

# **Pacific Basin Working Paper Series**

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Working Paper No. PB00-03

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December 2000

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# **Pegging and Macroeconomic Performance in East Asia**

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September 30, 2000

This version: December 7, 2000

\*Prepared for *ASEAN Economic Bulletin*. The opinions expressed in this paper are those of the author and do not necessarily reflect the views of the Board of Governors of the Federal Reserve System or the Federal Reserve Bank of San Francisco. The author thanks Chir-Jen Huang for research assistance.



## Introduction

As memories of the East Asian crises of 1997-1998 recede, attention has shifted back to the traditional problems of macroeconomic management in a small open economy. A key question, in this regard, is the appropriate choice of exchange rate regime. While the East Asian crises caused some disenchantment with pegging in the region, historical experience suggests that the appeal of pegging is very strong in many emerging markets. For example, Calvo and Reinhart, 2000 point out that many countries that claim to be floating actually intervene heavily in foreign currency markets.

Why do countries choose to peg? A number of explanations are offered in the literature. Pegging is widely thought to enhance macroeconomic discipline and stability, contributing to lower inflation, and also to enhance international trade. To the extent that it has these effects, results from the empirical growth literature suggest that pegging may also contribute to faster economic growth. However, as discussed below, it is difficult to test some of these claims empirically because the choice of exchange rate regime is endogenous. Pegging also has potential disadvantages. For example, a peg may make an economy less responsive to shocks, or increase its vulnerability to crises.

To shed some light on the relative merits of pegging in East Asia we briefly discuss what the recent literature has to say on this question. We then review the experience of the region over the period 1974-1999. We are particularly interested in describing the actual exchange rate policies of East Asian economies, and whether the choice of regime was associated with differences in macroeconomic outcomes, based on comparisons of average performance and volatility of macroeconomic indicators, as well as events around currency crisis episodes.

The paper is organized as follows. Section 2 provides a brief discussion of some relevant recent literature that highlights the potential benefits and costs of pegging, focusing on implications for inflation, macroeconomic restraint, output growth and volatility.<sup>1</sup> Section 3 outlines the extent to which East Asian economies opted for pegging or floating from 1974 to 1999, based on actual exchange rate behavior, using a classification method developed in ongoing research. Section 4 discusses average macroeconomic performance under pegged and floating exchange rate regimes in the region. We examine average behavior and volatility of inflation and real output growth,

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<sup>1</sup> Our discussion will not focus on optimum currency area considerations. For discussions along these lines focused on Asia see Eichengreen and Bayoumi (1996) and Bayoumi and Mauro (1999).

macroeconomic policy indicators, and external sector indicators. Section 5 discusses performance around currency crisis episodes. Section 6 concludes.

### **Pegging and Macroeconomic Discipline**<sup>2</sup>

A common justification for pegging is that it may provide a credible way of achieving disinflation. This follows from an extension of theories of stabilization policy in a closed economy setting. To illustrate, if there are frictions in the labor market, wages may be set so high that output is below its efficient level. If nominal wages are sticky, monetary authorities can reduce real wages—and increase output—by increasing inflation after wages have been set. Monetary authorities then have an incentive to promise low inflation so as to reduce inflationary expectations and wage demands, but then raise inflation afterwards in order to stimulate output. However, such promises will have little credibility. The public will know the monetary authorities' incentive to inflate, and raise its wage and price demands accordingly. As shown by Barro and Gordon (1983), if policymakers care about both inflation and output, the equilibrium outcome in this scenario benefits no one. The higher inflationary expectations lead to higher ex post inflation, with no corresponding output gains.

The inflation bias in monetary policymaking can be curbed if authorities can credibly pre-commit to a nominal target. However, in an open economy setting, it is not immediately obvious what nominal target should be chosen, whether the money supply, the exchange rate or some other target such as inflation. The answer is complicated by the fact that theoretical analysis suggests that in the absence of distortions, the choice of exchange rate regime has no implications for macroeconomic discipline or welfare. A country can achieve the same inflation or consumption outcomes by pegging the exchange rate and letting the money supply adjust, or targeting the money supply and letting the exchange rate adjust (e.g. see Helpman, 1981, Tornell and Velasco, 2000).

The choice of exchange rate regime may matter if it has some effect on the credibility of monetary authorities. For example, installing a central banker who is averse to inflation may enhance credibility. However, the public may be uncertain about the central banker's commitment to low inflation, and need to observe his (or her) actions to ascertain the degree of this commitment. It has been argued that under these conditions, the central bank should target the exchange rate because

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<sup>2</sup> This section draws on the survey in Moreno (2000b).

this is more transparent than alternative targets, such as the monetary base.<sup>3</sup> In a paper describing the interaction between the central banker and a public uncertain about the central banker's type, Canavan and Tomassini (1997) suggest that a central banker that is truly averse to inflation has an incentive to signal his type by selecting the most transparent target (a peg). This will lower inflation in a less costly fashion. In contrast, a central banker that prefers high inflation has an incentive to select a less transparent target (e.g. a monetary target under floating) in the hope that the public will mistakenly confuse him for a low inflation type. The lower inflationary expectations would amplify the impact of an inflationary surprise.

While Canavan and Tomassini emphasize how a peg may enhance the credibility of monetary authorities because of its greater transparency, a separate literature on currency crises emphasizes that the success of a pegged regime in curbing inflationary expectations may be limited because pegs are inherently vulnerable to shifts in inflationary expectations. Such shifts may be arbitrary, or reflect shocks to fiscal policy.

To illustrate the effects of arbitrary shifts in expectations, consider a situation in which the government decides to curb inflation by pegging the exchange rate. The credibility of this policy depends in part on how costly it is to abandon the peg. The government can ensure greater credibility by adopting measures that make abandoning the peg very costly (e.g. via a constitutional amendment), but this may be inefficient, because it limits the ability to offset distortions in output. Others have therefore argued for an institutional design in which a fixed but limited cost is imposed on the central bank for abandoning its low inflation policy. Under these conditions, the central bank adopts a low or zero inflation rule (a fixed or crawling peg) for small shocks, but it has an escape clause in which the peg is abandoned for sufficiently large shocks. Lohmann (1992) argues that this type of institutional arrangement can successfully minimize inflation bias and output distortions.

