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Working Paper 257

India's Experience in Navigating the Trilemma: Do Capital Controls Help?

R. Kohli

June 2011



INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS

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Abstract

Managing capital flows is the key policy challenge for emerging economies like India in the aftermath of the crisis. In contrast to other emerging markets who are levying capital controls, India's macro-monetary framework is distinguished by significant restrictions that help manage inflows. Against this context, the paper characterizes India's capital account management strategy through illustrating the 2006-07 episodes of capital inflows in the buildup to the global financial crisis. It shows how these restrictions allowed the authorities to straddle the open-economy trilemma and balance the exchange rate and price stability objectives. It offers relevant evidence on the effectiveness of India's capital controls in retaining monetary autonomy.

JEL Classifications: E5; E58; F3; F36; G15; G18; O16

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India's Experience in Navigating the Trilemma: Do Capital Controls Help?

R. Kohli¹

I. Introduction

The divergence in growth rates and monetary policy settings amongst the advanced and emerging markets (EMs) has significantly altered the course of global capital flows after the crisis. Private capital is flooding into these countries as asset allocations by global investors undergo a structural shift.² Besides volumes, the speed has increased too: Gross inflows have already reached 6 percent of emerging world GDP in a quarter of the time it took to reach a similar peak before the crisis.³ These trends pose a serious policy challenge for the recipient countries that have to balance the risk-benefit tradeoffs associated with such flows. While foreign capital is of immense value to these countries, many of which are under-invested and growing rapidly, the attendant risks are equally large. The dangers range from an abrupt reversal or sudden stop in capital flows to macroeconomic problems like asset price inflation, a consumption boom and currency overvaluation. The recent financial crisis has also highlighted the risks to financial stability that cross-border capital flows can engender, emphasizing the need for greater caution. Moreover, the macroeconomic environment is such that policy responses are constrained by fears of losing competitiveness as external demand remains weak and growth remains dependent upon domestic demand. This is pushing many EMs towards capital controls.

India shares this environment and the policy challenges with other emerging markets. As a fast-growing economy with a promising economic future, it is an attractive destination for foreign investors seeking quick, high-yielding returns upon their investments. In the Asian region, it is second only to China as a recipient of the current wave of foreign capital;⁴ this trend is also predicted to persist into the medium-term. As such, the challenge of managing capital inflows is shared commonly with other EMs, pointing towards the necessity of preparing responses to a volatile and possibly, prolonged, surge in capital flows that appears to be a repeat of the pre-crisis episode in 2006-07.

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² The Institute for International Finance) notes that a "...combination of favorable short and long-term pull and push factors has allowed EMs to evolve from an exotic to a more mainstream asset class" Net private capital flows to emerging economies are projected to rise to US \$960 billion in 2011 and \$1009 billion in 2012, following a 50 percent increase in 2010 (US \$908 billion) over the previous year (IIF, 2010).

³ *World Economic Outlook*, April 2011 (IMF).

⁴ For instance, the IIF forecasts that capital flows into the Asian region – accounting for more than 40% of the nearly \$430 billion net private capital flows to emerging markets in 2011 – are dominated by China, followed by India. More than half of the \$150 billion of FDI flows are expected to go to China, with \$36 billion going to India, while foreign purchases of domestic stocks, estimated at around \$120 billion a year, are also dominated by China and India.

Unlike other EMs however, India's macro-monetary framework and economic structure allows its policymakers to balance and accommodate the very concerns that other emerging markets are currently trying to address. Inter alia, these include loss of competitiveness, costs of sterilizing foreign exchange inflows, inconsistency of interest rate responses with inflation objectives, risks to financial instability and growth constraints upon fiscal responses. As a result, many countries - including Brazil, Korea, Indonesia, Taiwan, China, Thailand and Taiwan – have sought recourse to capital control measures⁵ to ward off the undesirable consequences of a prolonged, heavy inflow of foreign capital.

In contrast to this scenario, features like a restricted foreign presence in the domestic debt market and a current account deficit have enabled India to manage pressures upon the capital account in the recent past, allowing its policymakers to balance both exchange rate and price stability concerns to a reasonable extent. Such a strategy of capital account management was deployed to manage the capital inflows' boom in 2006-07 in the buildup to the global financial crisis. The approach allowed the central bank to delicately navigate the 'trilemma' by keeping an intermediate exchange rate regime but managing to retain its monetary autonomy at the same time.

This paper characterizes the experience. The case study is especially of interest in the context of an easier acceptance of capital controls as an additional option to deal with destabilizing capital flows, even as India remains a low probability country as far as their deployment is concerned. The current environment is similar to 2006-07 in at least one dimension, i.e. easy global liquidity with ultra-low interest rates fuelling a capital inflows' boom into countries with a confluence of high growth and interest rates. This provides the motivation to revisit the management of India's strategy of managing capital inflows.

The following section explains India's macro-monetary framework; Section III describes the monetary management of capital inflows in the boom years of 2005-07 and while Section IV explores the issue of monetary control in this context. Section V concludes with some possible lessons for emerging market countries.

⁵ For instance, Korea reimposed a 14% withholding and 20% capital gains taxes on foreign purchases of government bonds and capped the size of banks' FX derivatives books; Indonesia has lengthened the maturity structure of its central bank's liabilities (short-term external bank borrowing limited to 30% of capital) and made its one-month certificate less liquid (1-month minimum holding period for CB money market certificates); Taiwan has limited foreigners' access to time deposits; Thailand has liberalized capital outflows and withdrawn tax exemptions on foreign investments in government bonds (15% tax on interest income and capital gains earned by foreign investors); Brazil imposed a 60% reserve requirement on banks' short dollar position in the spot market, raised taxes on non-residents' debt investments from 2% to 4% and then to 6%, and increased the tax rate on nonresident margin deposits for derivative contracts from 0.38% to 6%; Turkey raised reserve requirements, extending them to repo transactions; and China imposed limits on Hong Kong banks' net open positions and ability to access yuan through China's foreign exchange market. (IMF, October 2010; IIF, January 22, 2011).

II. Macro-Monetary Framework

The concept of the open-economy trilemma goes back to the work of Robert Mundell in the 1960s. It points to the impossible coexistence of the three policy goals of free capital mobility, a fixed exchange rate and a monetary policy devoted to domestic objectives. This tenet constitutes the basic theoretical structure for choosing policy responses in an open economy. In this setup, free capital mobility is the in-built mechanism that equilibrates foreign and domestic interest rates, leaving a country with the choice of either a free exchange rate or interest rate control, but not both. Since financial integration is mostly irreversible and nearly all countries want to retain sovereignty over monetary policy, the common solution to this predicament is to free the exchange rate.

Most emerging economies however, hesitate to choose this option due to low levels of financial development, institutional weaknesses and structural rigidities that normally characterize these countries (Obstfeld, 2009). In such an environment, a complete adjustment of the exchange rate to volatile capital movements of a temporary nature can exacerbate real as well as financial vulnerabilities, tipping the risk-reward tradeoffs of financial globalization into negative territory. Balancing the two objectives - price stability and exchange rate – is then a better option in such circumstances *until* conditions evolve to support a corner choice posited by the trilemma. The key to navigation in the intermediate zone therefore, lies in the extent of financial integration, or capital mobility.

