

Global risk and the dollar

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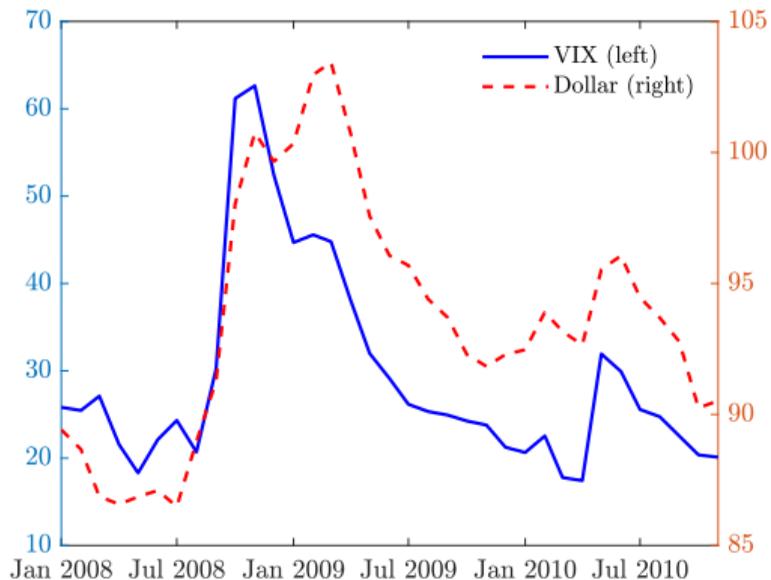
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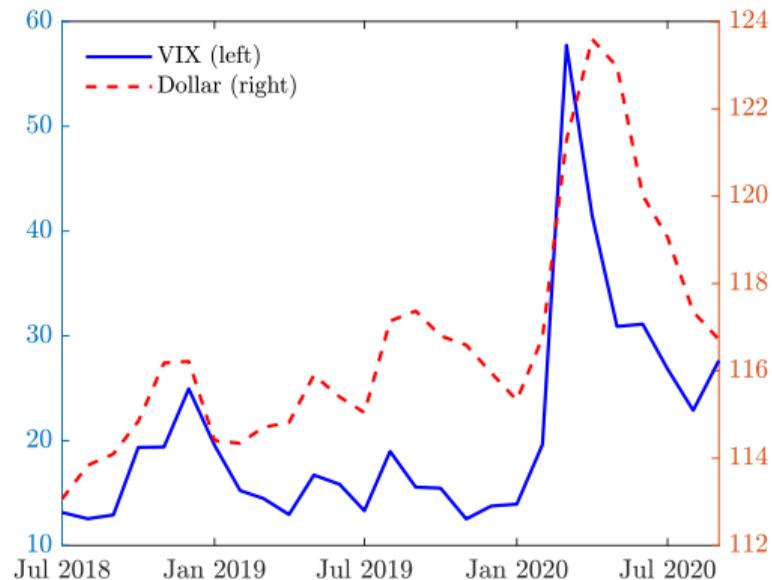
Views are those of the authors and not necessarily of the ECB.

Global risk and the US\$

Global Financial Crisis



COVID-19 crisis



Global risk and the US\$

When global risk aversion goes up the US\$ appreciates

- ▶ Prominent examples: Global Financial Crisis, COVID-19 pandemic
- ▶ But co-movement also significant in normal times
- ▶ Extensive theory building on safety/liquidity of US/US\$ assets
- ▶ But gaps in the empirics on role of US\$ for international transmission of global risk shocks

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For example: 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
- ▶ Does the trade channel or the financial channel dominate?

How does US\$ shape the international transmission of global risk shocks?

What we do

- ▶ Pull together US\$-global risk threads from theory in a unified empirical framework
- ▶ Quantify role of US\$ appreciation in international transmission of global risk shocks
- ▶ Bayesian proxy SVAR on US and RoW data for 1990m1 to 2019m12
- ▶ Identify global risk shocks using gold price changes on narratively selected days

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What we find

- ▶ Global risk shocks induce
 - ▶ US\$ appreciation and increase in VIX, real activity slowdown
 - ▶ Rise in Treasury premium, banks' US\$ buffers and share in debt issuance, 'flight-to-safety'
 - ▶ contraction in US net exports and tightening in global financial conditions

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 - ▶ Rise in Treasury premium, banks' US\$ buffers and share in debt issuance, 'flight-to-safety'
 - ▶ contraction in US net exports and tightening in global financial conditions
- ▶ When US\$ appreciation is counterfactually absent global recession is alleviated
- ▶ Hence: financial channel dominates trade channel

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

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Bayesian proxy SVAR of Arias et al. (2021)

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

$$\boldsymbol{\epsilon}_t = \begin{bmatrix} \boldsymbol{\epsilon}_t^{*'} & \boldsymbol{\epsilon}_t^{o'} \end{bmatrix}' \quad (1)$$

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Identifying assumptions with proxy variables m_t

$$E[m_t \boldsymbol{\epsilon}_t^{*'}] = V, \quad E[m_t \boldsymbol{\epsilon}_t^{o'}] = \mathbf{0} \quad (2)$$

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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
- ▶ Additional variables: US exports/imports, cross-border bank credit, Treasury premium, etc.
- ▶ Risk shock proxy $m_{1,t}$: High-frequency gold price surprises on narratively selected days
Bloom (2009); Piffer & Podstawski (2018)
- ▶ US MP shock proxy $m_{2,t}$: High-frequency interest rate surprises around FOMC meetings
Jarociński & Karadi (2020)
- ▶ Sample period: 1990m2 to 2019m12

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Estimation

- ▶ Algorithm of Arias et al. (2021) to estimate Bayesian proxy SVAR
- ▶ 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)

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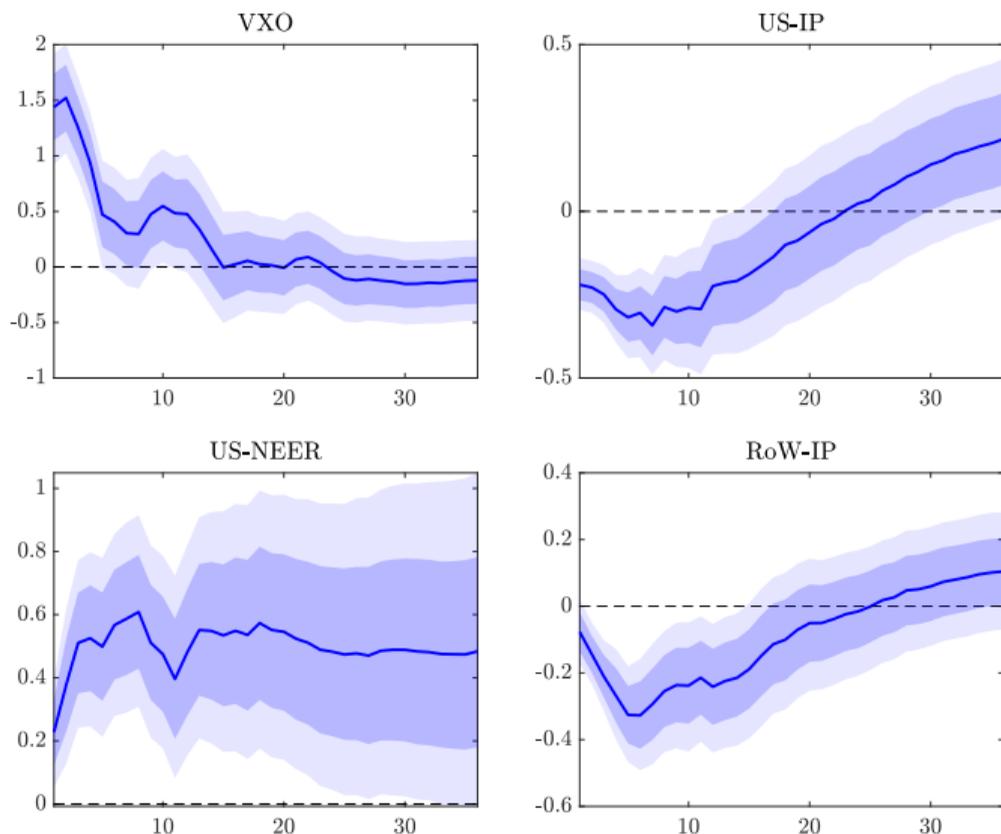
Baseline IRFs to a global risk shock

