)	0.233
Korea	0.960 (0.092)	0.779
Malaysia	1.000 (0.000)	0.999
Philippines	0.893 (0.064)	0.849
Singapore	0.755 (0.056)	0.848
Thailand	0.721 (0.085)	0.717
Taiwan	0.902 (0.041)	0.928

Dating the post-crisis period is necessarily somewhat arbitrary. Indonesia still seems to be in a quasi-crisis mode. For the other four crisis economies, 1998 was still a bad year with high risk premia in interest rates (see below) associated with the troubles of Russia and Brazil. However, by the beginning of 1999, recovery seemed at hand, and private foreign capital began to return, hence our choice of January 1999 to May 2000 for the post crisis period (Table 3).

The post-crisis equations in Table 3 show a tremendous improvement in all the goodness-of-fit (R square) coefficients compared to the crisis equations of Table 2. And except for Indonesia, the β_2 coefficients are now close to one—although not quite so tightly as the pre-crash coefficients in Table 1. China, Hong Kong, and now Malaysia are identically one. The fact that Hong Kong and China held their fixed dollar exchange rates throughout the crisis—and Malaysia has fixed its dollar exchange since September 1998, augurs well for the future robustness of the dollar-based system.

But a formal statistical test of this post-crisis return to the dollar standard is in order. For each country equation, we hypothesize that the degree of fixity to the dollar was the same post- as pre-crisis. More formally, we hypothesize that

$$\textbf{Ho:} \quad (\beta_2)\ \textbf{pre-crisis} = (\beta_2)\ \textbf{post-crisis}$$

This test was unnecessary in the cases of China, Hong Kong, and Malaysia, which now have fixed their exchange rates to the dollar. For the rest of the countries, one could reject this hypothesis if:

$$\frac{|\,(\beta_2)\text{post-crisis} - (\beta_2)\text{pre-crisis}\,|}{\text{Standard Error (post-crisis)}} > 2 \qquad (2)$$

Table 4. Hypothesis Tests of Pre- and Post-Crash Equivalence
(weekly data)

Country	Reject Null Hypothesis (95% confidence level)
Indonesia	No (-1.492)
Korea	No (0.279)
Philippines	No (-1.735)
Singapore	No (-1.736)
Thailand	Yes (-2.015)
Taiwan	No (-0.657)

These results suggest that the East Asian countries have made a clandestine return to their old pegged regimes—in fact to the same tightness of the peg that they had in the pre-crisis period. With this weekly data, only Thailand is just barely in the region to reject the null hypothesis. However, if one uses the daily figures shown below, then one fails to reject the null hypothesis, even for Thailand.

An important caveat concerns Indonesia. Because of the large standard error on the U.S. dollar coefficient, one cannot reject the null hypothesis that (β_2) post-crisis = 0. More generally, the Indonesian economy still seems to be out of control.

Daily Data: When the regression shown in equation (1) above is run on the basis of daily exchange rate data for our nine East Asian economies, the results are similar to the weekly data. But now the β_2 coefficients for the dollar are even closer to unity in non-crisis periods and the R squares are high. Then, except for China and Hong Kong, all the goodness of fit statistics fall apart in the crisis period, as the following three tables show.

Table 5. Pre-Crisis Period: January 1994 - May 1997

(daily exchange rate data)

Country	**USD coefficient: β_2 (standard error)**	**R - square**
China	0.996 (0.003)	0.995
Hong Kong	1.000 (0.002)	0.998
Indonesia	0.999 (0.008)	0.965
Korea	1.021 (0.016)	0.883
Malaysia	0.886 (0.014)	0.889
Philippines	0.987 (0.018)	0.836
Singapore	0.817 (0.012)	0.905
Thailand	0.955 (0.012)	0.923
Taiwan	1.015 (0.012)	0.928

Table 6. Crisis Period: June 1997 to December 1998

(daily exchange rate data)

Country	**USD coefficient: β_2 (standard error)**	**R - square**
China	1.001 (0.000)	1.000
Hong Kong	1.000 (0.003)	0.998
Indonesia	0.550 (0.388)	0.038
Korea	1.086 (0.226)	0.087
Malaysia	0.755 (0.138)	0.161
Philippines	0.788 (0.125)	0.196
Singapore	0.727 (0.061)	0.447
Thailand	0.688 (0.165)	0.107
Taiwan	0.930 (0.050)	0.552

Table 6 shows the same suspension of the East Asian dollar standard during the crisis period, that one saw in the case of the weekly data.

Table 7. Post-Crisis Period: January 1999 - May 2000
(daily exchange rate data)

Country	**USD coefficient: β_2 (Standard error)**	**R - square**
China	1.000 (0.000)	1.000
Hong Kong	0.998 (0.001)	1.000
Indonesia	0.848 (0.163)	0.182
Korea	0.957 (0.045)	0.706
Malaysia	1.000 (0.000)	1.000
Philippines	0.945 (0.040)	0.741
Singapore	0.818 (0.026)	0.848
Thailand	0.858 (0.049)	0.639
Taiwan	0.986 (0.024)	0.883

In the post-crisis period, the goodness-of-fit of the regression model improves in all countries (though the model still explains less than 20 per cent of the variance in the Indonesian rupiah), and the USD β_2 coefficient returns to previous levels or higher in almost all countries. From this very high frequency daily data, one cannot reject the null hypothesis for *any* of the East Asian countries that they have not returned to their old system of dollar pegs (except Malaysia, which is now running a fixed exchange rate).

Figure 5 presents a more dramatic picture of Korea's and Thailand's return to the dollar standard. Based on daily data, rolling 30-day β_2 regression coefficients are plotted over the pre-crisis, crisis, and post-crisis periods.

What can we conclude from this statistical analysis? At high data frequencies—weekly and even daily—the peg to the dollar is remarkably robust in non-crisis periods; whereas, at lower frequencies—monthly or quarterly—exchange rates drift more. The exceptions are the Chinese RMB, Hong Kong dollar, and Malaysian ringgit, which are now firmly pegged for any frequency of measurement.

7. The "Original Sin" Hypothesis and High-Frequency Pegging

What could be the motivation for emerging market governments to dampen these very short-term movements in the exchange rate?

Guillermo Calvo and Carmen Reinhart (2000a and b) show that this short-term rigidity, which they measure on a monthly basis, is quite general in emerging market economies in Latin America, East Asia, and elsewhere. Since the collapse of Bretton Woods exchange parities in 1971, the apparent move to more flexible exchange rates has been a mirage for much of the Third World. In the First World, only Britain, Japan, and now the EU, have freely floating currencies where their central banks don't react to daily exchange rate movements—with Canada and Australia approximating this state of bliss. In the appendix, Figures A-1 to A-4 show that the Japanese yen is much more volatile against the dollar on a daily basis than are the currencies of other East Asian countries. In the short term, only the yen floats freely.

In contrast, countries on the periphery of the industrial center have formally or informally pegged exchange rates through direct or indirect foreign exchange intervention—what Calvo and Reinhart call "fear of floating" or "soft pegs".

> The root causes of the marked reluctance of emerging markets to float their exchange rates are multiple. When circumstances are favorable (i.e., there are capital inflows, positive terms of trade shocks, etc.) many emerging markets are reluctant to allow the nominal (and real) exchange rate to appreciate..... When circumstances are adverse, the fear of a collapse in the exchange rate comes from pervasive liability dollarization. Devaluations are associated with recessions and inflation, and not export-led growth. (Reinhart 2000)

Reinhart helps explain exchange rate stickiness at lower frequencies, i.e., monthly or quarterly. Her explanation is consistent with our argument that linking to the dollar provides a common nominal anchor for domestic price levels in East Asia. But this nominal-anchor argument does not carry much weight at higher frequencies. Domestic price level stability is not significantly affected by dampening day-to-day movements in the exchange rate.

Why should governments in less-developed countries be so anxious to stabilize exchange rates against the dollar from one day to the next? One explanation attributes this to incomplete domestic financial markets—the original sin hypothesis:

> "Original sin"... is a situation in which the domestic currency cannot be used to borrow abroad or to borrow long term, even domestically. In the presence of this incompleteness, financial fragility is unavoidable because all domestic investments will have either a currency mismatch (projects that generate pesos will be financed with dollars) or a maturity mismatch (long-term projects will be financed by short-term loans).
>
> Critically, these mismatches exist not because banks and firms lack the prudence to hedge their exposures. The problem rather is that a country whose external liabilities are necessarily denominated in foreign exchange is by definition unable to hedge. Assuming that there will be someone on the other side of the market for foreign currency hedges is equivalent to assuming that the country can borrow abroad in its own currency. Similarly, the problem is not that firms lack the foresight to match the maturity structure of their assets and liabilities, it is that they find it impossible to do so. The incompleteness of financial markets is thus at the root of financial fragility. (Eichengreen and Hausmann 1999)

Why original sin exists in most emerging markets, including the debtor economies of East Asia, is an important stylized fact whose implications will become clearer as we proceed. Not only is private foreign borrowing denominated in foreign exchange, typically dollars, but it is mostly short-term—as are domestic currency credits. Markets in medium- or longer-term domestic bonds bearing fixed rates of interest are absent. Although still denominated in foreign exchange, only sovereign bond issues in international bond markets, and government borrowing from official international agencies, are somewhat longer term. But even these often have variable interest rates, i.e., so many points above LIBOR, tied to yields on short-term assets.

These incomplete markets make it difficult and expensive to hedge foreign exchange risk. Importers more than exporters find it difficult to cover forward commercial transactions, including ordinary trade credit, which must be continually repaid within a few days or weeks.

Consider first the case of a Thai importer who is *not* liquidity constrained but must repay dollar trade credit in 30 days. If foreign exchange regulations permit, the cheapest way to hedge would be to buy dollars today to hold on deposit for 30 days. But consider the opportunity cost of doing so. Figure 6 shows that, before the crisis of 1997-98, baht deposit rates of interest averaged about five percentage points more than interest rates on dollar deposits. Relative to going unhedged by holding higher interest baht deposits for 30 days, this (annualized) five percentage point margin is his cost of hedging.

Second, consider the case of an *illiquid* Thai importer, one who does not yet have ready liquid assets for repaying the debt. To fashion the same kind of hedge, he must first borrow baht from the bank, and in 1995-96 the prime loan rate in Thailand was 13.5 per cent. Then by investing in a dollar deposit at five per cent, he is hedged. But the opportunity cost of doing so has risen to 8.5 percentage points.

True, the illiquid Thai importer is more likely to resort to the futures market to buy dollars forward on an organized exchange if it exists. However the cost of this forward cover (not including brokerage fees) would be roughly the forward premium on dollars over baht—which one can show (McKinnon 1979) will be somewhere between the opportunity cost of the liquid importer and the illiquid, i.e., between five and 8.5 percentage points in our example. So with large interest differentials (more on how these get established below) between the center country and the periphery, merchants and manufacturers find the opportunity cost of hedging to be correspondingly high.