India's macro-monetary framework falls into the intermediate category. Capital mobility is far from perfect despite many years of liberalization. The dismantling of key capital account transactions has been linked to the achievement of macroeconomic goalposts, like inflation reduction, fiscal consolidation, and monetary-fiscal separation (Tarapore, 2006). Since such critically-interdependent reforms are slow to come about, capital account liberalization has been a slow, evolving process. The country has been especially cautious in opening the domestic debt market to foreign investors, reflecting the slow pace of fiscal consolidation and strong dependence on the domestic banking system for financing fiscal deficits at a reasonable price. To a large extent, the sequencing of capital account liberalization in India reflects the management of macroeconomic and external vulnerability risks (Reddy, 2000).⁶

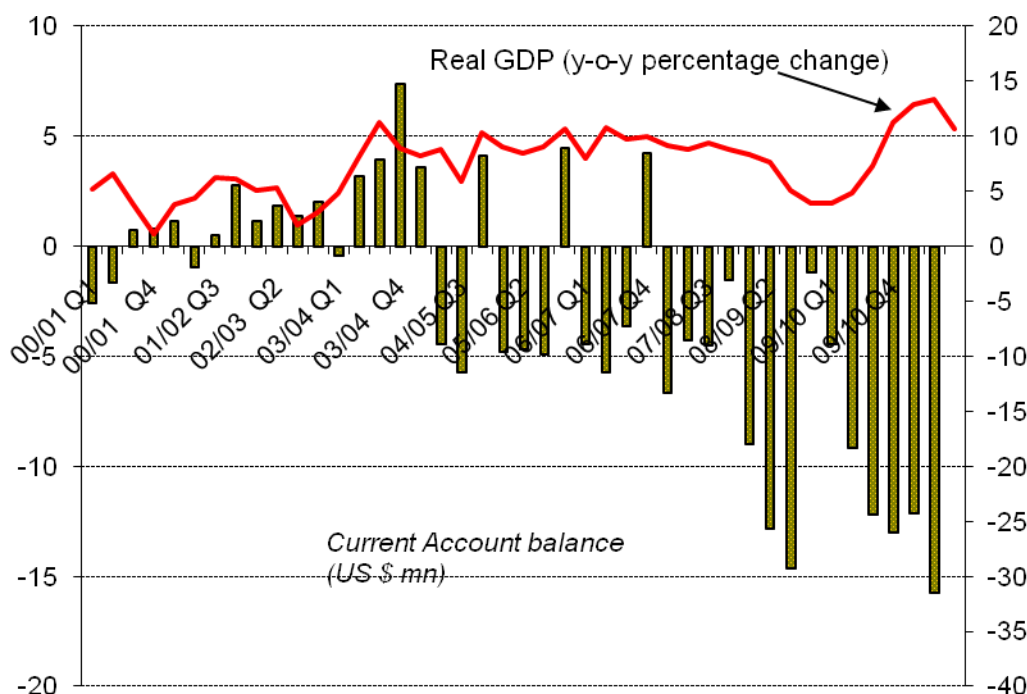
Both design and fortune allow India a structure that, to quite an extent, supports a simultaneous pursuit of the exchange rate and price stability objectives. First, the macro-monetary framework is characterized by significant capital controls, notably, on

⁶ For example, restrictions on capital inflows have been removed before those on capital outflows in view of the external financing gap; in times of surpluses, outflows have been liberalized fairly fast. Long-term borrowings have been preferred over short-term ones to enhance the productive capacity of the economy and lessen liquidity and roll-over risks from a sudden reversal. Non-debt creating inflows have been preferred to debt-creating inflows to minimize liquidity and interest rate risks for firms (See Reddy, 2000).

debt flows. Even after successive reviews of the liberalization process, the capital account remains not fully open and debt flows are managed.⁷ Regulation discriminates against debt flows in two main ways: Foreign investors' participation in the local government bond market is capped. Indian corporates can borrow abroad above a minimum maturity and below a maximum interest cost; these limits vary per economic sector, depending on perceived needs. The partially-open capital account keeps the wedge between domestic and foreign interest rates, allowing the central bank to balance both exchange rate and price stability objectives. Moreover, these controls offer singular policy tools to the policymakers to calibrate short-term capital flows.

The second structural feature that supports simultaneous balancing of exchange rate and price stability goals is a deficit on the current account. This helps moderate real exchange rate appreciation pressures; conversely, exchange rate flexibility assists adjustment of the deficit. India's macroeconomic constitution is distinguished by a persistent savings-investment gap. Historically, and as Figure 1 shows, the current account deficit widens when the country grows, largely reflecting increased capital goods and energy imports. On the other hand, export-dependency is low. The share of exports in aggregate output – around one-fifth - remains low relative to other Asian

Figure 1: India: Current Account balance and Real GDP



Source: RBI and author's calculations

⁷ Mohan (2008) gives a clear account of the logic behind this approach: capital inflows in excess of the domestic absorptive capacity can lead to overheating in the economy and create asset price bubbles. Abrupt reversals of short-term debt inflows, in particular, can be detrimental to the real economy.

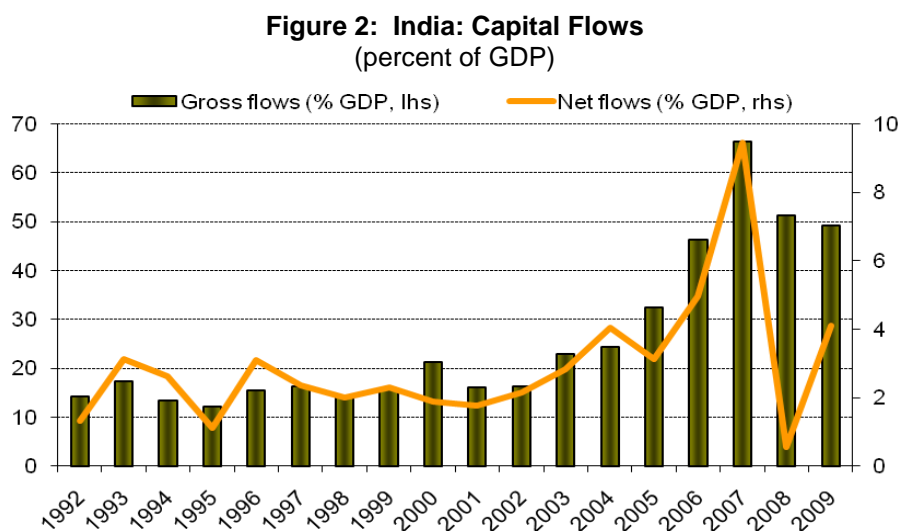
countries. India is fortunate also in that its ability to absorb higher amounts of foreign capital has been boosted with the structural shift to higher growth rates since 2004 and which has coincided with higher levels of private capital flows in this period. Illustratively, the average, annual 8.8 percent GDP growth over 2003-2007 was mainly driven by investment growth, including foreign direct investments. According to the IMF (2008), foreign capital met close to one-third of the country's aggregate financing needs by 2007, indicating the growing importance of foreign financing in India's accelerating growth rates. A growing capacity to absorb foreign capital therefore, allows mitigation of currency appreciation pressures and helps manage capital inflows.