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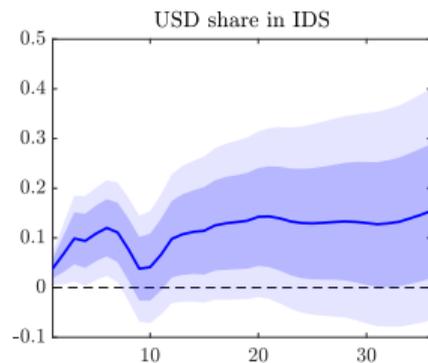
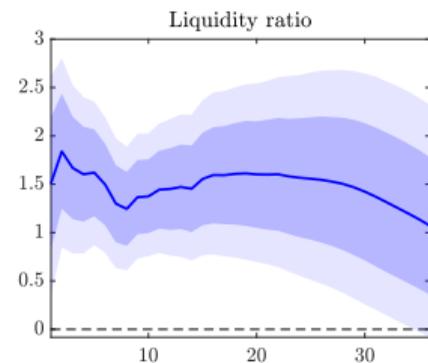
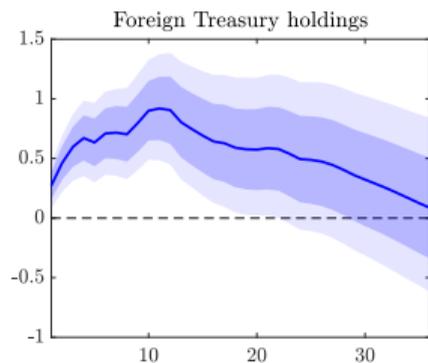
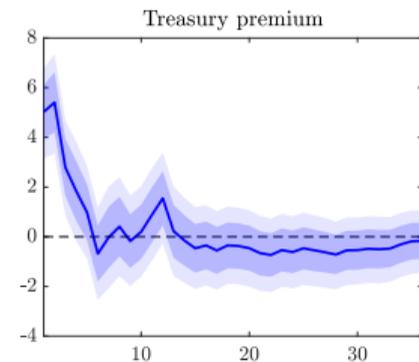
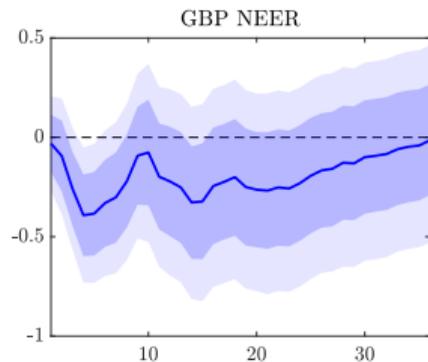
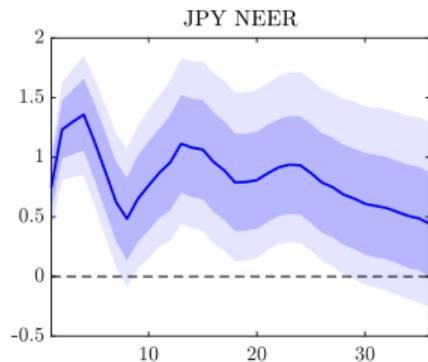
What if US MP stabilized the US\$?

Conclusion

Effects of global risk shocks: Baseline specification



Effects of global risk shocks: Pulling together threads in the literature



Sensitivity

▶ 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](#)

▶ Relationship between VIX and US\$ prior and after the GFC [▶ IRFs](#)

Lilley et al. (forthcoming)

▶ Effects on price and quantity of risk [▶ IRFs](#)

Bekaert et al. (forthcoming)

▶ AEs vs EMEs [▶ 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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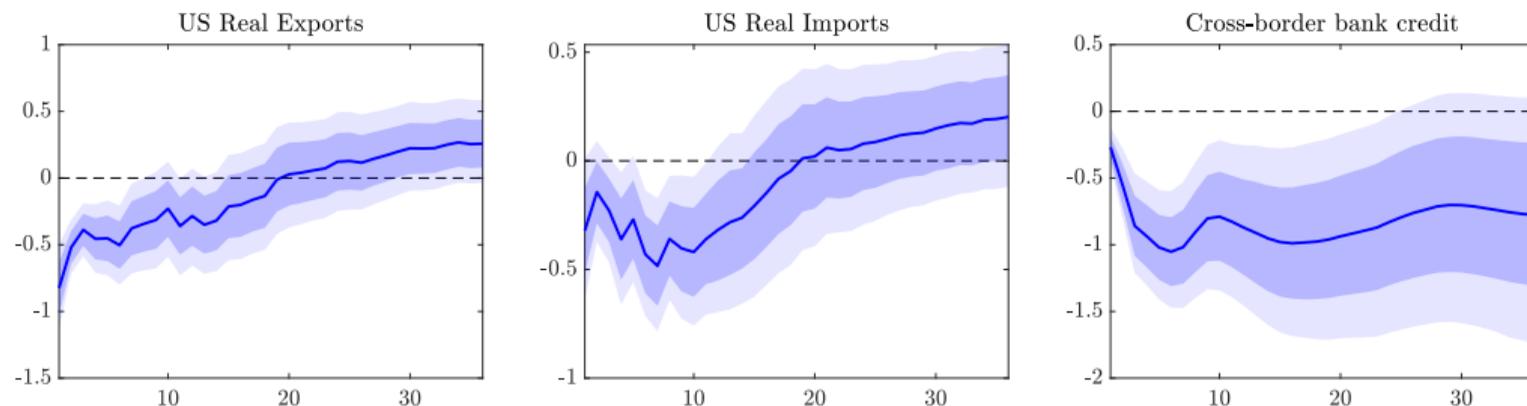
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Financial channel

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 financial conditions



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".

► Equity prices, spreads, global factors

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What if the US\$ did not appreciate?

How to assess the net effect of US\$ appreciation?