Now consider the problem faced by financial institutions. Suppose banks accept short-term deposits in dollars to finance their longer-term domestic loan portfolio in baht. Then, in the forward market, the cost of buying dollars forward to hedge the foreign exchange risk over 30 days will be between five and 8.5 percentage points. (Having banks themselves hold extra dollars on deposit for 30 days defeats the whole idea of accepting low interest dollar deposits to make high-yield baht loans.) In financing the bank's baht loan portfolio, having to hedge dollar deposits would be virtually equivalent (though perhaps a bit more expensive) to bidding directly for high-cost baht deposits.

However, banks whose motivation is one of simply servicing or facilitating the foreign exchange needs of their non-bank customers may well be willing to hedge. Suppose a good retail customer contracts with the bank to buy dollars 30 days forward. The bank will then charge the customer the prevailing

forward premium on dollars over baht, but then cover itself by buying a low-interest 30-day dollar deposit in exchange for a high-interest baht deposit—likely in the domestic interbank market.

What are the implications for bank regulation? If the regulatory authorities strictly limited any net direct or indirect foreign exchange exposure on the part of banks, this would drive them out of the business of accepting low-cost foreign exchange deposits to finance higher-yield domestic currency loans. The inflow of *short-term* foreign capital into the economy would be reduced. But such strict regulation would not impair the banks' role of servicing and facilitating foreign exchange transactions by domestic merchants and manufacturers.

However, strict regulation against foreign exchange exposure could severely limit the ability of the banks to act collectively as dealer-speculators to make the foreign exchange market. Stabilizing speculation by banks, the most natural foreign exchange traders and dealers, would not be possible.

Consider the implications for optimal short-term foreign exchange management, first when capital controls are absent, and second, when they are effectively applied.

Case 1: No capital controls, imperfect bank regulation. Either because regulatory weakness leaves too many banks (and possibly importers) with exposed foreign exchange positions, or because the government doesn't want to impose draconian rules on institutions against assuming *any* open foreign exchange position, an informal hedge is provided by keeping the exchange rate steady in the short term. The short time frame over which foreign currency debts—largely in dollars—are incurred, and then repaid on a day-to-day or even a week-to-week basis, defines the same time frame over which the dollar exchange rate is (and should be) kept stable in non-crisis periods.

Case 2: Direct capital controls. Suppose the government prevents banks, other financial institutions, and individuals from holding any foreign exchange assets or liabilities. Non-bank firms engaged in foreign trade cannot take positions in foreign exchange except for the minimum necessary in their particular trade. Importers are prevented from building up undue foreign currency debts except for ordinary trade credit, and exporters are required to repatriate their dollar earnings quickly. In particular, banks cannot accept foreign currency deposits or hold foreign currency deposits abroad, or make foreign currency loans. Then private agents in general, and banks in particular, cannot act as dealer-speculators to make the foreign exchange market (McKinnon, 1979). The exchange rate will become indeterminate unless the government steps in as a dealer to clear international transactions. Thus, the government must take an open position, which determines the level of the exchange rate, and assume the exchange risk. So if the government is determining the exchange rate anyway, why not keep it stable?

China and Malaysia more or less correspond to Case 2 in imposing capital controls, although not as rigidly as described under Case 2. Thus their governments have wisely fixed their dollar exchange rates—certainly in the short run and maybe longer. Because Korea and Thailand have now pretty well rid themselves of the last vestiges of the capital controls they once had, they correspond more to Case 1. And the Korean and Thai governments are indeed reducing exchange risk in their economies by keeping their rates virtually pegged in the short run, even if they cannot prevent some medium and longer-term movement—particularly in the unsettled aftermath of the 1997-98 crisis.

(However, while such soft short-term pegs reduce foreign exchange risk for well-behaved merchant traders and financial institutions, this regime may be exploited by financial institutions (and some traders) with moral hazard. Poorly regulated and under-capitalized banks with deposit insurance may be more willing to gamble by accepting short-term foreign currency deposits to finance their domestic loan portfolios. More on this moral hazard problem in the next section.)

What might we conclude? *With or without* capital controls, high-frequency pegging is optimal when there is original sin. Beyond the nominal anchor argument for stabilizing exchange rates in the medium and longer terms, there is a risk-reducing argument for very short term pegging.

But, except in a crisis, pervasive direct capital controls on the gross foreign exchange positions of banks (as under Case 2) are unlikely to be the first-best way of controlling exchange risk when private financial markets are incomplete (original sin).

First, preventing banks from accepting any foreign currency deposits, or making any foreign currency loans, disrupts banks' traditional role of clearing foreign payments and settling accounts. On any trading day, the enormous flow of foreign payments would have to be cleared directly by the central bank.

Second, such capital controls make it impossible for banks to do the covered interest arbitrage necessary to make the forward market in foreign exchange (McKinnon, 1979). Either the private sector is left with no mechanism for hedging international transactions itself, or the government (central bank) is dragged willy nilly into writing forward exchange contracts for private traders—a process which has been open to abuse around the world.

So, keeping our assumption of original sin, the first-best way of controlling risk in the foreign exchanges is encapsulated in Case 3 below.

Case 3: Net foreign exchange exposure of banks is regulated to be zero. The domestic banking authorities let authorized banks acquire foreign exchange assets and liabilities gross, but their net position, perhaps defined at end one trading day, must be zero. And, in making this calculation, the regulators also consider indirect as well as direct foreign exchange liabilities. For example, if a bank accepts dollar deposits but from then on lends to domestic firms in dollars, its balance sheet may look square. But the non-bank domestic borrower may now be exposed to currency risk and could default if the domestic currency is devalued. Exchange risk is translated into default risk into banking risk. Similarly, banks may undertake off-balance sheet transactions in derivatives which increase their foreign exchange exposure, and which are hard to detect.

While necessarily only approximate in practice, forcing banks to (near) zero net foreign exchange exposure is nevertheless a valuable regulatory principle. It counters the various margins of temptation not to hedge, as described above. In particular, it prevents banks from accepting foreign currency deposits to make domestic currency loans. But even if applied quite strictly, this regulatory principle leaves enough flexibility for the commercial banking system as a whole to perform its normal facilitating role in the foreign exchanges. For any given spot exchange rate, the clearing of international payments and settling of accounts can devolve from the central bank. The commercial banks can still undertake covered

interest arbitrage and so create a market in forward exchange to service the hedging needs of their non-bank retail customers.

That said, however, imposing the rule of no net foreign exchange exposure means that the banks still cannot act as (stabilizing) speculators to determine the level of the exchange rate. In this one important respect, Case 3 is similar to Case 2. With either capital controls or a rule of no net foreign exchange exposure, the exchange rate is indeterminate unless the government itself enters the market to act as a stabilizing speculator. So with first-best bank regulation for controlling risk in place, i.e., Case 3, the government is still forced to determine the equilibrium exchange rate.

With these cases, we have examined three quite different foreign exchange regimes. All three were found to be consistent with the high frequency pegging to the dollar observed in the original sin economies of East Asia.

8. The Honeymoon in the Interest Differential: A Simple Model

In post-crisis East Asia, do governments have much time to establish a better system of financial regulation for managing exchange risk? Without such regulatory reforms (Case 3 above), the cycle of short-term overborrowing, by weakly regulated banks and other financial institutions, might happen again.

However, in the aftermath of the crisis, there is a honeymoon effect. In 1999-2000, the differential in short-term interest rates between the peripheral East Asian debtor economies and the industrial center, as represented by the U.S., has been much narrower than normal—and even negative (figures 6 and 10). Correspondingly, the margin of temptation to accept unhedged foreign currency deposits to make loans denominated in the domestic currency has almost vanished. Thus, bank regulators have some temporary—but only temporary—breathing space to reform the system.

To see this, consider some interest rate identities for a very short term to maturity. Suppose no government controls on foreign exchange transacting so that a well-organized market in currency futures can exist. Then, by covered interest arbitrage among liquid banks, the (deposit) interest differential is equal to the to the forward premium:

$$i - i^* = f > 0 \quad \text{where} \tag{2}$$

i = the domestic nominal (deposit) interest rate.
i^* = the dollar (deposit) interest rate in the international capital market.
f = the forward premium on dollars in domestic currency.

If domestic banks accepting dollar deposits at the low interest rate i^* cover by buying dollars forward, the cost of the forward cover per dollar so borrowed is simply f. Thus, the effective interest rate on hedged dollar deposits is $i^* + f$.

$$i_{hedged} = i^* + f = i \tag{3}$$

So, with forward covering, there is no net interest gain from accepting dollar deposits over accepting higher interest deposits in domestic currency. Liquid hedged borrowers in foreign exchange see the same cost of capital as do domestic banks accepting deposits denominated in the domestic currency.

Banks without moral hazard would voluntarily cover the exchange risk. They may well have accepted dollar deposits simply for convenience in clearing international payments. In contrast, poorly capitalized banks prepared to gamble on the basis of government deposit insurance might well accept low-cost dollar deposits as an ongoing source of finance for loans denominated in the domestic currency—unless a vigilant regulatory authority forces them to hedge.

But how much of the interest differential in equation (2) represents a margin of temptation where banks with (latent) moral hazard will try to avoid regulatory sanctions and borrow in dollars anyway? Let us partition the interest differential into

$$\boldsymbol{i} - \boldsymbol{i}^* = \mathrm{E}\hat{\boldsymbol{e}} + \rho_{currency} \tag{4}$$

$\rho_{currency}$ is the currency risk premium as ordinarily defined. Apart from any unidirectional expected movement in the exchange rate, it represents the extra return required by investors to hold domestic rather than foreign currency assets. In the specific East Asian context, it represents domestic financial volatility—in interest rates or domestic price levels—measured against similar risk(s) prevailing in the markets of the center country, i.e., the U.S. Thus $\rho_{currency}$ increases with that country's exchange rate volatility against the U.S. dollar.

In the peripheral Asian debtor countries, $\rho_{currency}$ is (was before 1997) normally greater than zero. But it can be reduced toward zero if there is financial convergence with the U.S., i.e., the dollar exchange rate has been credibly stabilized so that interest rate volatility also approaches American levels (McKinnon 2000). Indeed, one motivation for high frequency pegging is to reduce the risk premium in domestic short-term interest rates, i.e., reduce $\rho_{currency}$.

