Management of Capital Flows in India

Abhijit Sen Gupta [1]   Rajeswari Sengupta [2]

[1] India Resident Mission, Asian Development Bank

[2] The Institute for Financial Management and Research

Financial Sector Developments, Issues and the Way Forward

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Outline

Introduction & Motivation

- Net capital flows to emerging markets have exhibited a sharp increase in volatilitydriven by widely shifting risk perceptions, uncertainty about recovery prospects and quantitative easing in advanced economies.
  [▸ Capital Flows]

- Such sharp swings create several problems for these countries, and have rekindled the debate on management of international capital flows.

- A country wants to actively manage international capital flows for two main reasons.
  - Unbridled capital flows tend to exacerbate financial fragilities, which can lead to a crisis.
  - Creates difficulties in macroeconomic management – "Trilemma"

- To counter these issues a number of countries have introduced additional measures regulating the flow of international capital.

- In recent years even the IMF has also shown a shift in its doctrine. [▸ IMF]

India's Approach to Capital Account Liberalization

- Capital account liberalization in India has taken place in a gradual manner, and has been viewed as a continuous process rather than a one off event.
- Realizing that the spillovers and externalities associated with different forms of capital flows would be different, a pecking order approach to the composition of capital flows has been adopted.
- India prioritized certain kinds of flows and agents in the liberalization process.
  - Shift away from debt to non-debt-creating flows.
  - Use of multiple instruments, including quantitative limits, price based measures and administrative measures.
  - Restricting short-term debt for trade transactions.
  - Avoiding excessive foreign currency borrowing by domestic entities.
  - Prudential regulations to prevent dollarization of balance sheets of financial sector intermediaries.
  - Gradual liberalization of permissible avenues for outward investments.
- Prioritization of certain flows helped in significantly altering India's external liabilities profile. ▸ Composition

India's Approach to Capital Account Liberalization

- Management of capital flows also aims to stem rapid appreciation of the real exchange rate as well as cool overheated asset prices such as stock and real estate.
  - Excessive capital inflows can result in rapid exchange rate appreciation, which can hurt exports of emerging markets.
  - Foreign capital can easily lead to asset price booms, with subsequent busts severely disrupting the economy.
- To be deemed effective the measures must reverse or at least slowdown the rate of appreciation or asset price increase observed prior to their introduction.
  ▸ Impact
- The calibrate approach has meant that India has not kept up with the pace of liberalization in terms of *De Jure* openness. ▸ De Jure Openness
- Or *De Factor* openness. ▸ De Facto Openness
- However, India's ranking improves considerably when one looks only at Non Debt creating flows. ▸ Non Debt

Negotiating the Trilemma

Definition (Trilemma)

A country can simultaneously achieve only two of the following three objectives: free capital flows, an independent monetary policy and a fixed exchange rate. ▶ Trilemma

- India, as other countries, seeks to attain these three objectives with varying degrees.
    - Capital flows aid growth by providing external capital to sustain an excess of investment over domestic savings or by financing the current account deficit.
    - A competitive exchange rate helps Indian exports, a large part of which is labour intensive.
    - An independent monetary policy stabilizes the economy in the face of domestic and exogenous shocks.
- Focus on this issue by following the methodology outlined in Aizenman et al. (2010).

Quantifying the Trilemma

- Monetary independence is measured as the inverse of the annual correlation of the monthly interest rates between India and the United States.

$$MI = 1 - \frac{corr(i, i^*) - (-1)}{1 - (-1)} \tag{1}$$

- The index for Exchange Rate Stability is calculated using the methodology introduced by Frankel and Wei (1994) where the degree of influence that G3 currencies have on Indian Rupee is estimated using the following model

$$\Delta log\epsilon_{INR,t}^{CHF} = \alpha_0 + \beta_{USD}\Delta log\epsilon_{USD,t}^{CHF} + \beta_{EUR}\Delta log\epsilon_{EUR,t}^{CHF} + \beta_{JPY}\Delta log\epsilon_{JPY,t}^{CHF} + \nu_t \tag{2}$$

- The model is estimated over a quarter and the goodness of fit, or the adjusted R^2 is the measure of exchange rate stability.

Quantifying the Trilemma

- For capital account openness we use the de facto measure based on the ratio of absolute value of net capital flows to GDP.

$$KO = \frac{|NKF|}{GDP} \tag{3}$$

- A possible way to manage the dichotomy between monetary independence and exchange rate stability, over the short-run, is by accumulating or decumulating reserves.

$$\Delta Res = \frac{|Intervention|}{GDP} \tag{4}$$

- The various measures are normalized so that they lie between 0 and 1.

