Understanding the pro-cyclicality of capital flows

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- Questions
- Literature
- Contribution
- Model
- Calibration to Indian data: A case study
- Results
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- Summary
Questions
Questions

- Are capital flows in emerging economies pro-cyclical?
- If yes, why are they pro-cyclical?
- What are the consequences of pro-cyclical capital flows?
- What is the role of financial integration and financial development in reducing pro-cyclicality of capital flows?
Are capital flows in emerging economies pro-cyclical?
What does the literature say on cyclicality of capital flows?

- Capital flows are pro-cyclical for Mexico and Turkey and acyclical for the United States (Alper, 2002)
- Gross capital flows are pro-cyclical in emerging economies (Broner et al. 2013)
- Gross capital flows tend to be positively correlated with domestic investment (Smith and Valderrama, 2009).
We study cyclical nature of capital flows in both developed and emerging economies.

Set of developed economies: Australia, Canada, Denmark, New Zealand, Sweden and U.S.

Set of emerging economies: India, Hungary, Korea, Malaysia, South Africa, Poland, Turkey, Colombia, Indonesia, Thailand, Brazil, Chile, and Philippines.

Inflows of capital:
- Net purchases of domestic assets by non-residents
- Sum of FDI, portfolio liabilities, other liabilities and financial derivatives liabilities (taking actual, not absolute values)

Outflows:
- Net purchases of foreign assets by residents
- Sum of Outward FDI, portfolio assets, other assets and financial derivatives assets
Methodology

- Annual data from 1990 onwards
- Hodrick-Prescott filter to extract the cyclical component of capital flows and GDP
- The cyclical component is used to study the correlation of capital flows with GDP
  1. Pro-cyclical: if correlation is positive and exceeds 0.35
  2. Counter-cyclical: if correlation is negative and absolute value exceeds 0.35
  3. Acyclical: if absolute value of correlation falls below 0.35
### Cyclical nature of capital flows and output volatility: Developed economies

<table>
<thead>
<tr>
<th>Country</th>
<th>Inflows</th>
<th>Outflows</th>
<th>Netflows</th>
<th>Gross flows</th>
<th>Output vol.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>0.16</td>
<td>0.34</td>
<td>0.33</td>
<td>0.55</td>
<td>1.20</td>
</tr>
<tr>
<td>Canada</td>
<td>0.16</td>
<td>-0.15</td>
<td>-0.29</td>
<td>0.22</td>
<td>2.02</td>
</tr>
<tr>
<td>Denmark</td>
<td>0.16</td>
<td>0.16</td>
<td>-0.07</td>
<td>0.03</td>
<td>1.94</td>
</tr>
<tr>
<td>New Zealand</td>
<td>0.28</td>
<td>-0.13</td>
<td>0.21</td>
<td>0.04</td>
<td>1.94</td>
</tr>
<tr>
<td>Sweden</td>
<td>-0.36</td>
<td>0.28</td>
<td>0.56</td>
<td>-0.03</td>
<td>2.48</td>
</tr>
<tr>
<td>US</td>
<td>0.39</td>
<td>0.10</td>
<td>0.52</td>
<td>0.09</td>
<td>1.75</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td><strong>0.16</strong></td>
<td><strong>0.12</strong></td>
<td><strong>0.26</strong></td>
<td><strong>0.006</strong></td>
<td><strong>1.93</strong></td>
</tr>
</tbody>
</table>

Data source: Datastream, Authors’ estimation
Cyclical nature of capital flows and output volatility: Emerging economies

