Central Banks as Dollar Lenders of Last Resort: Implications for Regulation and Reserve Holdings

Mitali Das, Gita Gopinath, Helene Hall, Taehoon Kim, and Jeremy C. Stein

Discussed by Tim Schmidt-Eisenlohr, Federal Reserve Board

5th BIS Workshop on Research on Global Financial Stability
Basel, December 15, 2023
The views expressed in this presentation are those of the authors and do not necessarily reflect the position of the Federal Reserve Board or the Federal Reserve System.
Overview

Model central bank reserve holdings:
- Central banks hedge private sector dollar liabilities with FX reserves.
- Desirable because taxation is distortionary with convex costs.

Main Results
- Neither (untargeted) capital requirements nor swap lines have the same hedging advantages.
- At a global level, there is too much reserve accumulation, which:
  - Depresses returns on dollar assets.
  - Reinforces over-reliance on dollar borrowing by firms.
Background: Reserves and Firm Debt Issuance

**Figure:** Foreign Reserves and Foreign Currency Debt

<table>
<thead>
<tr>
<th>Foreign exchange reserves</th>
<th>8. Share of foreign currency debt issuance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>Percent</td>
</tr>
<tr>
<td>2000</td>
<td>100</td>
</tr>
<tr>
<td>2005</td>
<td>90</td>
</tr>
<tr>
<td>2010</td>
<td>80</td>
</tr>
<tr>
<td>2015</td>
<td>70</td>
</tr>
<tr>
<td>2020</td>
<td>60</td>
</tr>
</tbody>
</table>

Source: Bertaut et al. (2021).

- Currency shares in foreign exchange reserves and debt issuance very similar.
- Story here: Foreign borrowing causes foreign reserves holdings (with a feedback loop).
USD is over-represented in foreign reserves.

Here: assume exogenous preference for U.S. safe assets.

Side note:
- Foreign share of Treasury holdings has been declining.
- Half of foreign holdings are from private - not foreign official.
Why do countries accumulate reserves?

- **Mercantilism**: prevent appreciation of exchange rate with trade surplus (e.g. China (?), Switzerland (?)).
- **Precautionary**: build reserves for emergencies (e.g. emerging economies after Asian Financial Crisis).

\[ \Rightarrow \text{Here: focus on precautionary motive.} \]

Why are precautionary reserves in dollars?

- **Good hedge against a local crisis** (if dollar appreciates).
- **Can do interventions to affect exchange rate**.

\[ \Rightarrow \text{Here: XR exogenous, so only hedging motive active.} \]
Three agents: HHs, central bank, banks.

Households:
- Invest in 3 assets:
  - Local currency safe assets $D_h$
  - Dollar safe assets $D_\$$
  - Bank equity $K$
- Have preference for safe assets $\theta_d(D_h + D_\$$) and dollar $f(D_\$$).

$$U = C_0 + \beta E[C_1] + \theta_d(D_h + D_\$$) + f(D_\$$)$$
Model: Banks, Exchange Rate, and Crises

Banks:
- Issue dollar bonds $B\$, domestic bonds $B_h$ and equity $K$.
- Have fixed investment size $I = Q_\$ B\$ + Q_h B_h + Q_K K$.

Exchange rate:
- Takes two values $1+z$ and $1-z$ with probability $1/2$ each.

Crisis:
- Exogenous probability of banking crisis $q$.
- Exogenous share of banks whose value falls to zero $q$.
- Solvent banks have liquidity costs when home currency depreciates: $\frac{\gamma B^2_\$}{I}$.
Central Bank:

- Accumulates reserves incurring negative return $S_K R_\$.
- Taxation has convex costs given by $\Omega(\tau)$.
- Central bank minimizes expected costs from reserve holdings and dead-weight loss of taxation:

$$\min_{R_\$} S_K R_\$ + \Omega(\tau)$$

- Dollar reserves useful because:
  - Dollar reserves are a good hedge for foreign currency debt.
  - Raising ad-hoc taxes is costly.
Model: Key Equation (Part 1)

Expected cost of bailout given crisis:

$$\frac{\psi}{2} \left[ (pB_h + (1 + z) pB_\$ - zR_\$)^2 + (pB_h + (1 - z) pB_\$ + zR_\$)^2 \right]$$

Hedging property:

- Dollar appreciation:
  
  $$(1 + z) pB_\$ \quad -zR_\$$$
  
  Repayment more expensive \quad Reserves more valuable

- Dollar depreciation:
  
  $$(1 - z) pB_\$ \quad +zR_\$$$
  
  Repayment less expensive \quad Reserves less valuable

⇒ With exchange rate surprises and convex tax costs, holding reserves is useful - even without exchange rate interventions.
Model: Externality

