Global spillovers:
Managing capital flows and forex reserves

Viral Acharya

(based on “Capital flow management with multiple instruments” w/ Arvind Krishnamurthy)

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Outline

- **Motivation** – Sudden stops and reversals -> Forex reserves

- **A measure of external sector resilience**
  - (Foreign-reserves – Short-term external debt or flows)/GDP

- **Reserves and capital controls are complements**

- **Key insights:**
  - Foreign reserves do not work absent macro-pru/capital controls
    - Reserves undone by short-term external debt; can make things worse!
    - Macro-prudential comes first; makes reserves effective
  - FPI flows in domestic debt versus external debt
    - Tradeoff: Lower external issuance costs versus greater vulnerability
    - Arbitrage -> Need to tax both foreign debt and FPI in domestic debt
    - Greater the reliance on external debt, greater the needed reserves
  - Macro-prudential measures to deal with the tradeoff
    - Size limits, maturity of investors and investments, rationing the risky.
SUDDEN STOPS AND REVERSALS: THE TAPER “TANTRUM”
Monetary easing -> EM capital flows

Emerging markets received close to half of global inflows after the crisis compared with less than 20 percent before...

Composition of Global Capital Flows
(Share of total flows)

Taper Tantrum (May-June 2013)

Source: Emerging Market Volatility – Lessons from the Taper Tantrum, IMF Staff Discussion Note, September 2014
QE, Taper Tantrum, EM MF Flows

Source: Market Tantrums and Monetary Policy by Feroli, Kashyap, Schoenholtz and Shin (Feb 2014)
TAPER TANTRUM AND INDIA
Volatility of FPI flows- ‘Surge’ & ‘Stop’

Source: RBI
Data for 2017-18 updated till July 2017
Taper Tantrum and Exchange rate

Source: Bloomberg and RBI
MEASURING RESILIENCE
A measure of external resilience

• **International or external-sector liquidity**
  – Country has issued net short-term (ST) debt claims to foreign investors
    • In the aggregate, should include unhedged foreign exposures and all reversible “hot money” flows
  – If foreigners run, does the country have adequate FX reserves?

  \[ \text{Liquidity}_i = \frac{FX \text{ Reserves}_i - ST \text{ Ext Debt}_i}{GDP_i} \]

  – Simply looking at reserves is inadequate and a potentially misleading indicator of vulnerability
  – Akin to Guidotti-Greenspan (1999) “rule”
Foreign reserves and short-term debt for EMs tend to rise together

Source: IMF (in trillion USD), see also Carstens (2016)
Trend in Forex Reserves for India

Source: RBI
Source: INDIA’S EXTERNAL DEBT, A Status Report, 2016-17 by Government of India
(Reserves – Short-term external debt)/GDP

Source: INDIA’S EXTERNAL DEBT, A Status Report, 2016-17 by Government of India
Does the measure work more broadly?

- **Cross-country outcomes** during the taper tantrum explained by liquidity

\[
\text{Liquidity}_{i,2013} = \frac{\text{Reserves}_{i,2013} - \text{ST Debt}_{i,2013}}{\text{GDP}_{i,2013}}.
\]

- Asset price changes from June ’13 to Oct ’17
(a) Change in Sovereign Bond Spread

(b) Stock Market Return

(c) Currency Appreciation
Does the measure work more broadly?

• Cross-country outcomes against global risk factors also explained by liquidity

\[
\text{Liquidity}_{i,2013} = \frac{\text{Reserves}_{i,2013} - \text{ST Debt}_{i,2013}}{\text{GDP}_{i,2013}}.
\]

• **Global factor**: the first principal component of the time series of
  – 10 year US Treasury yields (Rey, 2013)
  – VIX (Rey, 2013)
  – S&P500 stock return
  – Return on the US dollar basket index
  – Return on the commodity price index
(a) Change in Sovereign Bond Spread