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<thead>
<tr>
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<th>Inflows</th>
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<th>Netflows</th>
<th>Gross flows</th>
<th>Output vol.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hungary</td>
<td>0.52</td>
<td>0.51</td>
<td>0.69</td>
<td>0.48</td>
<td>4.44</td>
</tr>
<tr>
<td>Korea</td>
<td>-0.21</td>
<td>0.54</td>
<td>0.08</td>
<td>0.57</td>
<td>2.90</td>
</tr>
<tr>
<td>Malaysia</td>
<td>-0.03</td>
<td>-0.16</td>
<td>0.09</td>
<td>-0.10</td>
<td>3.74</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.54</td>
<td>0.38</td>
<td>0.59</td>
<td>0.53</td>
<td>2.15</td>
</tr>
<tr>
<td>Poland</td>
<td>0.20</td>
<td>-0.29</td>
<td>0.65</td>
<td>0.08</td>
<td>4.16</td>
</tr>
<tr>
<td>Turkey</td>
<td>0.72</td>
<td>0.75</td>
<td>0.49</td>
<td>0.82</td>
<td>5.99</td>
</tr>
<tr>
<td>Colombia</td>
<td>0.42</td>
<td>0.18</td>
<td>0.78</td>
<td>0.65</td>
<td>3.15</td>
</tr>
<tr>
<td>Indonesia</td>
<td>-0.10</td>
<td>0.32</td>
<td>0.62</td>
<td>-0.36</td>
<td>4.89</td>
</tr>
<tr>
<td>Thailand</td>
<td>0.27</td>
<td>0.06</td>
<td>0.61</td>
<td>0.17</td>
<td>5.31</td>
</tr>
<tr>
<td>Chile</td>
<td>0.58</td>
<td>0.31</td>
<td>0.02</td>
<td>0.44</td>
<td>3.00</td>
</tr>
<tr>
<td>Philippines</td>
<td>0.46</td>
<td>-0.04</td>
<td>0.54</td>
<td>0.34</td>
<td>1.9</td>
</tr>
<tr>
<td>India</td>
<td>0.71</td>
<td>0.16</td>
<td>0.66</td>
<td>0.72</td>
<td>1.82</td>
</tr>
<tr>
<td>Median</td>
<td>0.46</td>
<td>0.20</td>
<td>0.59</td>
<td>0.48</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Data source: Datastream, Authors’ estimation
Findings

- Capital flows in developed economies are acyclical
- Capital flows in emerging economies are strongly pro-cyclical
- The median output volatility in emerging economies is about 2 times higher than the median output volatility in developed economies
Why are capital flows in emerging economies pro-cyclical and consequences?
Why are capital flows in emerging economies pro-cyclical?

Plausible explanations by Kaminsky, Reinhart and Vegh (2004)

- In response to positive temporary productivity shock, borrow more to finance profitable investment opportunities
- In good times consumption is financed by borrowing from abroad
- Good times reduces country risk premium attracts foreign capital
Why are capital flows in emerging economies pro-cyclical? and possible consequences?

- Firm channel shaping cyclical pattern of capital flows (Aghion, Bacchetta, and Banerjee, 2004)
- When borrowing is limited by agent’s wealth, capital flows are pro-cyclical and may intensify the business cycle fluctuations (Pintus, 2007)
Role of financial integration and financial development
• Greater financial openness can be beneficial for economic growth once certain identifiable threshold in financial depth and institutional quality attained (Kose, Prasad and Taylor, 2011)

• Financial integration may reduce business cycle fluctuations once a threshold level of financial development is attained (Aghion, Bacchetta, and Banerjee, 2004; Aizenman, Chinn, and Ito, 2008)

• Implication for pro-cyclicality of capital flows: Domestic financial development in the backdrop of financial integration may reduce pro-cyclicality of capital flows (Aghion, Bacchetta, and Banerjee, 2004)
Contribution
We propose a model of household channel shaping cyclical pattern of capital flows.

Presence of liquidity-constrained households (Honohan, 2006), adjustment cost of borrowing (Yakhin, 2008; Bhattacharya, Patnaik and Pundit, 2013) along with shock to trend growth (Aguiar-Gopinath, 2007) can explain the pro-cyclicality in capital flows.

