IMES DISCUSSION PAPER SERIES

Synchronized Business Cycles in East Asia: Fluctuations in the Yen/Dollar Exchange Rate and China's Stabilizing Role

Ronald McKinnon and Gunther Schnabl

Discussion Paper No.2002-E-13

IMES

INSTITUTE FOR MONETARY AND ECONOMIC STUDIES

BANK OF JAPAN

C.P.O BOX 203 TOKYO
100-8630 JAPAN

IMES Discussion Paper Series 2002-E-13

August 2002

Synchronized Business Cycles in East Asia: Fluctuations in the Yen/Dollar Exchange Rate and China's Stabilizing Role

Ronald McKinnon* and Gunther Schnabl **

Abstract

Since the early 1980s, the smaller East Asian economies have experienced a synchronized busi-ness cycle. Before the Asian crisis of 1997-98, they pegged their exchange rates to the US dollar. Post crisis, we show that they have resumed dollar pegging on a high frequency, i.e., day-to-day, basis, with indications of a possible return to pegging at lower frequencies as well. The joint exchange rate stabilization of their currencies against the dollar reduces payments risk and strengthens trade link-ages in the region. However, it has also made East Asian economies more sensitive to fluctuations in the yen/dollar exchange rate. Sudden yen depreciation slows regional economic growth, and yen appreciation accelerates it. Against this, China's macroeconomic and exchange rate policies have been a critically important stabilizing influence. Because Japan's own economic slump can also be linked to the fluctuating yen/dollar exchange rate, and any deep depreciation of the yen would be economically disastrous for the whole East Asian region, we conclude that East Asia is a natural dollar zone that Japan should consider joining.

Key words: exchange rates, business cycles, East Asian dollar standard.
JEL classification: E32 and F31.

* Stanford University (E-mail: mckinnon@stanford.edu)
** Tübingen University (E-mail: gunther.schnabl@uni-tuebingen.de)

Table of Contents

List of Figures

List of Tables

1. Introduction

Since 1980, business cycles in the East Asian countries other than China and Japan have been remarkably synchronized. Because of this, the collective business cycle has been amplified with correspondingly greater macro economic instability in individual countries. Building on the work of C.H. Kwan (2001), we show how this synchronicity is linked to fluctuations in the yen/dollar exchange rate as well as to the marked rise in intra East Asian trade coupled with a relative decline in trade with the rest of the world. But why should fluctuations in the yen/dollar rate have such a pervasive effect on East Asia's smaller economies— Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand, and Taiwan?

In these countries, dollar pegging both before and after (although not during) the great East Asian crisis of 1997-98 is the reason. In our analysis, we show that high frequency, i.e., day-to-day, pegging to the dollar has become just as robust after as it was before the crash. We explain this "fear of floating" (Calvo and Reinhart, 2002) as a rational response by individual countries with underdeveloped domestic capital markets to the workings of the world dollar standard. As the yen/dollar rate fluctuates, however, this asymmetry between Japan that does not peg to the dollar and the others that do sets the stage for the synchronized East Asian business cycle.

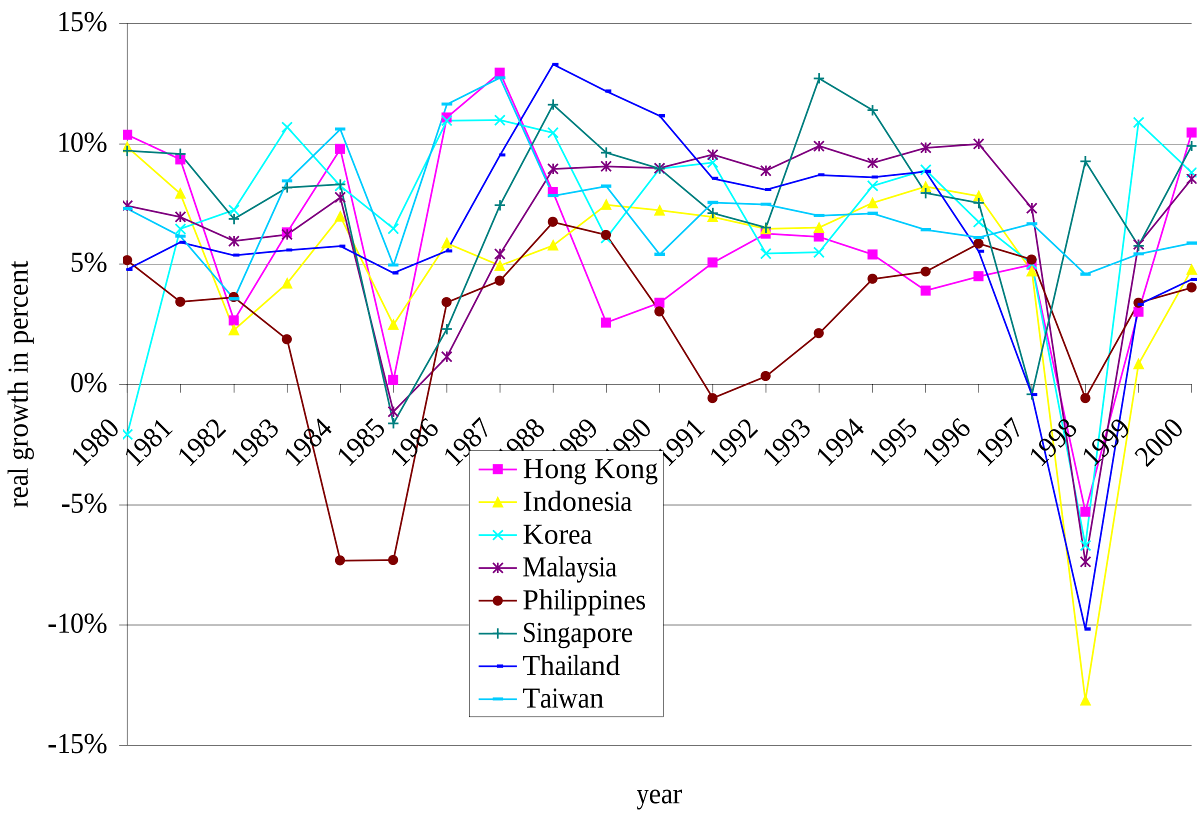
Beyond exchange rate fluctuations, we measure the interaction among GDP growth rates in the smaller economies on the one hand, and then with GDP growth in China, Japan, and the United States on the other. We show that the rapidly growing Chinese economy, with its fixed yuan/dollar exchange rate, is an important stabilizing influence for dampening regional income and exchange rate fluctuations.

Finally, for further mitigating this regional macroeconomic instability, we explore the policy options of the major players, i.e., China, Japan, and the United States. Despite overly abundant advice to the contrary, we show that Japan could not use a deep devaluation of the yen to export its way out of its current slump. Apart from the predictable protectionist reaction of the United States, the downturn in the other East Asian economies would be so steep as to negate any benefits to Japan. More generally, we also question the current mantra of the International Monetary Fund that exchange rates in East Asia should float more freely. Indeed, the region would benefit enormously if the yen/dollar exchange rate itself was securely tethered.

2. Growing Economic Integration and Synchronized Business Cycles in East Asia

Since the early 1980s, East Asian countries outside Japan chose a development strategy based on international trade and sound macroeconomic policies. Their subsequent rapid export-led economic growth with fiscal balance and relative price-level stability led to what the World Bank (1993) called the "The East Asian Miracle".

Figure 1: Synchronized Business Cycles in East Asia (EA_1), 1980-2000 (Yearly)



Source: IMF, Central Bank of China. EA_1 = Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand.

Less well known is that these high-growth economies have experienced a synchronized business cycle. Figure 1 shows that, since 1980, the real GDPs of the smaller East Asian economies have fluctuated in parallel. In particular, growth rates of Hong Kong, Indonesia, Korea, Malaysia, Taiwan, and Thailand have been highly correlated. These countries are the core of the East Asian business cycle, to which the Philippines and Singapore are more loosely attached.

For ease of notation, let us denote the bloc of the eight smaller East Asian countries—Hong Kong, Korea, Singapore, Taiwan; Indonesia, Malaysia, the Philippines, and Thailand—by EA_1. Then EA_2 is EA_1 plus China; and EA_3 is EA_2 plus Japan.

Output synchronization in the EA_1 countries springs from several related factors. First, their regional proximity and growing direct trade linkages have strengthened economic interdependence. More indirectly, they have been export competitors in third markets such as the United States and Japan. Second, they followed similar exchange rate, monetary, and fiscal policies. Third, the EA_1 countries were and are similarly affected by exogenous fluctuations in the yen/dollar exchange rate, our primary focus in this paper.

International trade has been the driving force behind the "miracle" growth with rapid industrialization. Initially, the East Asian economies relied heavily on exports to, and imports from, the United States, Japan, and other industrial countries. In the last two decades, however, intra East Asian trade became relatively more important (Urata 2001). From 1980 to 2000, Table 1 shows that exports to other EA_1 countries rose from 18.9% to 27.4% of overall EA_1 exports. The share of imports from other EA_1 countries increased from 15.3% to 26.7%. If China is included, the share of intraregional trade increases further: EA_2 exports to other EA_2 countries increased from 21.7% in 1980 to 37.3% in 2000.[1]

In contrast, East Asian trade with industrial countries other than the United States has declined comparatively. Table 2 shows that EA_1 exports to Japan fell from 19.2% in 1980 to 10.8% in 2000—although imports from Japan fell somewhat less. The relative shift away from trade with Rest of World (ROW) is even more striking.[2] The share of exports to ROW as a percentage of overall exports declined from 37.3% in 1980 to 28.5% in 2000. Including China, Table 2 also shows that the relative decline in EA_2 trade with ROW is just as pronounced.

---

1 The values for the respective single countries can be found in Table 18 in the appendix.
2 ROW trade is dominated by the European countries.

Table 1: Intra-Asian Trade, 1980-2000

	Exports			Imports		
	EA_3	EA_2	EA_1	EA_3	EA_2	EA_1
EA_1						
1980			18.9			15.3
1990			22.2			19.6
2000			27.4			26.7
EA_2						
1980		21.7			18.2	
1990		32.0			30.1	
2000		37.3			41.0	
EA_3						
1980	32.0			31.8		
1990	39.6			42.9		
2000	46.5			54.9		

Source: IMF: Direction of Trade Statistics. EA_1 = Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand, EA_2 = EA_1 + China, EA_3 = EA_2 + Japan

Table 2: East Asian Trade with China, Japan, US, and ROW, 1980-2000

	Exports				Imports			
	China	Japan	US	ROW	China	Japan	US	ROW
EA_1								
1980	1.5	19.2	23.1	37.3	4.7	23.8	17.1	39.1
1990	6.4	14.4	24.9	32.0	9.4	23.0	16.1	31.9
2000	11.9	10.8	21.4	28.5	14.7	19.6	14.3	24.8
EA_2								
1980		19.6	20.9	37.6		24.2	17.4	40.2
1990		14.4	22.5	31.1		21.9	15.6	32.4
2000		12.0	21.9	28.9		19.2	13.3	26.6
EA_3								
1980			22.6	45.4			17.4	50.8
1990			26.2	34.2			18.1	39.0
2000			24.2	29.2			14.8	30.3

Source: IMF: Direction of Trade Statistics. EA_1 = Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand, EA_2 = EA_1 + China, EA_3 = EA_2 + Japan, ROW = Rest of the World.

Instead of relying on the industrial countries as the sole driving force of their catch-up process, the smaller East Asian countries have developed their own economic dynamics. While there is no doubt that the intensification of intra-Asian trade and the synchronization of the business cycles are closely intertwined, the causality is unclear. Do closer trade linkages contribute to a common business cycle or are there common external shocks, or both?

Theoretically, rising trade between two countries can result in greater or weaker synchronization of aggregate demand fluctuations (Frankel and Rose 1998). If two countries engage in Heckscher-Ohlin or Ricardian type trade, they become more specialized in certain economic sectors or industries. Thus their business cycles tend to be more idiosyncratic. As trade in dissimilar products between two countries increases, with one country specializing in the production of, say, cars and the other specializing in the production of palm oil, both countries will react differently to exogenous shocks. Business cycles will differ.

Suppose, however, intra industry trade predominates as in electrical equipment and semiconductors. Because one country both imports from, and exports this equipment to the other, exogenous shocks will affect both in the same way. Business cycles will be synchronous. A sudden decline in the demand for computers would slow economic growth in both countries.

Because both types of trade patterns can be observed, the impact of strengthened trade linkages on the common business cycle is ambiguous. First, the “newly” industrialized club of Hong Kong, Korea, Singapore, and Taiwan—of which China is an increasingly important member— have rather highly developed and capital-intensive industries where intra-industry trade could be important. Second, the ASEAN core countries of Indonesia, Malaysia, Philippines, and Thailand focus more on agricultural products, raw materials, and labor- intensive products, where intra-industry trade is less important. Between the two groups, however, inter-industry trade would seem to predominate.

The upshot is that industry-specific random shocks are unlikely to generate the highly synchronized business cycles shown in Figure 1. Instead we must look for macroeconomic shocks that affect aggregate demand and broad industrial competitiveness across the board in East Asia outside of Japan. Hence we focus on fluctuations in the yen/dollar exchange rate.

But in order to understand the macroeconomic importance of the fluctuations in the yen/dollar exchange rate, a digression is necessary. We must first understand why and how the smaller East Asian economies choose to peg to the dollar so as to create “The East Asian Dollar Standard”—a sobriquet used by McKinnon (2000, 2001).

3. The East Asian Dollar Standard

During the 1980s up to the crisis of June 1997, all the smaller East Asian economies including China pegged their currencies to the dollar both on a low frequency and a high-frequency basis. After 1998, they returned to pegging on a high-frequency basis and could well return to low-frequency pegging in the future.[3] So understanding the persistence of the East Asian business cycle requires an understanding of why the EA_2 countries individually peg to the dollar and then the collective consequences. Let us discuss the rationale for low and high frequency dollar pegging in turn.

3.1 Low-Frequency Dollar Pegging and the Common Nominal Anchor

Low-frequency pegging is the stabilization of an exchange rate over longer periods such as months, quarters, or years. Based on monthly observations from 1980, Figure 2 shows that all East Asian countries except Japan stabilized the dollar values of their currencies up to the 1997-8 crisis—and, with the major exception of Indonesia, could be returning to such pegging in the near future. (With base 100, the various country panels in Figure 2 use the same vertical scale for dollar exchange rates so that the observer can more easily compare proportional changes.)

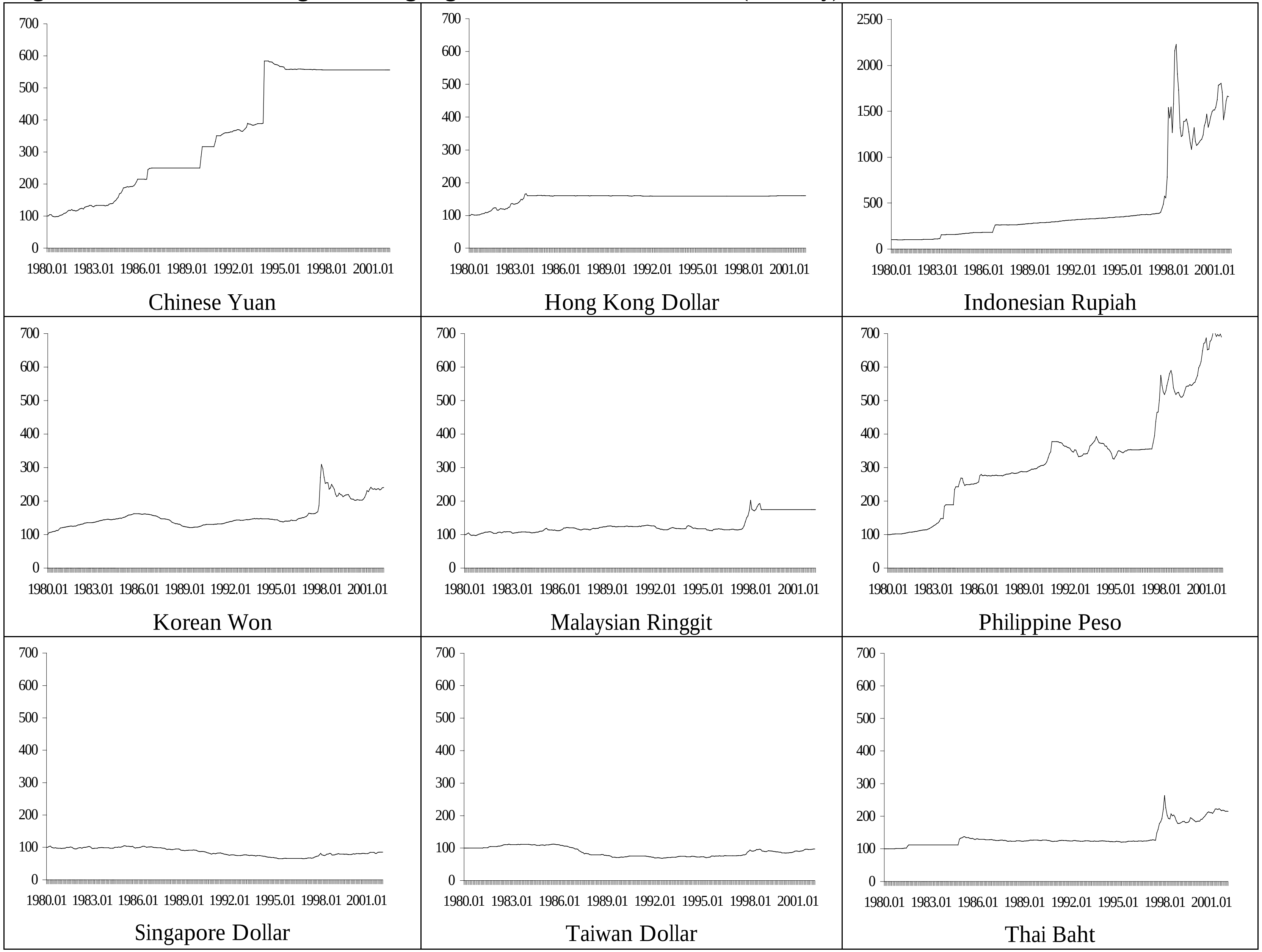
East Asian countries used a variety of exchange rate systems ranging from a currency board hard peg in Hong Kong to a sliding or crawling peg in Indonesia before 1997. Although these pegs were often not openly admitted or were disguised as currency baskets, the common adherence to the dollar is easy to recognize. After a series of official devaluations before 1994, China has since maintained a hard, if informal, peg of 8.3 yuan to the dollar and a unified foreign exchange market.[4] Malaysia introduced a fixed exchange rate of 3.8 ringgit to the dollar in September 1998.

---

3 Low frequency means exchange rate stabilization over a longer time period such as a month, quarter, or year; high-frequency means pegging on a day-to-day or week-to-week basis.

4 Before the 1990s, China's official exchange rate against the dollar was often changed, and different rates existed for commercial transactions. Only the official exchange rate is reported in Figure 2, but the foreign exchange market has been unified since 1994.

Figure 2: East Asian Exchange Rate Pegs against the Dollar, 1980 – 2002 (Monthly)



Source: IMF: IFS and Central Bank of China. Index 1980.01=100. Note different scale for Indonesia.

The rationale for low-frequency dollar pegging does not primarily arise because of strong trade ties with the United States. Table 2 shows that the US accounts for only about 21% of overall exports of EA_1 or EA_2 —and for considerably less of their imports. Instead, we focus on the fact that most of East Asian commodity trade is invoiced in dollars (McKinnon 2000). (The next section, on high-frequency pegging, analyzes the importance of dollar-denominated debt in the region.)

To show the predominance of dollar invoicing in East Asia, Table 3 displays Korea's invoicing practices. In the 1990s, the percentage of imports invoiced in US dollars was about 80%, while the proportion of dollar invoicing of Korean exports was even higher. Because the other EA_1 countries are less industrialized than Korea, their currencies are even less likely to be used in foreign trade, with the proportion of dollar invoicing being correspondingly greater.

Table 3: Invoice Currencies in Korean Trade, 1980-2000 (percent)

	Exports (receipts)					**Imports (payments)**				
	$	¥	DM	£	other	$	¥	DM	£	other
1980	96.1	1.2	2.0	0.4	0.3	93.2	3.7	1.7	0.5	0.9
1985	94.7	3.7	0.6	0.3	0.7	82.4	12.3	2.0	0.5	2.8
1990	88.0	7.8	2.1	0.5	1.7	79.1	12.7	4.1	0.9	3.4
1995	88.1	6.5	2.4	0.8	2.2	79.4	12.7	3.8	0.7	3.4
2000	84.8	5.4	1.8	0.7	7.3	80.4	12.4	1.9	0.8	4.4

Source: Bank of Korea: Monthly Statistical Bulletin. Trade in services is not included.

In striking contrast, yen invoicing in Korean trade is surprisingly small. In 2000, Table 3 shows that only 5.4% percent of Korean exports were invoiced in yen—and only 12 to 13% of Korean imports. This is "surprising" because Japan is at least as important a trading partner with Korea as is the United States—and direct investment by Japan in Korea has been much higher. (Table 3 also shows that the use of European currencies is negligible.)

The use of the yen invoicing in intra-Asian trade is of particular interest because the economic linkages with Japan are particularly strong. From Table 4, which summarizes how different currencies are used in overall Japanese trade, we draw two conclusions. First, in contrast to other industrial countries, the dollar—and not the domestic currency, i.e., not the yen—dominates. In

2000, 52.4% of Japan's worldwide exports and 70.7% of Japan's aggregate imports were invoiced in dollars—while only 36.1% of world exports and 23.5% of imports were invoiced in yen.

Table 4: Invoice Currencies in Japanese Trade, 1980-2000 (percent)

Exports

	World			US			Asia			EU		
	$	¥	other	$	¥	other	$	¥	other	$	¥	other
1980	66.3	28.9	4.8									
1987	55.2	33.4	11.4	84.9	15.0	0.1	56.5	41.1	2.4	8.2	44.0	47.8
1990	48.8	37.5	13.7	83.7	16.2	0.1	48.1	48.9	3.0	6.4	42.1	51.5
1995*	52.5	36.0	11.5	82.9	17.0	0.1	53.4	44.3	2.3	12.2	34.9	52.9
2000*	52.4	36.1	11.5	86.7	13.2	0.1	50.0	48.2	1.8	13.0	33.5	53.5

Imports

	World			US			Asia			EU		
	$	¥	other	$	¥	other	$	¥	other	$	¥	other
1980	93.1	2.4	4.5									
1987	81.7	10.6	7.7	90.6	9.2	0.2	87.6	11.5	0.9	19.5	27.3	53.2
1990	75.5	14.6	9.9	88.2	11.6	0.2	78.8	19.4	1.8	16.3	26.9	56.8
1995*	70.2	22.7	7.1	78.4	21.5	0.1	71.9	26.2	1.9	16.1	44.8	39.1
2000*	70.7	23.5	5.8	78.7	20.8	0.5	74.0	24.8	1.2	17.5	49.7	32.8

Source: Sato (1999), MITI: Yushutsu (Yu'nyû) Kessai Tsûka-date Dôkô Chôsa, and Ministry of Finance: Bôeki Torihiki Tsûka-betsu Hiritsu. Asia = 19 to 22 Asian Countries. * September.