The other component of the interest differential—the expected depreciation of the domestic currency, $\mathrm{E}\hat{\boldsymbol{e}}$—can be decomposed into two parts. First, the exchange rate can change predictably and smoothly according to the government's policy announcements and commitments—such as the downward crawl in the Indonesian rupiah before the 1997 crash. Second is the small probability of a regime change, a large, sudden devaluation whose timing is unpredictable.

$$\mathrm{E}\hat{\boldsymbol{e}} \equiv \mathrm{E}\hat{\boldsymbol{e}}_{predictable} + \mathrm{E}\hat{\boldsymbol{e}}_{regime\ change} \tag{5}$$

Both types of expected change in the exchange rate in (5) widen the nominal interest differential in (4). However, $\mathrm{E}\hat{\boldsymbol{e}}_{regime\ change}$ is part of the margin of temptation for banks with moral hazard to overborrow, while $\mathrm{E}\hat{\boldsymbol{e}}_{predictable}$ is not. If the exchange rate was expected to depreciate smoothly through time, even banks with very short time horizons will account for the higher domestic currency costs of repaying short-term foreign currency deposits. Therefore, we exclude $\mathrm{E}\hat{\boldsymbol{e}}_{predictable}$ from the *super risk premium*:

$$\rho_{super} = \rho_{currency} + \mathrm{E}\hat{\boldsymbol{e}}_{regime\ change} = \boldsymbol{i} - \boldsymbol{i}^* - \mathrm{E}\hat{\boldsymbol{e}}_{predictable} \tag{6}$$

The super risk premium, ρ_{super}, represents the margin of temptation for banks to overborrow in foreign exchange beyond what they might do if forced to hedge. (Even if banks were required to hedge their foreign exchange exposure, McKinnon and Pill (1996 and 1997) show that international overborrowing could still occur because banks with moral hazard assume too much domestic credit risk.) ρ_{super} has two components: the currency risk premium, as defined above; and the possibility that the regime could change through a discrete devaluation. The latter source of upward pressure on the interest rate on assets denominated in the domestic currency is sometimes called the peso problem.

The basic idea here is that the decision-making horizon of the bank with moral hazard is sufficiently short that it ignores unpredictable changes in the exchange rate. The managers of the bank simply hope that anything drastic, if it happens at all, will not happen on their watch. The super risk premium in the interest differential then defines their margin of temptation to gamble and accept foreign currency deposits unhedged.

How does this super risk pemium vary through time—specifically, through the pre-crisis, crisis, and then post-crisis episodes? For Korea, Malaysia, Philippines, and Thailand, Figure 6 plots their short-term interest rates against that of the U.S. during these three episodes from 1995 into 2000. In the pre-crisis period, their super risk premia were virtually the whole of the interest differential: up to May 1997, the differential was anywhere between two and 10 percentage points.

Empirically, it is hard to partition this differential between $\rho_{currency}$ and $\mathrm{E}\hat{\boldsymbol{e}}_{regime\ change}$ except to note that the possibility of a discrete devaluation was an important component, even though none of the four countries had an obviously overvalued exchange rate (McKinnon, 2000a). Indeed, the system of soft pegs had gone on for a decade or more. This interest differential contributed to the unhedged overborrowing we observed before the crash.

Then, from June 1997 to December 1998, virtually a complete loss of confidence in one or other of the four currencies occurred. In the crisis, these interest differentials widened to between five and 25 percentage points (Figure 6). In effect, there were extrapolative expectations: exchange depreciation led to expectations of further depreciation. But in these panic conditions, the problem was rapid capital outflows and not more overborrowing in the pre-crisis mode. (Still, importers in this period had terrific incentive not to hedge their exchange risks.)

Finally, we see the post-crisis honeymoon January 1999 to June 2000. Figure 6 shows short-term interest rates in the four crisis economies falling sharply, with Thailand's and Malaysia's rates even falling to two or so percentage points less than the American benchmark rate of five to six per cent. Thus, at these low short-term interest rates, East Asian importers have no incentive not to hedge their exchange risks, nor do banks have incentive to accept short-term dollar deposits to expand their loans in domestic currency. Hence the honeymoon for bank regulators.

The proximate cause of this remarkable fall in short-term interest rates was the change in the $\mathrm{E}\hat{\boldsymbol{e}}_{regime\ change}$ component of the interest differential. After the dramatic overshooting of the exchange rates of the devaluing countries, as confidence returned and the fear of another speculative attack became much more remote, the market began to anticipate the near-term appreciations of 1999 and 2000

(Figure 1). However, these appreciations remain erratic and difficult to predict as if the $\mathrm{E}\hat{\boldsymbol{e}}_{regime\ change}$ component had changed sign, i.e., from positive to negative. And this change could (more than) offset the effect of the ordinary currency risk premium, $\rho_{currency}$ on the interest differential. Hence the fall in *short-term* interest rates in the former crisis economies to levels sometimes even below those prevailing in the U.S. (Figure 6). The corresponding falls in short rates in the non-crisis economies were not nearly as marked (Figure 7).

But this is not the end of the story. From pre- to post-crisis, *long-term* expectations of future devaluations and other risks have not changed all that much. True, these long-term expectations are difficult to measure because of the absence of truly long-term bond markets in domestic currency within each of our affected economies. Korea comes closest to having a bond market, but really for just three years out. In August 2000, when Korean short-term interest rates were about five per cent, three-year bond rates were up at 9.5 per cent—and 10 or 20 year bond rates, if they existed, would be much higher still.

At moderately longer terms (six to eight years), sovereign bond issues denominated in dollars exist for each of our crisis economies. Because these carry default risk but not currency risk, these dollar interest rates are very much a lower-bound estimate of what hypothetical domestic-currency bonds would carry at the same term to maturity. And interest rates on these dollar-denominated bonds remain up at eight to 10 per cent in the post-crisis period (Figure 8). More importantly, in the post-crisis period, these sovereign bond interest rates seem to be somewhat higher than their pre-crisis equivalents. Because long rates are an average of expected future short rates plus a liquidity premium, the market seems to be betting that, within three years or so, short rates will rise back to where they were before the crisis, and maybe higher. So the honeymoon for the regulators will end like most honeymoons.

9. Lengthening the Term Structure of Finance

Is there a general lesson here about the feasibility of freely floating exchange rates among different classes of economies? In his chapter titled “The Confidence Game”, Paul Krugman (1999) identifies the differences thus:

> It seems, in other words, that there is a sort of double standard enforced by the markets. The common view among economists that floating rates are the best, if imperfect, solution to the international monetary trilemma was based on the experience of countries like Canada, Britain, and the United States. And sure enough, floating exchange rates work pretty well for First World Countries, because markets are prepared to give those countries the benefit of the doubt. But since 1994 one Third World country after another—Mexico, Thailand, Indonesia, Korea, and most recently, Brazil—has discovered that it cannot expect the same treatment. Again and again, attempts to engage in moderate devaluations have led to a drastic collapse in confidence. And so now markets believe that devaluations in such countries are terrible things; and because markets believe this, they are. (Krugman 1999)

He makes an important distinction. To cushion the effects of the fall in primary products prices from the Asian crisis, Australia and Canada could let their currencies float downward without capital controls and not be attacked. Why? Because exchange rate expectations for the Australian and Canadian dollars

were already fundamentally regressive: during the course of the downward float, people generally expected the rate to come back. Both were mature market economies with: (1) credible internal monetary mechanisms (independent central banks) for targeting their domestic price levels over the long run, and (2) relatively long terms to maturity for their internal and external debts. (In Asia, the non-crisis creditor countries of Taiwan and Singapore were (are) more like mature capitalist ones in these respects.)

Of course, (1) and (2) are complementary. Only with long term confidence in the purchasing power of domestic money (against the center country's) would exchange rate expectations be naturally regressive, and are long-term bond and mortgage markets possible to organize—both domestically and for commercial (non-sovereign) international borrowing. And having longer-term finance bolsters the credibility of the central bank to hit its inflation targets over the longer term.

Now return to our emerging market debtor economy with original sin. The term structure of finance is short and there is no history of central bank independence. Indeed, in most Third World economies—including the Asian five—the central bank has often been commandeered to provide cheap credit for promoting exports, subsidizing commercial banks, and otherwise directing credit in line with the government's development program. Sometimes, this strategy has been facilitated by ringing the country with capital controls. Correspondingly, there is a potential lack of confidence in the long-term exchange rate *unless* the government can effectively restrain itself.

During their miracle growth phases before 1997, the East Asian economies successfully pegged to the dollar as the nominal anchor for their domestic price levels. With the benefit of hindsight, however, we now know that this policy was seriously incomplete. First, and most obviously, was the failure to properly regulate the financial system—including the central bank itself in some cases—against undue risk-taking including short-term foreign exchange exposure.

Second, and more subtly, the East Asian debtor economies had not committed themselves to a long-term exchange rate parity in the mode of the 19th century gold standard (Goodhart and Delargy 1998)—even though they seemed to be securely pegged in the short and medium terms. Because of the short-term structure of finance, each was vulnerable to a speculative attack on its currency; but none had a long-run exchange rate strategy in place to mitigate the worst consequences of any such attack. Post-crisis, there was no well-defined tradition of returning to the pre-crisis exchange rate. In contrast, under the classical gold standard, if a government was forced to suspend its gold parity in a crisis, it was obligated to return to its pre-crisis parity (McKinnon 1996). This restoration rule kept exchange-rate expectations regressive.

Besides original sin itself, the problem was aggravated because the pre-1997 East Asian dollar standard was informal rather than formal. With the exception of Hong Kong, none of the countries involved had formally declared a dollar parity—and each had been classified by the IMF as following some variety of managed floating rather than being pegged to the dollar. Thus, with the forced suspension of these dollar pegs in the 1997-98 crisis, there was no traditional dollar parity (gold parity in the 19th century sense) to which the government was bound to return. In the crisis, the absence of regressive expectations led to a very inefficient trade off: the East Asian five suffered from both deep devaluations and very high (short-term) interest rates (McKinnon 2000a).

Thus, emerging market economies whose macroeconomic fundamentals are sound so as to permit a good fix for their exchange rates (McKinnon and Pill 1999) should extend the maturity of that commitment to the distant future. If the East Asian five had, before the 1997 crisis, adopted a restoration rule explicitly—and, ideally, collectively—they could have moderated the high interest rates and deep devaluations which bankrupted so many of their economies, once the attacks began. (Of course, countries that must rely on the inflation tax, and cannot credibly commit to long-run exchange rate stability, should not try it.) The benefits from having the exchange rate pinned down in the long run exceed those from having a hard short-term fix.

So, without going to complete dollarization, Latin American style, redemption from original sin is possible. Even though the domestic monetary regime and note issuing authority remain independent, the good record of fiscal balance in the East Asian economies suggests that a longer-term commitment to maintain their dollar exchange rates could be credible. Then, with regressive exchange rate expectations and the future price level more secure in the face of any mishap forcing the (temporary) suspension of the fixed exchange rate commitment, the authorities can seriously encourage lengthening the term structure of domestic and foreign finance in the bond market. An appropriate accounting framework with full disclosure for bond issuers, and a legal framework to secure the rights of bond holders, and so on, now become more relevant.

To escape from original sin, Eichengreen and Hausmann (1999) discuss, very perceptively, the need lengthen the term to maturity of domestic markets for bonds and bank loans. However, their approach is the inverse of what I am suggesting here. They want to start encouraging longer term bond finance by domestic institutional and legal changes and hope that this would lead to greater (long-term) exchange rate stability. I would start with a long-run exchange rate commitment, i.e., the restoration rule, to create a friendlier environment for strengthening the institutions governing bond markets. The emphasis of the two approaches is different, but they are not in conflict.

This is a virtuous circle. When long-term bond issues in the 19th century mode begin to displace short-term bank finance, the government's commitment to long-term exchange rate stability is naturally reinforced. On the one hand, lengthening the term structure of finance makes the economy less vulnerable to currency attacks in the foreign exchanges; on the other hand, its domestic banking system becomes less vulnerable to internal runs. In countries with original sin, the empirical evidence suggests that currency attacks and commercial bank runs are strongly correlated (Kaminsky and Reinhart 1999). Finally with a more vigorous domestic bond market, the central bank can better conduct domestic open market operations to defend the currency and secure the domestic price level over the longer run.