However, recent research shows that in a regime of this kind, arbitrary changes in the inflationary expectations of workers may trigger the escape clause and cause abandonment of the peg (Obstfeld, 1996). For example, if for some reason workers fear that the government is going to devalue, they will increase their wage demands accordingly, reducing competitiveness and output, thus triggering the escape clause and forcing the government to in fact devalue. As a result,

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<sup>3</sup> For example, data on the monetary base published by the IMF at the time of the Mexican peso crisis of December 1994 was about six months old. However, much more timely data on Mexico or other emerging markets are available now, on the respective central bank websites.

expectations of inflation (or currency devaluation) are self-fulfilling, and there are multiple equilibria consistent with differing *ex ante* inflationary expectations. Indeed, inflationary expectations under the “escape clause” rule may be the same as under floating, in which case the central bank incurs the cost associated with temporarily pegging and devaluing the currency without any reduction in inflation bias.

Changes in inflationary expectations may not be arbitrary; in some cases they reflect shocks to fiscal policy. To illustrate, suppose a country is pegging its currency and a financial crisis unexpectedly raises the future fiscal burden on the government. If the government cannot finance the larger deficit by raising taxes or lowering other expenditures, it will need to create more money. The peg will then collapse because the public anticipates an increase in future inflation (Burnside, Eichenbaum and Rebelo, 1998, Corsetti, Pesenti and Roubini, 1998).

Abstracting from credibility issues, the recent literature also sheds further light on how a peg may affect fiscal policy. It is apparent that because pegging the exchange rate may reduce the revenue from money creation, in some circumstances a decision to peg may require a fiscal contraction to ensure sustainability (Chin and Miller, 1998, provide an example in an overlapping generations model with optimizing agents.) However, under other conditions the reverse may be true. If fiscal authorities are impatient—caring more about what happens today than tomorrow—and dislike inflation, a pegged regime may be associated with less, rather than more, fiscal discipline. The reason is that a peg defers the inflationary costs of such lack of discipline to the future. Impatient policymakers then find it less costly to expand fiscal policy under a peg (Tornell and Velasco, 2000).

In the preceding examples, a pegged regime will be associated with lower inflation, while a floating regime will be associated with higher inflation. However, this does not reflect any disciplining effect of the exchange rate on macroeconomic policy. Instead, the association occurs because an arbitrary shift in expectations or a fiscal shock leads to the collapse of a previously sustainable peg, or because inflation is deferred to the future, when the currency is allowed to float. For this reason, observed macroeconomic outcomes under pegging and floating need to be interpreted with care.



## **Pegging and output**

Apart from being concerned with how pegging affects inflation and macroeconomic restraint, policymakers are also interested in how pegging affects output growth and volatility. Recent research offers insights on these questions as well.

To the extent that pegged regimes are associated with lower inflation and less volatility in the real exchange rate, they may stimulate more investment and openness, which in turn may enhance growth. (Recent evidence on the empirical relationship between inflation and openness on growth is provided respectively by Ghosh and Phillips, 1998 and Frankel and Romer, 1999.) However, the case that pegging may stimulate growth is not entirely straightforward. One reason is that evidence is weak that lower exchange rate volatility enhances trade, and therefore openness and growth (Moreno, 2000a). Furthermore, it can be argued that economic performance under a float at times reflects policies adopted during a peg. In particular, the recent currency crisis literature highlights the fact that pegging may accentuate business cycles, in which an unsustainable peg is associated with an economic boom, followed by a contraction once the peg collapses (Corsetti, Pesenti and Roubini, 1998). Under these conditions, a lower output growth under a float may be partly the result of policies in place under a peg. Pegged regimes may also facilitate panics in illiquid financial systems, even if these financial systems are otherwise efficient (Chang and Velasco, 2000).

Apart from the effects of pegging on growth, policymakers are concerned with the effects of pegging on the ability of the economy to respond to shocks in a manner that enhances welfare. The traditional literature, based on open-economy IS-LM models assumes that reducing the volatility of output is always desirable. In this framework, pegging is to be preferred in response to monetary (“LM”) shocks, while floating is to be preferred in response to real (“IS”) shocks, or to provide insulation from external shocks. As the source of any given shock is uncertain, an intermediate policy that takes into account the relative volatility of various shocks is most appropriate (Boyer, 1978). One shortcoming of the traditional analysis is that it is not based on optimizing behavior of consumers and producers, so no welfare analysis is possible. This shortcoming is addressed in more recent research. For example, Schmitt-Grohe and Uribe (forthcoming) illustrate the costs of permanently pegging the exchange rate using Mexican data. They calibrate an equilibrium small open economy model with non-traded, exportable and importable goods sectors, with sticky prices facing three external shocks: terms of trade, world interest rate and import-price inflation. Their estimates suggest that agents would rather give up between 0.1 and 0.3 percent of their nonstochastic

steady-state consumption than have a permanent peg (dollarization) adopted, because a peg prevents price adjustments to external shock that may dampen output fluctuations. Obstfeld and Rogoff (2000) suggest that pegging may also be undesirable because it prevents procyclical adjustment. In their setup, if there are shocks to productivity with sticky wages, an exchange rate peg does not allow real wages to adjust output in response to the shock. The best policy is a float with a procyclical monetary rule—suggesting that increasing, rather than reducing, the volatility of output may at times be desirable.

### **Pegging and Floating in East Asia**

The literature surveyed in the preceding section discusses the conditions under which pegging may be associated with lower inflation, greater macroeconomic discipline, faster growth, and varying degrees of output volatility. However, it is unclear to what extent these conditions apply to East Asia, and whether macroeconomic performance under pegging differs greatly from such performance under floating.

To shed some light on the relationship between pegging and macroeconomic performance in East Asia, we collected data for seven East Asian economies (Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea, and Thailand) for the period 1975-1999 from the International Financial Statistics CD-ROM of the International Monetary Fund. Monthly data were obtained on nominal exchange rates and the CPI, and annual data on the budget balance, money growth, and real GDP. We use monthly data to classify the exchange rate regimes and to identify currency crises (discussed briefly below). However, the analysis of macroeconomic outcomes (CPI, Real GDP growth, budget balance, money growth, nominal and real exchange rate and current account balance) is based on data at an annual frequency.

