Global risk and the dollar

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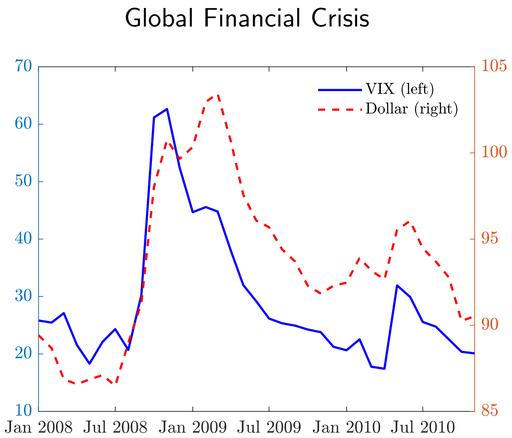
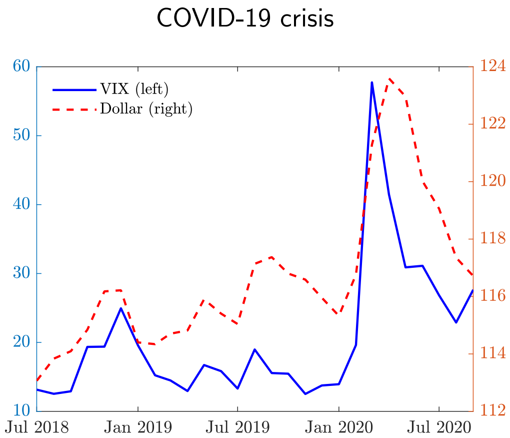
Global risk and the US$: strong co-movement in times of crisis





Research question

When global risk aversion spikes the US$ appreciates

- Prominent examples: Global Financial Crisis, COVID-19 pandemic
- But co-movement also significant in normal times
- Extensive theory (US's exorbitant privilege/duty, flight-to-US$-safety)
- But little known about role of US$ for transmission of global risk shocks

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Effect of US$ appreciation on RoW ambiguous in theory

- **Dampening** through expenditure switching away from US towards RoW goods
- **Amplification** through tightening in global financial conditions

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Does the trade channel or the financial channel dominate?

Our paper

Research question

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Approach

- Estimate Bayesian proxy SVAR on US and RoW data for 1990m1 to 2019m6
  Arias et al. (2021)
- Identify global risk shock using gold price changes on narratively selected days
  Bloom (2009); Piffer & Podstawski (2018)
- Counterfactual analysis using minimum relative entropy methods
  Robertson et al. (2005); Cogley et al. (2005); Giacomini & Ragusa (2014)
- Policy experiment using structural shock counterfactual (SSC)
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Findings

- Global risk shock induces US$ appreciation, a rise in risk aversion and a global recession
- As predicted by theory US net exports and global cross-border bank credit contract
- In counterfactual absence of US$ appreciation global recession is **alleviated**
- Hence **financial channel** **dominates** **trade channel**

Bayesian proxy SVAR of Arias et al. (2021)

Structural shocks in the VAR $\boldsymbol{A}(L)\boldsymbol{y}_t = \boldsymbol{\epsilon}_t$ are

$$\boldsymbol{\epsilon}_t = \left[\begin{array}{cc} \boldsymbol{\epsilon}_t^{\star\prime} & \boldsymbol{\epsilon}_t^{o\prime} \end{array} \right]' \quad (1)$$

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Identifying assumptions with proxy variables m_t

$$E[m_t \boldsymbol{\epsilon}_t^{\star\prime}] = V, \qquad E[m_t \boldsymbol{\epsilon}_t^{o\prime}] = \mathbf{0} \tag{2}$$

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Subject to Equation (2) estimate 'augmented VAR'

$$\widetilde{\boldsymbol{A}}(L) \begin{bmatrix} \boldsymbol{y}_t \\ m_t \end{bmatrix} = \begin{bmatrix} \boldsymbol{\epsilon}_t \\ \nu_t \end{bmatrix} \quad (3)$$

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Pros: (i) joint estimation/identification improves efficiency, (ii) allows coherent inference, (iii) accommodates weak instruments, (iv) can be extended to identification of multiple structural shocks with multiple proxies and sign/zero restrictions

VAR specification and estimation

Specification

- Starting point: Closed-economy US VAR of Gertler & Karadi (2015)
- Augment by: RoW industrial production, VXO, RoW policy rates, and US$ NEER
- For counterfactuals: US exports and imports, global cross-border bank credit
- Risk shock proxy $m_{1,t}$: HF gold price changes on narratively selected days
  Bloom (2009); Piffer & Podstawski (2018)
- US MP shock proxy $m_{2,t}$: HF interest rates changes around FOMC meetings
  Gertler & Karadi (2015); Jarociński & Karadi (2020)