- ▶ Compare baseline IRFs to IRFs from a '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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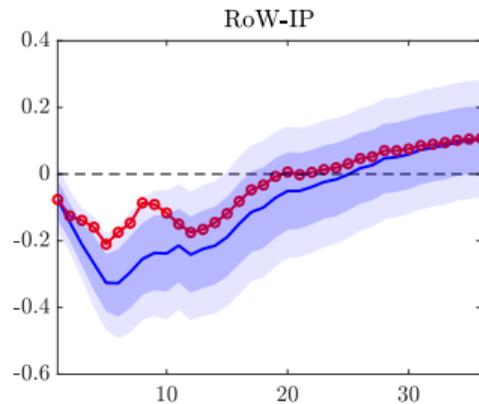
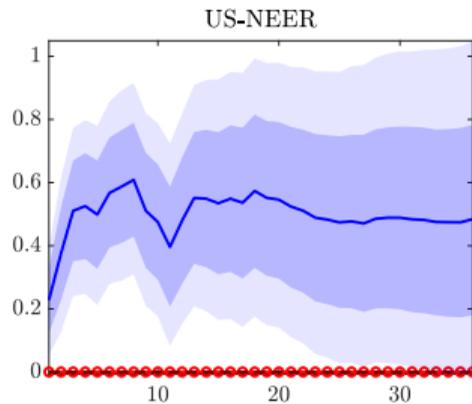
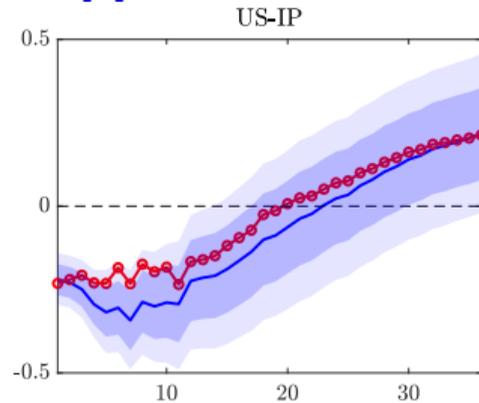
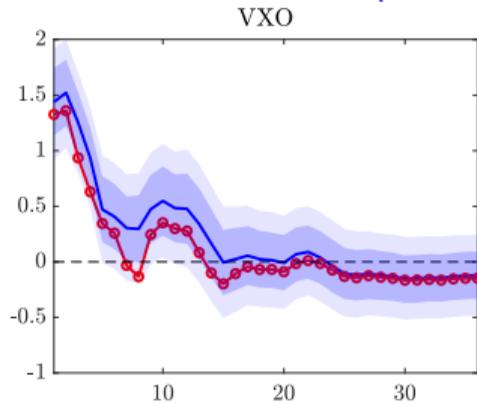
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Intuition for MRE

- ▶ 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

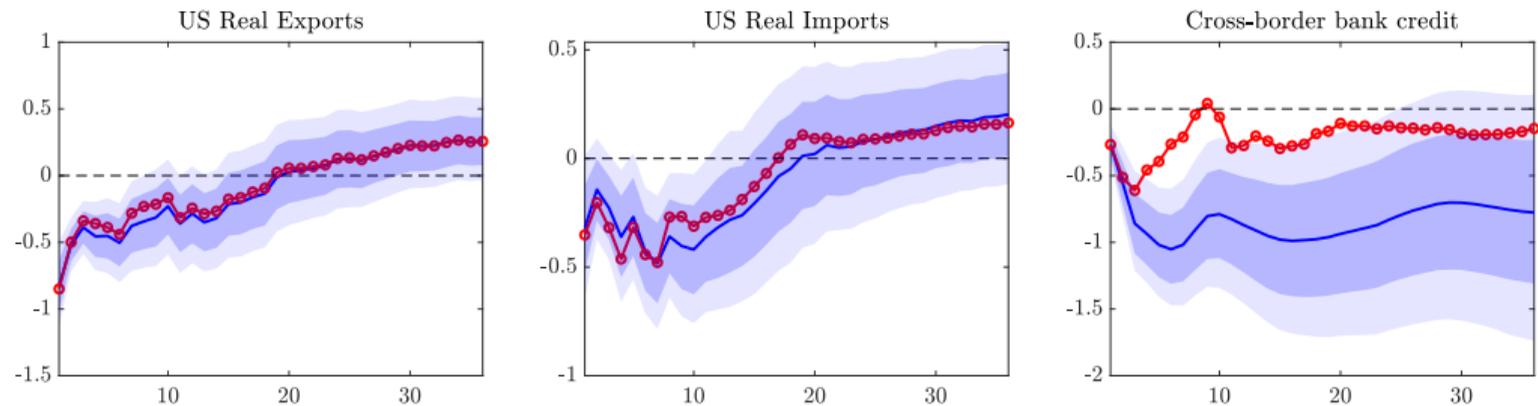
▶ Details MRE

Effects of global risk shocks w/o US\$ appreciation



► is US\$ special?

Effects of global risk shocks w\o US\$ appreciation



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Effects of Fed's pandemic emergency liquidity provision to foreigners

- ▶ Unprecedented Fed emergency liquidity provision to foreigners early in COVID-19 pandemic

Choi et al. (2021)

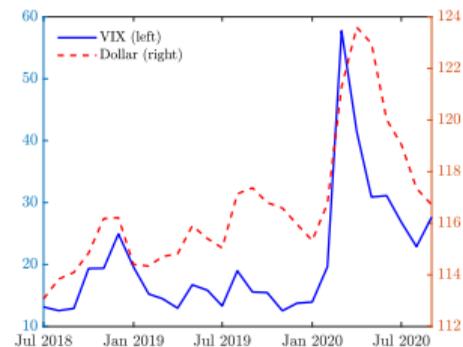
- ▶ Conceptually expands safe asset pool that reduces convenience yield and thereby mitigates US\$ appreciation

Jiang et al. (2021b,a)

Effects of Fed's pandemic emergency liquidity provision to foreigners

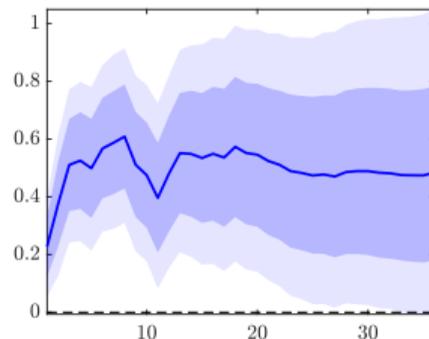
COVID-19 crisis

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- ▶ Indeed, US\$ appreciation in early-2020 much less persistent than in normal times



