Dollar Safety and the Global Financial Cycle

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U.S. Monetary Policy Spillovers?

- Easy US monetary policy over last decade, coupled with EM capital inflows

> *When monetary policy in large countries is extremely and unconventionally accommodative, capital flows into recipient countries tend to increase local leverage...*
>
> -Raghuram Rajan (2014)

- Vulnerability of EMs as US policy tightens (see taper tantrum and last two years)
- More broadly, Helene Rey's work on the global financial cycle and the role of U.S. monetary policy
  - Rey [2013], Miranda-Agrippino and Rey [2015], Gerko and Rey [2017]

What is the mechanism?

- Fed view: "There is nothing to see here"
  - Jay Powell (2018):

    ...while global factors play an important role in influencing domestic financial conditions, the role of U.S. monetary policy is often exaggerated.

  - Standard models imply small spillover effects raising some skepticism [see Bernanke, 2017]
- Principal alternative view: "Search for yield"

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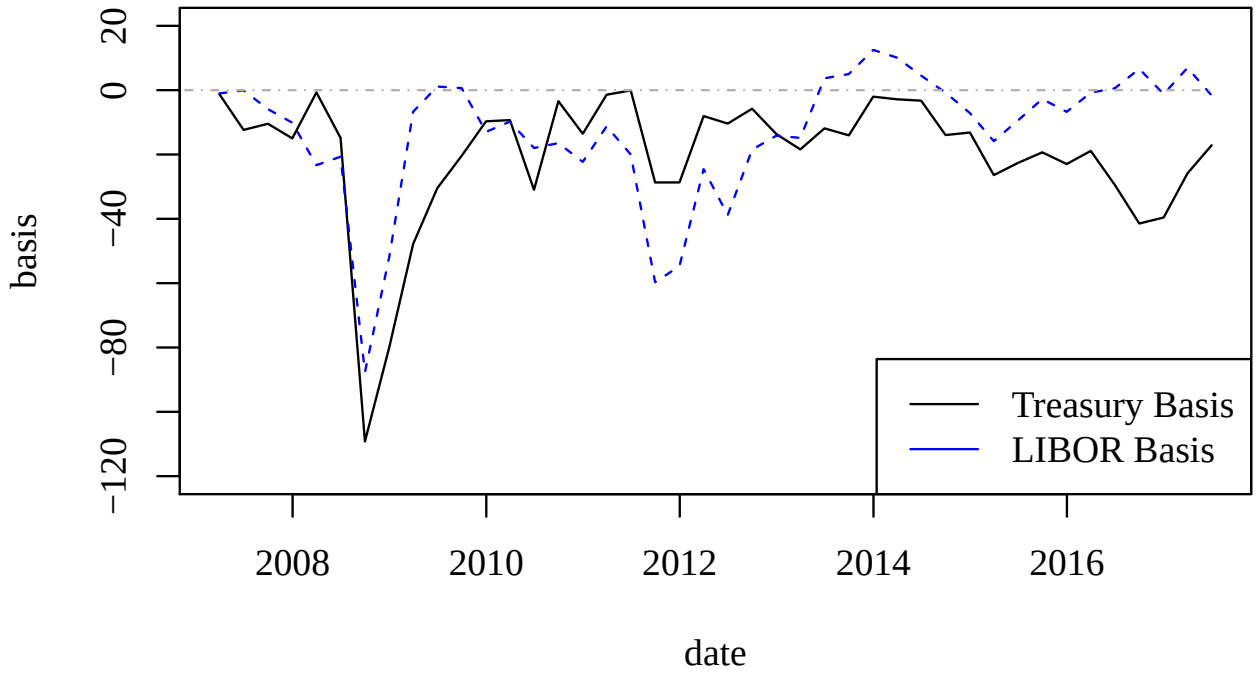
  - Standard models imply small spillover effects raising some skepticism [see Bernanke, 2017]
- Principal alternative view: "Search for yield"
- This paper: dollar safe asset demand

Dollar funding premium since crisis

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



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X Search for foreign yield: Basis is positive?

