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East Asian Crisis and Currency Pressure: The Case of India

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Abstract

This paper tests and explains the impact of the East Asian crisis on India's exchange rate. To examine this, an index of currency pressure is estimated for four countries -- Thailand, South Korea, Malaysia and India covering the period just before, during and after the crisis. A contagion model with panel data for these four countries is also estimated during the crisis period. On the basis of the panel data estimates, the paper concludes that while India experienced some effects of the crisis, these were not substantive. This is partly attributed to the role of stabilisation policy in India that included intervention in the foreign exchange market by the central bank, phased tightening of monetary policy and restrictions on capital flows.

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1. Introduction

This paper examines the effect of the 1997 East Asian financial crisis on India's exchange rate. It seeks to determine the effect of contagion, following the crisis, on India's exchange rate using panel data analysis for four countries: India, Thailand, South Korea and Malaysia². A measure of currency pressure is constructed for the period June 1997 to December 1998 to examine the extent of contagion.

The paper is organized as follows: Section two gives a brief background of the East Asian crisis. Section three introduces the concept of contagion, its role in the crisis and develops a measure of currency pressure. A model of contagion is developed in section four. Section five discusses the panel methodology used and the results of empirical panel data analysis. Section six gives an account of India's exchange rate system since the early 1990s. Section seven discusses some of the reasons for India's relative isolation from the East Asian crisis and section eight concludes and discusses the implications for future crises.

2. The East Asian Crisis

The East Asian financial crisis of 1997-98 came close on the heels of the Latin American crisis of 1994-95. Both crises were triggered by the sudden collapse of major regional currencies: the Mexican *peso* and the Thai *baht*. Preceding the crises periods, there were several similarities between the two catalyst countries. Mexico and Thailand had received large capital inflows and foreign investment in the 1990s and had been highly regarded by international investors. However, both had experienced deterioration in their export growth rates and rise in current account deficits in the years before the crises. The *peso* and *baht* had also appreciated significantly. Overvalued exchange rates, speculative attacks and investor panic, all led to currency depreciation.

There were, at the same time, significant differences between the two crises. Before the financial crisis of 1997, the model of development adopted by the East Asian economies was widely accepted as being extremely conducive for sustained growth over a long period. Unlike the Latin American countries, these economies had been distinguished by their high rates of capital accumulation and savings, and strong cooperation between the state and the private sector. They experienced high growth rates, low inflation and balanced government

² Singapore and Japan have been excluded from the analysis as they are generally accepted to have been least affected by the crisis. Indonesia and Philippines have not been included due to unavailability of monthly data for the period of study.

budgets. For example, the Thai economy had a budget surplus of 2.6 percent of GDP in the 1991 to 1996 period. Malaysia recorded an inflation rate of 4.2 percent while Korea had a savings rate of 34.8 percent in the same period Desai (2003). In fact, as Radelet and Sachs (1998) argue, many of the usual macroeconomic indicators of any financial crisis did not register any significant changes for the East Asian economies. Thus, the crisis caught most of the global financial system unaware.

It was however, the factors that had made the East Asian economies such stellar successes, promoted widely by the IMF and the World Bank, which became the reasons for the financial crisis that was to follow. There was rapid capital accumulation, but it was mostly by highly leveraged industries in exports and real estate.

The most important warning sign of the impending crisis was the fragility of the financial system. Credit extended by the banks to the private sector expanded very rapidly, financed mostly by the banks' huge offshore borrowings. Financial sector claims on the private sector increased from 100 percent in 1990 to approximately 140 percent in Malaysia, Thailand and Korea. Programs of partial financial liberalization in the late 1980s and early nineties had allowed the banks to channel foreign money into the domestic sector. For example, in Thailand, foreign liabilities of commercial banks increased from 5.9 percent to 28.4 percent of GDP between 1992 and 1995 (Radelet and Sachs, 1998). As the numbers in Table 1 show, the total international claims held by foreign banks increased from about 185 billion dollars for Thailand, Korea and Indonesia in end 1995 to 231 billion dollars in mid 1997. A large part of this bank credit was used by the private sector for real estate investment. Real estate loans ranged from 30 to 40 percent in Thailand and 15 to 25 percent in South Korea by late 1997 (Desai, 2003).

The problem of moral hazard afflicted much of the credit extended to the private sector. As the finance companies and banks borrowed heavily from abroad, they accumulated short term unhedged liabilities and lent long term to finance projects with questionable viability, and soon the borrowers missed repayments. These structural imperfections led to distortions – ratios of corporate debt to equity averaged 395 percent in South Korea and 450 percent in Thailand as the borrowing boom accelerated, compared to 106 percent in USA.

The borrowing boom therefore, was in several ways, the catalyst of the East Asian financial crisis. Although the economies had strong fundamentals, their financial excesses made them vulnerable to external shocks. Borrowing short term, lending long term, borrowing in dollars and yen and investing in assets which yielded returns in domestic

currencies made them even more so. In 1995, the strengthening dollar (against the yen) led to an appreciation of the East Asian currencies that were pegged against the dollar. This weakened their exports and threatened the stability of the domestic currencies. There were additional risks – banks in the debtor Asian five countries (Thailand, Indonesia, South Korea, Philippines and Malaysia) could not hedge their net holdings of short term dollar liabilities in the pre crisis period. Risk premiums in the domestic interest rates of debtor economies with original sin³ were also higher than on dollar assets of comparable maturity. Therefore, the banks tended to over borrow in dollars without covering for exchange risk. When a speculative currency attack occurred in this situation, it forced an immediate repayment of short term dollar debts. The banks could have tried to defend the respective currencies by running down the reserves, but eventually the currency would have to be devalued. The combination of these factors initiated the East Asian crisis in Thailand.

Table 2 shows change in some of the crisis indicators in the five East Asian countries and India. In Malaysia, the ratio of financial institutions' claims to domestic GDP had increased to 144.6 percent by 1996. The Thai current account deficit reached 8 percent of the GDP in late 1996, prompting foreign creditors to withdraw their Thai stockholdings. The Thailand central bank tried to initially support the *baht* in the face of declining inflows of foreign exchange, but then gave up.

The collapse of the Thai *baht* formally initiated the East Asian financial crisis. Other regional currencies followed suit, and the financial crisis rapidly turned into a full blown downturn, with significant effects on the real sector as well.

3. Contagion and the Crisis

Contagion may be defined as the transmission of a crisis to a particular country due to its real and financial interdependence with countries that are already experiencing a crisis (Fratzcher, 1998). Contagion is first manifested through the depreciation (sudden and large) in currencies across countries that have financial inter-linkages. Contagion effects may also arise when foreign investors ignore economic fundamentals and do not discriminate properly among countries (Calvo and Reinhart, 1996).

One of the first systematic treatments of contagion was done by Gerlach and Smets (1995), in which they analyzed the linkages between Sweden and Finland. The fall of the

³ The concept of 'original sin' is discussed by Eichengreen et. al. (2003). It is a situation in which the domestic currency cannot be used to borrow abroad or long term domestically. In the presence of this incompleteness, financial fragility is unavoidable because all domestic investments will have either a currency mismatch or a maturity mismatch.

Finnish Markka in 1992 led to an attack on the Swedish Krona. An ‘escape-clause’ model of exchange rate policy is used by Buitert et. al. (1996) to analyze the spread of currency crisis in a system of $N+1$ countries, N of which peg to the remaining country. Goldfajn and Valdes (1995) show how the presence of financial intermediaries can let small disturbances lead to large scale runs on the currency. The recently developed third generation models of currency crises attempt to explain the East Asian crisis of 1997-98. These focus on the moral hazard view of the underlying causes of the financial crises – i.e. liabilities of financial intermediaries which may be perceived to have an implicit government guarantee, but are essentially unregulated. These models also deal with contagion. Masson (1998) provides a framework for grouping causes of a crisis into common external shocks, spillover effects (trade competitiveness or portfolio rebalancing effects) and (pure) contagion based on market sentiments or herding behavior.

The contagion effect can be clearly seen in case of the East Asian economies. Although the East Asian crisis was triggered off in the Thai financial markets, it spread fairly quickly to Malaysia, Korea, Philippines, and Indonesia. Real linkages between the economies meant that the effects were not delimited to the financial sector only. The affected economies witnessed a sharp decline in output, employment and standards of living.