Normal times

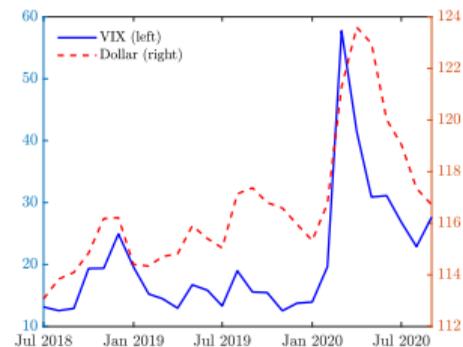
US-NEER



Effects of Fed's pandemic emergency liquidity provision to foreigners

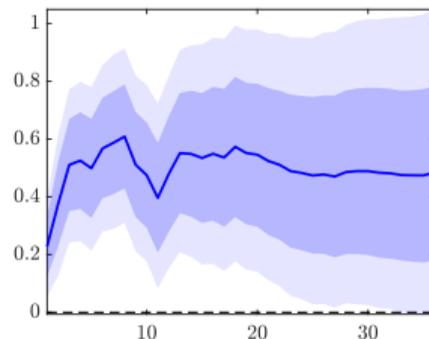
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- ▶ Conceptually expands safe asset pool that reduces convenience yield and thereby mitigates US\$ appreciation
Jiang et al. (2021b,a)
- ▶ Indeed, US\$ appreciation in early-2020 much less persistent than in normal times
- ▶ Did Fed emergency liquidity provision help avert even more severe global recession?
- ▶ Use sequence of identified US monetary policy shocks in structural scenario analysis
Bachmann & Sims (2012); Kilian & Lewis (2011); Wong (2015); Epstein et al. (2019)



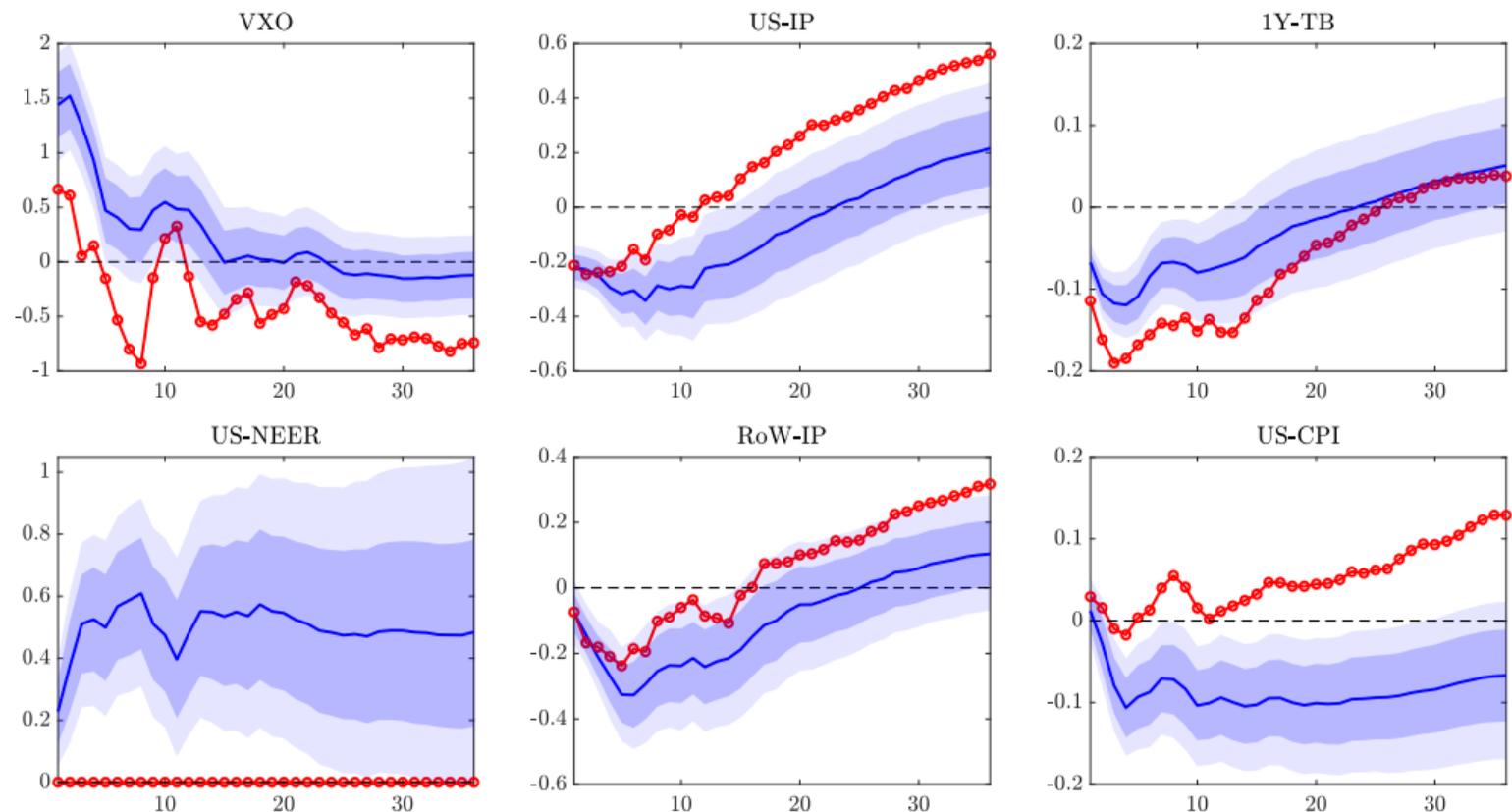
Normal times

US-NEER



▶ IRFs US MP shock

What if US monetary policy stabilised US\$?



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
- ▶ Global recession mitigated considerably

Fed emergency liquidity provision in early 2020 may have averted even more severe global recession

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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 financial conditions tighten

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

- ▶ Financial channel dominates trade channel
- ▶ Contraction in RoW real activity almost 50% smaller without US\$ appreciation
- ▶ Fed's pandemic emergency liquidity provision may have averted a more severe global recession