Second, although Japan's currency is a bit more important in trade with Asian neighbors, the differences are surprisingly small. In 2000, 48.2 % of Japan's exports to Asia and 24.8% of her imports from Asia were invoiced in yen. By comparison, 50% of Japanese exports to Asia and 74% of Japanese imports from Asia were invoiced in US dollars (Table 4).

Although Japan is the world's second largest industrial economy, the dollar is more widely used in Japanese trade with East Asia than is the yen. As Sato (1999: 574) puts it, the East Asian countries are unlikely to use the yen in their foreign trade except when that trade is with Japan. We conclude that the US dollar dominates invoicing in East Asian trade in general and intra-East Asian trade in particular. Thus, despite lively discussions as in Kwan (2001) about the possibility of a yen zone in East Asia, the revealed invoicing preferences of Asian importers and exporters indicate the contrary: the area has been, and is, a strong dollar zone—from which the dollar shows no signs of being displaced. This dollar invoicing helps explain why the smaller East Asian economies including China are so anxious to peg to the dollar at both low and high frequencies.

What is the rationale for low frequency—i.e., month-to-month, or quarter-to-quarter—pegging? First, volatile capital flows could otherwise lead to large changes in a country's real exchange rate that upset its international competitiveness. In addition, when spillover effects from one country to the other are large as in East Asia, collective pegging to the same currency has the incidental benefit of limiting beggar-thy-neighbor devaluations.

Second, the common low-frequency peg to the dollar can anchor any one country's price level. In noncrisis periods, price increases in the traded goods sector are pinned down. The upward drift of prices in the nontradables (service) sector is muted because of substitution relationships.[5] Thus the peg to the dollar did, and can once more, provide a powerful tool to control inflation in the East Asian countries. This fear of floating on a low-frequency basis is aptly summarized by Carmen Reinhart (2000: 69):

> 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.

How successful was the dollar anchor? Figure 2 and Figure 3 show the close link between exchange rate stability and price stability for tradable goods. From 1980 to 1997, the various country panels in Figure 3 shows that only the wholesale price indices of Indonesia and the Philippines rose significantly. Both countries had allowed their currencies to continually depreciate against the dollar albeit in a controlled fashion. In contrast the wholesale prices of the all other EA_1 countries which did not depreciate, or depreciated very little, are grouped around the wholesale price index of the United States. Before 1997, Singapore had allowed its currency to float gently upward against the dollar, and thus had slightly less wholesale price inflation than did the United States. Thanks to this collective pegging to the dollar, all East Asian countries had low or moderate inflation.

---

5 The difference between the price level for traded and nontraded goods (Balassa-Samuelson effect) is only significant for Hong Kong and Korea.

This common dollar anchor was more robust because all East Asian countries except Japan were on it. Then international commodity arbitrage within the whole East Asian dollar zone—and not just with the United States—could better pin down the domestic price level of any one participating country. Indeed, in the great 1997-8 crisis when Indonesia, Korea, Malaysia, Philippines, and Thailand were suddenly forced to devalue—and curtailed imports while trying to stimulate exports—this forced a deflation in the *dollar* prices of goods traded in the region (McKinnon, 2001). Thus China and Hong Kong which did not devalue experienced significant deflation in their domestic prices.

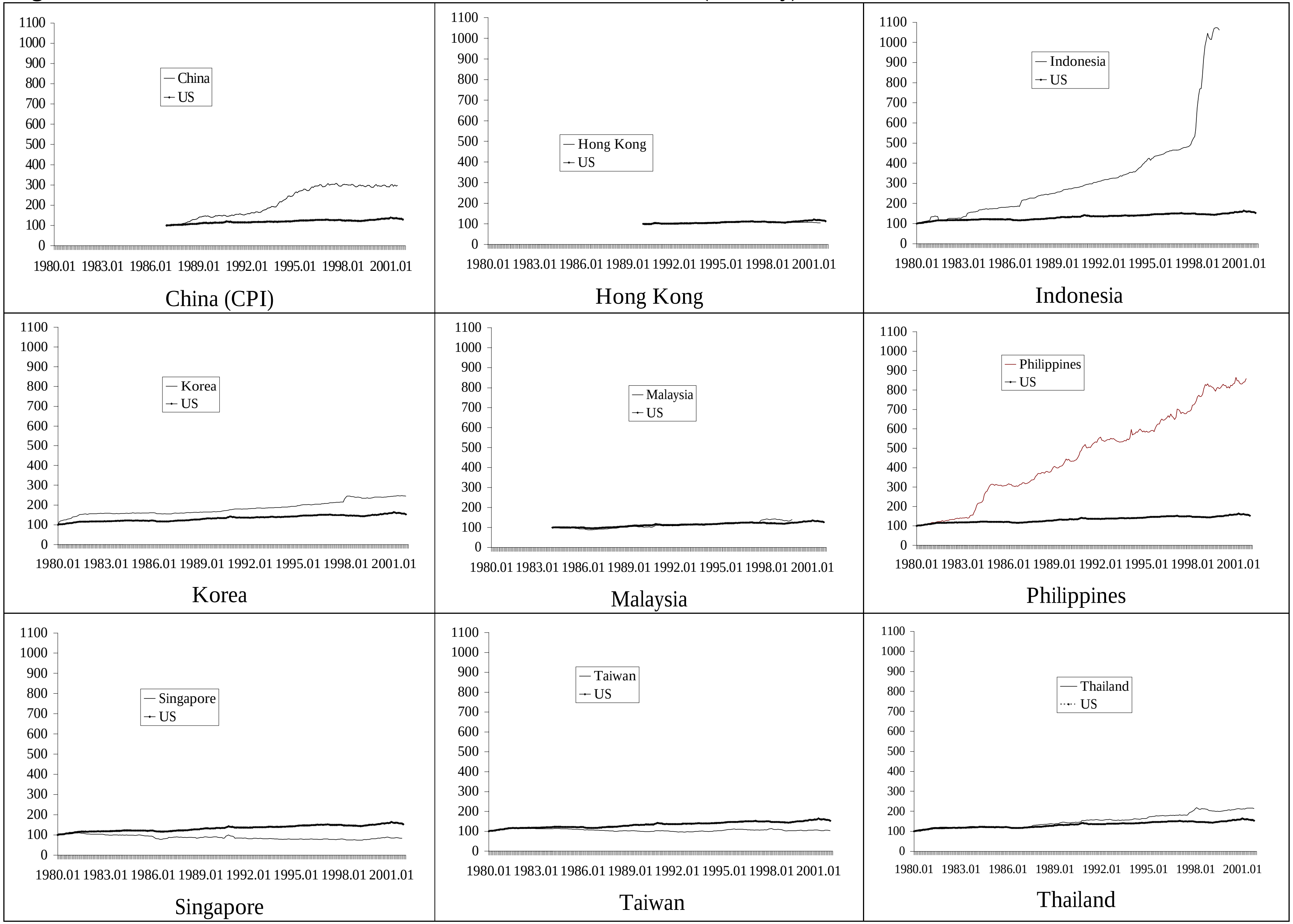
Further, the pre-1997 exchange rate target was consistent with fiscal discipline and the absence of excessive monetary expansion. As stressed by the World Bank's (1993) report on the East Asian Miracle and by the IMF in the aftermath of the Asian crisis, government budgets in the EA_1 economies had been virtually balanced. Before the crisis, the small East Asian countries had low budget deficits or were even running budget surpluses and inflation was moderate. The budget deficits were even low by the standards of industrialized countries.[6] Instead of currency overvaluation in the usual sense of purchasing power parity, the currency attacks in the formerly crisis economies were provoked by an undue build up of short-term dollar indebtedness over 1994-96.

What about the aftermath of the crisis? Hernández and Montiel (2001) suggest that the EA_1 countries are now allowing their currencies to float more at low frequencies than before 1997-98. However, much of this drift in exchange rates reflects the recovery from the over-depreciations in the crisis itself (Figure 2). We don't yet have enough postcrisis monthly or quarterly observations to get a firm indication of the robustness of any return to dollar pegging. However, as we shall now see, high-frequency day-to-day observations are available and more indicative.

---

6 In developing countries, fiscal and monetary discipline are closely linked because the domestic bond markets are underdeveloped. With the access to domestic and international bond markets restricted, printing money is the common means to finance public expenditure unless revenue from traditional taxes is substantial. A fixed exchange rate deprives the government of the inflation tax as revenue because undue monetary expansion would depreciate the domestic currency. Fiscal discipline is the only way to ensure the exchange rate's stability (Chin/Miller 1998).

Figure 3: Wholesale Price Indices of East Asian Countries, 1980 – 2001 (Monthly)



Source: Source: IMF, Central Bank of China. Indonesia except petrol. Hong Kong 1990.01=100, Malaysia 1984.01=100. China 1987.01=100.

3.2 High-Frequency Dollar Pegging and "Original Sin"

Unlike the nominal anchor argument for low-frequency pegging, the rationale for high-frequency pegging on a daily or weekly basis is grounded in the fact that the capital markets of emerging markets are incomplete—the doctrine of "original sin" as put forward by Barry Eichengreen and Ricardo Hausmann (1999: 3):

> "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 completeness, 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.

To mitigate the foreign exchange risk arising out of original sin[7], the government could impose strict capital controls in the Chinese mode which ensure that private banks don't hold or owe foreign currencies. This would drive the banks out of the profitable business of accepting low-interest rate foreign exchange deposits to finance higher yield domestic-currency loans. The inflow of short-term capital and associated dollar indebtedness would be restricted, which could well be what a prudent government prefers.

Less draconian than full-scale capital controls, government regulatory agencies could still prohibit banks (and possibly other financial institutions) from taking net open positions in foreign exchange. In this case, covered interest arbitrage would still be possible so that the banks could provide forward foreign exchange cover for their customers. For example, if a Thai importer wanted to buy dollars with baht 90 days forward, the Thai bank could sell the necessary forward dollars to the firm but would immediately be required to cover itself by buying dollars spot or forward—most likely in

7 To cope with original sin, the Asian Development Bank has recently planned to develop an Asian capital market by issuing local currency bonds (Financial Times 05/11/02, 3).

the international interbank market. But this prudential bank regulation of no net foreign exchange exposure would still prevent domestic banks from being international financial intermediaries, i.e., borrowing in foreign currencies to lend in the domestic one, and thus prevent currency mismatches.

What are the implications of such regulations for high-frequency exchange rate pegging? With either tight capital controls or prudential bank regulations in place, the currency cannot float “freely”. Commercial banks that are normally the dealers or stabilizing speculators in the inter-bank foreign exchange market would be prevented from taking open positions. The exchange rate becomes indeterminate unless the government acts as a dealer to clear international transactions. Thus, the government has no choice but to peg the rate—or “make” the foreign exchange market—from one day to the next. China and Malaysia more or less correspond to this case of imposing capital controls on the one hand, but then having to fix their exchange rates on the other.

If the government doesn’t want to impose draconian controls prohibiting private banks from holding open foreign exchange positions, or if these controls are imperfect, the government can still provide an informal hedge by keeping the exchange rate stable in the short-term. Forward commercial transactions including trade credit, which must be continually repaid in dollars on a day-to-day or week-to-week basis, receive an informal insurance against foreign exchange risk. High-frequency pegging allows the private banks and enterprises to repay their short-term foreign currency debts, which are largely denominated in dollars, with minimal exchange rate risk. Thus if a country’s financial markets are condemned by original sin, its regulatory authorities have strong incentives to undertake high frequency exchange rate pegging in order to mitigate payments risk (McKinnon 2001).

But high-frequency exchange rate pegging has an Achilles heel. Before the 1997-98 crisis, a peg to the dollar encouraged undue foreign borrowing in dollars because it reduced the short-term exchange risk for domestic borrowers investing in domestic currency assets. Those EA_1 financial institutions with moral hazard could accept low-interest dollar deposits, which they lent out to domestic enterprises at higher domestic interest rates, while ignoring the longer run risk of a discrete devaluation of the domestic currency.

Ignoring the risk involved in this transformation of dollar liabilities into domestic currency assets was a profitable source of income to domestic banks and other financial institutions. Should a major crisis occur, they could ignore largely ignore that risk because of domestic deposit insurance and other national and international “bail out” provisions. Thus, in Indonesia, Korea, Malaysia, Thailand

and the Philippines, the large interest spreads between domestic and foreign currency assets at stable exchange rates led to an unmanageable increase in their aggregate dollar liabilities. As long their exchange rates against the dollar remained fairly stable, domestic financial institutions could easily meet their daily or weekly international debt service payments.

At the onset of the crisis, the EA_2 central banks tried hard to prevent their currencies from depreciating. However, when pervasive speculation against the Thai baht finally forced the Thai central bank to abandon the peg in mid 1997, the Achilles' heel of the net dollar exposure became visible. On the banks' balance sheets, the baht worth of loans to the domestic enterprises remained the same while dollar liabilities in terms of domestic currency sharply increased. The net worth of the Thai financial institutions fell dramatically—as subsequently was also the case in Indonesian, Malaysian, Philippine and Korean banks. Thus, the larger the liabilities in foreign currency, the greater the government's incentive to prevent depreciation.

Sadder but wiser, we now know that the net foreign exchange exposure of domestic financial institutions should have been much more tightly regulated. To begin with, domestic banks in emerging markets should not be international financial intermediaries. But the exchange rate policies of the crisis countries themselves were not at fault. Under original sin, floating the exchange rate is unlikely to be viable. Having a freely floating exchange rate need not be a solution to this tendency to "overborrow" in foreign currencies. An erratic float may increase the risk premium in domestic interest rates against dollar assets. Even though the short-term exchange rate risk was higher under floating, domestic banks would see a relatively lower interest cost of borrowing in dollars instead of accepting high-cost deposits in the domestic currency. On net balance, their propensity to overborrow internationally could be just as great if the exchange rate floated (McKinnon / Pill 1999).

In summary, with or without capital controls, governments in countries whose domestic capital markets show original sin have strong incentives to keep their exchange rates stable in the short term against the dominant key currency in the regional system. And, as we will now show, the post-crisis East Asian economies (except Japan) have indeed returned to high-frequency dollar pegging.

3.2.1. The Post-Crisis Return to High-Frequency Pegging: a Formal Empirical Test

With Japan being such an important trader and an even more important source of capital in East Asia, post crisis many authors have proposed pegging to a broader currency basket (Rajan 2002). For instance, Kawai and Akiyama (2000) have proposed to increase the weight of the Japanese yen in the EA_2 currency baskets. Williamson (2000) recommends a 33% weight of the Japanese yen.

Using the regression model developed by Frankel and Wei (1994), we show that the smaller East Asian countries have more or less ignored these recommendations. Instead they have clandestinely returned to high-frequency dollar pegging on a day-to-day basis.

Before the crisis, many East Asian currencies were *de jure* pegged to a basket of major currencies, but typically the weights assigned to various currencies in the official basket were not announced. To detect the weights of various currencies, Frankel and Wei use an "outside" currency—the Swiss franc—as a numéraire for measuring exchange rate volatility for any EA_2 country. These volatilities could then be partitioned among movements in major currencies against the Swiss franc. For example, if changes in the Korean won against the Swiss franc are largely explained by the changes of the US dollar against the Swiss franc, we can conclude that the Korean won is virtually pegged to the US dollar. Alternatively it could be pegged to the Japanese yen or German mark.

To show this, we regress the exchange rates of each of the nine EA_2 currencies on the US dollar, the Japanese yen, and the German mark[8] with the Swiss franc as numéraire.[9] Equation 3.1 is the regression model.

$$e_{EA2CurrencySwissfranc_t} = \beta_1 + \beta_2 e_{DollarSwissfranc_t} + \beta_3 e_{YenSwissfranc_t} + \beta_3 e_{MarkSwissfranc_t} + u_t \tag{3.1}$$

The multivariate OLS regression is based on first differences of logarithms in these exchange rates. The residuals are assumed to be normal distributed and homoscedastic following $N(0, \sigma^2)$. The daily data are compiled from Datastream. According to Frankel and Wei, the β coefficients represent the weights of the respective currencies in the currency basket. If the EA_2 currency is closely fixed to one of the major currencies appearing on the right hand side of equation (3.1), the corresponding β coefficient will be close to unity. If a coefficient is close to zero, we presume no exchange rate stabilization against that particular currency.

8 As the leading currency of the European currency system, representing the Euro.

9 It can be argued that the Swiss franc is not an arbitrary numéraire with respect to the German Mark because the exchange rates of both currencies move in parallel to the US dollar (Hernández/Montiel 2002: 37-39). However, since the German mark does not play a significant role in the currency basket of the East Asian countries and since the Swiss franc moves more independently of the yen and the dollar, we can neglect this point.

As in McKinnon (2001), we run the regression for three periods: pre-crisis, crisis and post-crisis. The pre-crisis period (869 observations) is from February 1994, when China unified its foreign exchange market, to May 1997. We specify the crisis period (415 observations) to start in June 1997 when the peg of the Thai baht came under strong pressure and was abandoned. Our crisis period ends in December 1998 when the currency attacks had ended. The post-crisis (862 observations) starts in January 1999 and goes up to April 2002.

PRE-CRISIS

Table 5 reports the regression results for the pre-crisis period and shows the tight peg around the US dollar. The β_2 coefficients in equation 3.1 are all close to unity and reveal the strong efforts by Asian governments to keep the currencies stable against the dollar on a day-to-day basis. The β_2-coefficients range from 0.82 for the Singapore dollar up to 1 for the Chinese yuan, Hong Kong dollar, and Indonesian rupiah. The adjusted correlation coefficients(R^2) being close to unity indicate that fluctuations of the East Asian exchange rate against the Swiss franc can be almost fully explained by fluctuations of the dollar against the Swiss franc.

More specifically, the β_2 coefficients of the Chinese yuan, the Hong Kong dollar and the Indonesian rupiah are unity. Pre-crisis, Indonesia let its currency crawl smoothly downward at 4 to 5% percent per year, but nevertheless it kept the rupiah virtually fixed to the dollar on a day-to-day basis. China and Hong Kong maintained their fixed pegs to the dollar with no downward crawl. The β_2 coefficients of the Korean won, the Philippine peso, and the Taiwan dollar are very close to unity with lower, but still large t-statistics. For the Thai baht and the Malaysian ringgit, the β_2-coefficients are still close to 0.9 with some small weight on the yen as measured by β_3.

Singapore pegged less closely to dollar. Its β_2 was still 0.82 and highly statistically significant but some small weight was given to the yen and mark. Indeed, on a lower frequency basis, before 1997 the Singapore dollar drifted smoothly upward against the US dollar at about 1 to 2 percent per year. Singapore's somewhat different behaviour is quite consistent with its being a creditor country with longer term domestic capital markets. With a less fragile domestic financial system, the authorities were less concerned with pegging to the dollar and could give more weight to other currencies such as the yen.

In contrast, Table 5 shows that the β_3 coefficients for the yen and the β_4 coefficients for the mark are small or close to zero. Small weights can be observed for the Japanese yen for Korea, Malaysia, Singapore, Taiwan, and Thailand—but in general the weights are low, ranging from 0.03 (new Taiwan dollar) to 0.14 (Singapore dollar).

Table 5: Pegging on a High-Frequency Basis, Pre-Crisis (02/01/94 – 05/30/97)

	Constant	**Dollar**	**Yen**	**DM**	**R^2 Adj.**
Chinese Yuan	-0.00 (-1.15)	1.00*** (142.32)	-0.01 (-0.91)	-0.02 (-1.51)	0.98
Hong Kong Dollar	0.00 (0.30)	1.00*** (411.98)	0.00 (0.28)	-0.01 (-1.37)	1.00
Indonesian Rupiah	0.00*** (3.20)	1.00*** (121.21)	-0.00 (-0.87)	0.01 (0.83)	0.97
Korean Won	0.00 (1.42)	0.97*** (79.31)	0.06*** (4.20)	0.01 (0.28)	0.93
Malaysian Ringgit	-0.00 (-1.48)	0.88*** (66.74)	0.09*** (6.31)	0.01 (0.52)	0.91
Philippine Peso	-0.00 (-0.34)	0.97*** (56.55)	0.02 (1.05)	-0.01 (-0.50)	0.86
Singapore Dollar	-0.00 (-1.32)	0.82*** (50.06)	0.14*** (7.70)	0.08*** (3.12)	0.86
New Taiwan Dollar	0.00 (0.85)	0.98*** (85.22)	0.03** (2.02)	-0.01 (-0.62)	0.93
Thai Baht	-0.00 (-0.61)	0.92*** (91.17)	0.08*** (7.45)	-0.01 (-0.51)	0.95

Source: Datastream. Daily data. T-Statistics in Parentheses. * significant at the ten percent level. ** significant at the five percent level. *** significant at the one percent level. 869 observations.

CRISIS: JUNE 1997 – DECEMBER 1998

During this period, attempts to stabilise East Asian currencies against the dollar broke down. Large capital outflows and high volatility in the foreign exchange markets defeated any official stabilisation efforts. As shown in Figure 2, only China and Hong Kong continued with unwavering dollar pegs. All other countries abandoned their peg at low as well as high frequencies.

For high-frequency observations, Table 6 shows the estimations of the equation 3.1 for the crisis period. For β_2 the significantly smaller t-values for all countries except China and Hong Kong represent higher standard errors and thus higher volatility in the exchange rate against the dollar. The goodness-of-fit for these regressions falls completely apart: R^2 (adj.) fell sharply.

Table 6: Pegging on a High-Frequency Basis, Crisis (06/01/97 – 12/31/98)

	Constant	**Dollar**	**Yen**	**DM**	**R^2 Adj.**
Chinese Yuan	-0.00 (-0.39)	0.99*** (192.60)	0.00 (0.46)	0.01 (0.84)	0.99
Hong Kong Dollar	0.00 (0.02)	1.00*** (186.43)	0.01* (1.89)	0.00 (0.10)	0.99
Indonesian Rupiah	0.00 (1.12)	0.48 (1.06)	0.64** (2.35)	-0.15 (-0.25)	0.02
Korean Won	0.00 (0.62)	1.22*** (5.86)	0.05*** (0.41)	0.05 (0.15)	0.13
Malaysian Ringgit	0.00 (1.39)	0.70*** (5.33)	0.33*** (4.19)	0.11 (0.59)	0.20
Philippine Peso	0.00 (1.42)	0.75*** (6.10)	0.25*** (3.46)	0.27 (1.53)	0.23
Singapore Dollar	0.00 (1.01)	0.69*** (10.74)	0.33*** (8.48)	0.02*** (0.19)	0.49
New Taiwan Dollar	0.00 (1.24)	0.87*** (16.77)	0.08** (2.61)	0.11 (1.44)	0.58
Thai Baht	0.00 (1.04)	0.64*** (4.11)	0.32*** (3.46)	0.21 (0.95)	0.14

Source: Datastream. Daily data. T-Statistics in Parentheses. * significant at the ten percent level. ** significant at the five percent level. *** significant at the one percent level. 415 observations.

