India's trilemma: Financial liberalisation, Exchange rates, and Monetary policy.
Discussion

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Motivation

- Challenges in pursuing an open economy framework
- Monetary policy independence
- Exchange rate stability
- Capital account openness

India

- Reforms since mid-nineties
- Money market reforms: Govt. securities market
- Change in capital flows policy: Current account convertibility, Foreign exchange management act 1999
- Authors follow Aizenman, Chinn and Ito (2009)

Main arguments of the paper

- Rise in financial integration has come with limitations on monetary policy independence and exchange rate stability
- Rise of international reserves as a tool of macroeconomic policy is evident in India
- Intervention in the exchange rate market has successfully limited exchange rate volatility in India
- "Active intervention in foreign exchange markets and maintaining a degree of control over international capital flows has proved a potent combination of policy instruments in India."

Results summary

Trilemma and Reserves

Suggestions

- On data
- Redefine monetary policy independence
- Locate independence measurement in exchange rate regimes.
- Other measures of capital account openness: Gross flows on *current* and *capital* account.
- Increase frequency to monthly data instead of quarterly data.
- Use intervention data instead of Δ Net Foreign Assets as a sensitivity test.
- Locate discussion on inflation and inflation volatility in the context of monetary policy independence.

Data issues

Data

- Quarterly data has been used.
- All variables used are available at a monthly frequency.
- This study would benefit from a more fine grained perspective.

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- Since the study is about changing international reserves as a tool of macroeconomic policy, $\frac{\Delta reserves}{GDP}$ would avoid much manipulation required to the data.
- **"...weekly Wholesale Price Index (WPI)...averaging these for each quarter produces a quarterly inflation series."**
- Quarterly inflation data is available on the RBI website and other databases. Since WPI undergoes a lot of revision, it is important to use available data series.

Monetary policy independence needs to be
measured better

Measuring monetary policy independence

- Measurement through correlation

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- In many such cases, monetary authorities are likely to choose similar policy stances.

- Responsiveness to inflation in a counter-cyclical manner is the corner stone of good monetary policy.

- Measure monetary policy independence as responsiveness to inflation.

The Indian case

- The Indian business cycle is increasingly in synchrony with the US business cycle. (Jayaram, Patnaik and Shah, 2009)

- As noted by this paper too, India's financial integration, *de facto* has increased dramatically in recent years.

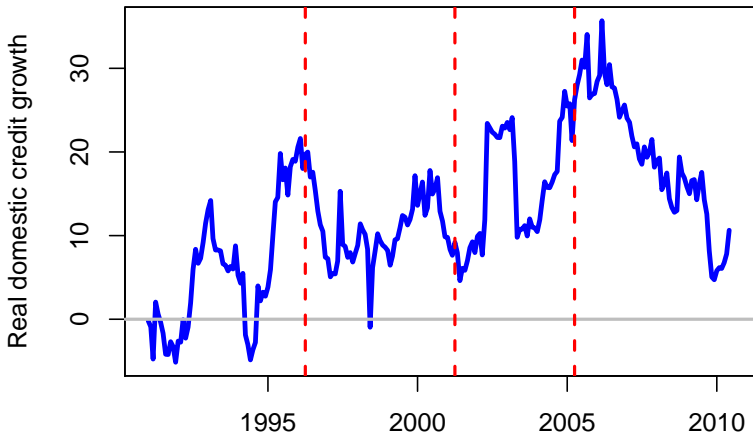- Measurement of monetary policy independence will have to go beyond correlations.

Monetary policy independence measure

Figure 4: Monetary Independence Index
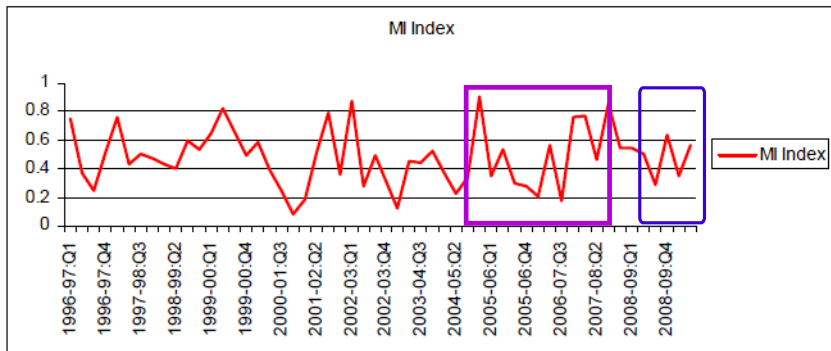
Real domestic credit growth suggests otherwise

