The Indian currency regime and its consequences

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Abstract

While the Indian rupee is claimed to be a 'market determined exchange rate', there is a gulf between the *de facto* and *de jure* exchange rate regime. An examination of the data reveals that India has a *de facto* rupee-dollar pegged exchange rate. From the early 1990s onwards, as India as reintegrated with the world economy, the implementation of this pegged exchange rate has induced increasing monetary policy distortions. The volatility of the rupee-dollar rate has substantial variation which have considerable implications for economic agents in understanding currency risk and monetary policy. However these changes in course have not been preceded by announcements from RBI.

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Since 1993, India's currency regime is said to be a managed float, a "market determined exchange rate" in the sense that there is a currency market and the exchange rate is not visibly administratively determined. However, RBI actively trades on the market, with the stated goal of "containing volatility", and influencing the exchange rate.

A distinction between the *de jure* currency regime - as claimed by a central bank - and the *de facto* currency regime - that is actually in operation - has been established in the literature. Many countries that claim to float, have a "fear of floating" (Calvo and Reinhart, 2002). This suggests an investigation into the Indian rupee.

1 What is the INR currency regime?

A currency regime is classified as a *de facto* peg when the volatility of the exchange rate against one currency is very low, owing to trading by the central bank. Reinhart and Rogoff (2004) identify the Indian currency regime over 1979-2001 as a "peg to the US dollar". Calvo and Reinhart (2002) propose a metric of currency flexibility that combines volatility of the exchange rate, volatility of reserves and interest rate volatility. The intuition of their measure is that when the central bank tries to set the exchange rate, this will require greater reserves volatility and greater interest rate volatility. Their calculations suggest that currency flexibility in India has not changed in the 1979-1999 period. This evidence is extended till 2003 in Patnaik (2003) with the same result. These results suggest that *de facto* currency regime in India did not change after 1979.

Figure 1 shows five years of three INR exchange rates, where all three cross-currency rates are re-indexed to the same starting value (of the INR/USD). While the INR/USD has some small changes, basically it has been unchanged over substantial periods of time, while other INR rates have moved significantly.

Table 1 for cross-currency volatilities, adapted from Patnaik (2003), highlights the phenomenon of pegging. The INR/USD has the lowest volatility of a range of cross-currency rates.[1] In the extreme case, if the INR/USD were a fixed rate, INR/JPY volatility would be exactly the same as USD/JPY volatility, since every change in the USD/JPY rate would yield an identi-

[1]The series was extended backwards in the period prior to the introduction of the Euro using the Deutsche Mark.

Figure 1 Three INR exchange rates

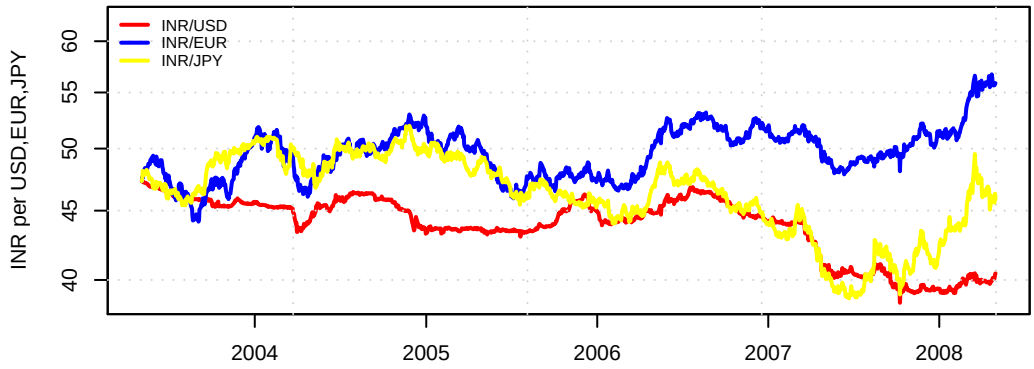
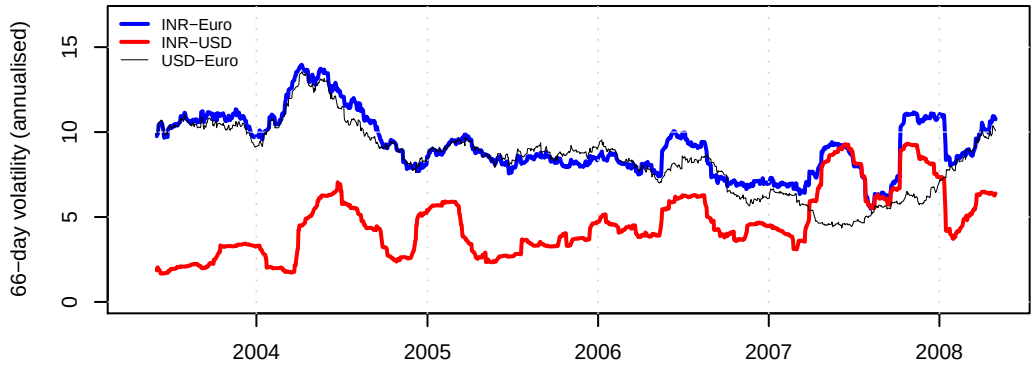