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Factor</td>
<td>-0.0753</td>
<td>-0.0627</td>
<td>-0.1228</td>
<td>-0.1162</td>
</tr>
<tr>
<td></td>
<td>(3.94)**</td>
<td>(3.32)**</td>
<td>(7.35)**</td>
<td>(6.72)**</td>
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<tr>
<td>Global Factor × Liquidity</td>
<td>0.0748</td>
<td>0.0784</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>(4.13)**</td>
<td>(3.21)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquidity</td>
<td>0.0012</td>
<td>-0.03</td>
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<td>-0.33</td>
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<tr>
<td>Country FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Year FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Restrict to Large Shock</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.01</td>
<td>0.04</td>
<td>0.01</td>
<td>0.05</td>
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<tr>
<td>N</td>
<td>21,331</td>
<td>2,188</td>
<td>13,733</td>
<td>1,413</td>
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</table>

(c) Currency Appreciation

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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tbody>
<tr>
<td>Global Factor</td>
<td>0.1539</td>
<td>0.1297</td>
<td>0.217</td>
<td>0.1828</td>
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<tr>
<td></td>
<td>(4.84)**</td>
<td>(4.97)**</td>
<td>(3.68)**</td>
<td>(3.71)**</td>
</tr>
<tr>
<td>Global Factor × Liquidity</td>
<td>-0.0986</td>
<td>-0.0843</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.23)**</td>
<td>(2.28)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquidity</td>
<td>0.0035</td>
<td>0.1021</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-0.18</td>
<td>(1.94)*</td>
</tr>
<tr>
<td>Country FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Year FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Restrict to Large Shock</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.07</td>
<td>0.21</td>
<td>0.08</td>
<td>0.24</td>
</tr>
<tr>
<td>N</td>
<td>27,615</td>
<td>2,848</td>
<td>17,823</td>
<td>1,843</td>
</tr>
</tbody>
</table>

** $p < 0.05$; *** $p < 0.01$. 
A MODEL OF RESERVES AND CAPITAL CONTROLS
Sketch of the model

• Caballero-Krishnamurthy (2001), Caballero-Simsek (2016).
• Three dates: 0, 1, 2
• Domestic borrower, foreign lender, central bank
• Representative firm (bank or multinational or exporter) takes on liability $L$ from foreign lender in foreign currency
• Invests domestically at normal-time exchange rate (=1)
• Liability is short-term, due at $t=1$; cash flows at $t=2$
• Retrenchment risk (sudden stop/reversal) w.p. $p$
• In case of retrenchment, the firm liquidates collateral $L$ domestically, converts to foreign currency at rate $e < 1$
• Incurs liquidation costs to meet the shortfall of $L(1 - e)$
• Central bank has reserves $X$ that are used to act as buyer of last resort of domestic currency in the retrenchment state
• $e = X / L$ ; Bankruptcy cost suffered = $f(L - X)$
Fire-sale externality

• Each firm is competitive; so does not internalize the impact of its short-term external liability on the price $e$

• Price $e$ increases in reserves $X$ and decreases in aggregate short-term external debt $L$

• Privately optimal $L$
  – Declines in $p$, the likelihood of sudden stop
  – Increases as anticipated $e$ increases, undoing the reserves (“moral hazard” channel of reserves)

• Socially optimal $L$ takes into account the cost of reserves and internalizes the fire-sale externality
  – Reserves are a form of bailout
  – Beyond a point, less reserves can be more!
Can the central bank do better?

• Central bank can “tax” short-term external debt to get firms to internalize the cost of reserves and the fire-sale externality (capital controls, macro-pru limits)

• In the extremis, an omniscient central bank can just limit $L$ to the “right” level

• More realistically, it has to charge a Pigouvian tax that increases in the likelihood of the retrenchment state and liquidation / bankruptcy costs

• Macro-prudential comes first; makes the reserves work!
  – Macro-pru limits the moral hazard channel of reserves
  – Make larger reserves effective as a defense against stops
Heterogeneity among firms