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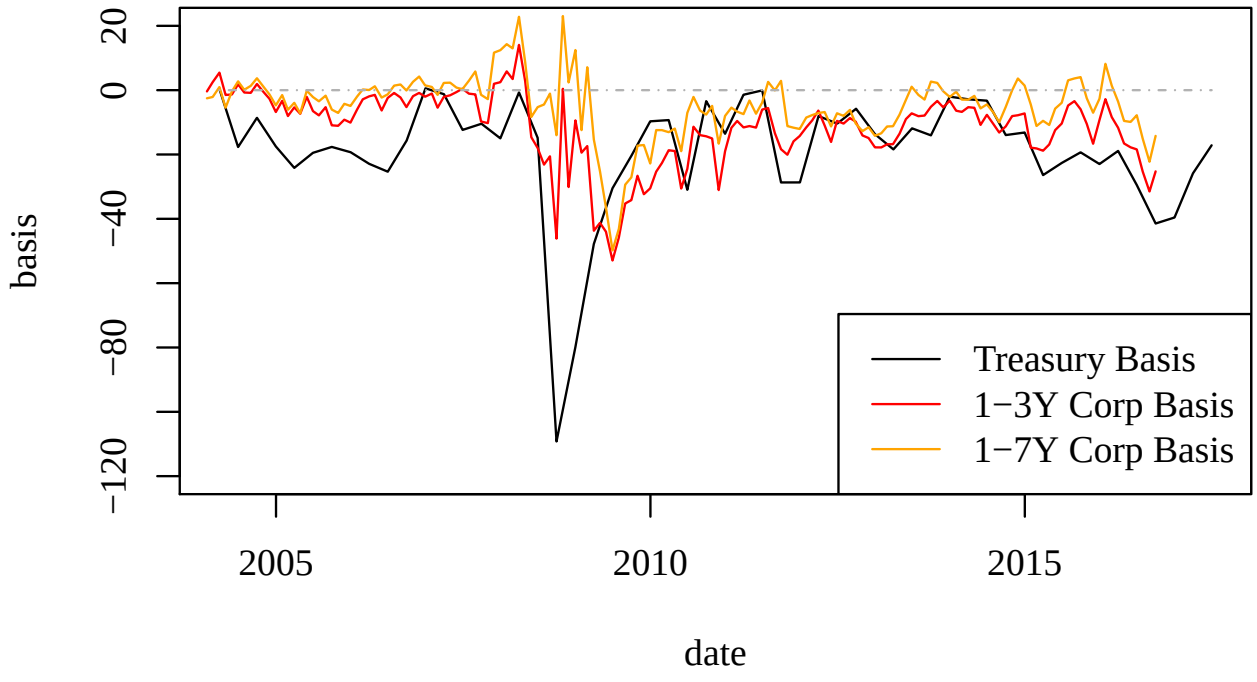

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Our argument

- Demand for safe dollar bonds is a feature of the “dollar is reserve currency" world
- Dollar bonds produced by US issuers against dollar revenues
- Funding advantage induces issuers all around the world to also tilt liabilities towards dollars
- Dollar currency mismatch around the world makes the value of the dollar a global risk factor
  - US monetary policy affects value of dollar and has spillover effects
  - Other shocks also matter

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Last decade explanation:

- Financial crisis and slow growth led to a reduction in U.S. produced safe dollar assets $\Rightarrow$ negative basis
- Foreign borrowers in growing economies (EMs) fill the gap
- Currency mismatch grows and has come back to bite when U.S. tightens policy and dollar strengthens

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

Households:

- OLG, consume home (non-tradable) good and supply labor $l_t \leq \bar{l}$ when young (date t), consume when old (date $t+1$).

Firms/Owners

- Firms use (l_t, k_t) produce output at $t+1$:

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

- Managers/owners of firms have net worth of the capital k_t
- And face a collateral constraint on borrowing to pay workers

Central bank sets i_t

Timeline

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

Bonds mature, household consumption

Manager net worth k_t, sink into production

Borrow (d_t) to pay workers

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

Borrowing, working capital, and production

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

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

Budget constraint for a firm at date t is:

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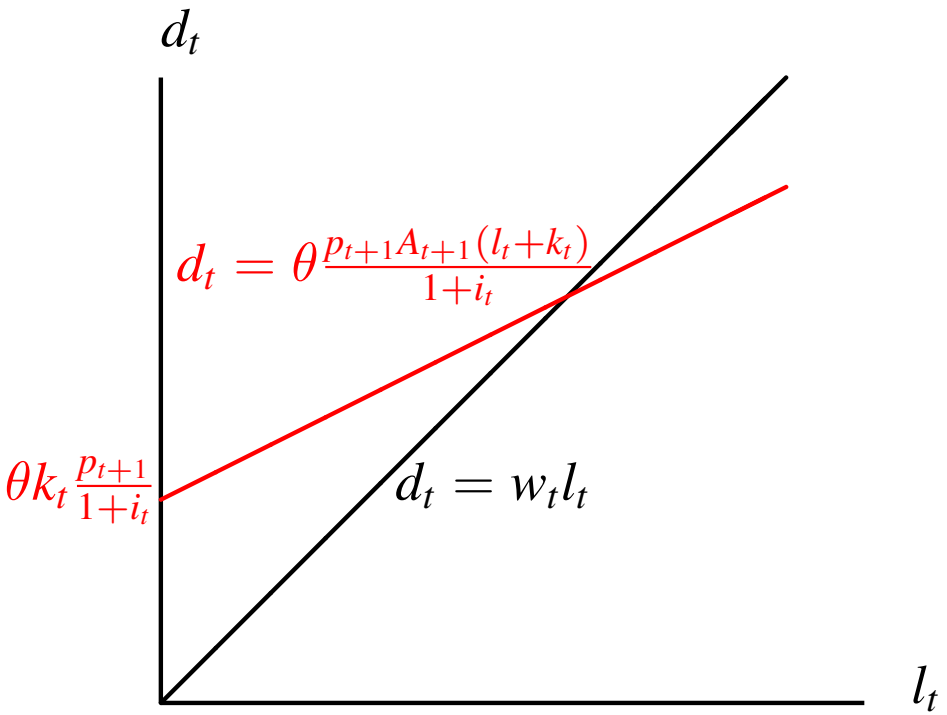