To proceed, we first need to determine what exchange rate regime is in place. One popular approach (see Ghosh, Gulde, Ostry, and Wolf, 1995 and IMF 1997) is to use the regimes reported by the countries themselves to the IMF, which appear in the annual publication *Exchange Rate Arrangements and Restrictions*. However, as noted by Edwards and Savastano (1999), Reinhart (2000) and Calvo and Reinhart (2000), the main disadvantage of using this source is that the reporting often appears to be imprecise. Calvo and Reinhart (2000) study the empirical properties of exchange rates, and of indicators of efforts to stabilize the exchange rate (foreign reserves, interest rates) and find that many countries that report to the IMF they are floating appear to be pegging. Fluctuations in the exchange rate of many self-proclaimed floaters are just as likely to fall within a

narrow band (2.5% in either direction for monthly data). Calvo and Reinhart find that self-reported floaters actually experience more foreign reserve volatility, suggesting heavy intervention.

In view of the uncertainty in interpreting self declared exchange rate regimes, in ongoing research we use a method to classify the exchange rate regime based on observed monthly exchange rate behavior.<sup>4</sup> The classification of the exchange rate regime proceeds in four steps<sup>5</sup>. First, for each country, we identify the major currency against which it has lowest lagging 12-month volatility. This is the initial candidate for defining the exchange rate regime in place.

Second, we check whether the lowest volatility  $s_{ij}$  of currency  $i$  against major currency  $j$  falls below a threshold  $\bar{s}$ . If so, we tentatively classify the regime in place in country  $i$  in that month as a peg against currency  $j$ . Otherwise, we classify the regime as floating. For purposes of this analysis, we use a threshold volatility that is 1/3 the volatility of the DM-\$ in the first half of 1993. A lower threshold volatility (for example, similar to Thailand's in 1993) leads to a classification similar to IMF's single currency pegs for a sample of 93 emerging markets, which appears to be too stringent. It is apparent that many countries that do not report single currency pegs are actually pegging. For a large sample of developing countries, the current threshold typically leads to a lower peg count than broader definitions of pegging used by Ghosh, Gulde, Ostry and Wolf (1995).

Third, we define a new regime only if it is sufficiently *persistent*, i.e. if it lasts for a certain number of months (six months for the purposes of this study). This deals with problem that the currency with the lowest volatility may occasionally change for a brief period (for example, during the collapse of an exchange rate peg), but then revert.

Fourth, in order to time regime switches more precisely, we add a percentage change criterion. If a switch in regime to fixed is reported according to the lowest volatility criterion, the absolute percentage changes in the exchange rate from  $t-1$  to  $t-n$  ( $n=12$ , and the check begins at  $t-1$ ) are checked. A change in regime is said to begin in the first month in which the change in exchange rate is less than or equal to the change at  $t$  or less than 5 percent annualized (whichever threshold is lower

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<sup>4</sup> Ghosh, Gulde, Ostry and Wolf, 1995, p. 3, argue that focusing on observed volatility of the exchange rate provides no indication of the degree of commitment to a peg. However, it is unclear from the data or the theoretical discussion that a declared exchange rate regime provides any information on commitment either.

<sup>5</sup> As noted earlier, we use monthly data to classify exchange rate regimes, but the discussion later in this paper will involve annual frequencies. To implement such a switch, we classify a country as pegging to the dollar in a given year if it was pegged to the dollar in most of the months. If there is a tie, the classification is based on the regime in place at the beginning of the year.

will bind). A similar procedure is used to refine the timing of a switch to a float, except that the lagged percentage changes must then be *above* the specified cutoffs. To illustrate the usefulness of this criterion, Hong Kong switched from floating to dollar peg in late 1983, but a simple volatility rule identifies the switch much later, in October 1984. This last step ensures the switch is recorded in 1983.

To sum up, using a minimum volatility criterion, a threshold volatility, and some adjustments to allow for persistence and to date changes in regime more precisely, we are able to classify a currency as pegged to one of five currencies (dollar, yen, deutschemark, franc sterling) or as a floating currency. In this paper, we will distinguish only between “any peg” (which refers to pegs to any of the five currencies indicated earlier) and “floating” regimes.

Figure 1 illustrates the share of pegged and floating regimes in the seven East Asian economies in every year between 1974 and 1999. The data reveal that East Asian economies choose to peg, rather than to float: in most years more than half the economies are pegged. There are 115 pegged observations, compared to 60 floating observations. Floating was most prevalent between 1978 and 1987, and also after 1997. One noteworthy feature is the rise in the share of countries pegging over the period 1992-1997. This is of particular interest in attempting to assess the implications of pegging versus floating because according to reports to the IMF less than half this proportion reported pegging to a single currency in East Asia.

Although this is not indicated in the figure, it is worth noting that our classification method indicates that during all pegged episodes in our East Asian samples, the peg is to the U.S. dollar. This is consistent with McKinnon’s (2000) statement that East Asia has traditionally maintained a dollar standard. It is also in line with earlier findings by Frankel and Wei (1994) indicating that exchange rate policies in East Asia resemble basket pegs with a high weight to the U.S. dollar.

Before proceeding with our assessment of economic performance under (dollar) pegging or floating, we need to confront the possibility of “survivor bias.” For example, as discussed earlier, high inflation is often associated with floating rates in the aftermath of currency crises, but if the currency collapse and inflation are the result of policies adopted during the pegged regime, it is inappropriate to attribute performance during such episodes to a floating regime. Edwards (1993) attempts to deal with survivor bias by taking the first year of a 10-year period and asks if countries with a fixed regime had lower inflation. However, this leaves open the question of what happened in the intervening 10 years that may have influenced observed inflation rates.

We attempt to illustrate the possible effects of “survivor bias” as follows. Assuming that the aftermath of a currency crisis is the result of the policies that preceded the crisis, we eliminate observations in the year of a currency crisis and the two years that follow, whenever the crisis is preceded by a peg. We use a definition of a crisis that is broadly consistent with the exchange regime classification, discussed in more detail below.

### **Pegging and Macroeconomic Outcomes**

To assess the relationship between pegging and macroeconomic outcomes we compute means and standard deviations of various macroeconomic indicators under pegged and floating regimes respectively. We also report the Z test statistics and marginal significance levels of the difference between means under pegging and floating.

We focus on three sets of macroeconomic indicators: (1) *indicators of macroeconomic performance* (Table 2)—comprising inflation and output; (2) *indicators of macroeconomic policy* (Table 3)—comprising nominal and real money growth and the budget balance as a percentage of nominal GDP. These are expected to influence inflation performance; (3) *indicators of external sector behavior* (Table 4) comprising openness and the current account as a proportion of GDP, and percentage changes in the nominal and real exchange rate. These are expected to influence output growth and volatility.

