Monetary Policy in the Aftermath of Currency Crises: the Case of Asia[1]

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Abstract

This paper evaluates monetary policy and its relationship with the exchange rate in the five Asian crisis countries. The findings are compared to previous currency crises in recent history. The paper finds that there is no evidence of overly tight monetary policy in the Asian crisis countries in 1997 and early 1998. There is also no evidence that high interest rates led to weaker exchange rates. The usual trade-off between inflation and output when raising interest rates suggested the need for a softer monetary policy in the crisis countries to combat recession. However, in some countries, corporate balance sheet considerations suggested the need to reverse overly depreciated currencies through firmer monetary policy.

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Summary

This paper attempts to shed light on the effect of monetary policy in stabilizing the exchange rate after a large collapse by analyzing a few episodes of large currency depreciations in the aftermath of currency crises, in particular the Asian crisis cases.

The paper finds that there is no evidence of overly tight monetary policies in the Asian crisis countries in 1997 and early 1998 based on the behavior of real interest rates. Negative real rates were encountered for Indonesia, Korea and Malaysia in early 1998 and for Thailand in the third quarter of 1997. In addition, real rates in Indonesia, Malaysia and Philippines are below their pre-crisis levels. There is also no evidence of large uncovered interest rate differentials in the Asian crisis countries in 1997 and early 1998. Using expected depreciation calculated from the Financial Times Currency Forecaster, negative interest rate differentials are found for Malaysia, Philippines, Korea and Indonesia at the beginning of 1998 and for Thailand in July 1997. However, in February - May 1998, very high interest differentials (larger than 20 percent per annum) are found for all the countries.

The paper also finds that, in the period July 97-July 98, the evidence on the relationship between real interest rates and real exchange rates is mixed. Real appreciations tend to be associated with higher real interest rates in Hong Kong (0.55), Indonesia (0.57), Malaysia (0.42), and Philippines (0.13). In contrast, we observe a negative correlation in Korea (-0.46) and Thailand (-0.46). In other crisis episodes, Mexico (94), Chile (82) and Mexico (82), the relationship between real interest rates and real exchange rates is also positive. Also, in regressions using daily data, there is no evidence that higher interest rates lead to weaker exchange rates. If anything , the relationship between nominal exchange rates (NC per $) and nominal interest rates is negative. One obtains a significant negative correlation in the period from July to October 1997, and from January to May 1998. The strongest negative correlation occurs in Indonesia and Korea in the second half of 1997 and in the Philippines in the first quarter of 1998. The only positive correlation is found for Malaysia in the last four months of 1997.

The analysis of the traditional trade-off between inflation and output when raising interest rates suggested the need for a softer monetary policy in the crisis countries to combat recession. However, in some countries, e.g. Indonesia, corporate balance sheet considerations suggested the need to reverse overly depreciated currencies through firmer monetary policy.

I. INTRODUCTION

What is the appropriate monetary policy in the aftermath of a currency crisis? Should interest rates be raised to appreciate the currency? The Asian crisis has put these questions at the center of economic policy making. This paper attempts to shed light on this question by analyzing a few episodes of large currency depreciations in the aftermath of currency crises, in particular the Asian crisis cases.

The paper intentionally does not aim to study the general relationship between exchange rates and interest rates. This leaves out several interesting issues but allows the paper to concentrate on the role of monetary policy in reestablishing currency stability after a large collapse.

The analysis of the appropriate monetary policy in the aftermath of currency crises has four building blocks. The first is to evaluate whether the exchange rate has overshot during the crisis, or in other words, whether the real exchange rate (RER) has become undervalued and needs to be brought back to equilibrium. The second block is to identify the mechanisms through which the RER could be corrected in case it is undervalued (or maintained in case the new real depreciated level is deemed appropriate). There are two ways to reverse an undervaluation —through nominal currency appreciation or through higher inflation at home than abroad (or a combination of the two). If avoiding an inflation buildup is an important concern and/or nominal appreciation is desirable for the benefit of domestic corporate and banking balance sheets, the extent to which the reversal occurs through nominal appreciations is fundamental. A key factor in evaluating the likelihood of this reversal is to estimate the exchange rate passthrough in the economy —or in other words, the extent to which the correction is expected to occur through inflation in the economy, in the absence of major changes in policies. The third block is to identify through which policies and under what circumstances the reversal occurs through nominal appreciation. In particular, it is important to evaluate whether nominal appreciations occur mainly in cases where interest rates are kept high. In addition, it is also important to evaluate whether other economic conditions, for example the state of the banking system and corporate sector, influence the relationship between interest and exchange rates. Finally, the fourth block is to evaluate the desirability of raising interest rates. Even if one identifies a set of policies and conditions that maximizes the effect of interest rates on the exchange rate, the costs of raising interest rates in terms of output loss, unemployment and financial system fragility could overcome the benefits of a more appreciated nominal exchange rate (or, at least a stable one).

There is considerable debate on each the four building blocks in general, and for the case of Asia in particular. The debate on the right measure of undervaluation (or overvaluation) has always been controversial, with some even doubting the notion that a currency could be fundamentally out of line. In the case of Asia, there is doubt whether the currencies were overvalued before the crisis and whether, despite the large real depreciation that followed the crisis, the currencies became undervalued (some argue that the extent of the shock justifies a much lower real exchange rate). With respect to the extent of exchange rate

passthrough, initial estimates suggest that the Asian economies have a much lower passthrough than typical developing countries, which implies that the real depreciation has persisted for longer than in other crisis cases, but also implies that the correction of the RER would likely occur through nominal appreciations (unless the current passthrough estimates reflect longer lags in Asia and we will observe much higher inflation in the future) .

An important debate has been about the relationship between interest rates and exchange rates. The traditional approach stresses that tight monetary policy is necessary to support the exchange rate and curb inflationary pressures. In the short run, higher interest rates make speculation more expensive by increasing the cost of shorting the domestic currency. Also, higher interest rates increase the return that an investor obtains from investing in the country. In the long run, higher interest rates may affect the exchange rate by reducing absorption and improving the current account. However, in the discussion of the role of monetary policy in the Asian crisis, several economists have raised the possibility that an increase in interest rates would have a negative effect on the exchange rate. Jeffrey Sachs (1998, pg. 31), for example, has been vocal in expressing his views that high interest rates would not stabilize currencies in the Asian case:

> "Despite sharply higher interest rates, currencies have not appreciated so the supposed benefits of this policy are in question. It is entirely possible that in the unique conditions of the midst of a financial panic, raising interest rates could have the perverse effect of weakening the currency . . . Creditors understood that highly leveraged borrowers could quickly be pushed to insolvency as a result of several months of high interest rates. Moreover many kinds of interest-sensitive market participants, such as bond traders, are simply not active in Asia's limited financial markets. The key participants were the existing holders of short term debt, and the important question was whether they would or not roll over their claims. High interest rates did not feed directly into these existing claims (which were generally floating interest rate notes based on a fixed premium over LIBOR). It is possible, however, that by undermining the profitability of their corporate customers, higher interest rates discouraged foreign investors from rolling over their loans."

On the opposite side of this debate Krugman (1998), also referring to the Asian crisis, writes:

> "I have heard some people propose what amounts to a sort of foreign exchange-interest rate Laffer curve: if you cut interest rates this will strengthen the economy, and the currency will actually rise. This is as silly as it sounds."

The precedence of the debate on the relationship between exchange rates and interest rates over the debate on the optimality of monetary policy in crisis cases is raised by Stiglitz (1998), a critic of the traditional approach:

> "Thus, although countries confronted with an exchange rate crisis have sometimes viewed themselves as facing a tradeoff between the adverse effect of exchange rate depreciation and interest rate increases, if increases in interest rates lead to a decreased capital flow, there is no tradeoff: higher interest rates weaken the economy directly, and actually exacerbate the decline in the exchange rate"

The other big debate on the role of monetary policy is on the **desirability** of increasing interest rates to support the exchange rate. Some doubt the optimality of tight policies. This line of argument takes as given that high interest rates may eventually stabilize the exchange rate but argue that the costs of doing so are very high and that letting the exchange rate float freely (and possibly become more undervalued for a while) is the least costly option. The costs of a tight monetary policy are usually identified with a large recession, unemployment, financial system bankruptcies, credit crunch and corporate failures. Of course, there are also costs in letting the exchange rate depreciate further, as argued by Goldstein (1998):

> "When market participants lose confidence in a currency and attach a high probability to further falls, it is difficult to induce them to hold the currency without higher interest rates...Moreover, halting a free fall of the currency takes on added importance when banks or corporations in the crisis country have large foreign currency obligations coming due in the short term."

This paper is organized as follows. In section II.A., the issue of the extent of undervaluation in Asia and other cases is explored. In section II.B., the paper analyzes the exchange rate passthrough in the Asian crisis case so far and compares it with other cases in history. In addition, it calculates the probability that a reversion of an undervaluation could occur through nominal appreciation. In section III, the paper explores the link between exchange rates and interest rates in the aftermath of the Asian crises. In section IV, the tradeoffs involved in the decision to raise interest rates are analyzed.

II. OVERSHOOTING AND REVERSALS

The effectiveness and desirability of implementing tight monetary policies to stabilize a currency crisis depends to a certain extent on the underlying causes of the crisis. A fair amount of attention has been dedicated to the question of what caused the Asian crises. There are three broad explanations:

(i) BOP crises driven by traditional fundamentals (à la Krugman 1978, Flood and Garber (1984)): overvaluation of the RER coupled with too much credit expansion resulting in excess demand and a growing balance of payments deficit that culminates in crisis and the adjustment of the RER.

(ii) Crisis as a result of panic by investors (Sachs and Radelet (1998)). Asian currency crises must be understood as a run on international reserves, i.e., as the international equivalent of commercial bank runs. Countries were vulnerable to runs because of high ratios of short term debt to reserves.

(iii) Crises were driven by more sophisticated fundamentals and should be understood as financial crises rather than simply currency crises (Krugman, 1998). The financial crises were caused by overlending to risky and unproductive projects fueled by explicit and implicit guarantees. When the bubble burst the crisis occurred.

There is also the possibility of a combination of the explanations above. For example, one may advance the argument that fundamental reasons made the countries vulnerable to speculative attacks and that panic was an element of the crises but not their ultimate cause.

Tight monetary policy is less controversial if one believes the underlying cause for the crises is point (i) above. Increases in domestic interest rates serve simultaneously to increase the interest differential with respect to the rest of the world and reduce the level of activity in the economy. In contrast, the panic and financial crisis explanations are not an overheating story and, therefore, there is a *possible* trade off for policy makers between recession (or the health of the banking system) and currency stabilization.

In general, it would be futile to try to appreciate the currency if one believed the currency has not overshot. Therefore, the following section evaluates the equilibrium real exchange rates for both the Asian and some other currency crises cases.

A. Is there Overshooting?

Table 1 shows available estimates of RER overvaluation prior to the Asian crises (Indonesia, Korea, Malaysia, Philippines and Thailand) and to 5 other crisis cases (Mexico(82), Chile (82), Mexico(94), Sweden (92) and UK (92)). The overvaluation estimates for the 5 Asian countries are taken from the literature. Goldman Sachs uses the Dynamic Equilibrium Emerging Markets Exchange Rates model (GSDEEMER) to calculate the equilibrium value for a large set of countries. For each country, they find a cointegrating relation between the multilateral real exchange rate and a set of fundamentals (using leads and lags) using quarterly data since 1980. The relationship between the real exchange rate and the fundamentals is interpreted as a long term relationship and its predicted value the equilibrium exchange rate. The fundamentals include a large set of variables that are known to influence the equilibrium real exchange rate —including terms of trade, openness, government size, and capital flows. The exact set of fundamentals varies per country. The difference between the equilibrium value and the actual exchange rate is defined as a misalignment measure (overvaluation/undervaluation). Chinn (1998) uses the Purchasing Power Parity concept to evaluate whether seven East Asian currencies were overvalued before the crisis. He uses a simple model that uses deviations from PPP and a trend in the real exchange rate to define misalignment. For the other crisis cases, the overvaluation measures

were derived in Goldfajn and Valdés (1996) using a methodology similar to Goldman Sachs' methodology.