Analysis of counter-factual

- From an intermediate stage of financial development and openness, financial integration along with financial development can significantly reduce pro-cyclicality of capital flows.
- Financial liberalisation and domestic financial development reduce output volatility, but absolute and relative consumption volatility may increase in the presence of a permanent income shock.
Model
Assumptions

- Small open economy
- Continuum of infinitely lived households and firms
- Heterogeneous households
  - Liquidity-constrained households: Fraction $\lambda$ of households with no access to financial service, can not save and borrow
  - Ricardian households: Fraction $1 - \lambda$ of households can save, borrow and smooth consumption
  - Financial development captured by a decline in $\lambda$
- Households supply unit labour inelastically
- One internationally traded risk-free bond
- Quadratic adjustment cost of borrowing
  - Financial integration is captured by a decline in the coefficient of adjustment cost of borrowing
Preferences

- Optimisation by Ricardian households

\[
\text{Max} \quad V_t = E_t \sum_{t=0}^{\infty} \beta^t \log(C_t^R) \tag{1}
\]

subject to

\[
C_t^R + I_t^R + B_t^R - \frac{B_{t+1}^R}{1 + R_t} + \frac{\kappa}{2} \left( \frac{B_{t+1}^R}{\Gamma_t} - \bar{b}^R \right)^2 \frac{Y_t}{\Gamma_{t-1}} \quad Y_t = R_t^K K_t^R + W_t \tag{2}
\]

- Interest rate on bond

\[
R_t = R^* + \psi (e^{\frac{B_{t+1}}{\Gamma_t}} - \bar{b} - 1) \tag{3}
\]

- Total consumption

\[
C_t = \lambda C_t^L + (1 - \lambda) C_t^R. \tag{4}
\]
Shocks

- Production

\[ Y_t = e^{a_t} K_t^{1-\alpha} \Gamma_t^\alpha \]  \hspace{1cm} (5)

- Technology

\[ a_t = \rho_a a_{t-1} + \epsilon_t^a \quad \epsilon_t^a \sim N(0, \sigma_a^2) \]  \hspace{1cm} (6)

- Growth of labour productivity

\[ \Gamma_t = g_t \Gamma_{t-1} \]  \hspace{1cm} (7)

- Growth shock

\[ \ln \left( \frac{g_t}{\mu_g} \right) = \rho_g \ln \left( \frac{g_{t-1}}{\mu_g} \right) + \epsilon_t^g; \quad \epsilon_t^g \sim N(0, \sigma_g^2) \]  \hspace{1cm} (8)
India: A case study
## Calibration

### Parameter values

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount factor</td>
<td>$\beta$</td>
<td>0.98</td>
</tr>
<tr>
<td>Rate of Depreciation</td>
<td>$\delta$</td>
<td>5%</td>
</tr>
<tr>
<td>Share of labour</td>
<td>$\alpha$</td>
<td>0.7</td>
</tr>
<tr>
<td>Interest rate elasticity of indebtedness</td>
<td>$\psi$</td>
<td>0.001</td>
</tr>
<tr>
<td>Adjustment cost parameter</td>
<td>$\phi$</td>
<td>2.82</td>
</tr>
<tr>
<td>Mean trend growth rate of labour productivity</td>
<td>$\mu_g - 1$</td>
<td>4.7%</td>
</tr>
<tr>
<td>Steady state foreign debt to GDP ratio</td>
<td>$B_{ss}/Y_{ss}$</td>
<td>23.75%</td>
</tr>
<tr>
<td>1-(No. of bank accounts/population)</td>
<td>$\lambda$</td>
<td>0.487</td>
</tr>
<tr>
<td>Persistence in TFP shock process</td>
<td>$\rho$</td>
<td>0.495</td>
</tr>
<tr>
<td>Volatility in TFP</td>
<td>$\sigma_a$</td>
<td>0.015</td>
</tr>
<tr>
<td>Persistence in labour productivity growth shock</td>
<td>$\rho_g$</td>
<td>0.261</td>
</tr>
<tr>
<td>Volatility in labour productivity growth shock</td>
<td>$\sigma_g$</td>
<td>0.020</td>
</tr>
</tbody>
</table>