The decline in R^2 is particularly marked for the rupiah, won, ringgit, peso and baht. Non-crisis Singapore and Taiwan coped with the crisis by lowering the weight of the US dollar and increasing the weight of the Japanese yen, which itself had depreciated sharply. Except for China and Hong Kong, the weight of the yen, i.e., the β_3 coefficients, increased during the crisis.

Clearly, by refusing to devalue in the great crisis, China and Hong Kong helped contain the inadvertently beggar-thy-neighbour devaluations in Indonesia, Korea, Malaysia, Philippines, and Thailand. Indeed, Malaysia's pegging of the ringgit in September 1998—albeit at a depreciated level— also helped contain contagious exchange rate changes in the region.

Post-Crisis

After the 1997-98 crisis, however, dollar pegging—at least when measured on a high-frequency, i.e. day-to-day basis—has made a remarkable return. As shown in Table 7, the β_2 coefficients for all countries again come close to unity as in the pre-crisis period. Except for Indonesia, the goodness of fit as measured by R^2 for each country's regression equation again becomes tight. Thus the smaller East Asian countries have largely returned to the pre-crisis practise of informal dollar pegging.

True, the Japanese yen seems to have assumed a certain post-crisis role in some currency baskets—particularly those of Thailand and Korea—but the yen weights are low in comparison to the US dollar. Small values for the goodness of fit of the regressions for the Indonesian rupiah and the Philippine peso, however, indicate that both countries have been less successful in stabilising their currencies after the Asian currency crisis. In particular, Indonesian foreign exchange policy and domestic inflation remain out of control.

A formal statistical test of the post-crisis return to dollar pegging at high frequencies supports our assumption. We perform this test for all currencies except the Chinese yuan, the Hong Kong dollar and the Malaysian ringgit, which are now firmly pegged to the dollar for any frequency of observation. The null hypothesis is that the β_2 coefficient for each country is the same before and after the crisis. At the 5% level of significance, this null hypothesis is only rejected for Thailand, which has given more weight to the yen in its currency basket than before the crisis. For all other countries, there is no significant difference in dollar pegging before and after the crisis.[10]

(However, at the lower month-to-month or quarter-to-quarter frequencies, Figure 2 shows more dollar exchange rate drift than before the crisis. The exceptions, of course, are China, Hong Kong, and Malaysia, all firmly fixed to the dollar at all frequencies of observation.)

---

[10] We test the hypothesis: (β_2) pre-crisis = (β_2) post-crisis.

The respective t-Test is: $\frac{(\beta_2)\text{post - crisis} - (\beta_2)\text{pre - crisis}}{\text{standard error (post - crisis)}} > 1.96$

The respective results are:

Rupiah	Won	Peso	Singapore Dollar	Taiwan Dollar	Thai Baht
0.11	1.38	0.47	0.63	0	2.86

Using rolling regressions, the country panels in Figure 4 summarise the dollar's weight in each East Asian currency basket during the 1990s. Based on daily data, the rolling 130-day β_2 coefficients— representing the weights of the dollar—are plotted for each of the EA_2 countries. A window of 130 days corresponds to an observation period of six months (5 observations per week). The first window starts on January 1, 1990 and ends on June 29, 1990. The β_2 coefficients are calculated for the first period. Then the window is shifted by one day and the β_2 coefficients are calculated again, up to April 2002. A value of unity stands for a 100 percent weight of the dollar in the respective currency basket. If the coefficient rises above 1, the estimation processes are unstable.

Table 7: Pegging on a High-Frequency Basis, Post-Crisis (01/01/99 – 04/22/02)

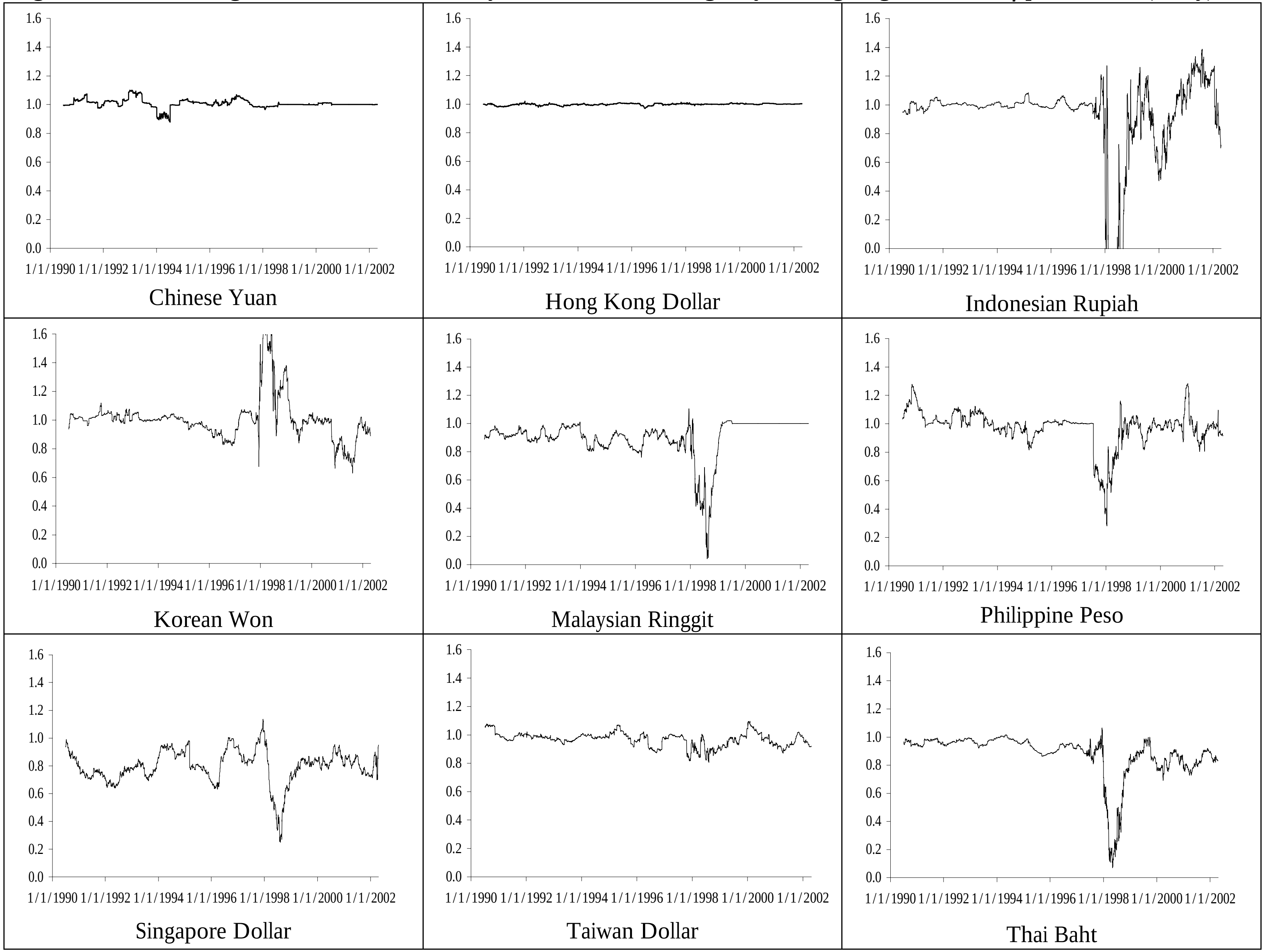
	Constant	**Dollar**	**Yen**	**DM**	**R^2 Adj.**
Chinese Yuan	-0.00 (-0.05)	1.00*** (2678.91)	0.00 (0.93)	-0.00 (-0.65)	1.00
Hong Kong Dollar	0.00 (2.58)	1.00*** (1630.40)	-0.00 (-0.82)	0.00 (0.30)	1.00
Indonesian Rupiah	0.00 (0.33)	0.99*** (10.50)	0.23*** (3.25)	0.26 (1.30)	0.25
Korean Won	0.00 (0.73)	0.93*** (32.73)	0.14*** (6.58)	-0.01 (-0.15)	0.74
Malaysian Ringgit	-0.00 (-0.02)	1.00*** (634.27)	-0.00 (-0.17)	-0.00 (-1.22)	1.00
Philippine Peso	0.00 (1.42)	0.95*** (27.11)	0.10*** (3.16)	-0.01 (-0.10)	0.54
Singapore Dollar	0.00 (0.85)	0.81*** (49.44)	0.16*** (13.09)	0.10*** (2.88)	0.87
New Taiwan Dollar	0.00 (1.18)	0.98*** (66.41)	0.00 (0.23)	0.00 (0.20)	0.89
Thai Baht	0.00 (1.17)	0.84*** (29.72)	0.16*** (7.75)	0.12** (2.01)	0.72

Data source: Datastream. Daily Data. T-Statistics in Parentheses. * significant at the ten percent level. ** significant at the five percent level. *** significant at the one percent level. 862 observations.

China and Hong Kong have a very stable dollar weight of unity for the whole observation period. For the other countries in the pre-crisis period, the dollar weights are also close to unity and stable. However, during the 1997-98 crisis, the exchange rate stabilisation broke down in Indonesia, Korea, Malaysia, Philippines and Thailand. In these crisis economies, Figure 4 shows sharp departures of their β_2 coefficients from unity. Singapore lowers the dollar's weight in its currency basket.

After the crisis, Figure 4 shows that countries have evolved somewhat differently. First, the stabilisation process seems still out of control in Indonesia. Second, Korea and Thailand seem to have slightly lowered the weight of the dollar. Third, Malaysia increased the dollar's weight to 100 percent. Finally, the Philippines and Taiwan seem to have returned to pre-crisis dollar weights. However, except for Indonesia, the dollar's weight in East Asian currency baskets has not changed significantly.

Figure 4: Dollar's Weight in East Asian Currency Baskets, 130-Trading-Day Rolling Regressions for β_2, 1990-2002 (Daily)



Source: Datastream. 1 corresponds to 100%. Note: A β_2-coefficient close to unity shows strong dollar pegging.

3.2.2 Reducing Daily Exchange Rate Volatility

However, knowing the dollar's β_2 coefficients from equation 3.1 is not the whole story on exchange rate volatility. In principle, the dollar could get the highest relative weight (as per Frankel and Wei, 1994) in the currency basket without the absolute day-to-day volatility of any one EA_2 currency against the dollar returning to its pre-crisis level.

Thus, a more direct, but complementary test, is necessary. We measure volatility as the percentage daily change of the national currency against the dollar (first log differences) from January 1990 through April 2002. The y-axes in the different country panels in Figure 5 have the same scale of ±8% against the dollar for all currencies.

But to understand what is high and what is low volatility, we need a standard of comparison. Calvo and Reinhart (2002) suggest that the only truly floating exchange rates are those of the inner group of mature industrial countries, such as the United States, Japan, Germany and Switzerland. Because these countries have mature, long-term domestic capital markets, their governments have little incentive for day-to-day exchange rate stabilization. Figure 5 compares the daily dollar volatilities of the EA_2 countries to those of Germany, Japan, and Switzerland. [11]

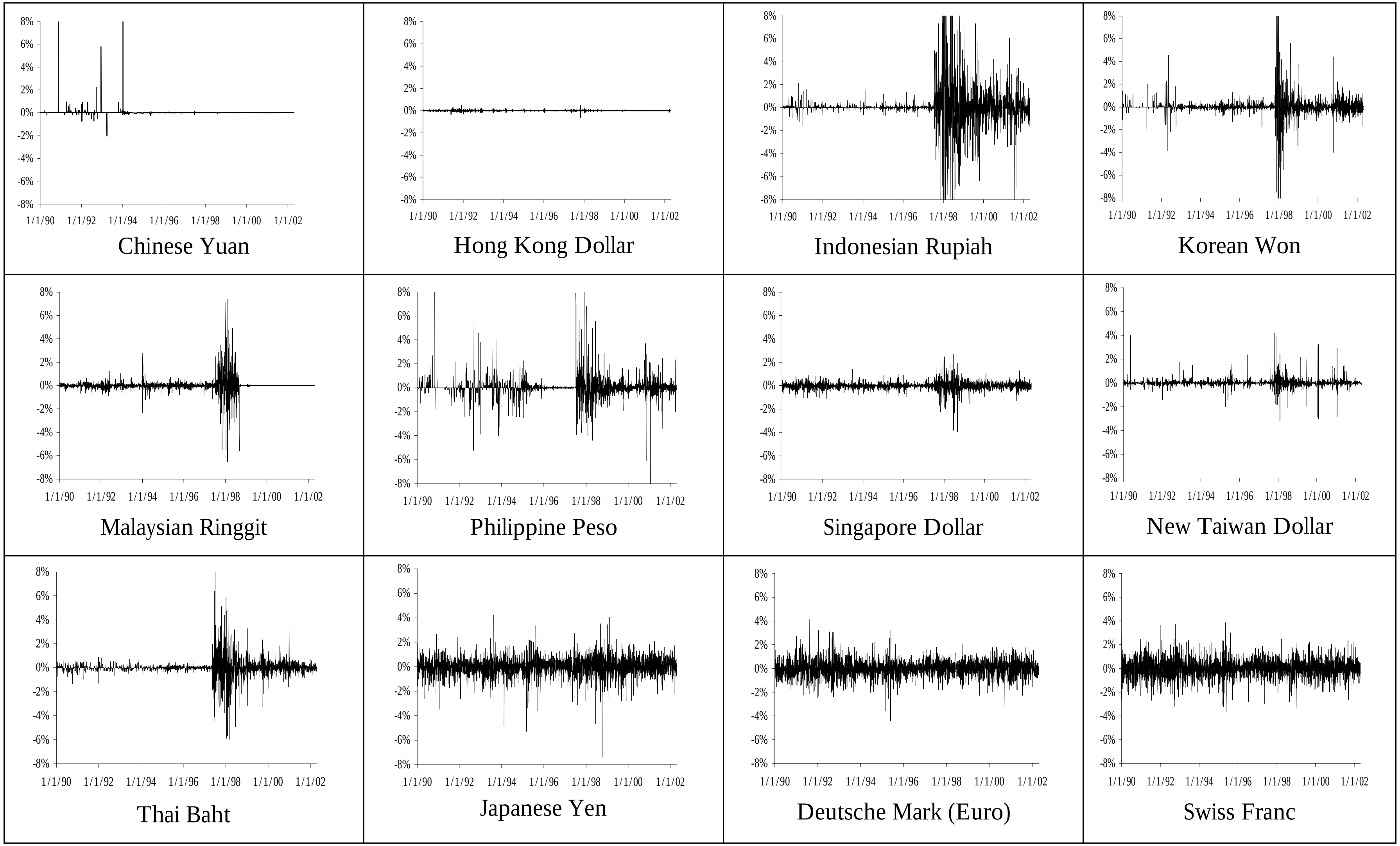
From Figure 5, the daily volatility of the dollar exchange rates of Germany, Japan, and Switzerland are indeed an order of magnitude higher than those of our EA_2 countries in non crisis periods. Not only is the daily exchange volatility of these industrial countries very high, but it does not change significantly over time. In contrast, the volatility of the EA_2 currencies is generally much lower—but with greater variability over time.

Specifically, the hard pegs of China and Hong Kong exhibit extremely low day-to-day volatility as well as a high stability over time. Discretionary changes in the Chinese yuan in the early 1990s occurred before the introduction of the hard peg in February 1994. Since then, the yuan has been even more stable on a day-to-day basis than has the Hong Kong dollar.

---

[11] These countries are free floaters against the dollar, but not necessarily against other currencies. For instance before January 1999, Germany was a member of the European Monetary System, which implied a stabilization of its exchange rate against other EMU currencies.

Figure 5: Exchange Rate Volatility against the US Dollar of Selected Crisis and Non-Crisis Currencies, 1990 – 2002 (Daily)



Source: Datastream. Volatility is daily percentage changes against the dollar.

For all the other EA_2 economies, we observe a changing pattern of daily volatility over time. Up to 1997/98 , high-frequency volatility was low except in the Philippines, which experienced higher volatility in the first half of the 1990s—although not as high as in the industrial countries. During the Asian crisis, turmoil in the capital and currency markets is reflected in much greater day-to-day volatility, which is most striking for of Indonesia, Korea, Malaysia, Philippines, and Thailand.

For the post-crisis period, we observe a more heterogeneous pattern. First, Singapore and Taiwan, not as strongly affected by the crisis, returned rather fast to the pre-crisis pattern. Note that Singapore stabilizes its currency on the basis of a more diversified currency basket, and therefore its overall exchange rate volatility is smaller than Figure 5 suggests. Second, Malaysia has adopted capital controls and a hard peg to the dollar, so that its exchange rate volatility has declined to zero.

Third, Korea and Thailand have significantly reduced exchange rate volatility, but it seems still to be slightly higher than before the crisis. The larger weight of the yen in the Thai and Korean currency baskets makes a complete return to the pre-crisis level of dollar pegging more difficult. Finally, although Indonesia and the Philippines have been quite successful in reducing the day-to-day volatility of their exchange rates compared to the crisis, volatility is still much higher than before.

The evidence given in Figure 5 is supported by Table 8, which reports the standard deviations of daily exchange rate fluctuations against the dollar. In the pre-crisis period, the standard deviations of the day-to-day exchange rate volatility of all EA_2 currencies are much smaller than the standard deviations of the so-called free floaters (Japan, Germany and Switzerland) which are our comparison set. The standard deviations of the hard pegs (China and Hong Kong) are close to zero during and after the crisis. For Indonesia, Korea, Malaysia, Philippines and Thailand, the standard deviations in Table 8 increase massively during the crisis period—with Singapore and Taiwan increasing less.

Since the crisis, the standard deviations of all affected countries have declined again (Table 8). Except for Malaysia, this exchange rate volatility of the crisis economies for the whole post-crisis period (1999-2002) is still larger than before the crisis. However, as depicted in Figure 5 the volatility was relatively higher at the beginning of the post-crisis period in 1999 than more recently in 2002.

To underline this last point, suppose our "post-crisis" period includes only daily observations from the year 2002. Then the right hand column in Table 8 shows that most EA_2 currencies are now less volatile against the dollar than they were before the crisis! In 2002, only Indonesia has still a significantly higher standard deviation. We conclude that all East Asian countries except Indonesia have more or less returned to the pre-crisis level of high-frequency pegging.

Table 8: Standard Deviations of Day-to-Day Exchange Rate Fluctuations against the Dollar

	pre-crisis	crisis	post-crisis	2002
Chinese Yuan	0.03	0.01	0.00	0.00
Hong Kong Dollar	0.02	0.03	0.00	0.00
Indonesian Rupiah	0.17	4.43	1.36	0.54
Korean Won	0.22	2.35	0.43	0.27
Malaysian Ringgit	0.25	1.53	0.02	0.00
Philippine Peso	0.37	1.31	0.62	0.19
Singapore Dollar	0.20	0.75	0.26	0.20
New Taiwan Dollar	0.19	0.50	0.21	0.11
Thai Baht	0.21	1.55	0.42	0.19
Japanese Yen	0.67	1.00	0.67	0.59
Deutsche Mark	0.60	0.58	0.64	0.46
Swiss Franc	0.69	0.66	0.65	0.48

Data source: Datastream. Percent changes. Pre-crisis = 02/01/94 – 05/30/97, crisis = 06/01/97 – 12/31/98, post-crisis = 01/01/99 – 04/22/02, 2002 = 01/01/02 – 04/22/02.

3.3 An Eventual Return to Low-Frequency Pegging?

With the benefit of hindsight, this post-crisis return to high-frequency dollar pegging is hardly surprising. For emerging markets in East Asia and elsewhere suffering from incomplete capital markets (original sin), it is an important tool for hedging foreign exchange risk. But could this clandestine return to high-frequency pegging augur an eventual return to low-frequency pegging as well?

After the turmoil of the Asian crisis, the IMF warns of "an important danger […] in slipping back into de facto pegging of exchange rates against the U.S. dollar" (Mussa et al. 2000: 33). For emerging markets open to international capital flows, Stanley Fischer (2001: 5-10) argued that soft pegs are not sustainable. Post-crisis, he sees most emerging markets moving towards more flexible exchange rates and rates Indonesia, Korea and Thailand as "free floaters" while China and Malaysia have "soft pegs". Indeed, Fischer sees movement towards a bipolar world where a few emerging markets such as Hong Kong adopt hard pegs, while all the others move toward greater exchange rate flexibility:

> In the last decade, there has been a hollowing out of the middle of the distribution of exchange rate regimes in a bipolar direction, with the share of both hard pegs and floating gaining at the expense of soft pegs. This is true not only for economies active in international capital markets, but among all countries. A look ahead suggests this trend will continue, certainly among the emerging market countries. The main reason for this change, among countries with open capital accounts, is that soft pegs are crisis-prone and not viable over long periods. (Fischer 2001: 22)

Similarly, based on monthly observations, Hernández and Montiel (2001) find that Indonesia, Korea, Philippines, Singapore, Taiwan, and Thailand have more flexible (but not purely flexible) exchange rates than in the pre-crisis period.

The IMF position in favor of more exchange rate flexibility in East Asia is reflected in its official classification of East Asian exchange rate arrangements shown in Table 9. As of June 2001, East Asian countries that have *not* adopted clearly visible pegs (China, Hong Kong, and Malaysia) are classified as managed or independent floaters.[12] Going one step further, the IMF sometimes pressures countries to announce an internal monetary standard—such as inflation targeting—as a substitute for relying on the exchange rate as their nominal anchor.

At lower frequencies, Table 10 supports this finding of greater volatility in the month-to-month exchange rate fluctuations of our sample currencies post crisis in comparison to pre-crisis. For all EA_2 currencies except the hard pegs of China, Hong Kong and Malaysia, standard deviations calculated from monthly data are significantly higher after 1998. This seems to indicate more low-frequency floating than before the crisis. However, much of this post-crisis variation in monthly exchange rates reflects recovery from the overshooting devaluations of the crisis itself (
Figure 6).

Moreover, whether the IMF's system of classifying exchange rates corresponds to reality has to be questioned--particularly at high frequencies of observation. As the IMF admits, in East Asia there are "prospects for – and the risks of – returning to implicit exchange rate coordination by a return to explicit or de facto currency pegs (or quasi pegs) to the U.S. dollar" (Mussa et. al. 2000: 33). Indeed, the IMF's "worst fears" could well be realized: low frequency dollar pegging will follow the path of high-frequency pegging, and exchange rate volatility will diminish.

---

12 Since as of September 2000, Thailand and Indonesia have been re-classified from "independently floating" to "managed floating".