The existence of large overvaluations would imply that one should expect large corrections of the RER in the aftermath of the crisis and would not necessarily call for policy action. The Latin-American crisis cases had clear misalignment in their RER of the order of 20-25 percent prior to the crisis. In contrast, the European cases had only mild overvaluations. Few observers indicated at the time of the ERM crises that overvaluation was at the root of the crisis. In fact, several papers advanced the hypothesis that the 1992 European crises were of the selfulfilling nature (the so-called second generation models).[2]

In Asia, the different estimates indicate that Malaysia, Philippines and Thailand systematically appear to have had the most overvalued currencies while Korea and Indonesia the least overvalued (Chinn's estimate indicates that the Won was actually undervalued). The magnitude of the subsequent real devaluations were not correlated with the initial overvaluation measures. In fact, besides Thailand, the larger depreciations occurred precisely in Indonesia and Korea. In all the Asian cases the extent of the real devaluation was larger than the initial overvaluation. One could argue that the previous overvaluation estimates are not reliable or, alternatively, that the crisis altered significantly the equilibrium RER's such that a larger depreciation of the RER is justified.[3] In fact, some argue that the large terms of trade decline in Korea justifies a large equilibrium depreciation after the crisis. However, the results suggest that there was scope to believe that the currencies had overshot or, at least, that further declines in the exchange rate were not desirable.

B. RER Reversion and Exchange Rate Passthrough

There are two ways to reverse an undervaluation—through nominal currency appreciation or through higher inflation at home than abroad (or a combination of the two). If avoiding an inflation build up is an important concern and/or nominal appreciation is desirable for the benefit of domestic corporate and balance sheets, the extent to which the reversals occurs through nominal appreciations is fundamental. A key factor in evaluating the likelihood of this reversion is to estimate the exchange rate passthrough in the economy.

Table 2 shows nominal depreciations, inflation and exchange rate passthrough coefficients for the 10 episodes. It is evident that the Latin American cases are different. They

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[2]See Eichengreen, Rose and Wyplosz (1994).

[3]The argument that the equilibrium RER had significantly depreciated must rely on permanent rather than transitory changes in fundamentals. For example, a post crisis panic by foreign investors that reduces the available short-term capital to the economy should not be confused with a permanent reduction in the capital available to the economy that would require an equilibrium depreciation.

had larger depreciations, higher inflations, and larger passthrough coefficients (in the order of 0.4) than the European and Asian cases. The European cases had depreciation rates of about 30-50 percent but only single digit inflations in the first 12 months after the crisis implying very low passthrough coefficients. The Asian crises are an intermediate case between the European and Latin American cases both in terms of inflation and passthrough coefficients.

It is interesting to note that the reversal of the real exchange rate occurred more slowly in the European cases. Inflation rates were higher in the second year after the crisis; the passthrough coefficients doubled or tripled when looking instead over the first 24 months. This suggests that if the Asian crisis cases follow the European pattern of slower but longer adjustment of RER's there is a potential role for policies to avoid inflationary reversals. (Of course, what determines the extent of the passthrough is not only the effectiveness of short run policies but also the inflationary history and labor market institutions of the country in question.)

In a more systematic way, we analyze all the episodes of currency collapses that resulted in undervaluations greater than 15 percent from a sample of 80 countries between 1980-1998.[4] We defined the undervaluation series as deviations of the actual exchange rate from a Hodrick-Prescott filtered series. The filtered series captures stochastic trends in the series and allows us to concentrate on the cyclical behavior of potentially non-stationary RER series. The filtered series represents the predicted equilibrium RER and captures the permanent changes in the relative prices between countries while the estimated undervaluation series represents the cyclical component of the RER movements since, as a misalignment, it must eventually correct itself. This approach will also net out from the undervaluation measure trends in the equilibrium RER, as for example the Balassa-Samuelson effect.[5] We used the INS effective real exchange rate that should, in principle, take into account third country effects.

Table 3 shows the number of cases found for different degrees of undervaluations. Since 1980, there are 116 cases with undervaluations of more than 10 percent but only 28 with more than 30 percent. Table 4 shows that the average duration of the episodes is 30 months with the overshooting reversing slowly over a period of about 20 months. This suggests that the reversal of undervaluation in Asian may be drawn out. This is an important consideration since there may be a role for policies to reduce the duration of the process even if the reversal occurs through nominal appreciations.

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[4]This analysis is drawn from the paper entitled "Does tight monetary policy stabilize the exchange rate?" by Goldfajn and Gupta (1998).

[5] The Balassa-Samuelson effect occurs when a country's tradable sector productivity grows faster than that of its trading partners ones and this differential growth is smaller in the nontradable sector. Then the relative price of nontradables increases faster at home than abroad, leading to a domestic real appreciation.

Table 1: RER Overvaluation Measures and Real Depreciations for Selected Crisis Cases
(in percent, + overvaluation)

	Overvaluation Chinn (1998) May, 1997 1/	Overvaluation Goldman Sachs (1998) June, 1997 2/	Goldfajn and Valdes (1996) Month Prior to Crisis	Real Depreciation 12 Month After Crisis 3/
Thailand	7.0	3.9		26.0
Malaysia	7.9	4.4		25.2
Philippines	19.1	5.5		22.1
Indonesia	-5.5	1.2		68.2
Korea	-9.1	3.3		26.5
Chile (82)			17.7	19.9
Mexico (82)			25.6	43.8
Mexico (94)			22.6	27.8
Sweden (92)			9.7	20.1
UK (92)			4.6	11.1

1/ PPI -based calculation.

2/ Based on J.P.Morgan Database.

3/ Based on REER from June 97 - June 98 in Asian cases.

Table 2: Inflation, Depreciation and Passthrough Coefficients for Selected Crisis Cases

	CPI Inflation 1/	Depreciation 1/ 2/	Passthrough Coefficient 3/ (After 1 year)	Passthrough Coefficient 3/ (After 2 years)
Asia:				
Thailand	10.8	47.7	0.23	
Malaysia	6.3	39.3	0.16	
Philippines	9.9	38.8	0.26	
Indonesia	59.6	394.4	0.15	
Korea	6.7	35.3	0.19	
Other Cases:				
Chile (82)	31.2	92.6	0.34	0.43
Mexico (82)	108.3	269.6	0.40	0.40
Mexico (94)	48.5	122.5	0.40	0.40
Sweden (92)	4.8	52.3	0.09	0.16
UK (92)	1.7	32.4	0.05	0.14

1/ First 12 months of the crisis. For Korea based on Sept, 97 to July, 98.

2/ Based on NEER for Asian countries and bilateral rates with respect to the dollar in the other cases.

3/ CPI inflation divided by depreciaton.

Table 3. Number of Undervaluation Cases

Depreciation Cutoff (percentage)	Total # of Cases	Proportion of Cases w/Tight Policy 1/	Proportion of Cases w/ Banking Crises 2/
10	116	32.3	41.4
15	77	29.2	45.4
20	49	22.5	46.9
25	36	17.2	50.0
30	28	13.6	57.1

Source: Goldfajn and Gupta (1998).

1/ Tight Policy is defined as real rates higher in the period than average rates.

2/ Banking crises dummies are obtained from several sources. See above source.

Table 4. Duration of Undervaluation Cases

Phase	Average # of Months
Build Up	9.5
Reversal	20.4
Total	29.9

Source: Goldfajn and Gupta (1998).

We calculate the probability of reversing an undervaluation through appreciations of the nominal exchange rate rather than higher inflation. We define that a reversal is through nominal appreciation if the exchange rate is responsible for more than 50 percent of the reversal.[6] The results show that the probability of a reversal through nominal appreciation is less than 40 percent (see Chart 1).

III. Relationship between Interest Rates and Exchange Rates

A. Theoretical Considerations

The conventional wisdom is that monetary policy tightens liquidity and stabilizes the exchange rate. In the short run, higher interest rates makes speculation more expensive. Also, higher interest rates increase the return that an investor obtains from investing in the country. In the long run, higher interest rates may affect the exchange rate by reducing absorption and improving the current account.

In the midst of an exchange rate crisis, interest rates are raised to make speculation against the currency more costly. If borrowing (shorting) the domestic currency to invest in the foreign currency is allowed, raising interest rates directly increases the costs of speculation. Even if shorting the domestic currency is not allowed, the increase in interest rates affects the opportunity cost of an investor deciding whether to invest in the domestic economy.

The expected return in investing in the country depends on the promised interest rate and the expected depreciation. The interest differential with respect to the rest of the world should allow for both an exchange rate risk premia and a probability of default:[7]

$$E[i]=i^{*}+E[\Delta e]+R$$

where $E[\Delta e]$ is the expected depreciation, E[i] is the expected return of an investment in the domestic economy, I^{*} is the safe return on an equivalent international asset and R is the risk

[6]For stricter definitions of reversals, i.e. requiring the exchange rate to undo up to 90 percent of the overshooting, we obtain much lower probabilities. See Goldfajn and Gupta (1998).

[7]Default here is defined more generally including partial payment, delay of payments or introduction of exchange controls.

Chart 1: Probability of Reversing Undervaluations through Nominal Appreciations

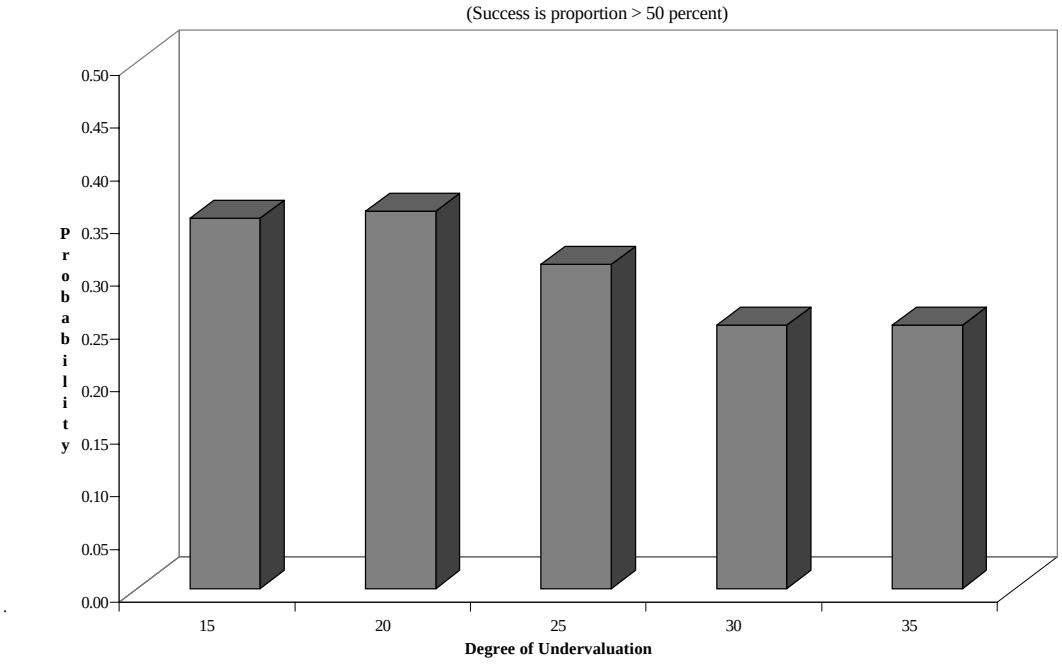
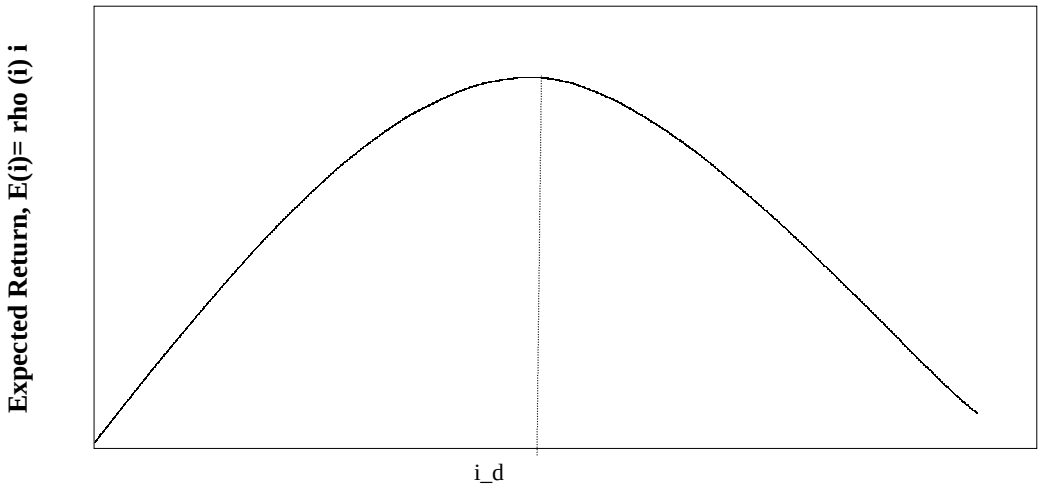


Chart 2: Expected Returns and Interest Rates



premium that is demanded by risk averse foreign investors faced with exchange rate volatility.[8] In principle, increases in interest rates should increase the expected return, turning investing in the domestic economy more attractive relative to abroad (i.e., making the right hand side of the equation above larger than the left hand side) and inducing capital inflows, which would increase the supply of dollars and immediately appreciate the exchange rate up to the point where the equation above holds again (in the Dornbusch (1976) model the exchange rate should actually overshoot its target such that agents expect a future depreciation).