Estimation

- Sample: 1990m2 to 2019m6
- Flat priors on VAR parameters
- Relevance threshold: 10% of proxy variable variance accounted for by global risk shock
  Caldara & Herbst (2019); Arias et al. (2021)

Introduction

Bayesian proxy SVAR model

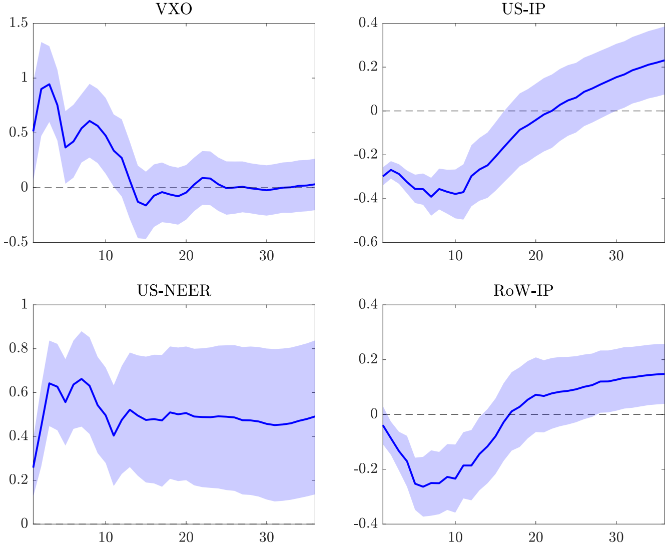
Baseline IRFs to a global risk shock

What if the US$ did not appreciate?

What if US MP stabilized the US$?

Conclusion

Effect of global risk shock



Baseline results

Global risk shock induces

- Increase in VXO and US$ appreciation
- Synchronised contraction in US and RoW real activity

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Sensitivity/extensions

- Global demand shock vs global risk shock IRFs
- Large VAR IRFs
  Giannone et al. (2015)
- Allow gold price surprises to be correlated with all structural shocks IRFs
- Effects on price and quantity of risk IRFs
  Bekaert & Hoerova (2014)
- Other currencies' responses IRFs

Refresher on trade and financial channel

Trade channel
Obstfeld & Rogoff (1996); Gopinath et al. (2020)

- US$ appreciation makes RoW goods cheaper relative to US goods
- Expenditure switching away from US towards RoW goods
- US imports from RoW rise, US exports to RoW fall
- US net exports fall, RoW net exports rise
- **Dampens** effects of global risk shocks on RoW

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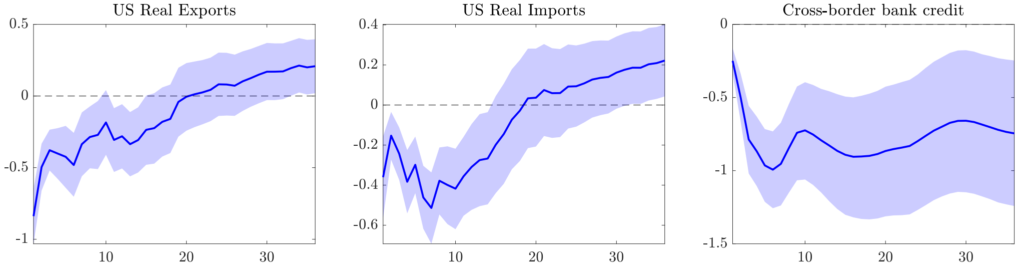
Financial channel

Bruno & Shin (2015); Aoki et al. (2018); Akinci & Queralto (2019); Bruno & Shin (2019); Mimir & Sunel (2019)

- RoW agents borrow in foreign currency
- US$ appreciation reduces RoW borrowers' net worth and makes them more risky
- International banks operating under VaR constraints reduce cross-border lending
- US$ appreciation associated with tightening in RoW financial conditions
- **Amplifies** effects of global risk shocks on RoW

Effects of global risk shock on trade and cross-border credit



Note: "Cross-border bank credit" excludes credit to the US. The data are taken from the BIS Locational Banking Statistics Table A7, and the variable is calculated as "External liabilities to all sectors of all reporting banks" less "External liabilities to all sectors of banks owned by US nationals".

What if the US$ did not appreciate?

How to assess the overall effect of US$ appreciation?