Table 1 Cross-currency volatility (daily returns, 4/1993 - 1/2007)

	USD	GBP	EUR	JPY
INR	0.291	0.575	0.663	0.738
USD		0.508	0.606	0.697
GBP			0.465	0.721
EUR				0.705

Figure 2 Cross-currency volatility



cal change in the INR/JPY rate. The table shows INR/JPY volatility - of 0.738% per day - is close to the USD-JPY volatility of 0.697%. Similarly, INR-EUR volatility of 0.663% per day is a lot like USD-EUR volatility of 0.606%. Finally, INR-GBP volatility at 0.575% per day is close to USD-GBP volatility of 0.508%. Indeed, INR exchange rates other than the INR/USD have volatilities like the other floating-rate currency pairs in the table. These are characteristics of a *de facto* INR/USD pegged exchange rate. The INR is pegged to the USD, and thereby floats with respect to all other currencies.

Figure 2 focuses on the recent period, with a 'moving window' estimator of currency volatility. In the months where the INR/USD was tightly pegged, INR/EUR volatility was the same as EUR/USD volatility. To the extent that there is a divergence between INR/EUR volatility and EUR/USD volatility, this conveys the extent to which the INR is not pegged to the USD.

One of the best tools for inferring the currency regime in operation based on currency market data is based on a regression.[2] An independent currency, such as the Swiss Franc (CHF), is chosen as an arbitrary 'numeraire'. Exchange rate time-series are re-expressed as daily returns, i.e. log price differences, and the following regression is estimated:

[2]This approach was made prominent by Frankel and Wei (1994), but has been invented several times before, going back atleast to Haldane and Hall (1991). Also see Benassy-Quere and Coeure (2003).

$$r_{\frac{\text{INR}}{\text{CHF}}} = \beta_1 + \beta_2 r_{\frac{\text{USD}}{\text{CHF}}} + \beta_3 r_{\frac{\text{JPY}}{\text{CHF}}} + \beta_4 r_{\frac{\text{EUR}}{\text{CHF}}} + \beta_5 r_{\frac{\text{GBP}}{\text{CHF}}} + \epsilon$$

As an example, $r_{\frac{\text{USD}}{\text{CHF}}}$ is the one-day returns on the USD-CHF exchange rate. Interpretation of the estimates falls into the following categories:

Fixed If India runs a fixed exchange rate to the USD, then every fluctuation in the INR/CHF rate merely reflects a fluctuation in the USD/CHF rate. The regression yields $\beta_2 = 1$, $\beta_3 = \beta_4 = \beta_5 = \sigma_\epsilon = 0$ and $R^2 = 1$.

Floating A floating rate is characterised by high values of σ_ϵ and a low R^2. A floating rate does not mean that $\beta = 0$. If (say) Japan is important in trade and financial transactions, the JPY will be significant. The coefficients reflect the true trade and financial linkages present in the economy.

Pegged Under a pegged INR/USD rate, we see $\beta_2 = 1$, and near-zero values for $\beta_3, \beta_4, \beta_5$. The size of σ_ϵ, and the regression R^2, convey how tight the peg is. Low values of σ_ϵ, and hence high values of the R^2, are associated with a less flexible exchange rate. If a basket peg is in operation, the regression will show the weights of the USD, the JPY and the EUR in the basket.