However, interest increases may reduce the expected return by increasing the probability of default. Interest rates may affect the probability of default by increasing the borrowing costs of corporations, by depressing the economy and reducing profits, by altering the net worth of corporations adversely exposed to interest rate changes, or, finally, by affecting the health of the banking system that tends to be naturally exposed to interest rate changes. The latter have a compounding effect on the economy since problems in the banking system may lead to credit crunches, disintermediation and bad allocation of credit.

Formally, the expected return on the domestic asset E[i] can be written as the product of the domestic interest rate, I, times the probability of repayment, ρ: $E[i] = \rho(I) I$. The equation can be rewritten in the following way:

$$\rho(i)i = i^{*} + E[\Delta e] + R$$

where $\rho' < 0$, $\rho'' < 0$.

Therefore, even though one should expect increases in interest rates to attract capital, there may be cases where additional increases in interest rates reduce the expected return and generate capital outflows. In such cases, raising interest rates paradoxically depreciates the currency (see Chart 2).

The level of interest rates needed to defend (or appreciate) a currency may be substantial. For example, in order to defend an **expectation** of a one percent fall in the exchange rate the next day, the overnight interest rate must be at least one percent per day (which is 3,678 percent per annum).[9] If agents are risk averse (and there is a positive risk premium, R) and the default probability is large, the required interest rate would be larger.

Proponents of tighter monetary policy argue that higher interest rates need only be temporary. Once the exchange rate has been stabilized interest rates could be allowed to

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[8]The risk premium must include also a portion for the uncertainty induced by default probability.

[9]This example is drawn from Stiglitz (1998).

decline. This argument is important given that the costs of persistently high interest rates could be substantial.

However, the question then is why should a *temporary* increase in interest rates lead to *permanent* effects on the exchange rate? One answer is that temporarily tight policies may signal the determination of the monetary authority to pursue exchange rate stability and low inflation. Temporary policies may then change the beliefs of investors. Even when the tight policies are withdrawn, the exchange rate would stabilize at a higher level.

Tight monetary policies do not always serve as a credible signaling device. Drazen and Masson (1994) have shown that if the costs of implementing the tight policies are too high, the temporary policy would actually reduce credibility because investors know that the policy could not be sustained. Under this theory, the relationship between interest rates and the exchange rate could be negative. When there are doubts about the determination of the authorities and temporary increases in interest rates lead to important reputational gains to the authorities, the effect of raising interest rates should be positive. However, when the reputional arguments are not essential and there are important structural problems, raising interest rates may have the opposite effect.

B. Interest Rate Policy in the Asian Crises Episodes: 1997-98

This section analyzes interest rate policy in the aftermath of the five Asian crises (Indonesia, Korea, Malaysia, Philippines and Thailand). There are several issues to consider.

The first issue is what measure of the nominal interest rate better represents the tightness of monetary policy and its effect on the exchange rate. Charts 3A and 3B show both interbank rates and "policy rates" for each of the crisis countries in 1996-98.[10] The charts suggest that for most of the countries, the major movements of monetary policy can be captured by any of the interest rates since they tend to move together. In what follows we use the "policy rates" as our representative nominal interest rate. The chart also shows the sharp increases in nominal interest rates since the crisis. Most of the countries, however, seem to have waited to raise interest rates until late in 1997 or early 1998. Indonesia initially raised interest rates substantially in July - August 1997 but reduced them subsequently, only raising them to higher levels in March - April 1998. Korea raised interest rates significantly at the end of the year, after the crisis. Thailand increased nominal rates continuously from May 1997 to March 1998.

The second issue is the appropriate expected inflation rate to be used in calculating real interest rates. The approach taken here is to calculate several measures of real interest

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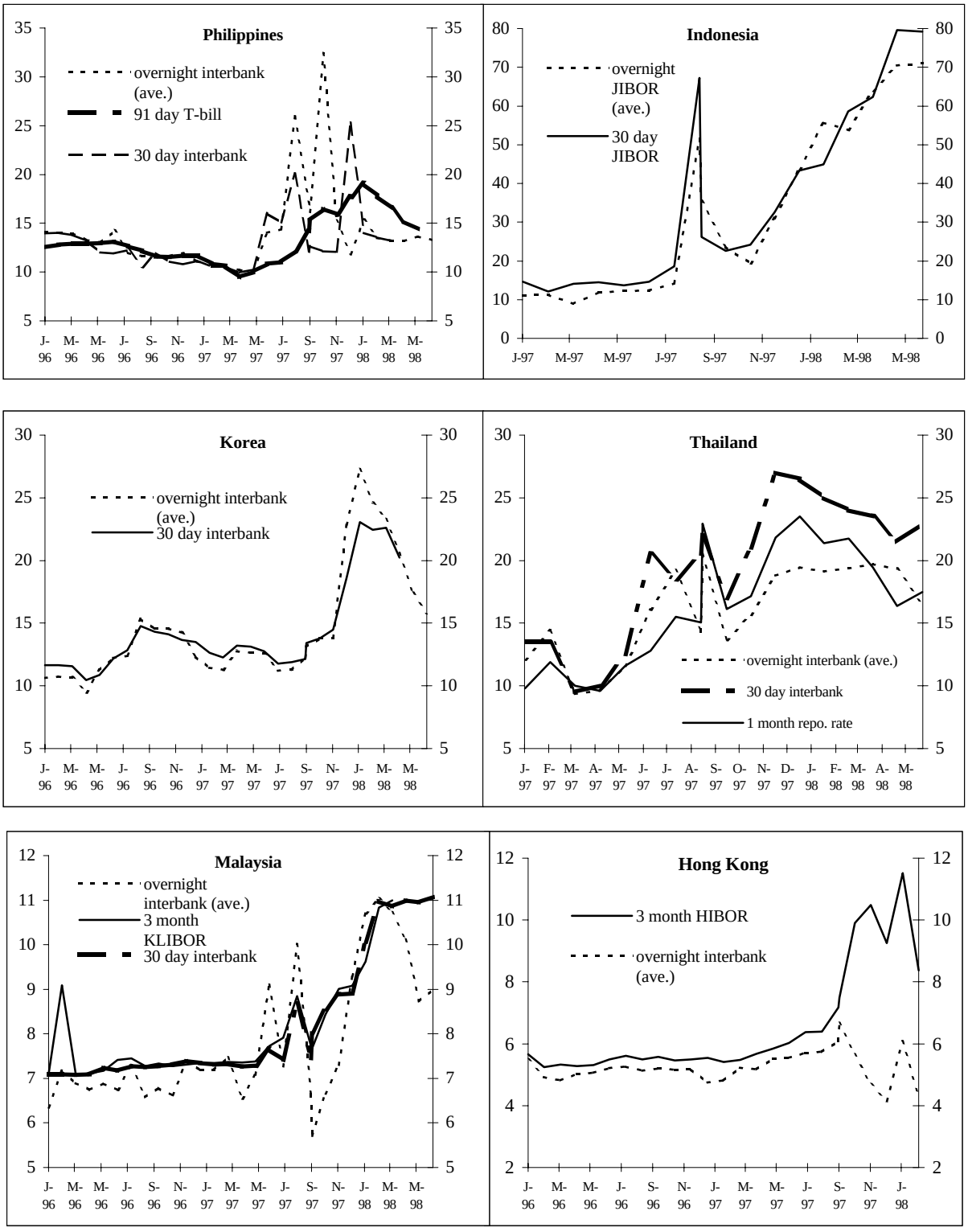
[10]The "policy rates" are the 1 month repo rate for Thailand, the 91-day T-bill rate for Philippines, the 3-Month Klibor for Malaysia, the 30-day JIBOR rate for Indonesia, and the overnight interbank rate for Korea.

Chart: 3A

NOMINAL INTEREST RATES

(in percent per annum)

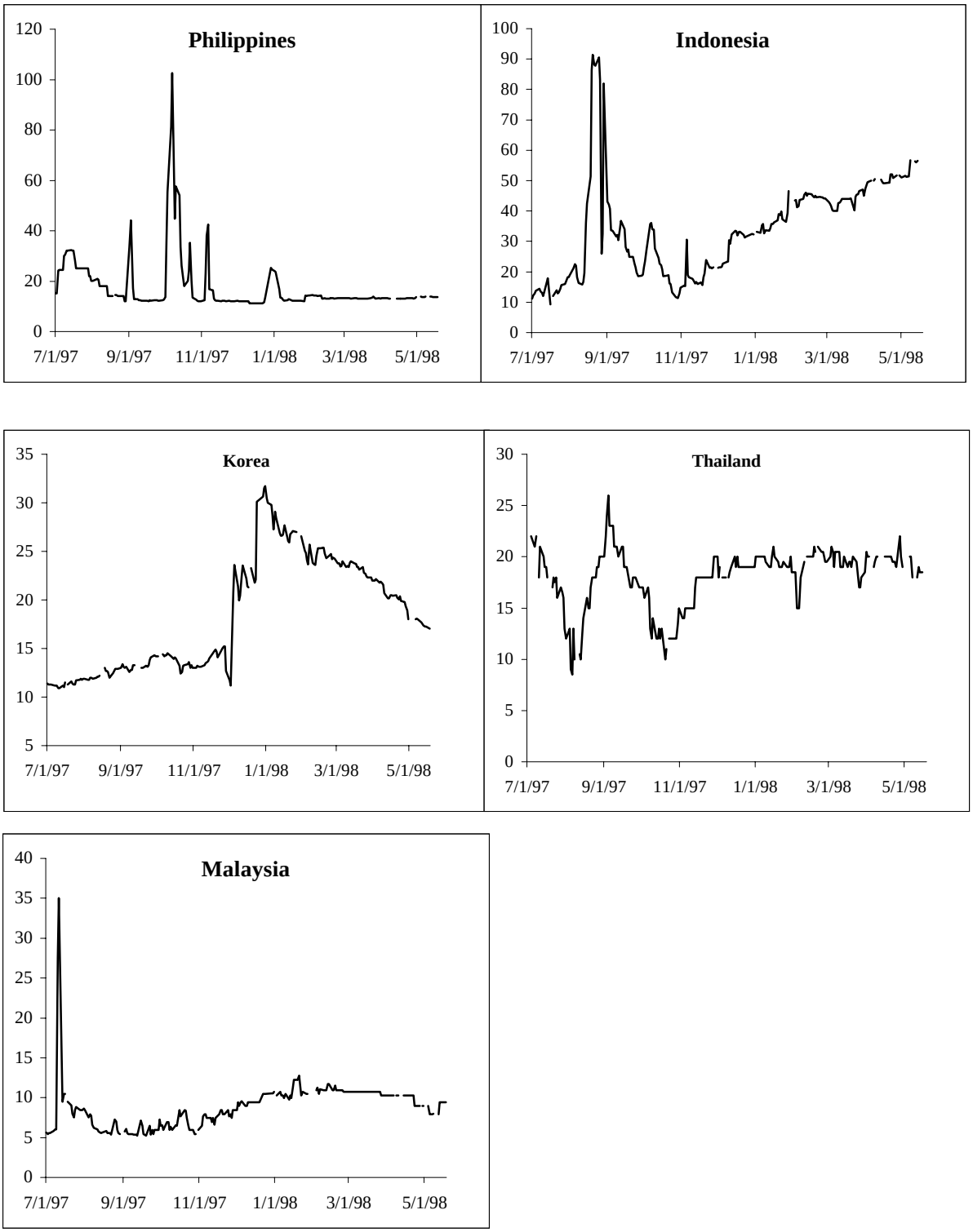


Sources: Data provided by authorities; and IMF staff calculations

Chart: 3B

OVERNIGHT CALL RATES (daily)

(in percent per annum)



Source: Bloomberg

rates based on different assumptions regarding expected inflation. Chart 4 shows five measures of real interest rates for each country. The measures are based on expected inflation, which in turn is proxied by: (i) the following month's inflation $\pi(t+1)$ annualized, (ii) survey forecasts from the Consensus Forecasts, (iii) the quarterly moving-average inflation centered at t, (iv) the previous month inflation $\pi(t-1)$ annualized, and (v) the previous 12-month inflation. The latter measures (iv)-(v) are based on adaptive expectations assumption, the former ones (i)-(ii) are based on rational expectations assumptions (theoretically, the survey forecasts should be based on all the information available) and measure (iii) is a combination of the two assumptions. The main result is that for each country there are two distinct groups of real interest rates with similar paths within the group but differing substantially across them.