The failure of the Thai central bank to support the *baht* and its subsequent float on July 2, 1997, had an impact on the neighbouring currencies of Malaysia, Indonesia and Philippines. By the beginning of the last quarter of 1997, the *ringitt* had lost 30% of its value (Table 3) before the start of the crisis. In South Korea, the widespread bankruptcies of corporations sent stock prices spiralling downwards and the prompted foreign investors to dump their holdings. After initial attempts by the central bank to support the *won* by running down reserves and raising the interest rates, South Korea also abandoned the defense of its currency in November 1997. Hence the financial interlinkages between the East Asian economies led to the transmission of the crisis that began in Thailand to the entire region, with the exceptions of Japan and Singapore. This is the contagion effect of the financial crisis. Before analysing the figures for currency pressure, however, we examine the evolution of the exchange rates and foreign reserves in the four countries given in Table 3. The highest percentage change in the *baht* occurred in January 1998, and this followed a persistent decline in foreign reserves from a high of more than 31 billion dollars in October 1997. Both these facts illustrate the advent of the currency crisis in Thailand. Malaysia and South Korea also saw the maximum depreciation in their respective currencies in January 1998. The foreign reserves in South Korea began to fall in October 1997. Unlike Malaysia, however,

where the decline in reserves was not reversed almost until the last quarter of 1998, Korean reserves recovered almost immediately in April 1998. The Indian Rupee never experienced the extreme depreciation. The maximum percentage change was only about 20 percent and even this occurred well after *baht*, *won*, and *ringitt* had depreciated the most. Foreign reserves also did not fluctuate very widely. These factors together suggest that India remained mostly immune from the contagion effect.

To capture the effect of the depreciation of the *baht* on the other East Asian currencies during the crisis period, i.e., the contagion effect of the financial crisis, an index of currency pressure is developed below.

Index of currency pressure

The numbers in Table 3 show some striking results: Thailand, Malaysia and Korea all experienced large deviations in the exchange rates⁴ from the trend level in June 1997. In contrast, India witnessed a comparatively mild change in the Rupee-Dollar rate during the same period. This reinforces the conclusions of Table 2: India was relatively isolated from the East Asian crisis.

To arrive at contagion analysis, we first introduce a measure of currency pressure. The measure of currency pressure developed in this paper is similar to that developed by Fratzcher (1998) and Eichengreen et. al. (1997). It is the weighted average of the percentage devaluation of the domestic currency above its trend and the percentage loss in reserves. The weights used are measured as the inverse of the variance for each variable. e measures the effect of an overvalued currency and is calculated using the difference of the average real exchange rate over the period prior to the crisis (September 1994 to May 1997) and the actual real exchange rate during each month of the crisis. The trend of the exchange rate is measured as the average rate of nominal depreciation or appreciation prior to the crisis. This is measured by the numerator of the first term:

$$CC_t = \frac{(e - (\sum e)/n)}{\sigma_e} + \frac{(Res)}{\sigma_{res}} \quad (2)$$

⁴ Exchange rates in Table 3 measure price of the US dollar in terms of the domestic currency. For example, the Rupee-Dollar exchange rate is the amount of US Dollar per Rupee. A fall in e therefore implies a depreciation of the domestic currency.

where n is the number of time periods and σ_e and σ_{res} are the standard deviations of the percentage changes in the exchange rate and reserves over the period January 1993 and May 1997. The measure may be interpreted as follows: a depreciation of the domestic currency i.e. a fall in e , a fall in reserves res and an increase in interest rates reduces the value of CC and hence represents higher currency crisis. A higher value of the currency pressure measure indicates a lower contagion level.

The index of currency pressure is constructed for India, South Korea, Malaysia and Thailand. As monthly data is irregular for Philippines and Indonesia for the period of analysis, these two countries are excluded from analysis (previously noted in footnote 2).

We attempt to provide a graphical analysis of the crisis using Figures 1-4. These illustrate the onset of the crisis after July 1997. In the country wise discussion below, we refer to figures for Thailand (1.1, 1.2), Malaysia (2.1, 2.2), South Korea (3.1, 3.2) and India (4.1, 4.2). The first set of figures in each pair refers to the corresponding graphs of exchange rate and foreign reserves movement; the second set is for the path of the index of currency pressure. Pair-wise figures therefore capture the fluctuations in the exchange rates, foreign reserves and the index of currency pressure in each country.

Although the *baht* experienced its biggest depreciation in January 1998, the currency pressure index fluctuated wildly between July 1997 and March 1998. As can be seen from Figure 1.1, the *bhat* depreciated by almost 50% in July 1997 at the onset of the crisis. Corresponding to this time, Figure 1.2 shows that the index attained its lowest value over the period under consideration i.e. currency pressure was very high.

In the case of Korea, as mentioned earlier, the central bank tried to defend the currency against early speculative attacks. It can be seen from Figure 3.1 that when the bank abandoned the *won* in November 1997, it plummeted. At this time, Figure 3.2 shows, that the currency pressure index attained its lowest values in December 1997 and January 1998.

Although Malaysia was distinguished from the other affected countries by the management of the crisis later, it also abandoned the currency peg. For the period of analysis, Figure 2.2 shows that the index for Malaysia fell to its lowest ever values, coinciding with the largest depreciation of the *ringgit*. It can also be seen from Figure 2.1 that foreign reserves had fallen at the time the country was trying to maintain the currency peg.

India experienced some of the fluctuations in the currency pressure index that affected the East Asian economies, but these were not as sharp as in the crisis-hit economies. The index did see some falls in November and December 1997 and later in June 1998 as is evident from Figure 4.2. The largest depreciation of the Rupee came in August 1998. It is

interesting to note that the Rupee *appreciated* marginally in July 1997, at a time when Thailand, South Korea and Malaysia experienced depreciations. From Figure 4.1, it can be seen that after the depreciation of the Rupee, foreign reserves began to increase once again.

Korea led a temporary turnaround in the Asian financial markets. As can be seen from Figures 3.1 and 3.2, the exchange rate and currency crisis measure recovered to some extent after December 1997. By March 1998, however, the Asian financial markets served another setback, and the values of relevant variables (exchange rates, foreign reserves and currency crisis measure) rapidly worsened again. The renewed financial pressure began to abate about May/June 1998. The *won* began to stabilize, gaining against the US dollar and was followed by other Asian currencies recovering.

By November 1998 and January 1999, Thailand and Korea were well on their way to recovery. In case of Malaysia, the *ringgit* had bottomed out by June 1998.

Given the measure of currency pressure developed above, we now estimate the contagion effect. We hypothesize the index of currency pressure as a function of domestic and external factors. These variables capture the effects of financial inter linkages between economies as in the case of East Asia.

4. A Model of Contagion

From mid August 1997, contagion rapidly spread to other ASEAN economies and by October, its effects were felt outside this block of countries. The East Asian economies continued to feel the effects of contagion till December 1997 and January 1998. We study the contagion effect over two sub-periods and the entire length of the crisis: June 1997 to February 1998; March 1998 to December 1998; and June 1997 to December 1998 with reference to Thailand, Malaysia, South Korea and India.

When faced with a currency crisis, the government can either devalue the currency; or meet the demand of foreign exchange by running down reserves or raise the domestic interest rate to increase the demand for domestic currency. Following Fratzcher (1998), to analyse the contagion effect, the index of currency pressure (which measures the extent of currency crisis) is modelled as a function of a measure of money supply, foreign reserves, and the real exchange rate.

We estimate a contagion model using panel data for the four countries – India, Thailand, Korea and Malaysia over the period June 1997 and December 1998 as follows:

$$CC_{it} = \alpha_{it} + \beta_{1i} m_{it} + \beta_{2i} res_{it} + \beta_{3i} e_{it} + u_{it}$$

where i is the index of countries and t is the time index in months.

The three economic fundamentals used to examine the contagion effect in the four countries in this paper are as follows: m is the ratio of money supply, M3, to the index of industrial production (y); res is the ratio of foreign reserves to y ; and e is the real exchange rate.

Krugman's (1979) seminal model suggests that the period preceding the crisis would be characterised by a persistent decline in international reserves. Therefore, a rise in foreign reserves res , which increases the ratio of reserves to y is expected to reduce the contagion effect or increase the value of CC_t .