### **Inflation and Growth**

As is well known, East Asia displayed an outstanding macroeconomic performance in the last quarter of the twentieth century, with moderate inflation and exceptionally rapid real GDP growth. As can be seen in Table 2, average inflation and inflation volatility are lower under pegging in East Asia. However the Z-test suggests that differences in average inflation rates are not significant across the two regimes. When we exclude currency crisis episodes, the point estimate of inflation becomes *lower* under floating than under pegging, but the difference is still not significant.

The table indicates that over the full sample, real GDP growth is faster under pegging (significant at 1 percent). However, this is partly an artifact of survivor bias. When we eliminate currency crisis episodes, the difference in real GDP growth is reduced considerably, and the significance level drops to 10 percent (compared to 1 percent for the full sample).

In the full sample, output volatility is lower under pegging than under floating, an interesting result for at least two reasons. First, as discussed earlier, floating is generally thought to provide more flexibility in the face of shocks. Second, fluctuations in the yen appear to have important

effects on trade and foreign direct investment flows (Goldberg and Klein, 1998), as well as on business cycles (Kwan, 1998) in East Asia. This is generally attributed to the fact that East Asian currencies are pegged to the U.S. dollar. Once again, the high volatility under floating is partly the result of crisis episodes. When these are eliminated, the difference in volatility between pegging and floating narrows as the volatility of output under floating falls.

To sum up, much of the adverse inflation and output performance under floating may be attributed to what occurs in the aftermath of currency crises—particularly the 1997 crises. Below, we discuss what occurs around crisis episodes in more detail.<sup>6</sup>

### **Budget balance, nominal and real money growth**

We expect inflation performance across exchange rate regimes to be related to macroeconomic policies, indicators of which are reported in Table 2. As can be seen, budget deficits are the same under pegging as under floating (about 1 percent). The point estimates of nominal and real M2 growth are slightly higher under pegging than they are under floating, but the differences are not statistically significant.

When we remove crisis years, the point estimates of the budget deficit fall to zero under pegging, but the difference is still not significant. Neither are differences between nominal and real M2 growth across the two regimes significant. Overall the impression conveyed by these results is that macroeconomic policy indicators behave similarly under pegging as they do under floating in East Asia. There is little in the indicators to suggest that pegged regimes are associated with greater fiscal or monetary restraint. By the same token, there is no evidence of the opposite effect suggested by Tornell and Velasco, 2000 and discussed earlier, that fiscal restraint is lower under floating.

### **External sector**

Table 3 compares the behavior of the current account balance, openness, nominal exchange rate and real exchange rate under pegging and under floating. It is not clear whether the current account, which is a measure of debt accumulation and sustainability (for example, see Milesi-Ferretti and Razin, 1998) should be larger under pegging or under floating. As for openness, we expect it to be higher under pegging if exchange rate stability matters for international trade. We also expect the nominal and real exchange rate to tend to depreciate more (larger positive number) or appreciate less

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<sup>6</sup> These results may be compared to those of Ghosh, et al. (1995) and IMF (1997) who find that while inflation is lower under pegging than under floating, real GDP per capita differences are not significant.

(smaller negative number) under pegging if the widely held view that East Asia used competitive exchange rate policy as a development strategy is correct.

For the full sample, the point estimates indicate that the current account deficit is the same under pegging than under floating. However, this is misleading: the current account deficit is much larger under floating when we exclude crisis episodes (with the difference to the pegged case significant at 5 percent). The reason is that the aftermath of crises, often attributed to floating because of the volatility of the exchange rate, are associated with significant reductions in the current account deficit (and sharp swings to surplus in 1997, as discussed below). Thus, on average, the countries in our sample have tended to borrow more from abroad when floating than when pegging.

As for openness, it is significantly larger (at 1%) when East Asian currencies are *floating*. One possible reason why pegging does not seem to be associated with greater openness is that it is not associated with a higher degree of competitiveness. In the full sample, the nominal and real exchange rates depreciate *less* under pegging than under floating. When currency crisis episodes are excluded, the differences narrow considerably, becoming insignificant. In addition, while nominal exchange rate volatility is consistently lower under pegging than under floating, the difference in volatility across the two regimes is much narrower for the real exchange rate, once we exclude currency crisis episodes. That is, pegged regimes in East Asia do not appear to be associated with sufficient gains in competitiveness or reductions in volatility as to have much of an impact on openness. This is not entirely surprising, given the evidence cited earlier that pegged regimes have little effect on international trade (Moreno, 2000a).<sup>7</sup>

### **Comparison with full sample of developing countries**

The preceding results may be compared with those for a sample of 98 developing countries examined by Moreno (2000b). In contrast to Asia, inflation tends to be much lower under pegging than under floating in the larger sample. However, real GDP growth is faster under pegging than under floating, as it tends to be in East Asia. The differences also narrow considerably (but remain significant) when currency crisis episodes (preceded by a peg) are eliminated, but remain much larger than they are in East Asia. As for the macroeconomic policy indicators, just as in East Asia, budget balances and real money growth are not significantly different under pegging and under

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<sup>7</sup> Having said all this, it is worth bearing in mind that the number of countries is small and is affected by the presence of Singapore in the sample, whose measure of openness as a percentage of GDP is very high.

floating. However, nominal money growth rates are much higher under floating in the larger set of developing countries.

Finally, in contrast to East Asia, there are no significant differences in openness across pegged and floating regimes in the larger sample of developing countries. However, the rate of depreciation is much higher under floating for this larger set, even after we eliminate crisis episodes or episodes of extremely high inflation (the top 1 percent inflation episodes). Thus East Asia is unusual among developing countries in that floating regimes are associated with successful monetary control and moderate rates of depreciation.

### **Macroeconomic Outcomes Around Currency Crisis Episodes**

In the preceding analysis, we reported results when currency crisis episodes are excluded in an effort to illustrate the possible effects of “survivor bias”. However, what occurs during crisis episodes is of direct interest to policymakers. In particular, we would like to address three questions: (1) What was East Asia’s macroeconomic performance during crisis episodes? (2) Did performance differ when a peg or a float preceded a crisis episode? (3) How different were the most recent 1997 crises?