Through this, evidence can be obtained about the *de facto* currency regime in a period of interest. It also offers a mechanism for monitoring the currency regime, so as to know about changes in the tightness of a peg and the identity of the currency or basket of currencies against which pegging is done.

Table 2 applies this model in a few interesting situations. These serve as examples of the regression approach to characteristing currency regimes. In addition, they generate international comparisons which help give us a cross-country perspective for thinking about the INR currency regime.

1. The first example is that of the Chinese yuan in the fixed exchange-rate period. The USD coefficient is 1, with an enormous t statistic of 2665.7. All other coefficients are 0. The residual standard deviation is just 0.007, and the R^2 is 99.99%. This shows us what the regression estimates look like when faced with a fixed exchange rate.

   China announced that from 22 July 2005 onwards, the Chinese Yuan would no longer be a fixed exchange rate, but would instead be pegged to a basket of currencies. While this may be the stated *de jure* situation, *de facto* there

Table 2 The currency regime as seen through regression estimates

Country & period	USD	JPY	EUR	GBP	σ_ϵ	R^2
Evolution of the Chinese currency regime						
28 Sep 1998	1.000	0.0001	0.0004	0.0001	0.007	**0.9999**
to 21 Jul 2005	(2665.7)	(0.4)	(0.4)	(0.3)		
22 Jul 2005	0.9975	0.0076	-0.0144	-0.0080	0.0590	**0.9894**
to 31 Dec 2006	(132.0)	(1.0)	(-0.6)	(-0.7)		
Pre-crisis Korea						
1 Jan 1981	0.9981	0.0004	-0.0127	0.0081	0.1232	**0.9757**
to 1 Jan 1996	(286.0)	(0.1)	(-1.5)	(1.7)		
Post-reforms India						
1 April 1993	0.9560	0.0286	0.0522	0.0213	0.2904	**0.8411**
to 31 Dec 2006	(88.2)	(3.6)	(2.2)	(1.6)		
Post-reforms Korea						
1 Jan 2000	0.7323	0.2530	-0.0295	0.0771	0.4317	**0.6789**
to 31 Dec 2006	(32.1)	(13.1)	(-0.6)	(2.7)		
Floating rates, all 1/1/2000 - 31/12/2006						
Brazilian Real	0.8254	0.1063	0.4504	0.1126	0.9808	**0.3208**
	(15.9)	(2.4)	(4.0)	(1.7)		
New Zealand Dollar	0.2076	0.1471	0.5294	0.2639	0.6345	**0.2516**
	(6.2)	(5.2)	(7.2)	(6.2)		
South African Rand	0.2060	0.1714	0.5814	0.2740	1.0240	**0.1268**
	(3.8)	(3.7)	(4.9)	(4.0)		

is a USD peg. As the table shows the coefficient of the USD barely moved – from 1 to 0.9975, the coefficents of all other currencies remain insignificant, and the R^2 is still at 0.9894. There is no evidence in favour of a basket peg; it is a simple USD peg.

2. The pre-crisis Korean Won was tightly pegged to the USD. After the crisis, the t statistic of the USD dropped from 286.0 to 32.1, reflecting an important reform in the currency regime. The Japanese yen has become very important in fluctuations of the Won under the new regime. This reflects trade and financial linkages between Korea and Japan. The σ_ϵ rose from 0.123 to 0.4317 and the R^2 dropped from 97.57% to 67.89%, but the Won is not yet a floating rate.

3. The Indian rupee appears to be pegged to the USD. At the same time, the JPY and the EUR do seem to affect the rupee. The R^2 of the regression is 84.11%, thus leaving little space for any other factors in determination of the nominal exchange rate.

