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

Motivation

Main arguments

Suggestions
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 $\Delta$ Net Foreign Assets as a sensitivity test.
- Locate discussion on inflation and inflation volatility in the context of monetary policy independence.
Data issues
• Quarterly data has been used.
• All variables used are available at a monthly frequency.
• This study would benefit from a more fine grained perspective.
Data

• “We average reserve figures for each quarter to construct a quarterly series for international reserves.”
• Stock of international reserves is available at the quarterly frequency. This could be used.
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- Stock of international reserves is available at the quarterly frequency. This could be used.
- “Since reserves are a stock and GDP is a flow, when we calculate the reserves-to-GDP ratio using quarterly data, we annualize the GDP figure by multiplying it by four.”
- Since the study is about changing international reserves as a tool of macroeconomic policy, $\frac{\Delta \text{reserves}}{\text{GDP}}$ would avoid much manipulation required to the data.
Data

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- “Since reserves are a stock and GDP is a flow, when we calculate the reserves-to-GDP ratio using quarterly data, we annualize the GDP figure by multiplying it by four.”
- Since the study is about changing international reserves as a tool of macroeconomic policy, \( \frac{\Delta \text{reserves}}{\text{GDP}} \) 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

\[ M.\text{Independence} = 1 - \frac{\text{corr}(i_i, i_j) - (-1)}{1 - (-1)} \]
Measuring monetary policy independence

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\[ M.\text{Independence} = 1 - \frac{\text{corr}(i_i,i_j) - (-1)}{1-(-1)} \]

- Several factors determine extent of comovement in interest rates:
  1. Degree of financial integration
  2. Degree of business cycle synchrony
  3. Nature of international economic / financial shocks (common shocks too)
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• Several factors determine extent of comovement in interest rates:
  1. Degree of financial integration
  2. Degree of business cycle synchrony
  3. Nature of international economic / financial shocks (common shocks too)

• 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

[Graph showing fluctuations in the MI Index with a boxed area highlighting a period from 2004 to 2008]
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)

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

*, **, *** 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

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td><strong>Coefficients</strong></td>
<td><strong>Standard Error</strong></td>
<td><strong>Coefficients</strong></td>
<td><strong>Standard Error</strong></td>
</tr>
<tr>
<td>Intercept</td>
<td>0.0778</td>
<td>0.0329</td>
<td></td>
</tr>
<tr>
<td>MI</td>
<td>0.0331</td>
<td>0.0265</td>
<td></td>
</tr>
<tr>
<td>ES</td>
<td>-0.1184**</td>
<td>0.0487</td>
<td>-0.0201</td>
</tr>
<tr>
<td>Res/GDP</td>
<td>-1.0215**</td>
<td>0.4448</td>
<td>-0.0626</td>
</tr>
<tr>
<td>MI*Res</td>
<td>-0.5574</td>
<td>0.3750</td>
<td>0.0453</td>
</tr>
<tr>
<td>ES*Res</td>
<td>1.7336**</td>
<td>0.6880</td>
<td>0.0573</td>
</tr>
</tbody>
</table>
Inflation, trilemma and reserves

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<tr>
<td>Intercept</td>
<td>-0.3360</td>
<td>0.1749</td>
<td>0.5480</td>
<td>0.1678</td>
</tr>
<tr>
<td>MI</td>
<td>0.0302</td>
<td>0.1406</td>
<td>-0.0872</td>
<td>0.0498</td>
</tr>
<tr>
<td>ES</td>
<td>0.4792*</td>
<td>0.2586</td>
<td>-0.5847**</td>
<td>0.2110</td>
</tr>
<tr>
<td>Res/GDP</td>
<td>5.3884**</td>
<td>2.3640</td>
<td>-2.4370**</td>
<td>0.9303</td>
</tr>
<tr>
<td>MI*Res</td>
<td>-0.5682</td>
<td>1.9927</td>
<td>0.3396</td>
<td>0.3429</td>
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</tbody>
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### Trilemma and inflation: Reserves (level)

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<tr>
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<tbody>
<tr>
<td>Intercept</td>
<td>0.0052</td>
<td>0.0022</td>
<td>0.0095</td>
<td>0.0064</td>
<td>0.0018</td>
<td>0.0071</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI</td>
<td>0.0005</td>
<td>0.0037</td>
<td>0.0001</td>
<td>0.0063</td>
<td>0.0126</td>
<td>0.0121</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KO</td>
<td>-0.0081</td>
<td>0.0261</td>
<td>-0.0466</td>
<td>0.0611</td>
<td>0.0072</td>
<td>0.0218</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔRes/GDP</td>
<td>0.1558</td>
<td>0.1281</td>
<td>0.0948</td>
<td>0.1370</td>
<td>0.1315</td>
<td>0.1153</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI*ΔRes</td>
<td>0.0843</td>
<td>0.2238</td>
<td>0.2378</td>
<td>0.1646</td>
<td>0.1945</td>
<td>0.2125</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KO*ΔRes</td>
<td>-5.6424***</td>
<td>1.6411</td>
<td>-2.1651</td>
<td>1.3795</td>
<td>-0.3952</td>
<td>0.3671</td>
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### Trilemma and inflation volatility: Reserves (level)

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<tr>
<td>Intercept</td>
<td>0.0680</td>
<td>0.0135</td>
<td>0.0905</td>
<td>0.0258</td>
<td>0.0159</td>
<td>0.0387</td>
</tr>
<tr>
<td>MI</td>
<td>-0.0547**</td>
<td>0.0230</td>
<td>-0.0807***</td>
<td>0.0255</td>
<td>0.0023</td>
<td>0.0658</td>
</tr>
<tr>
<td>KO</td>
<td>0.1899</td>
<td>0.1620</td>
<td>0.0569</td>
<td>0.2471</td>
<td>0.1473</td>
<td>0.1180</td>
</tr>
<tr>
<td>ΔRes/GDP</td>
<td>0.4455</td>
<td>0.7963</td>
<td>1.0890*</td>
<td>0.5540</td>
<td>-0.0607</td>
<td>0.6247</td>
</tr>
<tr>
<td>MI*ΔRes</td>
<td>-2.0319</td>
<td>1.3910</td>
<td>-0.6641</td>
<td>0.6658</td>
<td>-0.2259</td>
<td>1.1517</td>
</tr>
<tr>
<td>KO*ΔRes</td>
<td>16.2849</td>
<td>10.1976</td>
<td>-6.2057</td>
<td>5.5787</td>
<td>1.4725</td>
<td>1.9900</td>
</tr>
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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.
In summary...
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- Avoid data manipulation and obtain required frequency from RBI or CMIE Business Beacon database.
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Thank you