We define a currency crisis as an episode in which a currency depreciates sharply: specifically in which the percentage depreciation in the year of the crisis exceeds the lagging 12 month mean percentage change plus 3 standard deviations and is also larger than twenty five percent. The rolling 3 standard deviation criterion is over the same lagging 12-month period, and accounts for greater exchange rate volatility that may occur during periods of high inflation. The twenty-five percent criterion rules out changes that may exceed three standard deviations, but are quantitatively small (for example, a 10 percentage point change in the Hong Kong dollar may involve fractions of that currency that would not be considered a crisis).<sup>8</sup> A crisis is said to be preceded by a peg if a peg was in place the year before the crisis. Our method identifies 23 currency crisis episodes out of 175 available observations, an incidence of about 13 percent. A peg (to the dollar) preceded 15 of these crisis episodes, while a float preceded 8 such episodes.

Figures 2 to 4 illustrate the average macroeconomic outcomes in five-year periods centered on the crisis episodes. The data are scaled so that the crisis year (labeled 0) is set to 100, except for the budget balance and current account balance, which are ratios to nominal GDP. In the figures, we

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<sup>8</sup> Moreno (2000b) also examines the implications of eliminating the top 1% of inflation observations.



distinguish between crisis episodes up to 1996 and the 1997 crisis episodes, which were unusual because of the close coincidence in timing in different countries. In averaging for 1997, we only include countries which experienced a currency crisis and whose currency was pegged in 1996. Hong Kong is excluded from the 1997 group because its peg survived (it had no currency crisis). South Korea is excluded because it is classified as floating in 1996. However, a case can be made that Korea really belongs under the pegged category, as its currency was pegged throughout the first half of the 1990s. We could have added Korea to the countries whose 1997 crisis was preceded by a peg by modifying our criteria slightly. However we decided not to do this in this paper pending more systematic analysis of our exchange rate classification system with a larger dataset.

### **Inflation and output**

The pre-1997 results in Figure 2 indicate that over a cumulative five-year period, inflation is slightly higher under a pre-crisis peg, with cumulative inflation of 50 percent, versus 45 percent under a float. Cumulative output growth is nearly the same: 17.6 percent under a peg and 18.2 percent under a float. Thus, pegging has not consistently been associated with better performance around crisis episodes. In the case of 1997 crises that were preceded by a peg, output shows a steep contraction and on average has not recovered to pre-crisis levels.

There are also distinct differences in the patterns of pre- and post- crisis behavior. Prior to the 1997 episodes, inflation in crises preceded by a peg tends to rise after a crisis (from a cumulative 19 % over a two-year period before the crisis to 26 percent after the crisis). The reverse is true in the case of a pre-crisis float (inflation falls from 24 % pre crisis to 17 percent post crisis).

Figure 2 reveals that pre-crisis inflation is lower than the average for the pre-1997 episodes (a flatter slope), while the post crisis average is somewhat higher. However, the 1997 average disguises deflationary tendencies in most post-1997 crisis economies, due to the very high inflation in Indonesia in 1998.

There is evidence of an expansion and contraction cycle when the currency is pegged in the pre-1997 crisis episodes. Average output grows a cumulative 12.1 percent in the two years prior to the crisis and then slows down to a cumulative 5 percent in the two years after a crisis. The reverse is true under a pre-crisis float, as growth accelerates from a cumulative 7 percent in the two years before a crisis, to over 10 percent after the crisis.

In the 1997 crisis episodes, the “boom and bust” cycle is extreme: output rises strongly before the crises, followed by unprecedented steep contractions in the year after the currencies collapse. Korea, which was excluded from the 1997 crisis sample, experienced a similar cycle.

A number of explanations have been offered for why the output effects of the 1997 crises were so severe. One key difference with prior episodes is that the 1997 crises were associated with closely timed financial crises (Moreno, 1999b). As discussed in our theoretical survey, pegging may have contributed to these financial crises, either by encouraging excess borrowing, or facilitating runs on an illiquid financial system (Corsetti, Pesenti, Roubini, 1998, Chang and Velasco, 2000). Another difference is the sharp interruptions in capital flows to the region, as reflected in the behavior of the current account discussed below.<sup>9</sup>

### **Budget balance, Nominal and Real M2**

In the pre-1997 crisis episodes the budget is typically in deficit prior to the crises under a float, and close to zero under a peg. Budget deficits under a peg and a float tend to converge after a crisis. Once again, the 1997 crises are very different: the average budget balance shows a very large surplus before 1997 that is sharply reduced in the two years that follow the crises.<sup>10</sup>

As for nominal M2 growth, on average it accelerates in the two years after a pre-1997 crisis compared to the situation before a crisis, with M2 growth somewhat higher under pegging. In the case of the 1997 episodes, M2 growth is not unusually rapid before the crisis. (A similar point is made by Moreno, 1999a.) However, M2 growth after 1997 is slower than in previous crisis episodes.

The pattern of real M2 growth reveals a slowdown in the growth of liquidity just before a crisis (whether preceded by a peg or a float), followed by an acceleration. This pattern was reversed in 1997: the real growth of liquidity was on average faster before the crisis, but then subsequently slowed down. This pattern raises two questions. First, was the 1997 crisis preceded by unusually rapid real growth in liquidity, perhaps accounting for the severity of the subsequent collapse? Moreno (1999a) addresses this question and finds that the evidence is mixed. Second, was real liquidity creation sufficiently expansionary in the aftermath of the crises? It is not possible to answer

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<sup>9</sup> As there is a voluminous literature on the causes of Asia’s currency crises we do not discuss these various explanations in detail. See Moreno, 1998 for a brief review of alternative explanations.

<sup>10</sup> The observations two years after 1997 are for only three countries, Malaysia, the Philippines, and Singapore.

these questions unambiguously without more systematic research, not least because the sluggish growth in real M2 growth after 1997 may be the result—rather than the cause—of the steep decline in output. The post-1997 rising budget deficits and sluggish money growth may reflect disruptions to East Asian financial sectors that were not typical of prior currency crisis episodes.

