Policy Tradeoffs in an Open Economy and the Role of G-20 in Global Macroeconomic Policy Coordination

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Abstract

In this paper we investigate the different nuances of India's capital account management through empirical analyses as well as descriptive discussions. In particular we study the evolution of the capital control regime in India since 1991, and explore the rationale behind liberalizing certain flows, restricting others and the means employed to do so. Increased integration with global financial markets has amplified the complexity of macroeconomic management in India. We analyze the trade-offs faced by Indian policy makers between exchange rate stability, monetary autnomy and capital account opnenness, within the framework of the well-known Impossible Trinity or Trilemma and find that over time India has adopted an intermediate regime balancing the different policy objectives while at the same time accumulating massive international reserves. We also calculate the exchange market pressure (EMP) index in India, and track its evolution over the last couple of decades. We evaluate the extent to which the EMP index has been influenced by major macroeconomic factors and find that a deteriorating trade balance and decline in portfolio equity inflows are associated with a higher EMP while positive changes in stock market returns lower the EMP.

Keywords: Capital controls, Macroeconomic trilemma, Financial integration, Foreign exchange intervention, Sterilization, Exchange market pressure, Reserve adequacy.

JEL Code: E4, E5, F3, F4

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Policy Coordination[1]

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Abstract

In this paper we investigate the different nuances of India's capital account management through empirical analyses as well as descriptive discussions. In particular we study the evolution of the capital control regime in India since 1991, and explore the rationale behind liberalizing certain flows, restricting others and the means employed to do so. Increased integration with global financial markets has amplified the complexity of macroeconomic management in India. We analyze the trade-offs faced by Indian policy makers between exchange rate stability, monetary autnomy and capital account opnenness, within the framework of the well-known Impossible Trinity or Trilemma and find that over time India has adopted an intermediate regime balancing the different policy objectives while at the same time accumulating massive international reserves. We also calculate the exchange market pressure (EMP) index in India, and track its evolution over the last couple of decades. We evaluate the extent to which the EMP index has been influenced by major macroeconomic factors and find that a deteriorating trade balance and decline in portfolio equity inflows are associated with a higher EMP while positive changes in stock market returns lower the EMP.

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1.   Introduction

Emerging economies have been subject to increasingly volatile capital flows in recent years. Sharp swings in volatility, witnessed in recent years, have created a number of challenges for macroeconomic management in these countries, and have reignited the debate on the extent to which emerging economies should subject themselves to the vagaries of capital flows. Moreover, it has been widely agreed that the sharp volatility in capital flows in recent years had little to do with developments in emerging economies. The events up to the collapse of the Lehman Brothers resulted in `flight to safety' of international capital from emerging economies driven by sharp decline in the risk appetite of global investors. The subsequent pickup in capital flows to emerging economies was a result of widening interest rate differentials due to extremely low interest rates prevailing in the industrialized countries. The worsening debt crisis in Europe and a downgrade of US sovereign rating in the second half of 2011 caused investor sentiment to deteriorate once again and net capital flows to plunge across most emerging economies.

The rise in volatility of capital flows has made macroeconomic management more complex. Unbridled capital flows can exacerbate some of the existing financial fragilities and thereby lead to a costly crisis. Furthermore, massive unintended capital inflows can foster rapid real exchange rate appreciation, which can hurt exports of emerging economies. Alternatively, if the central bank intervenes to prevent the exchange rate from appreciating, it is likely to lead to an increase in money supply, fueling inflationary pressures. Many emerging economies have used fiscal, monetary and exchange rate policies, intervention in the foreign exchange market, domestic prudential regulations and finally capital controls to counter the impact of volatile flows. The

latter has included tax on inflows, additional capital requirements for foreign exchange credit exposure, minimum holding period and withholding tax to manage capital flow volatility.

India, like other emerging economies, has been subject to these capricious capital flows in recent years. During the pre-global financial crisis (GFC) period, foreign capital poured into India driven by sustained differential in growth potential of the advanced economies and India, easy liquidity and declining home bias in the developed countries. However, this trend reversed with the outbreak of the sub-prime crisis resulting in a rapid outflow of capital. The quantitative easing in advanced countries and faster recovery in emerging economies caused capital flows to change direction again in 2010 and early 2011. The deepening of the euro-zone sovereign debt crisis in the second half of 2011 and deteriorating domestic fundamentals resulted in capital reversing direction yet again.

We focus on some of the challenges that have emanated from India's increased integration with global capital markets. India has adopted a gradual and calibrated approach while liberalizing the capital account. This has helped India to negotiate the macroeconomic trilemma – maintaining a stable exchange rate, keeping capital account open and retaining monetary policy autonomy. In particular, instead of corner solutions, India has opted for an intermediate regime balancing the policy objectives as per the demands of the macroeconomic situation. Capital account management measures also impact the foreign exchange market. We calculate the exchange market pressure (EMP) index in India, and track its evolution over the last couple of decades. We also evaluate the extent to which the EMP index has been influenced by major macroeconomic

factors. We find that a deteriorating trade balance and decline in portfolio equity inflows are associated with a higher EMP while positive changes in stock market returns lower the EMP.

2. Capital Account Management in India

Capital account liberalization in India has been viewed as a continuous process rather than a one off event. During the post-Independence period until the early 1980s, India had a relatively closed capital account with external financing mainly taking the form of assistance through multilateral and bilateral sources on concessional terms. This approach was associated with an import substitution strategy and relied on tariffs and quotas to limit the need for foreign exchange. During the 1980s, capital flows were liberalized as traditional sources of financing had to be supplemented with additional foreign capital to finance rising current account deficit driven by high oil prices, selective liberalization of imports and a sharp depreciation of the rupee.

The subsequent phase of liberalization was under the overall reform process that was initiated in 1991. On the external front, the reforms included dismantling of trade restrictions, move towards current account convertibility, a market determined exchange rate and gradual opening up of the capital account. However, with the Latin American debt crisis of the early 1980s and the Asian financial crisis of 1997 in mind, India prioritized certain flows and agents in the liberalization process. In particular, non-debt flows were preferred to debt flows. Currently, barring a few sectors, foreign direct investment (FDI) is universally allowed with some of the sensitive sectors being subject to caps. Portfolio flows have also witnessed significant liberalization, though there still exist separate investment caps on sub accounts of foreign institutional investors (FIIs), individual FII and aggregate FII investments in a company. In contrast, debt flows are subject to

numerous restrictions including eligibility conditions for borrowers and lenders, minimum

maturity period, ceilings on interest rate spread and end-use restrictions.