Table 9: East Asian Exchange Rate Arrangements According to the IMF Classification

Country	Classification
China	Other conventional fixed peg arrangement
Hong Kong	Currency board arrangement
Indonesia	Managed floating, (fund-supported or other monetary program)
Korea	Independently floating (inflation targeting framework)
Malaysia	Other conventional fixed peg arrangements
Philippines	Independently floating (monetary aggregate target)
Singapore	Managed floating with no pre-announced path for the exchange rate
Taiwan	Managed floating*
Thailand	Managed floating(inflation targeting, fund-supported or other monetary program)
Japan	Independently floating

Source: IMF: IFS (April 2002) and * Fischer (2001: 8).

Table 10: Standard Deviations of Month-to-Month Exchange Rate Fluctuations

	pre-crisis	crisis	post-crisis
Chinese Yuan	0.25	0.03	0.00
Hong Kong Dollar	0.08	0.07	0.04
Indonesian Rupiah	0.26	26.54	6.43
Korean Won	1.01	11.53	1.91
Malaysian Ringgit	1.06	6.69	0.00
Philippine Peso	1.19	5.25	1.91
Singapore Dollar	0.76	2.88	1.18
New Taiwan Dollar	1.01	2.63	1.08
Thai Baht	0.43	8.88	1.67
Japanese Yen	3.66	3.64	2.58
Deutsche Mark	2.20	2.33	2.47
Swiss Franc	2.62	2.60	2.38

Data source: IMF: IFS. Percent Changes. Pre-crisis = February 1994 – Mai 1997, crisis = June 1997 – December 1998, post-crisis = January 1999 – April 2002.

The momentum for returning to the East Asian dollar standard is evident. First as stressed by Calvo and Reinhart (2002), emerging markets in general have a strong fear of floating. Second, Figure 6 and Figure 7 show that the monthly exchange rates of *both* the crisis and non-crisis countries were stable before 1997—and, since January 1999 could be returning to greater stability, albeit with possibly more low-frequency drift. Third, as Hernández and Montiel (2001: 23-24) observe, the official foreign reserves in EA_1 countries have increased surprisingly fast since 1998—as depicted in Figure 8 for China, Hong Kong, Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand. In Indonesia, Korea, and the Philippines, foreign exchange reserves have risen far above their pre-crisis levels. Only Singapore, which relies more on the domestic money market for stabilizing its exchange rate, has kept foreign reserves close to the pre-crisis level.

This rise in foreign reserves partly reflects attempts to dampen exchange rate appreciation after the deep depreciations in the 1997-98. But the accumulation could also be a "war chest" to support future official interventions to secure their dollar pegs. In 1997-98, countries with large foreign reserves such as Singapore, Taiwan, and Hong Kong could successfully defend their pegs against speculative attacks – or even prevent the attacks from occurring in the first place.

Figure 6: Crisis Countries: Exchange Rates against the Dollar (Monthly).

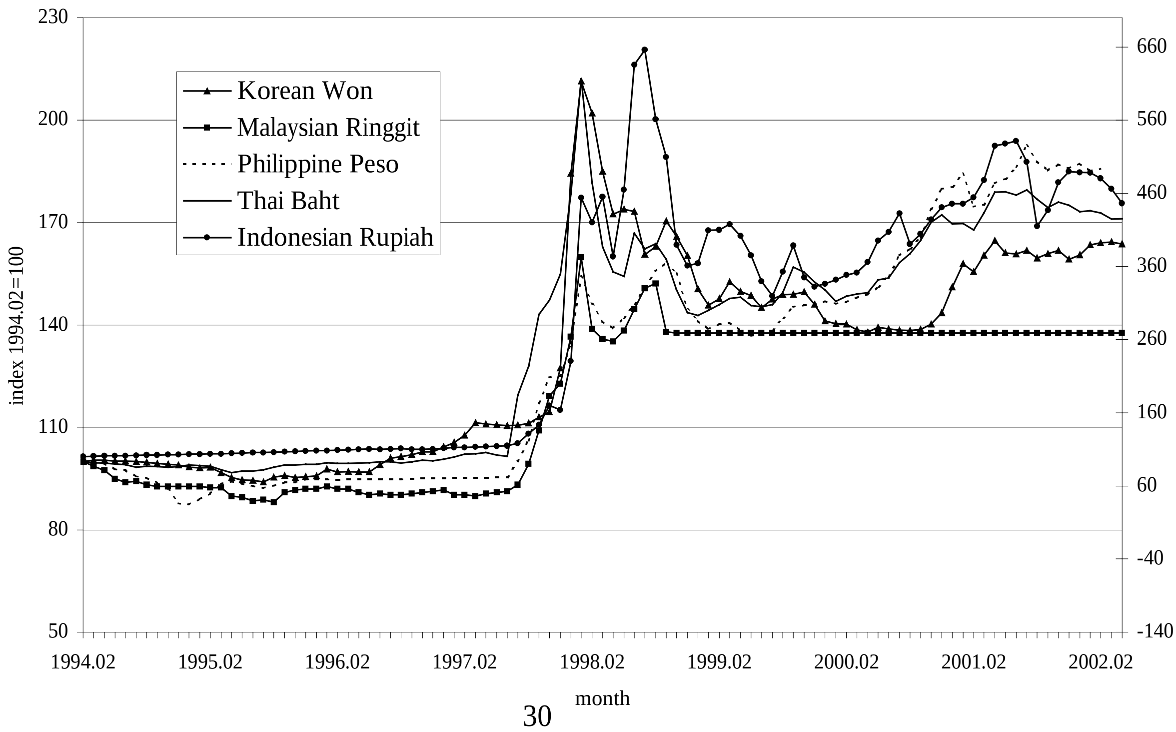
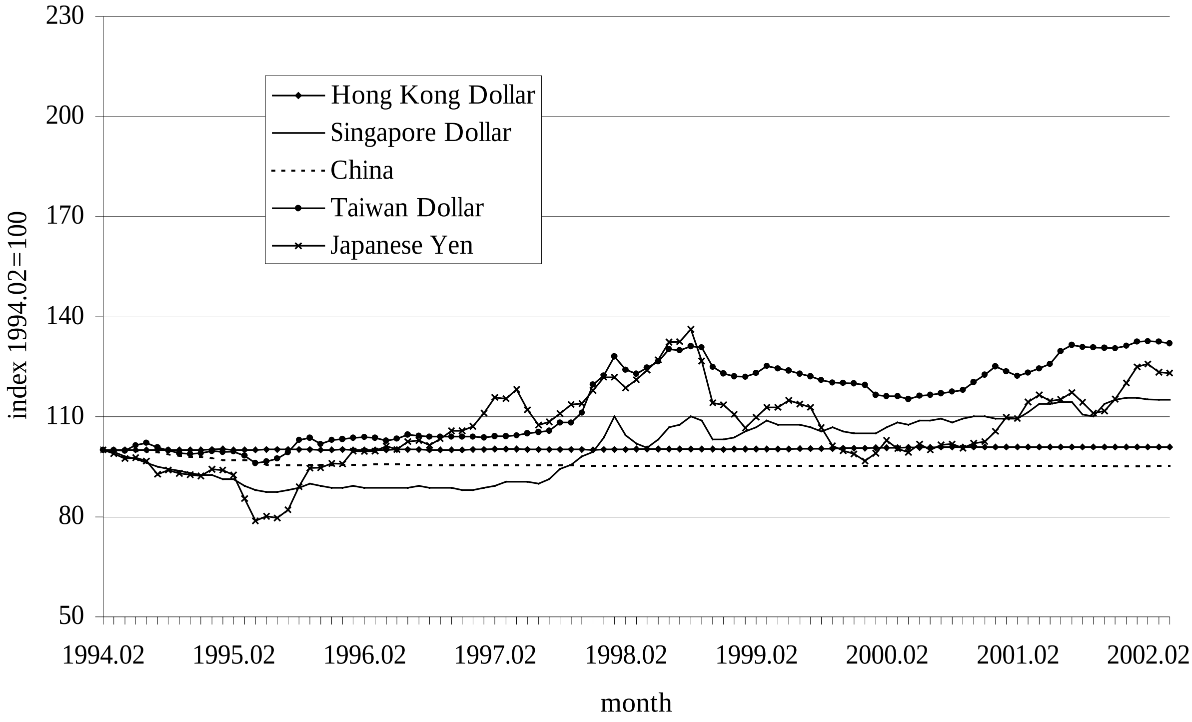


Figure 7: Noncrisis Countries and Japan: Exchange Rates against the Dollar, 1994.2 – 2002.4



(Monthly)

Source: IMF.

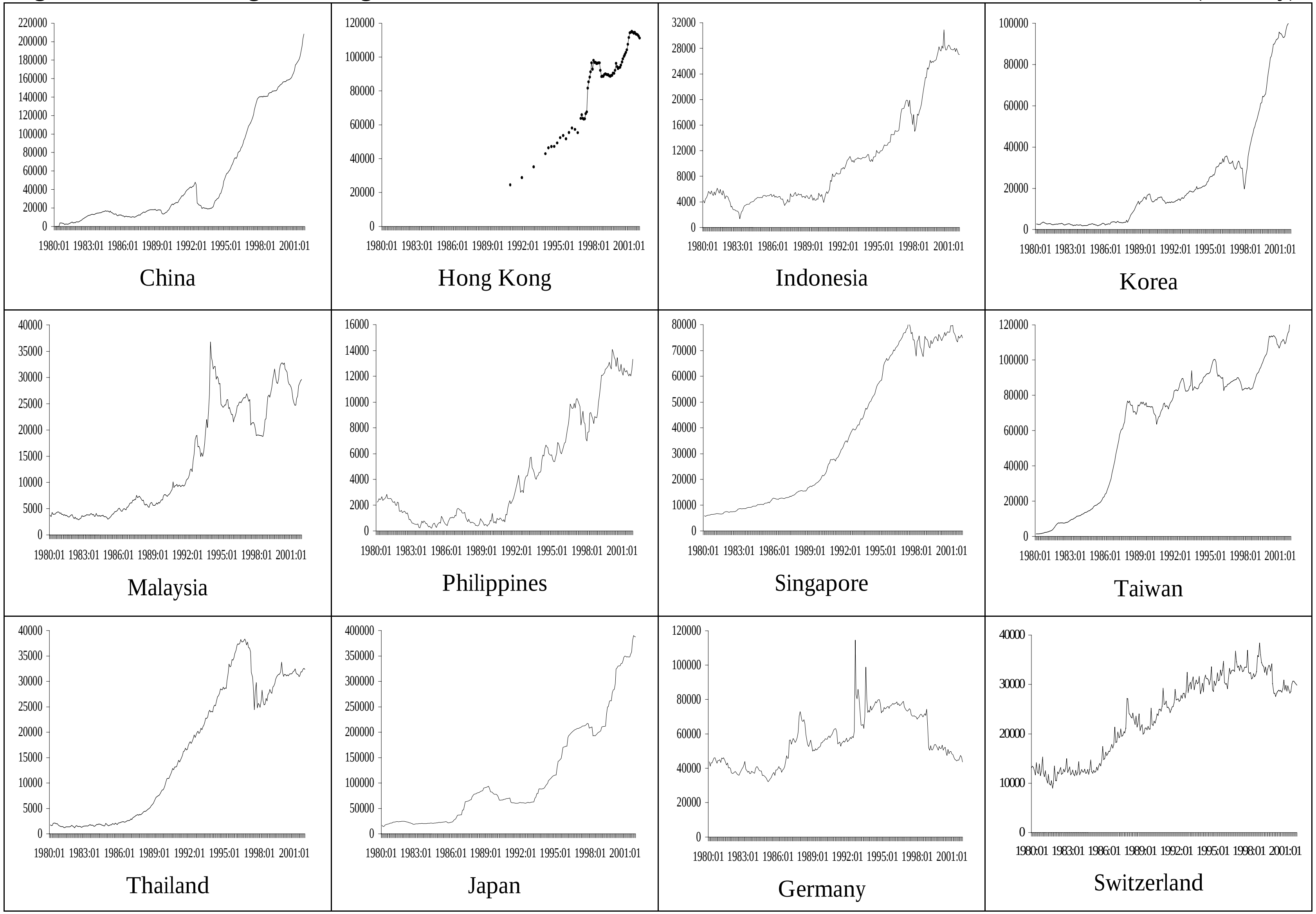
Fourth, reduced high frequency exchange rate volatility could be predicting reduced low-frequency volatility. Figure 9 plots the monthly volatility of our selected currencies. The time frame ranges from January 1980 to December 2001. We can draw the following conclusion. Before *and after* the Asian crisis, the EA_2 economies (with the exception of Indonesia) had less monthly volatility in their exchange rates than did the industrialized economies—Germany, Japan, and Switzerland.

Indeed, the boundary between high- and low-frequency pegging is blurry. In principle, monthly volatility is the aggregation of daily volatility. In a recent working paper the IMF admits that "high frequency exchange rate data for the developing countries … can help towards understanding what the objectives of the authorities may be with respect to the exchange rate, and how these objectives may change over time." (Wickman 2002)

In light of their increasing trade integration, re-establishing a common monetary standard among the EA_2 countries is devoutly to be wished. It would provide a strengthened nominal anchor for national price levels and mutual protection against (inadvertent) beggar-thy-neighbor exchange depreciations. So too is reducing risk in short-term payments flows. (But the fundamental problem of regulating banks against foreign exchange exposure still remains.) Stabilizing exchange rates collectively seems more rational than the IMF's cumulative institutional wisdom pushing for greater exchange rate flexibility—with no well-defined constraint on how any one country's exchange rate affects its neighbors'.

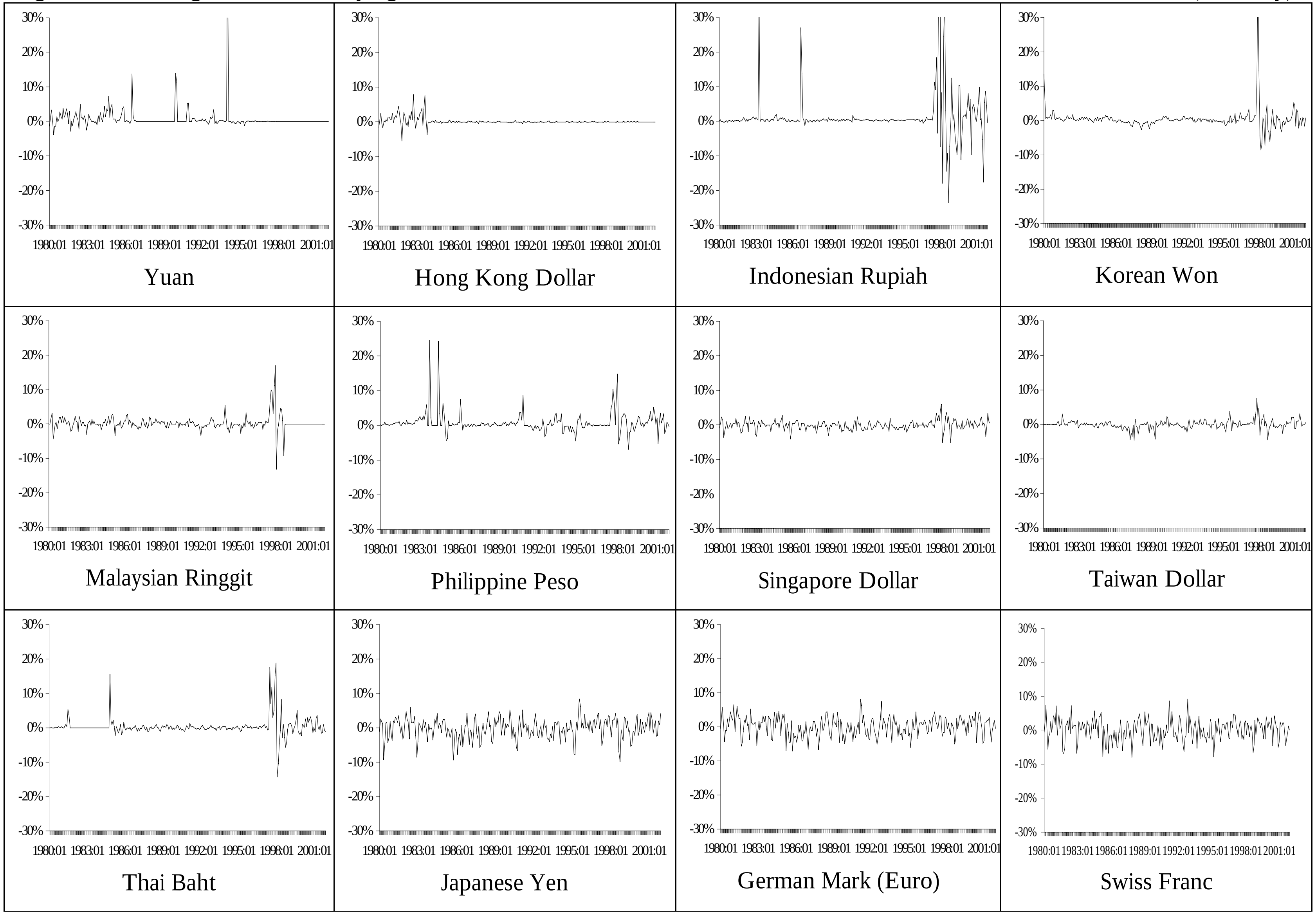
If restoring greater exchange stability under a common monetary standard, albeit one based on the dollar, is so advantageous, what is the main disadvantage of doing so? The brute fact that Japan is not part of it, and that the yen/dollar exchange rate fluctuates widely, is the central problem—as we now analyze.

Figure 8: Official Foreign Exchange Reserves of Crisis and Non-Crisis Countries in Millions of Dollars, 1980 –2001 (Monthly)



Source: IMF: IFS. Million Dollars. Note different scales on the y-axis.

Figure 9: Exchange Rate Volatility against the US Dollar of Selected Crisis and Non-Crisis Currencies, 1980 – 2001 (Monthly)

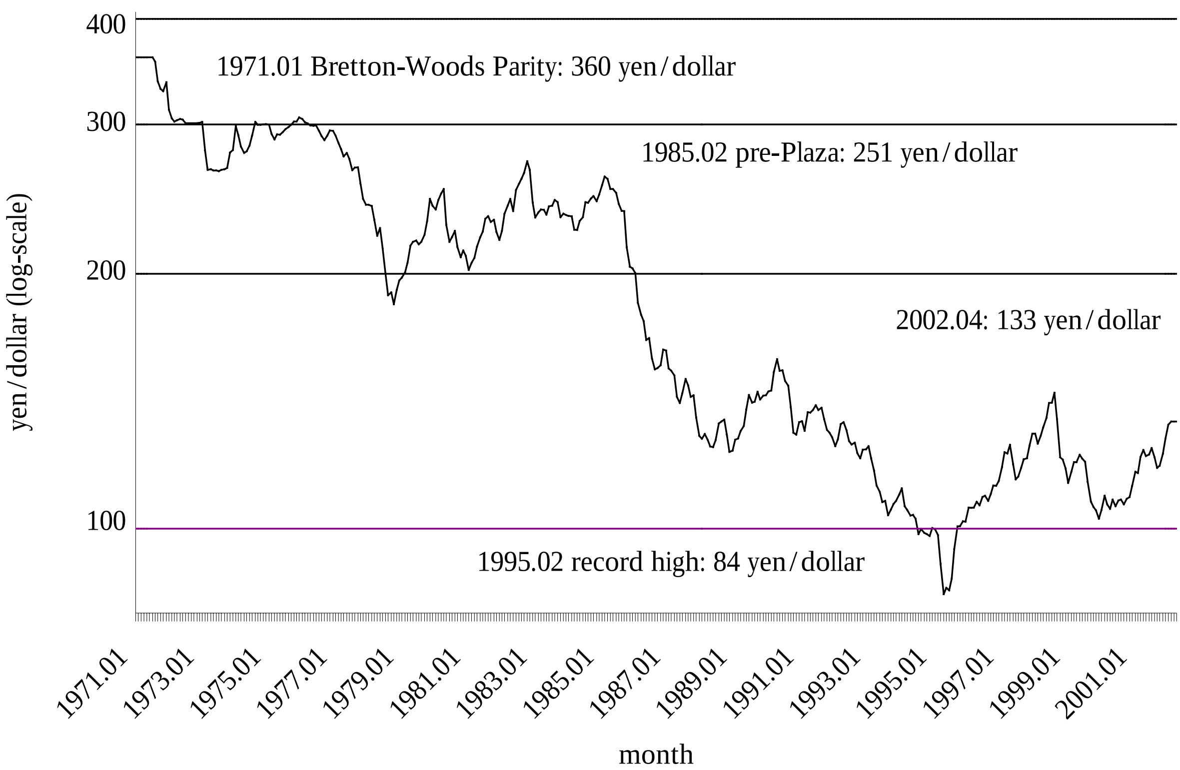


Source: IMF: IFS. Volatility is monthly percentage changes against the dollar.

4. The Loose Cannon: The Yen/Dollar Exchange Rate

If the East Asian monetary standard based on exchange rate pegs to the dollar were resurrected, trade and financial integration could proceed apace. Due to their export orientation and their relatively small size, the EA_1 economies are already very open. In 2000, trade (exports + imports) as a percentage of GDP ranges from 71% in Indonesia to 196% in Singapore. Although international trade has been—and will be—a critical factor in their economic success, it also increases their vulnerability to foreign “shocks”. And fluctuations in the yen/dollar exchange rate have been most important of these shocks.