These structural settings play a key role in the ability of policymakers to dynamically iterate between the three objectives of capital mobility, exchange rate flexibility and price stability. The parameters are varied according to the macroeconomic conditions, with a key role played by the restricted debt market that maintains the wedge between domestic and foreign interest rates. The next section illustrates the management of capital inflows in recent times while balancing the two objectives of price and exchange rate stability.

III. Monetary Management in the face of large Capital Inflows, 2006-07

A. The Capital Inflows' Episode⁸

With the resumption of the global capital flows' cycle after 2001, India – like other emerging market economies - witnessed steadily rising levels of foreign capital that quickly turned into a heavy gush in the build-up to the crisis. Figure 2 illustrates this



⁸ The IMF (2011b) has defined an episode of capital inflows a prolonged surge, where a surge refers to a quarter or year during which gross inflows significantly exceed their long-run trend and are also large in absolute magnitude. We follow that definition and regard this an episode.

increase. The pace of capital inflow into the country accelerated significantly from 2005: as a share of GDP, gross capital flows more than doubled from 32.4 percent in 2005 to 66.4 percent in 2007, representing a ten-fold increase over 2000 levels to US \$ 758 bn in 2007. The net capital account more than doubled from 4 percent of GDP in 2004-05 to 9.5 percent of GDP in 2007-08, reflecting the fast pace of integration with global financial markets. A broader measure of financial integration - the sum of both trade and financial transactions with the rest of the world – separately confirms the extent of global integration: total external transactions, as a share of GDP, reached 117 percent in 2007-08.

Table 1: India: A Decomposition of Reserve Buildup
(in billions of U.S. dollars)

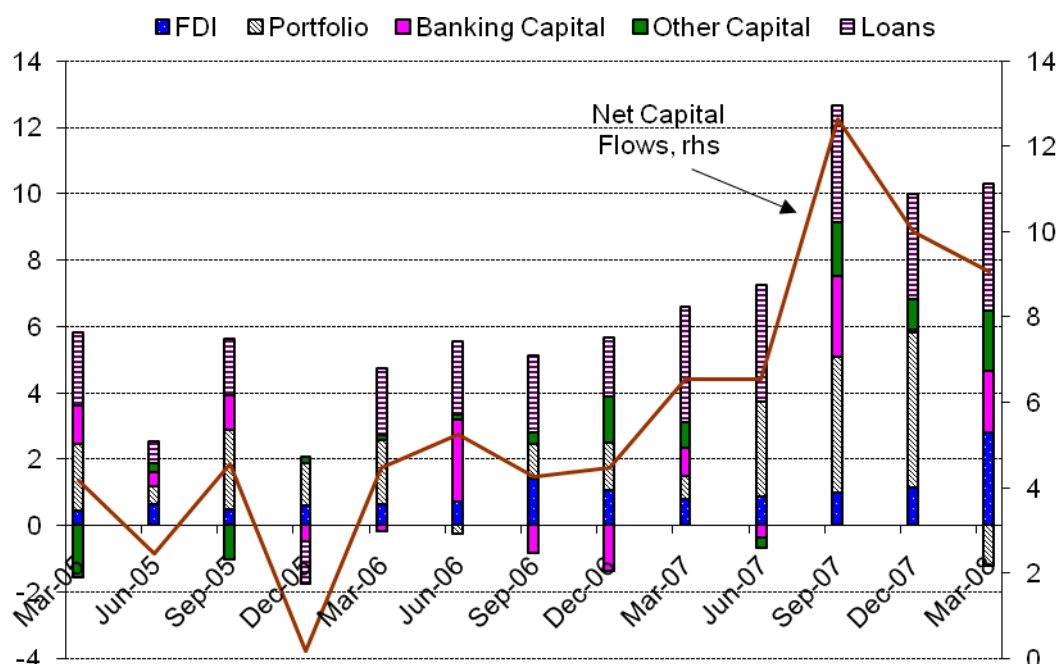
	Annual averages			Changes	
	1998-2000	2001-2005	2006-2007	2001-2005 -1998-2000	2006-07 -2001-05
Increase in foreign reserves	4.4	21.7	79.1	17.3	57.3
Current account balance	-3.8	2.3	-12.7	6.1	-14.9
Capital account balance	9.2	17.9	75.9	8.7	58.0
FDI, net	2.6	3.4	11.8	0.8	8.4
Errors and omissions, net	0.06	0.1	1.1	0.0	1.1
Non-FDI capital account balance (incl. errors & omissions)	6.7	14.6	65.2	7.8	50.7

Sources: RBI and author's calculations

The main source of the foreign capital inflows was non-FDI flows. These were driven by a combination of excess liquidity-low interest rates abroad and strong growth-rising stock prices-appreciating currency within the country. The non-FDI capital account balance turned into a large surplus in 2006-07, multiplying 6.5 times the average balance of US \$ 14.6 billion in 2001-05 (Table 1). Corresponding to the strong growth conditions of this period, the current account deficit averaged US \$ 13 billion, a swing from a moderate surplus of US\$ 2.3 billion averaged in the preceding five years. There were two main contributors to the US\$51 billion increase in non-FDI net inflows in 2006 and 2007 over the average 2001-05 levels.

- Higher purchases of debt and equity securities stocks by foreign investors. These nearly trebled from US\$ 12 billion to US \$ 35 billion in the two years to 2007.
- Higher borrowings offshore by Indian residents (domestic corporate enterprises), loans by whom more than trebled to an average 2.7 percent of GDP (US\$ 42 billion) in 2007, increasing their liabilities to non-residents.

Figure 3: India: Net Capital Account and Components
(in percent of GDP)



Source: CEIC database and author's calculations

Stable, long-term flows like direct investments, however, rose a modest 0.4 percentage points in this period (Figure 3). The contribution of foreign investors to the change in non-FDI inflows was considerable, almost half of the change in non-FDI capital inflows.

B. Management of Inflows

These surpluses were managed by a combination of policy responses that attempted to balance both exchange rate and price stability goals. The strategy comprised a combination of reserve accumulation-cum-sterilization, part feedback into money supply, exchange rate flexibility, liberalization of outflows and controls upon overseas borrowings by residents as a last resort in August 2007. For most part of the surge, the RBI pursued a strategy of dynamic shuttling between one and another response to achieve consistency in macroeconomic management and to avoid adverse outcomes associated with prolonged use of one response and/or instrument. At the peak of the boom in mid-2007, by which time the pressures on the capital account had intensified significantly, further liberalization of foreign debt inflows was temporarily paused, to resume when the macroeconomic cycle turned in 2008.

1. Monetary Management

Table 1 shows the increase in foreign exchange reserves of US\$ 57 billion in 2006-07 over the levels averaged in the preceding five years. The main reason for the

accelerated pace of reserve accumulation was the increase in the capital account surplus, driven by a sharp rise in net non-FDI capital flows, after adjusting for the current account deficit. Relative to 2005 levels, net purchases by the central bank doubled to US\$ 16 billion in 2006, rising rapidly by nine times to US\$ 77 billion in 2007. Monthly purchases averaged US\$ 5.9 billion in 2007, a sharp increase from the monthly purchases of US\$ 1.6 and 0.7 billion in 2006 and 2005.