**Table 1: Regulatory Framework for Capital Account Management**

|	Inflows	Outflows
Foreign Direct Investment	FDI is allowed under the automatic route and government approval route. In several sectors, investment up to 100% is allowed, while a few other sectors have sector-specific caps and guidelines. There are about 10 sectors in which FDI is prohibited.	Indian companies and registered partnerships may invest up to 400% of their net worth without approval. The ceiling is not applicable where the investment is made out of balances held in Exchange Earners' Foreign Currency account or out of funds raised through ADRs/GDRs. Lower limits and extra conditions apply to unregistered partnership and proprietorship firms
Portfolio Equity Investment	Registered FIIs such as pension funds, mutual funds, investment trusts etc. and QFIs are allowed to invest in equity. The ceiling for overall investment for FIIs and QFIs are 24% and 10% of the paid up capital of the company. The ceiling for FII investment can be raised up to the sectoral cap, subject to the approval of the board and the general body passing a special resolution to that effect. The limit is 20% of the paid up capital in the case of public sector banks. NRIs and Persons of Indian Origin (PIOs) can invest in equity up to 10% of the paid up capital of the Indian company, which can be raised to 24% subject to the approval of the general body. Holders of Overseas Citizenship of India certificates have the same rights to invest in India as NRIs (except to invest in agricultural land). QFIs can invest in those mutual fund (MF) schemes that hold at least 25% of their assets in infrastructure sector under the $3 billion sub-limit for investment in MFs related to infrastructure.	The overall limit on residents' investments in companies listed abroad is $200,000 a year. Resident corporations may invest up to 50% of their net worth in shares of listed companies abroad. Indian Mutual Funds are permitted to invest within an overall cap of $ 7 billion.
Portfolio Bond Investments	Registered FIIs may invest in debt securities issued by Indian corporates with an overall limit of $20 billion, with an additional limit of $25 billion in infrastructure bonds and a $20 billion limit on government securities. The investor base for G-Secs has been widened to include SWFs, multilateral agencies, insurance and pension funds. Infrastructure bonds have mandatory holding period. Different limits apply to NRIs.	Only resident individuals may invest in debt securities abroad subject to a yearly limit of $200,000.
Investments in money market	Only NRIs may invest in money market mutual funds.	Residents may purchase these instruments abroad without RBI approval.
Derivatives	These transactions are generally subject to limits and approval. Hedging of nonresidents' investments in India is allowed.	Commercial banks may purchase such instruments for their asset and liability management. Resident companies may use derivatives to hedge commodity price and foreign exchange debt exposures.
Loans	ECBs are allowed through automatic and approval route. ECBs through automatic route are subject to a cap of $20 million for a minimum three-year average	Lending abroad is generally subject to approval, except for certain trade credits and lending to foreign subsidiaries.

| | maturity and $750 million for a minimum five-year average maturity. ECBs through approval route can be higher than $750 million. External loans are subject to an all-in-cost ceiling and end-use restrictions. | |

Source: IMF (2012) and various RBI and SEBI notifications.

Table 1 highlights some of the existing guidelines influencing the flow of foreign capital in India. It is evident that there has been a hierarchy in the liberalization of capital flows with equity flows being given preference over debt flows. Within equity flows, FDI has been preferred to portfolio investments, while among debt flows, long-term flows have been preferred over short-term flows. This hierarchy has modified the composition of external liabilities. From comprising 95% of external liabilities in 1990, the share of debt liabilities have dropped to 33.2% in 2007. Over the same period the share of portfolio liabilities have increased from 1% to nearly 50%, while that of FDI has increased from 4% to 17.2%. As shown in Figure 1, this change in composition of liabilities in India has been in line with international experience.

Figure 1: Composition of Liabilities
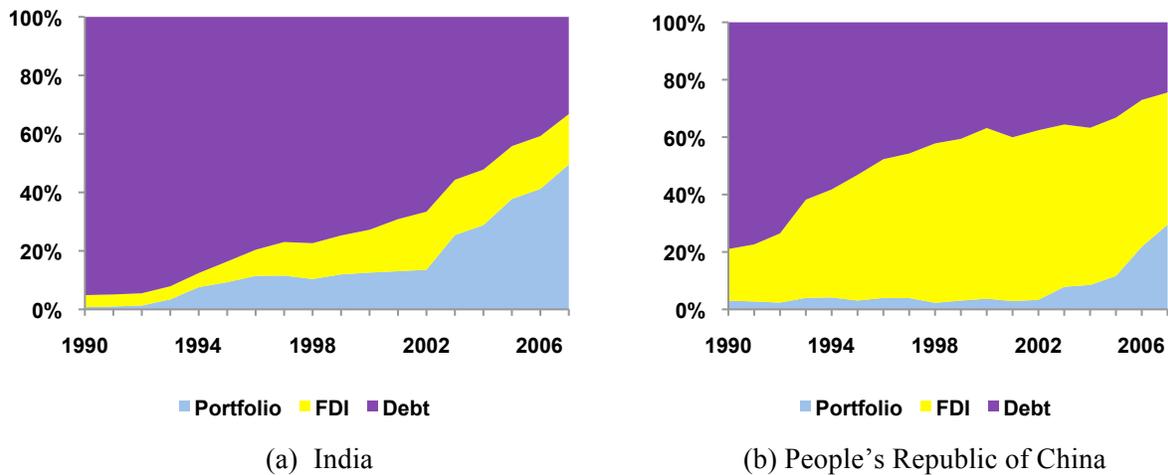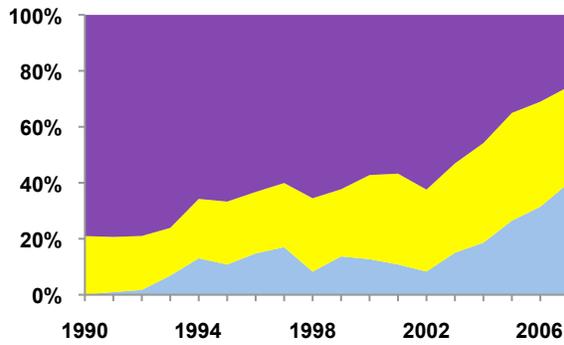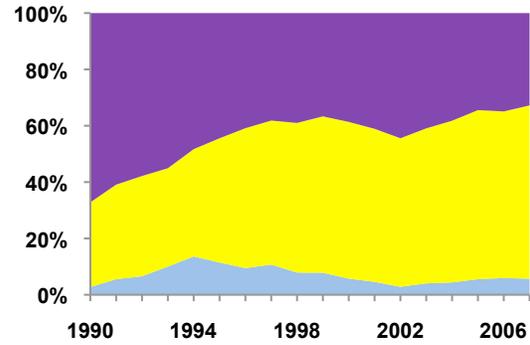
| (a) India | (b) People's Republic of China |

| (c) Brazil | (d) Chile |

Source: Lane and Milessi-Ferreti (2007)