India's Experience

- The rising extent of capital account openness has been associated with a drop in exchange rate stability. ▸ Trilemma

- The index of monetary independence witnessed a drop in Phase II but recovered in the following phases. ▸ Trilemma

- 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.

- The overall fit is extremely high and the coefficient for exchange rate stability and capital account openness are significant across all the specifications, but this is not the case with monetary independence. ▸ Table

- Obtain the contribution of each trilemma policy orientation by multiplying the coefficients with the average for each phase. ▸ Contribution

- Instead of opting for corner solutions, India has adopted an intermediate regime while negotiating the trilemma.

Impact on the Exchange Market Pressure Index

- During the period under consideration, RBI's capital account management may have well been driven by a desire to manage exchange rate stability.

- We measure the Exchange Market Pressure (EMP) in India, discuss its evolution over time and analyze a few factors that may have affected EMP during 1990-2011.

- EMP is a combination of exchange rate depreciation and international reserves loss (Girton and Roper, 1977; 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).

- We follow Aizenman and Sushko (2010) and use three different indices to measure India's EMP.

Impact on the Exchange Market Pressure Index

- Un-weighted sum of percentage nominal depreciation and percentage loss of reserves:

$$EMP_t = \frac{\Delta e_t}{e_{t-1}} - \frac{\Delta IR_t}{IR_{t-1}} \tag{5}$$

- Un-weighted sum of percentage exchange rate depreciation and international reserve loss, with reserve loss deflated by the monetary base or M2:

$$EMP_t^{\frac{IR}{M-Base}} = \frac{\Delta e_t}{e_{t-1}} - \frac{\Delta IR_t}{\frac{M_{t-1}}{e_{t-1}}} \tag{6}$$

- Weighted sum of demeaned percentage nominal exchange rate depreciation and percentage loss of international reserves where the weights are inverses of historical standard deviations of each series:

$$EMP_t^{Standardized} = \frac{1}{\sigma_{\Delta e}} \left(\frac{\Delta e_t}{e_{t-1}} - \mu_{i,\Delta e} \right) - \frac{1}{\sigma_{\Delta Res}} \left(\frac{\Delta IR_t}{IR_{t-1}} - \mu_{\Delta Res} \right)$$ ▸ EMP Figure

$$\tag{7}$$

Impact on the Exchange Market Pressure Index

- All 3 EMP indices display fair amount of fluctuations during early 1990s–period of heightened macroeconomic volatility during 1991 BOP crisis.

- Fluctuations in EMP series continue throughout 1990s shooting up during 1997-98 Southeast Asian crisis.

- Between1999Q1- 2008Q1, all 3 EMP indices are on average negative implying net excess supply of foreign currency, alleviated by combination of reserve gain and appreciation.

- Trend gets interrupted by sharp upward movement between 2008Q2 and 2009Q1-India went from average 10% combined nominal appreciation and reserve gains to a 14% combined nominal depreciation and reserve loss.

- EMP came down by 2009Q2 but since 2010 it has been on the rise again given the massive currency depreciation in the wake of Euro-zone sovereign debt crisis.

Impact on the Exchange Market Pressure Index

- Use multivariate time-series regression framework to estimate the link between EMP Index and selected explanatory variables.

- Trade balance/GDP, net FDI inflows/GDP, net portfolio equity inflows/GDP, % change in stock market returns and short-term external debt/GDP controlling for YoY WPI inflation.

- Deteriorating trade balance and decline in net portfolio equity inflows are associated with higher EMP. ▸ Table

- Positive changes in stock market returns lower EMP. ▸ Table

- Lower short-term external debt to GDP ratio improves EMP. ▸ Table

Asymmetric Intervention

- Intervention operations to curb excessive volatility and to ensure orderly conditions in the domestic forex market.
- The sustained buildup of reserves since the early 2000s contradicts this argument as management of exchange rate volatility would imply that reserve holdings do not change much over a period of time. ▸ Intervention
- Test the hypothesis that RBI intervened in an asymmetric manner i.e. by leaning against the wind, in order to prevent the Rupee from appreciating sharply.
- Central bank's loss function takes the following form.

$$L_t = \frac{1}{2}(R_t - R^*)^2 + \frac{\phi}{2}((\tilde{\epsilon}_t - \epsilon^*)^2 + \frac{\theta}{3}(\tilde{\epsilon}_t - \epsilon^*)^3) \tag{8}$$

where $R_t = (\Delta logReserves_t) * 100$ and $\tilde{\epsilon}_t = (\Delta log\epsilon) * 100$ with ϵ_t being the foreign currency price of one unit of domestic currency.