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

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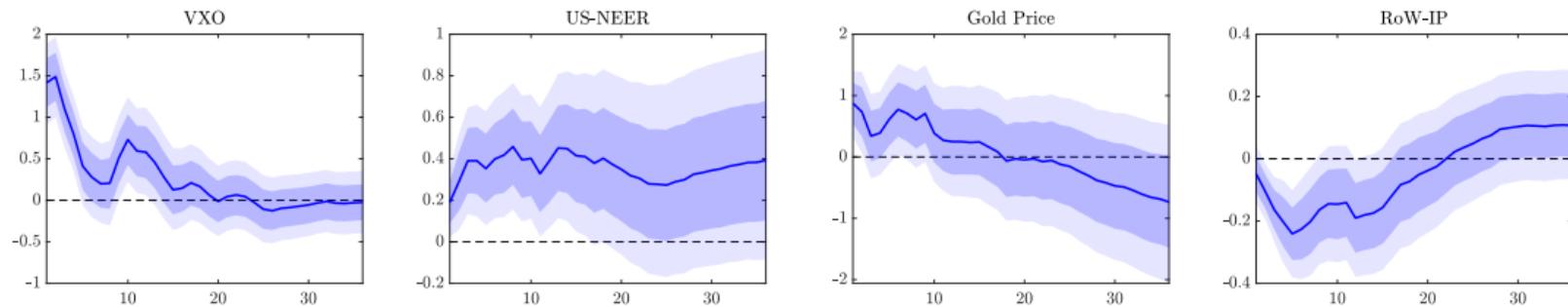
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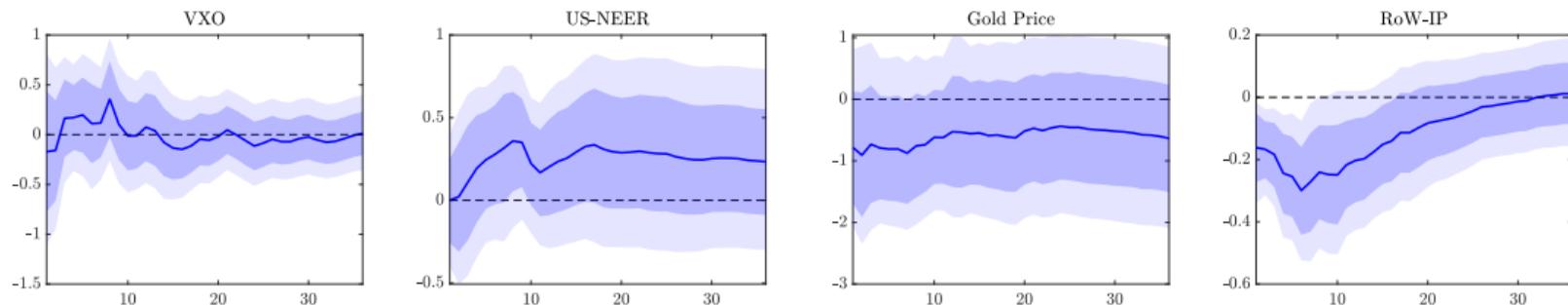
Wong, B. (2015). Do Inflation Expectations Propagate the Inflationary Impact of Real Oil Price Shocks? Evidence from the Michigan Survey. *Journal of Money, Credit and Banking*, 47(8), 1673-1689.

Global risk shock vs global demand shock

Baseline: Global risk shock



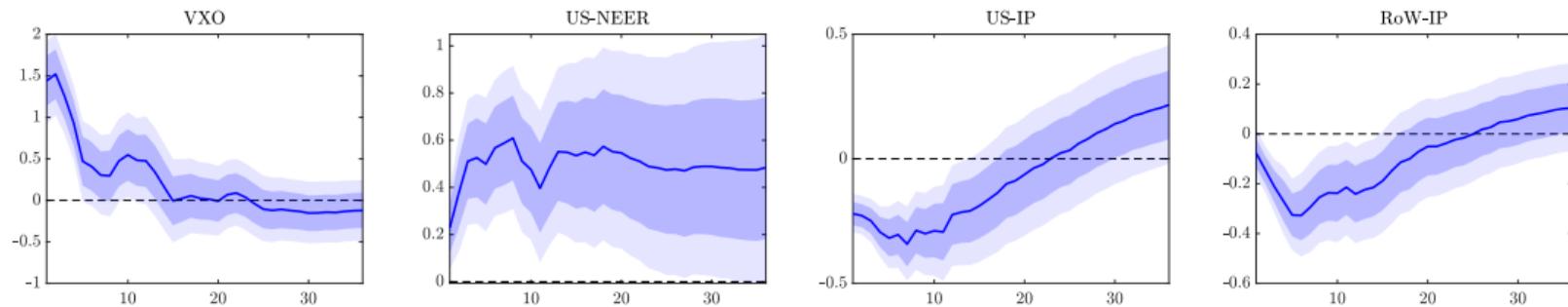
Global demand shock



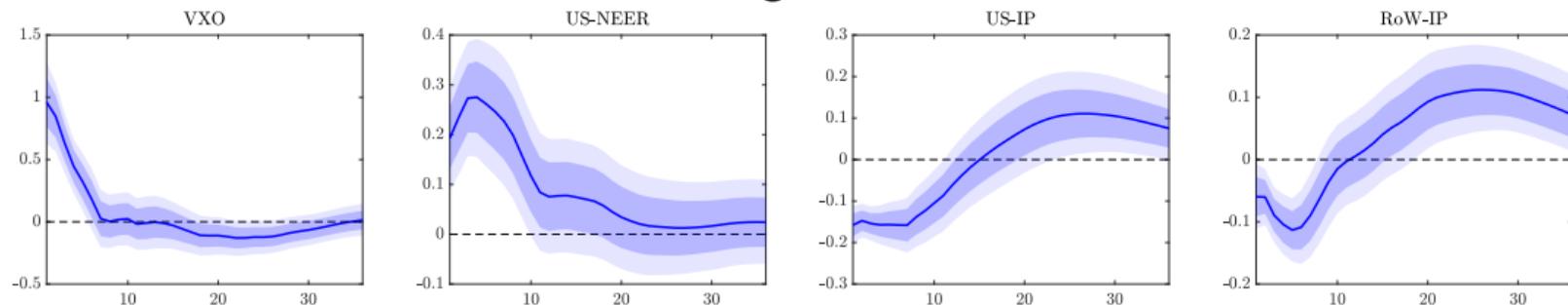
▶ Return

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

Baseline



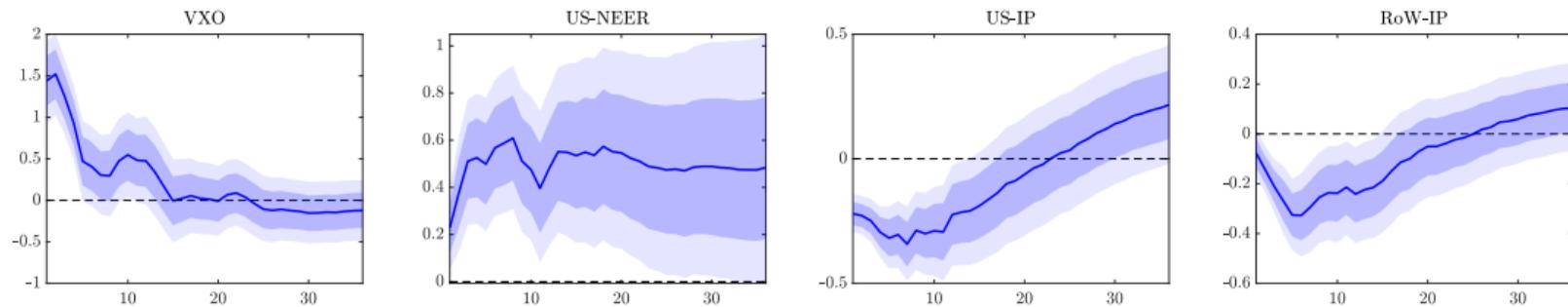
Large VAR



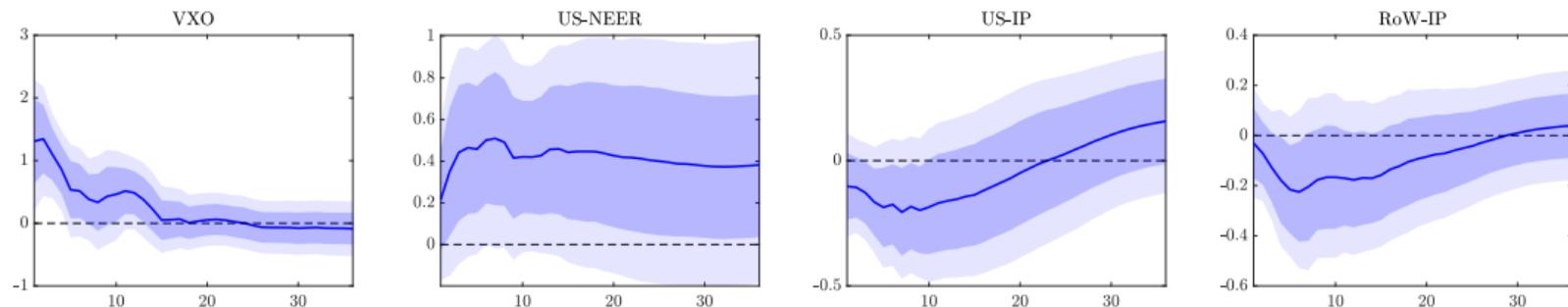
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Allow gold price surprises to be correlated with all structural shocks

