Dollar Safety and the Global Financial Cycle

Zhengyang Jiang[1] Arvind Krishnamurthy[2] Hanno Lustig[2]

1. Northwestern University
2. Stanford University and NBER

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Dollar equilibrium

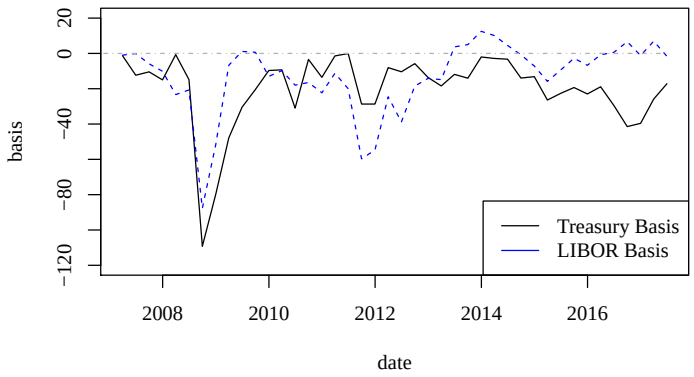
- U.S. balance sheet as world banker, [Gourinchas and Rey, 2007]
- Dollar bias in foreign bond and loan portfolios, [Bruno and Shin, 2014, Maggiori, Neiman, and Schreger, 2017]
- Dollar and Treasury bond flight to quality, [Jiang, Krishnamurthy, and Lustig, 2018a]
- U.S. monetary policy spillovers, [Rey, 2013, Miranda-Agrippino and Rey, 2015]
- Dollar as global risk factor, [Lustig, Roussanov, and Verdelhan, 2014]

This paper:

- Construct a model to explain these facts
- Stress in presentation: monetary policy shocks and spillovers
- Key assumption: there is a global demand for safe dollar assets

Dollar funding premium since crisis

Treasury Basis $\equiv$ 1-year US Treasury $-$ 1-year Foreign Govt swapped to dollars

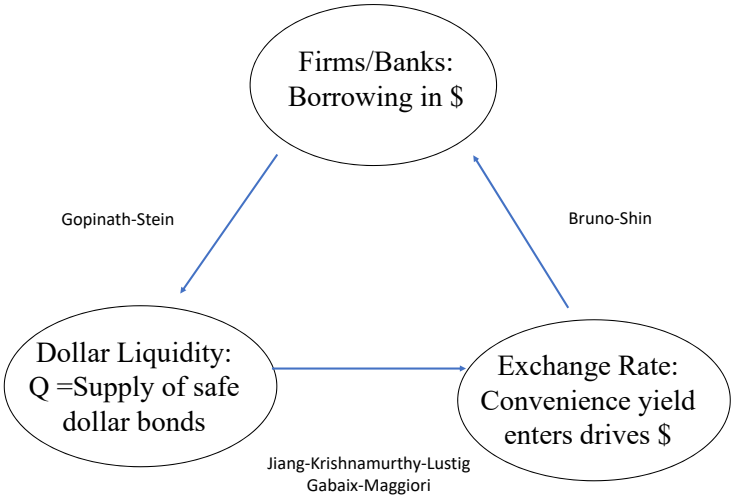


✓ Demand for dollar assets drives negative basis

Dollar funding premium since crisis

Treasury Basis $\equiv$ 1-year US Treasury $-$ 1-year Foreign Govt swapped to dollars

Corp basis from Liao [2018], who shows corporate effect is particularly for short-maturity, high-grade bonds.



1. US as world banker
2. Flight to quality
3. Dollar financing bias
4. Dollar as global risk factor
5. Monetary policy spillovers

U.S. Block: Households, Firms, and Central Bank

- $t = 0, 1, 2...$
- **Central Bank** sets i_t
- **Households**, OLG, consume home good [...for now; later add home and foreign goods]

$$U_t = E_t[c_{t+1}]$$

  Supply labor $l_t \leq \bar{l}$ when young (date t), consume when old (date $t+1$).
- **Firms** use (l_t, k_t) produce output at $t+1$:

$$f(l_t, k_t) = A_{t+1}(l_t + k_t), \quad A_{t+1} > 1.$$

  - Capital can be costlessly converted into goods one-for-one, and vice-versa:

$$\Rightarrow p_t = \text{[nominal] price of goods} = \text{price of labor} = \text{price of capital}$$

  - Firms run by owner-managers. Net worth of n_t at date t ($= k_t$ in equilibrium).