### **External sector**

Figure 4 reveals that in the pre-1997 crisis episodes the current account is typically in deficit before crisis, with some reversal after the crisis. Two characteristics of the 1997 episodes stand out. First, the average current account deficit before the crises is smaller than the average for prior crisis episodes. However, in part this is because of Singapore's large current account surpluses, which disguised large current account deficits in other economies, ranging from 3 to 8 percent in 1996. Second, the current account deficit tends to a large surplus after the crises, reflecting closely-timed interruptions in foreign credit in a number of economies that were associated with steep reductions in output discussed earlier. These closely timed interruptions may reflect the fact that East Asian economies faced common financial vulnerabilities.<sup>11</sup> Alternatively, they may reflect other factors, such as herding behavior (Kaminsky and Schmukler, 1999) or efforts by lenders who face difficulties in one country to rebalance their portfolios by reducing credit to another country (van Rijckeghem and Weder, 1999).

There is a rise in openness after pre-1997 crises—particularly under pegging, suggesting that the external sector is less vulnerable to contraction in the aftermath of crises than are other sectors. There also tends to be a pronounced post-crisis nominal and real depreciation when a peg precedes a crisis. The effect is smaller under a float. These patterns persist in the 1997 crises, but are much more extreme. Openness rises steeply, and the rate of nominal and real trade-weighted depreciation is unusually steep.

### **Summary and conclusions**

Our survey of the experience in pegging and floating in East Asia yields a number of interesting insights on the exchange rate policies adopted in the region, and the associated macroeconomic outcomes.

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<sup>11</sup> Moreno (1998) surveys this and other explanations.

First, our method confirms McKinnon's (2000) observation that East Asia has typically operated as a dollar currency area. We find that pegs occur often in the region, and are consistently to the U.S. dollar. Frankel and Wei, 1994, and Ohno, 1999, obtain similar results using different methods.

Second, lower inflation or greater macroeconomic restraint are apparently not a rationale for pegging in East Asia. Inflation performance under pegging is similar to that under floating, indeed it is *lower* under floating when we control for "survivor bias" by excluding crisis episodes that are preceded by a peg. Money growth rates and budget balances are also comparable across the two regimes. These findings broadly support the argument made by Glick, Hutchison and Moreno (1999) that pegging was not a cure for inflation in East Asia. This feature of East Asian economies makes them unusual among developing countries, and suggests that the credibility and macroeconomic discipline effects of pegged regimes that are often cited in the literature and in policy discussions are much less important in East Asia.

Third, the full sample data indicate that average growth tends to be higher under pegging than under floating in East Asia, which may partly explain the appeal of pegging. However, after accounting for survivor bias (by excluding sharp devaluation episodes that may be attributable to policies adopted during the pegged regime) the differences in growth rates across the two regimes narrow significantly. Also, the data do not necessarily support the commonly accepted view that pegging had the effect of enhancing competitiveness. There are no significant differences in nominal or real trade weighted exchange rate depreciation across the pegged and floating regimes after we account for survivor bias. The differences in real exchange rate volatility are also relatively small. Openness also tends to be higher under floating than under pegged regimes, suggesting that trade is not the channel by which relatively higher growth rates are achieved under pegging.

Fourth, a pegged regime is associated with higher cumulative inflation, and similar cumulative growth around currency crisis episodes before 1997. The 1997 crises we have examined, which were generally preceded by pegs, showed average inflation that was comparable or lower than prior crisis episodes. However, they were followed by unprecedented contractions in output. The poor output performance appears to reflect closely timed financial crises and interruptions in credit. Some caution is needed in interpreting these stylized facts because of the small size of the sample, and caveats about causality suggested by our earlier survey of the theory.

To conclude, East Asia is different. Average differences in macroeconomic performance under pegging and floating in the region were relatively modest, in contrast to the experience of other

developing countries or emerging markets, where inflation under pegging tends to be much lower. It appears that policymakers in the region are able to control inflation under floating as well as they do under pegging. Thus, some of the explanations for pegging traditionally emphasized in the literature do not appear to provide a rationale for pegging in East Asia. Policymakers in East Asia have nevertheless revealed a strong preference for pegging to the U.S. dollar, suggesting that the appeal of pegging reflects certain advantages of exchange rate stability not captured by our broad macroeconomic measures. This appeal persists in spite of the 1997 currency crisis episodes, which were largely preceded by pegs and raise the possibility that the costs of pegging may have risen significantly.

Given these findings, more systematic examination of the costs of benefits of alternative exchange rate and monetary arrangements (such as single currency or basket pegs, money targeting, inflation targeting) in East Asia would be worthwhile. Such an assessment, implemented in an equilibrium framework, or using more formal empirical analysis, may shed further light on the relative merits of East Asia's traditional exchange rate arrangements. Further research on why the severity of the impact of currency crises has increased in East Asia, and analysis of the extent to which pegging may have contributed to this outcome, would also provide insights that may be useful in current policy debates.

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**Table 1. Asia: Exchange Rate Regime, Inflation and Output**

	Peg	Float	Z-test
Inflation	8.2 (6.8)	8.8 (10.4)	-0.42
Real GDP Growth	7.2 (2.9)	4.2 (5.7)	3.88***
Excluding Currency Crisis Years Preceded by Peg and Two Years that Follow			
Inflation	8.9 (6.9)	6.9 (5.5)	1.07
Real GDP Growth	7.4 (3.1)	6.2 (4.1)	1.62
*** Significant at 1%			
** Significant at 5%			
* Significant at 10%			

**Table 2. Asia: Exchange Rate Regime and Macroeconomic Policy Indicators**

	Peg	Float	Z-test
Budget Balance	-0.01 (0.04)	-0.01 (0.05)	0.35
Nominal M2 Growth	20.1 (8.8)	18.6 (10.7)	0.85
Real M2 Growth	11.7 (7.3)	9.7 (9.9)	1.25
Excluding Currency Crisis Years Preceded by Peg and Two Years that Follow			
Budget Balance	-0.00 (0.04)	-0.01 (0.06)	1.0
Nominal M2 Growth	19.3 (8.7)	17.3 (7.0)	1.33
Real M2 Growth	11.2 (7.4)	10.7 (7.6)	0.33
*** Significant at 1%			
** Significant at 5%			
* Significant at 10%			

Liquidity growth:

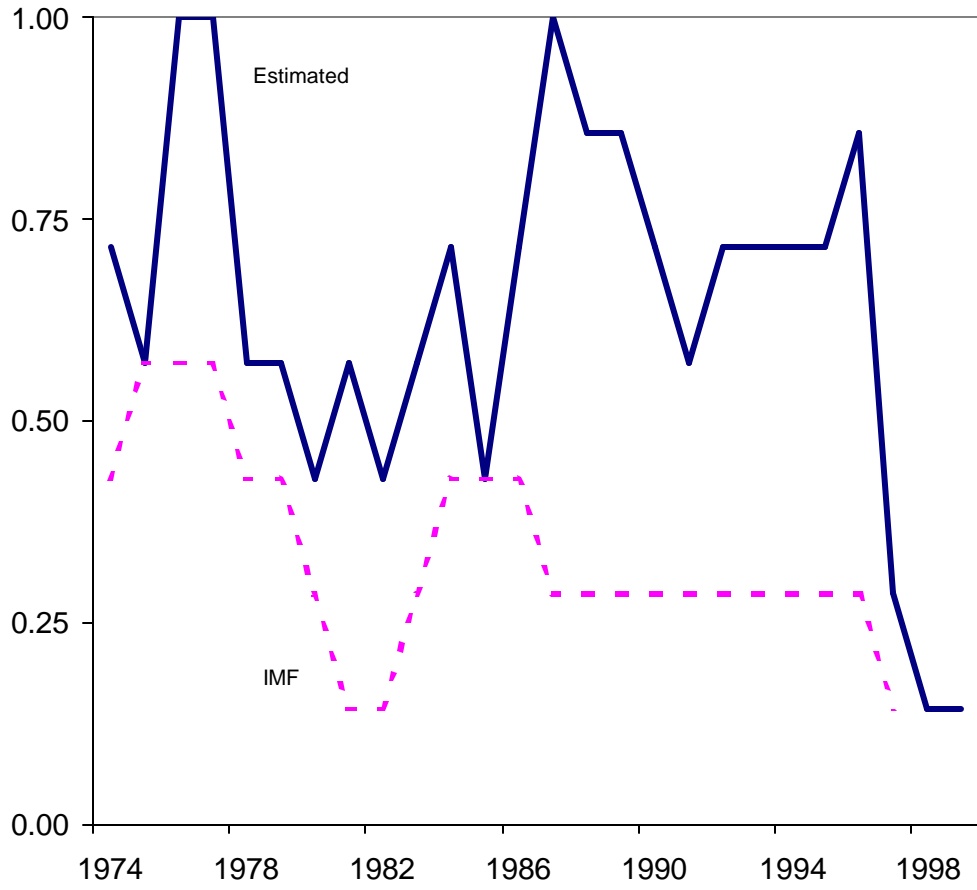
Both nominal and real money growth are slightly higher under pegging than under floating in East Asia. This is in sharp contrast to Latin America, where average nominal M2 growth is much higher under floating than under pegging., while real money growth—or real liquidity growth—is much higher under pegging than under floating.

**Table 3. Asia. Exchange Rate Regime and External Sector**

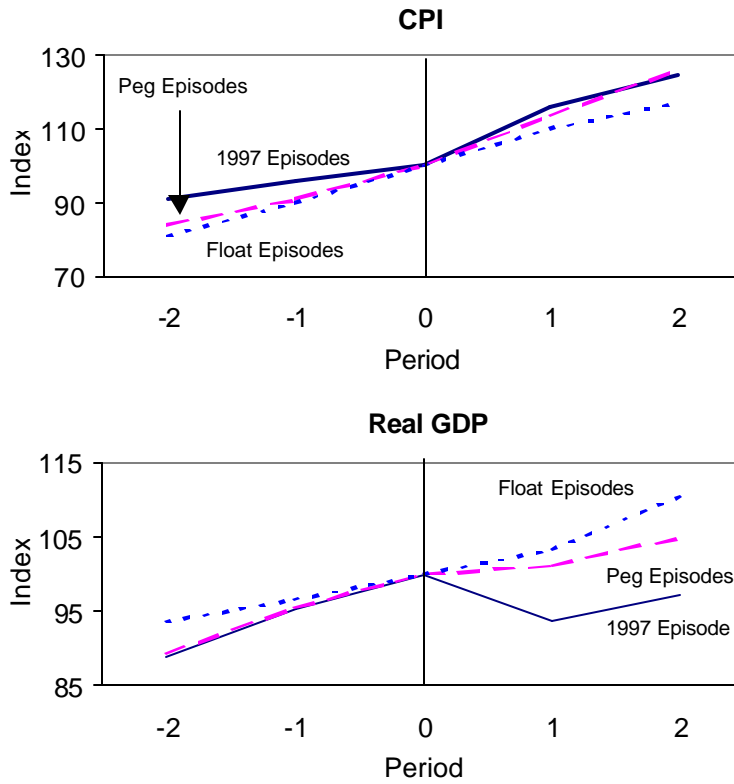
	Peg	Float	Z-test
Current Account Balance	-0.02 (0.05)	-0.02 (0.08)	0.35
Openness	0.96 (0.79)	1.40 (0.94)	-3.09***
Nominal Exchange Rate Change	2.95 (6.91)	11.2 (31.62)	-2.00**
Real Exchange Rate Change	0.65 (9.16)	4.76 (13.07)	-2.18**
Excluding Currency Crisis Years and Two Years that Follow			
Current Account Balance	-0.01 (0.06)	-0.04 (0.07)	2.13**
Openness	1.04 (0.82)	2.12 (0.95)	-3.38***
Nominal Exchange Rate Change	1.83 (4.45)	2.12 (7.53)	-0.22
Real Exchange Rate Change	-0.31 (7.76)	1.40 (8.67)	-1.09
*** Significant at 1%			
** Significant at 5%			
* Significant at 10%			