Baseline

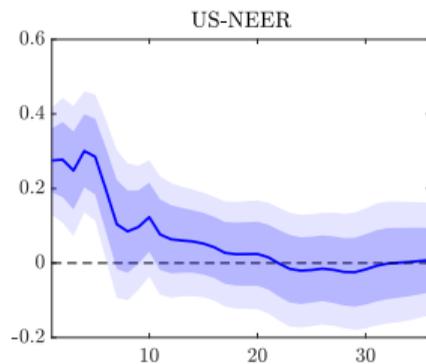
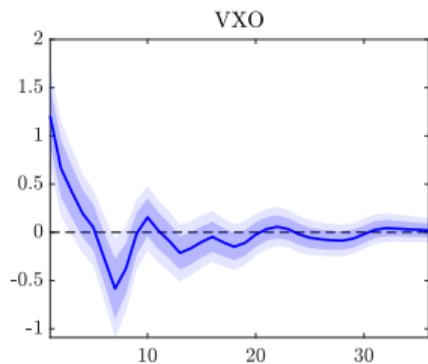
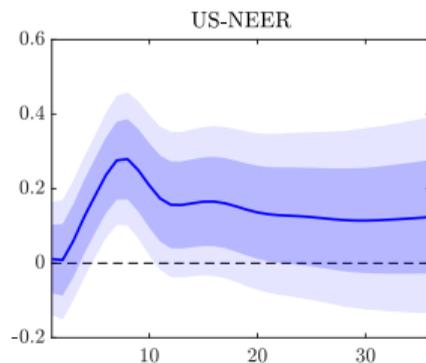
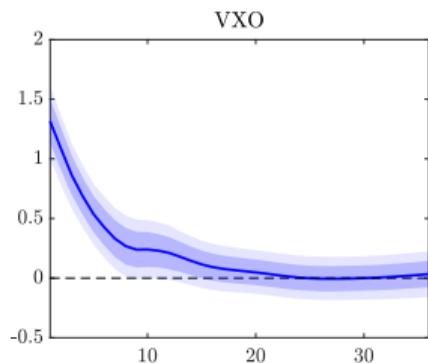


Weaker correlation restriction

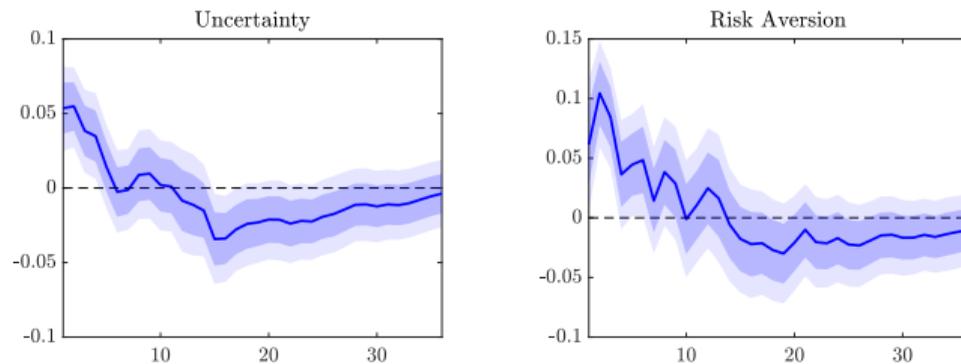


▶ Return

The VIX and US\$ prior (1990-2006, top row) and after (2007-2019, bottom row) the GFC



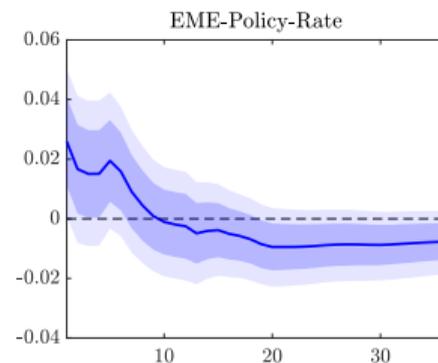
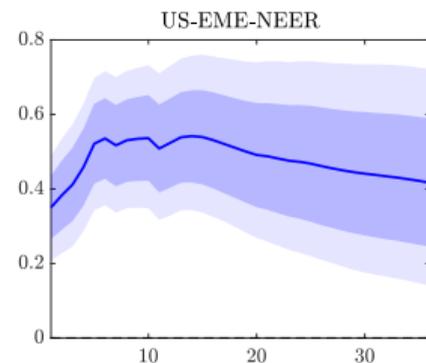
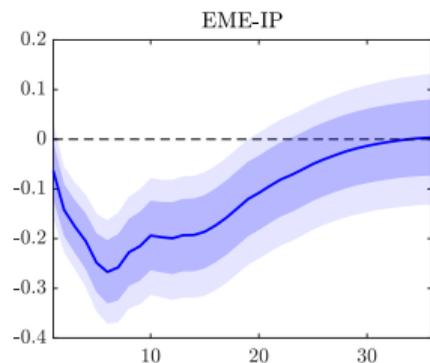
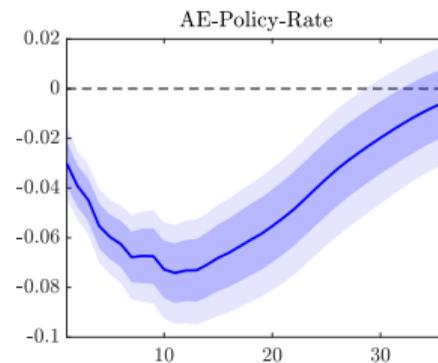
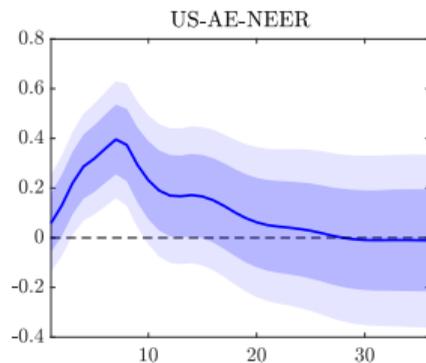
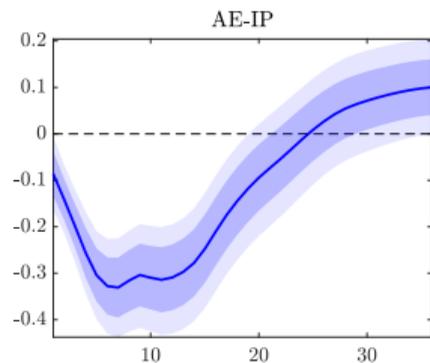
IRFs of the quantity and price of risk



Note: The figure displays the impulse responses of the measures of risk aversion and uncertainty constructed by Bekaert et al. (forthcoming).