- $\phi > 0$ is the relative weight the central bank puts on stabilizing exchange rate.
- $\theta > 0$ introduces the asymmetry in the loss function as an appreciation ($\tilde{\epsilon} > 0$) increases the central bank's loss while depreciation ($\tilde{\epsilon} < 0$) reduces the extent of loss.

Asymmetric Intervention

- The central bank faces a trade-off between stabilizing reserves and exchange rate simultaneously as interventions can reduce the extent of exchange rate deviation.

$$\tilde{\epsilon}_t - \epsilon^* = \alpha_0 + \alpha_1 R_t + \eta_t \tag{9}$$

- Minimizing Eq. (8) by choosing R_t subject to constraint given in Eq. (9) yields the optimaility condition.

$$R_t = R^* - (\phi\alpha_1)\tilde{\epsilon}_t - (\frac{\phi\theta}{2}\alpha_1)\tilde{\epsilon}_t^2 \tag{10}$$

- The optimality condition can be reduced to an empirically testable formulation

$$R_t = \beta_0 + \beta_1\tilde{\epsilon}_t + \beta_2\tilde{\epsilon}_t^2 + \upsilon_t \tag{11}$$

  where $\beta_1 = -\phi\alpha_1$ and $\beta_2 = -\frac{\phi\theta}{2}\alpha_1$ implying $\theta = \frac{2\beta_2}{\beta_1}$

- We use Generalised Method of Moments (GMM) to estimate the reduced-form Eq. (11)
- We identify four sub periods: Phase I: Apr 1993 to Aug 1998; Phase II: Sep 1998 to Mar 2004; Phase III: Apr 2004 to May 2008; and Phase IV Jun 2008 to Dec 2011.
- Barring Phase I, θ is positive and significant across all specifications, implying that the RBI has been intervening in an asymmetric manner since 1998.
- θ takes the highest value in Phase II while bulk of reserve accumulation happened in Phase III.
- Phase IV has witnessed a significant drop in the value of θ, although it continues to be positive and significant.

Sterilizing Interventions

- Interventions (*increase in net foreign assets*), if not sterilized, will lead to an increase in reserve money and decline in monetary independence.
- Much of the sterilization in India has been through reduction in holding of government bonds (*decline in net domestic assets*) and subsequently issuance of Market Stabilization Scheme Bonds.
- From 2003-04 onwards rising fiscal costs of sterilization forced RBI to only partially sterilize forex interventions.
- Objective: To what extent RBI has succeeded in limiting the impact of reserve accumulation on money supply and maintaining monetary autonomy.
- To estimate the extent of sterilization of RBI's forex intervention, we run the following model

$$\Delta NDA_t = \alpha + \beta_1 \Delta NDA_{t-1} + \beta_2 \Delta NFA_t + \beta_3 \Delta log(IIP)_{t-1} + \epsilon_t \tag{12}$$

where NDA is net domestic assets, NFA is net foreign assets and we also include 12 month lag of log IIP and lagged dependent variable.

Sterilizing Interventions

- Magnitude of β_2 is indicator of extent to which RBI has managed to insulate money supply from reserve accumulation.
- We use monthly data from RBI database and identify three sub periods:
- Phase I: Jan 1990 to Sep 1998 (*Rupee pegged to the Dollar*); Phase II: Oct 1998 to Mar 2004 (*Rupee moving to a basket peg with relatively more flexibility*); Phase III: Apr 2004 to Aug 2010 (*higher flexibility in Rupee*). ▶ Table
- Estimated sterilization coefficient is statistically significant only in Phase II and Phase III.
- From end 1998 to middle of 2004, almost 60% of the rise in NFA was offset by corresponding fall in NDA through RBI's sale of MSS bonds.
- Magnitude of the coefficient less than halves in Phase III with less than 30% of the rise in NFA being sterilized by a concomitant decline in NDA.

India's Reserve Management

- India's reserve accumulation has been driven by the central bank's policy of leaning against the wind.