Table 2: Reserve Bank of India's Balance Sheet

	<u>2005</u>	<u>2006</u>	<u>2007</u>
	(in billions of Rupees)		
Net Foreign Assets	6729.8	8661.5	12361.3
Net Domestic Assets	-999.3	-1571.6	-3078.3
Net Claims on Government	81.4	57.5	-1132.1
Net Claims on Banks	58.0	104.1	45.9
Net Claims on non-financial sector	71.8	15.4	17.9
Other items, net	-1210.4	-1748.7	-2010.0
Reserve Money	5730.6	7089.9	9283.0
Change over previous period, in billions of Rupees			
Net Foreign Assets	601.9	1931.7	3699.8
Net Domestic Assets	237.3	-572.4	-1506.7
Net Claims on Government	261.1	-23.8	-1189.6
Net Claims on Banks	5.4	46.2	-58.2
Net Claims on non-financial sector	5.3	-56.5	2.5
Other items, net	-34.5	-538.28	-261.31
Reserve Money	839.2	1359.3	2193.1
Reserve Money(percentage change)	17.2	23.7	30.9
Change in Net Foreign Assets/Reserve Money	0.11	0.27	0.40
Change in Net Domestic Assets/Reserve Money	0.04	-0.08	-0.16
Market Stabilization Bonds held by banks	290.6	629.7	1683.9

Sources: RBI and author's calculations

The heavy capital inflow severely strained the monetary base. Reserve money growth ran above 17 percent year-on-year in 2006, accelerating further to 30 percent for most part of 2007. The expansion in the monetary base was almost entirely driven by the increase in net foreign assets of the central bank, which almost doubled between 2005 and 2007 (Table 2). Money supply, or M3 (broad money) growth was 20 percent year-on-year in 2006-07, significantly above the central bank's projections of 15.0 per cent; at the peak of the surge in end-2007, money supply was running close to 25%. The increased liquidity allowed banks to increase the pace of lending by rapidly running down their stock of investments in government bonds and loaning close to three-fourths of their deposits by 2006-07. Bank credit growth crossed 30 percent (y-o-y) in 2006;

double that in 2004 (15 percent). In part, though, money supply and credit growth trends reflected strong growth conditions.

To limit the monetary impact of intervention and restrain the growth of reserve money, the central bank sterilized the foreign exchange inflows. Between March-December 2007, the RBI sterilized almost 43 percent of its net foreign exchange purchases on average, allowing partial feedback into money supply. Net foreign assets increased by Rs 3700 billion in 2007, while reserve money increased by Rs 2193 billion, or two-third of the increase in net foreign assets.

A simplified monetary policy reaction function can capture the extent of sterilization more formally (Cumby and Obstfeld, 1982). This takes the form

$$\Delta NDA_t = \alpha \Delta NFA_t + \varepsilon_t$$

assuming that the central bank neutralizes, or sterilizes, the monetary impact of foreign capital inflows (change in foreign assets ΔNFA_t) through changes in its domestic assets (ΔNDA_t). α is the sterilization coefficient that indicates the degree of sterilization with values ranging from minus one to zero. A coefficient value of -1 indicates complete sterilization or that the central bank completely neutralizes the increase in reserve money caused by the growth in net foreign assets through a reduction in its net domestic assets. On the other hand, lower values of the coefficient, or a zero, would indicate less or no sterilization.

Using monthly data over 2003:01-2008:06 yields the following regression equation.⁹

$$\Delta NDA_t = -0.64 \Delta NFA_t \quad (7.34)$$

$$Adj.R^2 = 0.55; DW = 1.94$$

This indicates that the central bank sterilized nearly two-thirds of the increase in monetary base due to capital inflows by direct reduction of its domestic assets over the full sample period. Restricting the sample to the 2005:01-2007:12 episode of high capital inflows increases the sterilization coefficient to 0.68 reflecting a higher offset in the boom period¹⁰.

The sterilization was conducted mainly through increased reserve requirements for banks, sales of Market Stabilization Bonds (MSBs) and a build-up in Government

⁹ Regressions include a first-order, autoregressive term ($\rho = -0.27, prob. = 0.10$) to control for serial correlation. Unit root tests indicated nonstationarity in levels of the two variables; both are I (1) or first-difference stationary processes.

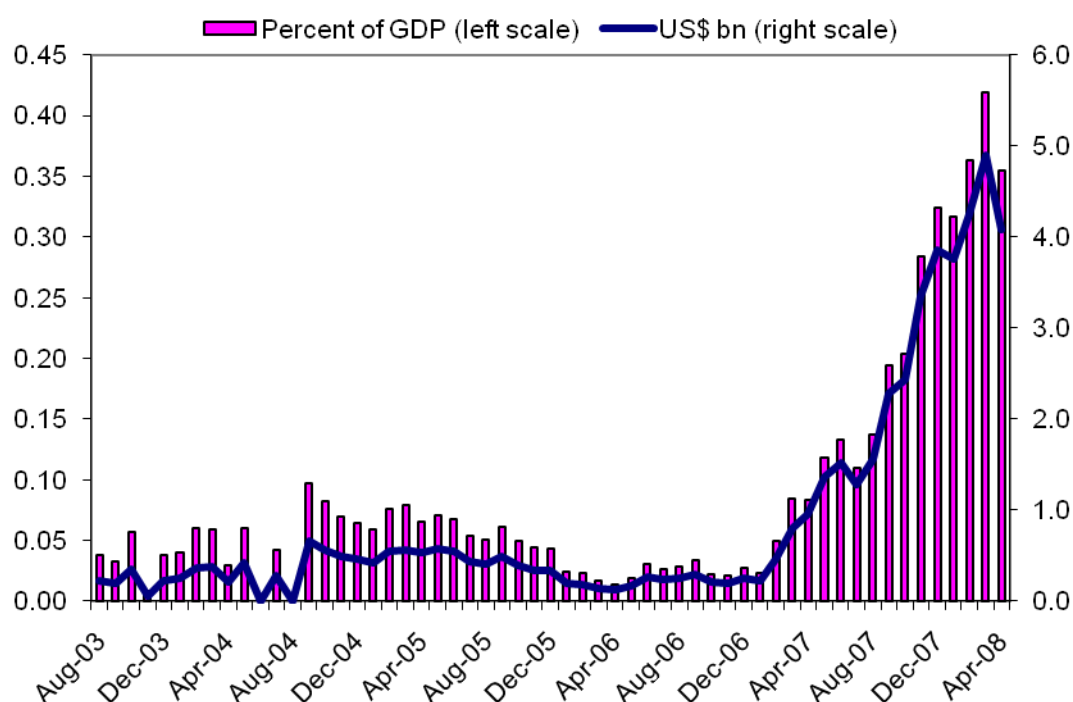
¹⁰ There is also some improvement in the specification $Adj.R^2 = 0.64; DW = 1.98$.

deposits at the RBI. Cash reserve requirements - the portion of net demand and time liabilities banks must keep as cash with the central bank – were raised progressively by 250 bps from 5 percent in December 2006 to 7.5 percent by end-2007, with two tranches of 50 bps each in April and November 2007 alone. Sales of MSBs rose to a monthly average of Rs 109 billion (US\$ 2.7 billion) each month in 2007 against the Rs 0.03 billion (US\$ 0.66 million) averaged in 2006.