Another key objective of active management of capital flows in India is to stem rapid appreciation of the exchange rate. Rajan and Subramanian (2005), Johnson et al. (2007) and Prasad et al. (2007) show that excessive capital inflows could result in rapid exchange rate appreciation, which can hurt exports. Bulk of the exports of developing countries like India tends to be concentrated in labor-intensive, low and intermediate technology products with thin profit margins. Hence, sharp exchange rate volatility can have severe employment, output and distributional consequences. The need for capital flow management measures is also driven by the existing state of financial development. Prasad and Rajan (2008) contend that in an underdeveloped financial system, foreign capital is likely to be channeled towards easily collateralized, non-tradable investments like real estate, leading to asset price booms, with subsequent busts severely disrupting the economy. Moreover, Aghion et al. (2009) argue that higher exchange rate volatility can stunt growth in countries with thin financial markets. Despite significant progress in the last two decades, India's level of financial development continues to lag behind the advanced economies. The 2012 Financial Development Report of the World

Economic Forum ranked India 40 out of the 62 countries covered, with India ranking poorly on institutional and business environment, financial stability and access as well as banking services.

The calibrated liberalization of the capital account was also driven by fiscal deficit and inflation rates in India being consistently higher than international levels. Both RBI (2006) and Planning Commission (2009) have argued that the adverse effect of a rising fiscal deficit and high inflation rates would be transmitted much faster in a liberalized capital account regime. These include pro-cyclical fiscal policy, increased volatility of bond yields, rise in monetary base in absence of sterilizing instruments and difficulties in securing funds to finance the fiscal deficit.

India started experiencing steadily rising levels of foreign capital since the early 2000s, which surged after 2005 due to excess global liquidity and a strong domestic economy. As a share of GDP, net capital flows more than doubled from 4% in 2005-06 to over 9.5% in 2007-08. The initial response to the surge in capital flows was to accumulate reserves with RBI purchasing $26.8 billion foreign exchange in 2006-07 and another $78.2 billion in 2007-08. Such scale of interventions severely strained the monetary base as the reserve money growth accelerated to 30% in 2007, completely driven by accumulation of foreign assets by RBI. Broad money growth peaked at 25%, well over the central bank's target of around 15%.

The RBI attempted to sterilize the impact of intervention and contain the growth in monetary base by reducing its holding of domestic assets and increasing the reserve requirements. The reduction of domestic assets took the form of selling Market Stabilization Bonds (MSBs). The stock of these bonds increased from Rs. 0.4 trillion in January 2006 to over Rs. 1.7 trillion in

October 2007. The interest expenses on MSBs led to rising cost of sterilization. Kohli (2011) estimates the sterilization cost increased from Rs. 7.6 billion per month in 2006 to over Rs. 31 billion in 2007. The sterilization cost, involving interest payments on MSBs and opportunity cost to the banking sector due to the rise in reserve ratio, peaked at 0.42% of GDP in March 2008.

The rising costs of sterilization forced RBI to incompletely sterilize the interventions in the foreign exchange leading to a growth in money supply and intensification of inflationary pressures. To combat these pressures, outflows were liberalized and the pace of monetary tightening was accelerated with the repo and the reverse repo rate rates being raised by a cumulative 125 basis points in 2006 and 2007. An appreciating currency and a widening interest rate differential provided a very attractive option to the domestic borrowers to access foreign funds, thereby further reinforcing currency appreciation and monetary tightening pressures.

With the surge in capital flow persisting and the inflationary and currency pressures not abating the government introduced a series of measures to regulate the flow of foreign capital inflows. A majority of these measures were imposed on debt flows such as capping of corporates' access to foreign currency funds, restrictions on conversion of foreign currency loans into Rupees, and reduction in ceilings on interest rate for foreign borrowings. Moreover, the use of Participatory Notes (PNs), an offshore derivative product, allowing overseas investors to participate in the Indian stock market was banned while interest rates on non-resident deposits were also lowered.

To evaluate the efficacy of some of the measures aimed at managing capital inflow, we look at the currency and stock price movements before and after the introduction of these measures. To

be deemed effective, these measures must reverse or at least slowdown the rate of change observed prior to their introduction. Figure 2 and Table 2 highlight the impact of some of the capital flow measures on stock prices and the exchange rate. We focus on the average daily change in the exchange rate and stock prices over a 30-day period before and after introduction of the measures. The evidence on the efficacy of capital controls on arresting exchange rate movement is mixed at best. The reduction of all-in cost ceilings in May 2007 and the restrictions on Participatory Notes in October 2007 led to a reversal of Rupee appreciation. Similarly, the fall in the value of the Rupee in the second half of 2011 was reversed after the restriction on canceling and rebooking forward contracts were introduced in December 2011. However, the restrictions on conversion of ECBs into Rupees in August 2007 and the re-imposition of the all-in-cost ceilings in December 2009 failed to reverse or slowdown the pace of appreciation. In fact there was a slight increase in the pace of appreciation after the re-imposition of all-in-cost ceilings. Even in the case of stock price movement, the impact of capital controls is ambiguous. The re-imposition of the all-in-cost ceilings as well as restrictions on canceling and rebooking forward contracts successfully reversed the trend in stock prices. However, the rising trend in stock prices continued after the introduction of various capital controls in 2007, though there was a moderation of the pace of increase after the reduction in ECB ceiling in May 2007 and restrictions on PNs in October 2007. The latter restriction had a particularly strong impact, as the PNs were an important source of FII investment in equities. In contrast, the restriction on conversion of ECBs into Rupees introduced in August 2007 was associated with a sharp acceleration in stock prices.

Figure 2: Impact of Capital Controls on the Currency and Stock Prices
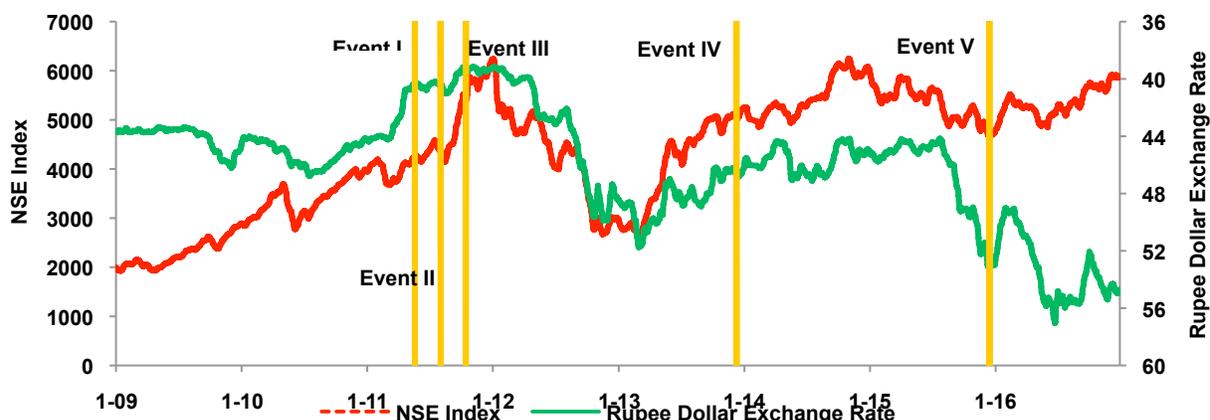
Note: Event I is the reduction in all-in-cost ceilings for ECBs. Event II refers to measures introduced to restrict conversion of ECBs into Rupees. Event III refers to SEBI's tightening of rules for purchase of shares and bonds in Indian companies through the PN route. Event IV is re-imposition of all in cost ceilings for ECBs that were discontinued during the GFC and discontinuation of the buyback of Foreign Currency Convertible Bonds. Event V refers to restrictions on canceling and rebooking of forward contracts.