One group, shown in the lower panel of chart 4 for each country, is composed by the real interest rates constructed using the past-12-month-inflation rates and the one based on survey data, which, surprisingly, implies that the forecasters in the survey probably based their forecast mainly on past information. These rates are always positive throughout the crisis and its aftermath. Some patterns emerge. Korea has the highest real rates of the five Asian countries in a range of 10-20 percent during the period, followed by Thailand at around ten percent. The rest of the countries exhibit relatively moderate rates, e.g. Malaysia (2-6 percent) or Philippines (4-12).

The other group of real interest rates uses some combination of previous, current or future inflation as the measure of inflationary expectations. This group shows that Indonesia, Korea and Malaysia had negative real interest rates in early 1998 and Thailand had the same in the third quarter of 1997. This is probably the consequence of the fact that inflation picked up very strongly and nominal interest rates lagged behind. For Indonesia and Philippines real interest rates have not to date reached their pre-crisis levels. The main conclusion is that there is little evidence of tight monetary policies in the Asian crisis countries in 1997 and early 1998, based on real interest rates using forward looking measures of expected inflation.

The third issue is whether real rates are the appropriate measure to evaluate the tightness of monetary policy. One of the arguments raised in the theoretical section is that high interest rates stabilize currencies by increasing the attractiveness of the economy to (foreign) investors. This means that one could look instead at uncovered interest rate differentials to evaluate the tightness of policies.[11] Again the procedure was to calculate several measures of uncovered interest rate differentials based on different estimates of expected depreciation. Chart 5 shows the results using expected depreciation calculated from the Financial Times Currency Forecaster. Similar to the real interest rates results, negative interest rate differentials are found for Malaysia, Philippines, Korea and Indonesia at the beginning of 1998 and for Thailand in July 1997. Also, very high interest differentials (larger than 20 percent per annum) emerge from March 1998 in all the countries. The results from the uncovered interest

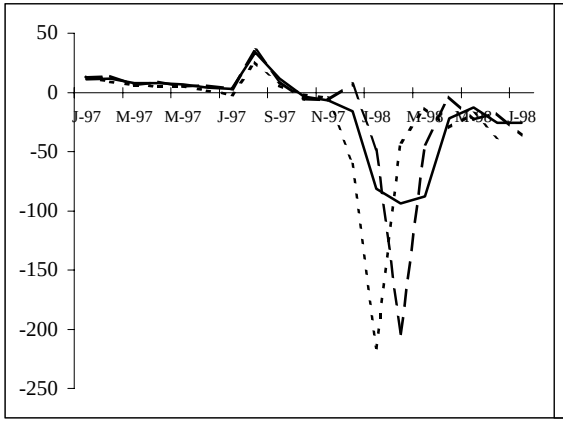
[11]The residual in the uncovered interest differential is sometimes identified automatically as the risk premium.

Chart: 4

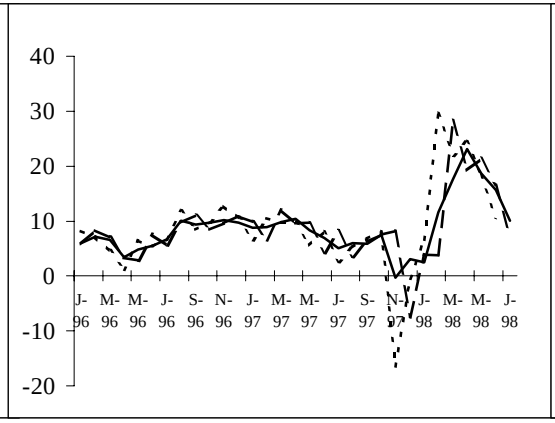
REAL INTEREST RATES *(various measures)*

i - $\pi_{qtr.\ ave:}$ ___ *i* - $\pi(t)$: __ __ *i* - $\pi(t+1)$:- - - -

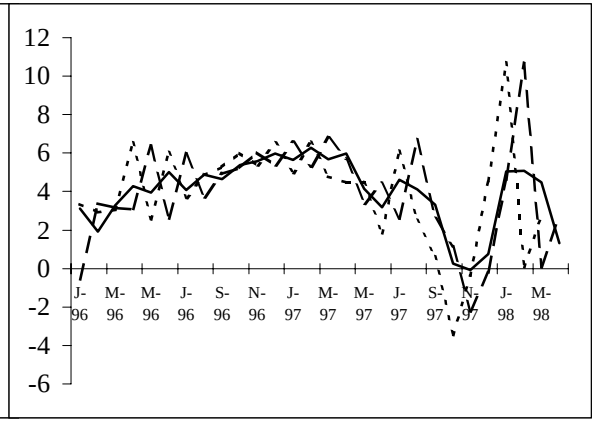
INDONESIA



KOREA

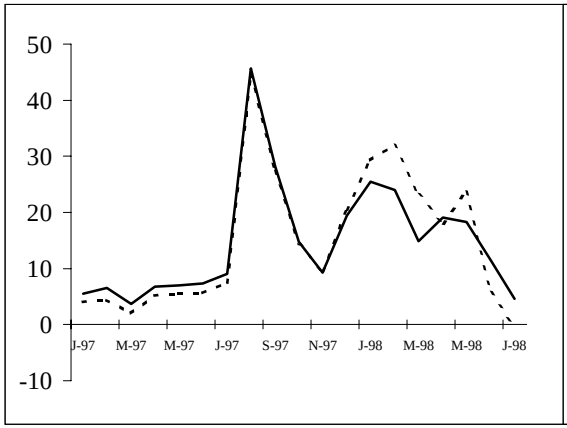


MALAYSIA

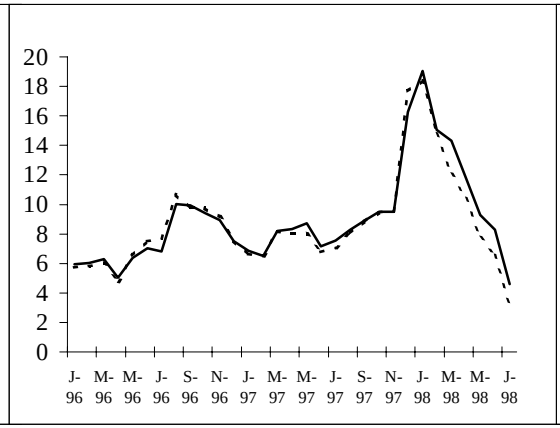


i - $\pi_{(past\ 12\ months):}$ ____ *i* - $\pi_{(survey\ forecast):}$ - - - -

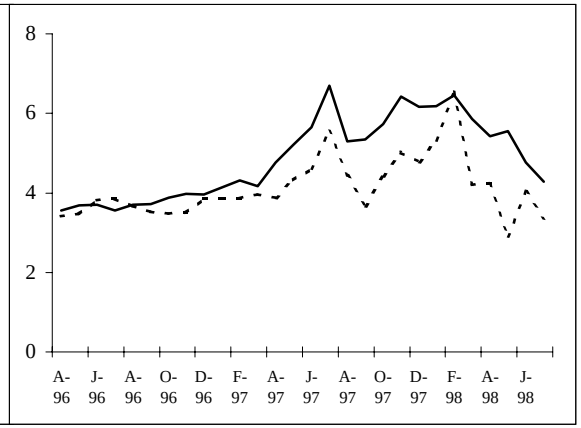
INDONESIA



KOREA



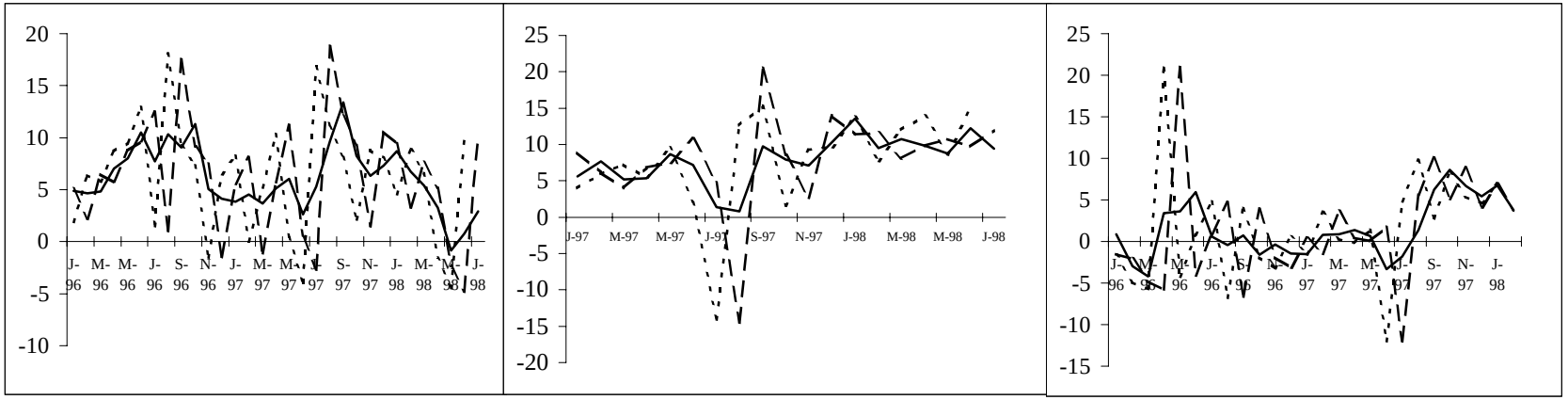
MALAYSIA



Sources: Data provided by authorities; and IMF staff calculations. Inflation forecast obtained from Asian Consensus Forecast.

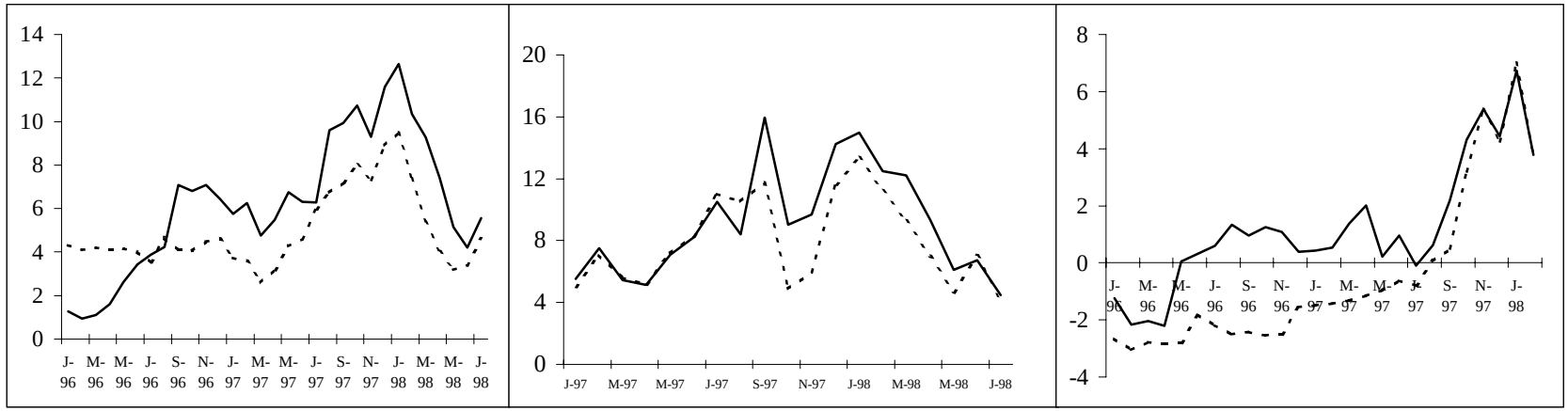
i - $\pi_{qtr.\ ave:}$ ___ *i* - $\pi(t)$: __ __ *i* - $\pi(t+1)$:- - - -