10. New Rules for the Dollar-Standard Game: A Concluding Comment

Start from the informal rules under which the East Asian dollar standard operates. These rules can be modified to make this common monetary standard more robust and efficient in the presence of original sin, and also to help lengthen the term-structure of finance for achieving redemption.[3] The most significant new or modified rules for the peripheral countries in the system would be:

3 If the sin is truly original, then of course there is no escape!

1. No net foreign exchange exposure by banks or other financial institutions with short-term assets or liabilities. Comprehensive capital controls are a second-best alternative. *Corollary*: in either case, the government must then make the dollar-based foreign exchange market on a day-to-day basis.

2. Move from informal dollar pegging to official dollar parities. Treat these parities as long-term obligations to which the government is committed after any crisis.

3. Make other institutional changes—improving legal recourse of creditors, greater accounting transparency, and so on—to lengthen the term structure of domestic finance by encouraging the development of bond and mortgage markets.

4. Rationalize the position of Japan within the dollar-based East Asian system. U.S. and Japan jointly commit to a benchmark parity for the yen/dollar rate over the long term. But let the yen/dollar rate float freely on a day-to-day or week-to-week basis.

To create a viable, longer-term bond market in the emerging market economies of East Asia, rules 1,2, and 3, offer both a carrot and a stick. To lengthen the term structure of both domestic and foreign finance, rule 1 is the stick and rules 2 and 3 are carrots.

Because of the special position of commercial banks in clearing domestic and international payments, they have been overly subsidized as short-term financial intermediaries. Formal or informal deposit insurance, special discount privileges with the central bank, and internationally organized bailouts by the IMF or similar international agencies, have all been designed to prevent systemic breakdowns in the payments mechanism for economies in distress. While all of this may be well and good, the incidental effect tilts the whole structure of finance toward the short-term. It reinforces original sin because international and domestic bond markets at longer term have not been similarly subsidized. Thus, rule 1 is a stick designed to force banks out of the business of being international short-term intermediaries, i.e., accepting foreign currency deposits to make domestic currency loans.[4]

Rules 2 and 3 hold out carrots to encourage longer term domestic and international bond markets for the private sector. In particular, rule 2 gives *long-term* assurance that the monies of the peripheral countries will not be willingly devalued against the dollar—see Section 9 above. This is important because U.S. Treasury bonds are the risk-free asset in international bond markets. Thus risk premia in the interest rates on bonds of the peripheral countries, particularly at longer term, would be reduced.

The analysis of Japan's position in the system is quite different. It is by far the largest creditor country with long-term bond markets of its own. Nevertheless, since the 1970s, the fear of yen *appreciation* generates a parallel fear of ongoing domestic deflation with nominal interest rates approaching zero (McKinnon and Ohno 1997, and forthcoming). Thus, by rule 4 quashing the fear of yen appreciation,

4 Within the purely domestic part of the system, maturity transformation by banks has also been (inadvertently) overly subsidized. Thus, there is a case for domestic regulation to limit maturity transformation by banks. But issues of purely domestic bank regulation are not treated in this paper.

Japan itself would be the main beneficiary with an end to deflation and an increase in nominal (although not real) interest rates on yen assets.

Over the past decade, Japan's unnaturally low nominal interest rates have had an unfortunate side effect on the rest of East Asia. Except in honeymoon periods, such low rates provoke banks and other institutions in the smaller East Asian economies to overborrow. Because of the (temporary) interest differential between, say, baht and yen assets, the margin of temptation to undertake unhedged short-term borrowing is accentuated. Thus, if Japanese nominal interest rates rose to more normal international levels, short-term capital flows in East Asia would become less volatile.

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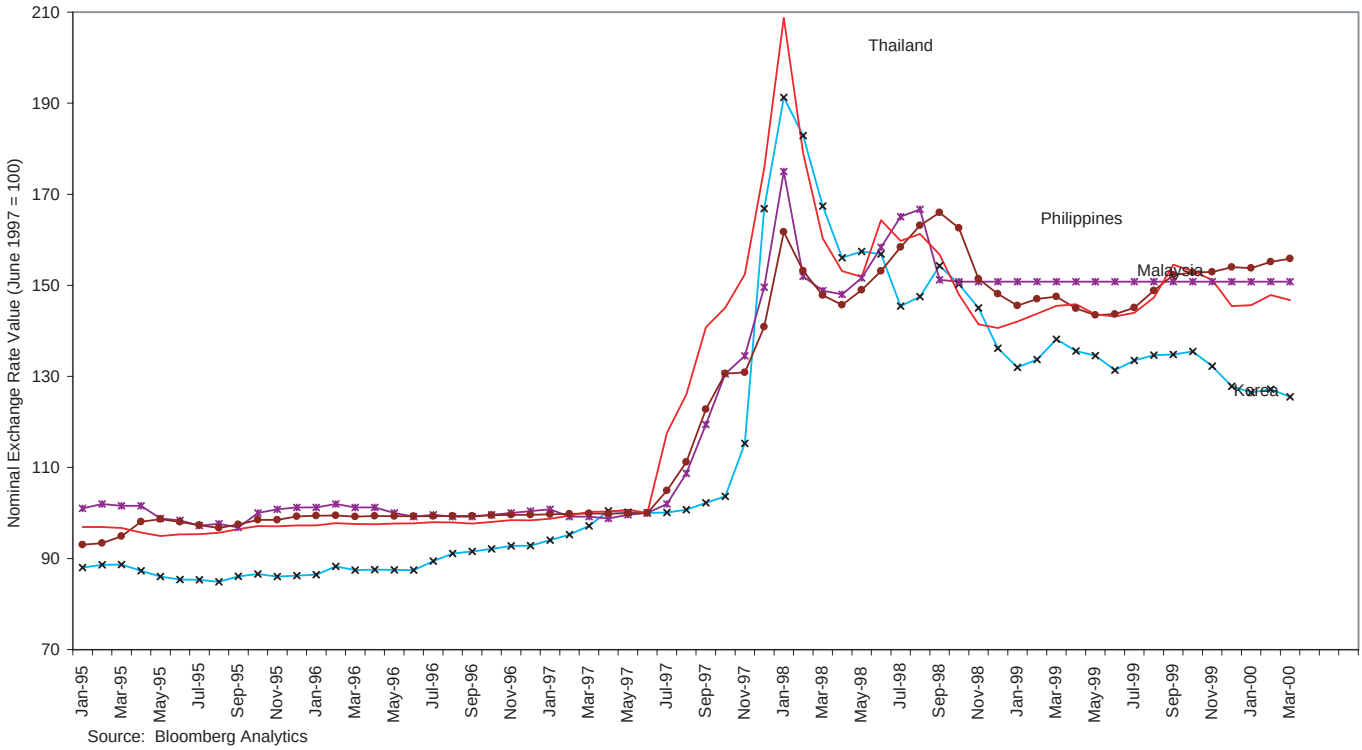
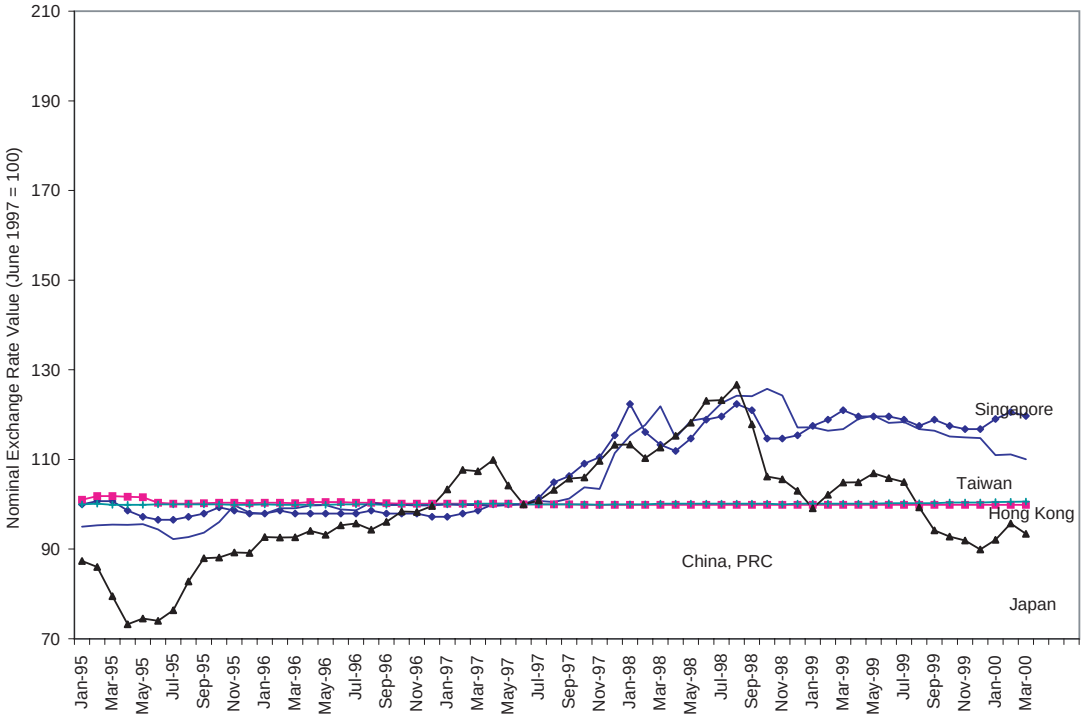
Figure 1: Nominal Exchange Rates against U.S. Dollar: Before and After the Crisis (Crisis Countries)



