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THE CONSEQUENCES OF CURRENCY INTERVENTION IN INDIA

ILA PATNAIK

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INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS
Core-6A, 4th Floor, India Habitat Centre, Lodi Road, New Delhi - 110003

Foreword

Since the BOP crisis of 1991 there have been two views of the macro-economics of the Indian economy. One is the standard model of the open economy (widely applied and accepted in the advanced economies) that shows strong trade-offs between a stable exchange rate and monetary independence in the presence of global capital mobility. This is summarised in the "impossible trinity" namely that a country cannot simultaneously have an open capital account, a fixed exchange rate and monetary policy independence. This paper shows that net capital inflows during 1993-4 and 1994-5 were met by un-sterilised intervention: RBI purchased foreign exchange to keep the nominal exchange rate constant and thus to keep the real rate from appreciating. It concludes that as a consequence reserve money and M3 expanded leading to higher inflation and consequent real exchange rate appreciation. The paper then contrasts this with the second episode of capital inflows starting in April 2002, which was handled by sterilised intervention and reduced monetary growth. Inflation remained low but the gap between Indian and global short-term interest rates widened and the fiscal costs of accumulating reserves rose sharply.

An alternative Keynsian model with growth cycles seems more appropriate to some, for poor highly populated Asian economies like India. When the growth rate is high (above trend) there will be pressure on non-tradable infrastructure sectors and the economy will behave very much like the neo-classical full employment economy. The "impossible trinity" will have relevance in this situation. When the growth rate is low (below trend) it will behave much more like a Keynsian economy, with monetary/fiscal policy as potential drivers of short-term recovery, with any government debt accumulation still having a negative effect on interest rates in the medium term. From this perspective the 1991-1992 reforms transformed the investment environment leading to a fast recovery from the 1991-2 crisis and large capital flows ($6 bi between October 1993 and September 1994). The savings inflow reduced interest rates (on 91 day treasury bills) during 1993-94. Thereafter, rising investment led to rising interest rates as demand for credit increased along with economic growth which rose to unprecedented highs during 1994-5 to 1996-7. Inflation also rose from June 1993 given the constrained supply of (inefficient public monopoly) non-tradable infrastructure services, with money supply accommodating the rising demand for money from April 1994. In contrast the growth rate of the Indian economy, private credit demand, long term interest rates and inflation have been on a downtrend since 1997. Thus in 2002-3, sterilised intervention did not lead to a rise in interest rates (on 91day T bills). Short term interests may however been held up by controls and RBI policy resulting in a flat term structure, a rising gap between global and domestic overnight rates and consequent arbitrage flows.

The current paper brings out some of these issues in a very simple and effective way, though it does not directly address the Keynsian growth hypothesis. It also makes a case for the operation of the "impossible trinity" given the opening of our capital account, and shows how the forward exchange markets are useful indicators of expectations.

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Arvind Virmani
Director & Chief Executive
ICRIER

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The consequences of currency intervention in India

Ila Patnaik[*]
ICRIER, New Delhi

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Abstract

Currency management in India has focused on delivering low levels of currency volatility. In earlier years, the implementation of the currency regime was enabled by the presence of capital controls. In recent years, India has made much progress towards capital account convertibility. This paper closely examines India's experience with the implementation of the currency regime in two episodes: 1993-95 and after 2002. We argue that the implementation of the existing currency regime now induces distorted monetary policy and fiscal costs. These costs of implementing the currency regime need to be factored into the choice of currency regime.

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1 INTRODUCTION

A key idea in modern open economy macroeconomics is the notion that when a country with an open capital account tries to implement a fixed exchange rate, it loses monetary policy independence. While few countries operate *fixed* exchange rates, more generally, this idea suggests that there may be tradeoffs between a stable exchange rate and an independent monetary policy.

India embarked upon liberalisation of the current account and the capital account in 1991. Today there exist a number of channels, legal and illegal, through which capital flows can take place. Considerable amounts of domestic and foreign capital can flow in and out of India in response to interest differentials and currency expectations.

In 1993, India shifted towards a 'market determined exchange rate', where the exchange rate was determined on a market and not administratively determined. The behaviour of the rupee has, however, remained largely unchanged since 1979. Over this period, the rupee has been a *de facto* peg to the US dollar with low currency flexibility. The implementation of this currency regime has been mainly through direct intervention by RBI on the foreign exchange market.

We can envision two important ramifications of RBI's currency interventions.

In terms of the direct impact, intervention (purchase of dollars) may have a monetary impact where the accumulation of reserves results in an increase in money supply. These effects can be 'sterilised', where the increase in reserves is offset by an sale of government securities leaving no impact on reserve money. In this case, there will be 'quasi-fiscal costs' deriving from the substitution of domestic assets by foreign assets on the central bank's balance sheet. In addition, sterilised intervention is limited in the following sense: when RBI sells bonds, this tends to drive up domestic interest rates and invite further capital inflows.

In addition, a managed exchange rate can provide profitable opportunities for speculators. If RBI purchases $1 billion at Rs.46 from a speculator, and sells them back to the speculator at Rs.45, there is a fiscal cost of Rs.100 crore.

At the extreme, if speculators come to believe that the currency regime is unsustainable, there can be a speculative attack on the currency. Traditionally, there has been a focus on speculative attacks where a currency experiences a sharp devaluation.

The opposite is also feasible. Extremely large amounts of capital will come into India if speculators have expectations of a sharp appreciation of the rupee. A scenario in which a reverse speculative attack can come about is one where (a) speculators believe that the central bank will not engage in nonsterilised intervention, and (b) it is apparent that the central bank is running out of tools for sterilisation. Similarly, if speculators believe that the fiscal costs of maintaining the regime are unsustainable, given India's fiscal problems, this could result in a reverse speculative attack.

With this conceptual framework, in this paper, we closely examine two episodes in India's recent history.

The first one, which we label Episode I, took place with the surge in capital inflows into the country in 1993. At this time, RBI chose to intervene strongly to prevent a rupee appreciation

and maintained a fixed parity currency regime at Rs.31.37 per dollar. At the time, open market operations were not a viable strategy. At first, reserves accumulation led to a rise in M_3 growth. RBI chose to engage in a monetary tightening, to bring down the money multiplier, in order to try to contain M_3 growth.

Episode II began with a strong *current* account in 2001-02. From 1999-00 to 2001-02, net capital inflows into India were remarkably stable at around $10 billion per year. Episode II was initiated by a change on the current account of $6.1 billion per year over this period.

The rupee was under pressure to appreciate. RBI purchased dollars intensively in preventing large moves of the exchange rate on any one day. In this fashion, the operation of the currency regime led to a sharp reserves accretion.

In terms of monetary consequences, this time, RBI was able to exploit the market development of the government bond market. It was able to sell bonds through open market operations and achieve sterilisation. Money supply growth did not go up. However, government had to incur quasi-fiscal costs.

The operation of the currency regime also led to speculative views about future rupee appreciation. Until July 2002, typically, the INR-USD forward premium embedded expectations of rupee depreciation. From July to November 2002, the forward premium suggested that the market did not expect a change in the exchange rate. From November 2002 onwards, the forward premium suggests that there are expectations about a further rupee appreciation. This has ignited capital inflows. These capital inflows have, in turn, fueled reserves accretion.

These experiences highlight the applicability of the logic of open economy macroeconomics for India today. India appears to have made enough progress on opening the capital account, so that currency policy comes at the price of distortions in monetary policy. This is a different environment from that present in preceding decades, when it appeared that it was possible to implement the prevailing currency regime without a price in loss of autonomy on monetary policy.

Episode II has also given India a taste of how every currency peg is vulnerable to currency forecasting and speculation. While there may be rules in place which apparently prevent certain forms of currency speculation, there is enough openness on the current account and the capital account, through which currency speculation is taking place.

In terms of currency flexibility, India is strikingly embedded in the economic philosophy of the late 1970s. This paper argues that in the new framework of capital account convertibility, there are new costs of upholding such a currency regime. The benefits of this currency regime may well outweigh these costs. But it is important that these costs be recognised, measured, and factored into policy analysis.

2   Implications of the impossible trinity for India

A key insight of open economy macroeconomics, which has come to prominence in recent decades, has been the idea of the 'impossible trinity' (Mundell 1961). This consists of the assertion that no country can simultaneously have an open capital account, a fixed exchange rate, and monetary policy independence. Specifically, once the capital account is open, and

Figure 1 Currency volatility and interest rate volatility (2000), using data for 24 countries from Baig (2001)
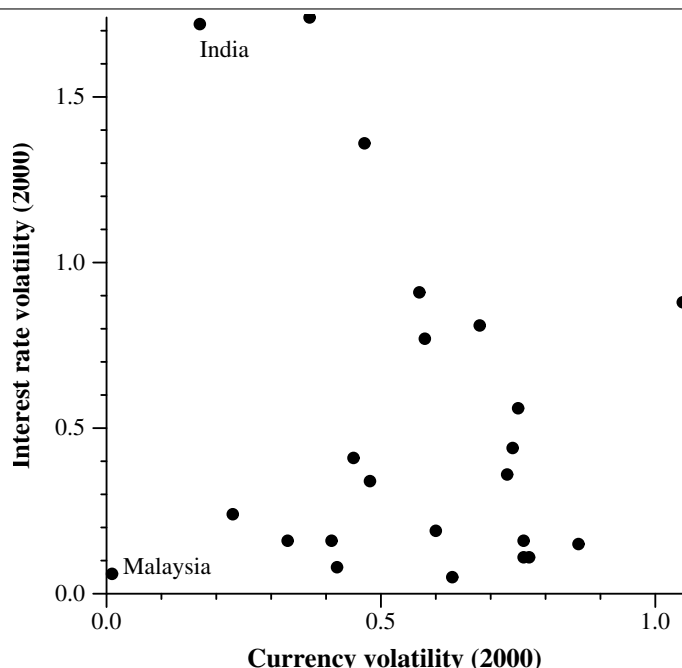
the exchange rate is fixed, monetary policy becomes determined by the needs of preserving the fixed exchange rate.