Assumptions

- All countries draw same exchange rate $\tilde{\epsilon}$.
- Bank crises are perfectly correlated across countries. $\Rightarrow$ Risk cannot be diversified.
- Supply of U.S. Treasuries $X_\$ \text{ fixed exogenously.}$
Change of Global Welfare with dollar reserves \( \frac{dW_G}{dR_s} \):

\[
-(Q_s - \beta) - \beta \frac{\partial \Omega}{\partial B_s} + \phi \left( (Q_s - \beta) - \frac{\beta(1 - p(q + h))\gamma B_s}{l} - \beta \frac{\partial \Omega}{\partial B_s} \right)
\]

Local planner’s FOC

Wedge between global and local planner

\[
\phi = \frac{dB_s}{dR_s} > 0
\]

Externality relevant if dollar borrowing increases in dollar reserve holdings.

- Then, the interest rate on global dollar assets is depressed.
- Which leads to too much borrowing in dollars, and raises liquidity and bailout costs.
Comments Overview

Comments:
- Modeling of capital regulation.
- GE solution / intuition / condition.
- Exogeneity of the exchange rate.
- Additional comments.
What is the purpose of bank capital regulation:
- Reduce probability of bank default.
- Prevent systemic banking crises.
- Reduce cost of bailouts given default.

Here:
- Probability of banking crisis \((q)\), share of banks that default \((p)\) are exogenous.
- Capital requirements force banks to finance in an inefficient way (no extra utility for consumers from holding \(K\)).
- Capital does reduce LC deposits and thereby size of total bailout needed in crisis.

⇒ What happens if capital affects probability of crises and share of banks affected?
Comment: Externality

Clearing condition:

\[ B\$(Q\$) + \bar{X}\$ = R\$ + D\$(Q\$) \]

Increase in \( R\$ \):
- Increases \( Q\$ \)
- Increases \( B\$ \) and \( D\$ \)

Necessary condition for main result:

\[ \phi = \frac{dB\$}{dR\$} > 0 \]

When is this the case?

⇒ In addition, show charts where you vary \( R\$ \) and show effects for \( Q\$, \( B\$, and \( D\$ \)?
Here:

- Dollar reserves hedge private dollar liabilities, conditional on exogenous exchange rate shock.

Alternative:

- Reserves help stabilize exchange rate.
- How would recommendations / results change if dollar reserves support exchange rates? Does this potentially reverse the externality result?
- Should governments intervene in XR markets or bail-out private debtors? Two distinct uses of reserves.
I did not understand what 'justified' means in the abstract. I would say they borrow in dollar because it is cheaper and this creates a mismatch on their balance sheet. I do not think there is anything normative about FC borrowing per se.

The result that equity is dominated in the baseline model could be explained a bit better.

Is equation (9) correct? I do not get 1/2 in the expression.
<table>
<thead>
<tr>
<th></th>
<th>(1) Int</th>
<th>(2) Int</th>
<th>(3) UIP</th>
<th>(4) UIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC</td>
<td>-1.397***</td>
<td>-2.523***</td>
<td>-0.594***</td>
<td>-1.232***</td>
</tr>
<tr>
<td></td>
<td>(0.0956)</td>
<td>(0.189)</td>
<td>(0.215)</td>
<td>(0.400)</td>
</tr>
<tr>
<td>FC X Low Volat.</td>
<td></td>
<td></td>
<td>2.441***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.233)</td>
<td></td>
</tr>
<tr>
<td>Ln(loan size)</td>
<td>-0.0946***</td>
<td>-0.0887***</td>
<td>-0.0858***</td>
<td>-0.0806***</td>
</tr>
<tr>
<td></td>
<td>(0.0259)</td>
<td>(0.0255)</td>
<td>(0.0262)</td>
<td>(0.0254)</td>
</tr>
<tr>
<td>Ln(maturity)</td>
<td>0.0962**</td>
<td>0.121***</td>
<td>0.0972**</td>
<td>0.115***</td>
</tr>
<tr>
<td></td>
<td>(0.0383)</td>
<td>(0.0354)</td>
<td>(0.0420)</td>
<td>(0.0400)</td>
</tr>
<tr>
<td>Ct-time FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Rating FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>11465</td>
<td>11062</td>
<td>6562</td>
<td>6560</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.427</td>
<td>0.449</td>
<td>0.583</td>
<td>0.588</td>
</tr>
</tbody>
</table>

- Average interest rate difference of about 140 BPs and average UIP deviation of about 60 basis points
- Differences only in countries with above median exchange rate volatility
Dollar appreciation increases the number of loans that become past due.

Effects driven by dollar loans (currency mismatch).
Great paper - I recommend reading it!

Would be very interesting to expand on the role of capital regulation and on using dollar reserves for currency interventions.

Looking forward to next version.