$$d_t \approx k_t \frac{p_t \theta A_{t+1}}{(1+ \underbrace{i_t - \pi_t}_{\text{real rate}}) - \theta A_{t+1}}.$$

Monetary policy sets the real rate

- Firms set prices, wages (p_t, w_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 is to set,

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

$\Rightarrow$ Equilibrium: capital (K_t) is the only state-variable

Monetary policy shock

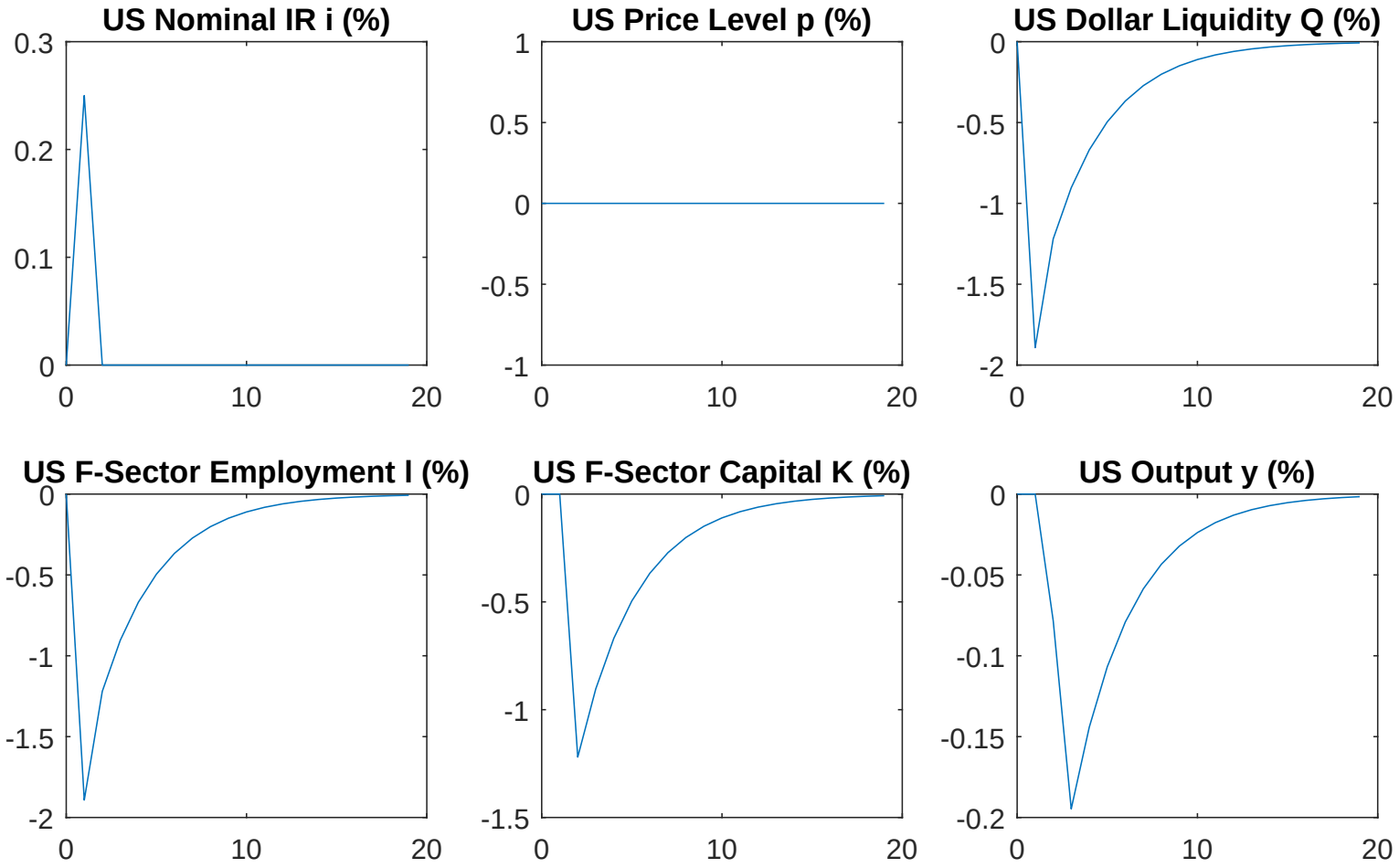


Figure: Impulse response to a U.S. monetary policy shock of 0.25%. Response variables are in %-deviation from SS values. Time in quarters.