Suppose a central bank embarks on tight monetary policy with an open capital account and a fixed exchange rate. Tight monetary policy gives higher interest rates, which attract capital inflows. The central bank has to buy foreign currency in order to prevent appreciation. This gives higher money supply, which frustrates the attempt at having tight monetary policy.

Few countries today adhere to the extreme position of having a fixed exchange rate. However, many countries which try to 'manage' a 'market determined exchange rate' face similar conflicts. If the focus on the stability of the exchange rate is greater, a central bank may be willing to sacrifice autonomy of monetary policy. Indeed, the greater the extent to which the central bank targets a stable exchange rate, the greater the loss of control over domestic money supply.

In the post-war years, many countries chose to have autonomy in currency policy and monetary policy, and obtained this by closing the capital account. The steady increase in openness on the capital account, in recent decades, is forcing many countries to now grapple with the *tradeoff* between preserving currency policy and preserving monetary policy independence.

Figure 1 illustrates this idea using a scatter diagram, using data for 24 countries from Baig (2001), where the currency volatility and the interest rate volatility in the year 2000 are superposed. Broadly speaking, it appears that countries with lower currency volatility have higher interest rate volatility.

Under an open capital account, is a currency peg even feasible, given the liquidity of modern financial markets? There is a common perception that in a world where currency market

turnover exceeds $1 trillion a day, and the resources available to speculators on financial markets vastly exceed those with most governments, the defence of a currency peg is infeasible. However, as Obstfeld & Rogoff (1995) emphasise, the breakdown of a currency peg is seldom related to the *physical* inability of a central bank to defend a peg. They observe:

> If central banks virtually always have the resources to crush speculators, why do they suffer periodic humiliations by foreign exchange markets? The problem, of course, is that very few central banks will cling to an exchange-rate target without regard to what is happening in the rest of the economy. Domestic political realities simply will not allow it, even when agreements with foreign governments are at stake.

Most currency regimes can be defended, if monetary policy can be sufficiently subordinated to the goals of exchange rate stability. However, the welfare costs of such a course may often be unpalatable, and few governments have the political will to single-mindedly pursue exchange rate policy at the expense of monetary policy distortions. In this sense, the breakdown of a currency regime generally takes place when the political cost of upholding the regime is unacceptably high.

How relevant is the impossible trinity for thinking about India's problems? Figure 1 shows that India features a policy choice involving high interest rate volatility and low currency volatility. The recent literature (Patnaik 2003, Calvo & Reinhart 2002, Reinhart & Rogoff 2002) has argued that India has had highly limited currency flexibility over the 1979-2003 period. This literature has shown that while India made a great deal of progress on removing restrictions on the current account and capital account in recent decades, little has changed in terms of exchange rate flexibility.

The conceptual framework of the impossible trinity implies that as liberalisation of the current account and the capital account came about, India should have steadily faced constraints whereby monetary policy came to be strongly influenced by the compulsions of maintaining the currency regime (Joshi 2003). The implementation of low levels of currency volatility in 1979 could involve very different consequences, as compared with the implementation of that very regime in 2003, given a very different environment on the openness of the capital account.

2.1   How open is India's capital account?

The key question in thinking about the relevance of the impossible trinity for Indian macro policy is: *Does India have an open capital account?* It is often argued that India has a fairly closed capital account, and can hence continue to decouple currency policy from monetary policy. Indeed, many observers have argued that India was unaffected by the East Asian crisis owing to a closed capital account.

How open is India's capital account? To what extent can domestic and foreign economic agents move resources across the border, in response to speculative views about ex-ante rates of return? It is observed that even in the nineties trade misinvoicing on the current account was a significant route for capital flows (Patnaik & Vasudevan 2000). There now appear to be many avenues through which asset market considerations, about ex-ante rates of returns,

can shape capital flows. These avenues can be used to move resources in and out of India, and engage in currency speculation. These include:

- For foreign investors, there is substantial openness through FII and FDI routes. FII investment into the *equity* market is largely unconstrained. However, FII investments into bonds fall under the existing capital controls governing external commercial borrowings.

- Indian firms can engage in foreign currency borrowing, subject to certain restrictions. Speculative views about the currency can sometimes be expressed using prepayment as opposed to rollover of foreign loans. One avenue through which Indian firms have been engaging in offshore borrowing is through trade credit, which is now freely permitted for horizons upto three years.

- A broad range of entities can choose to hedge or not-hedge using the INR-USD forward market, which can be used as a tool for expressing speculative views about the exchange rate.

- Firms can engage in currency speculation using the OTC derivatives market. The OTC derivatives market features zero transparency and weak regulations, and is hence a useful vehicle for such transactions.

- Indian firms have flexibility in pre-payment or delaying payments for current account transactions, which can be utilised to implement capital movements or speculative views on the exchange rate.

- NRI deposits are a channel through which currency speculation can be done.

- Gold is a vehicle through which many capital account transactions can now be effected without running afoul of currency controls.

- There are legal mechanisms through which individuals can send a few thousand dollars out of the country. If such windows are used by sufficiently many households, they could add up to substantial capital flows.

Going beyond these legal avenues, illegal channels like over-invoicing and under-invoicing of imports and exports still exist. Myriad Indian firms are now tightly interwoven into global production chains with complex contractual arrangements. Transfer pricing can be used within these existing trade relationships to implement capital flows. India has substantial export-oriented industries in fields such as gems, software, etc. In these areas, it is particularly difficult for a government agency to detect significant capital flows disguised as over-invoicing or under-invoicing.

At first glance, India appears to have an elaborate set of currency controls and restrictions through which movements of capital, and currency speculation, are sought to be limited. The arguments above suggest that these efforts may be fairly futile in terms of actually impeding the movement of capital across the border and inhibiting currency speculation. There is a need to review this framework of controls in terms of evaluating their direct costs of implementation, and the deeper distortions that they induce, given that the capital account is (in any case) susbtantially open.

In an ideal neoclassical world, infinite capital would be deployed when economic agents have sound forecasts about a future asset price movement. India is in an intermediate stage where substantial (though not infinite) capital can come to play when expectations of a price movement exist. The amounts of capital that appear to be mobile now seem to be large when compared with the magnitudes seen in the balance of payments.

Hence, today, it appears that there is a case for ascribing substantial openness to the present situation with India's capital account. To the extent that this is the case, the impossible trinity becomes an important conceptual framework in understanding macro-policy in India. Specifically, obtaining low currency volatility through a *de facto* peg to the USD would come at the price of independent monetary policy under certain circumstances. In this paper, we examine these relationships in two specific episodes.

3 CURRENCY REGIME IN INDIA

Open economy macroeconomics first became relevant in India in the early 1990s. After many decades of exchange rate controls, India liberalised the current account in July 1991. After a 2 year period of transition, the rupee became fully "market determined" in 1993.

In 1993, the capital account was opened, and foreign portfolio investment came into domestic capital markets. For a wide variety of foreign investors, India has capital account convertibility. At the same time, domestic markets were liberalised to move away from administered interest rates. This has created a new and challenging environment for the conduct of monetary and currency policy.

While the capital account was opened up, the rupee continued to be managed by the RBI. Evidence from a number of studies that characterise India's currency regime suggest that the rupee has been nominally pegged to the US dollar since 1979 (Patnaik 2003, Calvo & Reinhart 2002, Reinhart & Rogoff 2002). Sometimes, there has been a fixed exchange rate peg (such as the period in the 1990s where the exchange rate was Rs.31.37 per dollar).

According to RBI, the exchange rate is "market determined", in the sense that there is a currency market and the exchange rate is not administratively determined. However, RBI actively intervenes on the market, with the stated goal of "containing volatility". In practice, this gives a crawling peg, where changes in the exchange rate are smoothed over a long time period.

Currency intervention by the RBI in the 1990s has usually taken the form of a net purchase of dollars that prevented the rupee from appreciating. Episodes of sale of dollars by the RBI have been far and few. One notable episode was during the Asian crisis when the RBI stepped in to support the rupee.

India has experienced market-oriented reforms in many aspects of the economy over the 1980s and 1990s. In each of these areas, the reforms of the last two decades have reduced the role of government in price formation, moved away from fixed or administered prices, and increased the reliance upon economic adjustment through responses to the free movement of prices. However, these kinds of reforms have not taken place in the context of exchange rate policy, where standard metrics show that there has been no substantial change in currency flexibility from 1979 onwards.