Source: Authors' Calculation

Table 2: Impact of Capital Controls on Currency and Stock Prices

		Average Daily Currency Appreciation		Average Daily Stock Price Increase	
	Date of Introduction	Before	After	Before	After
Event I	May 22, 2007	0.198%	-0.003%	0.395%	0.113%
Event II	August 7, 2007	0.029%	0.027%	0.092%	0.271%
Event III	October 17, 2007	0.125%	-0.026%	0.670%	0.181%
Event IV	December 10, 2009	0.023%	0.026%	0.196%	-0.159%
Event V	December 15, 2011	-0.259%	0.253%	-0.385%	0.378%

Source: Authors' Calculation

Our simple analysis indicates that the introduction of capital control measures did not always lead to a reversal or even a slowdown in the rate of exchange rate appreciation or the stock prices. However, this is not to conclude that these measures were ineffective, due to the absence of counterfactuals. Moreover, to rigorously estimate the efficacy of capital controls, one would have to also look the impact of these measures on the volume and composition of flows (Patnaik and Shah, 2011) and the extent to which they allowed policymakers maneuverability in monetary and exchange rate management. We focus on this point in the next section.

3. Negotiating the Trilemma

India's increased integration with the global capital markets during the last two decades has increased the complexity of macroeconomic management in India. In particular, India had to negotiate the well-known macroeconomic trilemma. The standard formulation of the trilemma argues that it is impossible to attain monetary policy independence, exchange rate stability and capital market integration simultaneously. Only two of the three objectives can be obtained at a particular point in time. India, like other emerging economies, seeks to achieve each of the three objectives with varying degrees. While capital flows aid growth by providing external capital to sustain an excess of investment over domestic savings, a competitive exchange rate helps to maintain a sustainable current account balance and an independent monetary policy stabilizes the economy in the face of domestic and exogenous shocks. However, given the impossibility of attaining the three goals simultaneously, India had to balance the conflicting objectives. Moreover, the sharp increase in the volatility of capital flows during recent years has created a tension between monetary management and exchange rate management. As discussed in Section 2, excessive capital inflows have been found to result in rapid real exchange rate appreciation, which in turn hurts exports of emerging economies. Even a short-term appreciation can have lingering implications like permanent loss of export market share and reductions in manufacturing capacity. Alternatively, if the central bank intervenes to prevent the exchange rate from appreciating, it is likely to lead to an increase in money supply, fueling inflationary pressures.

In this section, we analyze India's management of the macroeconomic trilemma, the extent to which India has been bound by the trilemma and whether the trilemma has remained underutilized. Following Aizenman et al. (2010a, b) we quantify the various policy objectives

under the trilemma. We use quarterly data and cover the period 1996-97Q1 to 2011-12Q3. Our coverage is dictated by the availability of the data at a quarterly frequency, especially data on GDP.

Monetary Independence (MI)

Following Aizenman et al. (2010a, b), the monetary independence is measured as the inverse of the quarterly correlation of the interest rates between India and the US. The US is taken as the base country following Aizenman et al. (2010a, b) and Obstfeld et al. (2010) who argue that Indian monetary policy through this period has been most closely linked to the US. The quarterly indices are calculated using weekly 3-month Treasury Bill yields for India and the US. The data is taken from Global Financial Database. The index of Monetary Independence is given by

$$\text{MI} = \frac{corr\left(i_i, i_j\right) - (-1)}{1 - (-1)} \tag{1}$$

where *and i_i and i_j* are the 3-month Treasury Bill rates for India and the US respectively. This index can theoretically take a value between 0 and 1 with a higher value indicating greater degree of monetary independence. We find that for India the index ranges between 0.11 and 0.85. Hence we rescale this index to lie between 0 and 1.

Exchange Rate Stability (ERS)

We make use of the methodology introduced by Frankel and Wei (1994) to create an index of exchange rate stability. The degree of influence that major global currencies have on Indian Rupee can be estimated using the following estimation model

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$$\Delta \log \varepsilon_{INR,t}^{CHF} = \alpha_0 + \beta_{US}\Delta \log \varepsilon_{USD,t}^{CHF} + \beta_{EUR}\Delta \log \varepsilon_{EUR,t}^{CHF} + \beta_{JAP}\Delta \log \varepsilon_{JPY,t}^{CHF} + \mu \qquad (2)$$

where $\varepsilon_{i,t}^{CHF}$ is the exchange rate of currency i against the numèraire currency, which in this case is the Swiss franc and the currency i can be the US Dollar, Japanese Yen and the Euro. For the period prior to the introduction of the Euro, we consider the German Deutsche Mark. Under this estimation, $\hat{\beta}_i$ which is the estimated coefficient on the rate at which currency i depreciates against the numèraire currency indicates the weight of currency i in the basket. In the case where the currency under observation is pegged to a particular currency or a basket of currency we will have $\hat{\beta}_i = 1$ or $\sum_{i=1}^{I}\hat{\beta}_i = 1$ for the i currencies that are a part of the basket. Moreover, pegging to an individual or a basket of currencies implies a higher goodness of fit. In our estimation we use daily data, with the data being sourced from the Reserve Bank of India and Global Financial Database. We apply the estimation over a quarter and take the goodness of fit, or the adjusted R^2 as the measure of exchange rate stability. A higher R^2 indicates greater pegging to an individual or a basket of currencies. Again, we normalize the index so that it lies between 0 and 1.