The stock of MSBs peaked at Rs 1743 billion (3.7 percent of GDP) at end October 2007, nearly a fourfold increase in just two years from the Rs 373 billion in January 2006. Despite the sterilization however, reserve money growth averaged 31 percent in 2007 due to acceleration in capital inflows (Table 2).

The government, which bears the interest expenses on MSBs, had to contend with the mounting costs of sterilization. The costs of sterilization due to issuance of MSBs alone – calculated as the simple India-US Treasury bill rate differential times the stock of MSBs - averaged Rs 7.6 billion monthly in 2006. By 2007, these quadrupled to a monthly average of Rs 31 billion. Overall sterilization costs – the sum of interest payments on MSBs, repos and the opportunity costs for banks of CRR increases – peaked at 0.42 percent of GDP (US\$ 4.9 billion) in March 2008 from a minuscule 0.02 percent of GDP in January 2006. Monthly sterilization costs from all instruments exceeded US\$ 2.3 billion each month from September 2007 to April 2008 (Figure 4).

Figure 4: India: Cost of Sterilization



Source: RBI and author's calculations. Calculated as the sum of interest payments on the previous month stock of Market Stabilization Bonds and repos (India-US treasury yield differential times MSBs+repos) and the opportunity cost for banks of CRR hikes (PLR times liquidity removed through CRR hikes)

2. Balancing conflicting objectives: Price stability and Capital mobility:

The option of intervention-cum-sterilization mitigated exchange rate appreciation pressures from capital flows to an extent. The response was also consistent with the central bank's stance of gradual monetary tightening from October 2004. But the challenge from inflationary pressures intensified mid-2006 onwards amidst strong growth conditions. The annual rate of inflation remained above 6 percent from May 2006 to May 2007, well above the central bank's comfort zone. The pace of monetary tightening therefore, accelerated to cool down an overheating economy. Policy interest rates - repo and reverse repo – were tightened in three phases of 25 bps each in 2006, followed by a further 50 bps increase in the repo rate in 2007.

Rising interest rates however, attracted further inflows, straining the balance between interest rate and exchange rate control. Although foreign participation in the domestic debt market was (and remains) capped, permitted interest rate-sensitive capital inflows like foreign borrowings by resident firms jumped significantly in response to widening domestic-foreign interest rate differentials and an appreciating currency, an attractive combination for domestic borrowers. Foreign loans by residents rose to an average US\$ 3 billion monthly in 2007, compared to US\$ 2 billion in 2006 and US\$ 1 billion in 2005. Aggregate overseas loans totaled US\$ 33 billion in 2007, compared to the US\$ 12 billion in 2005, with US\$ 5.1 billion in the month of May 2007 alone.

The interest rate control was also undermined by the exploitation of carry-trade arbitrage by market agents and residents converting cheaper borrowings in foreign currencies into rupee deposits placed with the central bank's overnight liquidity adjustment facility (LAF). In response, the width of the corridor was widened steadily from end-2006 from 100 bps to 175 bps by April 2007, to generate greater volatility in short-term market interest rates to stem capital inflows and deter one-way bets by foreign investors. The central bank also addressed the arbitrage trade by capping absorption through the reverse repo window at Rs 30 billion daily in March 2007.

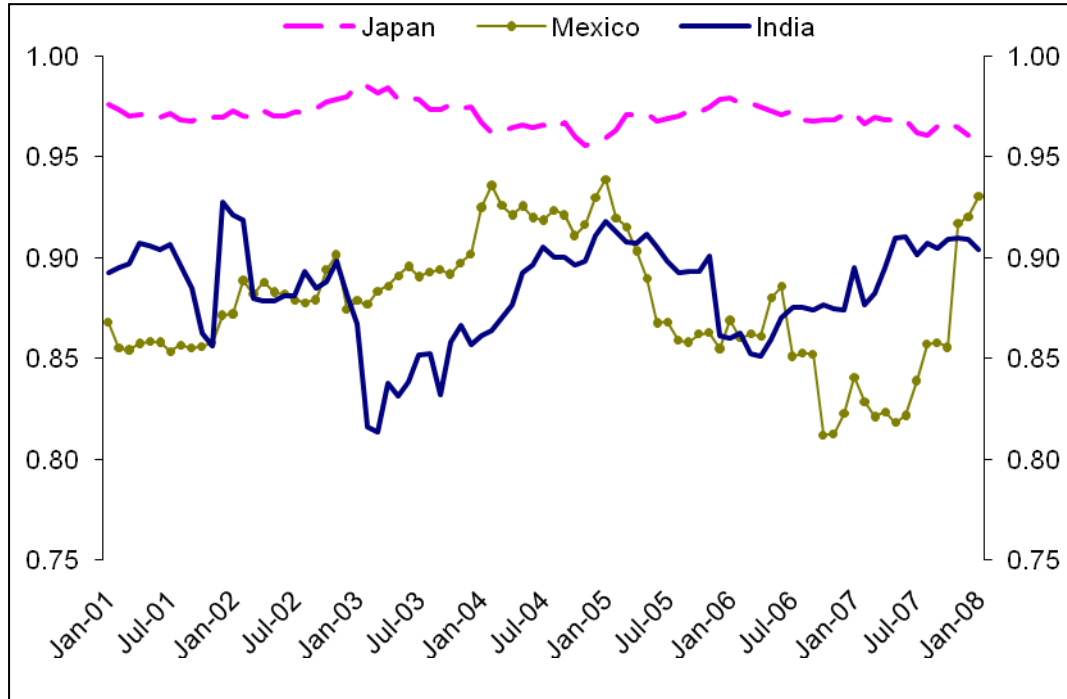
3. Exchange rate management:

Developments on the price stability front thus compelled monetary policy to lean more towards inflation stabilization. This was done through an increase in the adjustment from a change in the value of the currency. The degree of exchange rate flexibility can be meaningfully depicted through an index measure derived from the relationship between the nominal exchange rate and foreign exchange reserves, or the idea of exchange market pressure. The index of exchange rate flexibility, *ERF* is calculated as

$$ERF = \frac{Std(\Delta e_{i,t})}{Std(\Delta e_{i,t}) + Std(\Delta f_{i,t}) / mb_{i,t(-1)}}$$

Where ERF takes values from zero to one, with lower values signifying relative inflexibility. With the notations i and t denoting country and time (monthly), $Std(\Delta e_{i,t})$ is the monthly standard deviation of daily log difference in the nominal exchange rate vis-à-vis the US dollar, $Std(\Delta f_{i,t})$ is the standard deviation of monthly change in foreign exchange reserves and $mb_{i,t(-1)}$ is the one-month lagged monetary base.