• Sets of firms; set $i$ faces liquidation in the retrenchment state w.p. $p_i$

• Lower $p_i$ captures the relative safety of a firm: larger, more stable, export-oriented firms

• Now, $e = X / \int p_i L_i \, di$

• Riskier (safer) firms contribute more to the fire-sale externality and over (under) borrow

• Pigouvian taxation: $\frac{\tau_{F,i}^F}{\tau_{F,i}^F} = \frac{p_i}{p_i'}$. 
Foreign currency vs local currency debt

• Suppose now that foreigners can also invest in domestic currency debt (locally or abroad)
  – Assume foreign currency debt is cheaper (by $s$) due to accommodative policies abroad or lack of ease for foreigners in bankruptcy
• Foreigners leave domestic markets too in retrenchment state, not rolling over domestic debt (e.g., FPI outflow)
• “Twin crisis”:  
• FPI’s charge ex ante for the fx risk they bear: $p(1 - e)$
  \[ r^D - r \approx s + \phi(1 - e) \]
• In retrenchment state: $e = X / (L_{foreign} + L_{domestic})$
• Incentive to issue abroad due to cheaper costs (“carry”)
  – Carry trade ignores the fire-sale externality, as before
What can the central bank do?

• As before, to make the reserves effective, the central bank can “tax” issuance of short-term external debt
• However, firms have two markets to undo the central bank reserves
• If tax on foreign currency debt is high, then firms switch to domestic currency debt in spite of higher cost
  – Hence, central bank has to tax both margins of arbitrage
• This way, overall short-term external debt can be kept limited and reserves made to work in sudden stops
• To manage global spillovers, macro-pru on foreign flows into both foreign-currency and domestic-currency debt complement the central bank’s reserves
MANAGING CAPITAL FLOWS: THE RBI APPROACH
I. Caps on external debt

• Three primary types of non-government debt
  – **Foreign Portfolio Investment (FPI)** in domestic currency debt (both Government of India securities at center and state level, as well as corporate bonds)
  – **External Commercial Borrowings (ECB)** in foreign currency, typically loans to Indian corporations
  – **Rupee Denominated Bonds (RDB) or “Masala” bonds** issued overseas, typically listed on LSE

• Current limits:
  – FPI G-sec: $39 bln; SDL: $6 bln; Corporate: $36 bln
  – ECB + Masala bonds: $130 bln
II. Limits by investor horizon

- FPI limits by **Long Term** vs **General** investors:
  - Long Term includes Insurance firms, Endowments and Pension Funds, Sovereign Wealth Funds, Central Banks, and Multilateral Agencies

<table>
<thead>
<tr>
<th>Effective for Quarter</th>
<th>Central Government Securities</th>
<th>State Development Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General</td>
<td>Long Term</td>
</tr>
<tr>
<td>2017-18 Q3</td>
<td>29.29</td>
<td>9.31</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Corporate Bonds</th>
<th>Long term FPIs</th>
<th>General</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective for Quarter</td>
<td>General</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017-18 Q3</td>
<td>1.47</td>
<td>33.64</td>
<td>35.10</td>
</tr>
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</table>

*Source: RBI, DBIE.*
II. Limits by investor horizon (cont’d)

• FPI limits by Long Term versus General investors:
  – Long Term includes Insurance firms, Endowments and Pension Funds, Sovereign Wealth Funds, Central Banks, and Multilateral Agencies

• FPI restrictions in the past also included
  – Sub-limits for 100% debt funds as against minimum 70:30 equity-debt investment ratio funds.
  – Minimum lock-in periods of up to three years

• Counter to our theoretical analysis, long-term investors were not allowed by India to be eligible lenders to ECBs until 2015!
  – Domestic banks not allowed to refinance ECBs
III. Limits on maturity of investments

• Presently, FPIs are disallowed from investing in liquid short-term money-market instruments such Treasury bills or commercial paper (CP).
  – Prior to the taper tantrum, there was a carve-out for FPI investments in Treasury Bills and CP.