Capital Account Openness (KO)

The index of capital account openness is based on a *de facto* measure instead of a d*e jure* one as it is the volume of flows that creates a conflict between monetary independence and exchange rate stability as opposed to controls governing the movement of capital. A country with high *de jure* openness can have low capital flows and hence may be able to simultaneously stabilize exchange rate and retain monetary autonomy. Alternatively, a country with low *de jure* openness can witness large flows due to lax capital controls, and face a trade-off between ensuring monetary independence and exchange rate stability. The index of capital account openness is

based on net capital flows. The index is constructed as the ratio of absolute value of net capital flows to GDP.

$$KO = \left| \frac{\text{Net Flows}}{\text{GDP}} \right| \tag{3}$$

The focus on net capital flows is based on the fact that it is the capital account balance that is crucial for the trilemma. If capital inflows in a country were to be matched by an equal amount of outflows, the policymaker can retain monetary independence with a stable exchange rate. Finally, to make this index comparable with others, we normalize it to lie between 0 and 1.

In Figure 3, we highlight the evolution of the three indices over the period 1996-97Q1 to 2011-12Q3. While ERS index exhibited a downward trend since the early 2000s, the KO index witnessed an upswing till the onset of the GFC. The GFC led to a sharp drop in the KO index, as flows to emerging economies, including India dried up globally. Since 2010-11, KO index has shown signs of revival, although the various components of the capital account have displayed considerable volatility. Finally, the MI index witnessed significant volatility, although there is a perceptible upward trend since early 2000s.

Figure 3: Evolution of the Trilemma Indices

(a) Monetary Independence Index

(b) Exchange Rate Stability Index

(c) Capital Account Openness Index
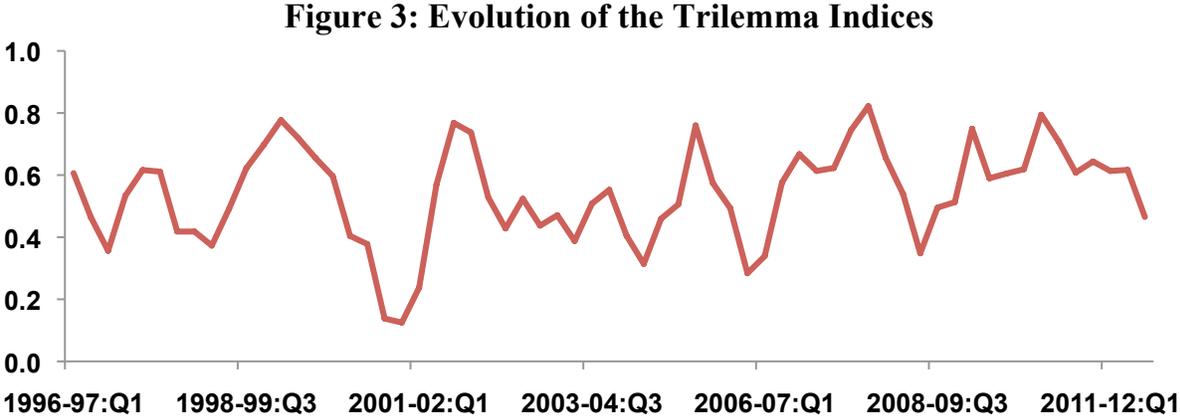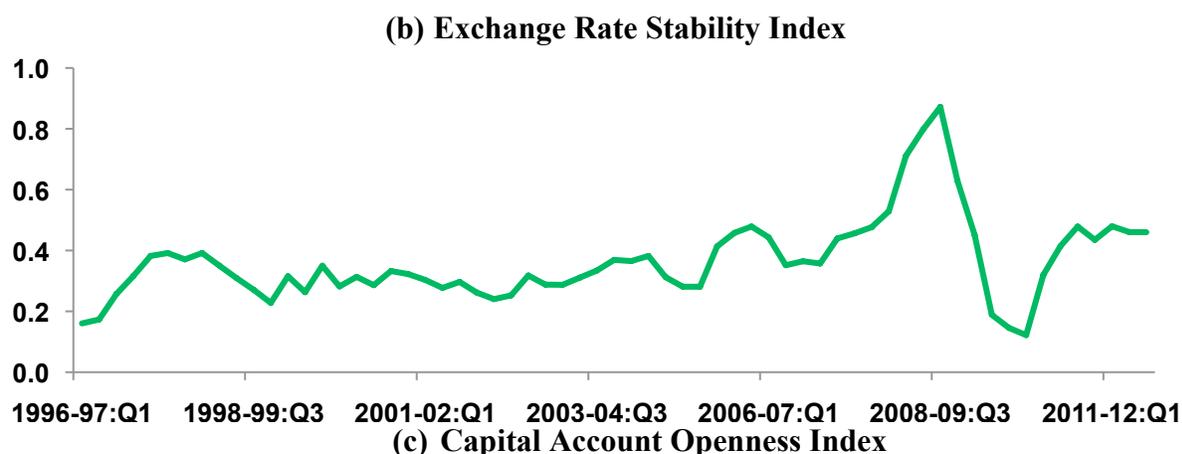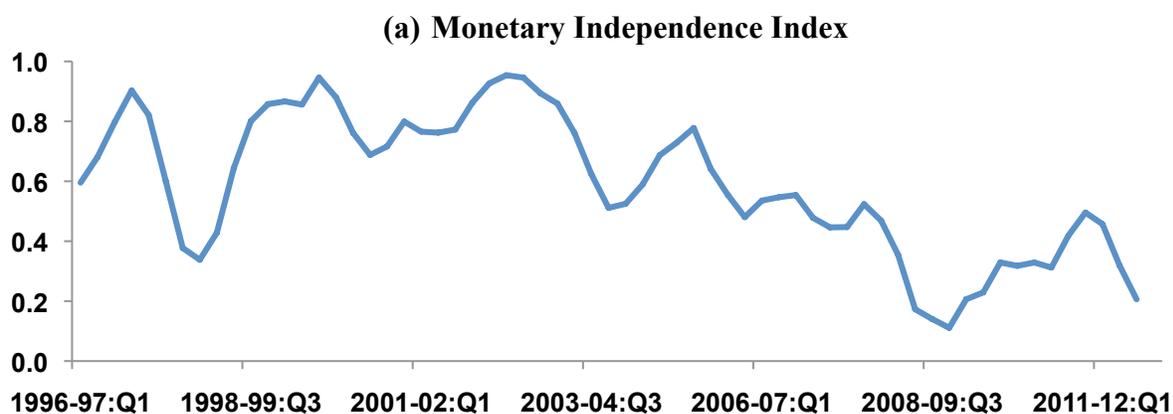
Source: Authors' calculations

The entire period from 1996-97Q1 to 2011-12Q3 was one of significant changes in economic conditions, and required balancing of the trilemma objectives. To effectively evaluate the shift in policy stance over the period under consideration, we divide the entire sample into four equal sub-periods; Phase I: 1996-97Q1 to 1999-00Q4, Phase II: 2000-01Q1 to 2003-04Q4, Phase III: 2004-05Q1 to 2007-08Q4 and Phase IV: 2008-09Q1 to 2011-12Q3.