**Figure 1.**

**East Asia Share of Pegs:  
Estimated and IMF Single Currency**

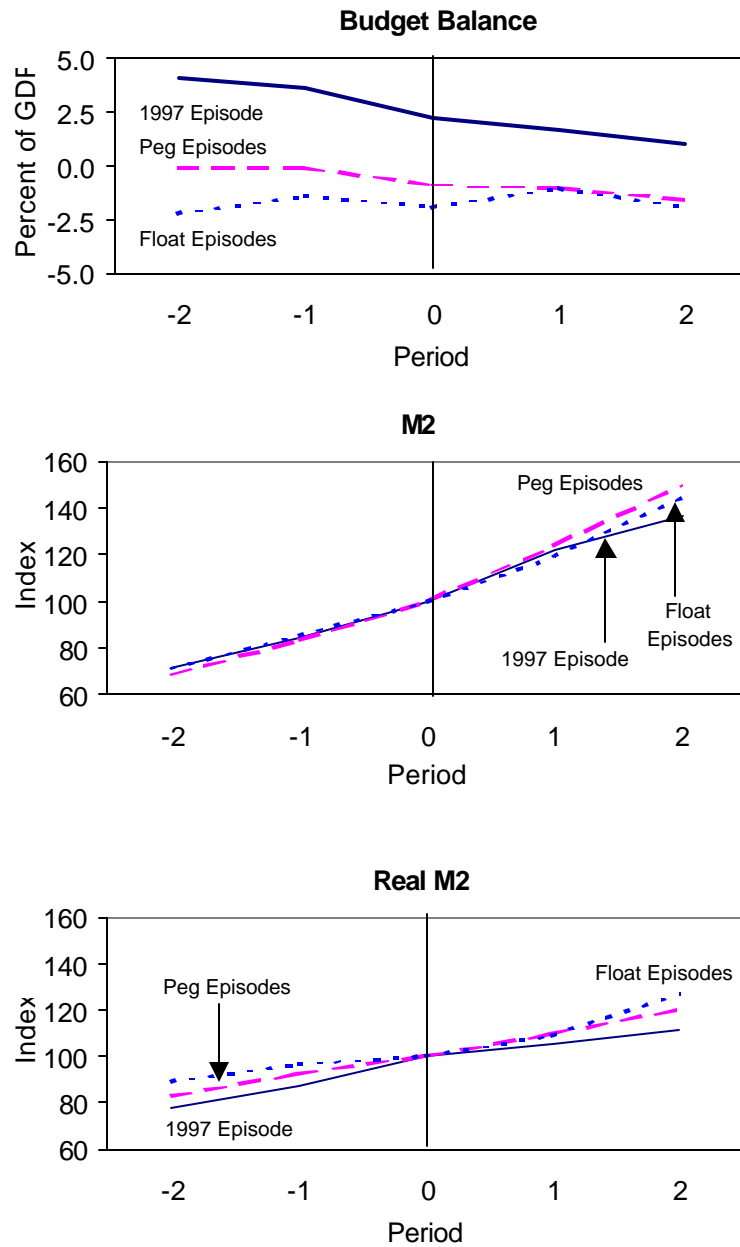


**Figure 2. Asia: CPI and Output around Currency Crisis Episodes**



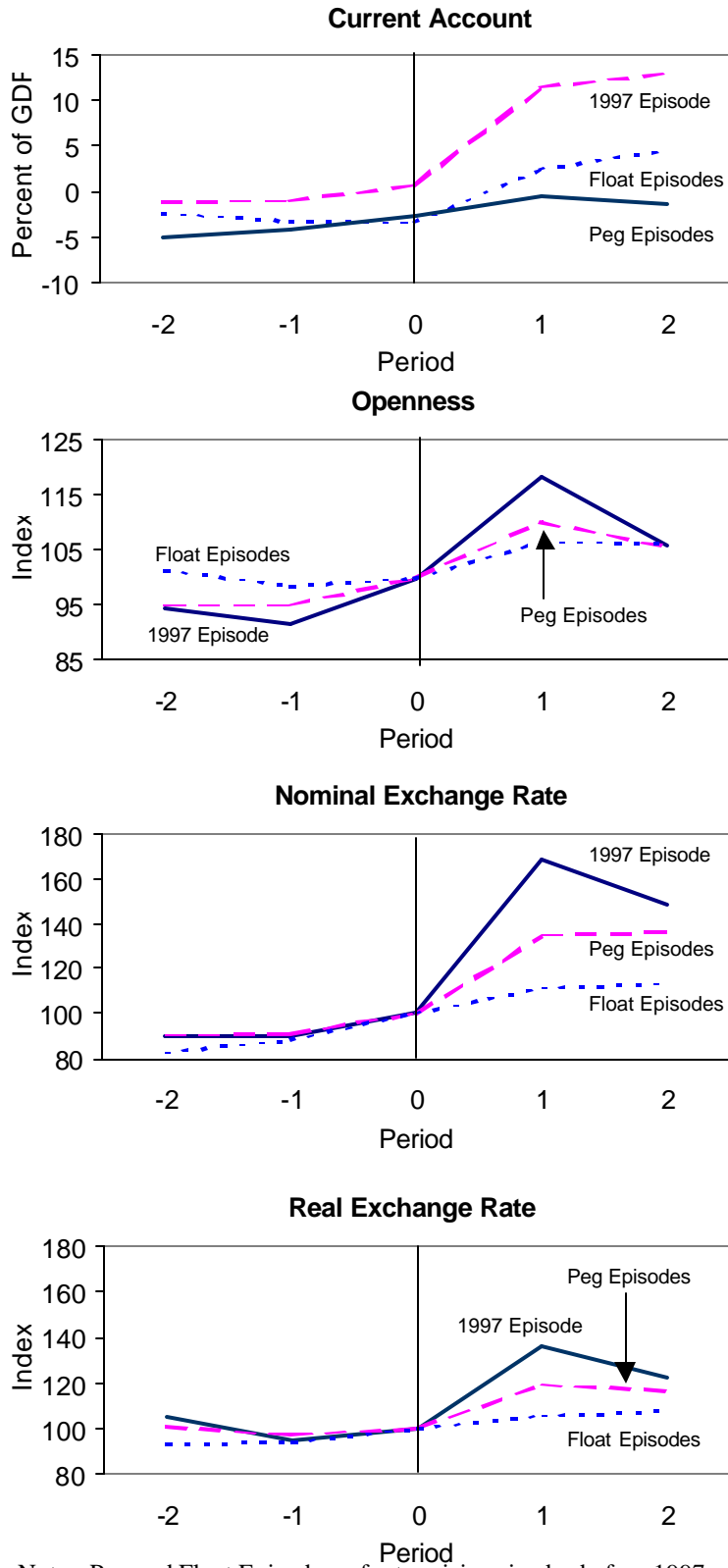
Note: Peg and Float Episodes refer to crisis episodes before 1997.

**Figure 3. East Asia: Macroeconomic Policy Indicators around Currency Crisis Episodes**



Note: Peg and Float Episodes refer to crisis episodes before 1997.

**Figure 4. East Asia: External Sector Indicators around Currency Crisis Episodes**



Note: Peg and Float Episodes refer to crisis episodes before 1997.