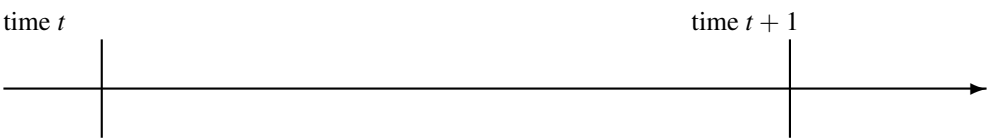
$$\sum_{t=1}^{\infty} (1-\sigma)^{t-1} \sigma \, n_t.$$

    Gertler-Kiyotaki preferences. σ is death rate. Consume when die, otherwise accumulate.

Timeline

Households born, work (l_t), save wage in bond (d_t)

Bonds mature, household consumption



Manager net worth sink into production k_t

Borrow (d_t) to pay workers

Output realized, debt repaid $\Rightarrow k_{t+1}$

Borrowing, working capital, and production

Firms face borrowing constraint, $\theta < 1$:

$$d_t \leq \theta \quad \frac{\overbrace{p_{t+1}A_{t+1}(l_t + k_t)}^{\text{PV of output at } t+1}}{1 + i_t} \quad .$$

Budget constraint for a firm at date t is:

$$d_t - p_t l_t \geq 0,$$

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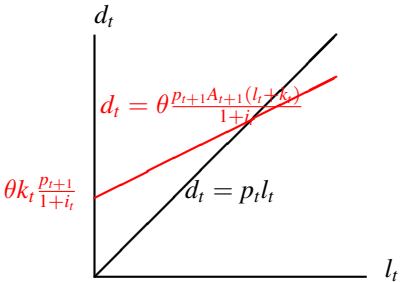

$$d_t \approx k_t \frac{p_t \theta A_{t+1}}{(1+\underbrace{i_t - \pi_t}_{\text{real rate}}) - \theta A_{t+1}}.$$

Monetary policy sets the real rate

- Firms set prices, wages (p_t, p_{t+1}) at start of date t.
  - One period price-stickiness
- Then central bank sets rate,

$$i_t = \bar{\pi} + \epsilon_t$$

  We study response to shock ϵ_t
- Optimal price setting for firms:
  - Households can also supply labor l'_t to an alternative I-sector.
  - Sector is CRS with productivity of one (so inferior to firms) but no financial constraints.
  - Set prices and wages at start of t as well,

$$\frac{p'_{t+1}}{p'_t} = 1 + \bar{\pi}$$

  - Competitive labor/goods market means,

$$\pi_t = \frac{p_{t+1}}{p_t} - 1 = \bar{\pi}$$

$\Rightarrow$ Equilibrium: net worth (=capital of K_t) is the only state-variable

Monetary policy shock

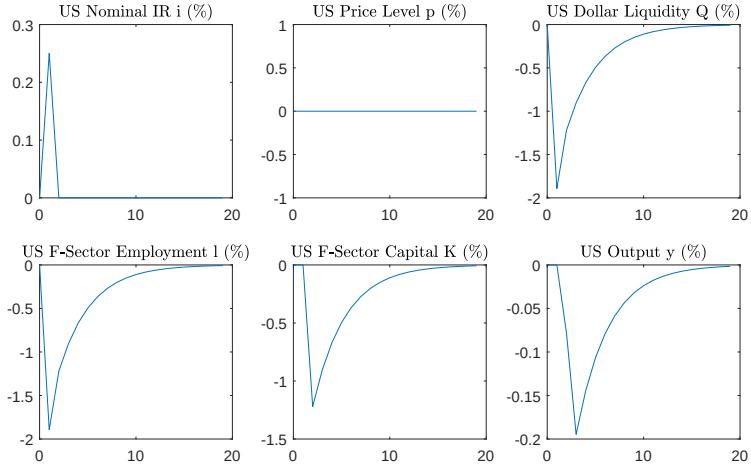

Figure: Impulse response to a U.S. monetary policy shock of 0.25%. Response variables are in %-deviation from SS values. Time in quarters.