- Compare baseline IRFs to 'no-US$ appreciation' counterfactual
- Apply 'minimum relative entropy' (MRE) approach in context of IRFs
  Robertson et al. (2005); Cogley et al. (2005); Giacomini & Ragusa (2014)

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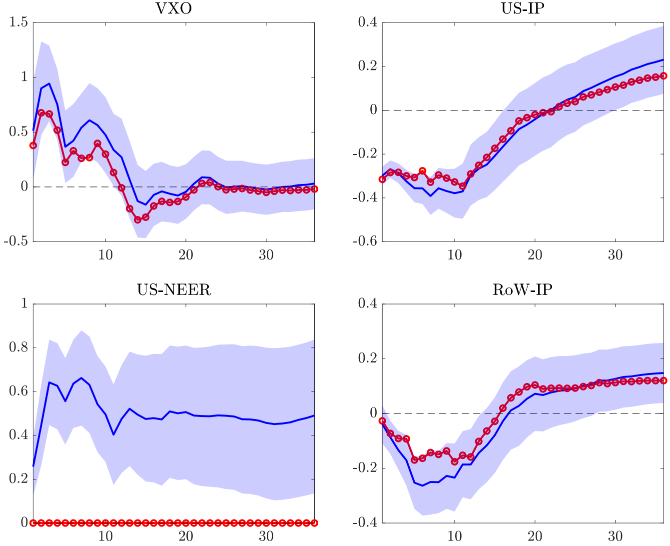
Intuition for MRE

- Seek counterfactual VAR in which global risk shock does not appreciate US$
- Disciplined by counterfactual VAR being 'minimally different' from actual VAR
- Corresponds to minimal 'tilt' of posterior of impulse responses
- Agnostic regarding structural forces that prevent US$ appreciation

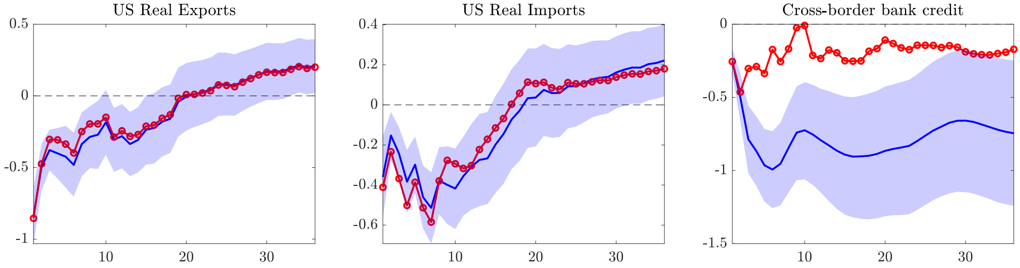
Details MRE

Effect of global risk shock **w\o US$ appreciation**



▸ is US$ special?

Effect of global risk shock **w\o US$ appreciation**



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Effect of global risk shock **w\o US$ appreciation**

In the 'no-US$ appreciation' counterfactual

- US net exports fall by less, **amplifying contractionary** effects on RoW
- Cross-border bank credit falls by less, **dampening contractionary** effects on RoW
- RoW real activity contraction estimated to be **dampened** overall

Effect of global risk shock **w\o US$ appreciation**

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Key implication

- US$ appreciation overall **amplifies** contractionary effects of global risk shocks
- **Financial channel dominates trade channel**

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Additional analyses in the paper

FX valuation effects? | US$ FX is special | US$ credit is special | Robustness to SSA approach | Role for US monetary policy?

What if US monetary policy stabilised US$?