▶ Return

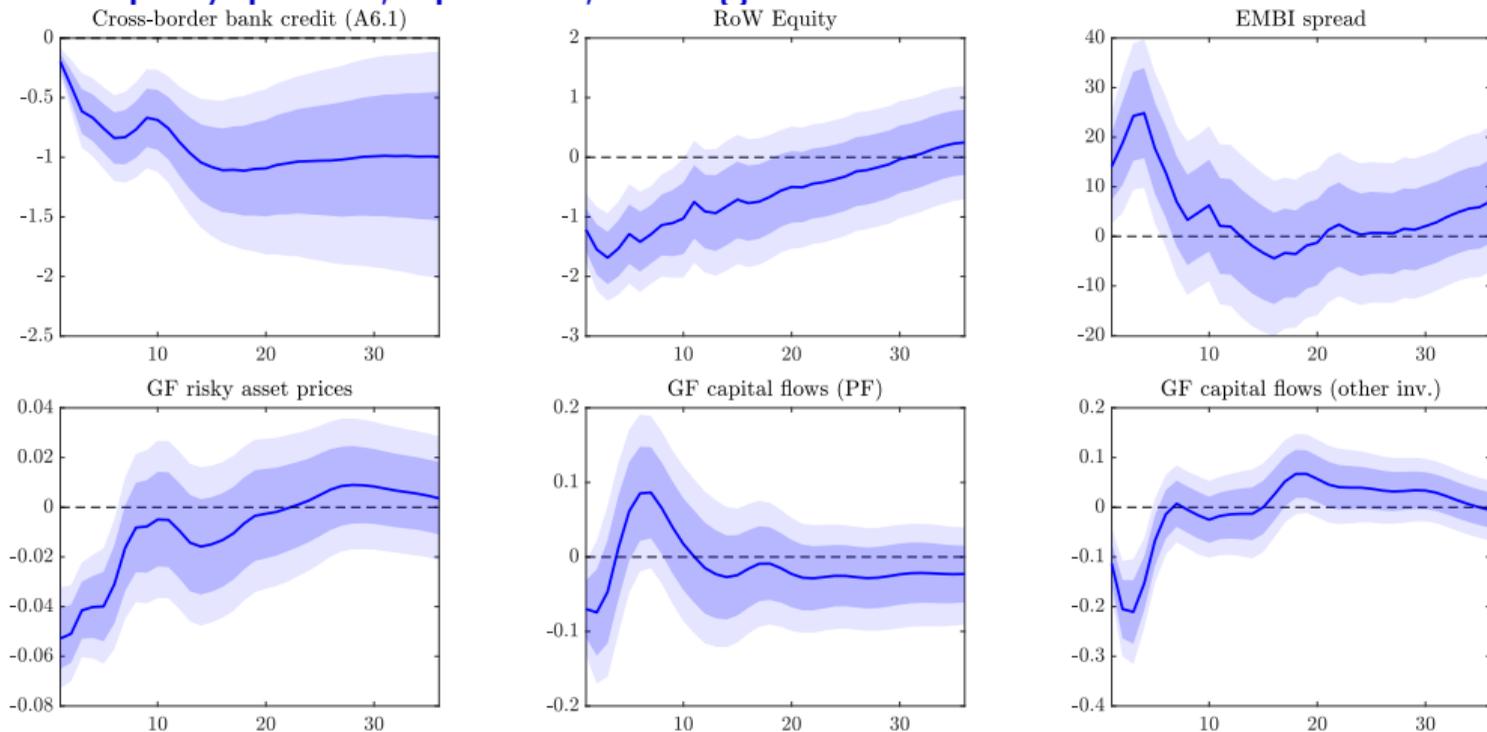
AEs vs. EMEs



Note: Due to the larger dimensionality of the VAR model we use informative Minnesota-type priors and optimal hyperpriors/prior tightness as suggested by Giannone et al. (2015) in the estimation.

▶ Return

IRFs of equity prices, spreads, and global factors



Note: See notes to fig: risk shock and fig: risk shock irfs corroboration. The upper-right panel depicts the response of cross-border bank credit taken from the BIS Locational Banking Statistics Table A7 based on nationality principle (calculated as "External liabilities to all sectors of all reporting banks" less "External liabilities to all sectors of banks owned by US nationals"). The left panel in the second row shows the response cross-border bank credit taken from the BIS Locational Banking Statistics Table A6.1 based on residency principle (calculated as "Banks' external claims on all sectors in all countries" less "Banks' external claims on all sectors in the US").

Minimum-relative-entropy (MRE) approach

Borrow idea from forecasting literature

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

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

$$f(\tilde{\mathbf{y}}_{T+h} | \mathbf{Y}_T, \tilde{\epsilon}_{T+1, T+h}) \quad (4)$$

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

$$\text{Min}_{\psi} \mathcal{D}(f^* || f) \quad \text{s.t.} \quad \int f^*(\tilde{\mathbf{y}}^{\$}) \tilde{\mathbf{y}}^{\$} d\tilde{\mathbf{y}}^{\$} = E(\tilde{\mathbf{y}}^{\$}) = 0 \quad (5)$$

$\mathcal{D}(\cdot)$ 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

$$f^*(\tilde{\mathbf{y}}_{T+h} | \mathbf{Y}_T, \tilde{\mathbf{e}}_{T+1, T+h}, E(\tilde{y}_{T+h}^{\$}) = 0) \propto f(\tilde{\mathbf{y}}_{T+h} | \mathbf{Y}_T, \tilde{\mathbf{e}}_{T+1, T+h}) \times \tau(g(y_{T+h}^{\$}(\psi))) \quad (6)$$

Solution to

$$\text{Min}_{\psi} \mathcal{D}(f^* || f) \quad \text{s.t.} \quad \int f^*(\tilde{\mathbf{y}}^{\$}) \tilde{\mathbf{y}}^{\$} d\tilde{\mathbf{y}}^{\$} = E(\tilde{\mathbf{y}}^{\$}) = 0$$