- The build-up of reserves meant that India was comfortably placed on the various traditional reserve adequacy indicators. ▸ Comparison

- However, since the outbreak of the sub-prime crisis in 2007, India has been witnessing a rising current account deficit and slowing capital inflows, with the latter barely able to finance the former.

- This in turn kept foreign exchange reserves largely stagnant over this period, resulting in significant deterioration of reserve cover. ▸ Evolution

- The deteriorating reserve cover has prompted the policymakers to introduce a host of measures since the second half of 2011 relaxing the restrictions on pricing and quantum of inflows. ▸ Table

Conclusion

- An emerging consensus that countries need to actively manage their capital account in the face of volatile capital flows.

- To minimize risks India has adopted a calibrated and gradual approach towards opening of the capital account, prioritizing the liberalization of certain flows.

- Instead of adopting corner solutions, India has embraced an intermediate approach in managing the conflicting objectives of the trilemma, balancing the policy objectives as per the demands of the macroeconomic situation.

- Recent years have seen a discernible shift towards monetary policy autonomy, which has been balanced with greater exchange rate flexibility of the exchange rate, which has acted as a shock absorber in a period of volatile capital flows.

- The intermediate approach has been associated with an asymmetric intervention in the foreign exchange market by the RBI resulting in large-scale reserve accumulation.

- However sterilization of this intervention has been partial at times leading to rapid increase in monetary aggregates and fuelling inflation.

- While greater exchange rate flexibility allows the exchange rate to act as a shock absorber, the hands-off approach has resulted in reserves remaining virtually stagnant since 2007, leading to a significant deterioration in the reserve adequacy measures.

Thank You!!!!

Appendix Outline

8 Appendix
- Global Capital Flows to Emerging Market Economies
- Coping with Surges in Capital Flows
- Composition of Liabilities
- Impact of Capital Controls on Currency & Stock Prices
- Cross Country Comparison
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    - De Facto Measures of Openness
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- Trilemma
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    - Configurations of the Trilemma
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- Intervention
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    - Estimates of Policy Preference
    - Extent of Sterilization
- Reserve Adequacy

Global Capital Flows to Emerging Markets
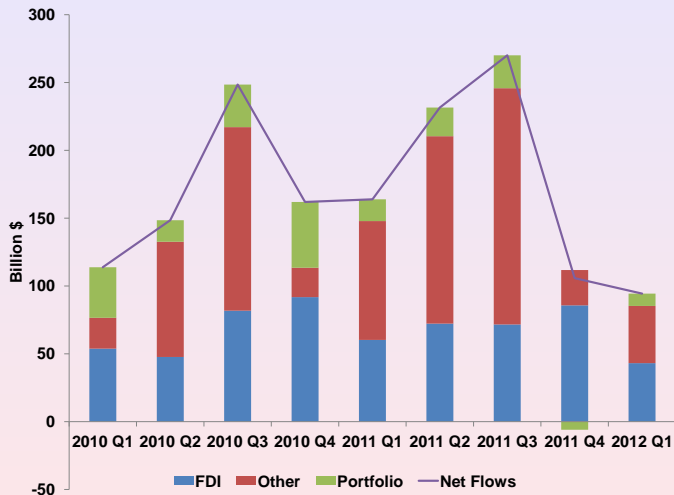
Source: Institute of International Finance ▸ Capital Flows

Coping with Surges in Capital Flows
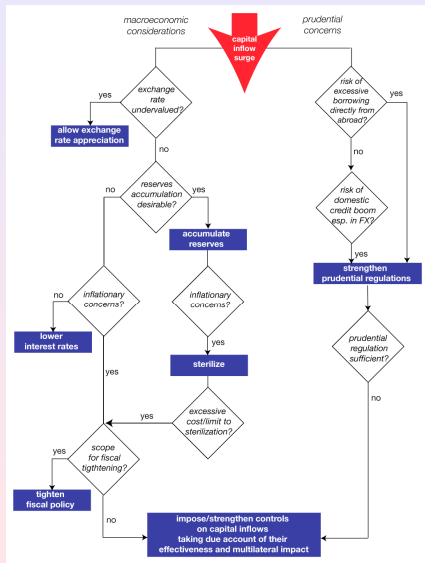
Composition of Liabilities
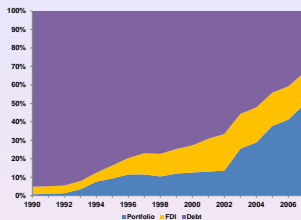
(a) India
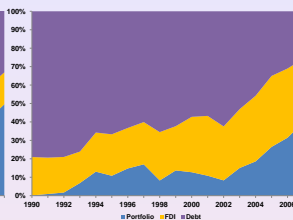
(b) Brazil
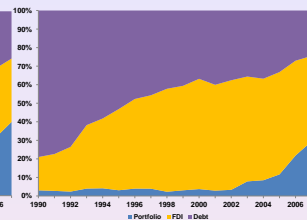
(c) China
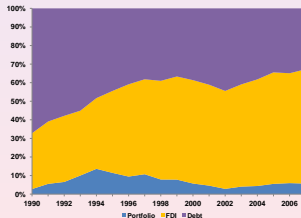
(d) Chile
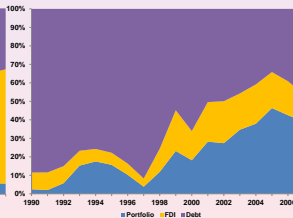
(e) Korea
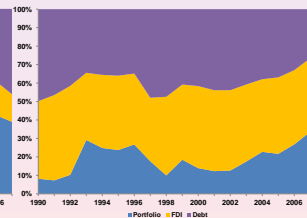
(f) Malaysia