4 CURRENCY INTERVENTION AND ITS CONSEQUENCES

RBI faces three paths for implementation of India's *de facto* peg to the USD:

- Direct intervention on the currency market,

- Intervention on the currency market at the behest of RBI through other banks such as SBI,[1]

- Indirect instruments: money supply, interest rates, administrative controls.

It is sometimes argued that currency management can be done in isolation, without affecting other aspects of the macro-economy. It is felt that RBI can modify the market price of the rupee by purchasing or selling USD, which would increase or decrease the size of foreign currency reserves, without incurring any other costs. Such a position was well justified prior to 1992, given the level of repression on current account and capital account transactions that prevailed in India, backed by FERA. However, there is a considerable clarity in the field of open economy macroeconomics, on the downstream ramifications of currency intervention, which suggests that the implementation of currency policy in an open economy *does* have important costs, and consequences for macro-policy.

There are broadly two parallel strands of thought on this question:

- The first explores the *monetary impact* of currency intervention, where policy makers are faced with the choice of distorted money supply (and its consequences) or sterilisation (and its consequences). When sterilisation takes place, it has fiscal costs.

- The second strand of thought focuses on the direct fiscal costs of coping with successful *speculative behaviour* by private actors. With increasing openness of the capital account, many economic agents will engage in currency speculation, which can often generate speculative profits at the expense of the central bank and (ultimately) the exchequer.

4.1 Monetary implications

At the root of the conflict between currency policy and monetary policy lies the expansion in the monetary base due to the central bank's intervention in the currency market. The basic relationship is:

$$\Delta M_3 = m(\Delta \text{NFA} + \Delta \text{RCG})$$

where M_3 is broad money, m is the money multiplier, NFA are the net foreign assets and RCG is the RBI credit to government. When RBI buys USD on the currency market, NFA goes up. This relationship suggests two avenues for mounting a response:

Impact on reserve money The rise in NFA can be 'sterilised' by reducing the central banks's credit to the government. As Kletzer & Spiegel (2000) say:

> Sterilisation is usually the first policy response to a sudden rise in financial capital inflows. Under this policy central, banks swap domestic securities, such as government treasury obligations, for incoming foreign assets. The net impact of a sterilisation exercise is that the monetary base is unchanged, but the share of foreign reserves in central bank asset holdings have increased.

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[1]For example, Ghosh (2002) uses newspaper reports about SBI purchases of USD as a proxy for RBI interventions. However, in this paper, as we focus on the impact of intervention on reserve money and therefore only on the net foreign exchange assets of the RBI, we look only at the RBI's direct intervention.

In the extreme, if the change in net foreign exchange assets (NFA) is fully matched by an offsetting change in reserve bank credit to the government (RCG), there is no change in money supply (M_3). Another channel for sterilisation, which has been used by RBI to a substantial extent in 2003, consists of borrowing from banks through the repo market. Here, government bonds are pledged to banks when borrowing from them, instead of being sold outright to them through open market operations.

It is now well understood that sterilised intervention only works to a limited extent and only in the short run. The key insight lies in the fact that selling government bonds in the domestic market tends to raise domestic interest rates, which invites further capital flows.

Impact on money multiplier The second strategy which a central bank can adopt is to exploit monetary tightening which would reduce the money multiplier m. This would involve policy initiatives such as raising CRR, forcing public sector entities to directly hold accounts with the RBI, etc.

4.2 Speculation

In a floating exchange rate regime, exchange rates are 'ordinary' financial time-series. A floating exchange rate which is formed in a speculative price process is essentially like the prices produced in other speculative markets, such as the securities markets where governments do not directly participate. In such regimes, currencies generally follow random walks, and currency forecasting is not profitable. If the exchange rate is martingale, the best predictor of a future exchange rate is the present exchange rate. In the finance literature, this is called 'an efficient market'.

When the exchange rate is not floating, and there are opportunities for forecasting, economic agents can be expected to engage in a wide variety of strategies to exploit these forecasts:

- In a *fixed exchange rate regime*, normally, central banks suffer from no speculative losses. However, near-infinite capital would be brought to bear when speculators believe that the fixed exchange rate peg would break. When a speculative attack takes place, central banks can suffer substantial losses.

- In a *crawling peg*, if there is non-random walk behaviour, and future exchange rates can be forecasted, then economic agents would try to exploit these forecasts. In the case of India, Patnaik (2003) documents violations of the random walk for the INR/USD exchange rate.

  When a central bank intervenes strongly in order to maintain a crawling peg, it can incur substantial losses owing to successful speculation. When a speculator sells \$1 billion to RBI at Rs.46/\$, and buys it back at Rs.45/\$, RBI makes a loss of Rs.100 crore. Speculators may see such profitable opportunities when there is a large fundamental move in the exchange rate, which is broken up into many small one-day moves owing to the operation of a crawling peg.

Speculative attacks are dramatic and important events. The classical logic of the speculative attack applies when rational economic agents perceive that a currency is overvalued, and that the central bank has run out of ammunition to defend it (Krugman 1979). When expectations of a devaluation set in, rational agents are likely to utilise all avenues (legal and illegal) in order to take capital out of the country. In the environment of a speculative attack, capital flight becomes a one-way bet for a rational economic agent. If there were a speculative attack on the rupee, a person who converts INR into USD, and invests in US treasury bills, stands

to earn a return equal to (a) the return on a US treasury bill plus (b) the depreciation of the rupee.

In an environment of a speculative attack, where a central bank is supporting an artificially overvalued exchange rate, there is a rush to *use* the distorted exchange rate to take capital out of the country. This leads to a phenomenon where central bank reserves are swiftly depleted, after which devaluation must inevitably follow. Specifically, the time-series of the stock of reserves shows an abrupt drop in the period of a speculative attack.

In an environment of a speculative attack, it is particularly difficult for a central bank to make small adjustments in the exchange rate. A small depreciation gives profits to rational speculators, and can encourage even larger speculative positions.

In the present situation in India, it is useful to think about the *reverse scenario*. This has been studied in Grilli (1986). We call this a 'reverse speculative attack' (RSA) In a RSA, rational economic agents perceive that the central bank is at the limits of its ability to maintain an artificially *undervalued* currency. When expectations of an appreciation set in, rational agents would use every means possible (legal or illegal) to bring capital into the country.

If an appreciation of the rupee appears very likely, then for a person who converts USD into INR, and invests in GOI treasury bills, the total return works out to (a) the return on a GOI treasury bill plus (b) the depreciation of the USD. Once such expectations set in, there would be a rush by economic agents to exploit the above strategies, and try to get into INR at the prevailing (undervalued) rate. Specifically, the time-series of the stock of reserves would show an abrupt rise in the period of a RSA.

In an environment of a reverse speculative attack, it may be difficult for a central bank to make small adjustments in the exchange rate. A small appreciation would give profits to the rational speculators who have already established positions, and could encourage even larger speculative positions.

A RSA is clearly different from a conventional speculative attack, insofar as there is no well-defined budget constraint of a finite stock of reserves which dwindles down to zero, as in a conventional speculative attack. As emphasised in Section 2, the key question concerns the extent to which speculators believe that the central bank is willing to distort monetary policy in order to sustain the currency regime. For example, if it is believed that the central bank will not engage in nonsterilised intervention, then an environment of an RSA can come about when it becomes clear that the instruments for sterilisation are becoming inadequate. More generally, when it appears that the political costs of sustaining the currency regime are unsustainable, a RSA could ensue.

Kletzer & Spiegel (1998) find that the spikes in estimated fiscal costs during capital inflow surges may represent periods of speculative attack on nominal exchange rate pegs, where the central bank is actively attempting to prevent exchange rate appreciation.

4.3   Fiscal aspects

In the case of sterilised intervention, Calvo (1991) warned about the 'quasi-fiscal costs' which ensue when central banks exchange high-yielding domestic government debt for foreign secu-

rities typically paying lower nominal yields. Quasi-fiscal costs (QFC) include the accounts of parastatal enterprises such as the central bank.

It is important to emphasise that QFC only pertain to *sterilised* intervention, where there is a manifestly visible substitution of a high interest rate security by a low interest rate security. One additional correction, which needs to be borne in mind, is that the conventional estimates of QFC are upwardly biased insofar as the higher interest rates on Indian government bonds partly reflect a risk premium for higher credit risk.

The fiscal costs of sustaining a currency regime may thus be expressed as the sum of three components:

1. Quasi-fiscal costs of sterilisation (if sterilised intervention is taking place),

2. Speculative losses suffered when implementing a crawling peg, and

3. Speculative losses in a speculative attack or a reverse speculative attack, in the event that such a speculative attack should take place.

These costs are generally not transparently visible on the balance sheet of the central bank. However, these costs are genuine economic costs and need to be recognised as such.

4.3.1 International experience with quasi-fiscal costs of sterilised intervention

Surges in capital inflows in a number of countries such as those in the Pacific Basin in the 1980s and early 1990s led to concerns about the implications of capital inflows for the exchange rate. If the exchange rate was floating, these inflows could lead to an appreciation of the currency, and loss of competitiveness. Many central banks resorted to sterilised intervention, in order to try to have a currency policy without simultaneously subordinating monetary policy.