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:

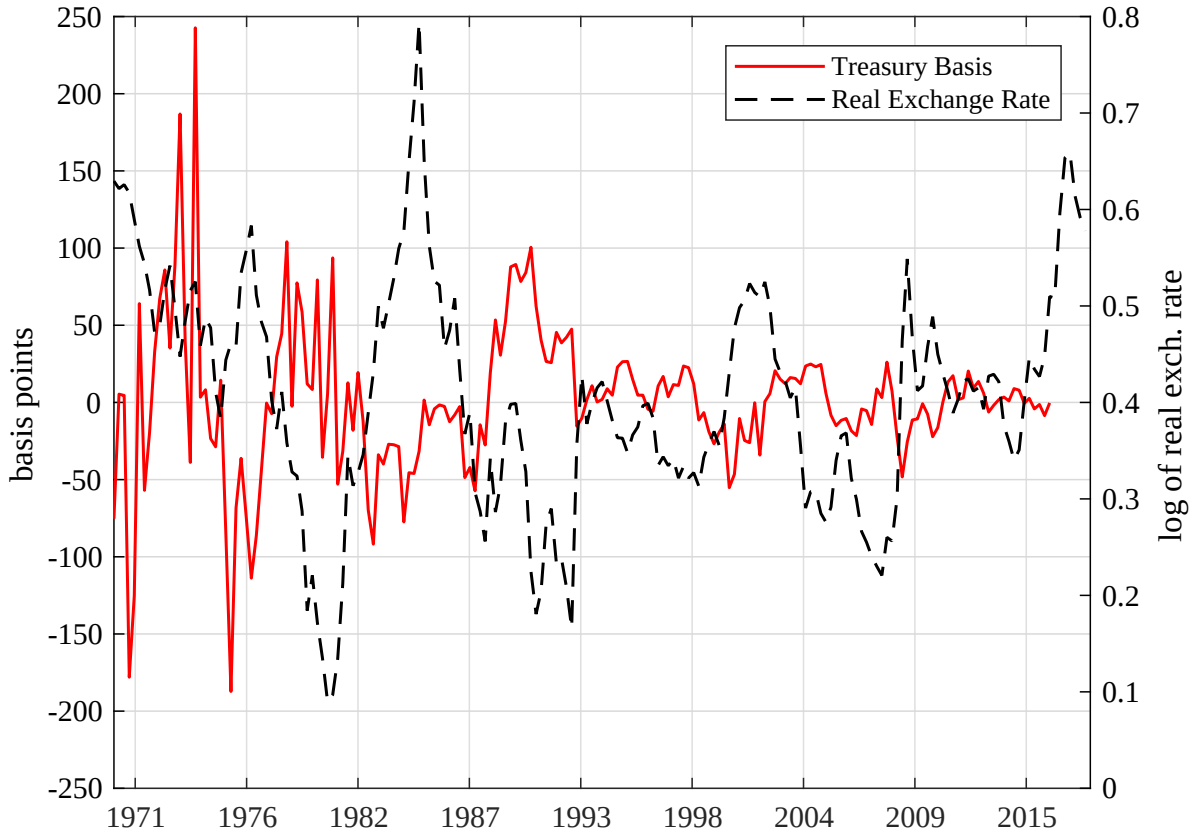
$$\lambda_t = \lambda(Q_t) \text{ with } \lambda'(Q_t) < 0.$$

e.g., as in Krishnamurthy and Vissing-Jorgensen [2012]

- Real exchange rate:

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

Convenience yield and dollar exchange rate



- One-year maturity Treasury basis from 1970Q1 to 2017Q2 for US/UK, in basis points, and the log real US/UK exchange rate.
  - Basis = yield on U.S. Treasury − yield on U.K. govt swapped into dollars
  - Basis is proportional to negative of λ_t. See Jiang, Krishnamurthy, and Lustig [2018].

US investors' carry trade

- US dollar bond holders 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 + partial capital mobility
  - Investors cannot short-sell dollar bonds
  - Only α fraction access foreign markets

$$Q_t = \alpha B_t$$

- Q_t is quantity of dollar liquidity traded to world investors.
  - US investors take the other side ... "search for yield".
- US balance sheet as in Gourinchas and Rey [2007].