<table>
<thead>
<tr>
<th>Type of securities</th>
<th>April-2013 $ bn</th>
<th>Jun-2013 $ bn</th>
<th>Nov-2013 $ bn</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Government debt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. T-bills within overall limit</td>
<td>25</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>b. Carved out limit for SWFs &amp; other LT FIIs</td>
<td>5.5</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>2. Corporate bond</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. CPs within overall limit</td>
<td>51</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>b. Credit enhancement bonds within overall limit</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>3. Total Limit (1+2)</td>
<td>76</td>
<td>81</td>
<td>81</td>
</tr>
</tbody>
</table>

Source: DBIE, RBI.
III. Limits on investment maturity (cont’d)

• Since the taper tantrum
  – Residual maturity restrictions of investments by FPIs in debt holdings of minimum three years of maturity at origination or purchase.
  – In ECBs, borrower can take on debt up to $50 million with minimum average maturity (MAM) of 3 years; or up to $50 million if the maturity is 5 years
    • Foreign currency denominated under the so-called Track-I of ECB, or INR denominated under Track-III of ECB.
  – In contrast, no borrowing limits within the overall ECB limit is imposed for borrowings meeting a minimum average maturity of 10 years
    • Foreign currency denominated borrowing under Track-II.
IV. Rationing high-liquidity demanders

• Only relatively high credit quality borrowers can tap into ECBs:
  – Coupon or “all-in-cost” ceilings by debt issue
  – Imposing sub-limits on investments in risky instruments such as unlisted corporate bonds and security receipts (a form of distressed asset resolution instrument)
  – Ruling out excessive correlated liquidations by imposing investment sub-limits by sector.

• These restrictions limit ECBs to high-rated borrowers, as suggested by our model.

• On the other hand, this form of taxation does not exist for domestic debt issuances purchased by the FPIs.
Table 5: Evolution of AIC spread (in bps) over Libor-6 month/Swap

<table>
<thead>
<tr>
<th>Minimum average maturity</th>
<th>3 year to 5 year</th>
<th>More than 5 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-05</td>
<td>200 bps</td>
<td>350</td>
</tr>
<tr>
<td>2007-08</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>2008-09</td>
<td>200</td>
<td>350</td>
</tr>
<tr>
<td>2009-10</td>
<td>300</td>
<td>500</td>
</tr>
<tr>
<td>2011-12</td>
<td>350</td>
<td>500</td>
</tr>
<tr>
<td>2015-16</td>
<td>300</td>
<td>450</td>
</tr>
</tbody>
</table>

Source: DBIE, RBI.
V. Harmonizing ECB and Masala Bonds

• Masala Bonds envisioned to provide wider access for Indian entities to international debt markets without currency risk

• Guidelines were more relaxed than ECB norms: No restrictions on investors; any corporate eligible to issue; no cost ceiling

• **Masala Bonds route gained popularity in the past year as “arbitrage” over ECB and FPI in domestic corporate bonds**
  - Used by related parties to circumvent ECB/FDI; Rates not linked to market
  - Used to camouflage ECBs

• **Recent Measures to address macro-prudential concerns:**
  - June 2017: Restrictions on ‘related party’ transactions
  - All-in-costs ceilings of G-Sec + 300 bps imposed
  - Minimum tenor which was originally 5 years aligned to ECB
    • Upto USD 50 mn: 3 years; above USD 50 mn: 5 years
Some food for thought...

- **Potential arbitrage of capital controls between ECB and FPI in debt markets**
  - Should there be all-in-cost ceilings on domestic debt FPI’s can invest in?

- **Greater linking of FPI and ECB + Masala bond caps to the extent of reserves**
  - Conversely, reserves accumulation policy contingent on the external short-term debt
  - Unclear that caps should be linked to the underlying market-size, as in GSEC and SDL case
  - Also caps should be on stocks, rather than flows

- **Shouldn’t the limits on Long-term investors be larger than for General investors?**
Is there arbitrage across FPI vs ECB?

Movement in O/S debt stock

Source: RBI, NSDL and SEBI