A high rate of monetary expansion is a leading indicator of the crisis (Kaminsky et. al 1997). The literature stemming from Krugman's analysis discusses how an expansionary monetary policy leads to a loss in international reserves, forcing the central banks to give up defending the currency, thereby resulting in a currency crisis. Hence, a rise in the ratio of M3 to y , m is hypothesized to lower the value of the dependent variable, i.e., the measure of currency pressure CC_t . An overvalued exchange rate is another leading indicator of the crisis. A rise in the exchange rate indicates a high demand for the foreign currency. This can be met by running down the international reserves or other channels such as raising the interest rate (Eichengreen et. al, 1996). Therefore, a rise in e leads to a fall in CC_t or an increase in the contagion effect.

Expected signs of economic fundamentals

Variables	m	res	e
Currency pressure (CC_t)	Negative	Positive	Negative

5. Panel Data Methodology and Empirical Estimates

Given that the contagion model involves four countries and is estimated over three different time periods, we use panel data methodology for estimation.

Panel data sets are typically data sets that pool observations on a cross-section of entities such as countries, firms, people etc. over multiple time periods. The primary advantage of such a data set stems from the large number of observations that become available and this leads to a greater reliability of parameter estimates. A typical panel data model can be written in the following form:

$$y_{it} = \alpha_i + X_{it} \beta + \varepsilon_{it}$$

where $i=1,2,\dots,N$ and $t = 1,2,\dots,T$

Here ‘i’ subscript denotes the entities and ‘t’ denotes the time period. There are N individuals and T time periods in a typical panel. Thus y is an NTx1 stacked matrix of the dependent variable, X is the NTxK stacked matrix of the K independent variables, β is the Kx1 vector of the unknown parameters and ε_{it} is the error term. Thus X_{it} is the i^{th} observation on the K explanatory variables. The individual effect, α_i , is constant over time t and specific to the individual cross-sectional unit i. ε_{it} is assumed to have zero mean and constant variance and to be independently distributed overtime and individuals.

In our model of contagion, N refers to the countries under consideration: Thailand, India, Malaysia and South Korea. K is the set of independent variables, m , res , and e . T is the number of observations corresponding to the selected time periods.

The choice of an estimation technique that is appropriate for the above model depends on the assumption of α_i . If α_i are assumed to be fixed parameters, then the model is fixed-effects model. On the other hand, if α_i are assumed to be random, so that $\alpha_i = \bar{\alpha} + \mu_i$, where $\bar{\alpha}$ is an unknown parameter and μ_i is a random variable with mean zero and constant variance, then the model is known as random-effects model.

Selection between fixed effects model and random effects model is based on the Hausman (1978) test. However, the random effects variance is based on the assumption that the number of individuals (N) exceeds the number of estimated parameters (K), not including the constant. In our case of varying coefficients, the number of countries, four, exceeds the number of estimated parameters, three, without the constant. Therefore the test cannot be estimated and used as a selection criterion. Thus, the Fixed-Effect model is estimated for the two sub-periods and the entire period.

The panel model is estimated for the whole period of the crises (1997:06-1998:12), and two sub periods: 1997:06-1998:02 and 1998:03-1998:12. The period wise analysis is given below and a summary of the results is reported in Table 4. We find that the signs of the coefficients are as expected.

First sub period: June 1997 to February 1998 – Thailand experienced significant currency pressure through all the three channels, money supply, foreign reserves and the exchange rate. The money supply m , and e were the significant factors resulting in contagion in South Korea. The noticeable fact of the Korean case is that there is immediate evidence of

contagion. Both Malaysia and India did not experience any contagion effects through any of the three channels.

Second sub period: March 1998 to December 1998 – Currency pressure affected Thailand through e . There is significant contagion only through e in the second sub period in South Korea. Contagion affected Malaysia through m and e in the second period. In India, there is some evidence of contagion through m and res .

Entire period of the crisis: June 1997 to December 1998 - The analysis for Thailand is different from other countries as it is the country where the East Asian crisis originated. Thus, currency pressure in the first period through m , res , and e in the first period is sufficient to ensure it via all the three channels in the whole period. Contagion affects Malaysia with a lag through m and e in the entire period. The same channels also cause contagion in South Korea. In India, there is no evidence of contagion, if we take the whole length of the crisis. This implies that contagion in the second sub period is not strong enough to result in a significant effect in the entire period.

It is evident from the results presented in Table 3 that there was only weak contagion effect in India. This is in sharp contrast to the results of other countries. Thailand, South Korea and Malaysia experienced contagion effects through at least two of the variables under consideration: m , e , or res .

6. Indian Exchange Rate: A Historical Perspective

Before we analyze how India insulated itself from the East Asian crisis, we provide some insight into the historical movements of the Indian exchange rate. Figure 5 shows the evolution of the Dollar-Rupee rate for the last decade.

From 1975 to 1992, the rupee exchange rate was officially determined by the Reserve Bank of India and was based on a weighted basket of currencies of India's major trading partners. India experienced a balance of payments crisis in 1991. It was due to a combination of internal weaknesses along problems of the external sector. Within the economy, the main causes were excessive regulation of private industry and trade by the government, a weak financial system and high fiscal deficits. In the external sector, the primary contributing factors was an overvalued exchange rate. The government undertook a comprehensive plan to deal with the crisis, among which, one was to devalue the exchange rate and transform the system from a discretionary, basket pegged system, to a market determined, unified exchange

rate, following a short intermediate period of dual rates. In July 1991, the Rupee was devalued by 18%.

Since 1993, the exchange rate has exhibited fluctuations that have been more severe during the crisis period. For instance, it depreciated by 6.31% between July 1997 and March 1998 and by approximately 11% from July 1997 to December 1998 (Table 3). Foreign currency reserves fell from 29 billion dollars to 26.77 billion dollars between July 1997 and June 1998. But by December 1998, reserves increased to 29.83 billion dollars.

Since August 1994, the rupee is convertible on the current account and the process of integration of the Indian financial market with the rest of the world is underway. Capital account convertibility is allowed for foreigners, foreign based corporates and non-resident Indians. Several types of exchange controls have been dismantled and the Indian rupee is no longer pegged. The Reserve Bank of India (RBI) however, continues to follow a policy of 'dirty' or managed floating.

The aim of the managed float of the Rupee is to foster international competitiveness and to limit daily market volatility. The Bank has used exchange market intervention, monetary policy and administrative measures for this. The regime can be interpreted to be more flexible during normal market conditions and managed when chaos prevails. In the former case, intervention may be viewed as passive, while in the latter case, active. The objective behind passive intervention could be to avoid a nominal appreciation or depreciation whereas in the case of active intervention, the objective is to avoid disruptive market corrections. During phases of active intervention, a combination of leaning with the wind and leaning against the wind may be applied, depending on the perceptions about the extent of accumulated misalignment at the beginning of any episode of exchange market pressure. Intervention is used for several reasons: evening out the volatility of the exchange rate and correcting the misalignment in relation to fundamentals as well as to prevent depreciation of the Rupee and keep it along the desired macroeconomic path. In the next section we examine whether intervention by the Central Bank helped to insulate the Indian economy from the effects of the East Asian currency crisis.

7. How did India insulate itself from the East Asian crisis?

It is clear from section 5 that there was very little contagion in the Indian context. As the data in Table 2 reiterate, India shared none of the crisis indicators of the affected East Asian economies.

India had learnt from the lessons drawn from its own external crisis in 1991, several of which were reinforced by the Mexican *peso* crisis. After 1991, several major economic and financial reforms were taken. Thus, India had in some sense, responded to the fallibilities present in the East Asian economies, which had contributed to the crisis of 1997. Before the crisis, the short term external debt was tightly controlled; the current account deficit was manageable; the limits on exposure of financial intermediaries to stocks and real estate reduced the risk they were subject to; the market determined exchange rate system was managed. This management continued from July 1997 to December 1998. There was also tight capital controls on domestic firms and individuals although foreign direct and portfolio investors in India enjoyed complete convertibility. As a result, it can be seen from tables 7 and 8 that the key macroeconomic indicators in India were stable during the period of the East Asian crisis and thereafter.