PHILIPPINES **THAILAND** **HONG KONG**



i - $\pi_{(past\ 12\ months):}$ ____ *i* - $\pi_{(survey\ forecast):}$ - - - -

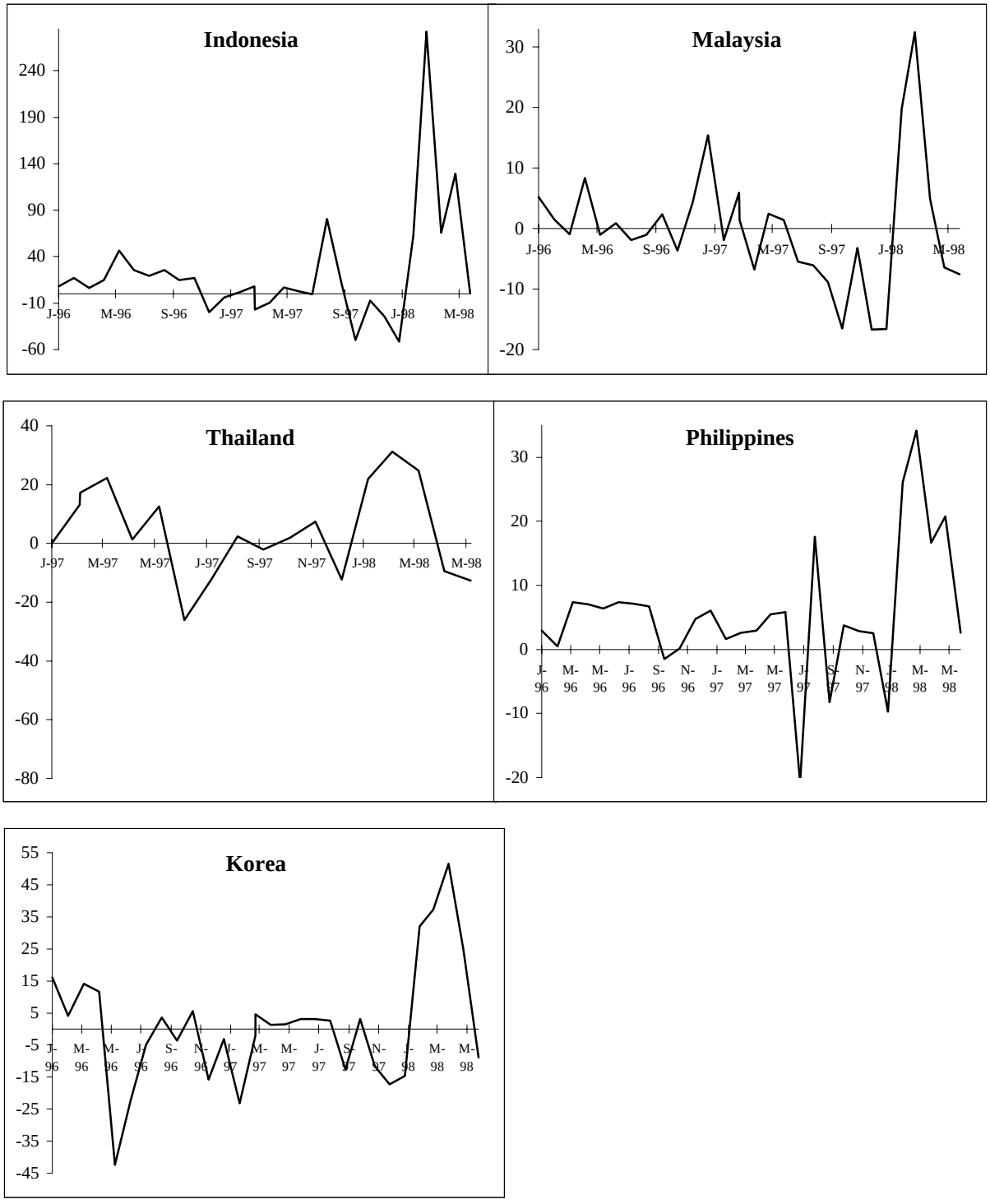
PHILIPPINES **THAILAND** **HONG KONG**



Sources: Data provided by authorities; and IMF staff calculations. Inflation forecast obtained from Asian Consensus Forecast.

Chart: 5

UNCOVERED INTEREST RATE DIFFERENTIAL 1/



Sources: Interest rate data provided by authorities; Currency forecast obtained from Financial Times Currency Forecaster

1/ Interest Rate Differential calculated by subtracting short term US treasury Bill yield and currency depreciation forecast from representative nominal rates. All numbers have been annualized.

rate differentials confirm that there is little evidence of overly tight monetary policies in Asia at the beginning of the crisis through early 1998.

The relationship between real interest rates and real exchange rates for the five countries considered is shown in Chart 6. As explained in the theory section, the traditional approach stresses that one should expect a positive correlation between exogenous interest rates shocks and the exchange rate. We have no independent data on monetary policy shocks but it is still interesting to look at the simple correlations. The evidence is mixed, in the period of the crisis July/1997 to July/1998, a fairly positive correlation exists for Hong Kong (0.55), Indonesia (0.57), Malaysia (0.42), and Philippines (0.13). In contrast, we observe a negative correlation in Korea (-0.46) and Thailand (-0.46).

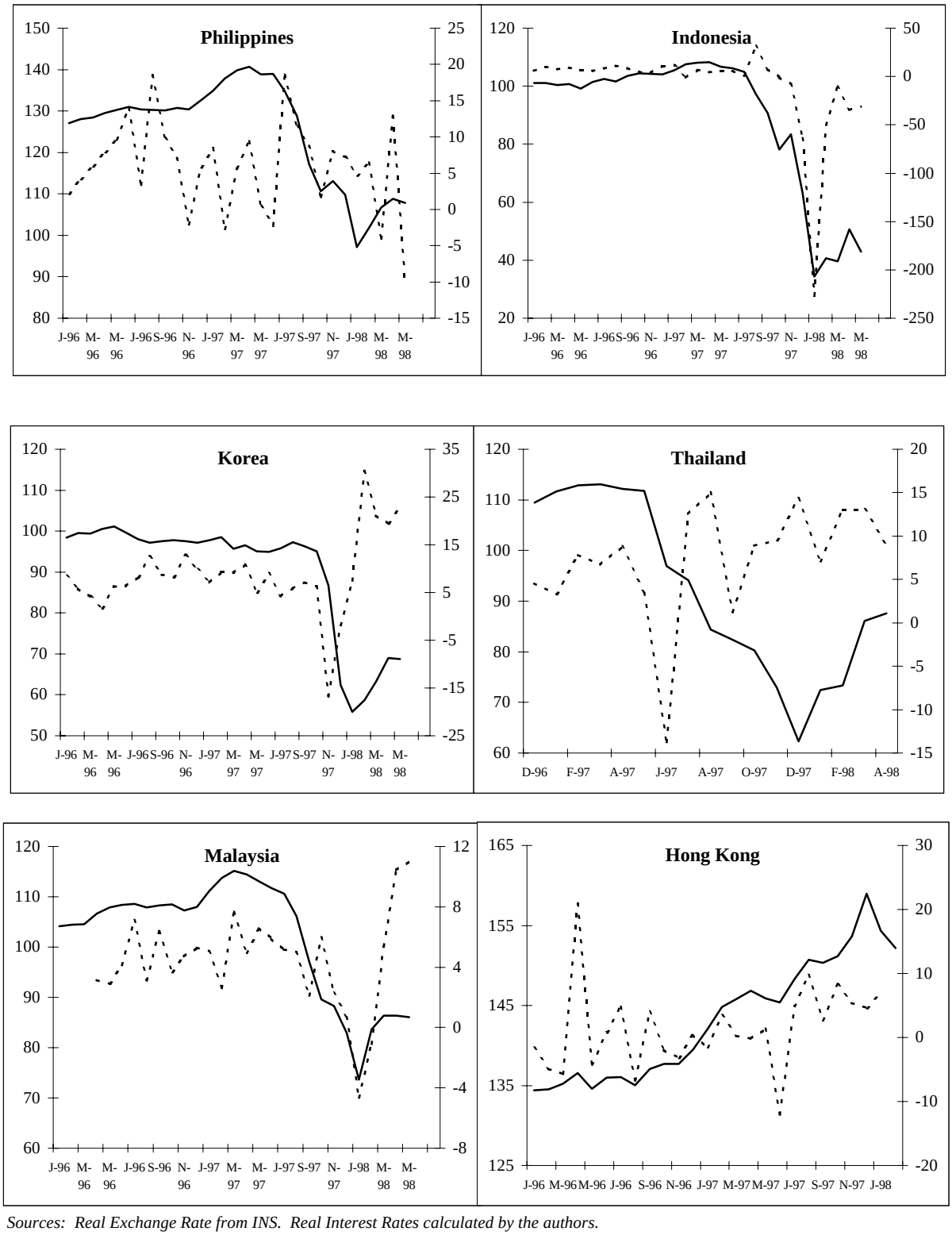
Chart 7 shows the relationship between real interest and exchange rates in the other crisis episodes. A positive correlation is evident in all the cases. In Mexico (1994), the recovery of the real exchange rate happened when real rates were raised in the second quarter of 1995. Likewise, in Mexico (1982) the real exchange rate recovered when interest rates were raised in mid-1982. In Chile (1982), interest rates were raised shortly after the crisis but allowed to fall immediately thereafter. The RER recovered initially but the recovery was not sustained. A notable feature is that the increases in real rates in these cases were much sharper than those seen in most of the Asian crisis countries.

One could analyze econometrically the relationship between real exchange rates and real interest rates by looking at historical data to increase the number of data points available. However, in this paper, we are restricting our attention to the correlation between these variables in crisis episodes. There are two alternative approaches. One approach is to extend the sample of crisis episodes and run a panel data set regression. This approach is followed in Goldfajn and Gupta (1998). Another approach is to use higher frequency data, i.e., daily data. In this case, we will need to focus our attention on the relationship between nominal exchange rates (national currency per unit of dollar) and nominal interest rates. Chart 8 shows the impulse responses of a vector autoregression regression of the changes in nominal interest rates on the changes in nominal exchange rates. The results show that the effect of a shock in interest rates on the exchange rate is insignificant in all the five cases (perhaps, the only exception is Philippines). This confirms previous results obtained in Ghosh and Phillips (1998) and Kaminsky and Schmukler (1998).

It is interesting to observe how the correlation of interest rates and exchange rates has evolved over time. Table 5 shows rolling regressions for the five Asian crisis cases plus a panel regression. As expected, when running the panel regression for the whole sample one does not obtain a negative correlation. However, there are periods where there was a negative correlation between the variables. In particular, one obtains a significant negative correlation in the period from the Thailand crisis to October 1997 and from January to April 1998. Looking at particular countries, the strongest negative correlation occurs in Indonesia and Korea in 1997 and Philippines in 1998. The only positive correlation is found for Malaysia in the last four months of 1997.

Chart: 6

REAL EFFECTIVE EXCHANGE RATES _____
REAL INTEREST RATES 1/ _ _ _ _



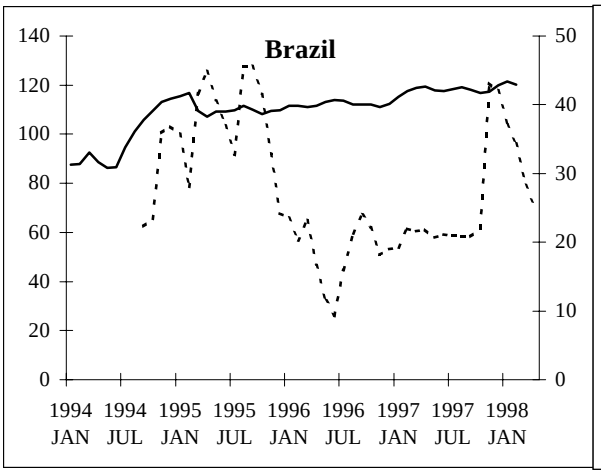
Sources: Real Exchange Rate from INS. Real Interest Rates calculated by the authors.

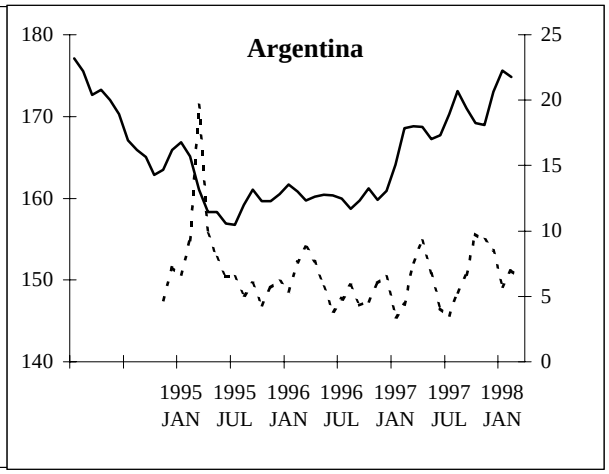
1/ Real Interest Rate is the nominal interest rate minus expected inflation extracted from the next month's inflation.

