The prudential use of capital controls and foreign currency reserves

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FRB Dallas - U. Houston - Bank of Mexico Conference October 2021
Theory and practice

- Capital flow management has become part of accepted policy toolbox

- Growing literature on second-best use of capital controls:

- Focus on “prudential use”

- Similar role of reserve accumulation
This paper

- Revisit literature using a unified model
- A few themes:
  - Monetary policy dilemmas for emerging economies
  - Capital controls ex ante and ex post
    - Role of a “vertical” view of crises
  - Capital controls and crisis management
  - Two interpretation of reserves (a reconciliation)
  - Role of fear of floating
Reserves

Figure 3: Reserve Accumulation and Exchange Rate Regime (Emerging Economies)
This paper

- Model ingredients:
  - T endowment, NT production (Schmitt-Grohe and Uribe 2016)
  - Sticky wages
  - Upward sloping supply of funds from international investors (Gabaix and Maggiori, 2015)
  - Fear of floating
- Related to unifying framework in Basu, Boz, Gopinath, Roch, and Unsal (2020)
Model

- Infinite horizon, representative consumer, preferences:

\[
\mathbb{E} \sum_{t=0}^{\infty} \beta^t U(c_t^T, c_t^N)
\]

\[
U(c_t^T, c_t^N) = \frac{1}{1-\sigma} \left( \phi^\rho (c_t^T)^{1-\rho} + (1-\phi)^\rho (c_t^N)^{1-\rho} \right)^{\frac{1}{1-\rho}}
\]

- Endowment process for (notice some similarity with DCP): \(y_t^T\)

- Technology to produce \(N\) goods

\[
y_t^N = n_t
\]
Model
Model (continued)

- Budget constraint

\[
\frac{1}{1 + i_t} a_{t+1} + \frac{1}{1 + i_t^*} e_t a_{t+1}^* - \frac{1}{1 + i_t^*} e_t b_{t+1}^* + p_t^T c_t^T + p_t^N c_t^N = e_t y_t^T + w_t n_t + a_t + e_t (a_t^* - b_t^*)
\]

- Position in pesos \(a_t\)

- Long position in dollars \(a_t^*\)

- Borrowing in dollars \(b_t^*\)
Nominal rigidity

- Inelastic supply of labor $\bar{n}$
- Non walrasian equilibrium
  \[ n_t \leq \bar{n}, \quad w_t \geq w \]
- With one equality
Supply of loans

- Two period lived international investors
- Face quadratic cost $\Phi$ of taking dollar position in the country
- Objective maximize

$$
E_t \left[ b_{t+1}^* - \frac{1 + i_t^*}{1 + \hat{i}_t^*} b_{t+1}^* \right] - \frac{1}{\omega_t} \Phi \left( \frac{b_{t+1}^*}{1 + \hat{i}_t^*} \right)
$$
Supply of loans (continued)

- Simple linear supply

\[ \frac{b_{t+1}^*}{1 + \hat{i}_t^*} = \omega_t \left( \hat{i}_t^* - i_t^* \right) \]

- Shocks to \( \omega_t \) (and possibly to \( i_t^* \))
Time line

<table>
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<tr>
<th>t-1</th>
<th>t</th>
<th>t+1</th>
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<td><strong>Ex ante:</strong></td>
<td><strong>Ex post:</strong></td>
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<td>Prudential interventions</td>
<td>Crisis: low realization of $\omega_t$</td>
<td>$\omega_{t+1} = \infty$</td>
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<td>Reserve accumulation</td>
<td>Tools:</td>
<td>$i^*_{t+1} = 1 - 1/\beta$</td>
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<td>✤ Monetary policy</td>
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</table>
Monetary policy dilemma
Time $t$: crisis

- **Separable case** ($\sigma = \rho$)

