Dollar Safety and the Global Financial Cycle

Zhengyang Jiang\textsuperscript{1}  Arvind Krishnamurthy\textsuperscript{2}  Hanno Lustig\textsuperscript{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 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 ≡ 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 ≡ 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.
Firms/Banks: Borrowing in $

Dollar Liquidity: \( Q = \) Supply of safe dollar bonds

Exchange Rate: Convenience yield enters drives $

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

References:
- Gopinath-Stein
- Bruno-Shin
- Jiang-Krishnamurthy-Lustig
- Gabaix-Maggiori
U.S. Block: Households, Firms, and Central Bank

- \( t = 0, 1, 2 \ldots \)
- **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. \( \sigma \) is death rate. Consume when die, otherwise accumulate.
**Timeline**

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

![Timeline Diagram](image)

- 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, $\theta < 1$:

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

Budget constraint for a firm at date $t$ is:

$$d_t - p_tl_t \geq 0,$$
Firms face borrowing constraint, $\theta < 1$:

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Budget constraint for a firm at date $t$ is:

$$d_t - p_t l_t \geq 0,$$
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 \(\epsilon_t\)
- 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,
  \[
p_{t+1}' = \frac{p_t'}{p_t'} = 1 + \bar{\pi}
\]
  - 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 $\lambda_t$ 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%
• 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 $\lambda$ 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 $\theta_t^*$. 
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:
    \[
    i_t < i_t^* + E_t s_{t+1} - s_t \ (= i_t^* - \lambda_t)
    \]
  • Borrowing constraint on \(Q_t^*\) of dollar bonds:
    \[
    Q_t^* (1 + i_t) E_t S_{t+1} \leq \theta^* A_{t+1}^* (k_t^* + Q_t^* S_t)
    \]

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 \(\lambda_t\)). 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 \(\lambda_t < \lambda\), no reason to borrow in dollars and hedging benefit to borrowing local-currency
  • If \(\lambda_t > \bar{\lambda}\), 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 $\theta_t^*$: Foreign recession; contagion; but no spillover to U.S.

Figure: Impulse Responses to Foreign Pledgability Shock: At time $t$ we reduce $\theta_t^*$ 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