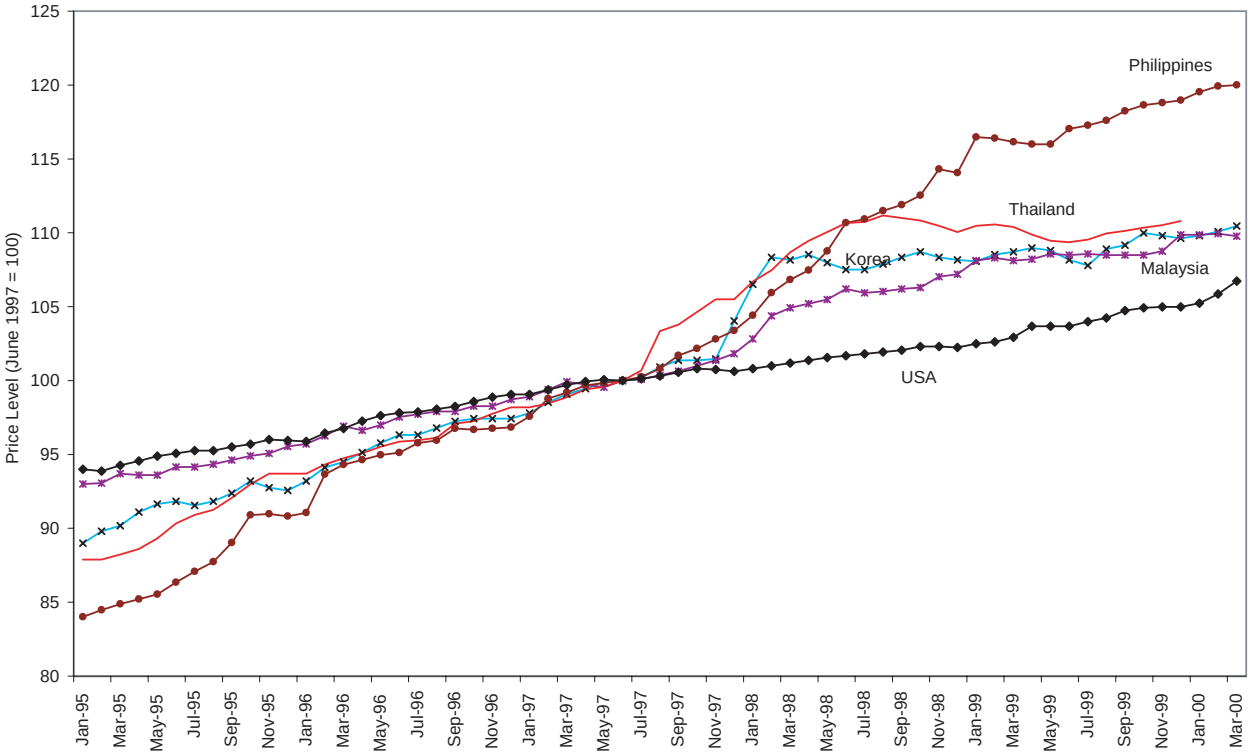
Source: Bloomberg Analytics

Figure 2: Nominal Exchange Rates against U.S. Dollar: Before and After the Crisis (Non-Crisis Countries and Japan)



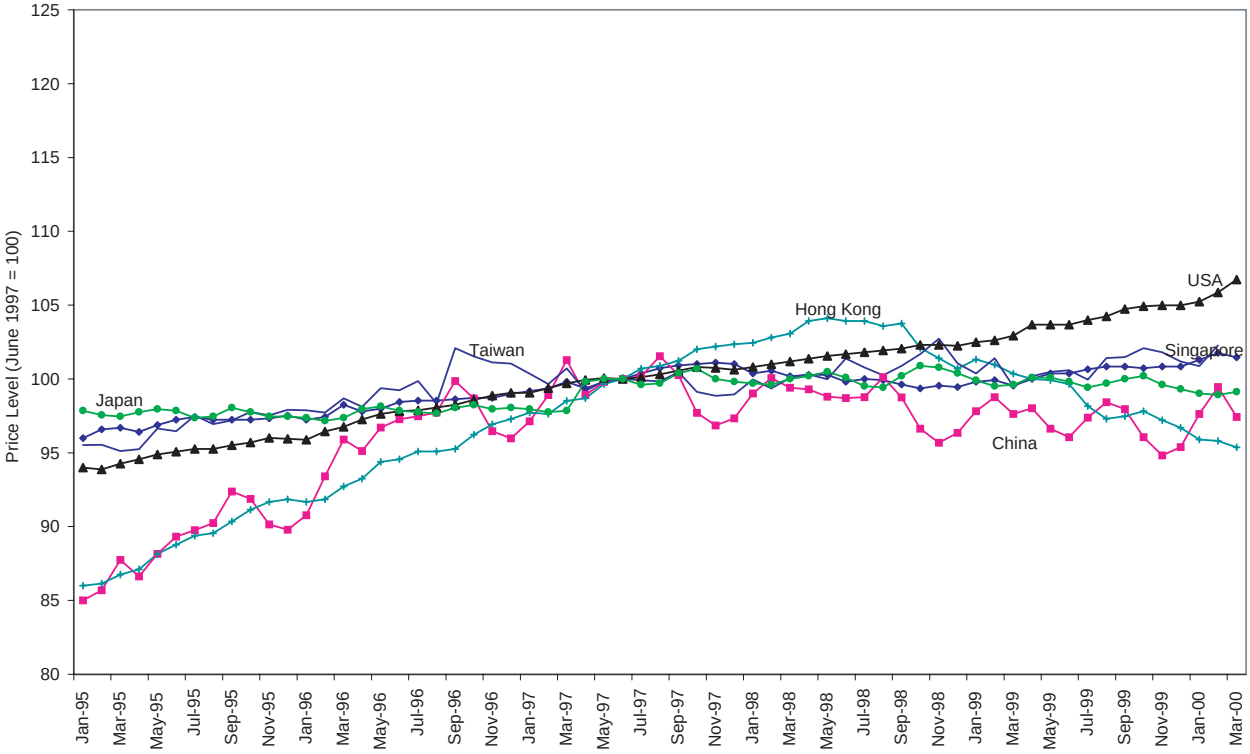
Source: Bloomberg Analytics

Figure 3: Consumer Price Levels: Before and After Crisis (Crisis Countries)



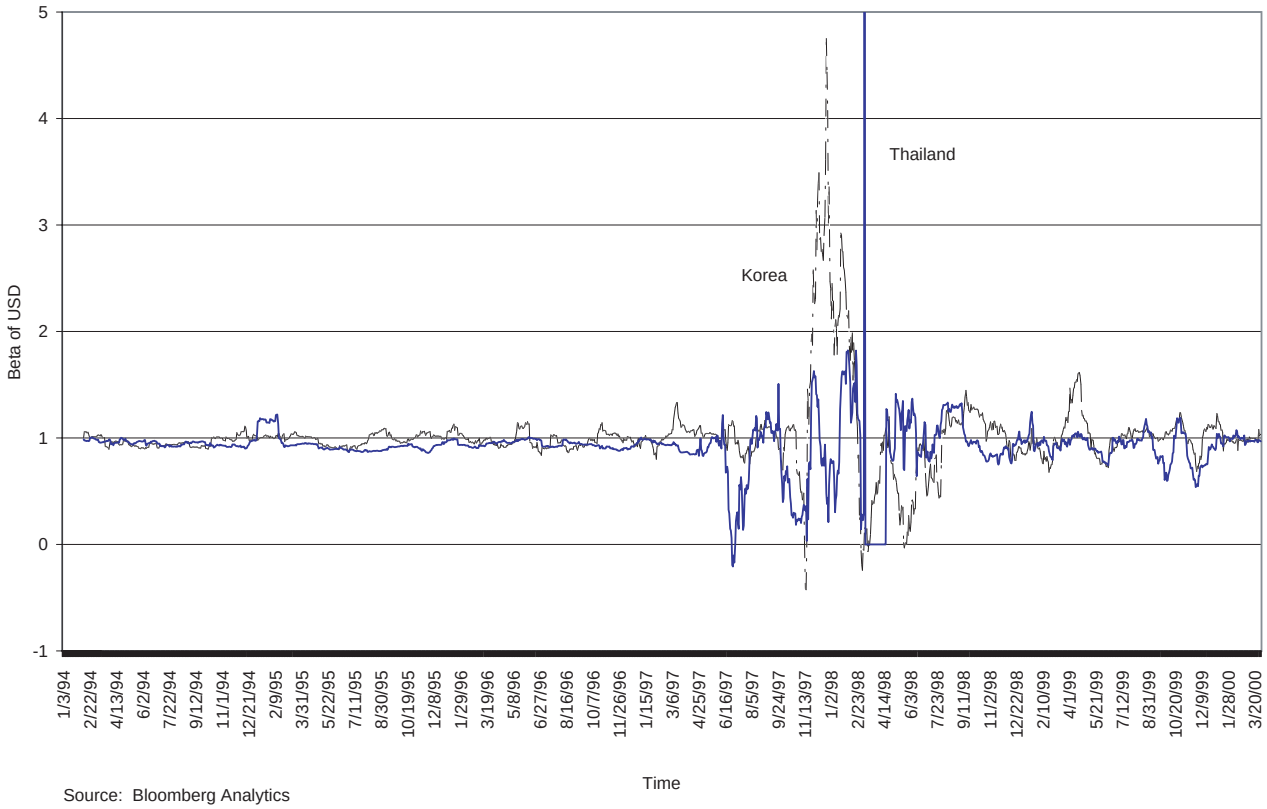
Source: International Financial Statistics, IMF

Figure 4: Consumer Price Levels: Before and After Crisis (Non - Crisis Countries and Japan)



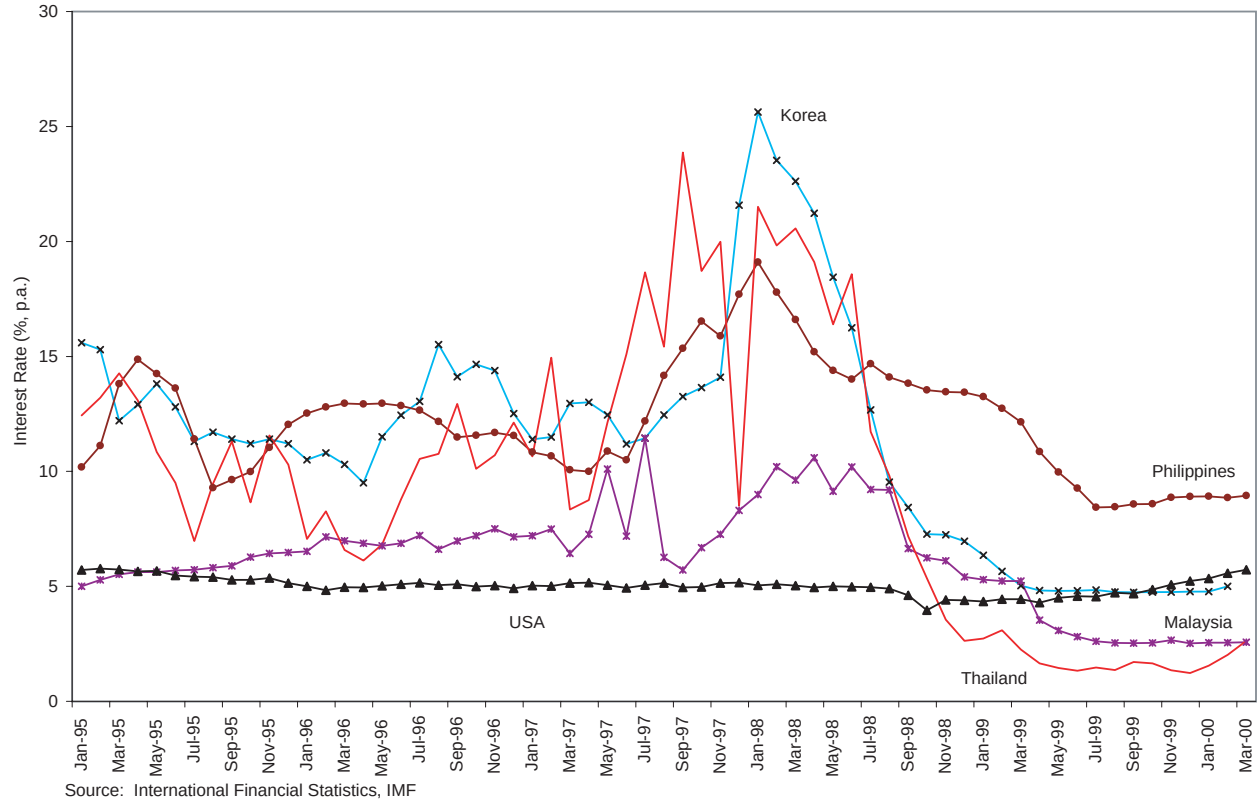
Source: International Financial Statistics, IMF