Responsiveness to inflation: Key yardstick

- A rolling open-economy Taylor rule with exchange rates as one of the variables.
- Second best option: dynamic estimates of interest rate sensitivity
- Example: Frankel, Schumkler and Serven (2002) show that interest rates of countries with more flexible regimes adjust more slowly to changes in international rates.

DCC-MGARCH approach

- Ad-hoc rolling-window used at present
- GARCH specifications allow for an econometric estimation of the rolling-window for calculating correlations.
- Kroner and Ng (1998) discuss MGARCH as a natural analytical framework for studying shock correlations.
- The Dynamic conditional correlation MGARCH model Engle(2002) and Engle and Sheppard (2001) allows one to model time-varying shock correlations between interest rate shocks in the presence of dynamic volatility.

Locate independence measurement in exchange rate
regimes

Exchange rate regimes

- A considerable body of literature has looked into identifying exchange rate regimes.
- Calvo and Reinhart (1999), Reinhart and Rogoff (2004), Zeileis et. al. (2010), Patnaik et. al. (2010).
- Measuring monetary policy independence in different regimes would lend consistency to the Trilemma argument.

Exchange rate stability

- The Indian exchange rate regime, has *de facto* changed considerably over time. (Patnaik et. al. 2010)
- This paper breaks down the entire time period into three:
  1. 1996-97:Q1 to 2000-01:Q2
  2. 2000-01:Q3 to 2004-05:Q4
  3. 2005-06:Q1 to 2009-10:Q2

Exchange rate regimes and the present window
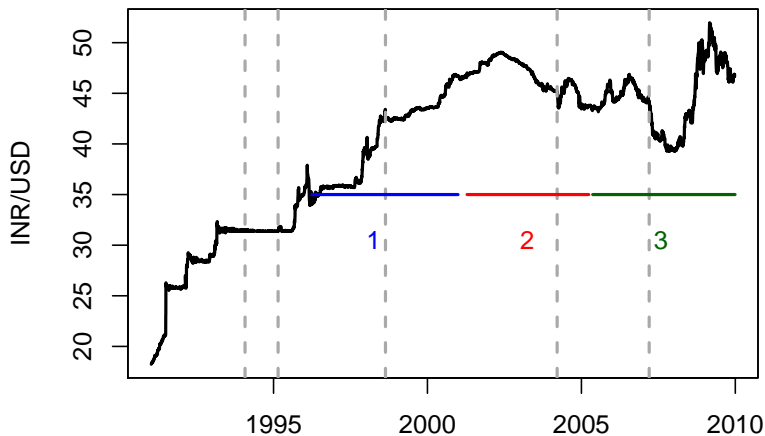
Other measures of capital account openness

Capital account openness

- Currently cross-border inflows and outflows scaled by GDP is used. This would be appropriate for a study that uses monthly data.
- Gross flows on the *current* and *capital* account may be a better measure of financial integration in quarterly studies.

Results

Results: Summary

- Reserve management and exchange market intervention
- Trilemma policy stance and inflation, inflation volatility
    1. Foreign exchange reserves (in levels)
    2. Changes in Foreign exchange reserves

Reserve management and exchange market intervention

"A coefficient of minus one indicates that the RBI has been completely successful in insulating base money from accumulation of reserves."

Table 1: Effect of Net Foreign Assets (NFA) on Net Domestic Assets (NDA)

(Dependent variable: Change in NDA)

Variables	1996Q2-2000Q3	2000Q4-2005Q1	2005Q2-2009Q3
Change in NFA	-0.768385***	-0.867774***	-0.443428***
	(0.259622)	(0.260602)	(0.181335)
Lagged change in NDA	0.663150***	-0.214493	0.047067
	(0.199194)	(0.225896)	(0.249181)
Change in log of IP	-14803.59***	-18653.10*	-15150.19
	(4816.056)	(10987.70)	(38005.97)
Constant	4865.866***	7989.290	19861.67*
	(1578.655)	(5638.952)	(10865.56)
Adj R squared	0.463650	0.444902	0.275034

*, **, *** denote statistical significance at 10%, 5% and 1% levels respectively.