Safe asset investors

- Risk neutral world investors who consume a world good (price one at all dates)
- World bonds pay i_t^*.
- Demand for dollar safe assets (the dollar liquidity supplied by U.S. firms).
- Euler equation of safe asset investor:

$$i_t + E_t s_{t+1} - s_t = i_t^* - \lambda_t,$$

where λ_t is convenience yield foreign investors assign to dollar liquidity.

  - Decreasing in quantity of dollar safe assets held:

$$\lambda_t = \lambda(Q_t) \text{ with } \lambda'(Q_t) < 0.$$

- Real exchange rate:

$$e_t = E_t \sum_{j=t}^{\infty} \lambda_j + E_t \sum_{j=t}^{\infty} (r_j - r_j^*) + \bar{e}$$

as in Jiang et al. [2018a]

US investors' carry trade

- US households will want to take the other side ("carry trade"):

$$i_t^* + E_t s_{t+1} - s_t > i_t$$

- We assume short-sale constraint
  - US households cannot short-sell dollar bonds ... otherwise $Q_t \uparrow$ and $\lambda_t \to 0$
  - Only supply of dollar bonds are those issued by firms, and these are sold to foreign investors

US investors' carry trade via U.S. banks

- US households will want to take the other side ("carry trade"):

$$i_t^* + E_t s_{t+1} - s_t > i_t$$

- Assume U.S. banks (owned by households) intermediate a carry trade
  - Households sell dollar bonds to U.S. banks
  - Banks sell the bonds to foreign safe asset investors
  - Invest proceeds in foreign bonds, earning carry trade return, returning profits to shareholders
  - Note: banks also face short-sale constraint and cannot sell more dollar bonds than they own.
- Q_t (produced by firms) is equilibrium quantity of dollar liquidity traded to world investors.

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- To discuss current account we replace household preferences as:

$$E_{t+1} \left[\alpha_H \log c_{t+1,H} + \alpha_T \log c_{t+1,T} + \alpha_W \log w_{t+1} \right]$$

Monetary policy shock, again

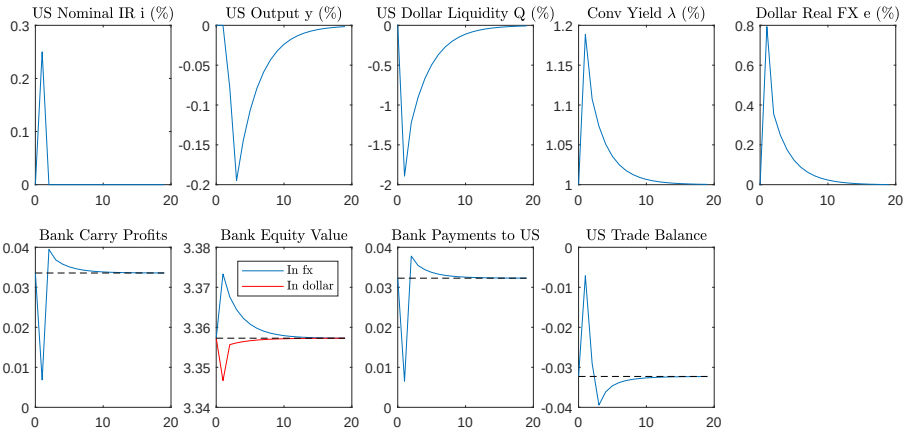

Figure: Impulse response to a U.S. monetary policy shock of 0.25%

International Monetary Equilibrium

- U.S. balance sheet as per Gourinchas and Rey [2007]
- Shocks that reduce Q_t (U.S. crisis ...) renders dollar liquidity scarce and appreciates the dollar as in Jiang et al. [2018a]
- Bank carry profits/losses are exorbitant privilege and duty of Gourinchas, Rey, and Govillot [2010]