- **Labor market eq. conditions + 3 equations**

\[ D(\hat{i}^*_t, a_t^* - b_t^*) = \omega_t \left( \hat{i}^*_t - i_t^* \right) \]  

\[ \frac{e_{t+1}}{e_t} (1 + \hat{i}^*_t) = 1 + i_t \]  

\[ n_t = \frac{1 - \phi}{\phi} \left( \frac{w_t}{e_t} \right)^{-\frac{1}{\rho}} C^T(\hat{i}^*_t, a_t^* - b_t^*) \]  

international loan market

domestic/international loans indifference

domestic demand
Assume policy maker’s objective is

\[ (1 - \beta) \left( U \left( c^T_t, c^N_t \right) - \Psi \left( e_t \right) \right) + \beta U \left( c^T_{t+1}, c^N_{t+1} \right) \]

Term \( \Psi \left( e_t \right) \) captures fear of floating (later on micro foundations)
Monetary policy dilemma

- International loan market
- Domestic policy menu

If FOF strong can even lead to pro-cyclicality
Do ex post capital controls help?

- Not quite
- Ex post trade off: would like to stimulate $c_t^T$ to increase demand also for $N$
- But facing upward sloping supply means paying higher borrowing premium
- Optimality

$$U_T(c_t^T, c_t^N) + U_N(c_t^T, c_t^N) \frac{c_t^N}{c_t^T} = \beta U_T(c_{t+1}^T, \tilde{n}) \left(1 + i^* + \frac{1}{\omega_t} \frac{b_{t+1}}{1 + i^*_t}\right)$$

AD externality

Borrowing premium extern.
Prudential policy
Effect of initial conditions

International loan market

Green lines: higher value of $a_t^* - b_t^*$

Domestic policy menu
Optimal choice of $b_t^*$

- Benefits of lower $b_t^*$: lower borrowing costs + higher demand (better policy menu)

$$U_T(c_{t-1}^T, \bar{n}) = \beta \left(1 + \hat{i}_{t-1}^*, \frac{1}{\omega_{t-1}} + \frac{b_t^*}{1 + \hat{i}_{t-1}^*}\right) E_{t-1} \left[U_T(c_t^T, c_t^N) + \iota_{n_t \leq \bar{n}} U_N(c_t^T, c_t^N) \frac{c_t^N}{c_t^T}\right]$$

- Ex ante both externalities go in same direction
Connections

- AD externalities with fixed exchange rates central in Farhi Werning (2012,) and Schmitt-Grohe Uribe (2016)

- In Costinot et al (2014) and FW (2014) flexible ex. rates, capital controls motivated by term-of-trade externalities (multiple goods)

- Here emphasis on pecuniary ext. in borrowing cost: less symmetry between ex ante and ex post (weaker case for ex post role of controls)

- “Vertical view” matters
Reserves: two views

- Two views of reserve accumulation
  - **Precautionary view**: need them to protect domestic spending if there’s a crisis
  - **Exchange rate management view**: need them for currency interventions to prevent excessive fluctuations in exchange rate


- Second view needs currency interventions to matter

- Ilzetzki, Reinhart, and Rogoff (2019)
Benefits of reserves

✦ Having higher $a_t^*$

✦ allows you to intervene in currency markets and prevent a large depreciation

✦ allows the country to have more spending capacity (keep domestic rate lower, stimulate consumption and spending)

\[
U_T(c_{t-1}^T, \tilde{n}) = \beta \left( 1 + \hat{i}_{t-1}^* + \frac{1}{\omega_{t-1}} \frac{b_t^*}{1 + \hat{i}_{t-1}^*} \right) E_{t-1} \left[ U_T(c_t^T, c_t^N) + \Psi'(e_t) \rho \frac{e_t}{c_t^T} \right]
\]

\[
U_T(c_{t-1}^T, \tilde{n}) = \beta \left( 1 + \hat{i}_{t-1}^* + \frac{1}{\omega_{t-1}} \frac{b_t^*}{1 + \hat{i}_{t-1}^*} \right) E_{t-1} \left[ U_T(c_t^T, c_t^N) + \psi \psi_N(c_t^T, c_t^N) \frac{c_t^N}{c_t^T} \right]
\]

Two sides of same coin!
Cost of reserves

- Budget constraint

\[
\frac{1}{1 + \hat{i}_{t-1}^*} (A_t^* + a_t^*) - \frac{1}{1 + \hat{i}_{t-1}^*} b_t^* + c_{t-1}^T = y_{t-1}^T
\]