As pointed out in Aizenman et al (2010a, b), policymakers can garner greater flexibility vis-à-vis monetary and exchange rate management in the short run by accumulating or depleting reserves. Consequently we also focus on ΔRes , the absolute change in reserves (as a percentage of GDP).[2]

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[2] We use data on actual intervention by the RBI to exclude valuation changes. The data is from Handbook of Statistics on the Indian economy.

Like other indices we also normalize ΔRes to lie between 0 and 1. Figure 4 shows the average of the various policy dimensions during the four phases. Across the phases, the rise in capital account openness has been associated with a drop in exchange rate stability. The index of monetary independence witnessed a drop in Phase II but recovered in subsequent phases.

Figure 4: Configuration of the Trilemma Objectives and International Reserves
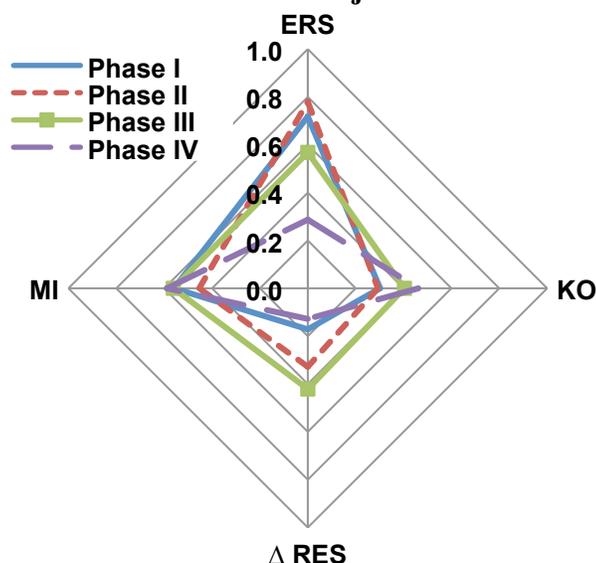
Source: Authors' calculations

Next, we examine the validity of the trilemma framework by testing whether the weighted sum of the three trilemma policy variables adds up to a constant – here set to be 2. We estimate the relationship for the entire period as well as the four phases outlined above. The results are given in Table 3. We find that the overall fit is extremely high with R^2 being above 0.93 across all the specifications. While the estimates for exchange rate stability and capital account openness are significant across all the specifications, it is not the case with monetary independence.

Table 3: Testing the Validity of the Trilemma Framework

	1996-97Q1 to 2011-12Q3	1996-97Q1 to 1999-00Q4	2000-01Q1 to 2003-04Q4	2004-05Q1 to 2007-08Q4	2008-09Q1 to 2011-12Q3
	Whole Sample	Phase I	Phase II	Phase III	Phase IV
Monetary Independence	0.656***	0.684**	0.125	0.158	1.244**

|					
	[3.448]	[1.986]	[0.516]	[0.861]	[2.711]
Exchange Rate Stability	1.388***	1.093**	1.511***	1.908***	1.774*
	[9.444]	[2.268]	[5.001]	[7.813]	[1.813]
Capital Account Liberalization	2.012***	2.419**	2.473***	1.997***	1.357**
	[8.392]	[2.918]	[3.078]	[5.861]	[2.696]
Observations	63	16	16	16	15
R-squared	0.954	0.949	0.980	0.989	0.934

Notes: Robust standard errors in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%.
Source: Authors' Calculations

To obtain the contribution of each trilemma policy orientation we multiply the coefficients with the average for each phase. The results are outlined in Figure 5. The high goodness of fit implies that the contributions add up to being very close to 2 across all the phases. The increase in exchange rate stability from Phase I to Phase II and Phase III was associated with a sharp drop in monetary independence. During Phases II and III, the RBI intervened heavily in the foreign exchange market to prevent appreciation in the face of strong capital inflows. It purchased $55.6 billion of foreign assets in Phase II, and another $134 billion in Phase III. The RBI tried to sterilize these interventions, through depletion of its stock of government bonds. As it started to run out of government bonds towards the end of 2003, a new instrument --- Market Stabilization Scheme (MSS) bonds were introduced. However, rising costs of sterilization forced the RBI to only partially sterilize the flows, resulting in loss of monetary independence during Phases II and III. Phase IV witnessed a resurgence of monetary independence with a decline in both exchange rate stability and capital account openness. The outbreak of the subprime crisis led to a flight to safety of foreign capital from India. The outflow was managed by allowing the Rupee to depreciate and through limited intervention in the foreign exchange market. Several capital account management measures such as raising the cap on foreign investment in bonds and

increasing the interest rate on NRI deposits were undertaken to attract greater capital inflows. At the same time a more independent monetary policy was pursued to bolster the Indian economy.[3]

Figure 5: Contribution to the Trilemma
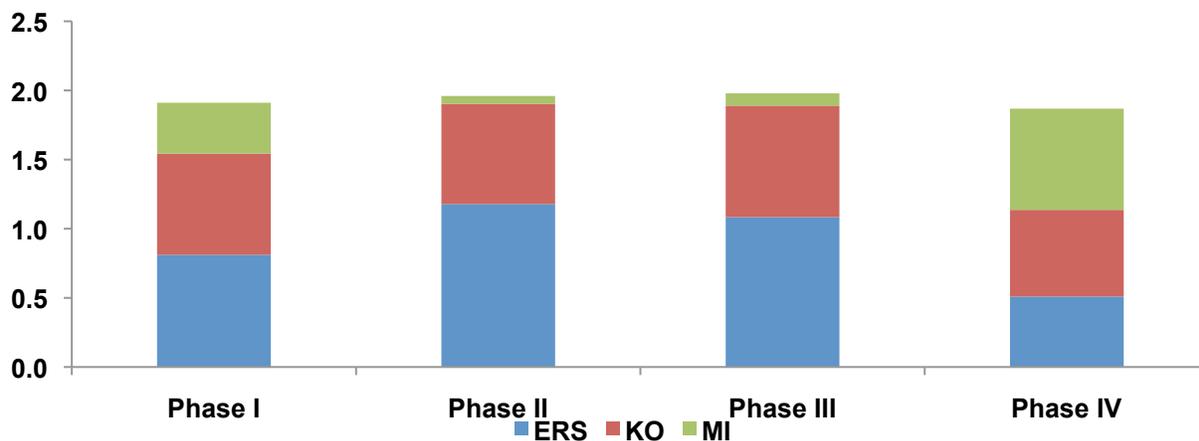
Source: Authors' calculations

Capital flows have remained volatile during most of Phase IV driven by uncertainty over the advanced economies' recovery prospects, large swings in risk aversion, loose monetary policy in the advanced economies and changing domestic fundamentals. In Phase IV, RBI intervened in a limited manner and allowed the exchange rate to move with greater freedom. While the Rupee appreciated by nearly 17% between March 2009 and April 2010, it weakened by 19% between August 2011 and December 2011. The drop in capital inflows and greater exchange rate flexibility allowed the RBI to pursue a more independent monetary policy. After the initial softening of monetary policy to stimulate growth, the RBI started tightening monetary policy from March 2010 in response to high inflation. This was in contrast with the advanced economies, which were following a soft monetary policy to stimulate growth.