Calvo et al. (1993) and Khan & Reinhart (1994) report estimates of quasi-fiscal costs for Latin America, based on observed spreads between domestic and foreign assets, and the size of foreign exchange reserves. Their studies indicate that these costs can go up to 0.25 to 0.5 per cent of GDP. Kletzer & Spiegel (1998) report estimates of quasi-fiscal costs for the Pacific Basin nations with similar magnitudes, but show that surges in capital inflows can result in quasi-fiscal costs rising up to over one percent of GDP. They say:

> If QFC represent a significant cost to government, it may play a role in the timing of the abandonment of a sterilisation program. Since the sterilisation program represents an effort to maintain a downward peg on a nominal exchange rate while maintaining a monetary policy objective, a central bank that decides that these costs have become too high will rationally choose to abandon such a program, either by allowing is exchange rate to appreciate or its money supply to rise.

The response to rising quasi-fiscal costs has varied across countries. Kletzer & Spiegel (1998) find that in response to rising QFC, Philippines, Mexico and Taiwan reduced the extent of sterilisation. While the increase in domestic credit was still contained, it no longer fully offset the impact of capital inflows. Other countries, such as Indonesia, Korea and Singapore maintained their sterilisation programs in the face of quasi-fiscal cost surges. In these countries domestic credit growth did not expand.

Table 1 Evolution of BOP in Episode I

	(Billion USD)	
Year	Current account balance	Net capital Inflows
1991-92	-9.6	3.7
1992-93	-1.2	2.9
1993-94	-1.2	9.6
1994-95	-3.4	9.1
1995-96	-5.9	4.7
1996-97	-4.6	11.5

Another response to rising QFC has been to give up the erstwhile currency policy. In Singapore, after the sudden rise in inflows, the central bank reduced its intervention in the forex market. Consequently, the nominal and real exchange rate appreciated significantly. Similarly, Chile and Spain widened their exchange rate band and allowed some appreciation (Kletzer & Spiegel 1998).

5 Episode I

With this conceptual framework, we now turn to a closer examination of two episodes where the relationships between currency intervention and monetary policy are clearly visible.

5.1 Initiation

The first episode that we study was caused by the surge of capital inflows in 1993-94 and 1994-95.

This inflow was partly the result of allowing foreign institutional investors (FIIs) to invest in Indian stock markets for the first time, greater flexibility for foreign direct investment (FDI), etc. FII inflows rose from $307 million over July-September 1993, to $935 million over October-December 1993, to $2283 million over January-March 1994.

The net capital inflow of over USD 9 billion during 1993-94 and 1994-95, though small by world standards, was over thrice that in previous years (see Table 1).

We identify Episode I as running from March 1993 to April 1995. However, in order to better understand this period, it proves to be useful to also examine data for some months before and after these dates.

5.2 Policy stance

Faced with this surge in capital flows, policy makers needed to make choices about currency intervention, sterilisation, etc. As Virmani (2001) observes:

> "In dealing with the monetary and exchange rate implications of the flow a three fold strategy was suggested:

Figure 2 Currency intervention in Episode I
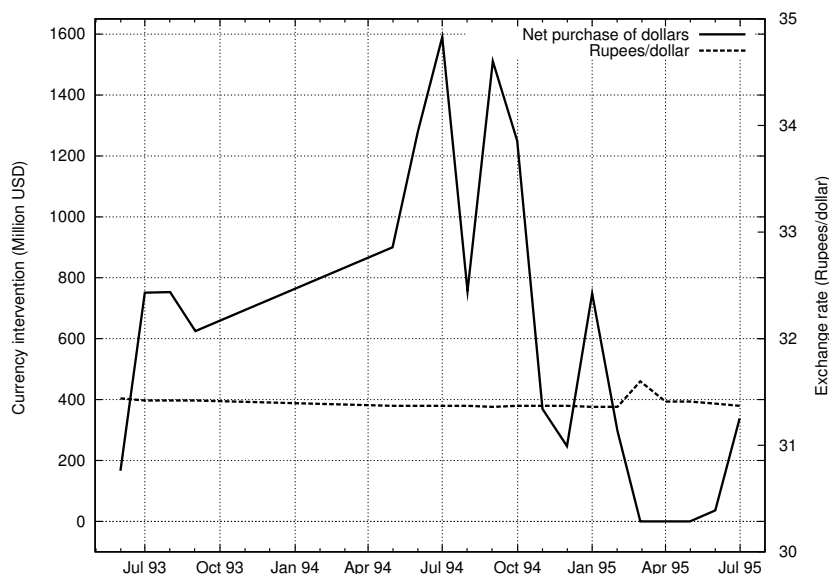
1. To absorb the temporary part of the upsurge in reserves and to partially sterilize the reserve build-up. The inflation rate would be carefully watched so that the sterilised proportion could be stepped up if pressure built up on the inflation front.
2. To not sterilise the permanent increase in the inflow so that it could increase the capital available in the economy, reduce real interest rates and stimulate investment.
3. To accelerate the opening up of the current and capital account to improve the efficiency of the economy so that these permanent inflows would be productively utilised."

Similarly, Acharya (2002) observes:

"Partial sterilisation of the foreign asset cumulation was undertaken through an increase in reserve requirements and some open market sale of government securities by the RBI . Fuller sterilisation operations were constrained by:

- The lack of depth in the government securities market,
- The sharp increase in new goverment securities because of major fiscal slippage in 1993-94 and
- A policy choice not to throttle monetary expansion at early stages of an investment boom."

Through such thought processes, RBI chose to engage in large scale intervention on the currency market. In particular, for a period that ran from 15/11/1993 to 3/3/1995, RBI effectively chose to operate a fixed exchange rate regime with Rs.31.37 per dollar.

5.3 Consequences

In a fixed exchange rate regime, there is a possibility of dramatic speculative attack. Apart from this, the normal operation of a fixed exchange rate regime does not induce currency speculation. However, this does introduce extreme reserves volatility. In India's case, in Episode I, in order to support the fixed exchange rate regime, RBI had to resort to buying USD on the market on a large scale.

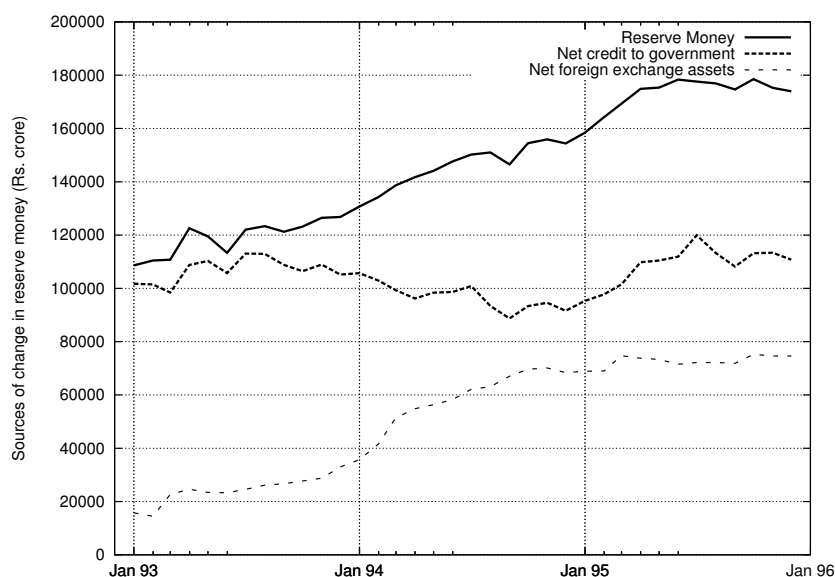**Figure 3** Sources of growth in reserve money in Episode I

Table 2 Monetary tightening in Episode I

Date	Action
11-Jun-1994	Cash Reserve Ratio (CRR) was raised from 14% to 14.5%.
09-Jul-1994	CRR was raised to 14.75%.
06-Aug-1994	CRR was raised to 15%.
29-Oct-1994	CRR for Foreign Currency Non-Resident (FCNR) Accounts was raised from 0% to 7.5%.
21-Jan-1995	CRR for Non-Resident accounts raised from 0% to 7.5%, and CRR for FCNR accounts was raised to 15%.
17-Jul-1995	Conditions for overdraft facility to stock brokers to draw money from banks were made more stringent.

Figure 3 shows that net foreign exchange assets increased sharply as a consequence of the currency intervention. For a variety of reasons, RBI chose to not engage in sterilisation through transactions on the secondary market. RBI credit to the government did not go down in order to compensate for currency intervention.

Hence, money supply grew sharply. Growth rates of over 20 per cent in M3 were witnessed in the second half of 1994. This was accompanied by an increase in the inflation rate. By December 1994 inflation had risen to over 15 per cent. (Figure 4). Whether inflation rose due to monetary factors or real side constraints is debatable, however, monetary policy was conducted within the RBI's intellectual framework where it was believed that higher monetary growth can be inflationary.

As a consequence, this led to an attempt by RBI to control the growth of money supply by reducing credit offtake, so as to contain the money multiplier. In an attempt to impact upon m, the cash reserve ratio was raised in June 1994. RBI consistently raised reserve requirements over the next few months (Table 2).