Figure 5: 30-trading-day Rolling Coefficients for U.S. Dollar: Before and After the Crisis



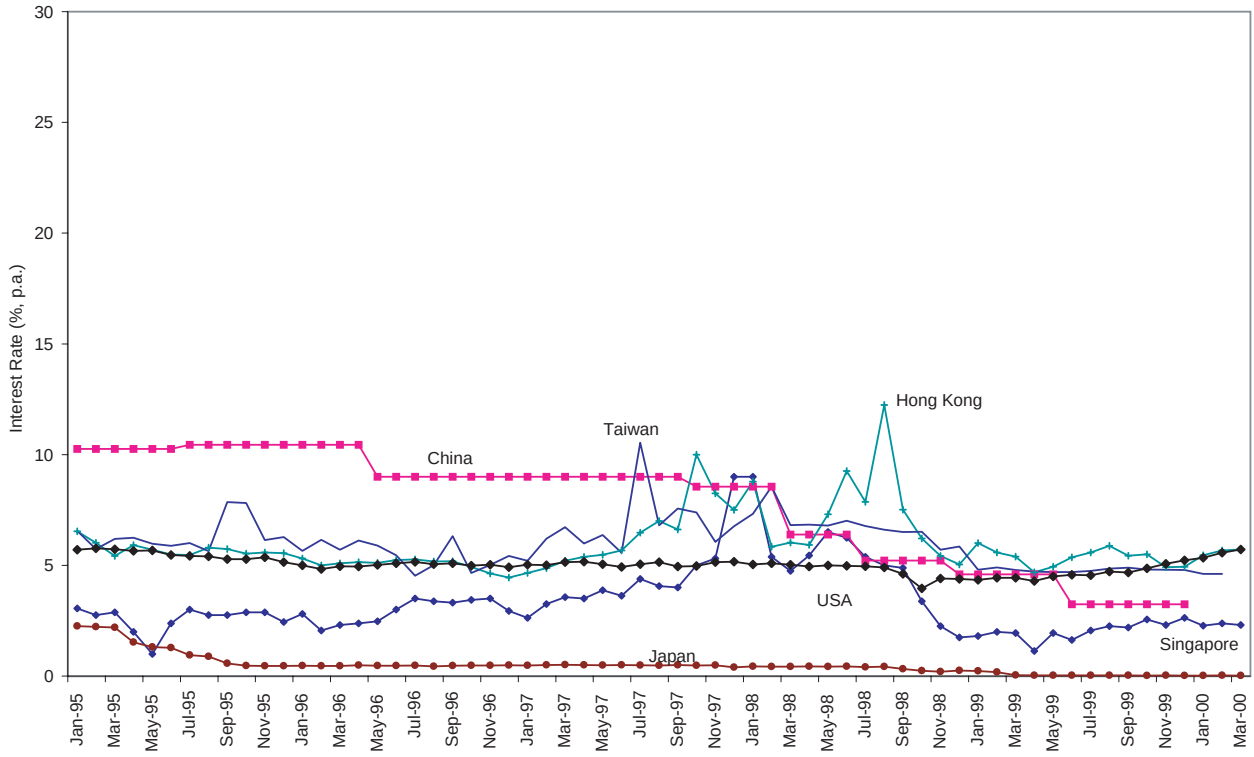
Source: Bloomberg Analytics

Figure 6: Short-term Domestic Currency Interest Rates: Before and After Crisis (Crisis Countries)



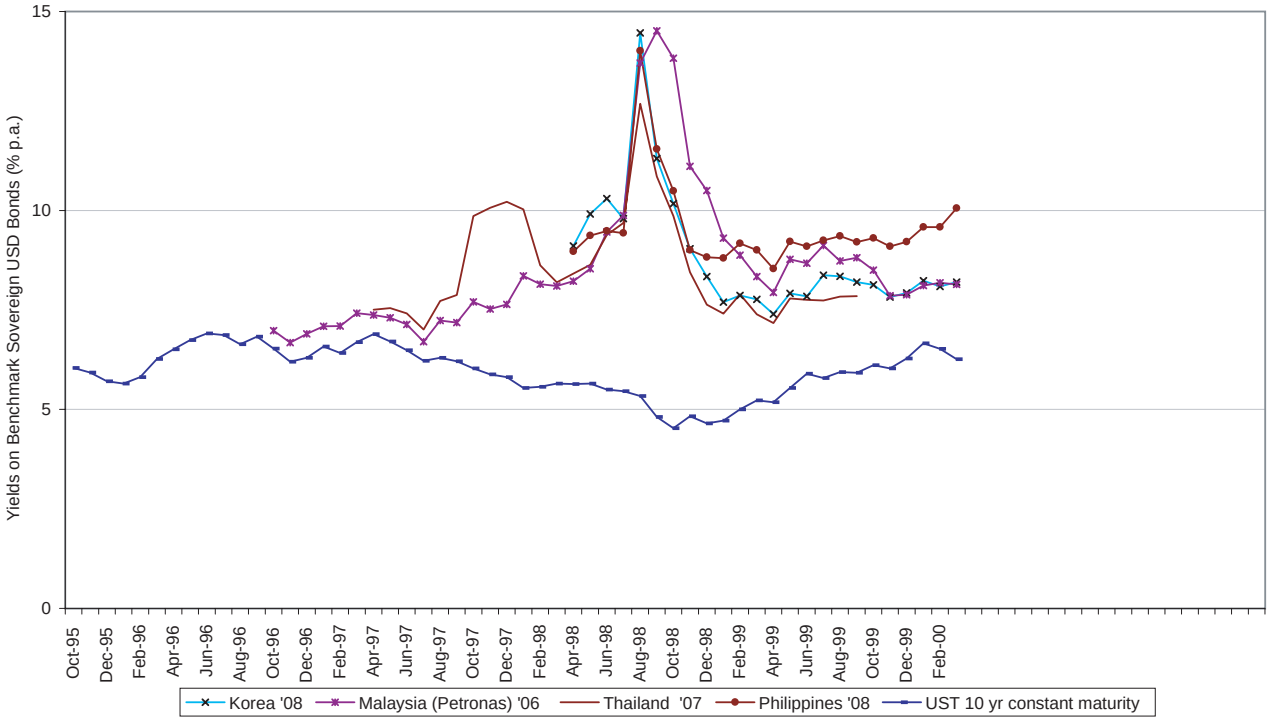
Source: International Financial Statistics, IMF

Figure 7: Short-term Domestic Currency Interest Rates: Before and After Crisis (Non-Crisis Countries and Japan)



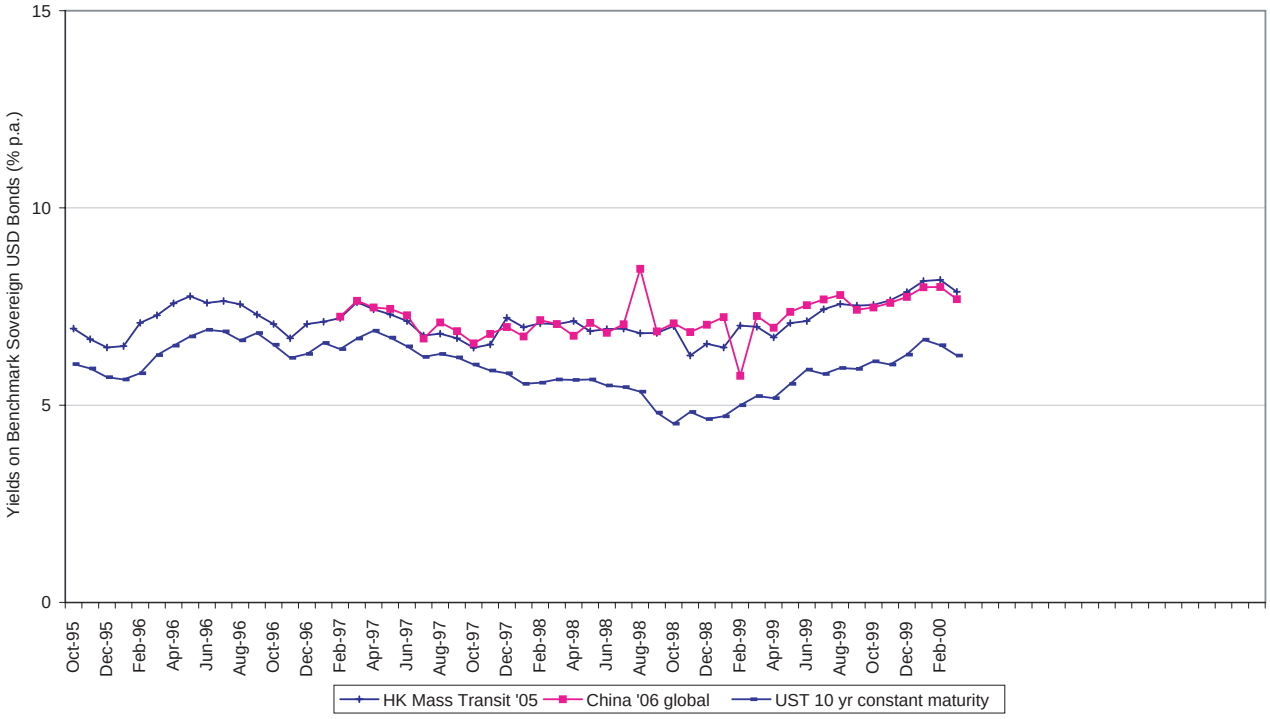
Source: International Financial Statistics, IMF

Figure 8: Emerging Market Sovereign Bond Yields in Dollars: Before and After the Crisis (Crisis Countries)