- Gov’t reserve accumulation is not neutral if in equilibrium with no intervention \( b_t^* > 0 = a_t^* \)

- However effect on net position \( A_t^* - b_t^* \) is less than 1:1

- Moreover there is opportunity cost \( \hat{i}_{t-1}^* - i_{t-1}^* \)

- Related to fiscal cost of reserve accumulation in Amador, Bianchi, Bocola, Perri (2020) and Fanelli, Straub (2021)
Administrative controls
Administrative controls

- Harder form of capital controls
- Foreign investors cannot repatriate a fraction of loans made at date $t$
- Constraint on foreign investors

\[ b_{t+1} \geq \Lambda_t b_t \]
Administrative controls

- Allows expanding $c_t^T$ without the added borrowing cost
- With heterogeneous domestic agents similar outcome from preventing flight of domestics
- More similar to extreme measures as Malaysia 1997 or Iceland 2008
- Costly ex ante (if constraint anticipated adds cost to lending)

International loan market
Fear of floating
Costs of depreciations

- Standard sticky prices don’t work (Egorov-Mukhin 2021)
- Balance sheet effects
- Feedback to spending in (possible backward bending IS)
- Credibility
Balance sheet effects

- Borrowing constraint that depends on price of N

\[ \frac{b_{t+1}^*}{1 + i_t^*} \leq \kappa \left( \frac{p_t^N}{e_t} \right) \]

- Example real estate prices
Contractionary devaluation

- Extreme case

\[ c_t^N = \frac{1 - \phi}{\phi} \left( \frac{w_t}{e_t} \right)^{-\frac{1}{\rho}} \left[ y_T - b_t^* + \kappa \left( \frac{w_t}{e_t} y_t^N \right) \right] \]

- In some region demand and employment may be decreasing in \( e_t \)
- Different mechanism in HANK: Auclert Rognlie Souchier Straub 2021
Even if employment is increasing in $e_t$ trade off still present

As depreciation reduces T consumption

$$c_t^N = \frac{1 - \phi}{\phi} \left( \frac{w_t}{e_t} \right)^{-\frac{1}{\rho}} \left[ y^T - b_t^* + \kappa \left( \frac{w_t}{e_t} y_t^N \right) \right]$$

$$c_t^T = y^T - b_t^* + \kappa \left( \frac{w_t}{e_t} y_t^N \right)$$

This more similar to our $\Phi$
Credibility/commitment

- Various dimensions: limited anchoring or reputation ($\pi_t = ky + E\pi_{t+1}$)
- Here we explore a financial version of a commitment problem
- Think of country at $t-1$ attracting flows in pesos from intermediaries
- Intermediaries now have SDF $m$

$$\frac{1}{e_{t-1}} \frac{b_t}{1 + i_{t-1}} = \omega_{t-1} E \left[ m_{t|t-1} \left[ \frac{e_{t-1}}{e_t} (1 + i_{t-1}) - (1 + i^*_{t-1}) \right] \right]$$
Optimal exchange rate volatility

- Consider equilibrium in which country borrows in pesos and holds dollar reserves
- Net position $a_t^* - a_t / e_t$
- Now using volatility of exchange rate provides insurance against shocks
- Depreciation has two benefits: state contingency and employment in $N$
- Cost from term in Lagrangian (under commitment)
  
  $+\lambda_{t-1} \omega_{t-1} \pi(s_t) m_{t,t-1} \frac{e_{t-1}}{e_t} (1 + i_{t-1})$
Connections

- Growing literature on risk premia and UIP deviations (Hassan, Mertens, Zhang 2020)
- Optimal monetary policy with portfolios. Fanelli (2019)
Conclusions

- Growing literature to understand role of non-standard policy tools as precautionary tools against crises
- Aggregate demand and pecuniary externalities will keep playing central role
- Some areas with many interesting open questions:
  - Where is fear of floating coming from?
  - Connection to frictional portfolio adjustment (why upward sloping supply? risk premia)