▸ Composition

Impact of Capital Controls on Currency & Stock Prices
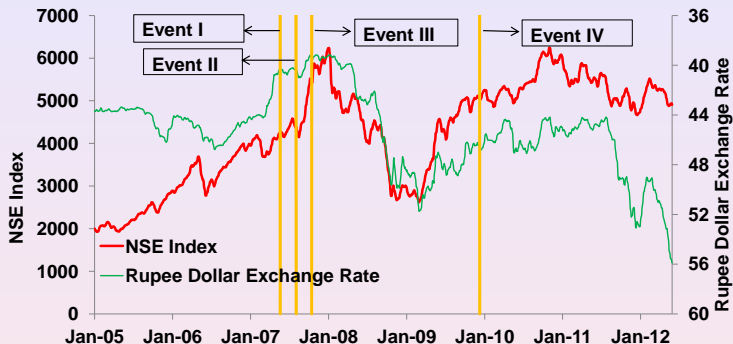
		Average Daily Currency Appreciation		Average Daily Stock Price Increase	
	Date of Introduction	Before	After	Before	After
Event I	May 22, 2007	0.198%	-0.003%	0.395%	0.113%
Event II	August 7, 2007	0.029%	0.027%	0.092%	0.271%
Event III	October 17, 2007	0.125%	-0.026%	0.670%	0.181%
Event IV	December 10, 2009	0.023%	0.026%	0.196%	-0.159%

▶ Impact

Cross Country Comparison of De Jure Openness

(a) 1970s

(b) 1980s

(c) 1990s
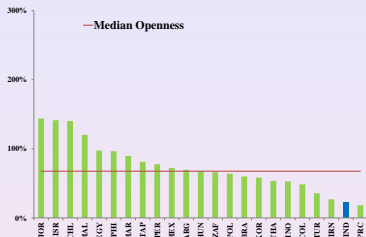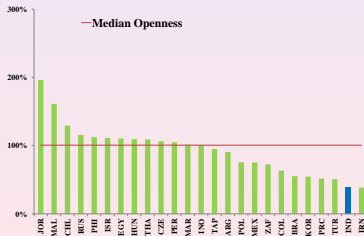
(d) 2000s

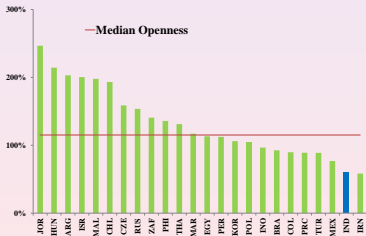# Cross Country Comparison of De Facto Openness
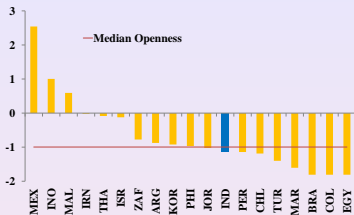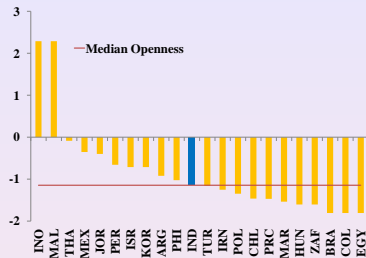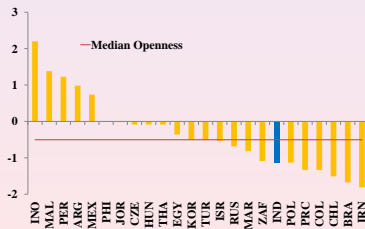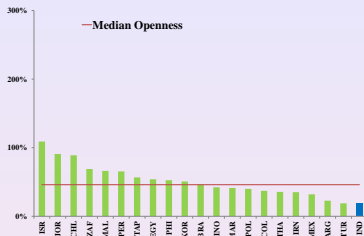
(a) 1970s