Figure 5 shows the phase of monetary tightening in 1994-95, as reflected in the short end of

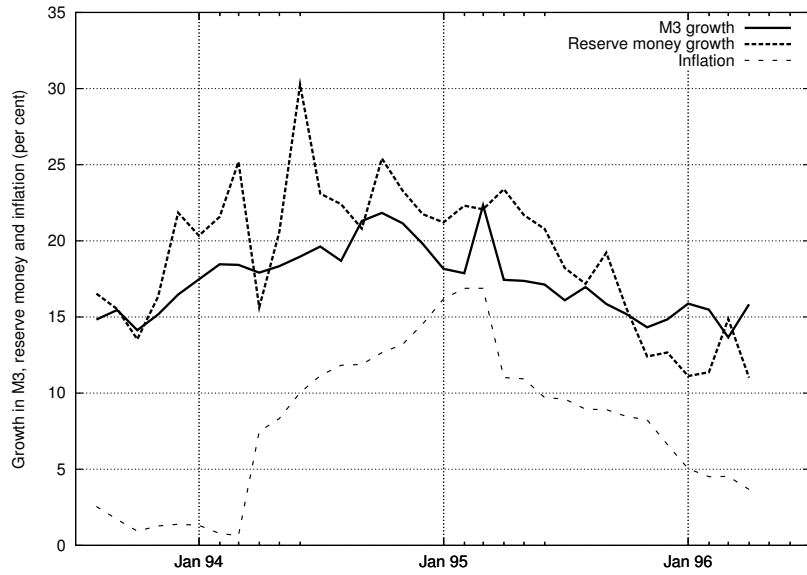**Figure 4** Money supply and inflation in Episode I

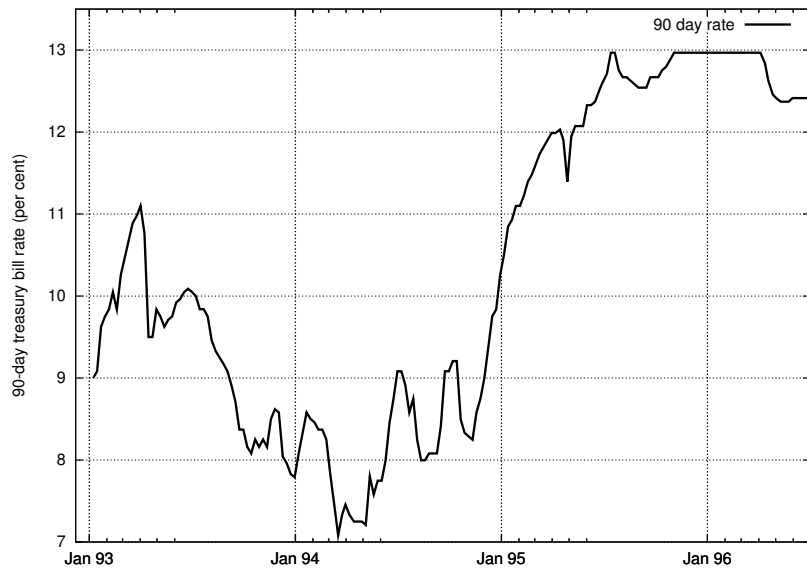**Figure 5** The 90–day treasury bill rate, Episode I

Table 3 Evolution of BOP in Episode II

	(Billion USD)		
	Current account balance	Net capital Inflows	Change in Reserves
1999-00	-4.7	10.2	+5.5
2000-01	-2.6	9.0	+4.3
2001-02	+1.4	9.5	+11.8
2002-03	+3.7	13.3	+21.3

the yield curve. The sharp rise in the 90 day rate between Jan 1994 and July 1995 took place at a time when money supply growth was high, even going beyond 20 per cent per annum. While this is puzzling, it might be explained partly by the thinness of the market and RBI's inability to sterilise monetary expansion while being able to impact short term rates directly.

Since the capital account was only partially open, higher interest rates did not directly attract additional capital. From September 1994 onwards, the equity index produced weak returns. Episode I may be said to have ended in 1995, when the volume of net capital inflows fell to nearly half that of the 1993-95 levels. Reserve money growth declined and M3 growth fell.

In this episode even though the RBI intervened to keep the nominal exchange rate fixed, the real exchange rate appreciated due to higher inflation in India. By 1995-96 the current account deficit had again risen to nearly USD 6 billion and was higher than net capital inflows thus depleting reserves, bringing down the growth in the monetary base and the stock of money.

6 Episode II

We identify Episode II as having commenced in April 2002. As of September 2003, this episode has not yet ended.

6.1 Initiation

In this period, official documents sometimes refer to currency interventions as being motivated by 'a capital surge'. However, the evidence (Table 3) shows a remarkably stable capital account in 2001-01 and 2001-02. From 1999-00 to 2001-02, net capital inflows into India were stable at roughly $10 billion per year. In contrast, it was the current account which switched around, from a deficit of $4.7 billion (1999-00) to a surplus of $1.4 billion (2001-02). This change (of $6.1 billion per year) was the major change which took place over this period.

Thus, in contrast with Episode I, this time, currency intervention was first motivated by a current account surplus rather than by a capital surge. The capital surge only took place from 2002-03 onwards. Foreign exchange reserves with the RBI grew sharply in 2001-02, that is, before the increase in capital inflows in the following year.
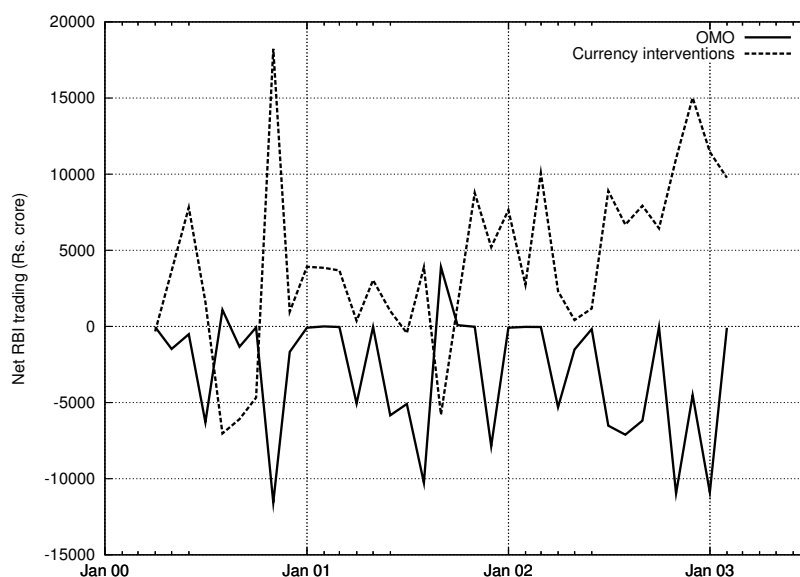
Figure 6 Currency intervention in Episode II

Table 4 Sources of reserve money growth in Episode II

Year	ΔNFA	RBI Credit to Govt.	Reserve Money	ΔNFA/ ΔRM
		(Rs. crore)		
1997-98	21,073	10,979	26,417	0.80
1998-99	22,064	17,379	32,884	0.67
1999-00	27,926	-4,275	21,269	1.31
2000-01	31,295	5,613	22,756	1.38
2001-02	66,794	-1,699	34,659	1.93
2002-03	**94,275**	**-32,076**	30,961	**3.04**

6.2 Policy stance

Figure 6 shows that RBI's intervention and the increase in net foreign exchange assets of the RBI have been systematically sterilized by open market operations of the RBI. In this figure, we see a striking and inverse relationship, where months with high purchases of USD were months where substantial sale of GOI bonds took place.

Through this, reserve money did not grow despite the increase in NFA. Instead, the share of NFA in reserve money increased sharply from 0.65 in 2001 to 0.78 in 2002 to 0.98 in 2003. Figure 7 shows the sharp decline in the share of RBI credit to the government in reserve money. As a consequence growth of reserve money remained under control (Table 4).

Since sterilisation was possible through the simplest route, i.e. open market operations, the route to reducing money supply through changes in reserve requirements, as in the first episode, was not required. On the contrary, the cash reserve ratio was reduced as part of the long term monetary policy objective of reducing financial repression and the burden on the banking sector. Figure 8 shows the steady pace of reducing CRR in this period.

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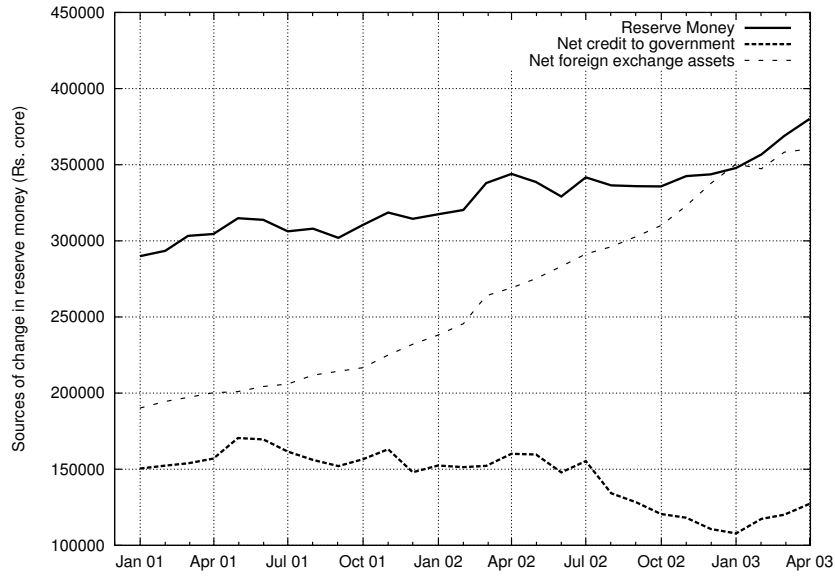
Figure 7 Sources of growth in reserve money