Monetary policy shock, again

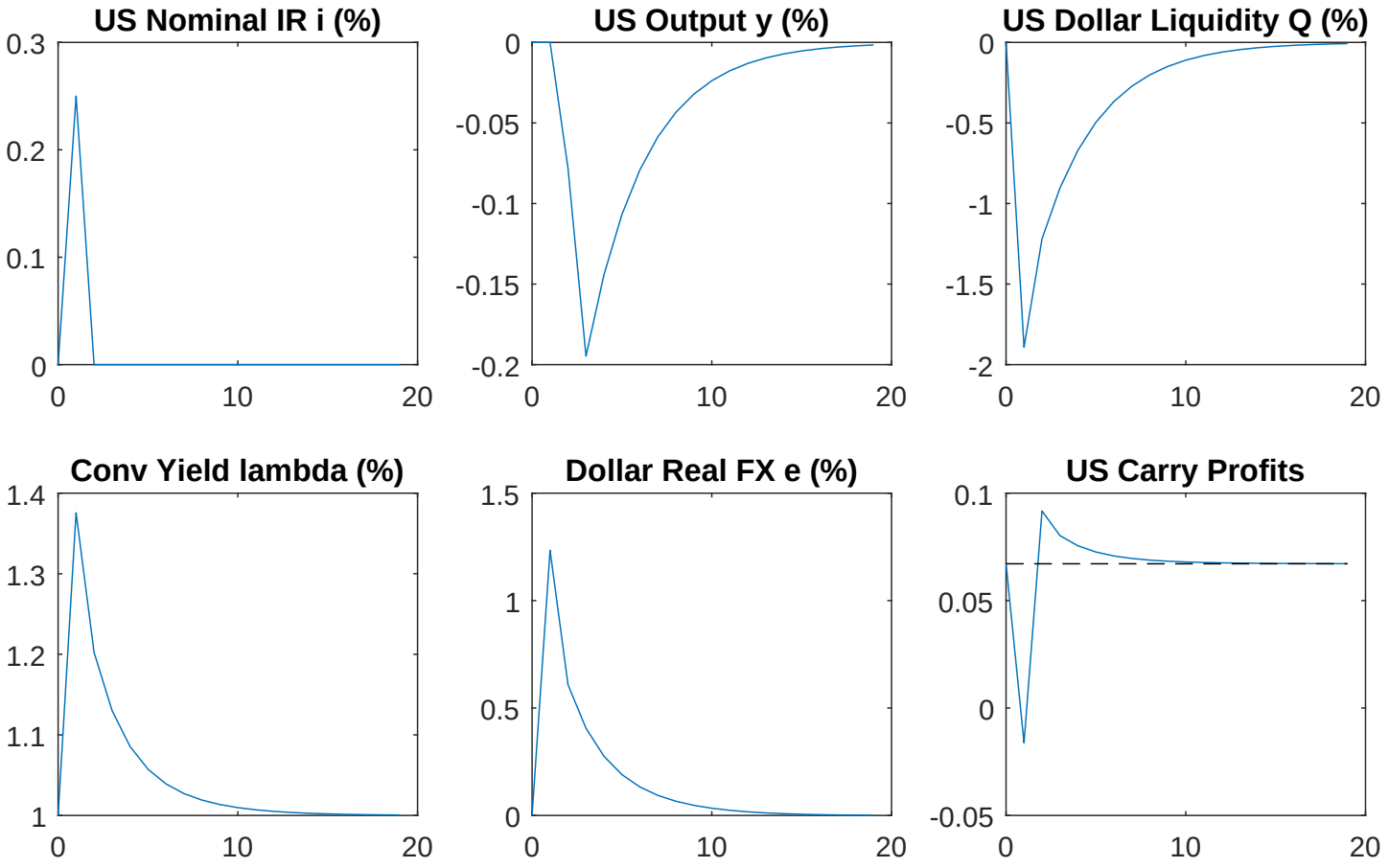


Figure: Impulse response to a U.S. monetary policy shock of 0.25%

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^*)