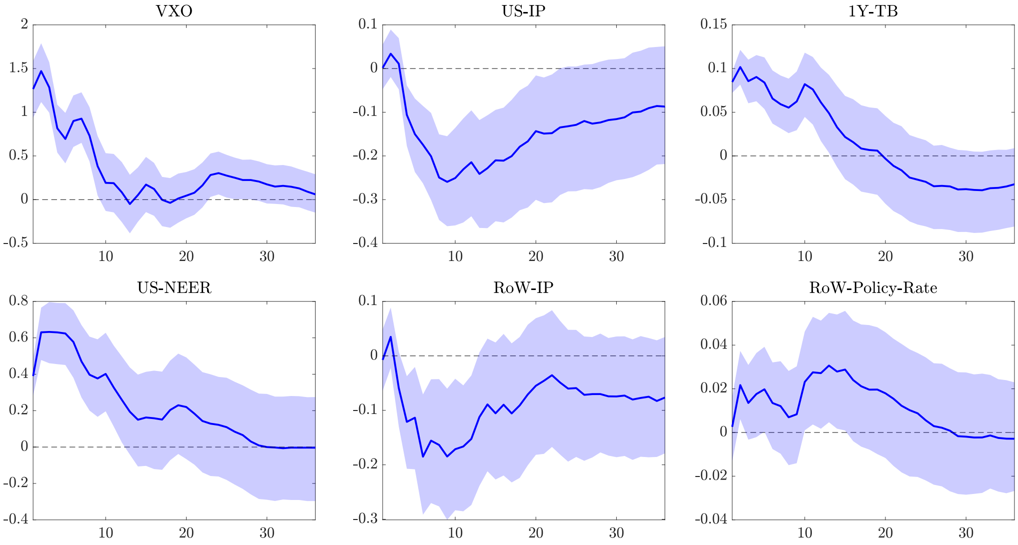
Use simultaneously identified US monetary policy shock
Gertler & Karadi (2015); Caldara & Herbst (2019); Jarociński & Karadi (2020); Miranda-Agrippino & Ricco (forthcoming)

Adopt structural shock counterfactual/structural scenario analysis approach
Bachmann & Sims (2012); Kilian & Lewis (2011); Wong (2015); Epstein et al. (2019)

In contrast to the MRE, SSC leaves the posterior of IRFs unchanged but changes the distribution of shocks to construct counterfactual scenario.

Along the impulse horizon, every period a US MP shock materialises such that US$ is stabilised

Effect of US monetary policy shock



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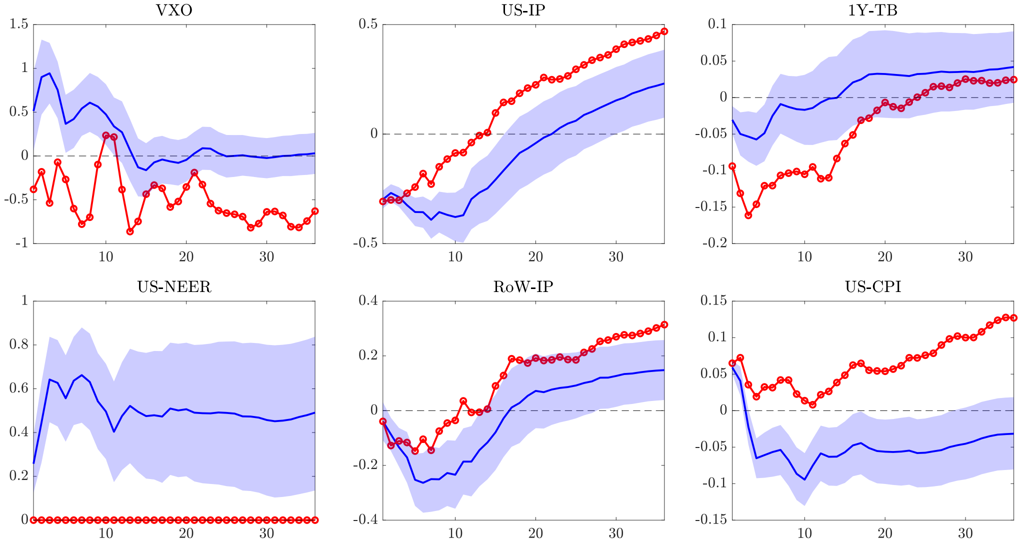

What if US monetary policy stabilised US$?

In a counterfactual in which US monetary policy steps in to stabilise US$

- US monetary policy loosened significantly more compared to past regularities
- Risk measures stabilised
- Global recession mitigated considerably
- But US consumer prices rise
- Fed's reluctance may be due to trade-off between output and price stabilisation

Conclusion

Global risk shocks have large effects on the global economy

- Induce US$ appreciation, a rise in risk aversion and a global recession
- US net exports and global cross-border bank credit contract

Does US$ appreciation dampen or amplify the effects of global risk shocks?