(b) 1980s

(c) 1990s

(d) 2000s

► Comparison

Non Debt Creating Flows

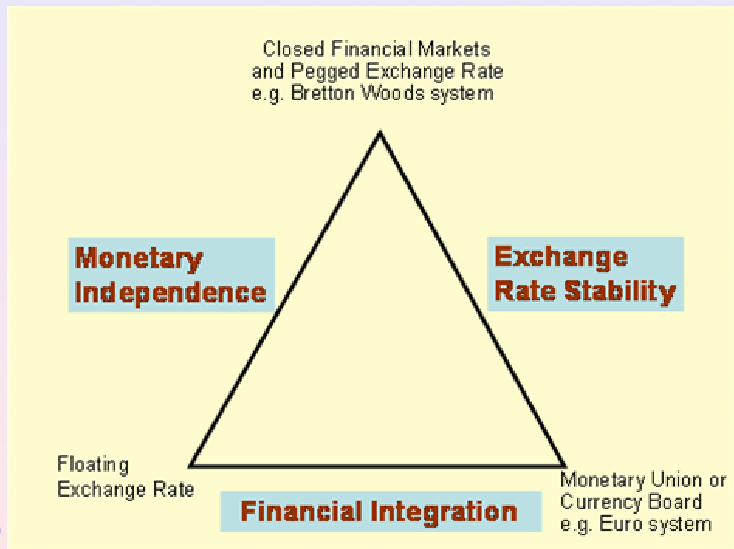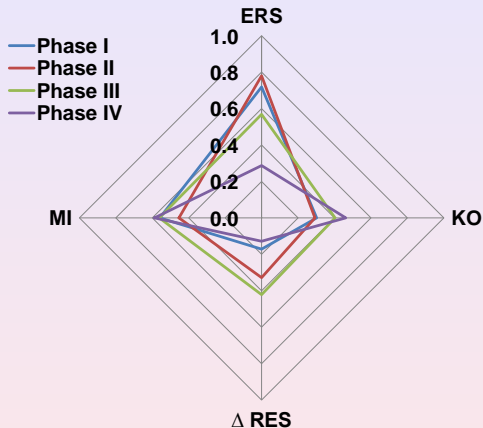
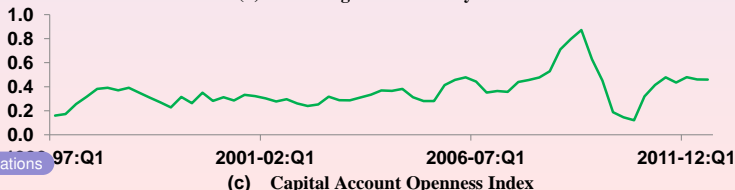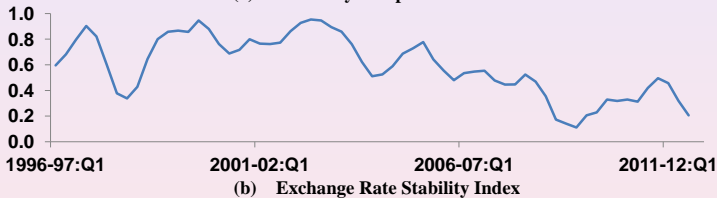(a) 1993

(b) 2007

Comparison

Trilemma

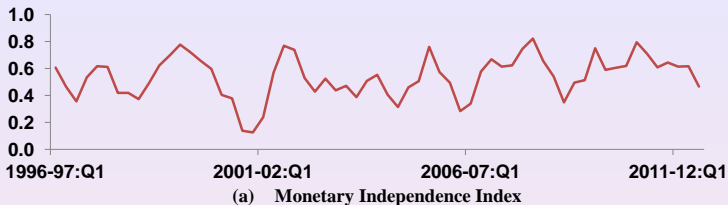# Configurations of the Trilemma

Phase I	1996-97Q1 to 1999-00Q4
Phase II	2000-01Q1 to 2003-04Q4
Phase III	2004-05Q1 to 2007-08Q4
Phase IV	2008-09Q1 to 2011-12Q3