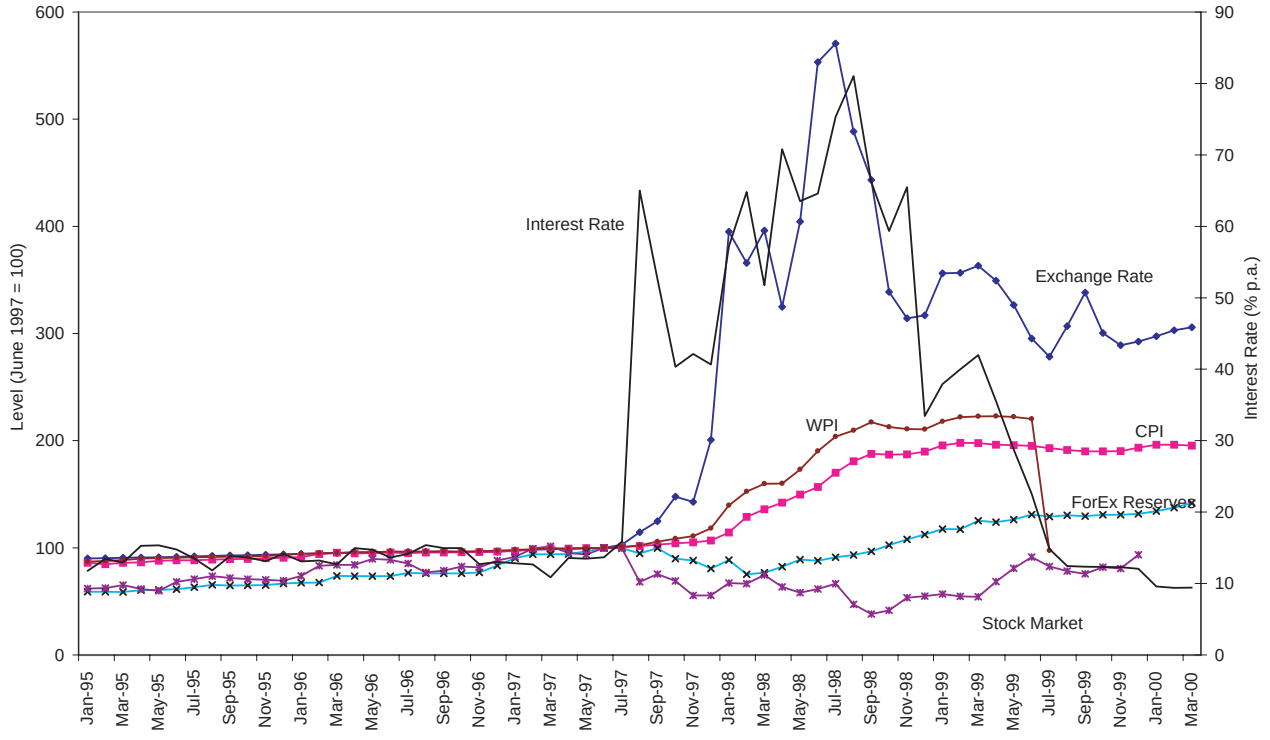
Source: U.S. Treasury

Figure 9: Emerging Market Sovereign Bond Yields in Dollars: Before and After the Crisis (Non-Crisis Countries)



Source: U.S. Treasury

Figure 10: Indonesia: Before and After the Crisis



Source: International Financial Statistics, IMF.

Table A-1: Daily Observations: Pre-Crisis Period January 1994 - May 1997

Observations: 889

		β_1	β_2	β_3			
	Constant	U.S. Dollar	Japan Yen	Deutschmark	R square	Adj R square	F statistic
China Yuan	0.000	0.996	0.000	0.012	0.99563	0.99561	67,142.17
	(0.000)	(0.003)	(0.003)	(0.007)			
Hong Kong Dollar	0.000	1.000	-0.002	0.002	0.99811	0.99810	155,457.53
	(0.000)	(0.002)	(0.002)	(0.005)			
Indonesian Rupiah	0.000	0.999	-0.014	-0.021	0.96058	0.96045	7,188.77
	(0.000)	(0.008)	(0.009)	(0.022)			
Korean Won	0.000	1.021	0.006	-0.032	0.88348	0.88308	2,236.68
	(0.000)	(0.016)	(0.017)	(0.041)			
Malaysian Ringitt	0.000	0.886	0.062	0.039	0.88911	0.88873	2,365.31
	(0.000)	(0.014)	(0.015)	(0.036)			
Philippine Peso	0.000	0.987	-0.009	-0.012	0.83598	0.83543	1,503.58
	(0.000)	(0.018)	(0.021)	(0.049)			
Singapore Dollar	0.000	0.817	0.114	0.037	0.90524	0.90492	2,818.02
	(0.000)	(0.012)	(0.013)	(0.032)			
Thai Baht	0.000	0.955	0.070	-0.087	0.92323	0.92297	3,547.57
	(0.000)	(0.012)	(0.013)	(0.031)			
Taiwan Dollar	0.000	1.015	0.015	-0.067	0.92799	0.92775	3,801.82
	(0.000)	(0.012)	(0.013)	(0.031)			

Source: Bloomberg Analytics and International Monetary Fund
Note: Standard Errors are in parentheses.

Table A-2: Daily Observations: Crisis Period June 1997 - December 1998

Observations: 412

		β_1	β_2	β_3			
	Constant	U.S. Dollar	Japan Yen	Deutschmark	R square	Adj R square	F statistic
China Yuan	0.000	1.001	0.000	0.000	1.000	1.000	1289001.652
	(0.000)	(0.000)	(0.000)	(0.001)			
Hong Kong Dollar	0.000	1.000	0.000	0.003	0.998	0.998	57485.443
	(0.000)	(0.003)	(0.002)	(0.005)			
Indonesian Rupiah	0.004	0.550	0.615	0.716	0.038	0.031	5.321
	(0.002)	(0.388)	(0.239)	(0.710)			
Korean Won	0.001	1.086	0.160	0.179	0.087	0.080	12.951
	(0.001)	(0.226)	(0.139)	(0.413)			
Malaysian Ringitt	0.001	0.755	0.244	0.506	0.161	0.155	26.233
	(0.000)	(0.138)	(0.085)	(0.252)			
Philippine Peso	0.001	0.788	0.318	0.240	0.196	0.190	33.176
	(0.000)	(0.125)	(0.077)	(0.229)			
Singapore Dollar	0.000	0.727	0.265	0.157	0.447	0.443	110.177
	(0.000)	(0.061)	(0.037)	(0.111)			
Thai Baht	0.000	0.688	0.216	0.588	0.107	0.101	16.366
	(0.000)	(0.165)	(0.102)	(0.302)			
Taiwan Dollar	0.000	0.930	0.036	0.077	0.552	0.548	167.72
	(0.000)	(0.050)	(0.031)	(0.091)			

Source: Bloomberg Analytics and International Monetary Fund
Note: Standard Errors are in parentheses.

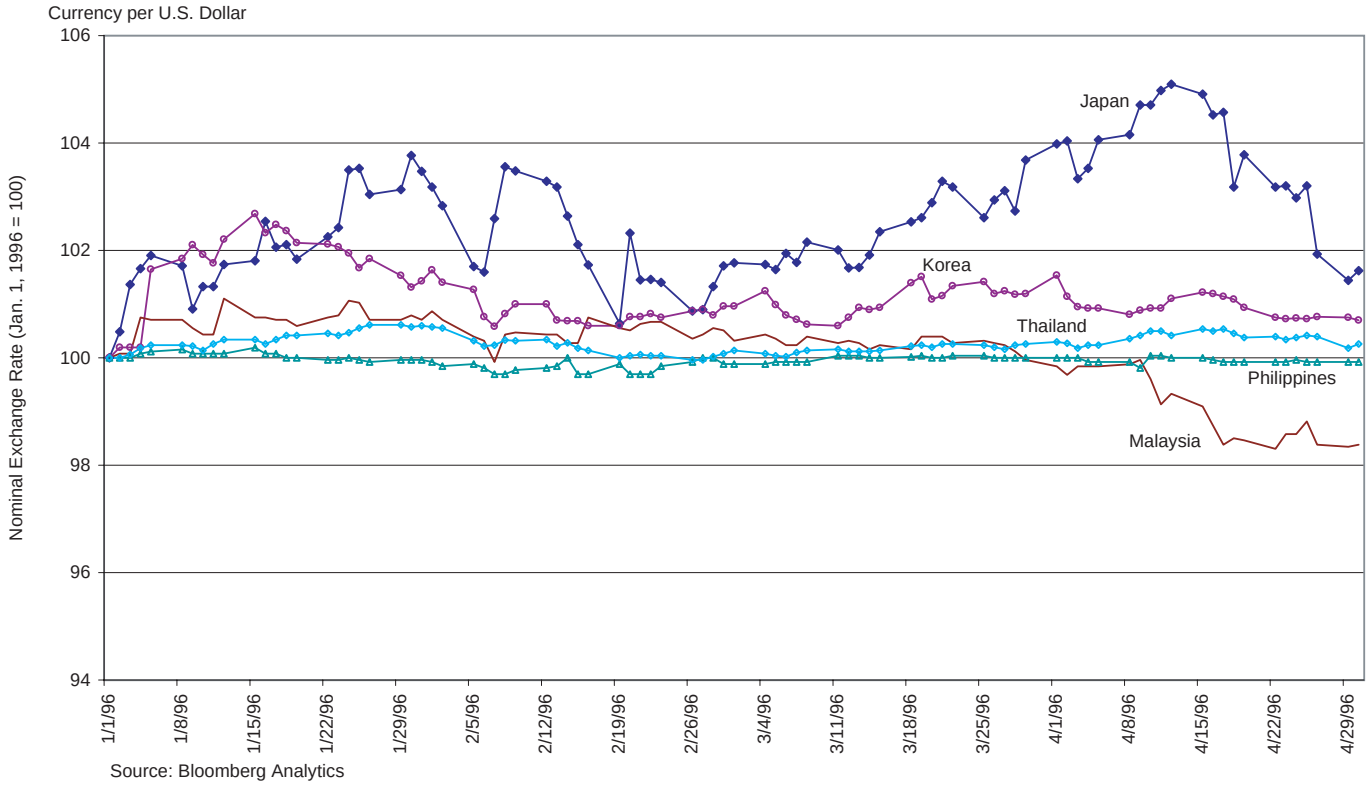
Table A-3: Daily Observations: Post-Crisis Period January 1999 - May 2000

Observations: 350

		β_1	β_2	β_3			
	Constant	U.S. Dollar	Japan Yen	Deutschmark	R square	Adj R square	F statistic
China Yuan	0.000	1.000	0.000	-0.001	0.99992	0.99992	1,492,141.09
	(0.000)	(0.000)	(0.000)	(0.001)			
Hong Kong Dollar	0.000	0.998	0.001	0.002	0.99977	0.99976	493,579.34
	(0.000)	(0.001)	(0.000)	(0.002)			
Indonesian Rupiah	0.000	0.848	0.299	0.063	0.18162	0.17452	25.59
	(0.000)	(0.163)	(0.111)	(0.329)			
Korean Won	0.000	0.957	0.070	0.147	0.70585	0.7033	276.75
	(0.000)	(0.045)	(0.030)	(0.090)			
Malaysian Ringitt	0.000	1.000	0.000	-0.001	1	1	1,960,427.44
	(0.000)	(0.000)	(0.000)	(0.001)			
Philippine Peso	0.000	0.945	0.067	0.042	0.74064	0.73839	329.35
	(0.000)	(0.040)	(0.027)	(0.080)			
Singapore Dollar	0.000	0.818	0.124	0.026	0.84805	0.84674	643.71
	(0.000)	(0.026)	(0.018)	(0.053)			
Thai Baht	0.000	0.858	0.128	0.014	0.63936	0.63623	204.47
	(0.000)	(0.049)	(0.033)	(0.098)			
Taiwan Dollar	0.000	0.986	-0.005	-0.051	0.88334	0.88232	873.26
	(0.000)	(0.024)	(0.016)	(0.048)			