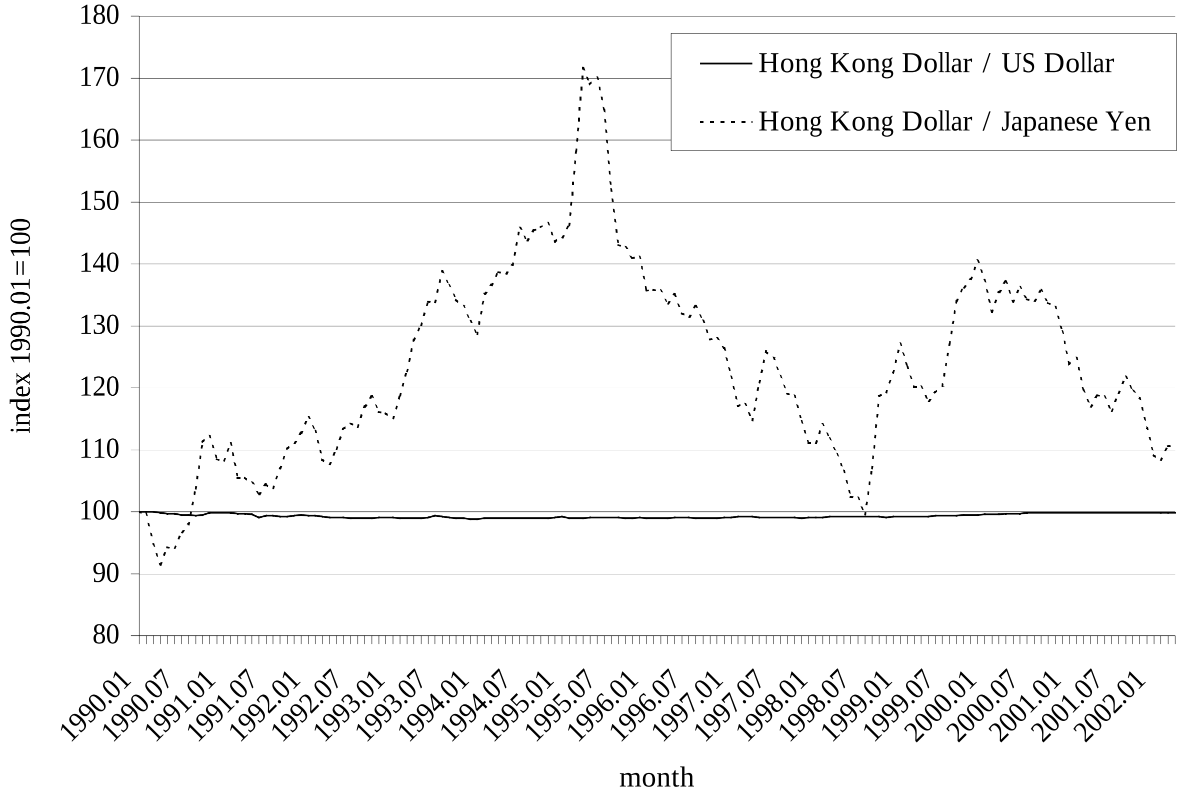
Figure 10: Yen/Dollar Exchange Rate, 1971-2002 (Monthly)



Source: IMF.

Alone among East Asian countries, Japan has chosen, or been forced to accept (McKinnon and Ohno 1997), a situation where its currency varies widely against the dollar at all frequencies of observation(Figure 5 and Figure 9). Since the early 1971, Figure 10 shows that the yen appreciating from its Bretton Woods Parity of 360 yen per dollar to around 124 yen per dollar today. Although the trend of continual yen appreciation seemingly (temporarily?) ended in 1995, fluctuations in the yen/dollar exchange rate have not abated in the last decade. Figure10 also shows the large variations in the yen/dollar exchange rate since 1990.

Figure 11: Exchange Rate of the Hong Kong Dollar, 1990-2002 (Monthly)



Source: IMF.

By keeping their exchange rates stable against the dollar, the smaller East Asian economies must cope with extraneous fluctuations of the dollar against the yen—at both low and high frequencies. To illustrate the magnitude of this problem over the past decade, Figure 11 shows large fluctuations of the yen against the Hong Kong dollar—which remained firmly pegged to the US dollar. Clearly, the yen/dollar exchange rate is a volatile outlier in the East Asian exchange rate system. This imbalance has important consequences.

4.1 Explaining the East Asian Business Cycle

The yen/dollar exchange rate affects collective EA_1 output in two ways: trade and foreign direct investment (Kwan 2001). The first is a real exchange rate or international competitiveness effect. Yen/dollar fluctuations impact Japan's international competitiveness both against the United States and against all the other East Asian countries—who are pegged to the dollar. While yen appreciation stimulates EA_1 exports, yen depreciation is a dangerous threat because it impairs the international competitiveness of the EA_1 economies. When the yen depreciates, EA_1 imports and competition from Japanese goods increase while their exports to Japan as well as to third markets decline.

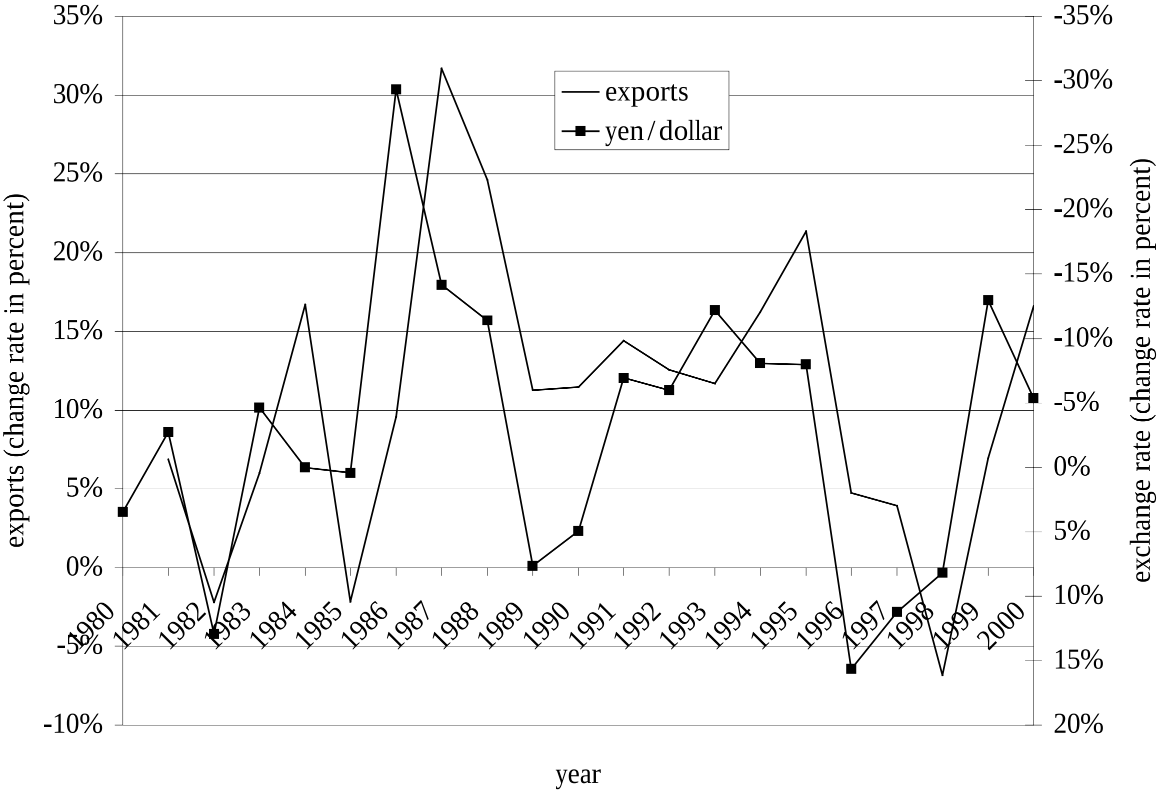
Based on annual observations of rates of growth,

Figure **12** shows that the exports of the smaller East Asian countries have fluctuated with the yen/dollar exchange rate. When the yen appreciated, such as following the Plaza Agreement (September 1985), EA_1 exports strongly expanded. In contrast, yen depreciation after 1995 slowed East Asian export expansion significantly. The change in overall EA_1 exports can be subdivided into a Japan, an intra-Asian, and a third market effect. Although not plotted here, all the three effects move in parallel with respect to changes in the yen/dollar exchange rate.

The second transmission channel is Japanese foreign direct investment (FDI) into the rest of East Asia. FDI is highly correlated with the yen/dollar exchange rate. FDI accelerates when the yen appreciates (Figure 13) because production and investment in Japan itself becomes relatively more expensive. When the yen is high and appreciating, the influx of Japanese long-term capital and know-how boosts domestic gross fixed investment in EA_1 and stimulates output—and vice versa when the yen is low.

The exchange-driven nature of Japanese FDI was particularly pronounced in the early 1990s. When the yen rose from 145 per dollar in 1990 to less than 80 per dollar in 1995, Japanese FDI to EA_1 increased fast (Figure 13). Japanese multinationals and even small and medium enterprises shifted unprofitable (parts of) the production process to the low-wage and generally lower-cost East Asian countries. In Japan, this rationalization process was perceived as hollowing out (*kûdôka*) of the Japanese economy, while it provided an additional growth stimulus to its small neighbors.

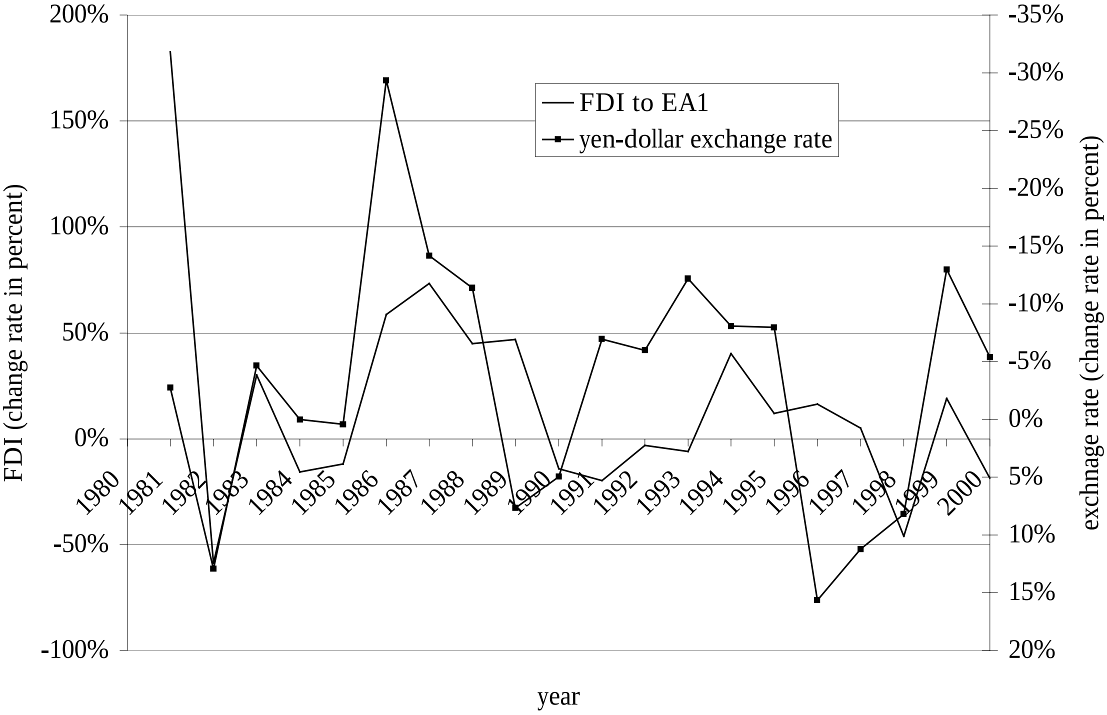
Figure 12: East Asian (EA_1) Exports and the Yen / Dollar Exchange Rate, 1980-2000 (Yearly)



Source: IMF. Note: EA_1 exports only excluding China and Japan.

Froot and Stein (1991) give another explanation for the dependence of FDI on exchange rates. The exchange rate affects foreign direct investment (and thus domestic investment) more when capital markets are imperfect. The profits of an FDI acquisition of real estate or production facilities are much more difficult to know for outsiders than is the case for portfolio investment because of asymmetric information.[13] Thus, the more internal financing (wealth) a firm can bring into a FDI project, the lower will be the total costs. An appreciation of the domestic currency increases the relative net worth of the domestic enterprise for investing abroad, and the domestic investor can bid more aggressively for foreign assets. The FDI out of the home country increases.

Figure 13: Japanese Foreign Direct Investment to East Asia (EA_1) and the Yen/Dollar Exchange Rate, 1980-2000 (Yearly)



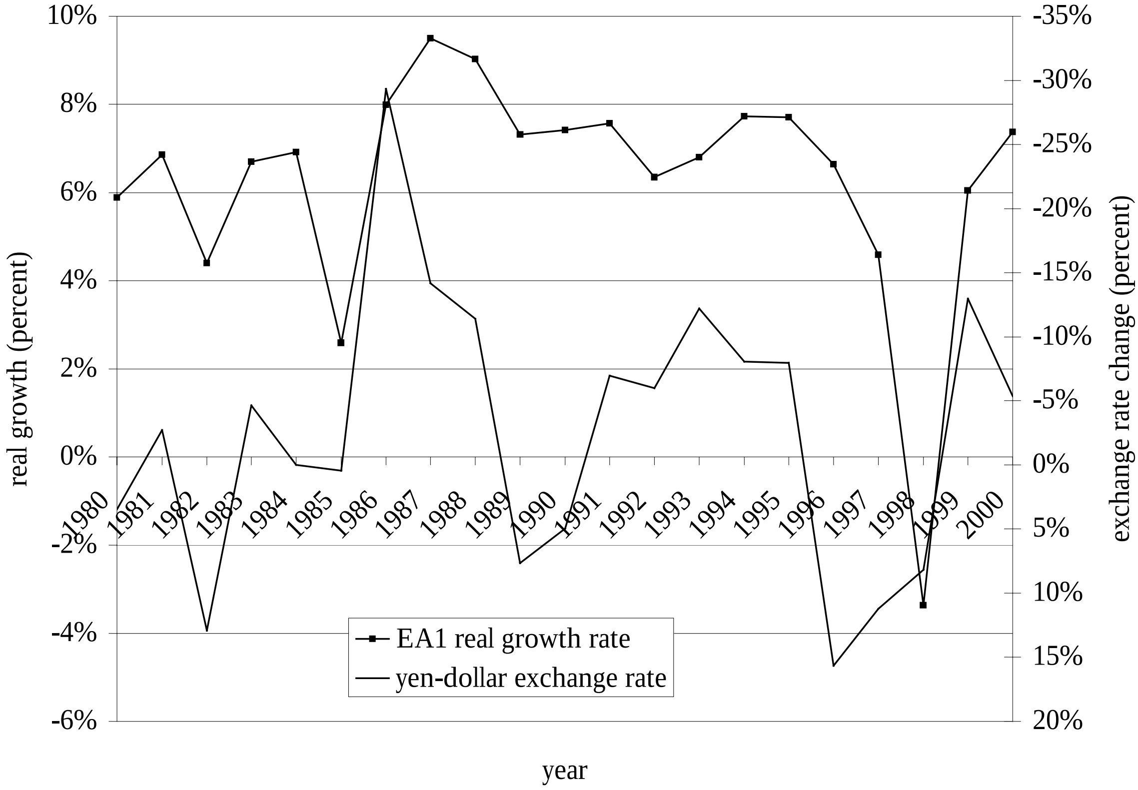
Source: Japan: Ministry of Finance and IMF.

Figure **14** shows that the EA_1 countries tend to grow faster when the yen is appreciating—and vice versa. But lags are involved so that a more formal regression analysis is necessary to show the full impact, both collectively and individually, on income growth in the other East Asian countries.

---

[13] External financing is assumed to be more expensive than internal financing because external creditors face higher costs to observe profits. While the domestic enterprise knows the profit of an FDI project, the outside creditor faces higher costs to acquire the information about the "true" return.

Figure 14: The East Asian (EA_1) Business Cycle[14] and the Yen/Dollar Exchange Rate, 1980-2000 (Yearly)



Source: IMF and Central Bank of China.

4.2 The Impact of Yen/Dollar Fluctuations on Regional Output

Consider first the econometric model of Kwan (2001: 38-41). For the period 1982-97, Kwan regressed the real growth rate of EA_2 (EA_1 plus China) on yearly changes in the yen/dollar exchange rate ($e_{YenDollar}$) and on real growth in the US (y_{US}). Kwan's multivariate distributed lag model of economic interdependency in East Asia is described by equation 4.1.

---

14 The EA_1 real growth rate (y_{EA1}) is calculated as weighted average of the real growth rates of eight (k = 8) small East Asian countries by the formula:

$$y_{EA_1 t} = \sum_{i=1}^{8} y_{i\,t} \frac{Y_{i\,t}}{\sum_{i=1}^{8} Y_{i\,t}}$$

$$y_{EA_2 t} = \beta_1 + \beta_2 y_{US_t} + \beta_3 e_{YenDollar_t} + \beta_4 e_{YenDollar_{t-1}} + u_t \qquad (4.1)$$

Table **11** reports our re-estimated coefficients of Kwan's model. As Kwan did, we used yearly data because quarterly data on real GDP are not available for most East Asian countries for the whole observation period. All regressions are run with yearly rates of change (first differences) to avoid problems caused by stationarity.[15] As Kwan found, Table 11 shows a strong inverse correlation between the yen / dollar exchange rate and growth in EA_2. For every one percent increase in the yen / dollar rate both current and lagged one year, Table 11 shows that real growth in EA_2 falls about 0.15%[16].

To further investigate the transmission of business cycles in East Asia, we modified Kwan's model in four respects. First, we introduced the impact of Japanese output fluctuations on the other East Asian countries as an additional exogenous variable.[17] Second, we disaggregated Kwan's model down to the individual country level to test whether fluctuations in the yen / dollar exchange rate have a different impact on output across Asian countries. Third, we isolated the important role of China within the East Asian macro system. Fourth, we identified the cyclic spillover effects from the EA_1 countries as a whole to individual members.

The estimations are performed in three steps. In step one, we estimate only the interactive output effects in East Asia from which exchange rate effects are excluded. The impact of changes in output in the US, China, Japan and $REA1_j$ (the EA_1 countries other than the jth one being considered) on output of the single East Asian country j is estimated. In step two, the impact of the yen / dollar exchange rate on output in the East Asia countries collectively and individually is estimated. Step three combines step one and two.

Y_i is the nominal GDP of country i in terms of dollar and y_i is the real GDP growth rate of country i.

15 For most countries the Augmented Dickey-Fuller test does not reject the null hypothesis of a unit root. Yet we view this acceptance as due to the low power of the test for our very short sample period.

16 The coefficients of the current and previous periods are added to a long-run multiplier. The long-run multiplier is more accurately explained below.

17 In reality Japanese growth is not exogenous, but strongly dependent on EA_1 growth. Nevertheless, since it is the main goal of this paper to describe the EA_1 business cycle, we treat Japanese growth as exogenous.

Table 11: The Kwan-Model of Fluctuations in East Asian Output (EA_2), 1982 – 2000

US GDP Growth	Yen/Dollar Exchange Rate Current	One year lag	Adjusted R^2	Durbin-Watson
0.18 (0.71)			-0.02	1.09
	-0.09** (-2.45)		0.22	1.42
	-0.07* (-2.08)	-0.08** (-2.49)	0.40	1.51
0.12 (0.52)	-0.08** (-2.32)		0.19	1.44
0.10 (0.53)	-0.06* (-1.97)	-0.08*** (-2.42)	0.37	1.47

Note: The dependent variable is annual output growth in EA_2. Data source: IMF and Central Bank of China. All estimations in terms of change rates (coefficients correspond to elasticities). Figures in parentheses denote t-values. * significant at the 10% level. ** significant at the 5% level.
*** significant at the 1% level.

4.2.1 Measuring Output Fluctuations

In step 1, we show how output fluctuations in the large countries—Japan, China, and the United States—influence output in the smaller East Asian economies. Let y_{Japan}, y_{China}, y_{US} and y_{REA1j} be annual growth in real output in Japan, China, the United States, and the rest of EA_1 (EA_1 except country j) respectively. We then regress the economic growth of country j on these variables.

But economic growth in Japan and $REA1_j$ are interdependent. Thus the assumption of zero covariance between the exogenous variables is violated. To cope with this problem, we run a simple univariate regression of y_{REA1j} on y_{Japan} as the exogenous variable.[18] The resulting residuals were then used in equation 4.2 as a right hand side variable $y_{REA1j\text{-}Jap}$ to represent East Asian growth filtered by the impact of Japanese growth. More generally, we then estimate real growth in the individual EA_1 countries and in EA_1 as a whole:

$$y_{j_t} = \beta_1 + \beta_2 y_{US_t} + \beta_3 y_{Japan_t} + \beta_4 y_{China_t} + \beta_5 y_{REA1_j - Jap_t} + u_t \qquad (4.2)$$

18 $y_{REA1_{j_t}} = \beta_1 + \beta_2 y_{Japan_t} + u_t$ with $u_t = y_{REA1_j - JAP_t}$. As will be proved below, the cyclical interdependence between EA_1 and China and the US is comparatively weak. Therefore, we don't control EA_1 growth for the impact of growth in China or the US.

Table 12: Mutal Determinants of East Asian Output, 1982 – 2000

j	US	Japan	China	$REA1_j$	R^2 adj. (R^2)
Hong Kong	0.40 (1.10)	0.57* (2.02)	0.24 (1.14)	1.20*** (4.31)	0.54 (0.65)
Indonesia	-0.16 (-0.43)	1.09*** (3.68)	0.21 (0.96)	1.22*** (4.39)	0.64 (0.72)
Korea	-0.13 (-0.34)	0.86** (2.86)	0.04 (0.19)	0.92*** (3.05)	0.43 (0.56)
Malaysia	-0.33 (-0.78)	0.60* (1.80)	-0.01 (0.03)	1.27*** (3.89)	0.46 (0.58)
Philippines	-0.22 (-0.54)	-0.05 (-0.17)	-0.65** (-2.74)	0.70** (2.28)	0.36 (0.50)
Singapore	0.06 (0.11)	-0.10 (-0.25)	-0.16 (-0.54)	0.39 (1.07)	-0.16 (0.10)
Taiwan	0.49* (1.84)	0.36* (1.74)	0.07 (0.45)	0.40 (1.69)	0.23 (0.40)
Thailand	-0.49 (-1.47)	1.42*** (5.51)	0.12 (0.60)	1.22*** (4.82)	0.75 (0.81)
China	0.58 (1.48)	0.10 (0.30)		-0.02% (-0.06)	-0.04 (0.11)
EA_1	0.02 (0.06)	0.61** (2.26)	-0.01 (-0.08)		0.11 (0.26)

Note: The dependent variable is annual output growth of the respective EA_2 countries. Data source: IMF and Central Bank of China. $REA1_j$ = EA_1 excluding country j. T-Statistics in Parentheses. * significant at the 10% level. ** significant at the 5%level. *** significant at the 1% level.

The regression results are reported in Table 12, where the effect of fluctuations in each of these larger countries on the individual smaller ones is shown. There are four main findings. First, the business cycles in China and the US have no measurable impact on the output fluctuations of the East Asian countries.[19] All coefficients for the US (β_2) and China (β_4) in equation 4.2 are insignificant. Only Taiwan's output fluctuations somewhat depend on those in the United States.

Secondly, as depicted in Figure 1, the evidence for a common business cycle in the small East Asian economies is strong—as reflected by the β_5 coefficients for $REA1_j$ in equation 4.2. For all the EA_1 countries except Singapore and Taiwan shown in Table 12, the β_5 coefficients are significant. This coefficient is significant at the 1% level for five countries (Hong Kong, Indonesia, Korea, Malaysia, Thailand) and at the 5% level for the Philippines. Taiwan's coefficient is close to the 10%-level of significance. The interactive output effects among the smaller Asian economies are particularly pronounced in Hong Kong, Indonesia, Korea, Malaysia and Thailand. And, not coincidentally, these countries were the hardest hit during the Asian crisis by the general contagion.