U.S. monetary policy shock

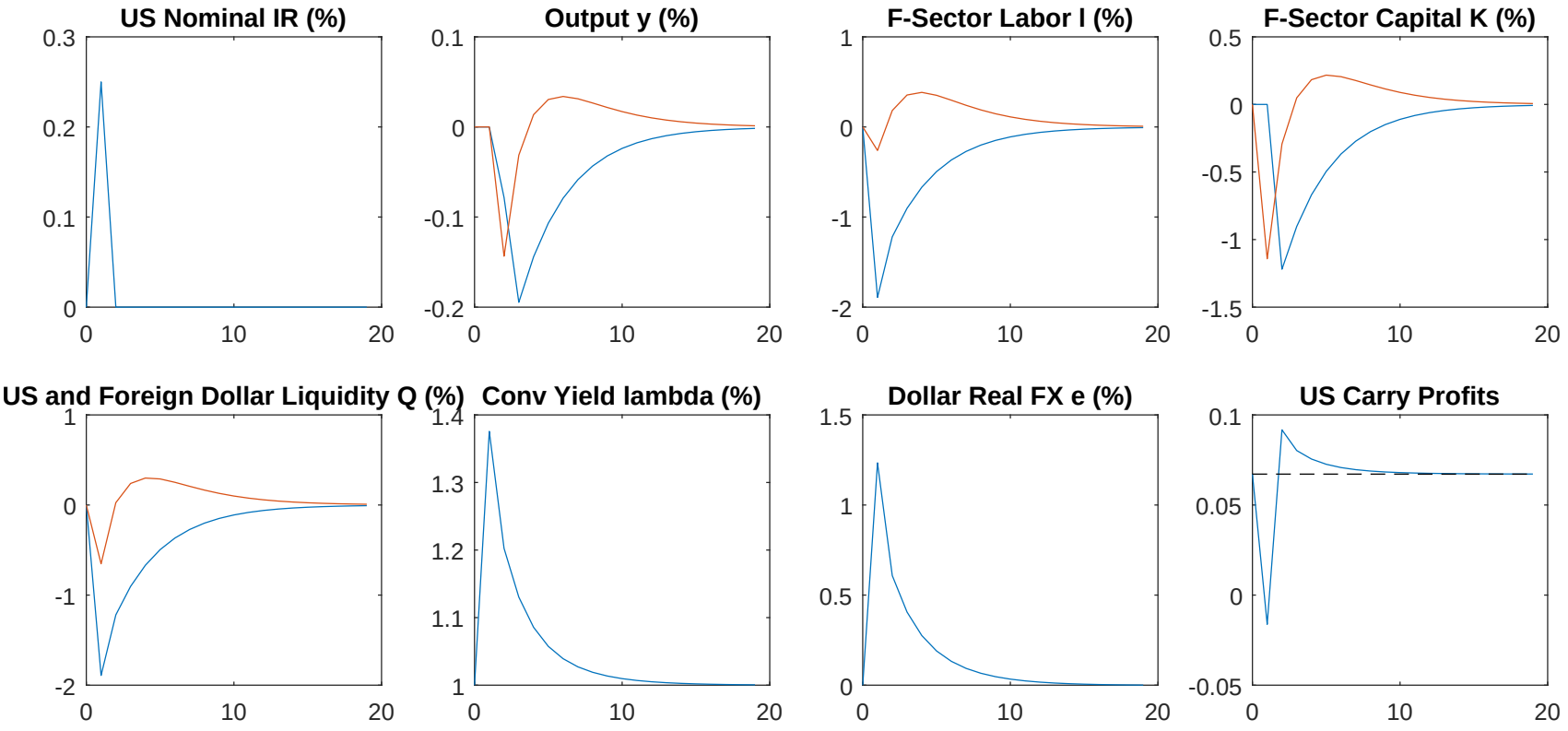


Figure: Impulse response to a U.S. monetary policy shock of 0.25%. Blue is US, red is Foreign.