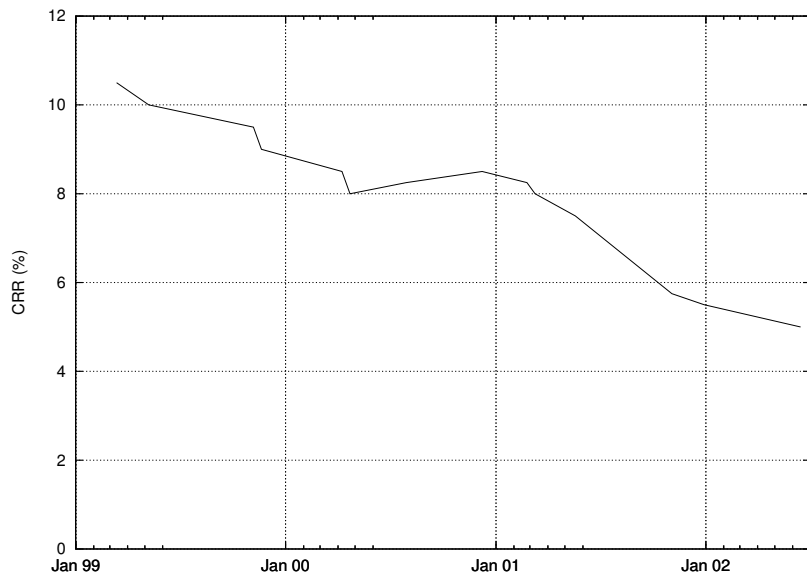**Figure 8** Drop in CRR in recent years

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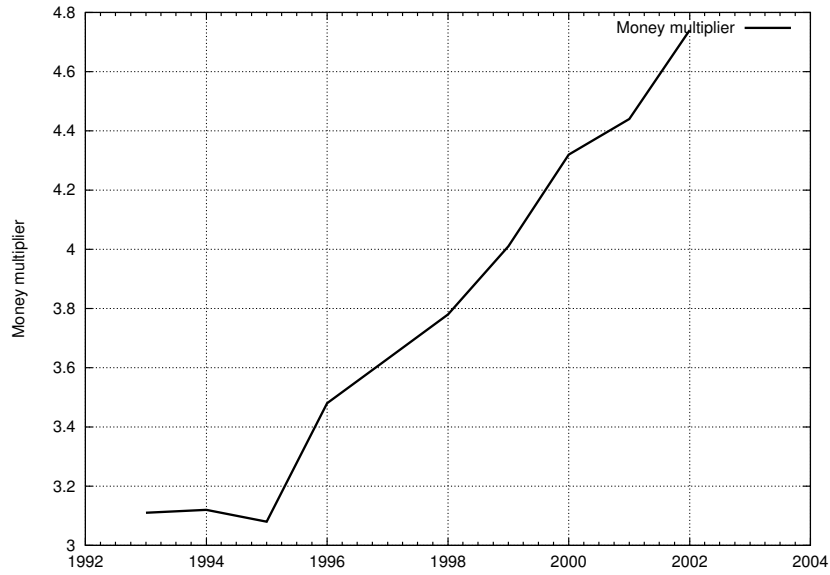**Figure 9** Money multiplier in recent years

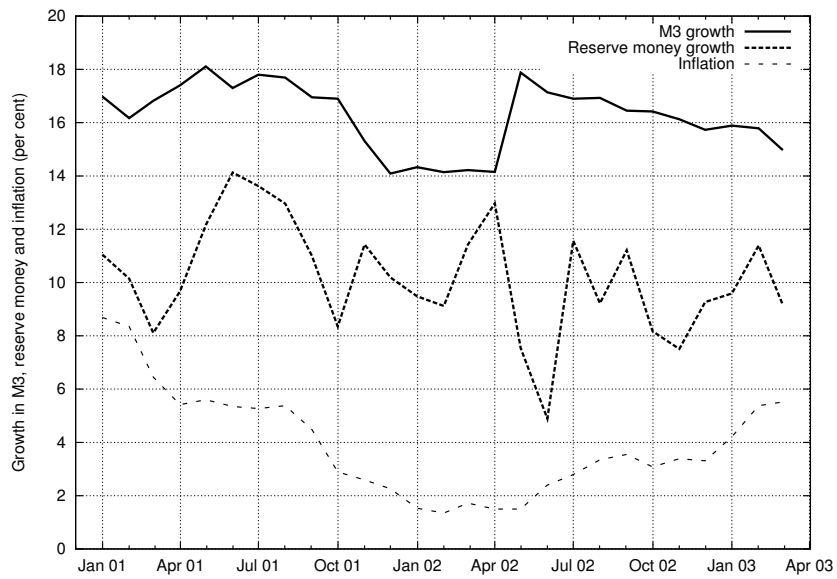**Figure 10** Money supply and inflation in Episode II

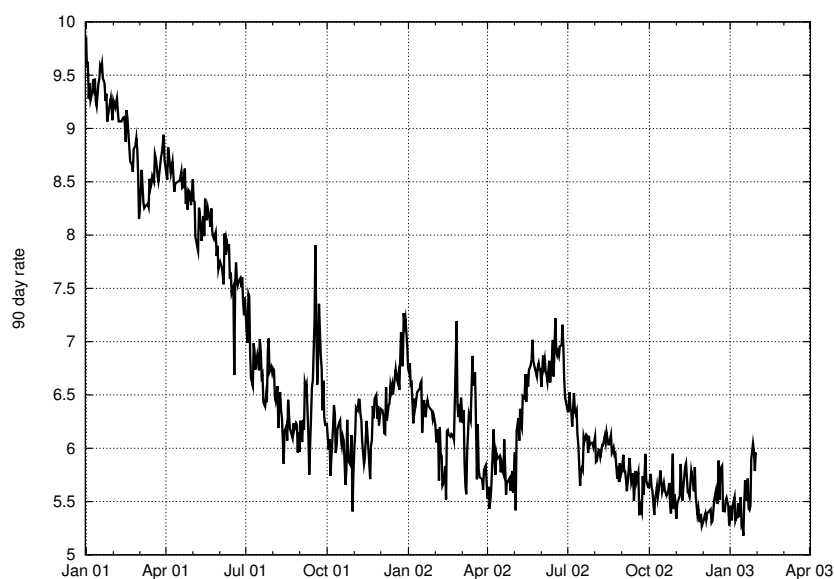**Figure 11** Evolution of short rate in Episode II

Table 5 Counterfactual: Episode II without sterilisation

Year	Sterilisation	Modified RM	M_3 growth	
			Simulated	Actual
1999-00	-4,275	284,830	16.35%	14.60%
2000-01	5,613	297,698	12.79%	16.67%
2001-02	-1,699	339,669	17.11%	14.37%
2002-03	-32,076	401,007	**24.34%**	14.97%

As a consequence, the money multiplier increased in value during this period (Figure 9). However, as a result of the large scale of sterilisation and the low growth of reserve money, the growth of money supply remained under control, despite the cuts in CRR and the increase in the money multiplier. Inflation was fairly low, and except for a few months when it rose due to the impact of higher petroleum and edible oil prices, it remained within acceptable levels (Figure 10).

Since money supply growth remained under control, the need to tighten money supply by pushing up interest rates as in the case of the first episode, also did not arise. On the contrary, interest rates were lowered as part of the a softer interest rate regime. Since inflation rates had declined, real interest rates were high. The bank rate and repo rates were reduced by the RBI during this period. Figure 11 shows the time-series of the short rate on the spot yield curve.

Sterilisation was central to this set of outcomes. Table 5 shows the growth of M3, had the RBI had not sterilized its forex intervention. In 2002-03, M3, which grew by 13.75 per cent, would have grown by 24.3 per cent. At this time, the targeted levels of money supply growth were 15-16 per cent, so growth of 24 percent would have been unacceptable. In 1994, when money supply growth had been allowed to rise to over 20 per cent, there had been attempts at severe monetary tightening. In the absence of open market operations, this growth might

Table 6 Counterfactual: Episode II using m of 1995-96

Year	Sterilisation	Modified RM	M_3 growth	
			Simulated	Actual
1999-00	-4,275	284,830	9.85%	14.60%
2000-01	5,613	297,698	4.52%	16.67%
2001-02	-1,699	339,669	14.10%	14.37%
2002-03	-32,076	401,007	**18.06%**	14.97%

Table 7 Quasi-fiscal costs in Episode II

Year	NFA	Interest	QFC as percent of	
	($ Bln.)	difference	GDP	Interest Exp
2001-02	55	4.5	0.56	8.05
2002-03	75	3.5	0.56	8.53
2003-04(Projected)	100	3.5	0.67	11.38

have been contained by sharp increases in the cash reserve ratio.

Table 6 shows that if the money multiplier had been raised to the 1995-96 levels, money supply growth could have been brought down to 18 per cent. RBI policy of sterilising its intervention was able to contain money supply growth *without* raising higher reserve requirements or interest rates. In other words, money supply and inflation in Episode II were controlled without the financial repression and tight monetary policy that marked Episode I.