Third, Japan has a pivotal role for the business cycle of EA_1. Japanese output changes have a significant impact on six out of eight East Asian countries—Hong Kong, Indonesia, Korea, Malaysia, Taiwan and Thailand. The coefficients for two countries (Indonesia and Thailand) are significant at the 1% level. Only the business cycles of the Philippines and Singapore seem not to be linked to Japan's. For EA_1 as a whole, the impact of the Japan's business cycle is significant at the 5% level.

Fourth, our estimates show that neither the US, nor Japan, nor the EA_1 countries collectively, significantly influence fluctuations in China's output—whose business cycle seems to be relatively uncorrelated with those in other Asian countries. China's economic development mainly relies on domestic growth, and is comparatively immune to exogenous shocks from abroad.[20]

4.2.2 Measuring Exchange Rate Effects

Despite the positive correlation of East Asian and Japanese output, their business cycles are far from being totally synchronized. Because of the asymmetric impact of changes in the yen/dollar exchange rate, Japanese and East Asian business cycles could diverge. The impact of a higher yen is to depress growth in Japan while stimulating it in the rest of East Asia.

In step 1, we measured interactive output effects while ignoring the exchange rate. Now, in step 2, we measure *just* the concurrent and lagged effect of the exchange rate on output in *each* of the East Asian countries. Concurrently, i.e., within the year corresponding to our annual observations, changes in the yen/dollar affect the competitiveness of exports (Figure 13). But also with a lag of one or two years, the further influence of foreign direct investment on output seems evident.

After regressing different lag lengths of the yen/dollar exchange rate on annual output changes for every East Asian country, lags of three periods or longer become insignificant. Therefore we report on regressions with a maximum lag of two years – as summarized in equation 4.3:

---

19 However, although not measured in our sample, the downturn in U.S. high tech industries in 2001 did significantly affect the smaller East Asian economies, particularly Korea, Taiwan, and Singapore.

20 See below for our discussion of countercyclical policy in China (section 5).

$$y_{j_t} = \alpha + \sum_{i=0}^{2} \beta_i e_{Yendollar_{t-i}} + u_t \qquad (4.3)$$

In equation 4.3, again there is the problem of multicollinearity where successive time series data on the yen/dollar exchange rate tend to be correlated. For any one estimated coefficient, its standard error is "too" large leading to an underestimation of its true t-value. However, the coefficients associated with each lag are still unbiased and efficient, and the overall fit of the model is adequately reflected in the R^2 and F-statistics. To measure of the cumulative or long-run effect of a change in the yen/dollar rate, we can simply sum the three coefficients for the zero, one, and two-year lags.

The results of so estimating equation 4.3 are reported in Table 13. The negative impact of the yen/dollar exchange rate on the outputs of the individual East Asian countries is strong. The coefficients for all countries including China are negative, or close to zero if positive. Six out of eight countries—a Hong Kong, Indonesia, Korea, Philippines, Taiwan, and Thailand—show significant coefficients for the current or for the lagged exchange rate. For Malaysia, the t-value for β_2 is close to being significant at the 10%-level.

More important are the long-run "multipliers" capturing the cumulative effect of exchange rate changes for all three periods— as shown in the right hand column of Table 13.[21] These are negative for all countries and range from –0.51 for Thailand to –0.07 for China. All t-values of the long-run multipliers (except for China and Singapore) are significant—and are particularly high for Thailand, Hong Kong, Indonesia, and Korea. The country with the highest value, i.e., that showing the greatest sensitivity to the yen/dollar, is Thailand—which of course is where the Asian crisis was triggered.

Although most EA_1 countries are affected significantly by changes in the yen/dollar exchange rate, the adjustment patterns are heterogeneous. For Hong Kong, Korea, and Taiwan—sometimes called Newly Industrialized Economies (NIEs)—the short-run multipliers are high and significant, while the intermediate multipliers fade out. This could reflect the more immediate loss in competitiveness of the NIEs' exports from a yen depreciation.

---

21 The long-run multiplier β^* is calculated as total sum of all short-run elasticities by the formula: $\beta^* = \sum_{i=0}^{2} \beta_i$

In contrast, the exchange rate effects on the ASEAN 4 countries—Indonesia, Malaysia, Philippines and Thailand—in the short term are low, but the lagged effects are stronger. The slow adjustment in these countries, whose exports don't compete directly with Japan, might reflect the lagged effect on FDI from exchange rate changes. When the yen depreciates Japanese (foreign direct) investment in the ASEAN 4 countries decreases, and their growth eventually declines. Because the planning horizon for FDI is longer, the adjustment process is slower.

Although somewhat different, the responses of the individual NIEs and the ASEAN 4 to yen/dollar fluctuations rate cumulate to a common reaction pattern for the EA_1 as a whole. Overall, Table 13 supports our view that the common EA_1 business cycle is generated largely by fluctuations in the yen/dollar exchange rate.

Table 13: Exchange Rate Determinants of East Asian Output, 1982 – 2000

	yen/dollar	**yen/dollar$_{t-1}$**	**yen/dollar$_{t-2}$**	**R^2 adj. (R^2)**	**LRM**
Hong Kong	-0.17** (-2.39)	-0.15* (-2.06)	0.01 (0.08)	0.37 (0.48)	-0.31*** (-3.04)
Indonesia	-0.06 (-0.67)	-0.10 (-1.09)	-0.19* (-1.96)	0.20 (0.33)	-0.35** (-2.54)
Korea	-0.17** (-2.11)	-0.04 (-0.48)	-0.10 (-1.29)	0.12 (0.35)	-0.31** (-2.73)
Malaysia	0.02 (0.20)	-0.11 (-1.08)	-0.15 (-1.62)	0.11 (0.25)	-0.24* (1.76)
Philippines	-0.00 (-0.03)	-0.04 (-0.51)	-0.18** (-2.15)	0.14 (0.28)	-0.22* (1.88)
Singapore	0.01 (0.16)	-0.13 (-1.55)	-0.01 (-0.10)	-0.01 (0.16)	-0.13 (-1.11)
Taiwan	-0.11** (-2.43)	-0.06 (-1.39)	0.00 (0.19)	0.30 (0.41)	-0.17** (-2.51)
Thailand	-0.10 (-1.23)	-0.17* (-2.03)	-0.24*** (-2.3.01)	0.50 (0.59)	-0.51*** (-4.39)
China	-0.06 (-0.78)	-0.07 (-0.97)	0.04 (0.48)	-0.05 (0.13)	-0.07 (-0.88)
Japan	0.03 (0.58)	-0.05 (-1.09)	-0.10** (-2.19)	0.22 (0.34)	-0.12* (-1.91)
EA_1	-0.10* (-2.13)	-0.09* (-1.79)	-0.09* (-1.90)	0.43 (0.53)	-0.28*** (-4.05)
EA_2	-0.07** (-2.30)	-0.08** (-2.17)	-0.03 (-1.02)	0.42 (0.52)	-0.18*** (-3.98)

Note: The dependent variable is annual output growth. Data source: IMF and Central Bank of China. LRM = long-run multiplier. T-Statistics in Parentheses. *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

Note that output growth in China is largely immune to fluctuations in the yen/dollar exchange rate. In Table 13, the exchange rate responsiveness of EA_2, which includes China, is significantly less than the responsiveness of EA_1, which does not.

4.2.3 Measuring Output Fluctuations and Exchange Rate Effects Simultaneously

In steps 1 and 2, interactive output effects (Table 12) and exchange rate effects (Table 13) were estimated separately from of equations 4.2 and 4.3 respectively. Now, to avoid specification bias, interactive output effects and exchange rate effects in East Asia are estimated jointly.

Including insignificant variables, such as output growth in China and the US, in equation 4.2 is of minor concern. The estimators are still unbiased, and the T-statistics remain valid— although their standard errors might have increased compared to a completely specified model. But, by dropping China and the US as explanatory variables, we gain degrees of freedom without losing accuracy.

Omitting a significant explanatory variable and thus under fitting the model could introduce more serious specification bias. We omitted the exchange rate from equation 4.2, and omitted Japanese and REA1j output from equation 4.3. If the yen/dollar exchange rate is correlated with Japanese or REA1j output growth,[22] the estimated coefficients and variances in each equation can be biased. The included variable may measure not only its own direct influence, but also capture the indirect impact of what is omitted. Thus, to reduce this specification bias, equations 4.2 and 4.3 are combined to get:

$$\mathrm{y}_{\mathrm{J}_t} = \beta_1 + \beta_2 y_{Japan-YenDollar_t} + \beta_3 \mathrm{y}_{\mathrm{REA1_j}-Jap-YenDollar_t} + \beta_4 \mathrm{e}_{\mathrm{YenDollar}_t} + \beta_5 e_{YenDollar_{t-1}} + \beta_4 e_{YenDollar_{t-2}} + \mathrm{u}_t \quad (4.4)$$

In estimating equation 4.4, how do we adjust for multicollinearity? Japanese output growth is influenced by the yen/dollar exchange rate. $\mathrm{REA1_j}$ output is strongly influenced by Japanese output and the yen/dollar exchange rate (up to two lags). Thus, we again regressed Japanese output on the

[22] The partial correlation coefficient is larger than zero—as shown Table 13.

yen/dollar exchange rate and used the resulting residuals as the exogenous variable $y_{Japan\text{-}YenDollar}$ in equation 4.4. But now we regress $REA1_j$ output on Japanese output and on the yen/dollar exchange rate (two lags). The resulting residuals, $y_{REA1j\text{-}Jap\text{-}YenDollar}$,is also an explanatory variable in equation 4.4.

The main determinants of the EA_1 business cycle, the regression coefficients from estimating equation 4.4, are reported in Table 14. Compared to equations 4.2 and 4.3, the goodness of fit increases for all countries despite the fewer degrees of freedom. The long-run multiplier, i.e., the cumulative effects, of exchange rate changes on output in EA_1 remains stable—while t-values increase further. Clearly, the yen/dollar rate is a pivotal determinant of the business cycle of all EA_1 countries individually (except Singapore) and of EA_1 as a whole.

But Table 14 also shows that China's economic growth remains comparatively immune to fluctuations in the yen/dollar rate and to business cycle fluctuations in other East Asian economies.

Table 14: Output and Exchange Rate Effects in East Asia, 1982 – 2000

	Japan	**REA_j**	**yen/dollar**	**yen/dollar$_{t-1}$**	**yen/dollar$_{t-2}$**	**LRM**	**R^2adj. (R^2)**
Hong Kong	0.65* (2.02)	0.92** (2.65)	-0.17*** (-3.06)	-0.16** (-2.66)	-0.02 (-0.41)	-0.35*** (-3.68)	0.61 (0.71)
Indonesia	0.84** (2.45)	1.56*** (4.00)	-0.07 (-1.09)	-0.12* (-1.81)	-0.15** (-2.44)	-0.34*** (-3.74)	0.66 (0.75)
Korea	0.97*** (3.12)	0.91** (2.57)	-0.17*** (-3.09)	-0.03 (-0.47)	-0.10* (-1.72)	-0.30*** (-3.64)	0.60 (0.75)
Malaysia	0.19 (0.75)	2.10*** (7.02)	0.02 (0.37)	-0.11** (2.26)	-0.14** (-2.99)	-0.23*** (-3.43)	0.79 (0.84)
Philippines	-0.89** (-2.40)	0.73** (1.82)	-0.00 (-0.02)	-0.05 (-0.66)	-0.18** (-2.69)	-0.23** (-2.35)	0.42 (0.58)
Singapore	-0.56 (-1.19)	0.25 (0.53)	0.01 (0.17)	-0.13 (-1.56)	-0.02 (-0.21)	-0.14 (-1.13)	-0.02 (0.20)
Taiwan[23]	0.48** (2.28)	0.08 (0.43)	-0.09** (-2.58)	-0.06 (-1.54)	0.01 (0.27)	-0.14** (2.68)	0.48 (0.65)
Thailand	1.01*** (3.29)	0.95** (2.85)	-0.10* (-1.81)	-0.16** (-2.90)	-0.23*** (-4.13)	-0.49*** (6.16)	0.76 (0.83)
China	0.13 (0.29)	-0.53 (-1.16)	-0.06 (-0.76)	-0.07 (-0.94)	0.03 (0.44)	-0.10 (-0.88)	-0.08 (0.21)
EA_1	0.44* (1.70)		-0.10** (-2.35)	-0.08* (-1.92)	-0.08* (-1.95)	-0.26*** (-4.34)	0.50 (0.60)
EA_2	0.37** (2.23)		-0.08** (-2.60)	-0.07** (-2.41)	-0.03 (-1.02)	-0.18*** (-4.18)	0.55 (0.65)

23 The coefficient for US real growth is 0.44* (2.03).

Note: The dependent variable is annual output growth. Data source: IMF, Central Bank of China. $REA1_j$ = EA_1 excluding country j. LRM = long-run multiplier. T-Statistics in Parentheses. * Significant at the 10% percent level. ** Significant at the 5% level. *** Significant at the 1% level.

Differences exist between the more general model of equation 4.4 and the less inclusive models of equations 4.2 and 4.3. By adding the exchange rate as an exogenous variable, some effects change substantially. For instance, Japanese output no longer has any effect on Malaysian output. All in all, however, Table 14 supports our hypothesis of the strong impact on the smaller East Asian economies of changes in Japanese output and the yen/dollar rate—from which China alone remains surprisingly insulated. When the yen is weak against the dollar, the others boom—and vice versa.

4.2.4 "Good" versus "Bad" Devaluations

But devaluations by EA1 countries only stimulate their growth when their international competitiveness jointly improves as an *incidental* consequence of a fall in the yen/dollar rate. The story would be quite different if any one of them depreciated individually. Then balance sheet effects become important. As outlined in section 3, many of the smaller East Asian economies have large liabilities denominated in US dollars. Thus devaluing the domestic currency against the dollar raises the domestic currency costs of servicing these foreign debts. As long any East Asian country's currency remains stable against the dollar, dollar depreciation against the yen does not impair the debt structure of its commercial banks or other financial institutions—but it does increase the export competitiveness of its economy, attracts foreign direct investment, and stimulates output.

In effect, among the smaller East Asian economies (EA_1), there are collective "good" devaluations i.e., when the dollar depreciates against the yen and improves international competitiveness. But there are individual "bad" devaluations when any one of them depreciates against both the dollar and the yen—as in Thailand in June 1997. This then is a recipe for widespread internal bankruptcies.

In effect, when the dollar depreciates against the yen, the EA_1 currencies as a group are seen to depreciate incidentally and not by conscious policy or by some loss of internal macroeconomic control. The dollar nominal anchor for their domestic macroeconomic policies remains intact. But, if a country individually devalues against the world's dominant money, market suspicions are aroused about the future course of its domestic monetary and fiscal policies and the stability of its price level.

Furthermore, keeping the dollar as the collective monetary anchor makes "beggar-thy-neighbor" devaluations within EA_1 less likely. Because a unilateral devaluation would negatively affect the mercantile competitiveness of neighboring EA_1 countries, a chain reaction is possible. All things considered, when an East Asian country devalues "on its own" against both the dollar and the yen, its output could contract rather than expand.

4.2.5 Japan's Interaction with the Smaller East Asian Economies: A Summary

To summarize the main sources of instability in the East Asian economy, Table 15 is a taxonomy of the macroeconomic impact of events in the Japanese economy—changes in the yen / dollar rate and Japan's business cycle – on the income of EA_1 . There are four possible combinations of changes in the yen / dollar rate and upswings or downswings in Japanese income. The plus signs in the body of the table indicate an expansionary effect on EA1—with minus signs indicating contraction. The numbers in the table correspond to the four cases analyzed more formally in the appendix.

Table 15: Economic Interaction between Japan and the Smaller East Asian Economies

	Upswing in Japan	**Downswing in Japan**
Yen appreciation	(1) + / +	(3) – / +
Yen depreciation	(2) – / +	(4) – / –

+ indicates a positive impact on y_{EA1}. and a – indicates a negative impact on y_{EA1}.

Case 1 is the best outcome for EA_1 countries. The yen appreciates against the dollar while the Japanese economy is expanding. The positive income effect and exchange rate effect reinforce each other to stimulate aggregate output. But discrete episodes are difficult to identify in the data.

Case 4 is the worst outcome for the EA_1 countries. Yen depreciation is aggravated by an economic downswing in Japan. This case was observed during the Asian crisis of 1997-98 when Japanese income turned down as the yen fell.

Case 2 applied in the early 1990s up to 1995. The strong yen was accompanied by a deep recession in Japan, what was widely characterised as "*high-yen induced recession*" (*endaka fukyô*). While the recession had a negative effect on the EA_1 economies, the yen appreciation boosted growth—with this exchange rate effect predominating. The EA_1 economies experienced high growth.

Case 3 seems to apply from mid 1995 through 1996. Japan's output increased as the yen declined. The initial net affect on EA1 was positive. But eventually the falling yen—which bottomed out at 147 to the dollar in June 1998—helped provoke the great Asian crisis, putting us back into Case 4.

Again we learn that the exchange rate effect usually dominates the income effect— an important empirical regularity to keep in mind when we discuss whether a deep devaluation of the yen would permit Japan to export its way out of its current slump.

5. China’s Stabilizing Influence in East Asia

The high volatility of the yen against the US dollar has caused major economic disturbances in East Asia’s smaller economies. Moreover, because of Japan’s sustained recession after 1991, it could not fulfill its roll as an engine of East Asian growth. The slump has worsened the prospect that Japan would resume a leading economic role in East Asia in the near future.

Partly because of Japan’s disappointing performance, China has risen to assume a pivotal economic role in East Asia. Since the early 1990s, China’s high real growth and the yuan’s stability against the US dollar have greatly contributed to the region’s economy. China’s decision not to devalue during the turmoil of the Asian crisis dampened contagious devaluations throughout the region—thus allowing debtor economies of Indonesia, Korea, Malaysia, Philippines, and Thailand to recover more easily, while even helping Taiwan and Singapore.

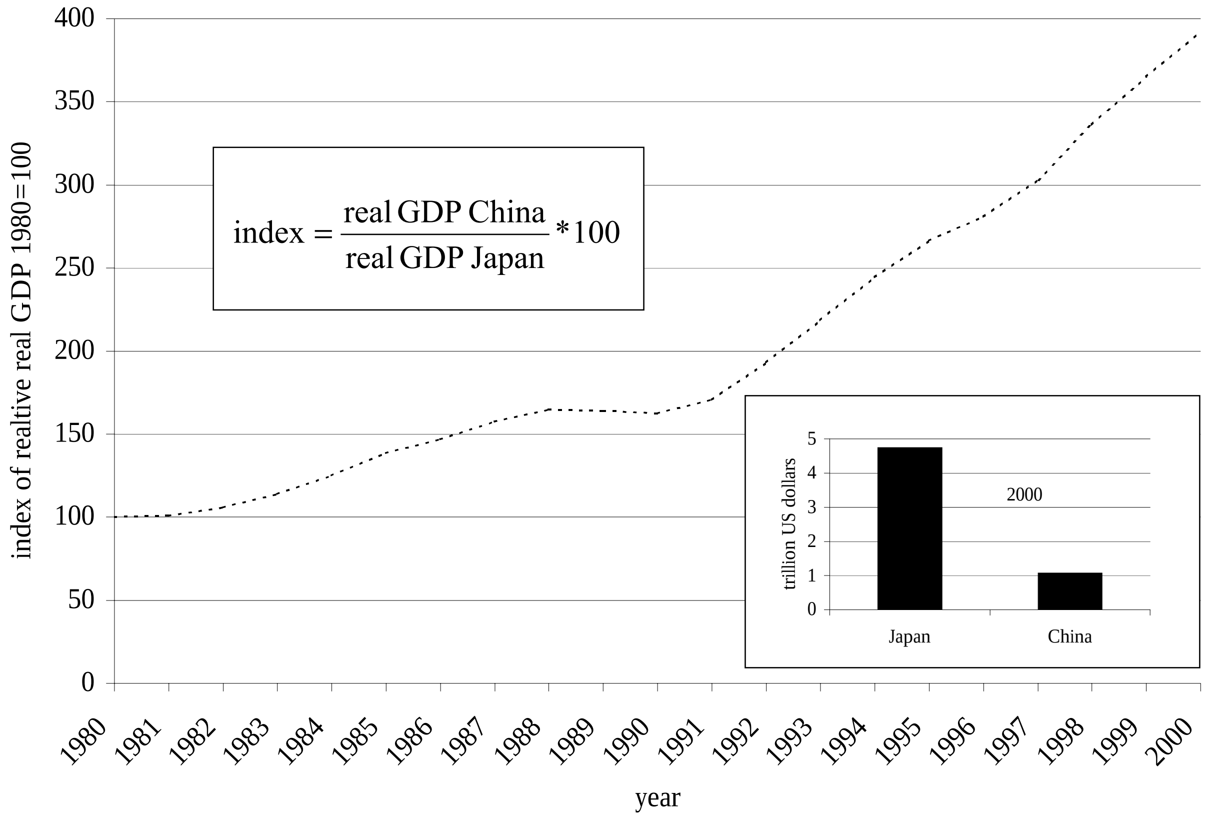
Although China’s economy is still small relative to Japan’s in terms of nominal GDP measured in US dollars, catch-up has been fast—particularly if measured in real terms (see Figure 15). Two decades of market-oriented reforms, an excellent economic performance, and the accession to the WTO have made China a regional economic power.

Today China is the second largest East Asian economy accounting for roughly 60% of the joint GDP of the EA_1 economies in terms of dollars. With an average annual growth rate of 9.65% from 1980 to 2000 and a continued high growth potential, China has had a positive impact on its smaller neighbors. The economic linkages grew steadily. From 1990 to 2000 the percentage of EA_1 trade with China has increased sharply. EA_1 exports to China increased from 6.4% of total EA_1 exports in 1990 to 11.9%, by 2000. EA_1 imports from China increased from 4.7% of total EA_1 imports in 1990 to 14.7%, by 2000 (see Table 2). Besides direct trade linkages, China’s industrialization has also become an important competitor with EA_1 countries in exporting to Europe, Japan, and the United States – another reason for keeping the yuan/dollar rate constant.

5.1 China’s Role as a Natural Stabilizer

With the growing integration of the East Asian production system, China has assumed the role of the region’s natural stabilizer. Not only has China’s output growth been the highest in the region during the last two decades; it has been also more stable than in any other East Asian country with the exception of Taiwan. Table 16 compares the coefficients of variation in the annual growth rates of the East Asian economies. Because of the strong impact of yen/dollar fluctuations, the coefficient of variation is the highest for EA_1 (0.47). If China joins EA_1 to form EA_2, the coefficient of variation declines considerably, to 0.26. Including Japan into the sample means importing instability. The coefficient of variation rises to 0.46.

Figure 15: Relative Size of Japanese and Chinese GDP, 1980-2000 (Yearly)



Source: IMF. Note: The base of 100 is arbitrary, and the broken line shows only China's real growth relative to Japan's and not the absolute size of the two economies.