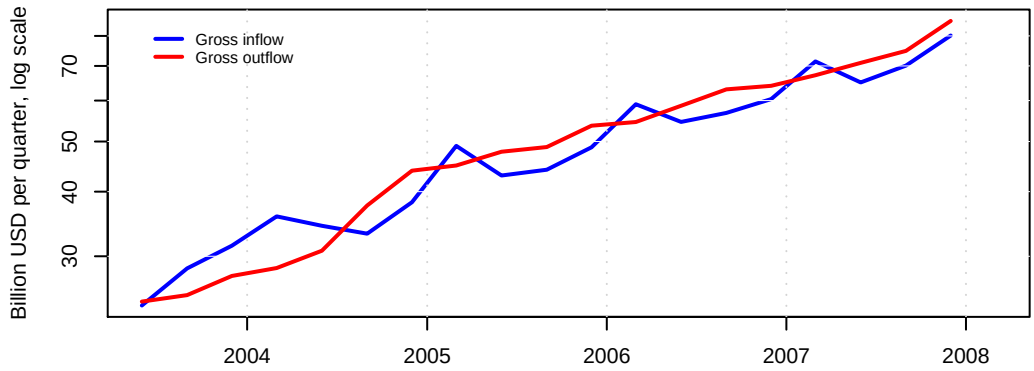
4. Finally, the table has New Zealand, Brazil and South Africa, over a common seven-year period. The symptoms of floating seen in the regression are: statistical significance of multiple currencies, a high σ_ϵ and a low R^2. The coefficients seen on the regression, with a floating exchange rate, reflect the country composition of trade and finance - as an example, the USD has an important coefficient for the Brazilian Real. For the South African Rand, which is a floating rate, we see that the coefficients of all currencies are significant and the R^2 is extremely low at 0.12. The coefficient of 0.58 for the Euro shows the importance of Europe in South Africa's trade and finance.

2 Implications of a pegged currency

A key insight of open economy macroeconomics, which has come to prominence in recent decades, is 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 the exchange rate is fixed, monetary policy is solely driven by the need to uphold the fixed exchange rate.

As an example, suppose a central bank embarks on tight monetary policy when there is a fixed exchange rate and no capital controls. Tight monetary policy gives higher interest rates, which attract capital inflows. The central

Figure 3 Growth of the current account (Billion USD per quarter)



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 have fixed exchange rates. However, trying to 'manage' an exchange rate yields similar conflicts. When an exchange rate target is sufficiently important, the attempt to force a desired price on the currency market can lead to a loss of monetary policy.

As Fischer (2006) points out, during the 1990s many economies were struggling to control or stabilize inflation. A pegged exchange rate was a tool for controlling inflation. The process of liberalisation of trade and capital flows then generated an impossible combination, and a series of financial crises erupted around the world.

In the Indian case, a system of strong capital controls backed by FERA was present at the outset. This made it possible to have a pegged exchange rate and monetary policy autonomy over the 1973-1993 period. In the decade of the 1990s, restrictions on the current account and the capital account were substantially, through not completely, eased.

Figure 3 and 4 show quarterly data for gross inflows on the current account, gross outflows on the current account, and net capital inflows over the last five years. The dramatic growth of these flows suggests an increasing openness on the capital account. As a consequence, the size of trades that RBI is required to place on the currency market, in enforcing the peg, has become bigger over time (Figure 5).

India does not have a completely open capital account, nor does India have a fixed exchange rate. Patnaik (2005) shows that there was a loss of monetary

Figure 4 Net capital flows (Billion USD per quarter)

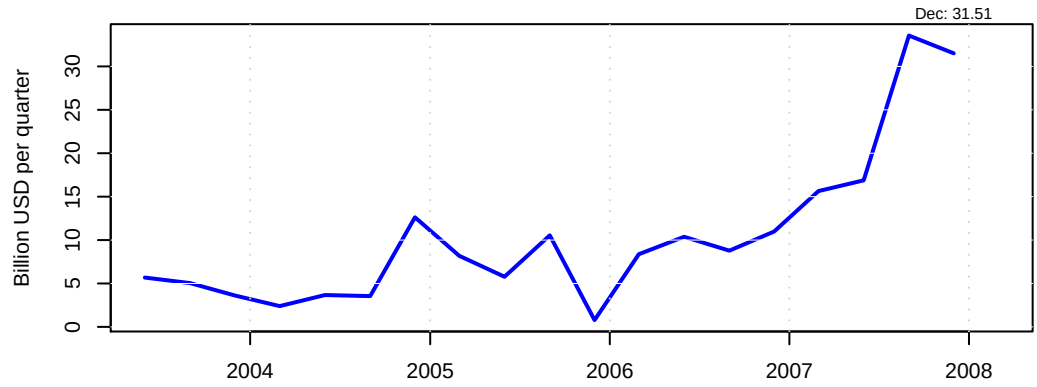


Figure 5 Net buy of USD by RBI on the currency spot market (Billion USD per month)