The Reserve Bank of India played an important stabilizing role during the crisis. Substantial intervention by the bank in the spot and forward exchange rate markets helped to curb speculative pressures and excessive volatility. The intervention policy adopted by the RBI is discussed below. We also highlight the main monetary measures undertaken during the crisis period as well as trade linkages.

Intervention Policy of the RBI during the East Asian crisis

We use the empirical observations on intervention and exchange rate volatility to show that the Bank was generally averse to excessive fluctuations of the exchange rate during the crisis, and took measures to moderate the movements in case of volatility in the foreign exchange market. This can easily be seen from Figure 6 which shows the level of RBI intervention during the East Asian crisis period as measured by sales and purchases of the US dollar. Gross intervention is the sum of purchases and sales of the US dollar, irrespective of the sign. Net intervention is the same, except that the sum takes account of the signs.

The monthly percentage change in the exchange rate and its volatility⁵ are plotted in Figure 7. We note that the volatility is generally a mirror image of the month-by-month changes. For example, between November 1997 and January 1998, the exchange rate registered a large decline in the monthly change, and a corresponding rise in volatility. Using Figures 6 and 7, we note the close association between the Bank's intervention and volatility of the exchange rate – higher level of intervention in January 1998 succeeded the

⁵ Volatility is measured by the moving three month standard deviation of the monthly percentage change in the exchange rate.

significantly higher volatility of the Rupee Dollar exchange rate between November-December 1997. High volatility between May-July 1998 resulted in the second major spike in intervention activity between July and September 1998. Thus, the RBI has used its intervention strategy to temper the volatility of the exchange rate following periods of large fluctuations in the exchange rate during the crisis period.

It is also worth noting that while the central bank's intervention activities were able to impart stability to India's foreign exchange market, similar actions were not possible in some of the East Asian countries due to a fixed parity with the dollar.

Monetary Measures Undertaken

Monetary policy was tightened in a phased manner from November 1997 onwards as RBI interventions were deemed inadequate in controlling the volatility of the foreign exchange market. This resulted in a mid-January 1998 package that signalled an increase in interest rates and increased the reserve requirements. The pressures of the foreign exchange market forced the RBI to resort to the "announcement effects" of the Cash Reserve Ratio (CRR), despite its previous commitment to use Open Market Operations (OMO) as the preferred indirect instrument of monetary policy. Other than CRR and repurchase operations, the RBI also used export credit and surcharges on import finance. The programme of reducing the Cash Reserve Ratio (CRR) was deferred to the future in November 1997. Additionally, a fixed repo rate of 4.5% was introduced to absorb surplus liquidity. In December 1997 and January 1998 the CRR was increased by 1%. Similarly, the interest rates on repos were further increased: first to 5% and then further to 9%. The reverse repo facility was made available to Primary Dealers in Government Securities market at the Bank Rate on a discretionary basis. The Bank rate rose from 9% to 11% in January 1998. In April 1998 the monetary measures were eased and CRR was reduced to its pre crisis levels. Interest rate on fixed repos was reduced to 7% and later to 6%. Monetary policy was tightened again in August 1998 (Acharya, 2001). As a result of these measures, the Rupee began to stabilize and market expectations of further depreciation were reversed.

Restrictions on Capital Flows

Traditionally, there have been two kinds of capital controls: targeted measures to regulate short term inflows and outflows and pervasive restrictions on all sorts of capital transactions.

Targeted measures include unremunerated reserve requirements, limits on open currency positions, taxes on cross border flows and quantitative restrictions on portfolio transactions⁶. These kinds of measures are usually used in episodes of ‘overheated’ portfolio inflows, or large capital outflows in a crisis period, when there were concerns about the effect of such flows on domestic interest rates and money growth.

Pervasive restrictions have been usually used to allow full use of domestic resources, without worrying about external volatility and influence. These include prohibitions on capital inflows and outflows, requiring approval for capital transactions, multiple exchange rate regimes, and often, current account restrictions. These kinds of measures were present in India before and during the East Asian crisis. Specifically: capital outflows by residents were highly controlled; portfolio investments by foreign investors could be made through FIIs only; offshore borrowing by Indian corporate was overseen by the government; the end use and maturity of foreign loans was also controlled and overall caps were set on external borrowing. Banks could not maintain foreign liabilities without prior approval and short term debt was not allowed. The result of these capital account restrictions was that the Indian exchange rate remained mostly isolated from the East Asian financial crisis, as discussed above.

Trade linkages with East Asian countries

India’s relative isolation from the contagion effects of the East Asian crisis can also be explained in terms of weak trade linkages with the other affected countries. Exports of 10 major East Asian countries (Thailand, Malaysia, Korea, Indonesia, Philippines, China, Hong Kong, Singapore, Japan Taiwan) amongst themselves account for about 50% of their total exports. Trade ties are thus strong. However, as can be seen from Table 5⁷, the East Asian economies affected by the crisis account for only a small portion of India’s foreign trade.

8. Conclusions and Implications

This paper has tried to analyse the effect of the East Asian financial crisis on the Indian exchange rate vis-a-vis three other affected countries. Active intervention by the Reserve Bank, controls on capital flows, phased tightening of monetary policy, weak trade

⁶ Among the East Asian countries, Thailand and Malaysia are good examples of countries that have used targeted measures during the 1997 crisis. Both economies have been fairly open to portfolio capital flows.

⁷ Ratios are indicative of trade for the past few years.

linkages and strong macroeconomic fundamentals ensured that India remained mostly immune from the East Asian crisis.

Over recent years, the broadly market-determined exchange rate policy has implied that the Indian exchange rate has demonstrated adequate flexibility against major world currencies. For instance, over 2001 and 2002, the Rupee depreciated approximately 5.7% and 3.4% against the US dollar. The period 2003-2005 saw an appreciation of the Rupee on average, while 2006 saw further depreciation. In 2007, it once again appreciated against the US dollar while the RBI demonstrated discretionary use of intervention policy to curb excessive movement in the exchange rate.

Financial markets in India have also overseen a paradigm shift. In the pre-liberalization era, they were characterized by administered interest rates, quantitative ceilings, captive markets for government securities, pegged exchange rate, current and capital account restrictions. Various reforms have ensured that the markets have made the transition to a regime of market determined interest and exchange rates, price based instruments of monetary policy, current account convertibility and phased liberalization of the capital account.

While India was able to insulate itself from East Asian crisis to a large extent, the imperative question now is whether India is equipped to avert any future crises. As India moves towards integrating with the global economy, it has learnt several lessons from its own 1990-91 crisis, the Latin American crisis as well as the East Asian crisis. These include ensuring prudential norms in the financial and banking sectors, reducing the exposure of the financial sector to speculative markets including real estate and stocks; maintaining fiscal stringency; keeping external debt and the current account deficit at a low level; reducing volatility in the foreign exchange markets as well as ensuring stability in capital flows.

To better understand the current state of the Indian economy, we examine first, the macroeconomic fundamentals of the economy, and second, the exposure of the economy to foreign capital inflows.

India's current macroeconomic fundamentals are shown in Table 6. These show that India's macroeconomic fundamentals should hold it in good stead in the years to come. The growth indicators show that the GDP growth approximately doubled between 1990-91 and 2005-06. The rate of GDP growth rose from about 3% in the 1950-1980 period, to 6% in the 1980s and 1990s. In the last four years, between 2003 and 2007, the economy grew 8.5% on average. Thus, there is tangible evidence of self accelerating growth. The ratios of savings and investment to GDP have grown and inflation has been kept in check. Prices have been

mostly stable as well. In line with the growing economy, the share of agriculture in GDP has also reduced to about 20% from 40% in the 1970s while the services sector is burgeoning at close to 60%.

The fiscal position of the government has also improved considerably. The deficit of the central and state governments reached unprecedented levels after the 1990/91 crisis. Since then, efforts have been made to control this. Under the Fiscal Responsibility and Budget Management Act of 2003, the government intends to reduce the ratio of the gross fiscal deficit to GDP to 3%.

Trade in goods (exports plus imports) as a percentage of GDP has increased from 14.6% in 1990-91 to 32.9% in 2005-06. Exports have grown from 5.8% of GDP in 1990-91 to 13.2% in 2005-06 while imports have risen from 8.8% to 19.7% over the same period. Current account deficit has decreased over the years showing the buoyant trade in services as well as remittances. On the other hand, foreign exchange reserves have seen a quantum jump from US \$5.8 billion in 1990-91 to US \$151.6 billion in 2005-06 reflecting the comfortable external position of the Indian economy.