What are the reasons for China's stabilizing influence? First, as is generally the case for large countries, China's openness is comparatively small. For the EA1 countries in 2000, international trade (exports + imports) as a percentage of GDP ranged from 71% in Indonesia to 196% in Singapore. In contrast, China's trade was only 42% of Chinese GDP.

Because of the comparatively large size of the domestic sector, trade and exchange rates play a less prominent role in China's business cycle. The country is less sensitive to shocks from abroad. Table 17 shows China to be relatively immune to output fluctuations in its neighboring countries, as well as immune from yen/dollar fluctuations. With growth mainly driven by domestic factors, China managed to insulate itself from most of the East Asian turmoil of the late 1990s.

Table 16: Annual Variation in Output Growth in East Asia, 1980 – 2000

	Mean	Standard deviation	Variation coefficient
China	9.65	3.40	0.35
Hong Kong	5.76	4.19	0.95
Indonesia	5.03	4.70	0.93
Korea	6.98	4.31	0.62
Malaysia	6.59	4.27	0.64
Philippines	2.48	3.82	1.54
Singapore	7.56	3.62	0.48
Taiwan	7.19	2.26	0.31
Thailand	6.15	4.90	0.80
Japan	2.53	2.28	0.90
EA_1	6.12	2.86	0.47
EA_2	7.62	1.97	0.26
EA_3	4.12	1.87	0.45

Data source: IMF, Central Bank of China. Yearly Data.

However, China's stable growth can't be attributed only to the momentum of its large domestic market. Particularly during the late 1990s, macroeconomic policy, i.e., a strong peg to the dollar as well as an effective counter-cyclical fiscal policy, contributed significantly to the economic stability of China itself and of the region as a whole.

Since 1994 after the unification of the official exchange rate and the swap rate for privileged enterprises, [24] the exchange rate has been unchanged at 8.3 yuan per dollar. Although officially called

[24] Before 1994, China had a multiple exchange rate system with an official exchange rate applied to the state enterprises and a more depreciated swap rate applied to export and other selected new industries. Foreign trade was mainly funneled through state trading companies which largely insulated domestic prices from exchange rate changes.

a "managed float", the yuan-dollar rate has behaved like a hard peg. Even during the economic downturn and the turmoil of the Asian crisis, the Chinese government resisted the temptation, and foreign advice, to cushion the economic slowdown by devaluing the renminbi. Thus did China's stable exchange rate dampen the domino effect of potential new rounds of competitive devaluations.

After the crisis, China's neighbors like Thailand or Korea—which had allowed their currencies to depreciate sharply against the dollar during the crisis—could more easily nudge their exchange rates back up. By keeping its currency stable, China helped prevent a worse downturn in the East Asian economies. As well, the stable yuan/dollar rate lessened mercantile conflicts with the US and thus facilitated China's accession to the WTO in 2001.

Table 17: Output and Exchange Rate Effects: China versus East Asia (EA_1), 1982 – 2000

	Japan	EA_1	yen/dollar	yen/$dollar_{t-1}$	yen/$dollar_{t-2}$	LRM	R^2adj. (R^2)
China	0.13 (0.29)	-0.53 (-1.16)	-0.06 (-0.76)	-0.07 (-0.94)	0.03 (0.44)	-0.10 (-0.88)	-0.08 (0.21)
EA_1	0.44* (1.70)		-0.10** (-2.35)	-0.08* (-1.92)	-0.08* (-1.95)	-0.26*** (-4.34)	0.50 (0.60)

Data source: IMF, Central Bank of China. Yearly data. EA_1 = Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand. LRM = long-run multiplier. t-Statistics in Parentheses. * Significant at the 10% level. ** Significant at the 5% level. *** Significant at the 1% level. Data abstracted from Table 14.

Ex post facto, Table 17 shows that China immunized itself from fluctuations in the yen/dollar rate on the one hand, and from income fluctuations in other East Asian countries on the other. For all the right-hand side variables, the regression coefficients purporting to explain China's output growth are insignificant. In contrast, Table 17 shows how sensitive was income growth in the EA1 countries to these same explanatory variables: their regression coefficients are all significant. But what about the pressures on China's economy *ex ante* ? How did the authorities deal with incipient downturns?

5.2 The Post-1997 Keynesian Stimulus to China's Domestic Demand

China's exchange rate stabilization is not the whole story. In the great crisis and its aftermath, China relied on the stimulation of domestic aggregate demand to offset the international economic slowdown instead of risking regional and global repercussions by out-exporting its neighbors.

Because the contribution of international trade to overall economic growth is comparatively small, domestic demand stimulation was seen to be more effective.

Beginning in Thailand in June 1997 but extending to Korea in December 1997 and Japan in early 1998, depreciations in all these neighboring countries imposed strong deflationary pressure on China. Thus, starting in March 1998, China took strong Keynesian measures to slow its internal deflation. China's 'New Deal' encompasses a strong expansion of public expenditure on infrastructure and on mass residential housing. Since 1998 public works have increased by 20% per year. In 2001 as well as in 2002, the (announced) stimulus package amounted to $18 billion (150 billion RMB).

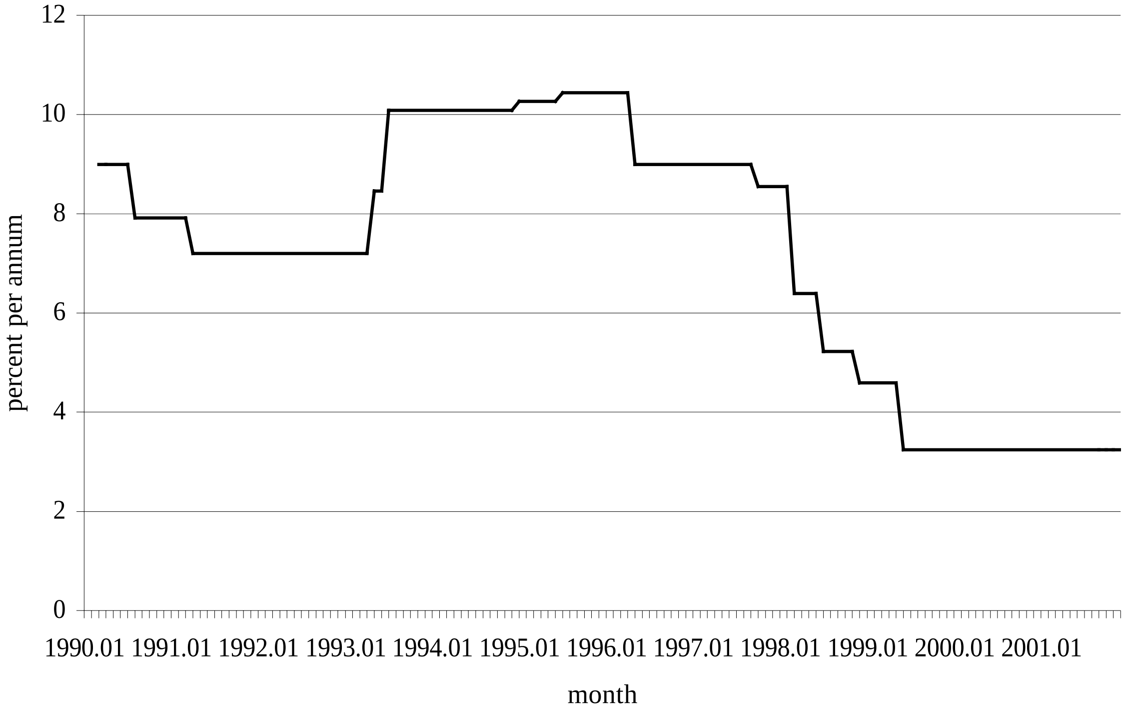
The Keynesian demand packages were financed by the sale of public bonds and by heavy borrowing from the state-owned banking system in the form of so-called policy loans, which are not counted as a part of the official deficit. Excluding bank policy loans, official yearly budget deficits rose from 0.7 percent of GDP in 1997 to 2.8 percent in 2000. The fiscal spending seems to be sustainable in the near future. At the Ottawa meeting of the International Monetary Fund and the World Bank November 2001, China's finance minister, Xiang Huaicheng, assured that the country would continue its proactive domestic policy to spur the economy (Fidler 2001).

Further, monetary expansion complemented the effect of the fiscal expansion. Indeed, in China's case, fiscal and monetary policies are hardly distinguishable. The central bank eased the austerity policy, which had been adopted in 1993, in two ways. First, the state banks were pressured to extend credit for the construction industry, exporters, home purchases, and infrastructure projects as well as to the struggling state-owned enterprises. Second, interest rates were reduced. Figure 16 shows the lending rate falling from 9.0% in September 1997 to 3.2% in 2001).

The sustainability of China's new Keynesian economic policy has been questioned. Many observers see China's murky banking sector to be a considerable threat to economic stability. The lending of the state owned banks is not driven by mere profit considerations, but sometimes by political pressure. The banking sector often has to support unprofitable state-owned enterprises. A large percentage of bank credits might eventually default. These non-performing loans, which are estimated to be anywhere from 6% up to 40% of GDP, could drive up the future cost of recapitalizing the banking system and thus should be considered government debt (McKinnon 1993).

Is this public debt manageable? If all components of public debt (official debt and estimated non performing loans of the banks) are taken into account, the public debt ratio of China is approximately 60 to 70% of GDP. Therefore, the recent Keynesian anti-cyclical stabilization measures do not constitute a substantial danger for the economy's stability. In contrast, Japan's public debt has risen to more than 140% of GDP, even not including the cost of recapitalizing Japanese banks.

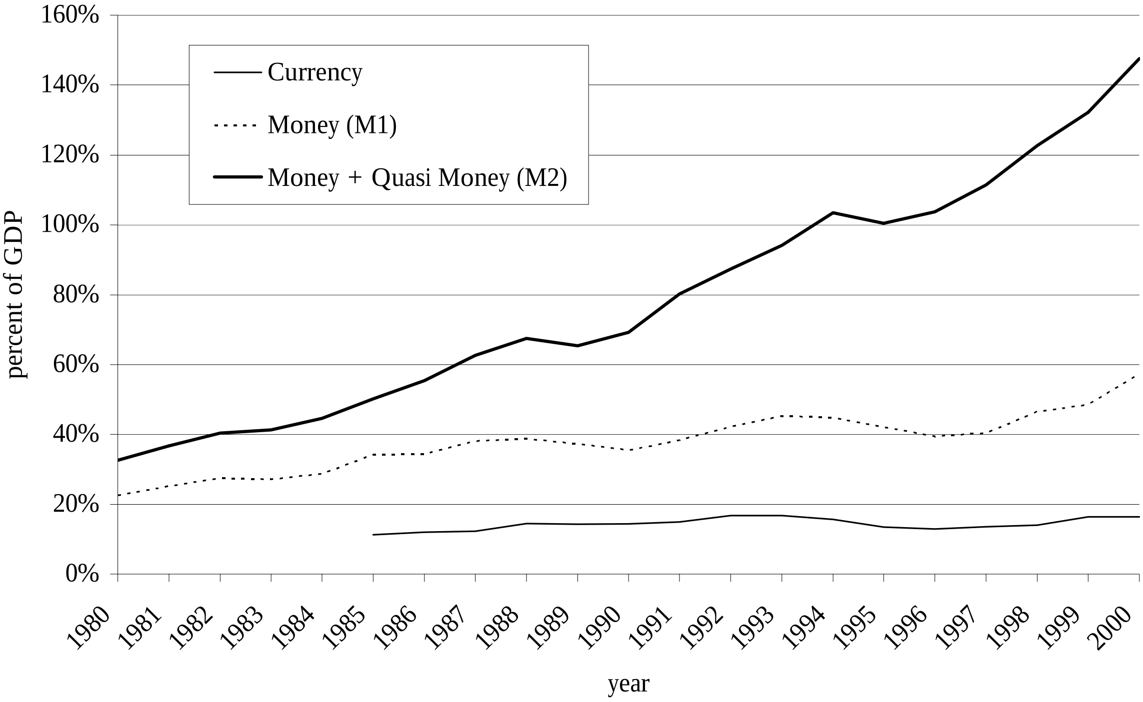
Figure 16: China: Bank Interest Rate, 1990-2001 (Monthly)



Source: IMF. Rate charged by the People's Bank of China on 20-day loans to financial institutions.

Second, the debt-to-GNP ratio is not the only measure of sustainability. The overall size of the financial system is equally important. In China, monetary instruments still dominate the domestic financial system. Figure 17 shows the rapid buildup of M2, currency and bank deposits, from 1978 (just before China began liberalizing) through 2001. The current ratio of M2 to GNP approaches 150%, which is enormous by international standards and particularly so for a developing country. Thus, China's financial system can cope with a rapid build up of explicit and implicit government borrowing without resorting to "printing money" in the Latin American mode. Of course a rapid buildup of government debt is not sustainable indefinitely. But China has a lot of financial leeway for financing changes in government expenditures without provoking a general loss of confidence in the public finances and a flight from the currency.

Figure 17: China: Monetary Aggregates, 1980-2000 (Yearly, percent of GNP)

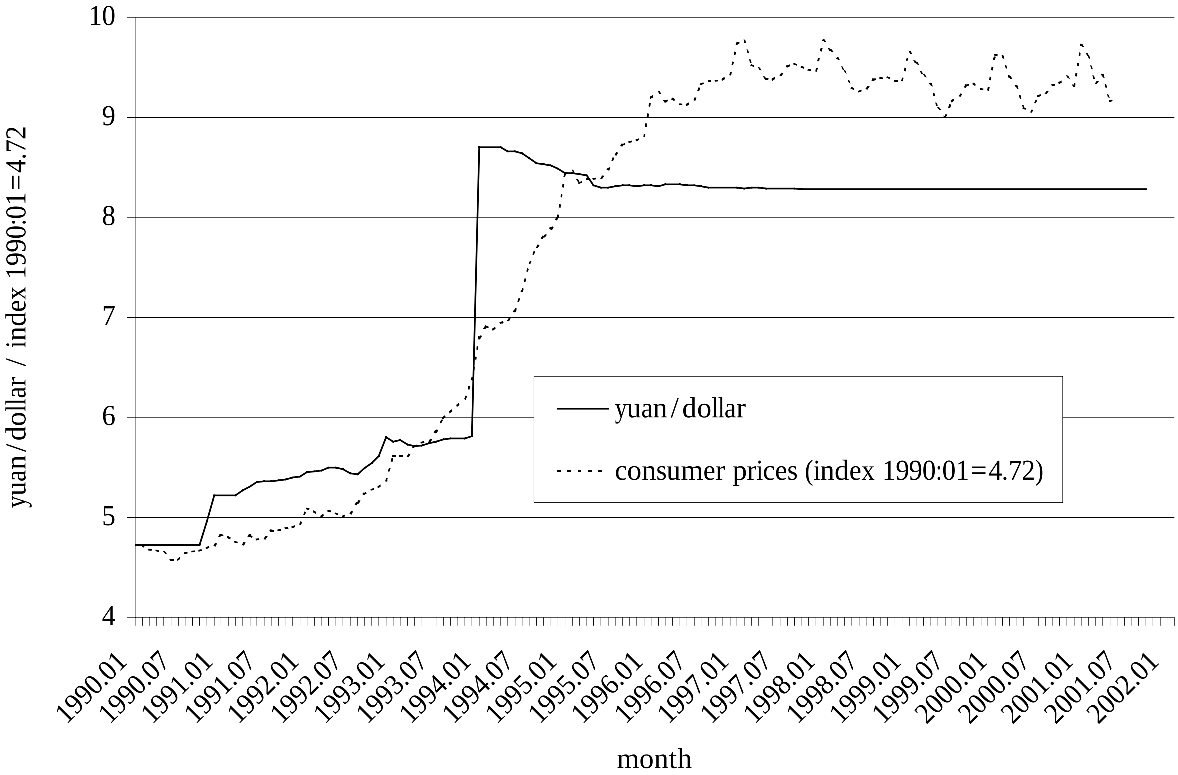


Source: IMF. Currency = currency outside the banking sector. Money = currency outside the banking sector plus demand deposits other than those of the central government. Quasi money = sum of time, savings, and foreign currency deposits of residents other than central government.

Beyond budgetary leeway, however, stationary expectations about the price level, domestic interest rates, and the foreign exchange rate are also necessary for countercyclical fiscal policy to work with maximum effectiveness. This theoretical point has been well established in the now-standard Mundell-Fleming model (1963) of how monetary and fiscal policy work themselves out in an open economy. Since 1994, China's exchange rate has been stable, since 1996 its price level has been fairly stable albeit falling slightly (Figure 18), and since 1998 its deposit rates of interest converged to low levels—below 2% as if expectations of future interest rates were also low (Figure 16).

Thus, in response to Premier Zhu Rongji's $1trillion multi-year program of new public expenditure beginning in March 1998, confidence (stationary expectations) that there would be no deflationary exchange rate appreciation on the one hand, or a flight from yuan-denominated assets necessitating a rise in domestic interest rates on the other, was central to the remarkable success of the program in expanding domestic aggregate demand. The strong deflationary pressure from abroad arising out of the Asian crisis was successfully offset. Not only did this help maintain China's real economic growth, but it ameliorated the synchronized downturns in the other East Asian economies.

Figure 18: Yuan / Dollar Exchange Rate & Chinese Consumer Prices, 1990.1-2002.1 (Monthly)



Source: IMF.

So the policy of fixing the renminbi's exchange rate at some "traditional" level, by now 8.3 yuan per dollar, is central to China's emerging role as the balance wheel in the East Asian system. During a major crisis, this policy limits competitive depreciations among the smaller East Asian economies and facilitates their return to exchange stability in its aftermath. On the other hand, stationary exchange rate expectations enable countercyclical fiscal policy within China itself to be more effective—thus helping to further dampen the regional business cycle.

6. Should Japan Join the East Asian Dollar Standard?

Our message is clear: the yen/dollar exchange rate needs to be permanently tethered. Fluctuations increase the volatility of the East Asian business cycle—and greatly increase exchange risk in the smaller East Asian economies as well as in Japan itself. Otherwise the burden on China of being the fixed point in the Asian system could become too great.

However, our view is not prevailing economic doctrine. Although mutually inconsistent, two alternative views are more in line with received wisdom on what ails Japan on the one hand, and how to achieve greater exchange rate stability in East Asia on the other. The first focuses on depreciating the yen so that Japan can inflate its way out of its slump, while the second focuses on internationalizing the yen by giving it more weight in the currency baskets of the smaller East Asian economies. Let us discuss each in turn.

6.1 Yen Devaluation and Japan's Economy

Should the Japanese yen be depreciated to save the ailing Japanese economy? Lars Svensson, Alan Meltzer, Ben Bernanke, the IMF and many others have proposed to revive the Japan's economy through yen depreciation. For instance, Meltzer (1999: 189-190) states that yen devaluation has no strong negative impacts on Japan's trading partners, particularly if the positive impact of a Japanese recovery is counted: "In my view, and supported by the experience of the past decade, devaluation would be a cheaper, and I believe, faster way to restore prosperity to Japan and its neighbors." Do their models fit with the results of our empirical estimations?

McCallum (2000) and Blanchard (2000) neglect the international repercussions of a yen depreciation in advocating a stronger monetary expansion with yen depreciation. Svensson (2000), Meltzer (2000) and the IMF (2000: 28-30, 2001: 28-9) show concern for the repercussions of a yen devaluation on other Asian countries, but assume that the negative effect that a yen depreciation might cause in East Asia's smaller countries would be more than offset by Japanese imports from East Asia.

Our estimations prove the opposite. First, we contradict the notion of Bernanke (2000: 161) that the beggar-thy-neighbor thesis is rooted in the 1930s Great Depression and does not apply to Japan and East Asia. We have shown in Tables 13 and 14 that changes in the exchange rate of the yen against the dollar have a strong impact on the smaller East Asian economies. Such changes are the main determinant of the East Asian business cycle. Therefore we support the concern of Okina (1999: 179). In the face of Japan's large trade surplus, Japanese government intervention to sell dollars, with the express aim of depreciating the yen below some rough measure of purchasing power parity, would provoke severe opposition from Japan's trading partners—and with good reason.

Beyond East Asia, however, the biggest threat of all would be a protectionist response from the United States. From the 1970s up to 1995, there were continual threats of American trade sanctions against Japan coupled with official pressure to appreciate the yen in order to lessen Japan's trade surplus and reduce its mercantile competitiveness in American markets (McKinnon and Ohno, 1997 and 2001). And in 2002, with America's trade deficit burgeoning once more, a large depreciation of the yen could well undermine America's now shaky "strong-dollar" and "no-Japan-bashing" policy.

Our estimations also conflict with the view of Svensson (2000: 303), Callen and McKibbin (2001), and others that a positive income effect in Japan can offset the negative effect of a major yen devaluation on East Asian trading partners. In an IMF Working Paper, Callen and McKibbin (2001:35) estimate that the effect on the rest of Asia is "minimal" if, to stimulate the Japanese economy, the Bank of Japan (BOJ) purchases government bonds to lower real interest rates and depreciate the yen. (Of course, at best the BOJ can only influence nominal interest rates—when they are not near zero.) In their model, the negative exchange rate effect (stronger competition in the East Asian export markets) in the first period is weaker than the positive income effect (rising imports into Japan) in the second period so that the overall stimulus to the other East Asian economies is slightly positive.

We agree that an economic upswing in Japan stimulates income growth in smaller neighboring countries. And, in percentage terms, the income multiplier is indeed larger than the exchange rate multiplier. A one percent increase in Japan's income growth causes 0.44 percent additional growth in EA_1 in the first year. In contrast, a one percent yen depreciation against the dollar reduces EA_1 growth by 0.26 percent over three years.

However, just comparing percentage multipliers ignores the magnitude of the exchange rate changes being contemplated. If, say, the authorities try to depreciate the yen by 20 to 30 percent, this is much higher than any plausible increase in Japan's income growth, say 4 to 5 percent. Between 1980 and 2000, Japanese yearly real growth ranged from –2.90 to 6.21 percent. But yearly exchange rate changes were between –34.75 and 14.54 percent. The range of fluctuations in the exchange rate (49.29 percentage points) is more than five times that in income growth (9.11 percentage points).

This difference in magnitudes explains why in the 1990s the yen exchange rate effect dominated the Japanese income effect. The peril from a yen depreciation is better understood by the smaller East Asian economies than by US theorists and the IMF. These countries oppose yen depreciation just as they welcome China's decision to maintain its hard peg to the dollar (*The Economist* 2002).

Japan and East Asia are mutually dependent. The 1996-97 yen depreciation against the dollar worsened the Asian crisis, but the Asian crisis also returned to Japan. Lower Japanese exports to East Asia, declining profit expectations of Japanese affiliates in East Asia, and rising credit defaults to Japanese banks in East Asia, triggered Japan's 1998 financial crisis. Thus, a yen depreciation not only would hurt the smaller economies, but could eventually hurt Japan itself.