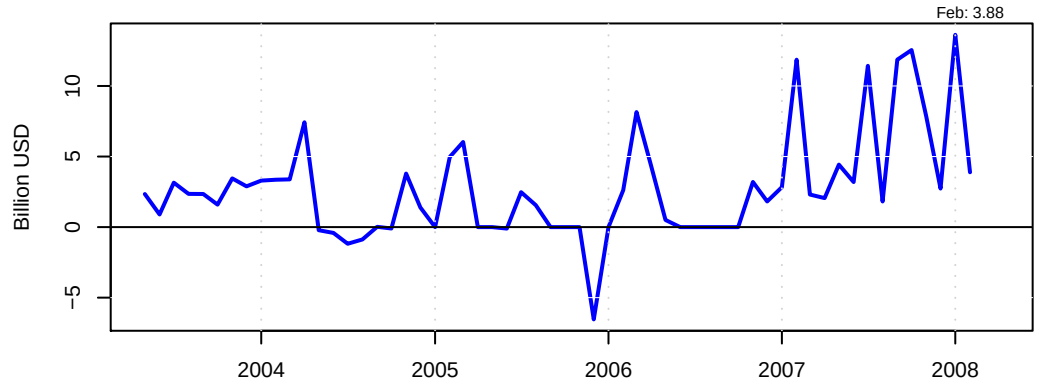
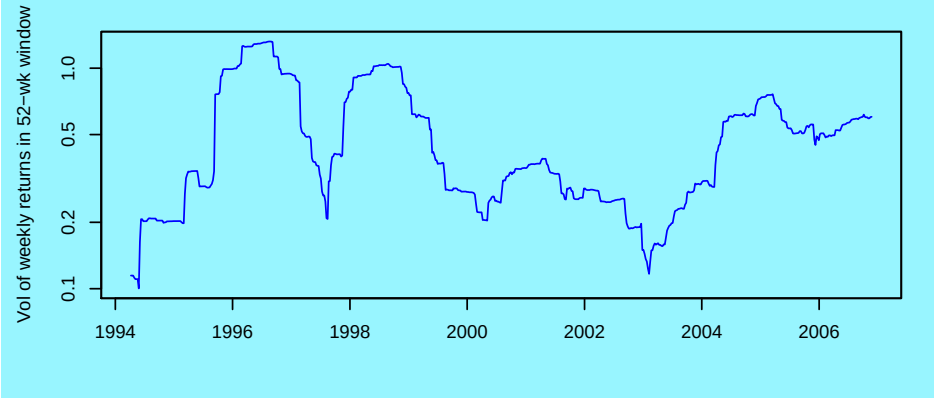


Figure 6 Time-varying volatility of the INR/USD exchange rate (one-year moving window)



policy autonomy in the 1990s.

As an example, in 1998, when local business cycle conditions were weak, the pegged exchange rate led to a tight monetary policy. Conversely, in the period after 2002, when local business cycle conditions were buoyant, the pegged exchange rate led to monetary expansion and accelerating inflation. The currency regime is now a central issue in understanding monetary policy and capital flows (Shah and Patnaik, 2007).

3 Time variation in currency flexibility

While the INR currency regime has overall been *de facto* pegged to the USD, the *extent* of pegging has varied significantly through this period.

Figure 6 shows a 'moving window' estimate of INR/USD volatility. The scale of this graph runs from values like 0.1% per week to values like 1% per week - a range of 10:1. There have been multi-month periods where the INR/USD exchange rate was fixed, but there have also been periods where the volatility of the INR/USD was closer to that of the INR/EUR or the INR/JPY.

These changes in currency flexibility have not been preceded by announcements from RBI. Currency flexibility has risen and dropped without this information being transparently shared with economic agents. This information matters directly to economic agents with currency exposure, who need forecasts of currency volatility for making decisions on currency hedging. In addition, complexities of implementation of the currency regime are now

of central importance in understanding monetary policy and capital flows. Given this lack of transparency at RBI, monitoring and understanding Indian macroeconomics requires an ongoing process where the ideas and methods of this paper are applied in inferring the *de facto* currency regime from the data.

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