▸ Configurations

Evolution of the Trilemma Objectives

(a)   Monetary Independence Index

(b)   Exchange Rate Stability Index

▸ Configurations

(c)   Capital Account Openness Index

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	0.98	0.989	0.934
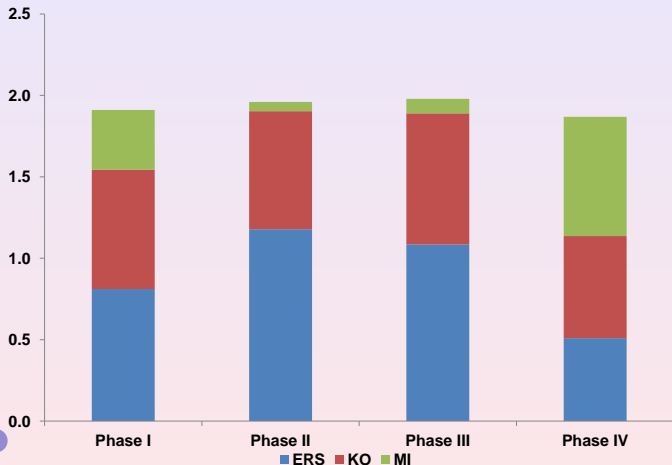
Contribution to the Trilemma

Impact on the Exchange Market Pressure Index
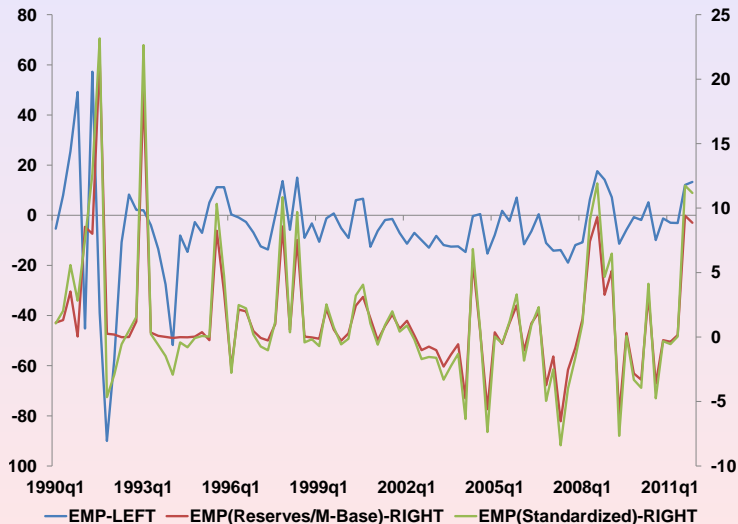
Impact on the Exchange Market Pressure Index

	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	0.662	0.198	0.071
	[0.429]	[0.218]	[0.058]
Observations	60	60	60
R-squared	0.189	0.086	0.131

▸ Table

Impact on the Exchange Market Pressure Index

	EMP	EMP(Reserves/M-Base)	EMP(Standardized)
Trade Balance (% GDP)	-1.583***	-0.166	-0.116*
	[0.493]	[0.244]	[0.065]
Net FDI Inflows (% GDP)	-1.111	-0.155	-0.088
	[1.033]	[0.474]	[0.133]
Percentage Change in Stock Market Returns	-0.286***	-0.118***	-0.036***
	[0.069]	[0.028]	[0.008]
WPI Inflation	0.009	-0.073	-0.012
	[0.455]	[0.218]	[0.059]
Observations	60	60	60
R-squared	0.295	0.214	0.262

▸ Table

Impact on the Exchange Market Pressure Index

	EMP	EMP(Reserves/M-Base)	EMP(Standardized)
Net Portfolio Equity Inflows (% GDP)	-1.770***	-0.271	-0.144
	[0.887]	[0.392]	[0.102]
Net FDI Inflows (% GDP)	-0.562	0.628	0.078
	[1.707]	[0.751]	[0.213]
Percentage Change in Stock Market Returns	-0.205**	-0.108*	-0.030**
	[0.102]	[0.063]	[0.014]
Short-term External Debt	-1.950***	-0.346	-0.167***
	[0.744]	[0.265]	[0.065]
WPI Inflation	1.005	0.295	0.106
	[0.764]	[0.381]	[0.104]
Observations	60	60	60
R-squared	0.618	0.449	0.554