6.3 Consequences

Through this episode, to the extent that speculators have been able to successfully forecast the exchange rate, RBI has been incurring speculative losses. Further, by sterilising its intervention the RBI prevents domestic interest rates from falling. This prevents the absorbtion of capital inflows into the economy by a rise in investment. Growth foregone due to sterilised intervention can be significant (Lal et al. 2002).

In this section, we focus on the quasi-fiscal costs of sterilised intervention. We estimate the quasi-fiscal costs of the sterilized intervention in 2001-02, using ideas from Kletzer & Spiegel (1998). We focus on the interest differential between the returns on domestic government bonds and foreign interest rates times the amount of foreign exchange reserves held by the central bank. Our estimates are based on interest differentials as estimated by RBI (RBI 2003).

Our estimates suggest that sterilised intervention by the RBI between April 2001 and March 2002 cost an estimated Rs 2813.3 crores as QFC. This is about 0.56 percent of GDP in both 2001-02 and 2002-03. (Table 7). If reserves were to rise to USD 100 billion next year, and assuming GDP growth and inflation rates of 6 per cent each, quasi-fiscal costs could rise to 0.67 per cent of GDP or roughly 11% of the interest expenses of GOI. These are substantial values, when compared with the experience of other countries which have attempted sterilised intervention. If USD 25 billion are added to reserves in 2003-04 then with an average interest

differential over the year of 4 percent and the INR/USD rate at Rs 47 there will be an additional cost of Rs 4500 crore to the RBI.

6.4 India's currency forward market as a unique source of information

The INR/USD forward market is a particularly important source of *information* about currency expectations. In a conventional forward market, arbitrage strongly defines what the forward rate should be. Even if there are strong speculative views and positions on the market, in a normal forward market, there is no interesting interpretation that we can attach to the level of the forward premium - since this is purely determined by covered interest parity. When violations of market efficiency arise, near-infinite capital comes into play in arbitrage, and tends to push the forward price back to fair value.

The forward market in India, in contrast, is an interesting source of information because RBI rules impose sharp restrictions upon the ability of banks to engage in covered interest parity arbitrage. This serves to break the link between the spot and the derivative. Official pronouncements from the RBI have periodically claimed that this extreme policy position, which makes an efficient dollar-rupee forward market impossible, is driven by the *goal* of separating currency policy from monetary policy.

When arbitrage does *not* determine prices, information from the forward market is genuinely interesting insofar as it conveys expectations about the future. If economic agents expect the rupee to depreciate, there would be a greater interest in selling rupees forward – exporters would stay unhedged, and importers would be likely to hedge. Conversely, if economic agents expect the rupee to appreciate, there would be greater interest in buying rupees forward.

If RBI rules did not restrict arbitrage, then the forward premium would be non-informative. Under the existing policy framework, it is a uniquely useful market-based measure of future expectations; one that is not available in other countries where regulators do not inhibit arbitrage.

The arithmetic of forward pricing is based on 'covered interest parity'. Covered interest parity involves comparing two routes for riskless USD investment. An investor could convert \$1 into $(1 + r_u)^T$ through r_u, which is obtained from the US zero coupon yield curve for T years. Alternatively, the investor could convert into INR at the spot price S, invest in the GOI zero coupon yield curve and obtain a locked-in cashflow of $S(1 + r_i)^T/F$ by converting back into USD at the rate F at date T. Under no-arbitrage, these two investment strategies have to yield an identical return, through which the fair value for F can be computed. Once we know the fair value, we can measure the error when compared with the observed market price.

Apart from conveying expectations of the market, the error between the observed forward premium and its fair value also shows the arbitrage opportunity available to a foreign investor.

6.5 Speculative capital inflows

In Episode I, when RBI chose to prevent the appreciation of the rupee, the exchange rate stayed fixed at Rs.31.37 for an extended period of time. This was like a fixed exchange rate

Figure 12 INR appreciation in Episode II
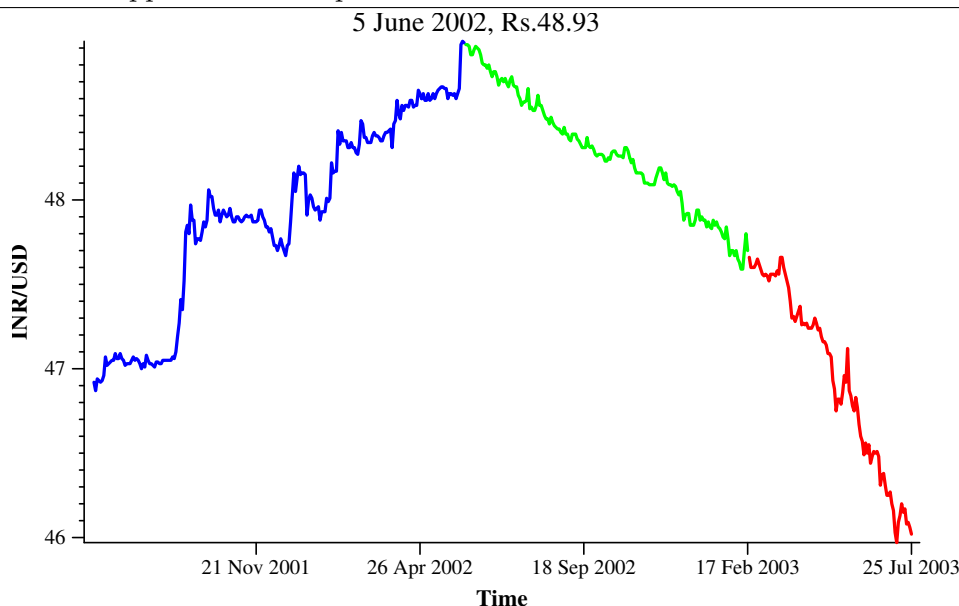
regime, and the key question (from a speculative viewpoint) was about when the peg would be abandoned.

In Episode II, there was no rate around which the RBI tried to defend the USD. RBI has followed a policy of preventing large moves of the currency, so that on most days, the INR/USD exchange rate has changed by less than Rs.0.1. This has given trends in the exchange rate (see Figure 12). At the same time, the *volatility* of the INR-USD exchange rate was unusually low (See Figure 13). Hence, economic agents faced a situation where it appeared that future exchange rates could be forecasted with a certain degree of confidence.

Apart from time-series forecasting by economic agents, we may also expect considerations based on QFC. With the level of the reserves rising, and high quasi-fiscal costs associated with sterilisation, there could be expectations of a more flexible currency policy. In addition, this was a period where the US dollar had been sharply depreciating versus the Euro and the Yen. This could have raised expectations of a rupee appreciation.

There are three elements of evidence about the extent to which economic agents have tried to setup positions based on currency forecasts.

Forward premium Figure 14 superposes the fair value of the forward premium for the 90-day forward market, computed through covered interest parity, and the actual forward premium observed in India. This shows that until July 2002, the observed premium was higher than the fair value. This reflected expectations of a currency depreciation. From July 2002 till November 2002, the forward premium was at value derived from covered interest parity. From November 2002 onwards, the market forward premium dropped below the fair value.

From March 2003 onwards, the forward premium has dropped sharply. This partly merely reflects the change in fair value (i.e. changes in the 90-day rate in India and in the US). However, there has also been a widening of the gap between the two series.

Figure 15 shows the time-series of the *error* between the actual and the fair value of the

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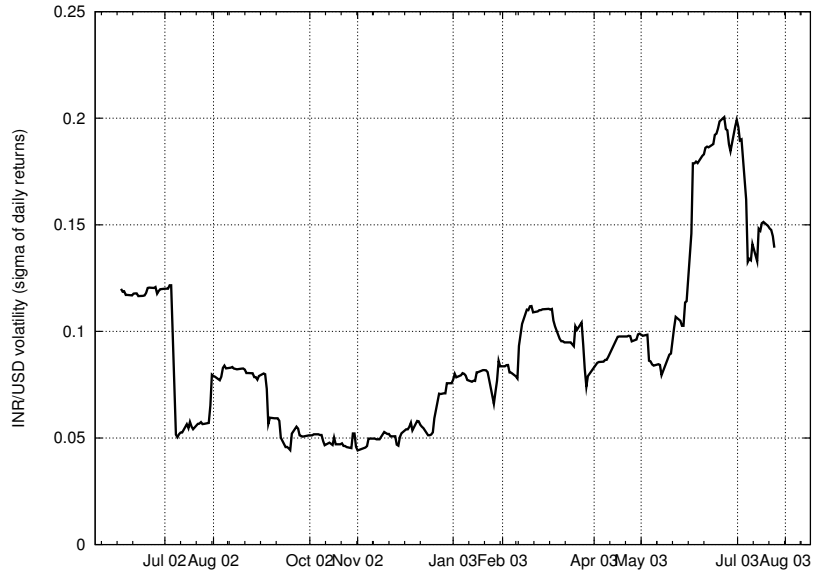**Figure 13** INR-USD volatility in Episode II