Wealth gain of U.S. in a global flight-to-dollar

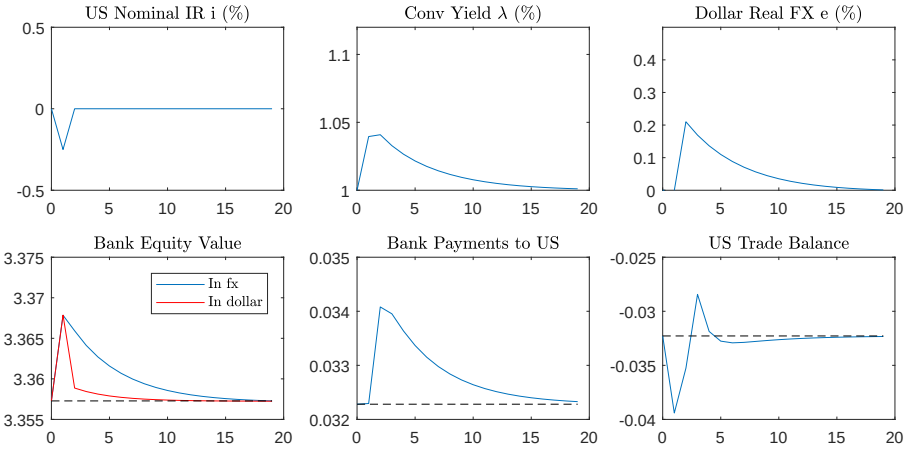

Figure: Shock increasing λ along with U.S. monetary policy easing

Foreign country: Households and firms

Almost same as U.S. model but a real model with no price stickiness

- OLG households consume world good and supply labor
- Firms:

$$f(l_t^*, k_t^*) = A_{t+1}^*(l_t^* + k_t^*), \quad A_{t+1}^* > 1 + i_t^*$$

- Borrowing constraint, parameterized by θ_t^*.

Borrowing choices

Local (non-dollar) currency:

- Borrowing constraint:

$$d_t^* \leq \theta^* \frac{A_{t+1}(l_t^* + k_t^*)}{1 + i_t^*}.$$

Dollar borrowing:

- U.I.P. violation:

$$i_t < i_t^* + E_t s_{t+1} - s_t \quad (= i_t^* - \lambda_t)$$

- Borrowing constraint on Q_t^* of dollar bonds:

$$\underbrace{Q_t^*(1 + i_t)E_t S_{t+1}}_{\text{repayment in foreign currency}} \leq \theta^* A_{t+1}^*(k_t^* \underbrace{+ Q_t^* S_t)}_{\text{foreign currency proceeds}}$$

Comment: Most existing borrowing choice models rest on expensive local currency debt (i.e. high i_t^*). Ours is about cheap dollar borrowing cost (caused by high λ_t). The former models predict foreign borrowings; but are equally about \$, Yen, SFR...

Equilibrium

- Dollar demand from world safe asset investors:

$$\lambda_t = \lambda(Q_t + Q_t^*).$$

- Two state variables (K_t, K_t^*)
- Equilibrium borrowing:
  - If $\lambda_t < \underline{\lambda}$, no reason to borrow in dollars and hedging benefit to borrowing local-currency
  - If $\lambda_t > \overline{\lambda}$, only borrow in dollars
  - Otherwise indifferent and and equilibrium pins down fraction of dollar borrowing
- For impulse responses, we assume parameterization such that firms go to the corner and borrow in dollars upto an exogenously specified max fraction of $\gamma < 1$.