- Financial channel dominates trade channel
- Contraction in RoW real activity about 1/3 smaller without US$ appreciation
- US monetary policy could stabilise US$ and mitigate substantially global contraction

The US$ exchange rate and US$ cross-border bank credit play a unique role

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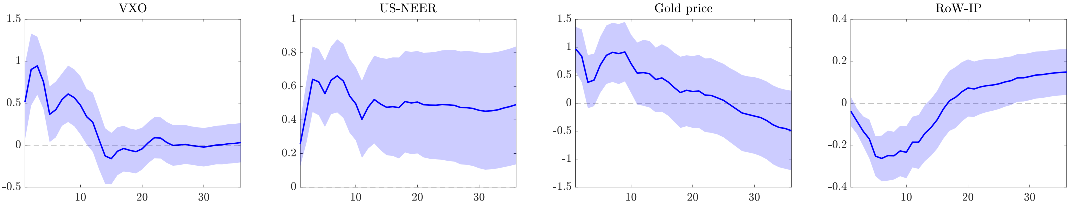
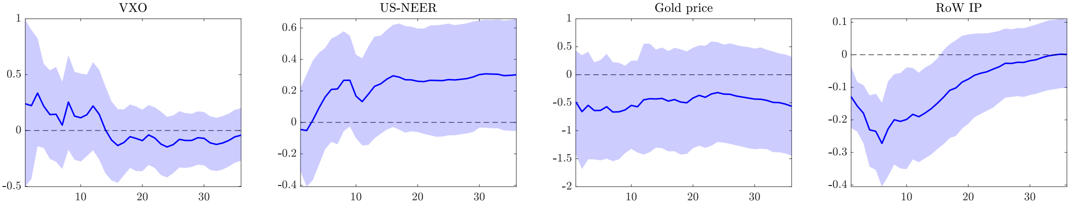
Global risk shock vs global demand shock

Baseline: Global risk shock



Global demand shock



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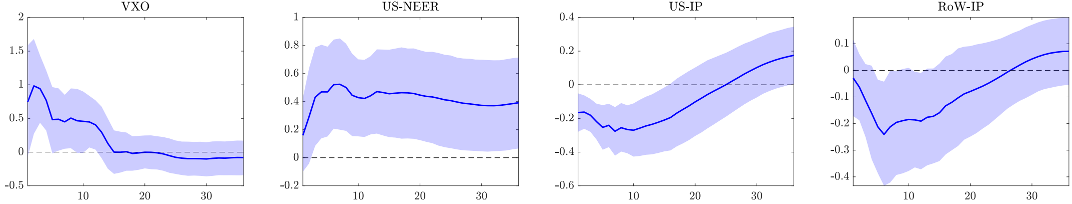
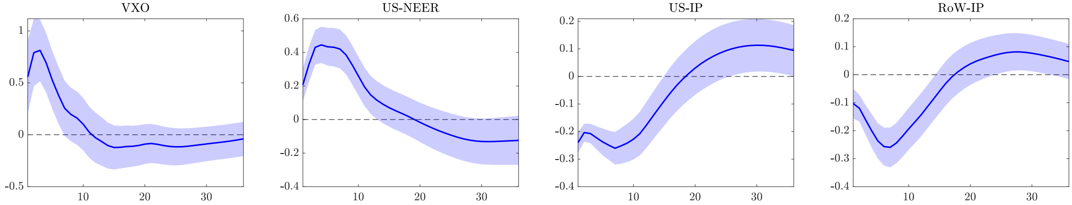
Baseline vs large VAR with optimal hyperpriors (Giannone et al., 2015)

Baseline



Large VAR



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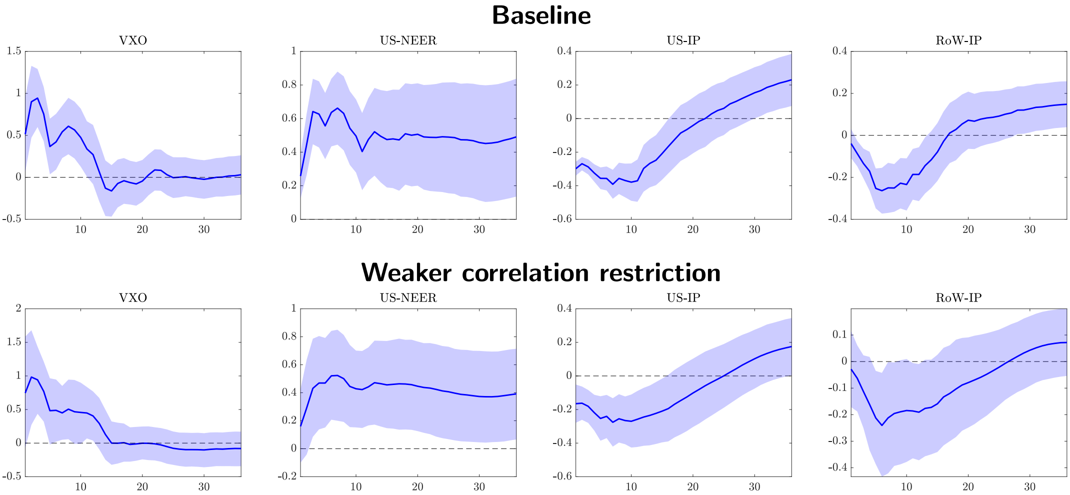
Allow gold price surprises to be correlated with all structural shocks