The Indian economy also experienced a large increase in net capital flows following the introduction of reforms in the 1990s. Net capital inflows more than doubled from an average of US \$4 billion in the 1980s to an average of approximately US \$9 billion during 1993-2000. The proportion of non-debt flows in total capital flows increased from 5 percent in the second part of 1980s to 43 percent during 1990s and further to about 70 percent in 2000-2006. Table 4 shows the details of the division between non-debt and debt creating flows.

As shown in Table 7, within non-debt creating flows, the proportion of portfolio investment in total capital flows was more than 50 percent in 2003-04 to 2005-06, up from 28 percent in 1990-91 to 1996-97 and 18 percent in 1997-98 to 2002-03. This drop in the 1997-98 through 2002-03 period was possibly due to the East Asian crisis as reflected in the data given in Table 7.

The rise in the proportion of portfolio investment has also imparted increased volatility to the total capital flows, which in turn, increases the volatility of the exchange rate. While the RBI has been playing an important role in the stabilization of capital flows via sterilization activities, with increased capital liberalization and global integration, India is now exposed to the volatility of foreign capital flows and, in general, that of the international financial environment.

Thus, despite the strong economic fundamentals, a sound financial architecture and active intervention by the central bank, a decade after the East Asian crisis, it is difficult to predict if India will be able to avert financial crises in the future. Due to the increase in the openness of the economy, India is now more vulnerable to external shocks than it was a decade ago. The key issue is that financial contagion is difficult to anticipate especially since to some extent it depends on investor confidence, market sentiment and trust in financial markets, institutions as well as policy measures. With a change in confidence, Keynes' 'animal spirits' may come into play that can make investors susceptible to herd behaviour and speculative bubbles that can turn out to be self-fulfilling.

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Figure 1.1 – Exchange Rate and Foreign Exchange Reserves in THAILAND