Ignoring this negative feedback, if the initial impact effect of a yen depreciation failed to boost the Japanese economy, the outcome for the East Asian economies would be even worse. Goyal and McKinnon (forthcoming) argue that Japan's liquidity trap—with nominal interest rates on yen assets compressed toward zero—could even be tightened from one-time "surprise" devaluation of the yen. In a continued zero-interest rate environment, there is no presumption that bank lending would expand to support higher income growth.

Finally, the people in the Japanese Ministry of Finance argue that the consequences of yen depreciation for the region would be more manageable now than during the Asian crisis because, they believe, that many Asian countries have adopted more flexible exchanges (IMF 2001: 34). But the major empirical thrust of Section 3 in our paper is to show how the EA_2 countries have returned, or are returning, to fixing their exchange rates to the dollar—and why it is quite rational for them to do so when the dollar is the dominant trading currency.

6.2 The Currency-Basket Approach to "Internationalizing" the Yen

Many economists have recognized implicitly or explicitly how random fluctuations in the yen/dollar rate destabilize economies in the ever-more-integrated East Asian region. Although not advocating yen depreciation, their common policy solution is for the yen to be given more weight in the exchange rate baskets of each of the other nine countries—see Kawai and Akiyama (2000), Williamson (2000), Kwan (2001) and Rajan (2002).[25] The result would be greater effective, i.e., multilateral, exchange rate stability within East Asia. Japan itself would be a major beneficiary because its real effective exchange rate against major trading partners would be more stable even if the yen/dollar rate continued to fluctuate.

However, we suggest that this proposed solution is also misplaced. Why change the monetary cum exchange rate policies of nine East Asian economies, including large ones like China and Korea, when changing just Japan's would be sufficient—and also to Japan's advantage? Japan's macroeconomic slump, with interest rates trapped near zero, can also be linked to yen/dollar fluctuations.

(Unfortunately, the exchange rate origins of Japan's slump and low interest liquidity trap are too complex to be analyzed in this paper—but see McKinnon and Ohno (1997 and 2001), and Goyal and McKinnon (forthcoming). These papers demonstrate that a long-term secure peg for the yen/dollar exchange rate is sufficient for Japan to escape from its low interest liquidity trap, and thus necessary for reviving its economy. However, securing a long-term credible peg for the yen/dollar exchange rate will require the cooperation of the United States.)

Further, maintaining basket pegs would still require the dollar as the intervention currency. Thus, each country's exchange rate against the dollar would have to be continually adjusted at both high and low frequencies according to the weights in the putative currency basket. But continual movement in dollar exchange rates is contrary to the revealed preferences of East Asian central banks seeking to anchor their price levels while minimizing payments risk.

Finally, any multilateral exchange rate agreement such as pegging to a common currency basket requires a nominal anchor. In a world of N fiat monies, one currency – the Nth – must act as the anchor. The Nth country's central bank directs its national monetary policy toward stabilizing its national price level without trying to stabilize its exchange rate. In contrast, the other N–1 central banks bend their monetary policies toward stabilizing their exchange rates against the Nth currency. Before the advent of EMU, Europe was essentially a deutsche mark zone – with the mark as the anchor currency.

In this paper, we argue that East Asia is *already* a natural dollar zone, though one requiring further tinkering to stabilize the yen/dollar rate. Perhaps in the future, Japan will recover its monetary

---

25 Oh and Harvie (2001) discuss even closer monetary cooperation: target zones for intra regional exchange rates and an Asian monetary system modeled on the European Monetary Union (EMU)..

equilibrium and China will jettison its capital controls and liberalize its domestic financial markets. Then, in a new pact not based on the dollar, either the yen or the renminbi could become the anchor currency for securing intra East Asian exchange-rate *and* price-level stability. However, choosing between these two currencies would be contentious politically and the economics are unclear. In the indefinitely long interim, simply rationalizing the existing dollar-based system is the most straight forward solution for securing greater macroeconomic stability in East Asia.

References

Bernanke, Ben 2000: “Japanese Monetary Policy: A Case of Self-Induced Paralysis?” In Mikitani, Ryoichi / Posen, Adam (eds.): *Japan’s Financial Crisis and its Parallels to U.S. Experience*, Institute for International Economics, Special Report 13, 149-166.

Blanchard, Olivier 2000: “Bubbles, Liquidity Traps, and Monetary Policy.” In Mikitani, Ryoichi / Posen, Adam (eds.): *Japan’s Financial Crisis and its Parallels to U.S. Experience*, Institute for International Economics, Special Report 13, 149-166.

Callen, Tim / McKibbin, Warwick 2002: “Policies and Prospects in Japan and the Implications for the Asia-Pacific Region”, *IMF Working Paper* 01/131, Washington D.C.

Calvo, Guillermo / Reinhart, Carmen 2002: “Fear of Floating”. *Quarterly Journal of Economics* 117, 379-408.

Chin, Daniel / Miller, Preston 1998: “Fixed Versus Floating Exchange Rates: A Dynamic General Equilibrium Analysis”. *European Economic Review* . 42, 1221-1249.

The Economist 2002: “Koizumi’s Depreciation Tour”, 01/19/02 – 01/25/02, 34-35.

Eichengreen, Barry / Hausmann, Ricardo 1999: “Exchange Rates and Financial Fragility”. *NBER Working Paper 7418*, Cambridge (Massachusetts).

Fidler, Stephen 2001: “Beijing Rules out Devaluation to Spur Exports”. *Financial Times* 11/19/01.

Fischer, Stanley 2001: “Exchange Rate Regimes: Is the Bipolar View Correct?”, *Journal of Economic Perspectives* 15, 3-24.

Frankel, Jeffrey / Rose, Andrew 1998: “The Endogeneity of the Optimum Currency Area Criteria”. *Economic Journal* 108, 1009-1025.

Frankel, Jeffrey / Wei, Shang-Jin 1994: “Yen Bloc or Dollar Bloc?” Exchange Rate Policies in East Asian Economies. In: Ito, Takatoshi / Krueger, Anne (eds.): *Macroeconomic Linkage: Savings, Exchange Rates, and Capital Flows*, Chicago, 295-329.

Froot, Kenneth / Stein, Jeremy 1991: “Exchange Rates and Foreign Direct Investment: an Imperfect Capital Market Approach”. *Quarterly Journal of Economics* 106, 1191-1217.

Goyal, Rishi / McKinnon, Ronald 2002: “Japan’s Negative Risk Premium in Interest Rates and Slump in Bank Lending”. Forthcoming in *The World Economy*.

Hernández, Leonardo / Montiel, Peter 2002: “Post-Crisis Exchange Rate Policy in Five Asian Countries: Filling in the “Hollow Middle”?”, *IMF Working Paper* 01/170, Washington D.C.

International Monetary Fund 2000: *Staff Report for the 2000 Article IV Consultation, Japan*, Washington, D.C.

International Monetary Fund 2001: *Staff Report for the 2001 Article IV Consultation, Japan*, Washington, D.C.

Kawai, Masahiro / Akiyama, Shigeru 2000: *Implications of the Currency Crisis for Exchange Rate Arrangements in Emerging East Asia.* World Bank, East Asia Department, Washington, D.C.

Kwan, Chi-Hung 2001: *Yen Bloc: Toward Economic Integration in Asia*, Brookings Institution, Washington, D.C.

McCallum, Bennett 2000: "Theoretical Analysis Regarding a Zero Lower Bound on Nominal Interest Rates". *Journal of Money and Banking* 32, 4, 870-904.

McKinnon, Ronald 1993: "Financial Growth and Macroeconomic Stability in China, 1978-1992: Implications for Russia and Eastern Europe", Ch, 13 in McKinnon, Ronald: *The Order of Economic Liberalization*, Baltimore and London, Johns Hopkins University Press. 187-216.

McKinnon, Ronald 2000: "The East Asian Dollar Standard, Life after Death?", *Economic Notes*, Banca Monte dei Paschi di Siena 29, 31-82.

McKinnon, Ronald 2001: "After the Crisis, the East Asian Dollar Standard Resurrected". In: Stiglitz, Joseph / Shahid, Yusuf (eds.): *Rethinking the East Asian Miracle.* Oxford University Press, New York, 197-244.

McKinnon, Ronald / Ohno, Kenichi 1997: *Dollar and Yen. Resolving Economic Conflict between the United States and Japan*, MIT Press, Cambridge Massachusetts.

McKinnon, Ronald / Ohno, Kenichi 2001: "The Foreign Exchange Origin of Japan's Economic Slump and Low Interest Liquidity Trap". *The World Economy* 25, 3, 279-315.

McKinnon, Ronald / Pill, Huw 1999: "Exchange Rate Regimes for Emerging Markets: Moral Hazard and International Overborrowing". *Oxford Review of Economic Policy* 15, 3, 423-464.

Meltzer, Allan 1999: "Comments: What More Can the Bank of Japan Do?" *Bank of Japan Monetary and Economic Studies* 17, 3, 189-191.

Mussa, Michael / Masson, Paul / Swoboda, Alexander / Jadresic, Esteban / Mauro, Paolo / Berg, Andrew 2000: "Exchange Rate Regimes in an Increasingly Integrated World Economy". *IMF Occasional Paper*, Washington DC.

Oh, Junggun / Harvie, Charles 2001: "Exchange Rate Coordination in East Asia". *Journal of the Korean Economy* 2, 249-296.

Okina, Kunio 1999: “Monetary Policy under Zero Inflation: A Response to Criticisms and Questions Regarding Monetary Policy”, *Bank of Japan Monetary and Economic Studies*, July 1999, 157-182.

Rajan, Ramkishen 2002: “Exchange Rate Policy Options for Post-crisis Southeast Asia”, *The World Economy* 25, 137-163.

Reinhart, Carmen 2000: “The Mirage of Floating Exchange Rates”, *American Economic Review* 90, 65-70.

Sato, Kiyotaka 1999: “The International Use of the Japanese Yen: the Case of Japan’s Trade with East Asia”, *The World Economy* 22, 547-584.

Svensson, Lars 2001: “The Zero Bound in an Open Economy: A Foolproof Way of Escaping from a Liquidity Trap”, *Bank of Japan Monetary and Economic Studies* 19, 277-306.

Urata, Shojiro 2001: “Emergence of an FDI-Trade Nexus and Economic Growth in East Asia”, in Stiglitz, Joseph / Shahid, Yusuf (eds.): *Rethinking the East Asian Miracle*, Oxford University PressNew York, 409-459.

Wickham, Peter 2002: “Do “Flexible” Exchange Rates of Developing Countries Behave Like the Floating Exchange Rates of Industrialized Countries?”*IMF Working Paper* 02/82,Washington D.C.

Williamson, John 2000: *Exchange Rate Regimes for Emerging Markets: Reviving the Intermediate Option*. Institute for International Economics, Washington D.C.

World Bank 1993: *The East Asian Miracle: Economic Growth and Public Policy*, Oxford University Press.

Appendix 1: A Structural Model of Economic Interdependence between Japan and East Asia

Our model focuses on Japan and the small East Asian economies (EA_1). It describes the impact of the Japanese economy on these countries through income and exchange rate effects – as summarized in Table 15 above. Prices are assumed constant, and nominal variables correspond to real variables. All variables are in logs. Absolute changes correspond to flows and percentage changes.

The model is based on the national income identity. The EA_1 GDP (y_{EA1}) is assumed to consist of private consumption (c_{EA1}), government consumption (g_{EA1}) investment (j_{EA1}) and exports (x_{EA1}) minus imports (m_{EA1}):

$$y_{EA1} = c_{EA1} + g_{EA1} + j_{EA1} + x_{EA1} - m_{EA1} \tag{A.1}$$

Net exports are assumed to be equal to the current account:

$$ca_{EA1} = x_{EA1} - m_{EA1} \tag{A.2}$$

The current account ca is equal to the financial account fa (capital exports minus capital imports) with negative sign (balance of payments equilibrium):

$$ca_{EA1} = - fa_{EA1} \tag{A.3}$$

Income and exchange rate effects on EA_1 income via goods markets

First, we scrutinize the impact of the Japanese economy on the EA_1 business cycle through the goods markets. We assume exports and private investment to be the transmission channels. The exchange rate of the East Asian currency is assumed to float against the Japanese yen, while it is pegged to the dollar.

$$e_{EA1CurrencyDollar} = \bar{e}_{EA1CurrencyDollar} \tag{A.4}$$

From A.4, we can express EA_1 exports as function of Japanese real income y_{Japan} and the yen/dollar exchange rate $e_{YenDollar}$:

$$x_{EA1} = \delta y_{Japan} - \varepsilon e_{YenDollar} \tag{A.5}$$

δ is the elasticity of EA_1 exports with respect to Japanese income:

$$\delta = \frac{dx_{EA1}}{dy_{Japan}} \quad \text{with } \delta > 0$$

An economic expansion in Japan stimulates growth in its small neighbour countries by means of a larger Japanese import demand for EA_1 goods, while a recession slows down output in EA_1.

ε is the exchange rate elasticity of EA_1 exports with respect to the yen/dollar exchange rate. It covers EA_1 exports to Japan as well as competition in third markets under the assumption that the exchange rate of the East Asian currencies are stable against the dollar.

$$\varepsilon = \frac{dx_{EA1}}{de_{YenDollar}} \quad \text{with } \varepsilon < 0$$

An appreciation of the yen against the dollar (falling $e_{YenDollar}$) leads to higher EA_1 exports and vice versa.

In accordance with our empirical finding, imports depend on the domestic activity:

$$m_{EA1} = \kappa y_{EA1} \tag{A.6}$$

κ is the elasticity of imports with respect to the domestic activity. It is assumed to be larger than zero and smaller than unity.

$$\kappa = \frac{dm_{EA1}}{dy_{EA1}} \quad \text{with } 1 > \kappa > 0$$

A larger growth of domestic income is also expected to increase the demand for imported goods.

The second transmission channel through which Japan can affect EA_1 national income is domestic EA_1 investment. j_{EA1}. j_{EA1} is assumed to depend on the nominal interest rate and the yen/dollar exchange rate:

$$j_{EA1} = -\phi i_{EA1} - \eta e_{YenDollar} \tag{A.7}$$

φ is the semi-elasticity of domestic investment with respect to the interest rate.

$$\varphi = \frac{dj_{EA1}}{di_{EA1}} \quad \text{with } \varphi < 0$$

If the interest rate declines, an increase in domestic investment is expected and vice versa.

η is the elasticity of the domestic investment with respect to the exchange rate. η captures the exchange rate effect on the foreign direct investment, which is a part of domestic investment.

$$\eta = \frac{dj_{EA1}}{de_{YenDollar}} \quad \text{with } \eta < 0$$

With a yen appreciation against the dollar (falling exchange rate), Japanese foreign direct investment in EA_1 increases. Spill-over effects are also assumed to boost also purely domestic investment. A yen depreciation leads to a decline of Japanese foreign direct investment in EA_1.

To capture the overall economic interaction between Japan and EA_1 we plug A.5, A.6. and A.7 into A.1. This yields:

$$y_{EA1} = \frac{1}{1-\kappa}(c_{EA1} + g_{EA1}) - \frac{\varphi}{1-\kappa} i_{EA1} + \frac{\delta}{1-\kappa} y_{Japan} - \frac{\eta + \varepsilon}{1-\kappa} e_{YenDollar} \tag{A.8}$$

Note that κ is assumed to be larger than zero and smaller than unity. Thus $(1 - \kappa)$ in the denominator enforces the effect of the variable in the numeraire without changing the sign. If further, c_{EA1}, g_{EA1} and i_{EA1} are assumed constant, the national income in the EA_1 economies depends on national income in Japan and the yen/dollar exchange rate.

$\delta/(1 - \kappa)$ describes the positive correlation of Japanese income on EA_1 income. $-(\eta+\varepsilon)/(1 - \kappa)$ describes the inverse impact of changes of the yen/dollar exchange rate on EA_1 income, which is transmitted via exports and foreign direct investment. Since η and ε have the same sign their common impact is always non-ambiguous. A yen/dollar appreciation stimulates growth in EA_1, a depreciation slows down EA_1 real growth.

Assuming that the exchange rate effect dominates the income effect, we can model the impact of yen/dollar exchange rate changes on the current account of the EA_1 economies. In general we can assume, that the developing EA_1 economies import capital to finance their economic catch up. Therefore the current account is negative. Plugging A.5 and A.6 into A.2 yields:

$$-ca = -\delta y_{Japan} + \varepsilon e_{YenDollar} + \kappa y_{EA1} \tag{A.10}$$

According to equation 4.10, an economic expansion in Japan leads to a decrease in the EA_1 current account deficit ($\delta < 0$), while an economic expansion in EA_1 increases it by means of a higher import demand. Further, a depreciation of the Japanese yen against the dollar increases the EA_1 current account deficits ($\varepsilon > 0$). Again, the exchange rate and income effects are opposed, but the exchange rate effect is stronger, a yen depreciation leads to an increase in the current account deficit. This was exactly what was observed before the Asian crisis.

Table 18: Regional Distribution of East Asian Trade, 1980-2000 (Appendix 2)

	Exports							Imports						
	EA_3	EA_2	EA_1	China	US	Japan	ROW	EA_3	EA_2	EA_1	China	US	Japan	ROW
Hong Kong														
1980	23.2	18.6	12.3	6.3	26.2	4.6	50.6	56.5	33.5	13.9	19.6	11.8	23.0	31.7
1990	44.2	38.5	13.7	24.8	24.1	5.7	31.7	74.0	57.9	21.1	36.8	8.1	16.1	18.0
2000	51.1	45.8	10.3	35.5	22.5	5.2	26.5	77.6	65.5	22.6	42.9	6.8	12.1	15.6
Indonesia														
1980	63.9	14.6	14.6	0.0	19.6	49.3	16.5	49.2	17.7	15.9	1.8	13.0	31.5	37.8
1990	66.6	24.0	20.8	3.2	13.1	42.5	20.3	47.9	23.1	20.1	3.0	11.4	24.8	40.7
2000	57.7	34.5	30.0	4.5	13.7	23.2	28.7	51.5	35.4	29.4	6.0	10.1	16.1	38.4
Korea														
1980	28.7	11.2	11.2	0.0	26.5	17.4	44.8	33.7	7.2	7.2	0.0	22.2	26.6	44.1
1990	33.5	14.9	14.9	0.0	28.6	18.6	37.8	34.2	9.3	9.3	0.0	22.8	25.0	43.0
2000	42.6	31.6	19.8	11.8	22.4	11.0	35.0	46.1	24.2	16.3	7.9	19.7	21.9	34.2
Malaysia														
1980	50.8	28.0	26.3	1.7	16.3	22.8	32.9	44.8	22.0	19.6	2.3	15.1	22.8	40.1
1990	56.4	41.0	38.9	2.1	16.9	15.3	26.7	54.9	30.8	28.8	1.9	17.0	24.2	28.1
2000	53.2	40.2	37.1	3.1	20.5	13.0	26.2	61.2	40.1	36.2	3.9	16.6	21.1	22.2
Philippines														
1980	40.7	14.1	13.3	0.8	27.5	26.6	31.7	32.8	12.9	10.3	2.7	23.3	19.9	43.6
1990	37.1	17.3	16.5	0.8	37.5	19.8	25.1	43.4	24.9	23.5	1.4	19.5	18.4	37.1
2000	56.4	30.2	27.7	2.5	29.3	14.6	25.9	55.3	34.1	31.3	2.8	19.7	21.2	25.0
Singapore														
1980	44.5	36.4	34.8	1.6	12.5	8.1	43.0	50.2	32.3	29.7	2.6	14.1	18.0	35.6
1990	45.9	37.2	35.7	1.5	21.3	8.8	32.8	53.7	33.6	30.2	3.4	16.1	20.1	30.2
2000	51.4	48.9	45.0	3.9	17.3	7.5	26.3	61.8	44.5	39.3	5.2	15.1	17.3	23.2
Taiwan														
1981	28.1	17.1	17.1	n.a.	36.1	11.0	35.8	37.2	9.3	9.3	n.a.	22.5	28.0	40.3
1990	37.0	24.6	24.6	n.a.	32.4	12.4	30.6	41.7	12.4	12.4	n.a.	23.0	29.2	35.3
2000	48.9	37.7	37.7	2.8	23.5	11.1	27.7	54.0	26.5	22.1	4.4	17.9	27.5	28.0

continued…

	Exports							Imports						
	EA_3	**EA_2**	**EA_1**	**China**	**US**	**Japan**	**ROW**	**EA_3**	**EA_2**	**EA_1**	**China**	**US**	**Japan**	**ROW**
Thailand														
1980	39.1	24.0	22.1	1.9	12.7	15.1	48.3	38.4	17.3	12.7	4.5	14.5	21.2	47.1
1990	37.3	20.1	18.9	1.2	22.7	17.2	40.0	54.9	24.6	21.3	3.3	10.8	30.4	34.2
2000	48.1	32.4	28.1	4.3	22.5	15.7	29.4	62.2	36.2	33.1	3.1	11.7	25.9	26.2
China														
1980			30.6		5.4	22.2	41.8			6.3		19.6	26.5	47.6
1990			50.6		8.5	14.7	26.2			37.3		12.2	14.2	36.2
2000			30.5		23.5	15.8	30.2			39.5		9.4	17.6	33.4
Japan														
1980		21.8	17.8	3.9	24.5		53.8		20.7	17.7	3.1	17.4		61.9
1990		29.6	27.5	2.1	31.7		38.7		26.6	21.5	5.1	22.5		51.0
2000		39.8	33.4	6.5	30.1		30.1		39.9	25.4	14.5	19.1		41.0
US														
1980	18.6	9.2	7.5	1.7		9.4	81.4	22.0	9.1	8.7	0.5		12.8	78.0
1990	23.8	11.4	10.2	1.2		12.4	76.2	32.3	14.3	11.2	3.2		18.0	67.7
2000	21.8	13.5	11.4	2.1		8.4	78.2	32.0	20.0	11.4	8.6		12.1	68.0
EA_1														
1980			18.9	1.5	23.1	19.2	37.3			15.3	4.7	17.1	23.8	39.1
1990			22.2	6.4	24.9	14.4	32.0			19.6	9.4	16.1	23.0	31.9
2000			27.4	11.9	21.4	10.8	28.5			26.7	14.7	14.3	19.6	24.8
EA_2														
1980		21.7			20.9	19.6	37.6		18.2			17.4	24.2	40.2
1990		32.0			22.5	14.4	31.1		30.1			15.6	21.9	32.4
2000		37.3			21.9	12.0	28.9		41.0			13.3	19.2	26.6
EA_3														
1980	32.0				22.6		45.4	31.8				17.4		50.8
1990	39.6				26.2		34.2	42.9				18.1		39.0
2000	46.5				24.2		29.2	54.9				14.8		30.3

Source: IMF: Direction of Trade Statistics. EA_1: Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand. EA_2: EA_1 + China. EA_3: EA_2+ Japan. ROW: Rest of the World. Taiwan included starting in 1982.