Standard errors are denoted in parentheses.

Inflation volatility, trilemma and reserves

Table 3: Inflation volatility, trilemma configuration and reserves

	1996-97:Q1 to 2000-01:Q2		2000-01:Q3 to 2004-05:Q4		2005-06:Q1 to 2009-10:Q2	
	Coefficients	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*
Intercept	0.0778	0.0329	0.0255	0.0438	0.0537	0.0838
MI	0.0331	0.0265	-0.0103	0.0130	0.0440	0.0728
ES	-0.1184**	0.0487	-0.0201	0.0551	-0.1454	0.1339
Res/GDP	-1.0215**	0.4448	-0.0626	0.2428	-0.1404	0.3600
MI*Res	-0.5574	0.3750	0.0453	0.0895	-0.2354	0.3413
ES*Res	1.7336**	0.6880	0.0573	0.3121	0.5809	0.5949

Inflation, trilemma and reserves

	1996–97:Q1 to 2000–01:Q2		2000–01:Q3 to 2004–05:Q4		2005–06:Q1 to 2009–10:Q2	
	Coefficients	*Standard Error*	*Coefficients*	*Standard Error*	*Coefficients*	*Standard Error*
Intercept	-0.3360	0.1749	0.5480	0.1678	-0.3762	0.5114
MI	0.0302	0.1406	-0.0872	0.0498	0.0022	0.4447
ES	0.4792*	0.2586	-0.5847**	0.2110	0.6269	0.8175
Res/GDP	5.3884**	2.3640	-2.4370**	0.9303	1.8456	2.1979
MI*Res	-0.5682	1.9927	0.3396	0.3429	-0.0242	2.0838
ES*Res	-6.6584*	3.6561	2.9826**	1.1959	-2.7331	3.6326

Trilemma and inflation: Reserves (level)

	Coefficients	Standard Error	Coefficients	Standard Error	Coefficients	Standard Error
Intercept	0.0052	0.0022	0.0095	0.0064	0.0018	0.0071
MI	0.0005	0.0037	0.0001	0.0063	0.0126	0.0121
KO	-0.0081	0.0261	-0.0466	0.0611	0.0072	0.0218
ΔRes/GDP	0.1558	0.1281	0.0948	0.1370	0.1315	0.1153
MI*ΔRes	0.0843	0.2238	0.2378	0.1646	0.1945	0.2125
KO*ΔRes	-5.6424***	1.6411	-2.1651	1.3795	-0.3952	0.3671

Trilemma and inflation volatility: Reserves (level)

	Coefficients	Standard Error	Coefficients	Standard Error	Coefficients	Standard Error
Intercept	0.0680	0.0135	0.0905	0.0258	0.0159	0.0387
MI	-0.0547**	0.0230	-0.0807***	0.0255	0.0023	0.0658
KO	0.1899	0.1620	0.0569	0.2471	0.1473	0.1180
ΔRes/GDP	0.4455	0.7963	1.0890*	0.5540	-0.0607	0.6247
MI*ΔRes	-2.0319	1.3910	-0.6641	0.6658	-0.2259	1.1517
KO*ΔRes	16.2849	10.1976	-6.2057	5.5787	1.4725	1.9900

Intervention data available

- Since data on intervention is available in India, an alternate regression to test for would be intervention on NDA, both scaled by reserve money.

- Regressions of the Trilemma with reserves do not suggest that intervention has been successful. They only show that reserve accumulation is correlated with capital flows.

Locate inflation and inflation volatility in the
context of monetary policy independence

Inflation and inflation volatility

- Aizenman et. al. (2010) show that inflation and inflation volatility largely depends on monetary policy independence, using a variety of controls in the regression.

- Since this is a single country approach, it would be more appropriate if any empirical analysis on inflation could locate itself with monetary policy independence.

- At present, barring the first period, neither inflation nor inflation volatility are strongly affected when both Monetary policy independence and exchange rate stability are in the regression.

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Thank you