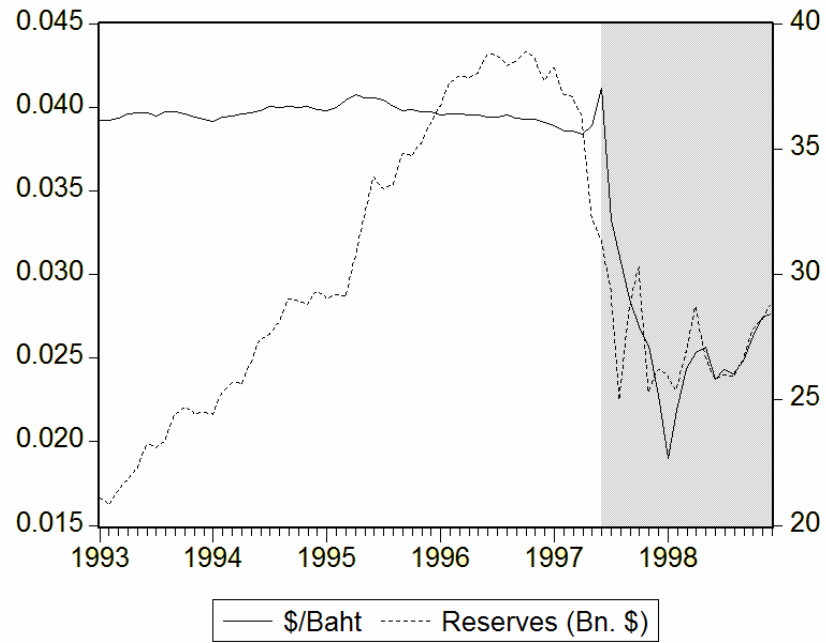


Figure 1.2 – Index of Currency Pressure from 1993:02-1998:12 in THAILAND

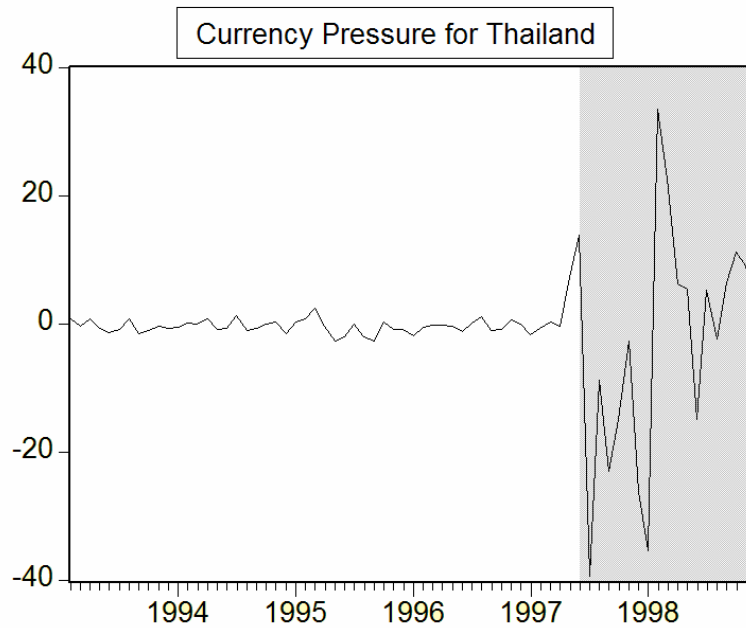


Figure 2.1 – Exchange Rate and Foreign Exchange Reserves in MALAYSIA

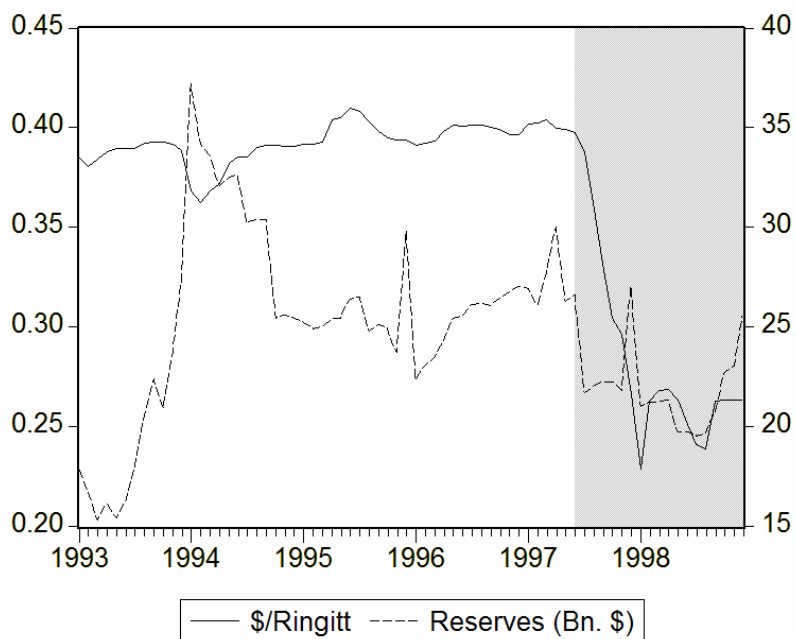


Figure 2.2 – Index of Currency Pressure from 1993:02-1998:12 in MALAYSIA

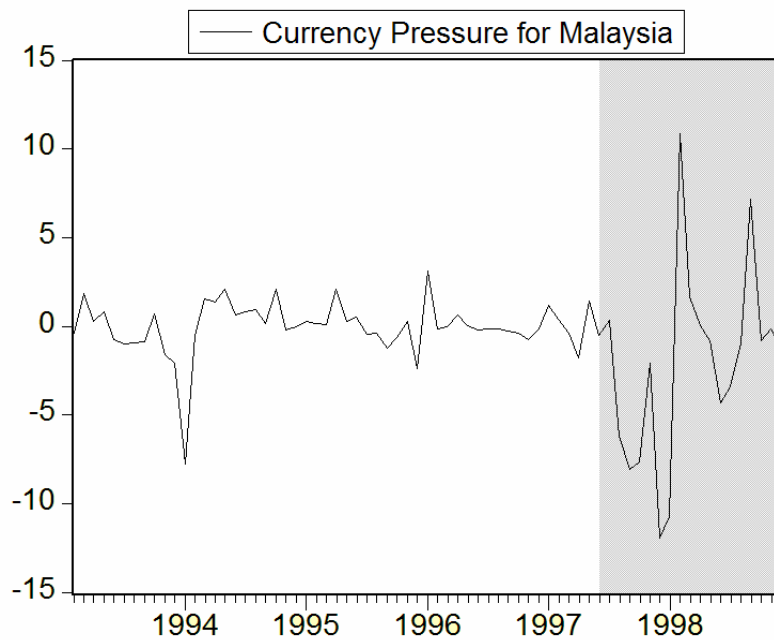


Figure 3.1 – Exchange Rate and Foreign Exchange Reserves in KOREA

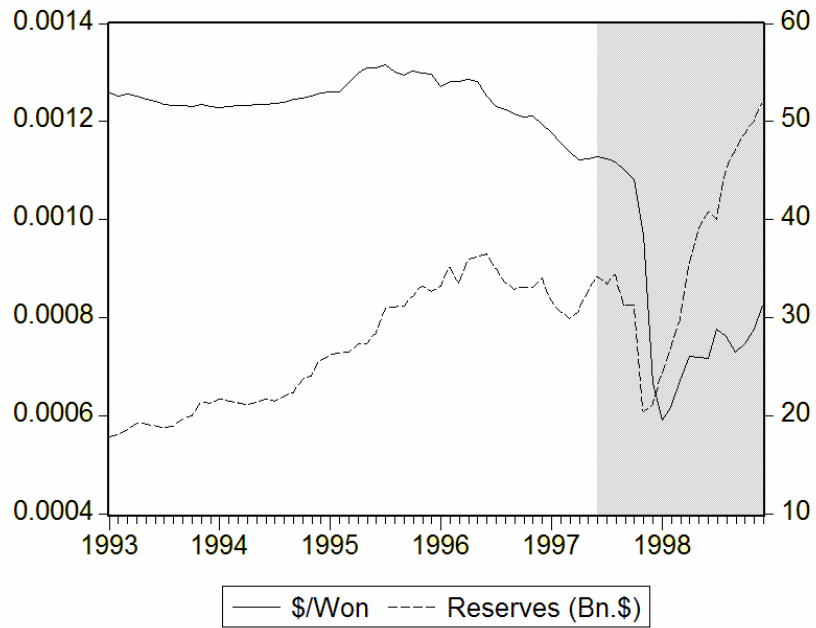


Figure 3.2 – Index of Currency Pressure from 1993:02-1998:12 in KOREA

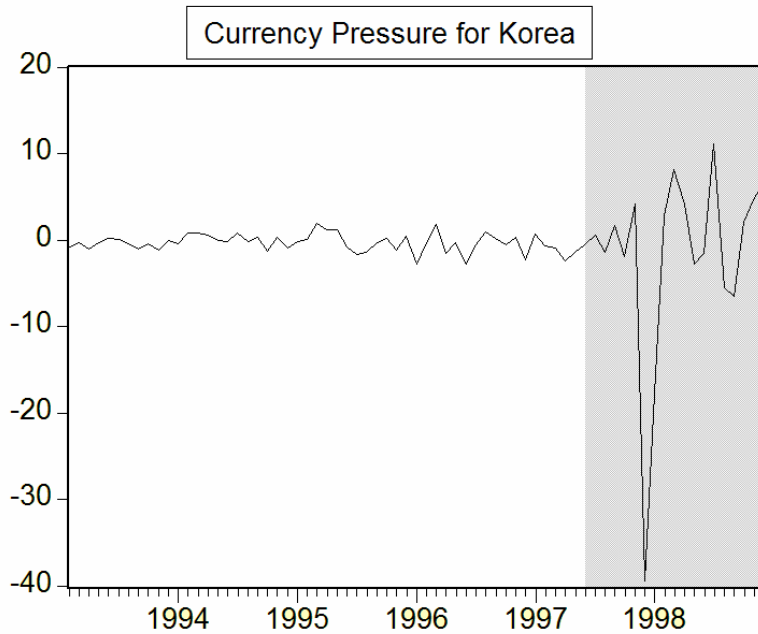


Figure 4.1 – Exchange Rate and Foreign Exchange Reserves in INDIA