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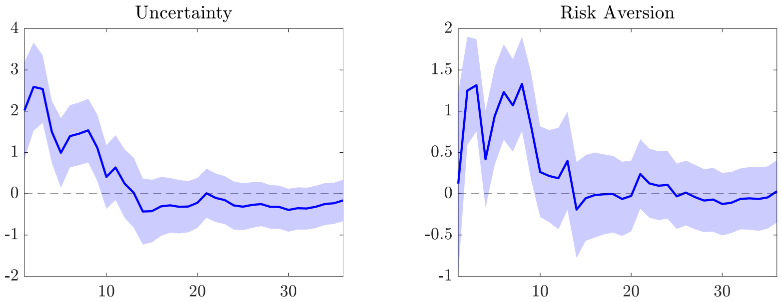
IRFs of the quantity and price of risk



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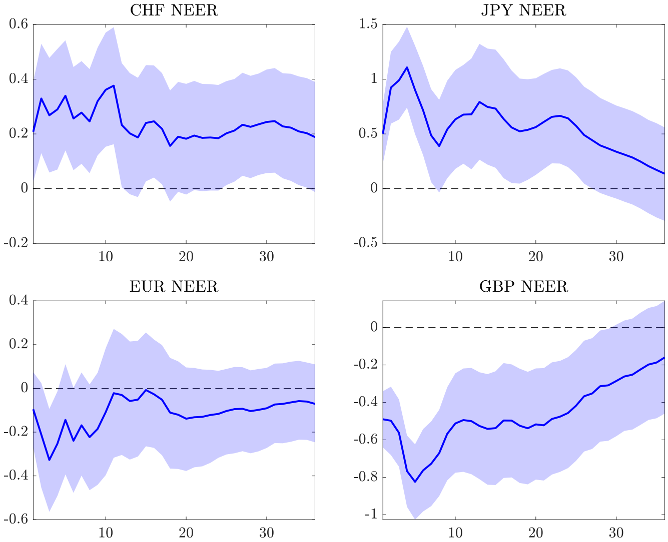
Effect of global risk shock: Other currencies



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Minimum-relative-entropy (MRE) approach

Borrow idea from forecasting literature

- Incorporate restrictions from theory to improve forecasts
- IRF as forecast $\widetilde{\boldsymbol{y}}_{T+h}$ conditional on $\epsilon^{u}_{T+1} = 1$, all other shocks zero, in short: $\widetilde{\boldsymbol{\epsilon}}_{T+1,T+h}$

Start from posterior beliefs about effect of risk shock in **actual** world

$$f(\widetilde{\boldsymbol{y}}_{T+h} | \boldsymbol{Y}_{T}, \widetilde{\boldsymbol{\epsilon}}_{T+1,T+h}) \tag{4}$$

Then determine posterior belief f^* about effect of risk shock in a **counterfactual world**

$$Min_{\psi} \ \mathcal{D}(f^*||f) \qquad s.t. \quad \int f^*(\widetilde{y}^{\$})\widetilde{y}^{\$} d\widetilde{y}^{\$} = E(\widetilde{y}^{\$}) = 0 \tag{5}$$

$\mathcal{D}(\cdot)$ is Kullback-Leibler divergence between counterfactual and actual posteriors f^* and f

Minimum-relative-entropy (MRE) approach

It turns out counterfactual posterior f^* results from updating baseline posterior f

$$f^*(\widetilde{\boldsymbol{y}}_{T+h}|\boldsymbol{Y}_T, \widetilde{\epsilon}_{T+1,T+h}, E(\widetilde{y}^{\$}_{T+h}) = \mathbf{0}) \propto f(\widetilde{\boldsymbol{y}}_{T+h}|\boldsymbol{Y}_T, \widetilde{\epsilon}_{T+1,T+h}) \times \tau\left(g(y^{\$}_{T+h}(\boldsymbol{\psi}))\right) \quad (6)$$