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

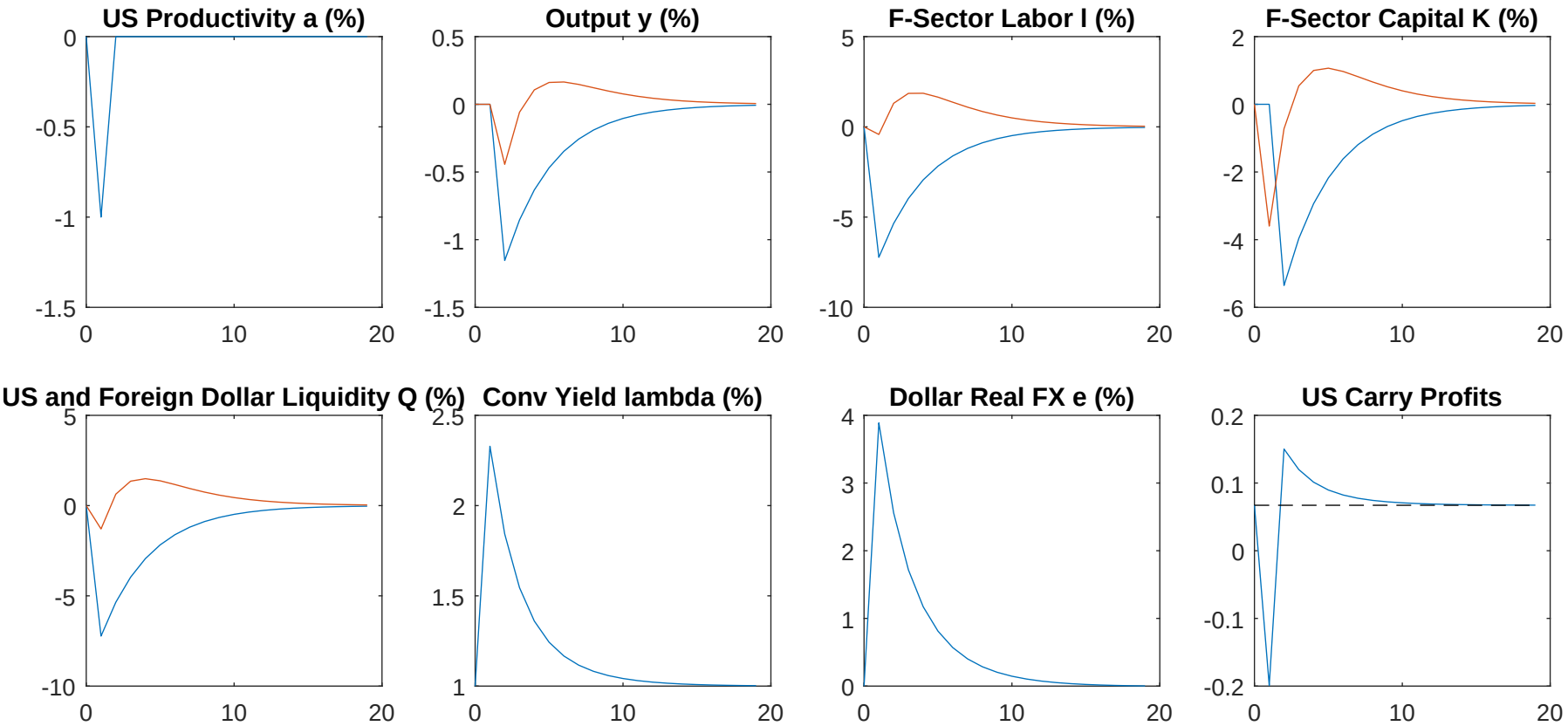


Figure: Impulse Responses to U.S Productivity Shock. A_{t+1} falls -1%. Blue is US, red is Foreign.