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[3] The RBI took a series of measures to counter the drop in liquidity in the aftermath of collapse of Lehman Brothers. These included lowering of key policy rates, Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR), unwinding of MSS bonds, and lowering of prudential norms related to provisioning.

Overall, we find that instead of opting for corner solutions, India has adopted an intermediate regime while negotiating the trilemma. This has been buttressed by selective capital flow management measures.[4] In doing so, India has resorted to a multiple instrument approach. The overall policy architecture thus encompasses active management of capital flows, especially volatile and debt flows, moderately flexible exchange rate regime with the RBI intervening at times to prevent excessive volatility, sterilization through various instruments like MSS bonds and changes in CRR and finally, building up of a stockpile of reserves.

4. Impact on the Exchange Market Pressure Index (EMPI)

4.1 Measurements and Evolution of EMP Indices

The RBI's management of capital account could be driven by a desire to moderate certain types of capital inflows or to manage exchange rate stability. It may be reasonable to conjecture that the goal was the latter in the context of financial trilemma. Accordingly we measure the exchange market pressure (EMP) in India, discuss its evolution over time and analyze a few crucial macroeconomic factors that may have affected the EMP over the last couple of decades. EMP is a combination of exchange rate depreciation and international reserves loss-a concept pioneered by Girton and Roper (1977), and applied frequently in the analysis of EMEs (Frankel, 2009). A positive (negative) EMP indicates a net excess demand (supply) for foreign currency, accompanied by a combination of reserve loss (gain) and currency depreciation (appreciation).

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[4] Our results are broadly consistent with other studies focusing on India's trilemma management such as Hutchison et al, (2011); Aizenman and Sengupta (2012); Sen Gupta and Majhi (2012) among others.

In order to measure EMP in India, we follow Aizenman et al. (2012) who investigate the factors explaining EMP in emerging economies during the 2000s. The first measure of EMP is the un-weighted sum of percentage nominal depreciation and percentage loss of reserves:

$$EMP_{i,t} = \frac{\Delta e_{i,t}}{e_{i,t-1}} - \frac{\Delta IR_{i,t}}{IR_{i,t-1}} \tag{4}$$

where $e_{i,t}$ stands for nominal Rupee exchange rate per U.S. dollar and $IR_{i,t}$ denotes international reserve holdings (excluding gold) by India during quarter t. $\Delta e_{i,t}$ and $\Delta IR_{i,t}$ denote changes in nominal exchange rate and international reserve holdings respectively between quarters t and t-1.

Our second measure, EMP (IR/M-Base), is defined as the un-weighted sum of percentage exchange rate depreciation and reserve loss, with reserve loss deflated by the monetary base:

$$EMP_{i,t}^{IR/M-Base} = \frac{\Delta e_{i,t}}{e_{i,t-1}} - \frac{\Delta IR_{i,t}}{M_{i,t-1}/e_{i,t-1}} \tag{5}$$

where $M_{i,t-1}$ stands for M2 in local currency units of India in quarter t-1, and the monetary base is converted to U.S. dollars. According to the monetary model-based EMP measure popularized by Girton and Roper (1977), specification (2) provides a real measure of international reserve loss, normalized by the monetary base.

The third and final measure, EMP (Standardized), is the weighted sum of demeaned percentage nominal exchange rate depreciation and percentage loss of international reserves where the weights are inverses of the historical standard deviation of each series:

$$EMP_{i,t}^{S\tan dardized} = \frac{1}{\sigma_{i\Delta e}}\left(\frac{\Delta e_{i,t}}{e_{i,t-1}} - \mu_{i\Delta e}\right) - \frac{1}{\sigma_{i\Delta RES}}\left(\frac{\Delta IR_{i,t}}{IR_{i,t-1}} - \mu_{i\Delta RES}\right) \qquad (6)$$

where $\mu_{i\Delta e}$ and $\mu_{i\Delta RES}$ denote the historical means of percent nominal exchange rate depreciation and percent changes in international reserve holdings. Similarly, $\sigma_{i\Delta e}$ and $\sigma_{i\Delta RES}$ represent historical standard deviations of both these series for India.

Figure 6 shows the time-series evolution of the three EMP indices with the un-weighted EMP on the left axis and EMP (IR/M-Base) and EMP (Standardized), on the right axis.

Figure 6: Evolution of the EMP Indices: 1990Q1-2011Q4

Source: Authors' Calculations

As can be seen from the figure, all three EMP indices display a fair amount of fluctuations during the early 1990s, representing the period of heightened macroeconomic volatility during and in the aftermath of the 1991 BOP crisis in India. The un-weighted measure of EMP (left axis) indicate that between 1990Q1 and 1990Q4 India went from an average 5% combined nominal appreciation and gains in international reserve holdings to a 50% combined nominal

depreciation and international reserve loss. The fluctuations in all three EMP series continue throughout the 1990s shooting up during the 1997-98 Asian Financial crisis.

From 1999Q1 to 2008Q1, all three EMP indices are on average negative implying net excess supply of foreign currency, alleviated by a combination of reserve gain and appreciation. According to the un-weighted EMP, during this period Indian economy experienced on average a 7% combined nominal currency appreciation and gains in international reserve holdings. This also coincides with the period of Great Moderation in the global economy during which all EMEs in general experienced nominal appreciation and massive accumulation of reserves.

The downward/negative trend in the EMPs through the early and mid 2000s gets interrupted by a sharp upward movement between 2008Q2 and 2009Q1—the period of global turbulence centering around the collapse of Lehman Brothers in the US. Between 2008Q1 and 2008Q4, India went from an average 10% combined nominal appreciation and gains in reserve holdings to a 14% combined nominal depreciation and reserve loss. This is comparable to the EMP of other EMEs who during the same period went from an average 10% combined nominal appreciation and gains in international reserves holdings to a 20% combined nominal depreciation and international reserve loss (Aizenman et al. 2012).

Like other EMEs, the EMP in India (by all three measures) came down by 2009Q2 and switched back to net nominal currency appreciation combined with hoarding international reserves. This trend continued in India till the end of 2010. Since then however the EMP has been on the rise

again given the massive currency depreciation that India has been experiencing in the wake of the Euro-zone sovereign debt crisis.