Figure 5: India: Exchange rate Flexibility



Note: The index - value from 0 to 1 - is the standard deviation of exchange rate movements divided by an exchange market pressure index (the sum of exchange rate volatility and volatility in reserves, normalized by lagged base money). A lower value indicates relative inflexibility. Source: IFS and author's calculations

Figure 5 shows the index increased from 0.85 in April 2006 to 0.91 from May 2007 onwards, reflecting a rise in flexibility relative to historical values and in comparison to both advanced (Japan) and emerging economies (Mexico). Real appreciation averaged over 2 percent each month from May to August 2007. The domestic currency appreciated vis-à-vis the US dollar in nominal terms too - by over 9 percent in 2007, relative to 2006 levels. As capital inflows intensified from May 2007, nominal appreciation exceeded 11 percent annually for ten successive months.

4. Macro prudential measures and capital controls:

Finally, as the prolonged surge in capital inflow persisted and currency appreciation pressures remained unabated, policymakers capped residents' access to foreign

currency borrowings and prohibited conversion of foreign currency loans into rupees in August 2007. Specifically, outright caps were imposed upon foreign loans above US\$ 20 million for domestic expenditures; loans above these limits for domestic use had to be specifically approved by the central bank; and loans in excess of the cap had to be parked overseas. Also restricted were participatory notes (PNs), an offshore derivative product allowing overseas retail investors exposure to the Indian stock market.

The above monetary and exchange rate management measures were also combined with macro prudential measures at a fairly early stage of the boom to cool down asset prices and prevent build-up of financial vulnerabilities. *Inter alia*, these included varying the costs of short-term trade credits and other overseas borrowings by residents in correspondence with rising domestic interest rates; tightening provisioning norms and risk-weights on bank loans for stocks and real estate sectors to check diversion of foreign funds via banks towards fueling asset prices; lowering interest rates offered by Indian banks on non-resident Indian deposits (other foreign deposits are not permitted) to make these less attractive; delaying further liberalization of foreign participation in the debt market; and encouraging outflows through further liberalization for different resident categories.

These initiatives succeeded with varying degrees. Summarily, encouraging outflows like easing restrictions upon financial investments abroad by residents had little or no impact due to the pro-cyclicality of such flows. But countercyclical macro prudential restrictions upon banks succeeded in insulating balance sheets from the financial shock that followed. Likewise, limiting overseas loans by residents led to some moderation in residents' foreign borrowings, which averaged US\$ 2 billion monthly in the six months following the restrictions as compared to an average US\$ 3.4 billion for the corresponding preceding period.

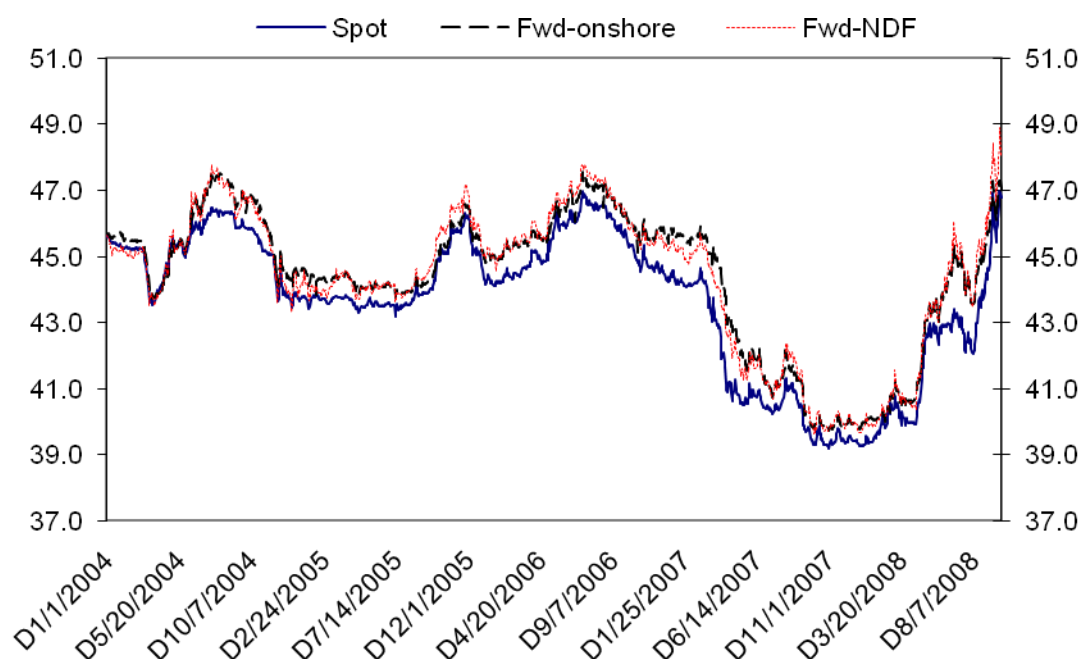
But the evidence on whether the central bank was able to retain monetary control in straddling the two objectives of interest rate and exchange rate stability remains open. The next section addresses this issue.

IV. Monetary Independence: The Evidence

Central to the simultaneous pursuit of two objectives of exchange rate and price stability is the issue of monetary independence. Was the central bank able to navigate the middle-path without losing its control over the domestic interest rate in the face of high capital mobility and reserves' accumulation with the help of existing capital controls? This section of the paper attempts an answer by looking at onshore–offshore yield differentials, their persistence and significance and whether the uncovered interest parity relationship holds for Indian data. The pattern follows the lines of Ma and McCauley (2007), who examine the efficacy of China's capital controls in the face of a large influx of overseas capital.

The increased financial integration noted in Section 2 of the paper was also accompanied by financial market development within India as well as abroad. Of especial relevance here is the emergence of offshore markets¹¹ that established a link with the domestic market through arbitrage and hedging activities, opening new arbitrage opportunities besides the conventional trade misinvoicing channel. It is likely that capital account restrictions could have been rendered less effective due to the transmission of price movements in one market to the other as market participants rebalanced their risk exposures. Figure 6 showing the co-movement in the rupee-dollar spot, forward and non-deliverable forward (NDF) rates indicates the exploitation of price differentials by market traders during this period.

Figure 6: Spot, Forward and NDF rates
(1 year, Re/\$)



Source: Bloomberg, L.P.

Other evidence however, indicates significant onshore-offshore market segmentation during this period. The *BIS Triennial Central Bank Survey* (2008) analysis for that period shows that trading activity was quite segmented: non-residents dominated the offshore market, while residents accounted for more than 80 percent of local market turnover. Further, the offshore amounts traded were about 25-30 percent of onshore transactions (Tsuyuguchi and Wooldridge, 2008).¹² Cyclical and temporary factors also dominated trade volumes during 2004-07 as these partly reflected leveraged trades with

¹¹ An example is the rupee derivatives market in Singapore that allows investors to get an exposure to Indian interest rates and the rupee/dollar exchange rate almost as they would onshore (Kohli, 2010).