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

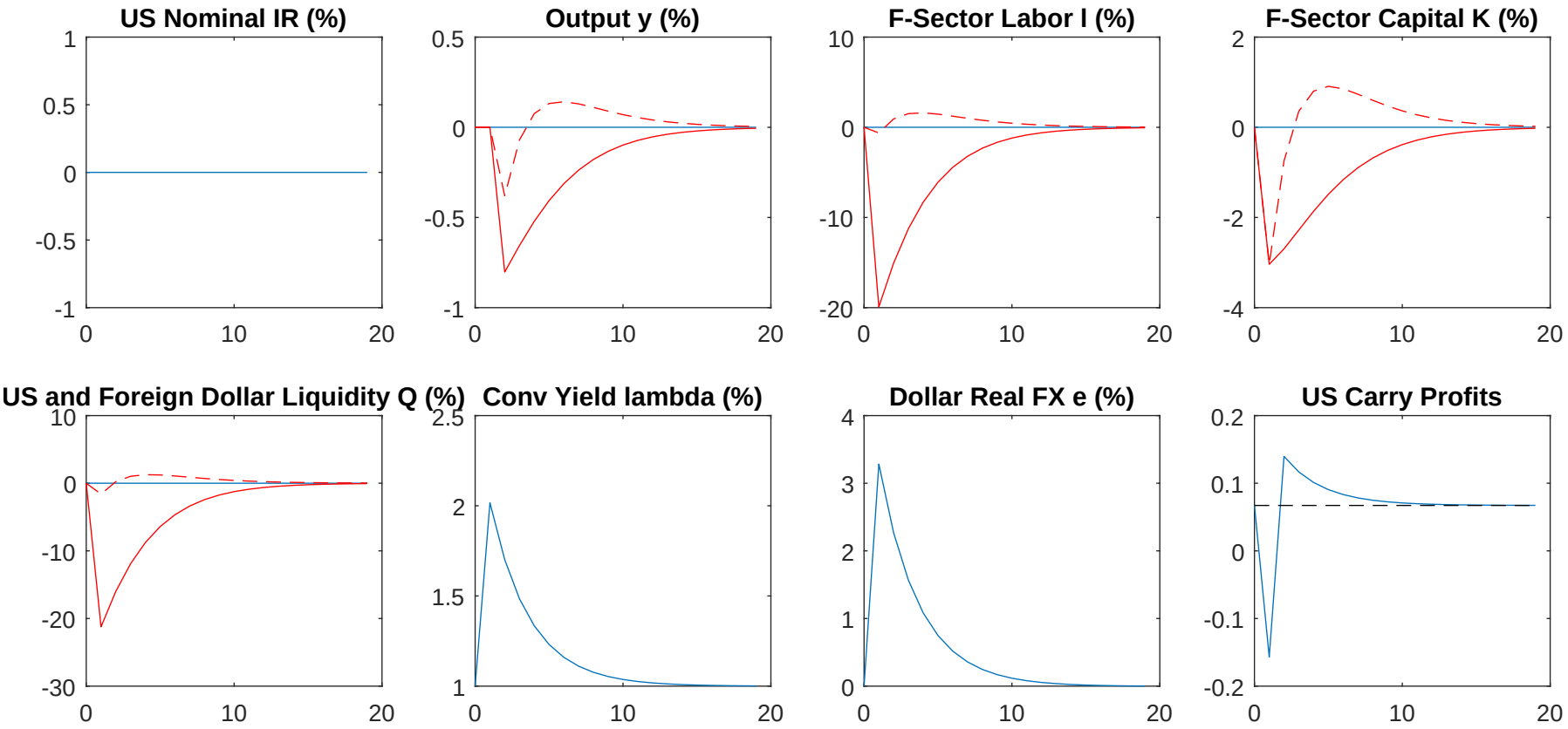


Figure: Impulse Responses to Foreign Pledgability Shock: At time t we reduce θ_t^* unexpectedly by 5%. The shock dissipates with autocorrelation of 0.7. Blue is US, red is Foreign 1, red-dash is Foreign 2.

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
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Triffin dilemma

- Triffin (1960): U.S. produces dollar assets, not enough gold..... 
- New version (Farhi et al. [2011],He et al. [2018]): World wants dollar U.S. Treasuries, not enough fiscal backing.... 
- New version 2: World wants dollar safe assets, produced both by U.S. and foreign.... world currency mismatch 

Conclusion

Dollar safe asset demand helps to understand importance of U.S. monetary policy in world economy

Persistent shortage in US dollar safe assets has led to dollar funding premium and incentives for growing EMs to issue dollar bonds

Growing currency mismatch leads to vulnerabilities

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From this perspective, US monetary policy has been too tight!

Monetary policy shock and basis

Basis constructed from Bunds and Treasury bonds. FX cross is USD/EUR.

	Dependent variable:			
	Change in 2-Year US/Germany Treasury Basis		Change in USD/EUR	
	(1)	(2)	(3)	(4)
Fed Funds Future Shock	-27.01^{***}		-0.05^{***}	
	(6.95)		(0.02)	
Policy News Shock		-41.76^{***}		-0.08^{***}
		(8.06)		(0.02)
Constant	-0.12	0.12	0.0004	0.001
	(0.31)	(0.28)	(0.001)	(0.001)
Observations	52	52	52	52
R^2	0.23	0.35	0.14	0.24
Adjusted R^2	0.22	0.34	0.12	0.23
Note:				*p<0.1; **p<0.05; ***p<0.01

High-Frequency (+/- 30 min) Identification of Monetary Shock. Sep 2007 to March 2014. Nakamura and Steinsson [2018].

Ben S Bernanke. Federal reserve policy in an international context. *IMF Economic Review*, 65(1):5–36, 2017.

Emmanuel Farhi, Pierre-Olivier Gourinchas, and Helene Rey. *Reforming the International Monetary System*. Centre for Economic Policy Research, 2011.

Elena Gerko and Hélène Rey. Monetary policy in the capitals of capital. *Journal of the European Economic Association*, 15(4):721–745, 2017.

Gita Gopinath. The international price system. Technical report, National Bureau of Economic Research, 2015.

Pierre-Olivier Gourinchas and Helene Rey. International financial adjustment. *Journal of political economy*, 115(4):665–703, 2007.

Zhiguo He, Arvind Krishnamurthy, and Konstantin Milbradt. A model of safe asset determination. *American Economic Review*, 2018.

Zhengyang Jiang, Arvind Krishnamurthy, and Hanno Lustig. Foreign safe asset demand and the dollar exchange rate. Stanford GSB Working paper, 2018.

Arvind Krishnamurthy and Annette Vissing-Jorgensen. The aggregate demand for treasury debt. *Journal of Political Economy*, 120(2):233–267, 2012. ISSN 00223808, 1537534X. URL http://www.jstor.org/stable/10.1086/666526.

Matteo Maggiori, Brent Neiman, and Jesse Schreger. International currencies and capital allocation. 2017.

Silvia Miranda-Agrippino and Hélene Rey. World asset markets and the global financial cycle. Technical report, National Bureau of Economic Research, 2015.

Emi Nakamura and Jón Steinsson. High frequency identification of monetary non-neutrality: The information effect. *Quarterly Journal of Economics*, 2018.

Helene Rey. Dilemma not trilemma: The global financial cycle and monetary policy independence. Jackson Hole Paper, 2013.

Hyun Song Shin. Global banking glut and loan risk premium. *IMF Economic Review*, 60(2):155–192, 2012.