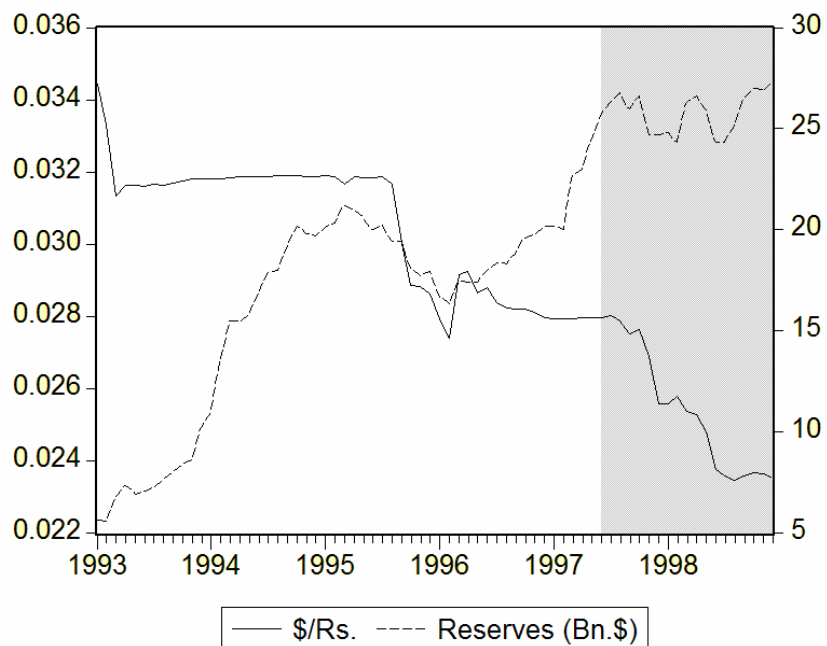


Figure 4.2 – Index of Currency Pressure from 1993:02-1998:12 in INDIA

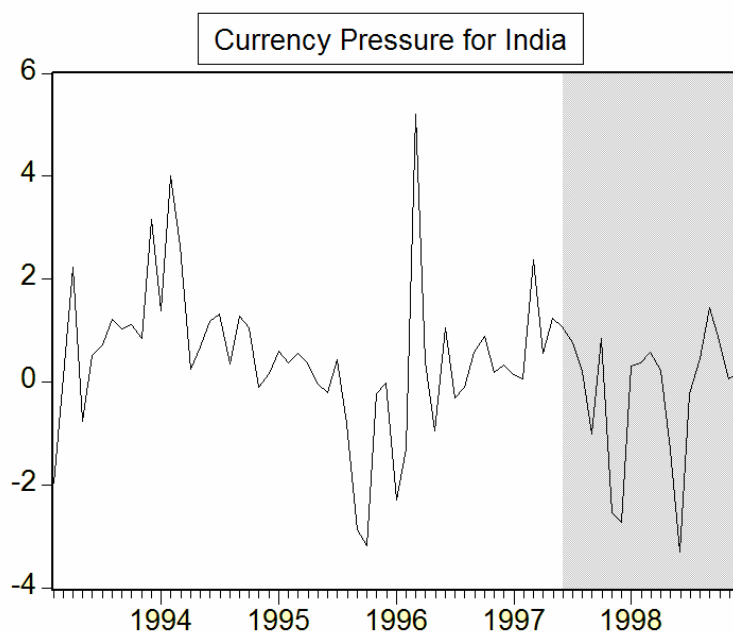


Figure 5

US \$/Indian Rupee

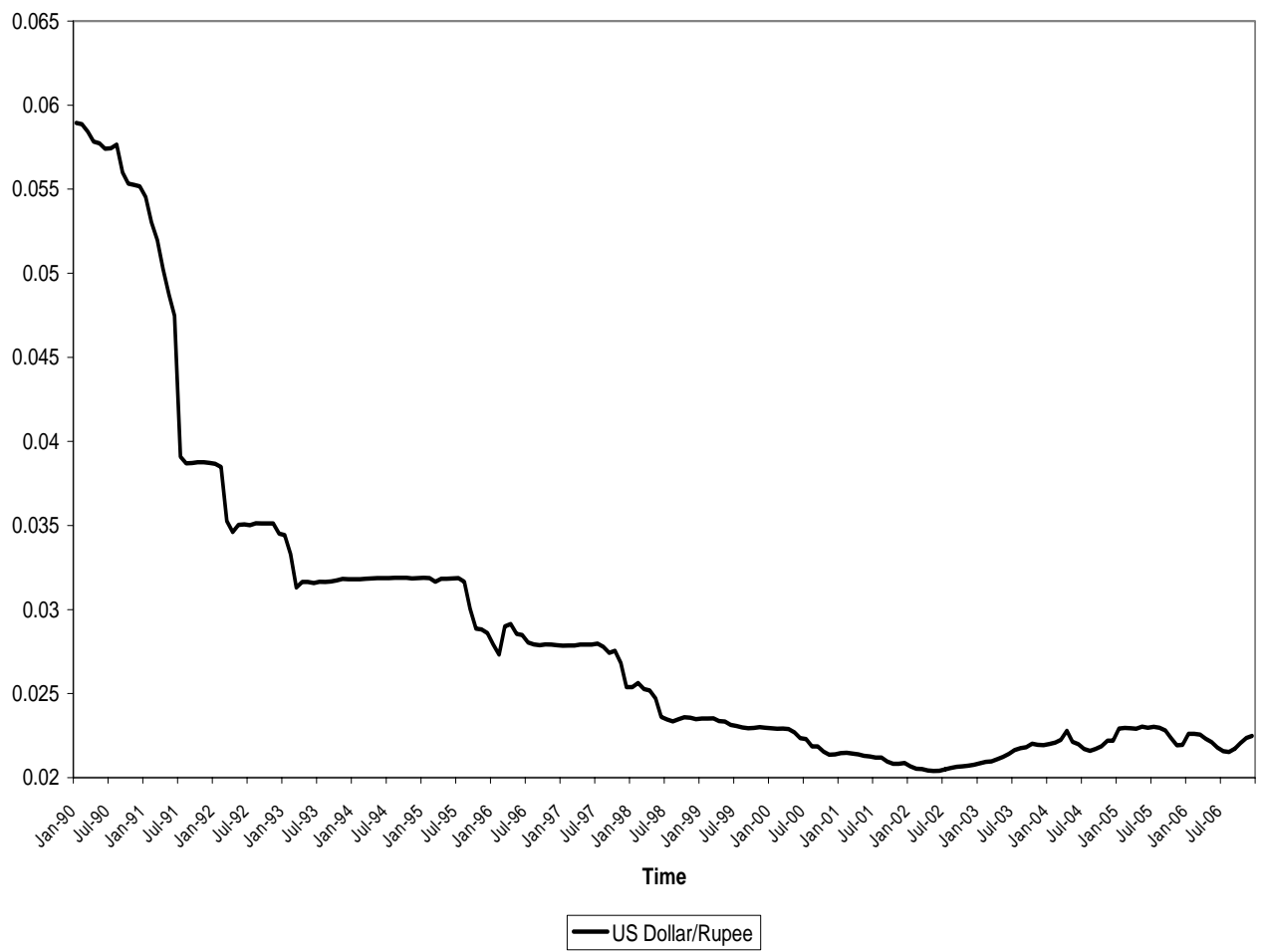


Figure 6

RBI Intervention

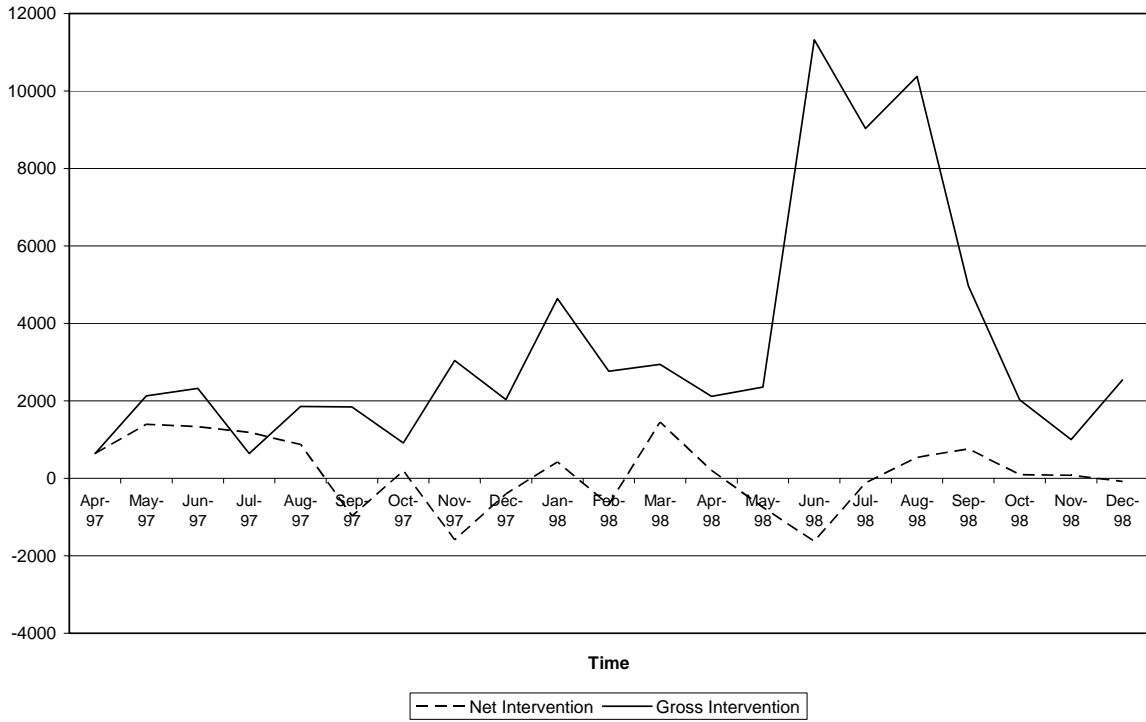


Figure 7

Monthly % Change and Volatility for \$/Rs. Exchange Rate

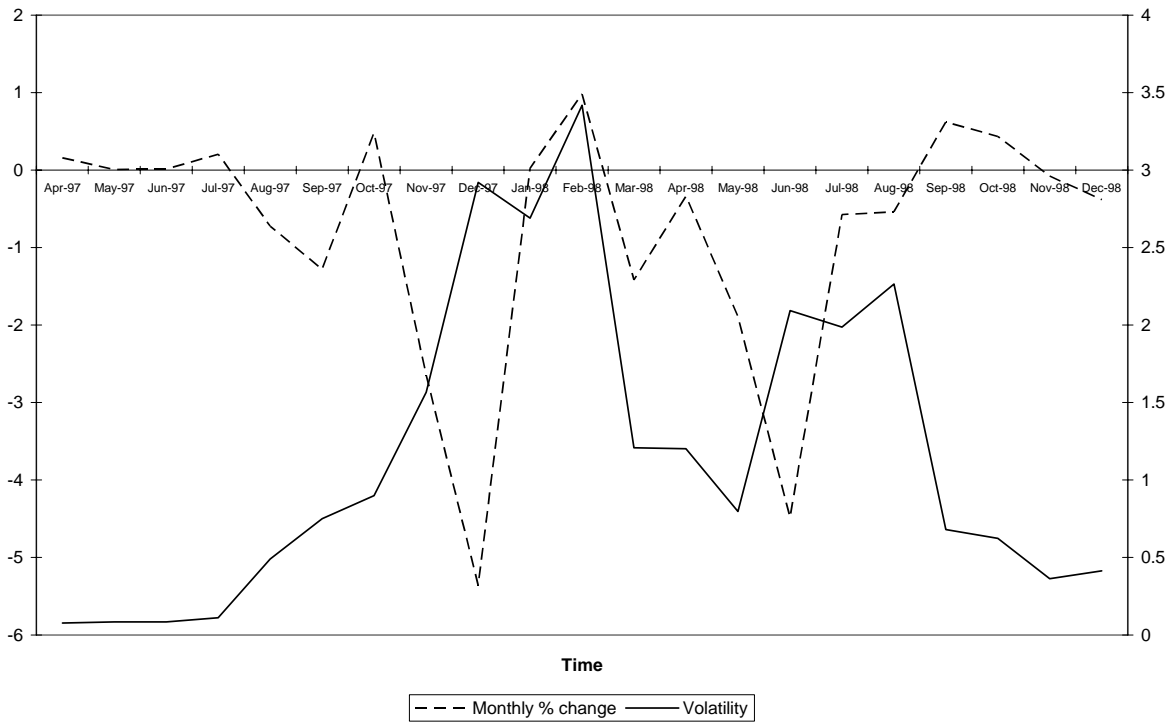


Table 1: International Claims held by Foreign Banks: Total Outstandings

Country	End 1995	End 1996	Mid 1997
Thailand	62.8	70.2	69.4
Indonesia	44.5	55.5	58.7
Malaysia	16.8	22.2	28.8
Philippines	8.3	13.3	14.1
Korea	77.5	100.0	103.4

Source: Bank for International Settlements

Note: Figures are in US\$ billions.