▸ Table

Monthly Intervention
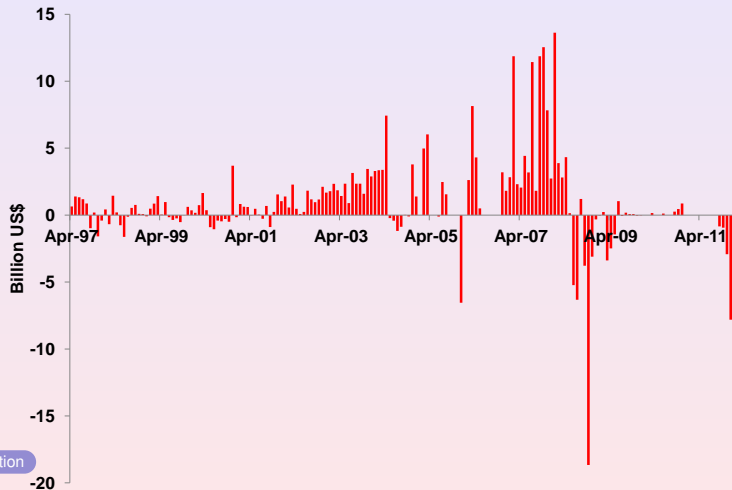
Estimates of Policy Preference

	Apr-93 to Aug-98	Sep-98 to Mar-04	Apr-04 to May-08	Jun-08 to Dec-11
	Phase I	Phase II	Phase III	Phase IV
β_0	-0.023	0.864***	1.138**	0.707***
	[0.035]	[0.026]	[0.05]	[0.033]
β_1	-0.509***	-3.366***	-0.630***	-1.410***
	[0.069]	[0.221]	[0.120]	[0.03]
β_2	0.053	-2.164***	-0.243***	-0.377***
	[0.034]	[0.654]	[0.055]	[0.087]
θ	0.208	1.286***	0.771***	0.535***
	[0.152]	[0.040]	[0.013]	[0.004]
No. of Observations	49	67	50	43
J Statistic	9.38	10.19	9.93	11.55

▸ Table

Extent of Sterilization

	Apr 1990 to Sep 1998	Oct 1998 to Mar 2004	Mar 2004 to Aug 2010
Constant	878.367	1523.943	4227.436**
	[-607.922]	[-1005.134]	[-1929.542]
Change in NFA	-0.208	-0.609***	-0.269*
	[-0.231]	[-0.128]	[-0.152]
Lagged change in NDA	0.226***	-0.052	0.158*
	[-0.094]	[-0.187]	[-0.094]
Lagged change in log of IIP	-11829.18	-9133.15	115470.10***
	[-9543.64]	[-10163.47]	[-31567.53]
Observations	41	66	76
R-Squared	0.099	0.212	0.249

▸ Table

Cross Country Reserve Adequacy
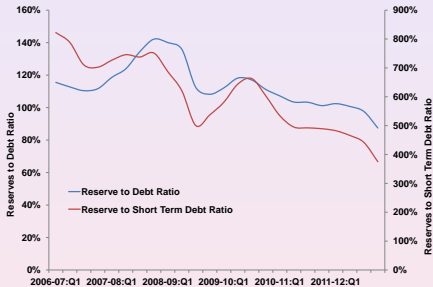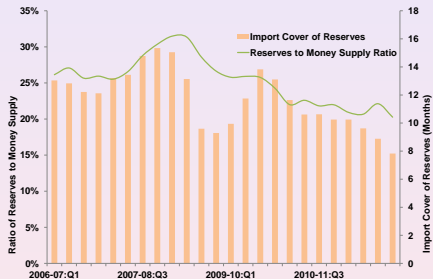

(c) Import Cover
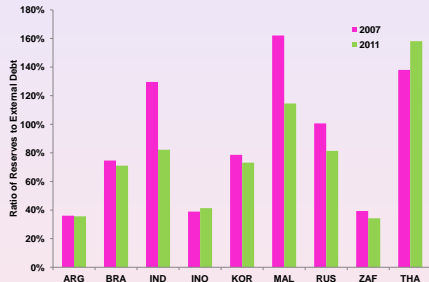
(d) External Debt Cover

▸ Reserve Management

India's Reserve Adequacy

(a) External Debt Cover

(b) Import & M2 Cover

▸ Reserve Management