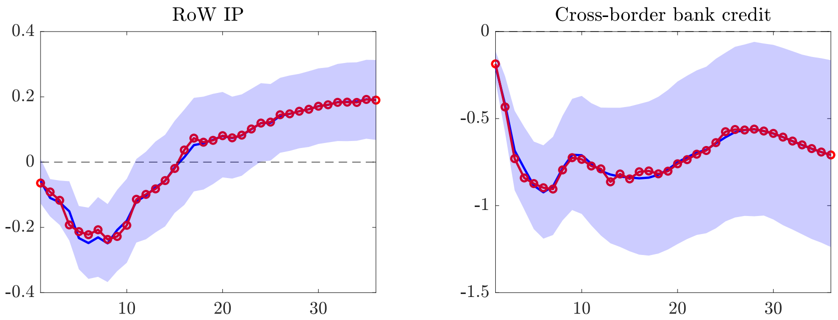
Solution to

$$Min_{\psi}\ \mathcal{D}(f^*||f) \qquad s.t. \quad \int f^*(\widetilde{y}^{\$})\widetilde{y}^{\$} d\widetilde{y}^{\$} = E(\widetilde{y}^{\$}) = 0$$

provides tilt $\tau(\cdot)$ in counterfactual posterior

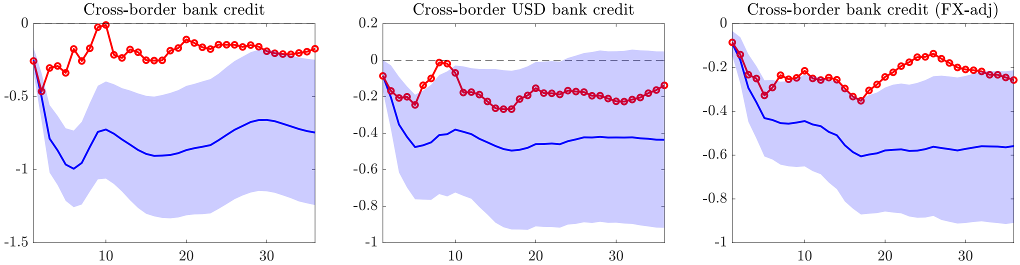
▸ Sampling ▸ Illustration of tilting
▸ Return

Is the US$ special? (Absence of) Yen appreciation inconsequential



Other currencies' responses ▸ IRFs

Mechanical exchange rate valuation effects in non-US$ credit component?



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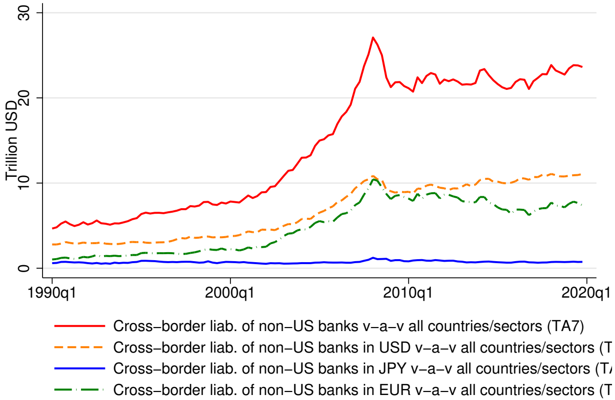
US$ special: (Absence of) Yen appreciation inconsequential

Cross-border bank credit in JPY and CHF quantitatively small



...and also financed by insured deposits

Ivashina et al. (2015)

Return

Is US$ cross-border bank credit special?

Bruno & Shin (2015) highlight the effect of variation in borrowers' riskiness on VaR constraints of globally active banks and their **overall** cross-border lending

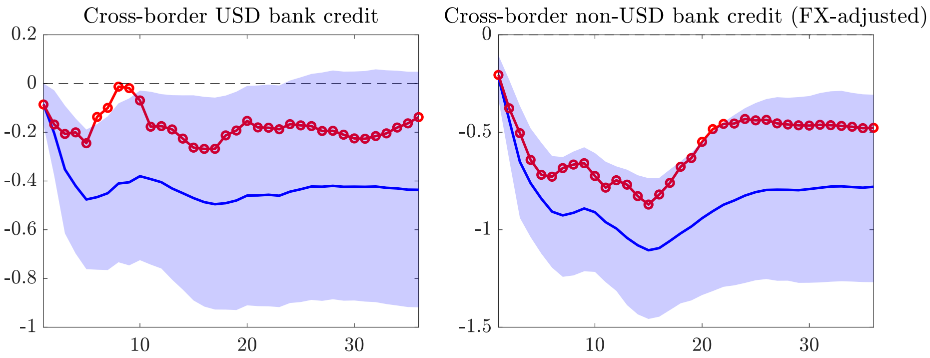
Ivashina et al. (2015) present a model in which globally active banks **cut US$ lending by more than EUR lending** in response to a credit quality shock

Key model features motivated by the data:

- US$ lending based on unsecured funding in the US, EUR lending based on secured deposit funding in the EA $\Longrightarrow$ **US$ funding more risk-sensitive**
- Limited capital in FX swap markets gives rise to CIP deviations $\Longrightarrow$ **Cannot perfectly substitute US$ by EUR funding**

Avdjiev et al. (2019) document a 'triangular' relationship between (i) a stronger US$, (ii) larger CIP deviations, and (iii) contractions in cross-border US$ bank credit.