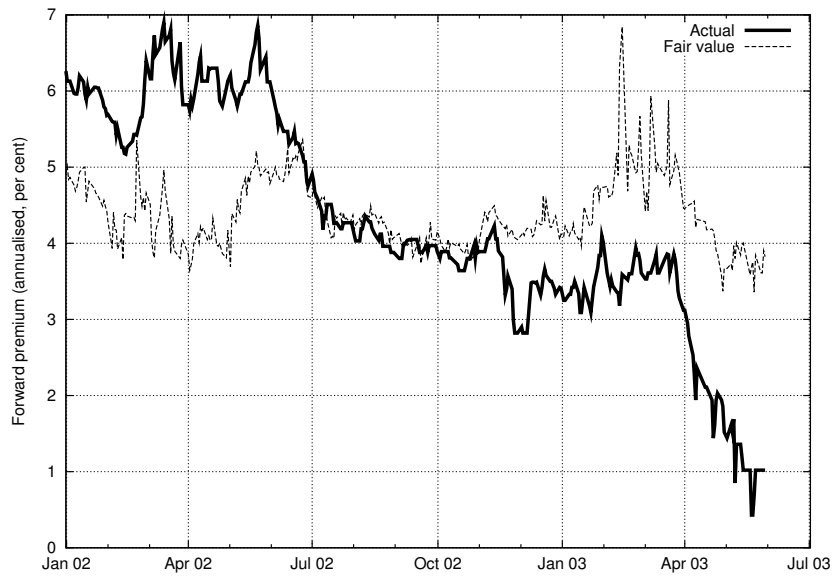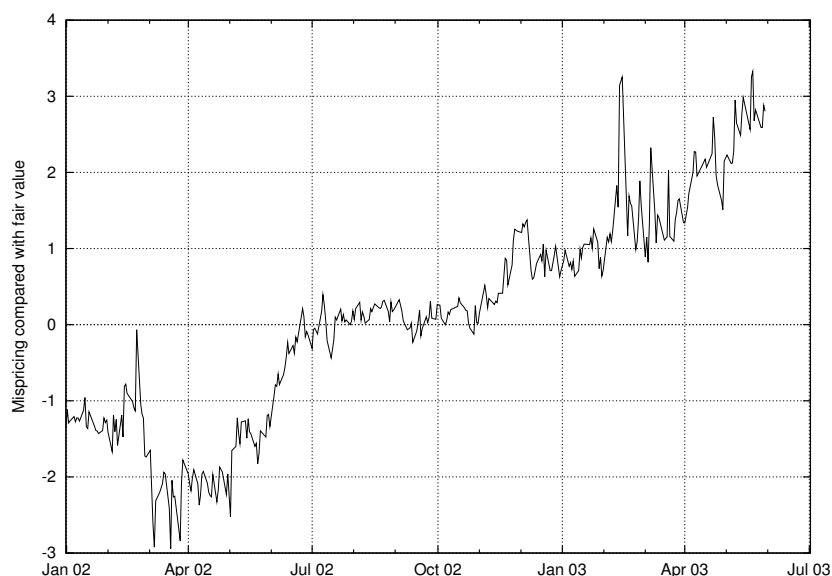**Figure 14** INR/USD forward premium : actual and fair value

Figure 15 INR/USD forward premium: Error between actual and fair value

INR/USD forward premium. This highlights the change, between expectations of deprecia-tion from March 2002 to May 2002, and the expectations of appreciation seen from November 2002 onwards.

Apart from conveying expectations of the market, the error between the observed forward pre-mium and its fair value also shows the arbitrage opportunity available to a foreign investor. In recent months, this shows excess returns of over 200 basis points, for a foreigner who buys GOI bonds and has a locked-in repatriation into USD at a future date using the forward market.[2]

Going by this figure, under conditions like those prevalent from March 2002 to May 2002, there are incentives to take capital out of India. Under conditions like those prevalent from November 2002 onwards, there are incentives to bring capital into India.

NRI deposits The period after June 2002 has also seen an increase in NRI deposits, especially the rupee denominated NRE deposits, as interest rates higher than international rates combined with expectations of rupee appreciation, make these rupee deposits attractive. Non Resident External (NRE) accounts are repatriable accounts, a facility for non-resident Indians whereby which they can deposit foreign currency in Indian banks in rupee accounts and withdraw money in the foreign currency. This gives them the rupee rate of interest as well as a return due to currency appreciation or depreciation. High interest differentials and expectations of rupee appreciation create arbitrage opportunities for capital inflows into NRE accounts. 2002-03 saw a sharp increase in deposits in NRE accounts. An RBI statement issued on the subject, however, shows that part of this is due to retirement of NRNR accounts, a facility that has been closed since April 2002. The total deposits in NRI deposits has not increased beyond trend levels. They rose from USD 2728 million in 2001-02 to USD 2804 million in 2002-03.

FII purchase of debt In recent weeks, there has been a sharp increase in the purchases by FIIs of

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[2]Strictly, the observed forward premium should be slightly higher than that computed from covered interest parity, owing to the country credit risk premium required for India exposure. However, the failure probability of a GOI bond on a 90-day horizon is likely to have been negligible through this period. Hence, this is unlikely to be an important issue in our analysis.

Table 8 Summarising Episode I and Episode II

Aspect	Episode I	Episode II
Initiation	Liberalisation on capital account	Current account
Policy stance		
Currency regime	Fixed parity	Crawling peg
Sterilisation	Partial	Full
Consequences	Monetary expansion; financial repression	Monetary targets attained; Speculative losses; quasi-fiscal costs.

debt. This is consistent with the existence of exceptionally attractive rates of return faced by capital inflows into India.

FIIs as a whole face a ceiling of investment of no more than $1.5 billion in government securities. Hence, this is not a channel through which substantial capital flows can materialise. However, this does constitute a source of *information* about currency expectations, and the responses of rational agents.

7 CONCLUSIONS

A key insight into Indian macroeconomic policy today is based on the impossible trinity. India has broadly had a *de facto* peg to the USD, with very low currency volatility, from 1979 onwards. In the early years of this regime, India did not face the impossible trinity, owing to harsh currency controls based on FERA. In that world, it was accurate to argue that the implementation of currency policy could be done without substantial costs.

Starting from 1993, and particularly in the last five years, India has obtained a revolution in terms of external sector policy, owing to greater openness on the current account and the capital account. This gave substantial flexibility to domestic and foreign economic agents to move resources across the border, and to engage in currency speculation.

This revolution requires a fresh analytical paradigm for thinking about questions surrounding the currency regime. This openness implies that Indian macro policy is increasingly constrained by the impossible trinity. In this world, preservation of the *de facto* peg to the USD, with very low currency volatility, would increasingly crowd out autonomous monetary policy.

We see such constraints upon policy, in operation during the two episodes examined in this paper.

In Episode I, the impact on the exchange rate of a surge in capital inflows in 1993 was sought to be blocked by currency interventions. This had major consequences for monetary policy over 1994-1996. Partial sterilisation was done, through monetary tightening which reduced the money multiplier. Perhaps the most remarkable thing about Episode I was the extent to which a small external sector, and extremely small capital inflows, were able to impact upon a substantially larger domestic economy.

Speculative behaviour in Episode I was muted, for two reasons. First, in Episode I, RBI chose to operate a fixed exchange rate regime. In a fixed exchange rate regime, there are no profit opportunities on a day-to-day basis. There may be dramatic profits when a speculative

attack brings down the fixed exchange rate regime. However, Episode I did not end in a dramatic speculative attack. The second issue was openness on the current account and the capital account. In the early 1990s, India had begun some limited steps towards freeing up the current account and the capital account. However, there were relatively few vehicles through which economic agents could express speculative views.

Episode II, which has not yet ended, differs from Episode I in many interesting ways. Episode II began as a current account problem. The currency regime consisted of a crawling peg and not a fixed exchange rate regime. This lent itself to opportunities for speculation, and thus created a surge of capital inflows.

By this time, India had made major progress in having a secondary market for government bonds. Hence, sterilisation was feasible through open market operations. RBI used these with considerable success to attain goals of monetary policy. However, sterilised intervention is at best a short-term and limited response. It does not constitute a solution to the underlying problems. The direct 'budget constraint' that will be faced stems from the fact that RBI has a limited stock of government bonds which can be sold in sterilisation. In addition, sterilisation is fundamentally self-defeating by preventing the downward adjustment of domestic interest rates. In an equilibrium outcome, preservation of currency policy would require ceding monetary policy, and accepting lower domestic interest rates.

Episode II has also highlighted the fiscal costs of implementing the existing currency regime, both through losses against speculators, and quasi-fiscal costs. The recent drop in RBI profits may reflect these phenomena at work.

These episodes highlight the applicability of the logic of open economy macroeconomics for India today. The arguments of this paper suggest that India has made enough progress on opening the capital account, that currency policy comes at the price of distortions in monetary policy. This is a different environment from that present in preceding decades, when it appeared that it was possible to have currency policy without a price in loss of autonomy on monetary policy.

Episode II has also given India a taste of how every currency peg is vulnerable to currency forecasting and speculation. While there may be rules in place which apparently prevent certain forms of currency speculation, it is important that policy analysis is not conducted assuming a closed capital account. There is enough openness on the current account and the capital account, through which currency speculation is taking place.

In terms of currency flexibility, India is strikingly embedded in the economic philosophy of the late 1970s. This paper has argued that in the new framework of capital account convertibility, there are new costs of upholding such a currency regime. The benefits of this currency regime may well outweigh these costs. But it is important that these costs be recognised, measured, and factored into policy analysis. Thus, the ideas of this paper could be useful in new thinking about the costs and benefits of this currency regime, and an evaluation of alternative approaches to the currency regime.

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