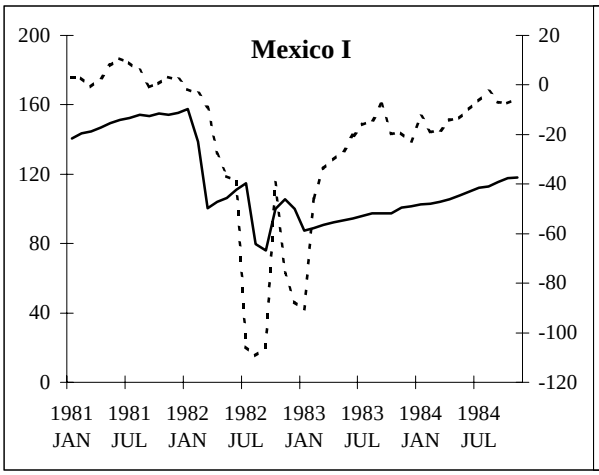
Chart: 7 (Latin America)

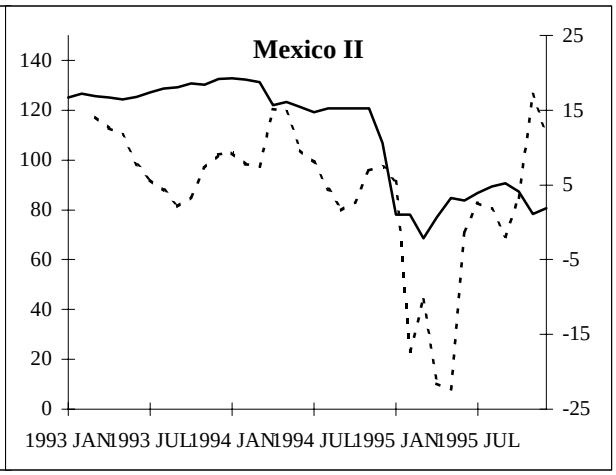
REAL EFFECTIVE EXCHANGE RATES _____

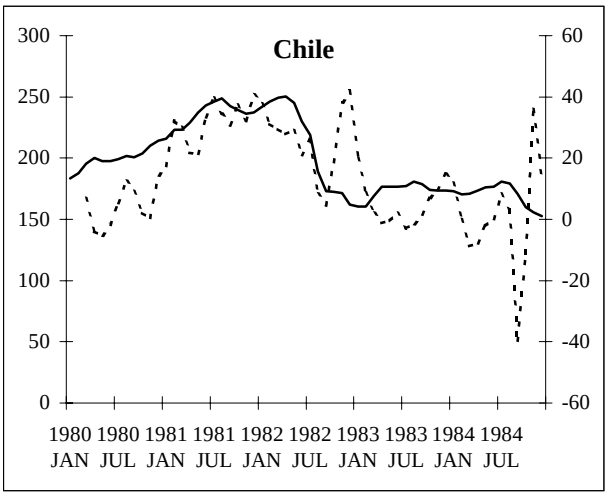
REAL INTEREST RATES 1/ _ _ _ _











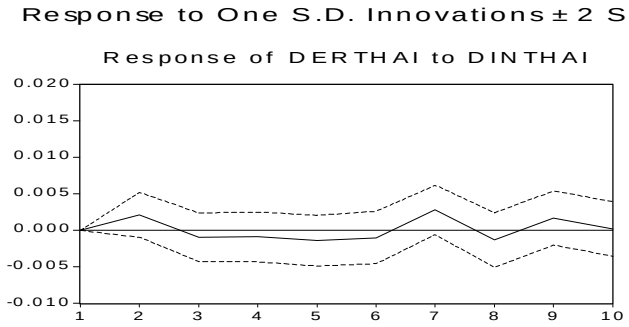
Sources: Real Exchange Rate from INS. Real Interest Rates calculated by the authors.

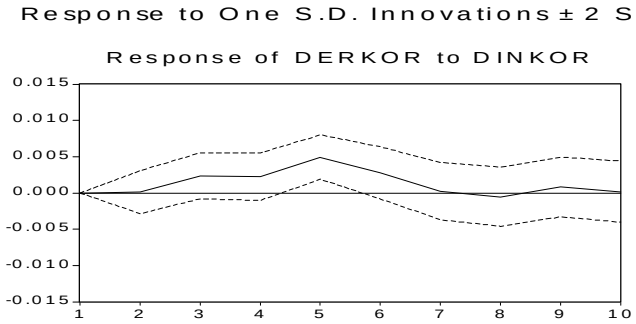
1/ Real Interest Rate is the nominal interest rate minus expected inflation extracted from the next month's inflation.

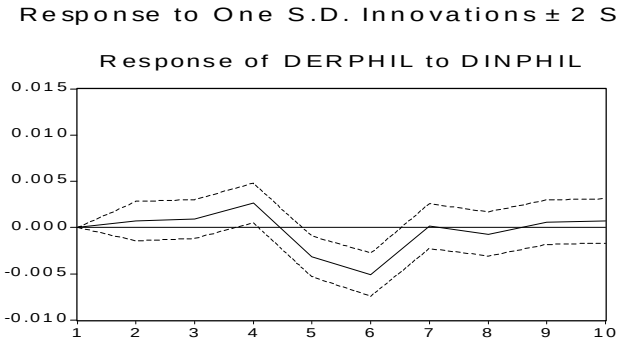
Chart 8

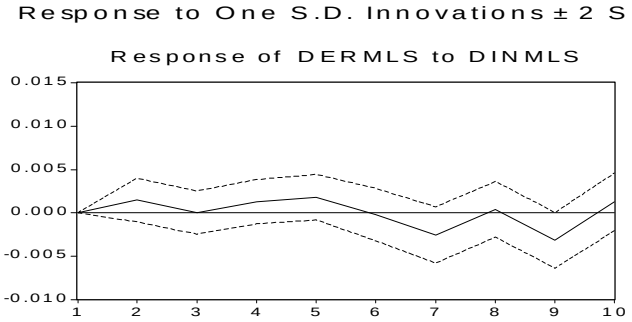
Impulse Response of Exchange Rate Changes due to Innovations in Interest Rate Changes

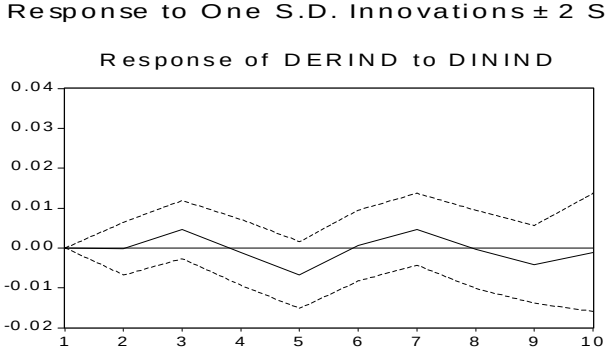
(Country Code: THAI-Thailand, KOR-Korea, MLS-Malaysia, PHIL:Philippines, IND: Indonesia)











Note: VAR estimation, using daily data from 06:01:1997 to 05:18:1998. Contains a constant term and 12 lags of each variable.

Dependent Variable (DER followed by country code): first log difference of exchange rate vis-à-vis US$

Independent Variable (DIN followed by country code): first difference of daily call rate

Source: Data obtained from authorities and IMF staff estimates.

Table 5
Individual and Panel Data Regression of Nominal Exchange Rates on Nominal Interest Rates

Sample:	June, 1997 Sep, 1997	July, 1997 Oct, 1997	Aug, 1997 Nov, 1997	Sep, 1997 Dec, 1997	Oct, 1997 Jan, 1998	Nov, 1997 Feb, 1998	Dec, 1997 Mar, 1998	Jan, 1998 Apr, 1998	Whole Sample
Fixed Effects Panel									
(with 1 lag of independent variable)									
coeff. Est	-0.0003	-0.0002	-0.0001	-0.00006	-0.00002	-0.0001	-0.002	-0.002	-0.00009
t-stat	-2.49**	-1.66*	-1.21	-0.29	-0.11	-0.38	-1.61*	-1.76*	-0.52
Country by Country regression									
(with 1 lag of independent variable)									
Indonesia									
coeff. Est	-0.0006	-0.0005	-0.0006	-0.0003	0.0008	0.0005	0.0003	0.0004	-0.0004
t-stat	-2.95**	-2.27**	-2.04**	-0.258	0.31	0.14	0.63	0.66	-0.71
Malaysia									
coeff. Est	0.0001	0.00008	0.002	0.005	0.001	0.002	0.001	-0.002	0.0001
t-stat	0.28	0.16	1.00	2.21**	0.4	0.37	0.20	-0.33	0.19
Philippines									
coeff. Est	-0.0002	0.00003	0.000006	-0.000004	-0.000007	-0.0003	-0.0007	-0.006	-0.00004
t-stat	-0.41	0.14	0.02	-0.01	-0.02	-0.65	-3.51**	-3.63**	-0.19
Korea									
coeff. Est	0.0002	-0.002	-0.01	-0.003	0.002	-0.001	0.002	0.003	-0.0009
t-stat	0.39	-2.32**	-3.16**	-0.78	-0.45	-0.32	0.55	0.83	-0.38
Thailand									
coeff. Est	0.001	0.001	0.0006	0.001	0.001	-0.001	0.0009	-0.0008	0.0008
t-stat	1.11	1.33	0.54	0.67	0.55	-0.56	0.33	-0.36	0.82

*Note: Results of regressions using daily data. Significance at 10% and 5% level are denoted by * and **.*

In summary, this section has two main results. First, we find little evidence that monetary policy was overly tight in the immediate aftermath of the crises. Second, there is no clear evidence that higher interest rates led to weaker exchange rates. If anything, we find that there are periods where higher rates led to stronger exchange rates.

IV. Optimality and Tradeoffs in Raising Interest Rates

The previous section discussed the relationship between interest rates and exchange rates and considered the hypothesis that interest rates can stabilize the exchange rate. Even if one accepts this hypothesis, the costs of using monetary policy may be too large to justify high interest rates. This section evaluates the benefits of raising interest rates to defend the currency with the alternative of letting the exchange rate overshoot.

The alternative to raising interest rates is not necessarily a free fall in the exchange rate, although the risk of a spiral inflation-depreciation exists. It is possible that large declines in the exchange rate could prompt the operation of automatic stabilizers. In the medium term, the real depreciation of the currency could induce a reversal of the current account and would generate a larger supply of dollars that would appreciate the currency. In the short run, the expectations of future recovery could bring stabilizing speculators back to the market.

The traditional analysis stresses the trade-off that has, on one hand, the potential negative effect that sustaining tight monetary policy has on output, unemployment, and investment, the latter with important repercussions in the long run. On the other hand, allowing the exchange rate to overshoot has a negative effect on inflation. In addition, too large an exchange rate misalignment for too long may also cause recession and layoffs in the nontradable sector.

The proponents of using higher interest rates to stabilize the currency argue that the increase in interest rates need only be temporary and, therefore, the effect on output is limited. Few will dispute that a prolonged period of very high interest rates may produce such a decline in output that may tilt the trade off in favor of letting the exchange rate overshoot. In fact, it is well known from the experiences during the great depression and subsequent stock market crashes, that the optimal response of a first round of corporate failures is to increase liquidity (or, equivalently, reduce interest rates) rather than sustain a tight monetary policy.

A more modern analysis stresses the trade off based on the relative effect of interest and exchange rates on the balance sheets of corporations, in particular, in the banking system. In this framework, the key is to evaluate the relative exposure of companies to changes in interest rates and exchange rates. On the one hand, increases in interest rates raise the cost of borrowing to highly leveraged companies and, in the banking system, increases in interest rates may significantly reduce profits due to the existence of maturity mismatches. In addition, failures in the nonbank corporate sector may induce failures in the banking system through increases in non-performing loans. On the other hand, in the same manner that increases in interest rates may induce problems in the corporate sector, an overdepreciated currency

increases the funding costs of corporations exposed to foreign currency. In particular, in developing countries with fixed exchange regimes, banks and companies tend to have a currency mismatch in their portfolio and are vulnerable to large changes in the exchange rate. However, some corporations in the tradable sector have a natural hedge to changes in the exchange rate since part of their receipts is in foreign currency.

The evidence on the relative cost of interest rate versus exchange rate changes on the corporate sector is scarce. For the banking system, the study by Demirguc-Kunt and Detragiache (1997) for 30 developing and industrial countries show that high interest rates substantially increase the probability of a financial crisis while depreciations of currencies have little, if any effect.

Table 6 shows for the Asian crisis cases a few indicators that hint at the relative cost of interest rate versus exchange rate changes. Table 7 shows the same indicators for other currency crises. From the perspective of the traditional trade off (output versus inflation), the overall low rates of inflation and large declines in output in the five Asian crisis cases suggest that the relative cost of an additional increase in interest rates may have been higher than an additional decline in the exchange rates. This is particularly true if a comparison with the previous Latin American currency crises is made, where inflation rates tended to be higher and output declines smaller. The only caveat is if the lags in Asia were to imply a larger passthrough in the future, as suggested in section II.B, and, therefore, a higher inflation.

A different perspective emerges if one considers the relative exposures to exchange rates versus interest rates. Indonesia had the highest external debts and the largest real depreciation compared to Asia and, also, to other currency crises cases. This suggests a large exposure to exchange rate changes. Korea with relatively a low external debt (compared to both Asian and other crises) and high debt/equity ratio of domestic corporates suggests a high exposure to interest rate increases. This could explain the subsequent trend in Korea toward lower interest rates. In Thailand both the high debt to equity ratio and the large ratio of credit to the private sector as a percentage of GDP suggests a large exposure to high interest rates. This assessment, in conjunction with the traditional trade-off (large drop in output and relatively low inflation), suggests that a trend towards lower rates was beneficial. Philippines had a relatively high real rate if one considers that its debt to equity and private credit to GDP ratios are relatively low and the expected decline in output is moderate. In contrast, Malaysia had a relatively low rate considering the low debt to equity ratio (although the credit to the private sector was substantial).