4.2   Estimation of EMP determinants

In this sub-section we use a multivariate time-series regression framework in order to estimate the link between EMP and a few selected explanatory variables. The objective is to quantify the statistical as well as economic significance of these factors in accounting for exchange market pressure patterns over the sample period. Following Aizenman et al. (2012) in our first specification we include trade balance to GDP ratio, share of net FDI inflows and net portfolio equity inflows in GDP separately and we also control for year on year WPI (wholesale price index) inflation.[5]   Estimation results are reported in Table 4. The three columns pertain to the three different EMP measures as detailed in the previous section. The last two measures are used as dependent variables in the time-series regressions as robustness check for our baseline results on column 1.

As can be seen from column 1 of Table 4, a deteriorating trade balance is associated with a higher EMP, a result that makes intuitive sense. When EMP is standardized or deflated by monetary base, the estimated coefficient of trade balance continues to have the predicted sign, but it is no longer statistically significant. An increase in net portfolio equity inflows lowers the EMP. This effect is both statistically and economically significant. For instance a 10 percentage points rise (decline) in portfolio equity inflows (outflows) is associated with a 16.7 percentage points lower EMP when measured using the un-weighted index. The association between EMP

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[5] We are constrained by the number of observations and hence have not added too many controls in the EMP estimations for lack of sufficient degrees of freedom.

and equity flows is also robust to the normalization of reserves by monetary base as well as standardization of the EMP index. Neither inflation nor the share of net FDI inflows in GDP seems to have any significant impact on the EMP over the sample period.[6]

Table 4: Factors affecting EMP in India (1990Q1-2011Q4)

Variables	EMP	EMP(Reserves/M-Base)	EMP(Standardized)
Trade Balance (% GDP)	-1.420***	-0.096	-0.095
	(0.578)	(0.263)	(0.074)
Net FDI Inflows (% GDP)	-1.073	-0.137	-0.083
	(0.944)	(0.448)	(0.124)
Net Portfolio Equity Inflows (% GDP)	-1.667**	-0.661*	-0.206**
	(0.758)	(0.366)	(0.098)
WPI Inflation	-1.667	0.198	0.071
	(0.429)	(0.218)	(0.058)
Observations	60	60	60
R-Squared	0.1892	0.0858	0.1306

Notes: Robust standard errors in parentheses. *, **, and *** indicate correlations significant at 10%, 5%, and 1% respectively
 Source: Authors' Calculation

We had also incorporated percentage change in stock market returns (BSE Index) as well as the ratio of short-term external debt to GDP in the EMP estimations. Stock market returns happened to be highly correlated with WPI inflation and trade balance. When added without these two explanatory variables in the regression, stock market returns were found to be significantly associated with EMP measured using all three indices. In other words, positive changes in stock returns lower the EMP and vice versa. Quarterly data on short-term external debt is available only from 2006Q1 onwards from the Quarterly External Debt Statistics (QEDS) database maintained jointly by the BIS-IMF-World Bank. When added to the estimation, external debt was found to be negatively associated with EMP—a lower short-term external debt ratio increases the EMP, but the effect was found to be statistically significant only for the un-

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[6] We also conducted the estimation using Newey-West standard errors and results came out to be the same.

weighted EMP index. These results are not reported here for brevity but are available upon request. Our results thus primarily highlight the importance of portfolio equity flows and also stock market returns to some extent, in accounting for exchange market pressure in India from 1990Q1 to 2011Q4.

5.   Co-ordination in Capital Controls: Role of G20

In recent times there has been a widespread debate among economists and policy makers regarding the efficacy of capital controls in managing volatile cross-border capital flows. While capital controls and similar macro-prudential measures are useful in ensuring macroeconomic and financial stability in countries especially during times of sudden stops and surges, there are considerable risks involved as recently highlighted by the Global Financial Crisis of 2008. A coordinated approach across countries in implementing capital controls is likely to be more effective than unilateral actions, given that any prudential measure adopted to tackle capital flow volatility is bound to have cross-border spillover effects, often times putting the burden of adjustment on other countries.

As argued by Ostry, Ghosh and Korinek (2012), one of the reasons why countries may wish to impose capital controls on inflows is to maintain an undervalued currency thereby sustaining a current account surplus. By restricting capital inflows, the debtor country may seek to manipulate the inter-temporal terms of trade in its favor. Such a unilateral policy action by one country is likely to have a beggar-thy-neighbor impact by forcing a situation of current-account deficit on the importing country. Alternatively, if countries use capital controls in order to mitigate the risks associated with volatile foreign borrowing, it is likely to magnify the macro-

financial stability risks for other countries by diverting the unwanted, volatile flows to countries that are less able to absorb the same. Within such a multilateral context, coordination across countries may be useful in producing a globally efficient outcome, especially when imposition of capital controls is associated with welfare costs.

Thus, any decision by a country to impose capital controls may need to take into account the associated multilateral repercussions. And here the G20 can play an effective role by ensuring that the severity of boom-bust cycles in capital flows is mitigated through cooperation and coordination among its member countries thereby fostering global financial stability. In this context it maybe worthwhile to mention that India, a major emerging economy adopted a series of financial liberalization measures since 1991 and these have mostly been unidirectional since then. Barring a couple of exceptional instances, India has not used capital controls unilaterally to manage volatile capital flows.

6. Conclusion

The recent increase in volatility of global capital flows has reignited the debate about appropriate capital flow management measures. Volatile capital flows tend to complicate macroeconomic management by aggravating real exchange rate misalignment, excesses in credit market, asset price booms and busts and exacerbating overall financial fragility. Furthermore, they complicate the policy trade-offs related to current account deficit, exchange rate, inflation, availability of external capital to finance investment, and reserve holdings. These policy dilemmas reiterate the need to actively manage capital flows. This can be achieved through a gamut of policy measures

of which capital controls are a part. Relying exclusively on the latter would be erroneous-capital controls can be effective, but are not always foolproof, and are vulnerable to leakages through financial engineering.

India's experience highlights the adoption of a calibrated approach towards capital account liberalization to minimize risks associated with financial fragilities and macroeconomic distortions. Furthermore, in dealing with capital flows India has resorted to a multiple instrument approach encompassing capital flow management measures, increasingly flexible exchange rate regime with the RBI intervening from time to time, sterilization of these interventions through multiple instruments like MSS bonds and CRR, and building up of a stockpile of reserves.

India has navigated the well-known macroeconomic trilemma by embracing an intermediate approach, and balancing the policy objectives as per the demands of the macroeconomic situation. In recent years, a shift towards greater monetary policy autonomy to tackle growing domestic inflationary pressure has been balanced with greater flexibility of the exchange rate.

In order to assess the impact of capital account management on the foreign exchange market, we also focus on the exchange market pressure (EMP) index and analyze its various macroeconomic determinants. We find that EMP has exhibited a great deal of fluctuation in India during the period 1990 to 2010 due to global and domestic events and has primarily been affected by changes in the trade balance, portfolio equity inflows and stock market fluctuations.

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