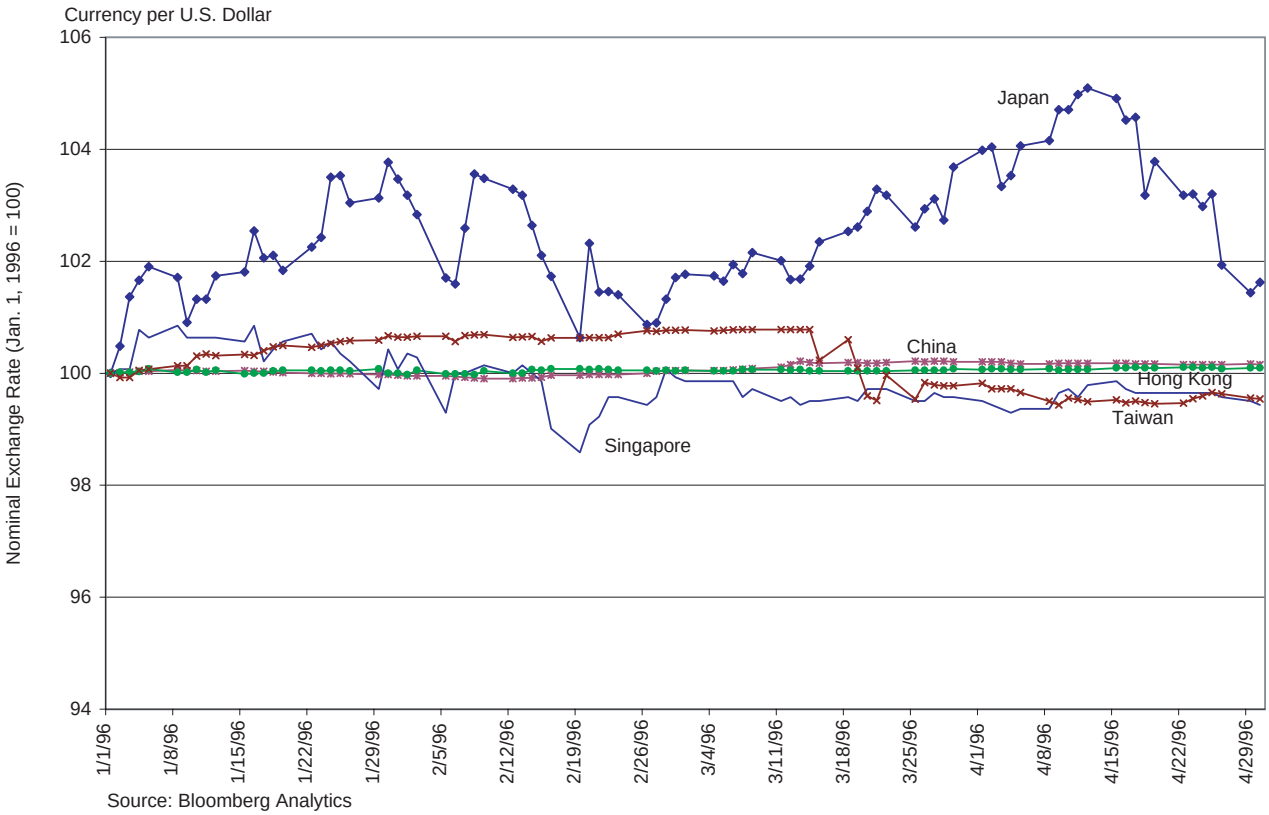
Source: Bloomberg Analytics and International Monetary Fund
Note: Standard Errors are in parentheses.

Figure A-1: Daily Nominal Exchange Rates: Jan-Apr 1996 (Crisis Countries and Japan)



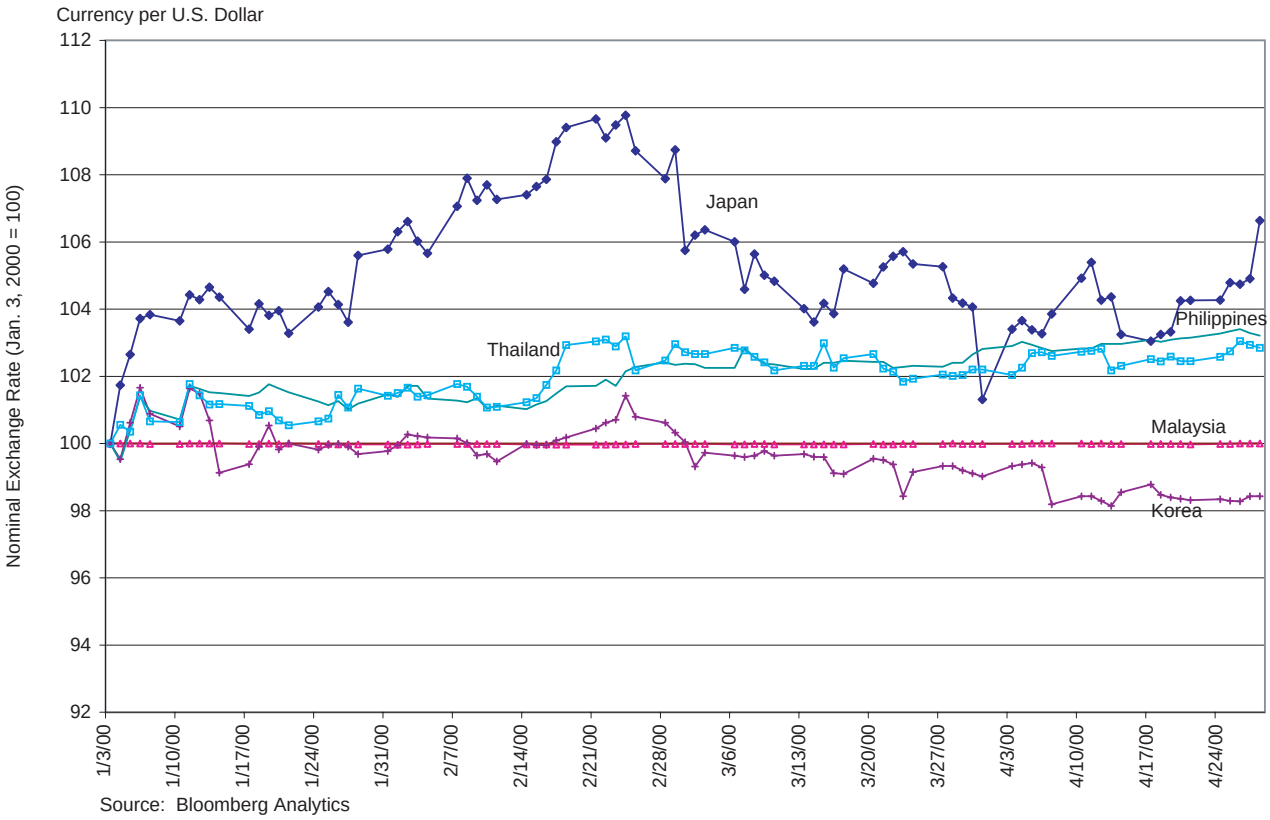
Source: Bloomberg Analytics

Figure A-2: Daily Nominal Exchange Rate: Jan-Apr 1996 (Non-Crisis Countries and Japan)



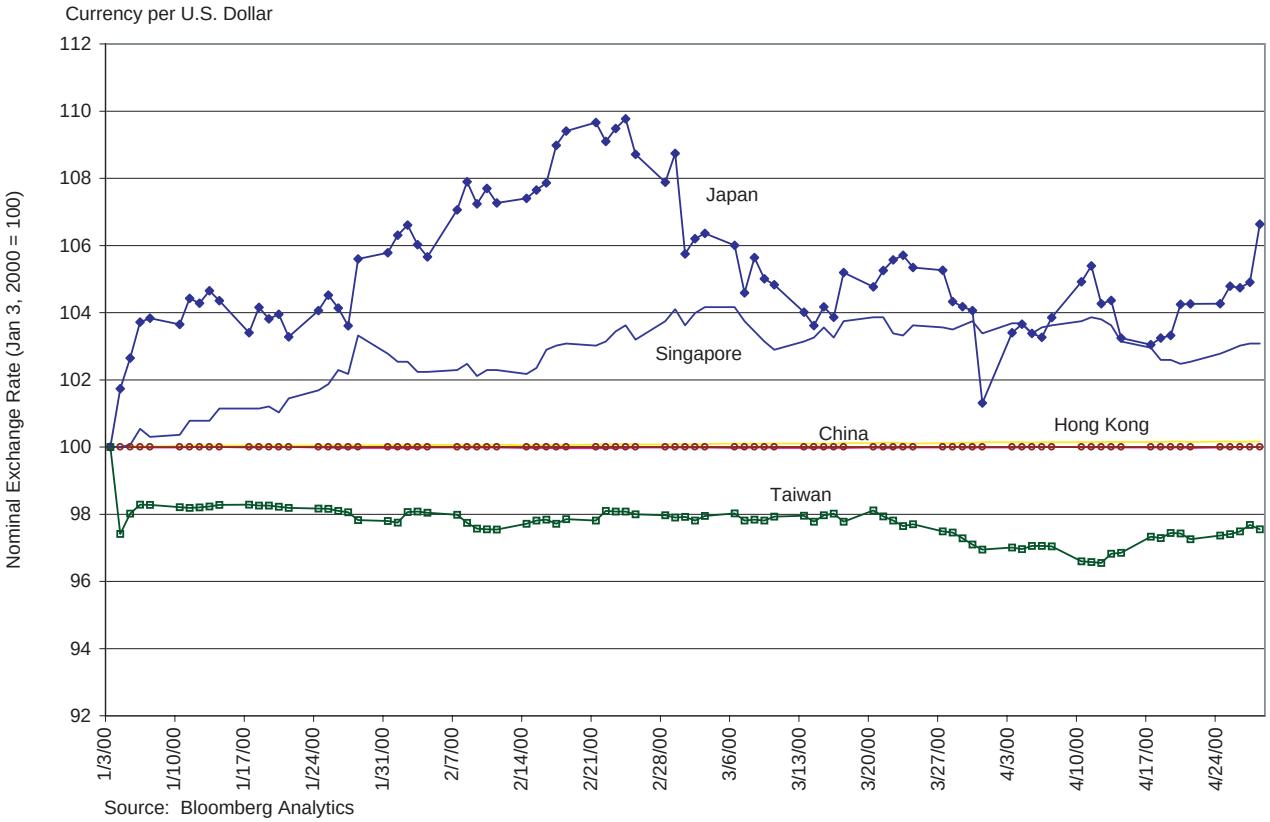
Source: Bloomberg Analytics

Figure A-3: Daily Nominal Exchange Rates: Jan-Apr 2000 (Crisis Countries and Japan)



Source: Bloomberg Analytics

Figure A-4: Daily Nominal Exchange Rates: Jan-Apr 2000 (Non-Crisis Countries and Japan)



Source: Bloomberg Analytics