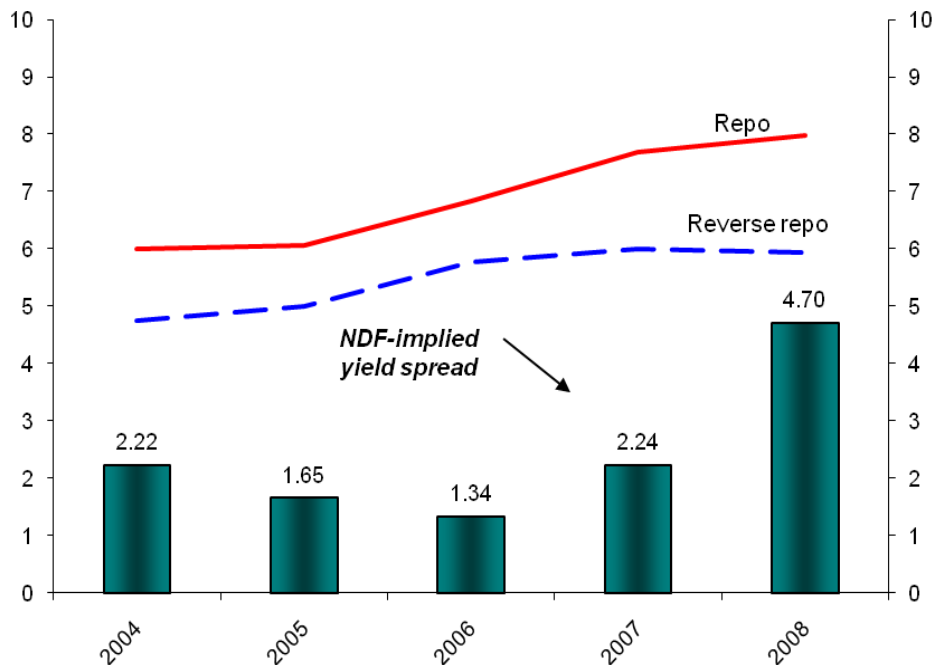
¹² See Kohli (2010) for further discussion.

short-investment horizons and potential returns on carry trades (Gyntelberg and Remolona, 2007).

The relevant question here is whether arbitrage between local and foreign markets succeeded in eliminating the onshore-offshore yield gap. For an earlier period -1999-2003 - Ma et al (2004) have found significantly higher interest rates domestically than abroad for India in a comparative assessment of non-deliverable forward (NDF) markets across Asian economies, over. Their estimated spread between onshore and NDF-implied offshore interest rates ranges between 400-1,000 basis points for this period.

Extending these computations, we find that the onshore-offshore yield gaps¹³ narrowed to a range of 224-462 bps over 2004-08 (Figure 7). The segmentation in the spreads is persistent, with a minimum average spread of 134 basis points in 2006. The larger yield gap in 2007 coincides with the accelerated monetary tightening and widening of the LAF corridor (Section III), a faster pace of reserve accumulation (32 per cent in 2007

Figure 7: Onshore-offshore yield spreads and policy rates
(in percent)



*Note: One year government paper and NDF (non-deliverable forwards) implied yields.
Source: Bloomberg, CEIC and author's calculations*

¹³ The yield gap calculations are based upon the NDF exchange rates (1 year), offshore US dollar rates and the onshore rupee interest rates of similar maturity. Based upon the methodology in Ma & McCauley (2007).

against 7 per cent in 2006) and sterilization. In addition, the wider gap in 2007 reflects a sizeable fall in offshore rates from May-December 2007 as heavy capital inflows – exceeding US\$ 2 billion each month – flooded onshore markets due to increasing expectations of a strengthening domestic currency.

The narrowing spreads, or increasing convergence, could be due to both inflation convergence and increased financial integration as controls on capital flows were relaxed or, maybe, less effective. Standard tests of uncovered interest parity therefore, are a firmer gauge of evidence whether capital controls were effective in maintaining the domestic-foreign interest rate wedge or, in other words, enabled the central bank to pursue an independent monetary policy.

Table 3 provides the first set of evidence on this. A test of the hypothesis that the uncovered dollar/rupee interest differentials are significantly different from zero shows that the null of no significance is rejected by the data for both overnight and 3-month India-US Treasury bill and money market rates. The uncovered nominal interest rate differentials differ significantly from zero at both maturities for the entire sample. On an average, the overnight and 3-month interest differentials are in a statistically significant 480-313 bps range over 2000:01-2009:02 for two different measures of interest rates and for the two sub-sample sets. A dummy to account for tightening monetary conditions from 2006:01 shows that the spreads, though narrower in relation to the full sample, remained significant nevertheless. The declining trend in the differentials in the pre-boom period reverses with the monetary tightening after 2006, reflecting that the differentials trended upwards after 2006. The trend reversal is similar and statistically significant across all maturities and measures of interest rates.

Table 3: India-US Interest rate differentials, significance tests

	Average differential		Trend	
	Full sample	2006-09	2000-05	2006-09
Overnight				
<i>Repo-FFR</i>	4.73*	2.09**	-0.08***	0.09**
<i>Call-FFR</i>	3.25**	1.71	-0.13**	0.04**
3-month				
<i>Treasury bill</i>	3.13**	1.95***	-0.03***	0.09***
<i>MIBOR</i>	4.80*	2.51***	-0.05***	0.13***

Tests report average differentials for full sample, 2001:01-2009:02, monthly data with dummy for 2006-09 to capture monetary policy shift in the period. Trend coefficients in columns 3 & 4 are intended to test for decline/rise in differentials in different regimes.

*, **, *** indicate significance at 10, 5, and 1 percent levels respectively; Regressions include AR (1) term, (not reported); Durbin-Watson test statistic value is in 1.96:2.26 range indicating absence of serial correlation; Adjusted R-square is 0.79-0.89 range for all regressions.

FFR - US Federal Funds rate; MIBOR - Mumbai interbank rate

Another assessment can be had from examining the dynamics of the UIP relationship over time. This helps reveal whether deviations from the mean are transitory, i.e. before capital flows eliminate the arbitrage opportunity, or permanent (the result of barriers to capital flows). What is the evidence for India in this regard?

Cheung et al (2003) show that if interest rate differentials converge to some equilibrium level determined by a country's risk considerations, then the series should be stationary. Table 4 presents the results of unit root tests of different measures of the India-US interest rate differentials. These strongly reject the stationarity of uncovered interest differentials at overnight, 1 month and 3 months horizons (except for short overnight rates), indicating that deviations from the mean are permanent. Capital mobility, as the in-built equilibrating mechanism, is thus insufficient to restore the parity condition and lead to convergence. Restricting the test to the 2005-09 period, lower panel of the table, does not modify this conclusion.

Table 4: Time series properties of Uncovered Interest Parity ($i - i^* - \Delta S_t$)

2000-09	Repo-US FFR	Call-US FFR	1 mth Mibor-US Libor	3 mth India- US TBR	3 mth Indian MIBOR-US TBR
Unit root tests					
Stationary	No, I(1)	No, I(1)	No, I(1)	No, I(1)	No, I(1)
Persistence					
Ar (1)	1.37***(16.7)	0.55***(5.4)	0.79***(7.96)	0.74**(3.59)	1.05***(10.63)
Ar (2)	-0.23 (1.72)	0.03 (0.26)	0.11 (0.86)	0.17 (0.88)	-0.14 (0.99)
Ar (3)	-0.38**(2.97)	0.07 (0.59)	0.04 (0.33)	0.12 (1.07)	0.10 (0.75)
Ar (4)	0.52*** (5.56)	-0.02 (0.19)	-0.20 (1.58)	-0.19* (1.96)	-0.24 (1.66)
Ar (5)	-0.24*** (6.79)	0.10 (0.89)	0.16 (1.57)	0.08 (0.76)	0.16 (1.67)
2005-09					
Stationary	No, I(1)	Yes, I(0)	No, I(1)	No, I(1)	No, I(1)
Persistence					
Ar (1)	1.16*** (7.49)	0.67*** (5.98)	0.83*** (5.54)	0.91*** (11.43)	1.07* (7.14)

*, **, & *** indicate significance at 10, 5 and 1 percent levels. Repo-India policy rate; US FFR – Federal Funds rate; Call – India overnight money market rate; Mibor – Mumbai interbank overnight rate; India and US TBR – Indian and US Treasury bill rates. Call rate equation includes dummy for March 2007. Adjusted R-squares (not reported) range: 0.75-0.94.