Table 6: Asia 5 -- Selected Indicators for Policy Trade-off, 1998

	Thailand	Malaysia	Philippines	Indonesia	Korea
Traditional Trade-off (growth versus inflation):					
CPI Inflation Forecast 1/	7.6	7.2	5.3	42.0	8.5
Growth Projection for 1998	-8.0	-4.0	-0.7	-12.0	-5.0
Effective Real Exchange Rate on April, 1998 (June, 97 =100)	66.3	77.2	78.5	47.7	72.6
Balance Sheet Trade-off:					
Corporate Debt/Equity Ratio (in percent)	419	200	63	950	518
Credit ot Private Sector/GDP Ratio, end-1997 (in percent)	145	162	56	61	74
External Debt (as a percent of GDP)	59.6	43.6	62.1	78.0	51.2
of which: short term debt	19.4	10.4	15.7	15.0	14.3
Monetary Policy:					
Nominal Interest Rates on July 1998	16.1	11.0	14.9	79.2	13.0
Real Interest Rates 2/	7.9	3.5	9.1	26.2	7

1/ Expected Inflation for the second half of the year annualized. Staff Estimates.

2/ Real interest rate calculated using the exact formula (1+i)/(1+inf) - 1.

Country Notes:

Malaysia: Nominal interest rate is three month interbank rate. External Debt numbers are end-1997.

Philippines: Nominal interest rate is the three month Treasury Bill. Effective Debt/equity ratio is based on a sample of companies (full data n.a.) and based on net rather than gross debt. Impact on corporate sector based on 1997 data.

Korea: Nominal interest rate is the three month CD rate. External Debt numbers are end-1997. Debt/Equity ratio is based on top 30 Chaebols.

Indonesia: Nominal rate is the one month interbank rate. External debt numbers include $ domestic debt and GDP is calculated as 4 times June quarter GDP at average e/r for June quarter. Debt equity ratio calculated using market value of equity of incorporated co's only (equity is thus understated and D/E overstated). Simple monthly interest rates are converted to represent compounded annualized rates.

Thailand: Nominal interest rate is the one month repurchase rate. External Debt numbers are end-1997.

Table 7: Selected Indicators for Policy Trade-off, Other Currency Cases

	Chile ('82)	Mexico ('82)	Mexico ('94)	Sweden ('92)	UK ('92)
Traditional Trade-off (growth versus inflation):					
CPI Inflation 1/	30.1	208.7	52.0	4.4	1.02
Growth Rate 2/	-2.3	-4.1	-7.5	-1.2	1.0
Effective Real Exchange Rate, (crisis period = 100)	76.7	55.5	75.4	76.3	98.1
Balance Sheet Trade-off:					
Credit to Private Sector/GDP, in the year of devaluation (%)	68.2	7	40	54	127
External Debt (as a percent of GDP)	67.3	52.1	37.3	#na	#na
of which: short term debt	12.3	15.2	7.0	#na	#na
Monetary Policy:					
Nominal Interest Rates on the Month of the Crisis	34.8	34.2	26.4	82.38	8.8
Real Interest Rates 3/	8.1	-24.6	7.3	78.5	5.56

1/ 12 month inflation from the onset of the crisis. The same holds for REER.

2/ Annual GDP growth rate from the quarter of the crisis.

3/ Real interest rate calculated as the nominal interest minus CPI inflation, both defined above.

Country Notes:

Chile: Nominal interest rate is the deposit rate.

Mexico: Nominal interest rate is treasury bill rate.

Sweden: Nominal rate is the overnight call money rate.

UK: Nominal interest rate is the overnight interbank rate.

V. CONCLUSION

This paper evaluated monetary policy and its relationship with exchange rate in the five Asian crisis countries. The findings are compared to previous currency crises in recent history. The paper argues that there was room to believe that the exchange rates had overshot during the crisis and that further declines were not desirable, naturally raising the question of the appropriate policies to revert this overshooting.

The paper finds that there is no evidence of overly tight monetary policy in the Asian crisis countries in 1997 and early 1998. Negative real rates were encountered for Indonesia, Korea and Malaysia in early 1998 and for Thailand in the third quarter of 1997. In addition, real rates in Indonesia, Malaysia and Philippines are below their pre-crisis levels. There is also no evidence of large uncovered interest rate differentials in the Asian crisis countries in 1997 and early 1998.

There is also no evidence that high interest rates led to weaker exchange rates. Simple correlations using monthly data provide mix results and vector autoregression model estimations with daily data imply, if anything, that higher interest rates are associated with stronger exchange rates. There are a couple of issues one should consider regarding this result. First, the Asian crisis generated an increase in the risk premium demanded for holding the crisis countries assets. This increase in premium is associated with both a higher interest rate and a more depreciated exchange rate that would tend to bias the result in favor of finding a perverse effect of interest rates on the exchange rate. However, the perverse effect is not found despite this natural bias. Second, the paper recognizes that the relationship between interest rate and exchange rates is more complex and is affected by other macroeconomic policies and the political support and credibility they enjoy. In absence this credibility, even large increases in interest rates would not be succesful in stemming exchange rate depreciations. Third, in order to test more rigorously this result, one needs to assemble a larger data set, which is only available once a great number of currency crises are considered. This larger exercise is performed in a separate paper (see Goldfajn and Gupta, 1998).

The paper highlights the need to reconcile the traditional interest rate-exchange rate tradeoff with a corporate balance sheet approach. The cost associated with high interest rates to stabilize the currency can be overwhelming if the banking sector is fragile. On the other hand, if the corporate sector is heavily exposed to foreign debt, then increasing interest rates may be the appropriate policy. Monetary policy in the aftermath of currency crisis requires close attention to these issues.

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Appendix A

Description of Monetary Policy in the Asian Crisis Cases

Korea

Korean authorities reacted to counter the steep decline in the value of the won during the winter of 1997-98 by raising overnight interbank interest rates. By January 1998, the overnight rate had been raised to around 30 percent (see Chart 3A), subsequently leading to sizable increases in short and long term corporate borrowing rates as well.[12] The maintenance of the high rates managed to halt the persistent decline of the currency. The high interest rates also slowed monetary growth. By the end of March 1998, reserve money had contracted below the indicative Fund program target,[13] thus necessitating a slight downward revision of the end-June indicative target.

Foreign exchange market stability was restored in February, 1997. The call rate was gradually decreased as a response to the improvement of the won's value. By early May, the overnight call rate had come down to 18 percent,[14] while at the same time the currency had recovered 25 percent since its end-1997 levels.

The lowering of the interest rate brought some relief to the highly leveraged institutions. The monetary authorities kept close vigil on the currency markets though, and resolved to tighten monetary policy by virtue of higher rates in case of any hint of renewed exchange rate instability.

Malaysia

In the aftermath of the contagion spread by the baht devaluation, the Malaysian ringgit faced speculative attacks. During the speculative attack episode in mid-July 1997, overnight call rates rose up to 35 percent (see Chart 3B) . But since the attempts to hold up the currency were not successful, the authorities decided to rely less on interest rate instruments to tackle exchange rate volatility. Interest rates were lowered almost to pre-crisis levels, and more

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[12]By February 1998, cost of new borrowing had increased to 26 percent for commercial paper and overdrafts, 21 percent for corporate bonds, and 18 percent for bank loans.

[13]The March 1998 reserve money figure was 22 trillion won, as opposed to the program target of 23.6 trillion won.

[14]The easing in borrowing rate was also reflected in the early May three-year corporate bond rate, which fell to 18 percent.

emphasis was given to various measures to reduce expenditure and credit growth in the economy.[15] Despite these measures, the rhetoric against speculators and measures to restrict trading in the domestic stock and currency market led to sustained decline of the ringgit.[16]

The rationale provided by the Malaysian authorities about their unwillingness to pursue a vigorous interest rate defense was twofold. First, there was consensus among political leaders that the adverse impact of high interest rates in impeding growth made it a very delicate policy choice. Furthermore, the strong contagion effects from the rest of the region appeared likely to overwhelm any stability induced by higher rates. Nevertheless, the authorities, in the wake of their discussion with Fund, Bank, and ADB officials, recognized the need to supplement the existing policies to curb monetary growth with a flexible short term interest rate policy that will allow them to respond to renewed pressure in the currency market. The authorities acknowledged the need to do this in light of the likelihood that the cost of prolonged period of undervaluation was higher than that of short term interest rate hike.[17] They asserted to maintain a forward looking interest rate policy that would ensure real interest rates of 3-4 percent on 3-month deposit instruments.

Philippines

The *de facto* peg maintained by authorities of the Philippines since late 1995 became unsustainable in July 1997 in the face of regional currency crises, leading to a free floating peso. During the period when the peso-US$ exchange rate was kept virtually constant, the central bank had in effect eliminated the scope for independent monetary policy, but continued to follow previously established base money targets. The floating of the peso eliminated this inconsistency in the policy framework.

The base money targeting was carried out by adjusting the overnight and term repos, as well as the reverse repos. However, holding the interest rate low was a long standing priority, and after a short period of tight monetary policy in mid-1997,[18] monetary policy became largely accommodative between September 1997 and January 1998. The relatively lower rates (as opposed to market rates) offered by the central bank brought the amount of open market

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[15]Such as restricting property sector lending and loans for financing stock market activity.

[16]The ringgit fell, from 2.57 to the dollar in July 1997, to 4.39 in January 1998,.

[17]The increase in import costs for the corporate and industrial sector, as well as devaluation induced inflationary pressures.

[18]This was done mostly through raising policy interest rate above market rates, and by increasing liquidity reserve requirements, which are the obligatory treasury bill holdings of the banks.

operations almost to zero by January 1998. The period was also accompanied by a large shortfall of net international reserves (NIR) from the program target.

Policy makers seemed to acknowledge the need to stabilize the exchange rate and maintain target NIR levels but they strongly disputed the effectiveness of raising interest rates noting that higher rates would adversely affect ailing banks and enterprises, thus causing more panic among the agents and would be unlikely to stem the pressure from the regional contagion. They found the existing gap[19] between bank lending rates and other rates as excessive, and wanted to pursue measures to reduce them. However, it is possible that the high rates reflected, to a large extent, the difficulty faced by the banks to build badly needed capital and provision for non-performing loans.

Indonesia

After facing sustained selling pressure in the wake of the baht devaluation, the Indonesian authorities relinquished the rupiah peg in August 14, 1997. This event was preceded by futile interest rate defense in late July and early August.[20] The weeks subsequent to the free floating of the rupiah saw the currency slide to nearly 4000 to the dollar, from the pre-crisis level of approximately 2500. In response, the authorities announced a wide range of reform initiatives, and sought IMF assistance in stabilizing the economy. During October and early November the currency showed some signs of stability. At the same time, interest rates came down to almost pre-crisis levels.[21]

However, this respite was short-lived. By late November, due to major uncertainty regarding the actual implementation of the economic reforms, increasing pessimism of the extent of economic contraction, as well as lack of confidence in the political leadership, the rupiah tumble drastically. A vicious circle of devaluation ensued, and by late January, the rupiah crossed over the 13,000 to the dollar level. The authorities tried to stem the currency slide by pursuing monetary tightening. Overnight JIBOR was raised to nearly 40 percent by end-January, while the weighted average rate in the interbank market rose to over 90 percent (see Chart 3B).

But the high interest rates failed to bring prolonged respite to the market. A combination of sharp decline in the value of the rupiah and steep increase in domestic interest

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[19]In January 1998, the end of period prime lending rate was 25.4 percent and the 1-month PHIBOR was 23.6 percent, as opposed to BSP 1-month rate of 16.9 percent.

[20]At one point the overnight JIBOR was pushed over 42 percent.

[21]In October, the 30 day JIBOR was 20.6 percent, barely 3 percent over July levels.

rates hurt the balance sheet of most firms tremendously.[22] Thus despite the resolve to support the currency and contain inflationary pressures, the authorities found their objective floundering in the face of an across the board liquidity crisis. The immediate impact of this crisis was reflected in the segmentation of the banking market, where the weaker banks relied on extensive liquidity support, and the better off banks had to deal with interest rates that were persistently above 30 percent. Between November 1997 and March 1998, liquidity support for banks increased by the equivalent of about 8 percent of GDP. The inflationary spiral and the lack of confidence in the banking sector led to increased demand for currency despite the high interest rates. As inflation rates picked up, real interest rates actually became substantially negative in early 1998. The low real rates limited the ability of the authorities to absorb excess liquidity through open market operations.