Table 2: Selected crisis indicators

Country	Indicators			
	Current account/GDP (%) 1996	Capital account/GDP (%) 1996	Financial Inst. Claims on Private sector/GDP (%)	
			1990	1996
Thailand	-8.0	10.6	83.1	141.9
Indonesia	-3.5	4.9	50.6	55.4
Malaysia	-5.3	9.4	71.4	144.6
Philippines	-4.3	11.0	19.3	48.4
Korea	-4.8	4.8	56.8	65.7
India	-1.6	3.1	26.8	24.7

Source: Radelet and Sachs (1998)

Table 3: Foreign exchange reserves and percentage change in exchange rates

	India		South Korea		Malaysia		Thailand	
	% change in exchange rate (from June 1997)	Foreign Exchange Reserves (\$bn)	% change in exchange rate (from June 1997)	Foreign Exchange Reserves (\$bn)	% change in exchange rate (from June 1997)	Foreign Exchange Reserves (\$bn)	% change in exchange rate (from June 1997)	Foreign Exchange Reserves (\$bn)
Jul-97	-0.22	29.64	0.23	33.45	2.45	21.82	23.60	30.35
Aug-97	0.29	29.85	0.90	31.14	9.66	22.11	32.58	25.86
Sep-97	1.59	29.15	2.41	30.43	19.91	22.27	44.30	29.54
Oct-97	1.18	29.65	4.13	30.51	30.61	22.34	53.05	31.21
Nov-97	3.94	27.61	15.97	24.40	34.13	21.88	59.96	26.18
Dec-97	9.36	27.57	65.68	20.40	49.49	20.90	80.25	26.89
Jan-98	9.31	27.60	90.56	23.51	73.63	19.82	116.03	26.57
Feb-98	8.51	27.18	82.62	26.71	51.23	19.92	87.61	26.08
Mar-98	10.32	28.76	67.11	29.75	48.14	19.91	68.34	27.61
Apr-98	10.67	29.04	56.33	35.54	48.07	19.86	62.36	29.46
May-98	12.76	28.35	56.78	38.76	50.91	19.83	60.45	27.38
Jun-98	17.79	26.77	57.12	40.90	58.49	19.81	73.39	26.50
Jul-98	18.69	26.82	45.04	43.02	64.95	19.65	69.16	26.70
Aug-98	19.29	27.59	47.84	45.09	66.71	19.69	71.24	27.79
Sep-98	18.68	28.90	54.70	46.98	51.38	20.82	65.64	27.29
Oct-98	18.13	29.44	51.10	48.83	51.04	22.86	56.43	28.48
Nov-98	18.36	29.40	45.00	50.02	50.94	23.09	49.91	28.89
Dec-98	18.97	29.83	36.58	52.04	51.03	25.68	48.94	29.54

Source: Various Central Banks and IFS

Note: Highlighted numbers denote maximum levels.

Table 4: Tests of Significance of Variables in the Contagion Model

Variables	Time period		
	1997:06–1998:02	1998:03–1998:12	1997:06-1998:12
Thailand			
M	Sig*	Not Sig	Sig*
Res	Sig*	Not Sig	Sig*
E	Sig*	Sig*	Sig*
South Korea			
M	Sig**	Not Sig	Sig*
Res	Not Sig	Not Sig	Not Sig
E	Sig*	Sig*	Sig*
Malaysia			
m	Not Sig	Sig***	Sig**
res	Not Sig	Not Sig	Not Sig
e	Not Sig	Sig*	Sig*
India			
m	Not Sig	Sig**	Not Sig
res	Not Sig	Sig**	Not Sig
e	Not Sig	Not Sig	Not Sig

Note:

* Significant at 5% level of significance

** Significant at 10% level of significance

*** Significant at 15% level of significance

Table 5: Share of East Asian countries in India's exports and imports

Country	Export (%)	Imports (%)
Thailand	1.03	0.90
Malaysia	1.12	1.79
Korea	1.77	3.25
Indonesia	1.33	2.20
Philippines	0.48	0.15

Source: *Monthly Review, Centre for Monitoring Indian Economy (CMIE)*

Note: Figures are for 2005-06 fiscal year.

Table 6: Indian Economy -- Key Variables**External Indicators**

	1990-91	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2003-04	2004-05	2005-06
Trade Balance*	14.6	21.5	18.8	18.7	18.3	19.4	22.4	24.3	29.3	32.9
Exports*	5.8	9.1	8.7	8.5	8.0	8.2	9.9	11	12.2	13.2
Imports *	8.8	12.4	10.2	10.1	10.2	11.1	12.5	13.3	17.1	19.7
Current Account Deficit*	-3.1	-2.7	-1.2	-1.4	-1.0	-1.0	-0.8	2.6	-0.4	-1.3
REER	99.98	100.97	98.95	103.07	94.34	95.28	99.3	99.04	99.68	102.27
NEER	88.04	89.09	89.03	91.97	90.34	90.42	88.48	88	90.5	88.96
Exchange Rate: Re/\$	17.94	35.69	35.49	37.16	42.07	43.33	47.07	45.6	44.63	45.29
Foreign Exchange Reserves (billion \$)	5.8	21.7	26.4	29.3	32.5	38	42.3	113	141.5	151.6
External Debt*	28.7	26.2	23.4	22.1	21.2	21.2	20.5	19.6	18.1	15.8

Key Economic Indicators

	1990-91	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2003-04	2004-05	2005-06
Real GDP Growth	5.6	7.3	7.8	4.8	6.5	6.1	4.4	7.5	8.5	9
Saving*	23.1	25.1	23.2	23.1	21.5	24.2	23.4	29.7	31.1	32.4
Investment*	26.3	26.9	24.5	24.6	22.6	25.3	24	28	31.5	33.8
Fiscal Deficit (of Centre and State)*	9.4	6.5	6.4	7.3	9.0	9.5	9.4	8.5	7.5	7.4
Inflation (WPI)**	-	8.0	4.6	4.4	5.9	3.3	7.2	5.5	6.4	4.4

Source: Reserve Bank of India Handbook of Statistics; Economic Survey, 2007

Note: * Expressed as % of GDP; **WPI for All Commodities with 1993-94 as base year

Table 7: Composition of Capital Inflows to India

	1990-91	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2003-04	2004-05	2005-06
Total Capital Inflows (Net) (US billion \$)	7.1	4.1	12	9.8	8.4	10.4	10	17.3	28.6	24.2
Composition of Capital flows (percent to total)										
1. Non-debt Creating Inflows	1.5	117.5	51.3	54.8	28.6	49.7	67.8	93.7	54.6	86.1
a. Foreign Direct Investment	1.4	52.4	23.7	36.2	29.4	20.7	40.2	25.8	21.4	32.7
b. Portfolio Investment	0.1	65.1	27.6	18.6	-0.8	29	27.6	67.9	33.2	53.7
2. Debt Creating Inflows*	83.3	57.7	61.7	52.4	54.4	23.1	59.4	-6.0	35.2	37.0
3. Other Capital	15.2	-75.2	-13	-7.2	17	27.2	-27.2	12.3	10.2	-23.1
4. Total (1 to 3)	100	100	100	100	100	100	100	100	100	100

Source: Report on Currency and Finance, Reserve Bank of India

Note: * Debt creating inflows include the following: external assistance; external commercial borrowings; short-term credit; non-resident Indian deposits and rupee debt service.