U.S. monetary policy shock

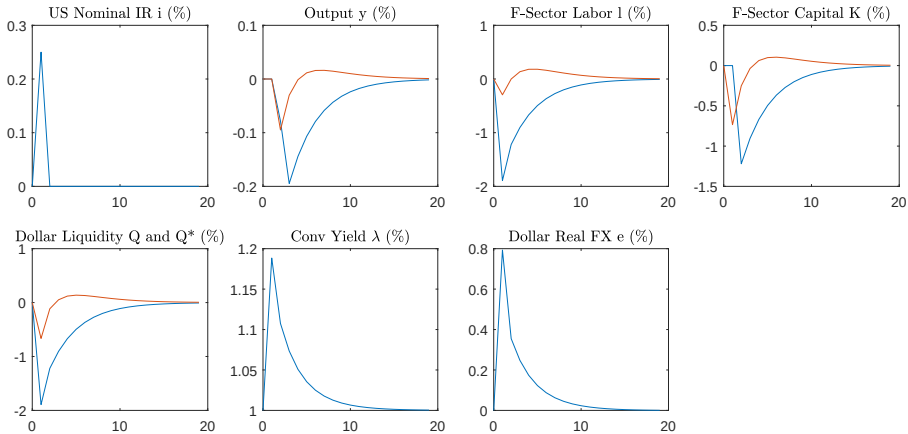

Figure: Impulse response to a U.S. monetary policy shock of 0.25%. Blue is US, red is Foreign.

US recession (no monetary policy response): Dollar appreciates; Foreign recession

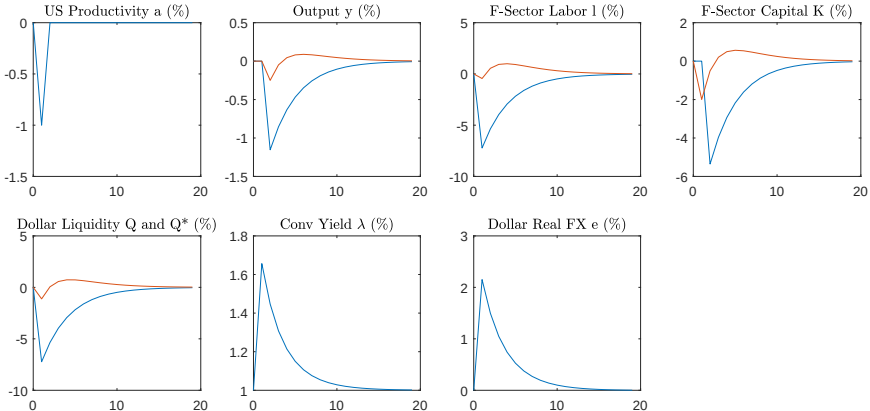

Figure: Impulse Responses to U.S Productivity Shock. A_{t+1} falls -1%. Blue is US, red is Foreign.

Foreign shock to θ_t^*: Foreign recession; contagion; but no spillover to U.S.

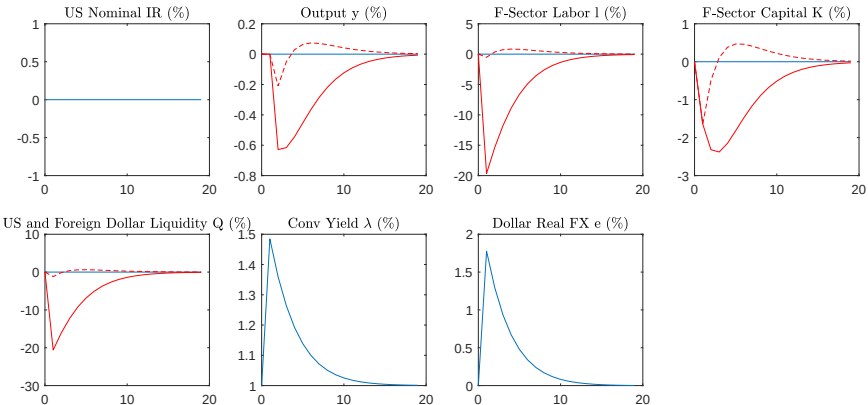

Figure: Impulse Responses to Foreign Pledgability Shock: At time t we reduce θ_t^* unexpectedly by 5%. The shock dissipates with autocorrelation of 0.7. Blue is US, red is Foreign 1, red-dash is Foreign 2.

Results

Spillover and Asymmetry

- U.S. shocks spill over to foreign
- Foreign shocks do not spill over to U.S.
- U.S. shocks do not spill back
- Foreign shock contagion
- Dollar is a global risk factor

Conclusion

We assume dollar safe asset demand as a primitive

And tie together key features of the world's dollar equilibrium:

1. US as world banker
2. Flight to quality
3. Dollar financing bias
4. Asymmetric monetary policy spillovers
5. Dollar as global risk factor

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