Note: Lags after order 1 insignificant in all equations. I and i^* are domestic and foreign interest rates respectively while ΔS is change in the Re/US dollar spot rate.

The speed at which the equilibrium interest differential, i.e. the tax equivalent of capital account restrictions and the country risk premium, converges is yet another means of uncovering whether interest parity holds. In principle, the speed of convergence will depend upon the degree of development of the domestic capital market and the degree of capital mobility: Higher the restrictions, slower the speed of adjustment of deviation

from the equilibrium; alternately, if capital is able to move relatively freely, a more rapid convergence towards equilibrium would be observed. Assuming that the interest differential follows a univariate process, a significant autoregressive (AR) process, with a coefficient closer to 1, would indicate capital control; the opposite is true if the differential converges to zero with a small or zero coefficients (Cheung *et al.*, 2003).

The lower panel of Table 4 presents evidence on persistence, as indicated by the autoregressive process. The AR coefficient is statistically significant and displays strong persistence upto five lags at all short-term horizons (except one month). This indicates imperfect integration for the deviations from the parity condition are predictable; an unsurprising result because India still retains significant capital controls. So markets are not efficient enough to arbitrage away the deviations; if capital moves across markets quite freely, arbitrage can generate profits based upon a predictable pattern of persistent deviation and help restore parity. But the existing capital controls in India still prevent his kind of arbitrage.

Two, the point estimate of the autoregressive coefficient is also close to unity, signifying the existence of country risk and capital restrictions. Three, the overnight market interest rate differential (interbank call rate less the US federal funds rate) has the smallest AR(1) coefficient, 0.55, over 2000-09, rising to 0.67 in 2005-09, which suggests increasing financial market linkages at least at very short horizons. The size of the AR(1) coefficient is close to unity for 4 out of 5 measures examined, indicating that capital controls make the deviation persistent and predictable as markets are not able to arbitrage it away.

While the usual caveats apply when making inferences from short samples the evidence above shows that capital controls continued to provide a degree of short-term monetary autonomy to the central bank despite a significant trend decline in the interest differentials. Notwithstanding the exchange rate linkage, capital controls permitted the Indian interest rates to diverge significantly from those of the US Federal Reserve in the face of very heavy capital inflow. The facts thus support the notion that capital controls were sufficiently effective in the face of large and persistent inflow of capital in the 2006-07 boom, more recently characterized by the IMF (2011) as an episode¹⁴.

V. Conclusion

As a combination of structural and cyclical factors trigger a fresh episode of portfolio capital flows into emerging market economies, policy concerns for the latter are focused upon shielding themselves from this onslaught. Incorporating fresh lessons learnt from the 2008 crisis, the policy toolkit of EMs has now been expanded to include capital controls, the use of which was abhorred and generally dissuaded until recently.

¹⁴ The IMF (2011b) has defined an episode of capital inflows a prolonged surge, where a surge refers to a quarter or year during which gross inflows significantly exceed their long-run trend and are also large in absolute magnitude.

This is the context motivating this paper. It studies India's strategy of dynamic management of the capital account that was deployed to deal with the capital inflows' boom that preceded the crisis in 2006-07. The strategy enabled India's policymakers to reconcile the exchange rate and price stability objectives along with a partially-closed capital account to a reasonable degree. The strategy and experience are both of some relevance to many EMs that are currently struggling to limit their macroeconomic responses and instead using capital controls in order to address somewhat similar objectives.

The paper describes India's macro-monetary framework and economic structure, which allowed policymakers to steer within the intermediate zone of the open-economy trilemma and achieve domestic price objectives while addressing exchange rate concerns to a considerable extent in the face of a prolonged and heavy surge in capital inflows. It illustrates the monetary management of capital inflows by the authorities through a combination of policy responses that often varied in order to achieve consistency in macroeconomic management. Capital controls in existence at the time allowed sufficient policy latitude to the authorities to vary responses, avoid the undesirable consequences associated with overuse of one or another instrument for a prolonged period and effective in preserving monetary independence amidst an environment of strong growth and overheating pressures.

In this regard, the study by Aizenmann et al (2008) is particularly illustrative for it shows that the coefficients on the three macroeconomic policy goals vary over time for a group of developing countries, suggesting countries alter the weights on the three policy goals; they further establish that all three variables of the trilemma - exchange rate stability, financial integration and monetary independence have converged for developing countries, suggesting a convergence "...towards managed exchange rate flexibility buffered by sizeable international reserves holdings, enabling the retention of monetary autonomy even as financial integration proceeded." This is also affirmed by a recent articulation of India's capital account management framework by Gopinath (2011).

The paper has also examined the case for retention of monetary control by the Indian central bank during this episode with the help of simple, price-based tests of uncovered interest parity. It finds that capital controls were effective in maintaining the wedge between domestic and foreign interest rates, an essential condition for pursuing an independent monetary policy. These findings match those of Magud, Reinhart and Rogoff (2011) who find that capital controls seem to make monetary policy more independent in their recent survey. The bulk of the empirical evidence on the efficacy of capital controls also shows that the area where capital controls have been most successful is in providing more autonomy for monetary policy and altering the composition of capital inflows, while success on reducing the volume of inflows and reducing exchange rate pressures has been mixed (Clements and Herman 2009).

In the light of the popular recourse to capital controls by many emerging economies in the current episode of capital flows, the role of capital controls in enabling monetary independence highlighted in the paper should be of current interest. The paper also offers useful policy insights on managing capital inflows through the illustration of India's experience. For instance, it demonstrates the possibility of reconciling growth-promoting national priorities like exchange rate competitiveness, encouraging foreign direct investments, containing asset-price spillovers, etc. in an extraordinarily difficult global environment through deft management of the capital account.

The illustration of practical handling of a capital inflows episode in this paper could also be a useful pattern for other liberalizing countries to study. For example, the combination of limited substitution of foreign-domestic bonds with relatively unrestricted equity inflows during capital account liberalization appears to allow monetary autonomy, which is necessary to gain time for domestic financial market development and achieve macroeconomic stability in most cases; such a pattern also permits a liberalizing economy to increase its pool of available capital at lowered costs. Moreover, the demonstrated ability to pursue an in-between solution to the trilemma, or rather, avoidance of an extreme corner solution during financial liberalization, as India has been able to do with some success, is an attractive option to pursue by countries who are compelled to distribute relative price adjustments across different channels and sectors in order to overcome structural rigidities, macroeconomic and political constraints and balance output-employment concerns even while they value the benefits from greater financial openness.

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