

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

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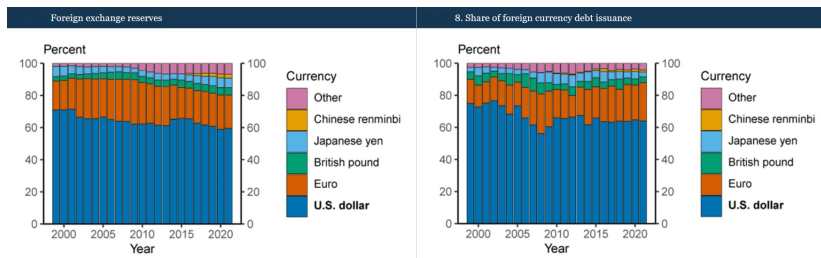
Model central bank reserve holdings:

- 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.

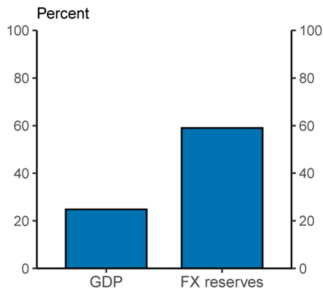
Figure: Foreign Reserves and Foreign Currency Debt



Source: Bertaut et al. (2021).

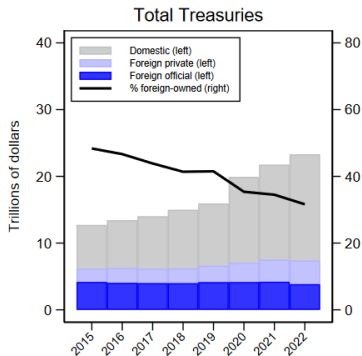
- Currency shares in foreign exchange reserves and debt issuance very similar.
- Story here: Foreign borrowing causes foreign reserves holdings (with a feedback loop).

Background: Reserves, Treasuries, and the Dollar



Note: U.S. share of 2020 nominal world GDP compared to the dollar's share of globally disclosed foreign exchange reserves in 2020:Q4. At current exchange rates.

Source: IMF COFER; IMF World Economic Outlook database.



- 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).

⇒ 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.

⇒ 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:

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

Hedging property:

- Dollar appreciation:

$\underbrace{(1+z)pB_{\$}}$	$\underbrace{-zR_{\$}}$
Repayment more expensive	Reserves more valuable

- Dollar depreciation:

$\underbrace{(1-z)pB_{\$}}$	$\underbrace{+zR_{\$}}$
Repayment less expensive	Reserves less valuable

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

Assumptions

- All countries draw same exchange rate $\tilde{\epsilon}$.
- Bank crises are perfectly correlated across countries.
⇒ Risk cannot be diversified.
- Supply of U.S. Treasuries $X_{\$}$ fixed exogenously.

Model: Externality, Key Equation (Part 2)

- Change of Global Welfare with dollar reserves $\left(\frac{dW_G}{dR_\$}\right)$:

$$\underbrace{-(Q_\$ - \beta) - \beta \frac{\partial \Omega}{\partial B_\$}}_{\text{Local planner's FOC}} + \phi \underbrace{\left((Q_\$ - \beta) - \frac{\beta(1 - p(q + h))\gamma B_\$}{I} - \beta \frac{\partial \Omega}{\partial B_\$} \right)}_{\text{Wedge between global and local planner}}$$

$$\phi = \frac{dB_\$}{dR_\$} > 0$$

Externality relevant if dollar borrowing increases in dollar reserve holdings.

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

Comments:

- Modeling of capital regulation.
- GE solution / intuition / condition.
- Exogeneity of the exchange rate.
- Additional comments.

Comment: Modeling Capital Regulation

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?

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 $D_{\$}$?

Comment: Exogeneity of Exchange Rate

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.

Niepmann and Schmidt-Eisenlohr (2022): UIP Deviations

	(1) Int	(2) Int	(3) UIP	(4) UIP
FC	-1.397*** (0.0956)	-2.523*** (0.189)	-0.594*** (0.215)	-1.232*** (0.400)
FC X Low Volat.		2.441*** (0.233)		1.261*** (0.476)
Ln(loan size)	-0.0946*** (0.0259)	-0.0887*** (0.0255)	-0.0858*** (0.0262)	-0.0806*** (0.0254)
Ln(maturity)	0.0962** (0.0383)	0.121*** (0.0354)	0.0972** (0.0420)	0.115*** (0.0400)
Ct-time FE	Yes	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes	Yes
Observations	11465	11062	6562	6560
R^2	0.427	0.449	0.583	0.588

- 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

Niepmann and Schmidt-Eisenlohr (2022): Dollar and Past Due Status

	(1)	(2)	(3)	(4)
D ln(XR)	1.899*** (0.412)	-0.431 (1.086)	-1.785 (1.089)	
D ln(XR) × FC		2.691** (1.161)	3.479*** (1.161)	4.588*** (1.745)
Lagged rating	0.0492** (0.0226)	0.0477** (0.0226)	0.0454** (0.0221)	0.0492** (0.0249)
Ln(loan size)	-0.0430*** (0.0140)	-0.0524*** (0.0143)	-0.0717*** (0.0161)	-0.0785*** (0.0184)
Ln(maturity)	-0.0467** (0.0225)	-0.0471** (0.0225)	-0.0698** (0.0272)	-0.0724** (0.0308)
FC		0.0848 (0.0593)	0.119* (0.0698)	0.102 (0.0845)
Time FE	Yes	Yes	Yes	No
Ct FE	No	No	Yes	No
Ct-time FE	No	No	No	Yes
Ct-Time-Ind FE	No	No	No	No
Ct-Time-Ind-Rat FE	No	No	No	No
Observations	147,103	147,103	119,767	51,811
Pseudo R ²	0.039	0.045	0.096	0.078

- Dollar appreciation increases # 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.