Parameter of adjustment cost of borrowing $\kappa$ is chosen to match moments from data and the simulated series.
## Results
### Comparing moments: Period 1992-2011

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Data*</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sigma_c$</td>
<td>1.05</td>
<td>1.02</td>
</tr>
<tr>
<td>$\sigma_y$</td>
<td>1.02</td>
<td>1.02</td>
</tr>
<tr>
<td>$\rho_{GF}$</td>
<td>0.70</td>
<td>0.73</td>
</tr>
<tr>
<td>$\rho_{INFLW}$</td>
<td>0.72</td>
<td>0.72</td>
</tr>
<tr>
<td>$\rho_{OFLW}$</td>
<td>0.15</td>
<td>0.61</td>
</tr>
</tbody>
</table>

**Source:** Ghate, Pandey and Patnaik, 2013
In response to a positive shock to trend growth of productivity

- Liquidity constrained households raise consumption by the same amount of rise in income.
- Unconstrained households anticipate higher future income.
- Raise current consumption by more than the rise in income via borrowing against future income.
- Frictions endogenously easing in good times cause strong pro-cyclicality of capital flows.
Policy implication
Analysis of counter-factual under alternative values of $\kappa$ and $\lambda$

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Benchmark (\kappa = 10) (\lambda = 0.487)</th>
<th>Dev (\kappa = 10) (\lambda = 0.001)</th>
<th>Lib (\kappa = 0) (\lambda = 0.487)</th>
<th>Lib &amp; Dev (\kappa = 1) (\lambda = 0.350)</th>
<th>Lib &amp; Dev (\kappa = 0) (\lambda = 0.001)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\sigma^y)</td>
<td>3.20</td>
<td>3.19</td>
<td>2.59</td>
<td>3.16</td>
<td>2.61</td>
</tr>
<tr>
<td>(\sigma^c)</td>
<td>3.27</td>
<td>3.34</td>
<td>3.21</td>
<td>3.23</td>
<td>4.32</td>
</tr>
<tr>
<td>(\frac{\sigma^c}{\sigma^y})</td>
<td>1.02</td>
<td>1.05</td>
<td>1.23</td>
<td>1.02</td>
<td>1.65</td>
</tr>
<tr>
<td>(\rho_{GF})</td>
<td>0.72</td>
<td>0.70</td>
<td>-0.29</td>
<td>0.20</td>
<td>-0.37</td>
</tr>
<tr>
<td>(\rho_{INFLW})</td>
<td>0.75</td>
<td>0.70</td>
<td>-0.30</td>
<td>0.14</td>
<td>-0.38</td>
</tr>
<tr>
<td>(\rho_{OFLW})</td>
<td>0.61</td>
<td>0.61</td>
<td>-0.29</td>
<td>0.25</td>
<td>-0.36</td>
</tr>
</tbody>
</table>
Permanent income shock, financial frictions and pro-cyclical capital flows

- Financial integration reduces adjustment cost of borrowing and hence pro-cyclicality of capital flows
- Access to foreign finance allows investment smoothing and hence decline in output volatility
- But unconstrained household can raise consumption even more causing absolute and relative consumption to rise
- Financial development allows more people to respond to permanent income shock causing larger fluctuations in consumption volatility
Domestic financial frictions, adjustment cost of borrowing and the presence of a permanent income shock may generate pro-cyclical capital flows.

From an intermediate stage of financial development and openness, domestic financial development alone can only mildly reduce pro-cyclicality of capital flows.

The interaction of financial liberalisation with financial development can significantly reduce the pro-cyclicality of flows.

Output volatility declines with financial development and integration.

The absolute and relative consumption volatilities may increase beyond a threshold level of financial openness and development.