Is US$ cross-border bank credit special?



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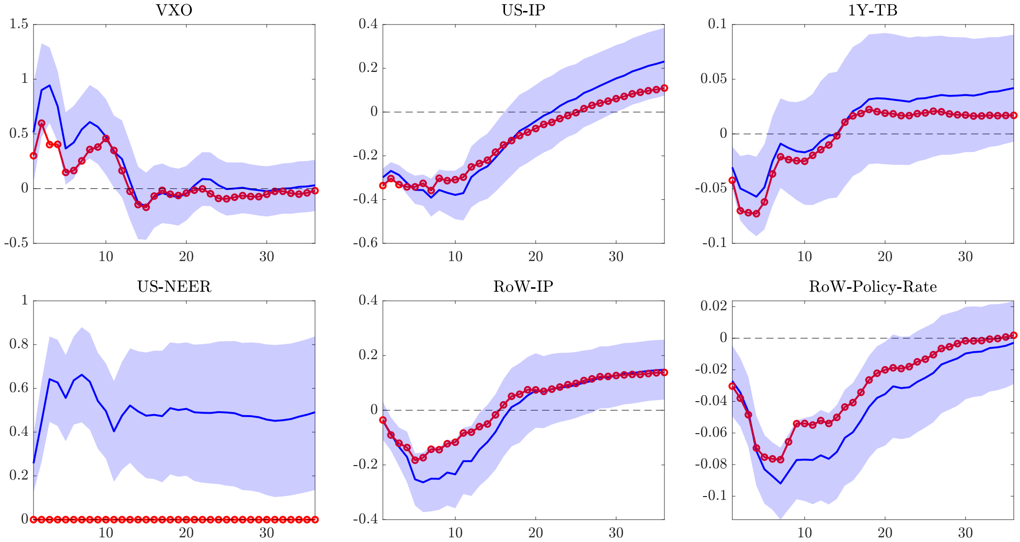
Effect of global risk shock w\o dollar appreciation (SSA)



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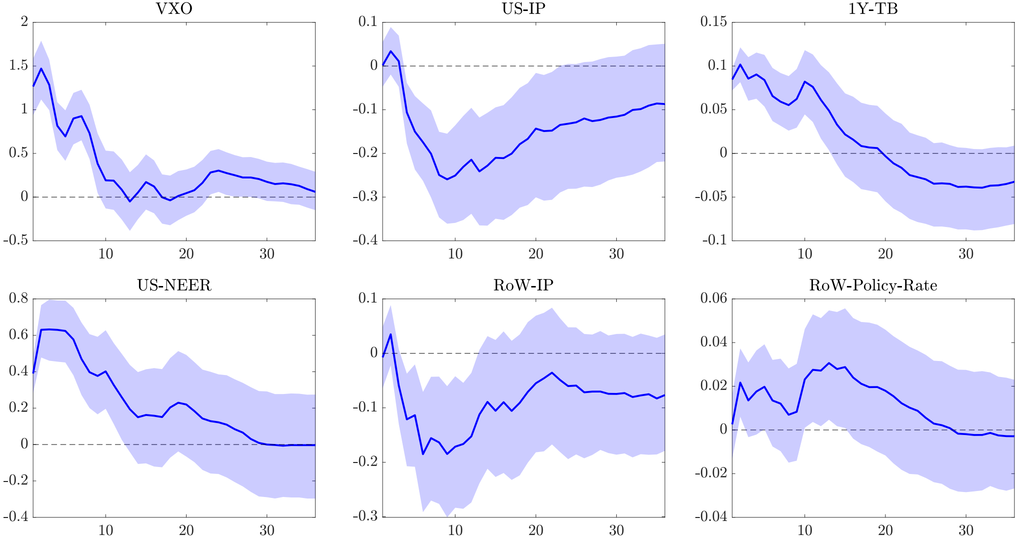
Effect of US monetary policy shock



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