Thailand

Thailand's monetary policy typifies the challenges of an interest rate defense during a currency crisis. After heading off speculative attacks at the beginning of 1997,[23] the Thai authorities faced renewed attacks during the months of May and June. Despite vigorous defense by means of forward market intervention, imposition of various restrictions to make the short sale of baht costly, and sharp interest rate hike,[24] the selling pressure on the baht proved to be overwhelming. The resulting and potential loss of reserves forced the authorities to release the baht from its peg on July 2.

The authorities followed the free floating of the baht with a relatively accommodating monetary policy, as reflected by the fall of interbank interest rates to nearly pre-crisis levels by mid-August, when overnight rates fell to 14.35 percent. This was done with the expectation of the market renewing its confidence in the ongoing reform efforts, and also to help ease the cost of debt servicing for the ailing banks and finance companies. The expectation, however, proved to be wrong as political uncertainties and delays in pushing through reforms etc. kept market confidence low. The exchange rate continued to face pressure, and the authorities had to allow rates to rise again. Overnight repo rates jumped to 23 percent in September (see Chart

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[22]It was estimated by Fund staff that majority of the publicly listed non-bank companies were technically bankrupt by end-January. Another estimate of the Bank of Indonesia indicated that banks representing over 70 percent of private banking sector assets had capital (risk adjusted) below the regulatory requirements.

[23]Market commentators suggest that the baht was attacked by speculators in late January/ early February. The central bank defended this attack successfully, and subsequent to the defense interest rate declined noticeably, e.g. overnight interbank rates came down to 8.55 percent in March, as opposed to 12.8 percent in February; over the same time period, overnight repo rates declined to 8.7 percent from 12.24 percent.

[24]By late June, overnight rates reached 19 percent.

3B), while minimum lending rates rose by about 200 basis points in desperate attempts to halt the slide of the baht.

Interest rates did not rise uniformly though. The Thai market began to segment at this stage as the large domestic banks sought to place excess reserves in risk free assets, thus commanding a lower overnight borrowing rate[25], whereas smaller institutions, increasingly short of the required collateral, continued to face relatively high interest rates of over 20 percent in the interbank market. Any possibility of the interest rates being lowered was subsequently dashed as widespread regional contagion from November onwards brought further selling pressure on the baht. This led to across the board interest rates staying above 19 percent through the spring of 1998.

One aspect of the interest rate movement during the ongoing crisis has been the relative rigidity of the broader rates' structure. Despite the big fluctuations in the overnight interbank rates, deposit and lending rates remained relatively stable during the episode. The Thai authorities imposed a deposit rate cap in September 1997,[26] done primarily to limit moral hazard on the part of financial institutions covered by the bailout guarantee. Additionally, the large banks had little incentive to offer higher rates to depositors who were already shifting their deposits from smaller, weaker banks to them.[27] On the lending side, banks were reluctant to charge higher rates which will lead, under the prevailing uncertain economic environment, to an increase of the average riskiness of loans. Thus, despite a tight monetary policy, the broader rates have been generally lower.

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[25]In mid-October, over night repo rates fell to 12 percent, largely driven by rates as low as 8 percent for the most creditworthy banks.

[26]The interest rate cap constrained deposit rates to 300 basis points above the average deposit rate of the four major banks.

[27]It should be noted that some smaller, ailing banks have tried to raise rates aggressively, as well as offered additional benefits to attract depositors.

Appendix B

Description of Interest Rate Policy in Other Crises Cases

Mexico, 1982

The Mexican 1982 crisis was the typical balance of payment crisis explained by the traditional theory. A large fiscal deficit (-8.0 percent of GDP in 1981) coupled with large current account deficits (-6.5 percent in 1981) and an overvaluation of the real exchange rate by about 25 percent combined with a fixed exchange regime led to a major BOP crisis. The recommendation from international economists was to tighten fiscal and monetary policy in order to generate the external and internal adjustment needed to stabilize the economy. High interest rates were also desirable to increase the attractiveness of the economy to foreign capital. After the large nominal devaluation the real exchange rate depreciated by 43 percent and had clearly overshot. Notwithstanding the overshooting, nominal rates were kept low and real interest rates were substantially negative, probably because of mounting banking problems. There was no clear monetary tightening and the real exchange rate did not recover for a long period. Only when real interest rates were increased that the RER slightly recovered. The lack of tightening meant that inflation reached three digits in 1983.

The Mexican 1982 crisis was a severe balance of payment crisis that lasted the whole decade. It was coupled by a banking crisis. In the first year after the crisis output dropped by 4.2 percent and only recovered moderately in 1984 by 3.6 percent. The current account had a reversal of 10.5 percent of GDP in two years (1981 to 1983).

Chile, 1982

The Chilean 1982 crisis was more similar to the Mexican crisis of 1994 than to the 1982 crisis. The exchange rate was overvalued by about 15-10 percent as a consequence of an attempt to keep the nominal exchange rate fixed at 39 pesos per dollar by the “Chicago Boys” and the current account deficit soared to 14.5 percent of GDP in 1981. However, Chile was running a fiscal surplus of 1.7 percent of GDP in 1981.

After the devaluation, a large real depreciation followed (20 percent). Initially, the authorities increased interest rates that generated very high real interest rates that helped the RER to recover. However, given the severity of the banking crisis and the very large drop in output (-14.1 percent) in 1983, interest rates were allowed to fall and the RER recovery to stall.

The current account had an improvement of 8.8 percent of GDP in two years (1981 to 1983). Inflation jumped to 23 percent in 1983 (from one digit inflation rate) and would stay at this level for the next decades. Probably, the large recession that followed the crisis prevented inflation to reach a three digit figure as in the 1982 Mexican crisis.

Sweden, 1992

Sweden had a fixed exchange rate system until 1992 and the monetary policy was primarily directed at maintaining the peg. In June 1992 the rejection of the Maastricht Treaty in a Danish Referendum raised doubts about the proposed movement toward a common currency. Growing tensions in the ERM and the difficulties of the Finnish Markka put pressure on the krona. The Riksbank raised the marginal interest rates by a total of 4 percentage points after the currency outflows totaled Skr 30 billion in the last two weeks of August.

Further pressure was put on krona when Finland floated the markka on September 8, 1992. The Riksbank intervened heavily in the foreign exchange markets and raised the interest rates. The marginal interest rates were first hiked to 24 percent on September 8, to 75 percent a day later and to 500 percent on September 16.

Calm returned to the foreign exchange markets subsequently and the interest rates were lowered to 11½ percent by November 1992. A poor reception to a Treasury bill auction on November 12 started a new wave of currency outflows, which resulted in an increase in interest rate to 20 percent on November 19, 1992 followed by an abandonment of the peg on the same day.

The currency depreciated by 10 percent instantaneously, there was further depreciation in subsequent months and by end-June 1993, the total depreciation of Krona against ECU was about 20 percent.

Monetary policy in the aftermath:

Price stability was announced to be the overriding goal of the monetary policy. The annual increase in the consumer price index was to be limited to 2 percent from 1995, with a 1 percent margin on either side of the target.

Between Nov. 1992 and June 1994 the Riksbank reduced its short term lending rates in a series of gradual steps by a cumulative 5½ percentage points to a low of 6.9 percent. The interest rate was later raised by 50 basis points to 7.4 percent between August 1994 and November 1994.

United Kingdom

The United Kingdom shifted from a floating exchange rate system to the pegged exchange rate mechanism of the ERM on October 8, 1990. The monetary policy was directed toward maintaining the sterling within a band of 6 percent. Base rates were reduced in a series of steps from 15 percent in October 1990 to 10 ½ percent by September 1991.

In December 1991, German short-term interest rates were raised by ½ percentage point. This interest rate rise was matched by all other ERM countries except for UK. At the same

time, the United States cut its discount rate by one percentage point. The Sterling/DM rate hovered around 2½ percent below the central rate until the general election on April 9, 1992, when the sterling recovered briefly after the election. The U.K. cut base interest rates a further ½ percentage points in May 1992 to 10 percent.

Due to the rejection of the Maastricht Treaty, interest rate cuts in the U.S. interest rates and a 3/4 percentage point increase in the German discount rate, tensions were being faced in the ERM. U.K. permitted the pound to fall within its band and by early August 1992 the pound was only slightly above its 6 percent floor.

Further cut in the U.S. interest rates pushed the dollar to an all-time low against the Deutsche mark and sterling. Lira was devalued by 7 percent on September 14 and the pressure on sterling continued. The Bank of England intervened to rescue the currency, backed up by a two percentage point increase in base lending rates to 12 percent on September 16, 1992. The speculation continued despite the announcement that base lending rates would be raised to 15 percent. Overnight rates shot up to 100 percent. On the same day sterling had dropped below the ERM floor and its membership was suspended.

In the aftermath:

The interest rate hikes of the previous day were canceled on September 17. The base interest rates were reduced to 9 percent by September 22. Further cuts in interest rates of one percentage point each were made on October 16 and November 13 1992.

After going down to a level 15 percent below the ERM floor in early October, by end-January 1993 the sterling's effective exchange rate stabilized at around 13 percent below its September 16 level. The goal of monetary policy in the aftermath of the withdrawal of sterling was stated to be that of achieving price stability, with retail price inflation to be contained within a range of 1- 4 percent.

Mexico, 1994/95

In November 1994, Mexico attempted a step devaluation to correct the overvaluation of the exchange rate. The devaluation triggered a run on the reserves of the central bank, with capital outflows and creditors unwilling to role over short term debt.

Although the exchange rate was previously overvalued, the extent of the nominal depreciation implied that immediately after the crisis implied that the Mexican RER overshot its long run value.

In the first couple of months after the crisis, the Mexican government seemed unwilling to raise interest rates and real interest rates became sharply negative (see Chart 7). In June 1995, Mexican interbank nominal interest rates were raised sharply to 48.8 in 1995, with the

inflation (CPI) rate running at 35 percent, the nominal rates implied real interest rates of about 15 percent.

The consequence was a sharp drop of 6 percent in real GDP and a severe banking crisis. The recovery was fast, however, and, in 1996, Mexico's GDP growth was 5 percent.

Appendix B

Defending the currency from speculative attacks: Selected cases

Attention has been given to the circumstances under which countries choose (or are able to) defend their exchange rates. A theoretical framework has been advanced by Obstfeld (1994), among others, where policy makers face a trade off when pegging their exchange rate. The nature of the trade off varies across models but all have a common flavor. On one hand, letting the exchange rate float implies a fixed cost from the loss of credibility. This cost is rationalized by the fact that policy makers have to abandon their disinflation goal usually linked to an exchange anchor. On the other hand, the cost of maintaining the peg is associated with either (i) the output costs of maintaining an overvalued currency (ii) the excess current account deficit of an overvalued currency (iii) the budget consequence and output costs of higher interest rates needed to defend their currency.

This framework has been associated with self-fulfilling currency crises because the relative cost of defending the currency changes under attack and policy makers may choose to abandon the peg once the attack occurs (e.g., the higher interest rate needed to defend the currency from a speculative attack may imply that the peg is not worth keeping).

In the Asian case, there is an additional trade off that can be identified: the relative costs to the banking and corporate sector of their exposure to interest versus exchange rate effects. In this context, speculative attacks occurred in countries that seemed to weight strongly the balance sheet cost of an increase in interest rates (and also the real costs of this strategy).

Argentina

Argentina's currency board arrangement was tested twice in the last few years, first, in the midst of the Mexican crisis and currently as a spillover of Asian and Brazilian crises.

In 1995, money market rates were raised to 20 percent. With inflation approximately zero this implied equivalent real rates. GDP dropped by 5.5 percent and unemployment reached 17 percent (from 12 percent in 1994).

In 1997, money market rates were raised in the midst of the Asian/Brazilian crises to 10 percent. Real interest rates are equivalent to nominal rates since inflation ranged between zero and 0.5 percent. GDP growth in 1998 is expected to remain at 1 percent and unemployment at 17 percent.

In both cases, interest rates were maintained high for only a few months.

Brazil

During the Tequila crisis, following the Mexican devaluation, the currency came under pressure. The exchange rate depreciated by 7 percent. Money market rates reached 65 percent but were allowed to slide down to 20 percent. With inflation at about 10-15 percent, this meant real rates of up to 45 percent. The effects on growth were not substantial in the first year since Brazil GDP growth in 1995 reached 4.2 percent but growth faltered in 1996.

Brazil, in October 1997, faced renewed pressures on its currency peg as a contagion from the Asian currencies. Nominal interbank interest rates were raised to 46 percent in mid-November to defend the currency from a speculative attack. The interest rates were allowed to slide back to 25 percent in April 98. Real interest rates reached 42 percent. The RER was kept stable but at a cost of a predicted growth of 1 percent.