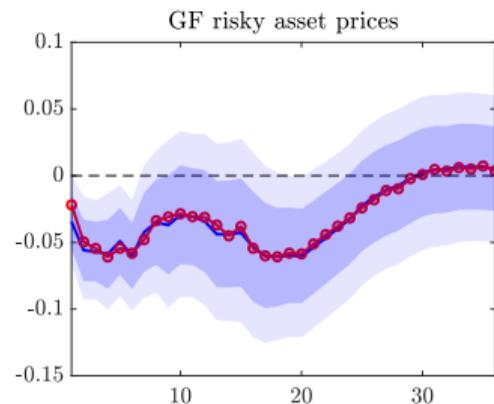
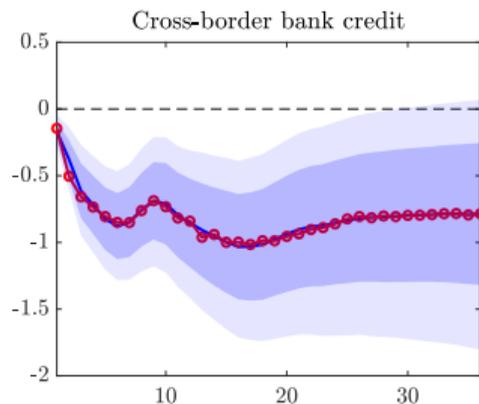
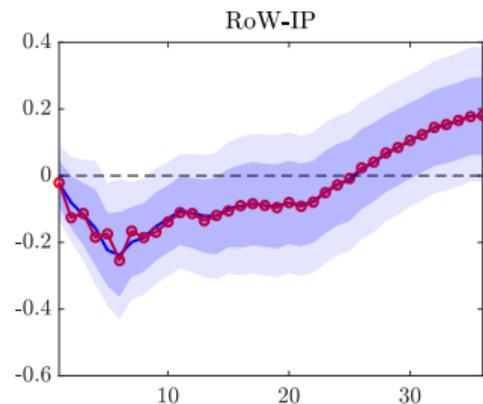
provides tilt $\tau(\cdot)$ in counterfactual posterior

▶ Sampling

▶ Illustration of tilting

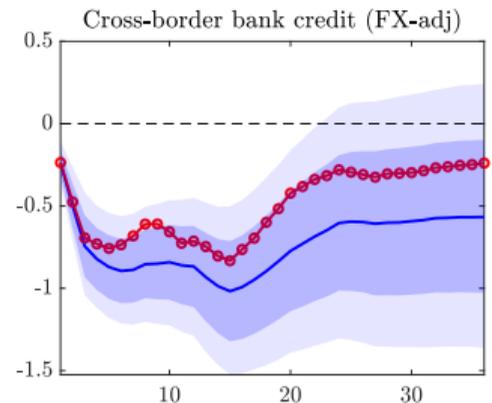
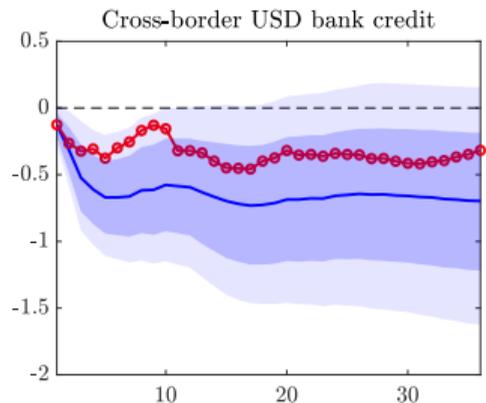
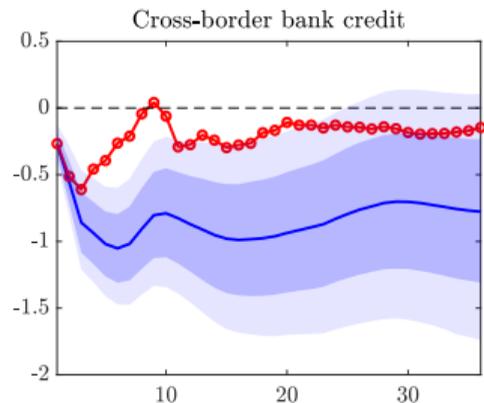
▶ Return

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



► Return

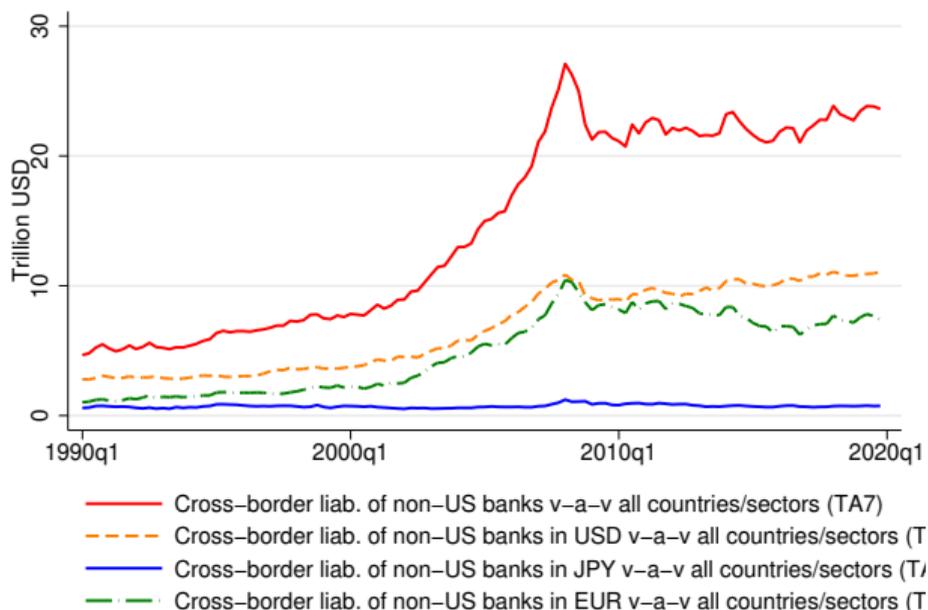
Mechanical exchange rate valuation effects in non-US\$ credit component?



► Return

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

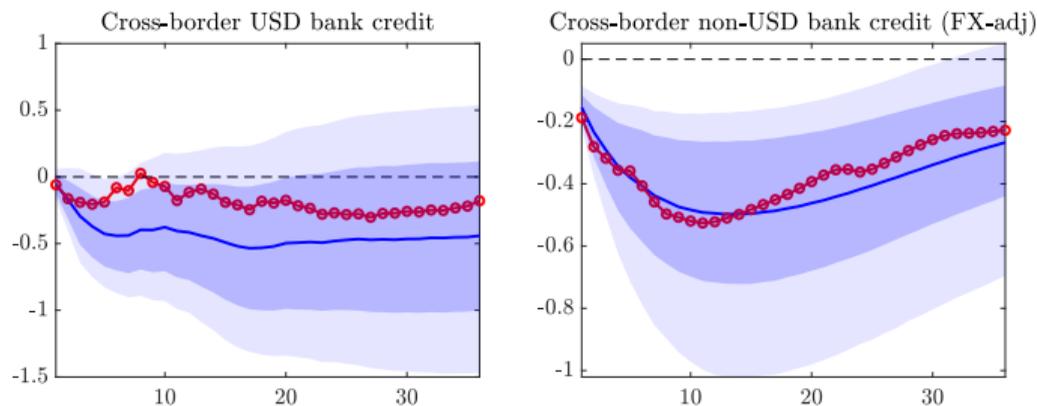
Ivashina et al. (2015) present a model in which globally active banks **cut US\$ lending by more than EUR lending** in response to a credit quality shock

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 \implies **US\$ funding more risk-sensitive**
- ▶ Limited capital in FX swap markets gives rise to CIP deviations \implies **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.

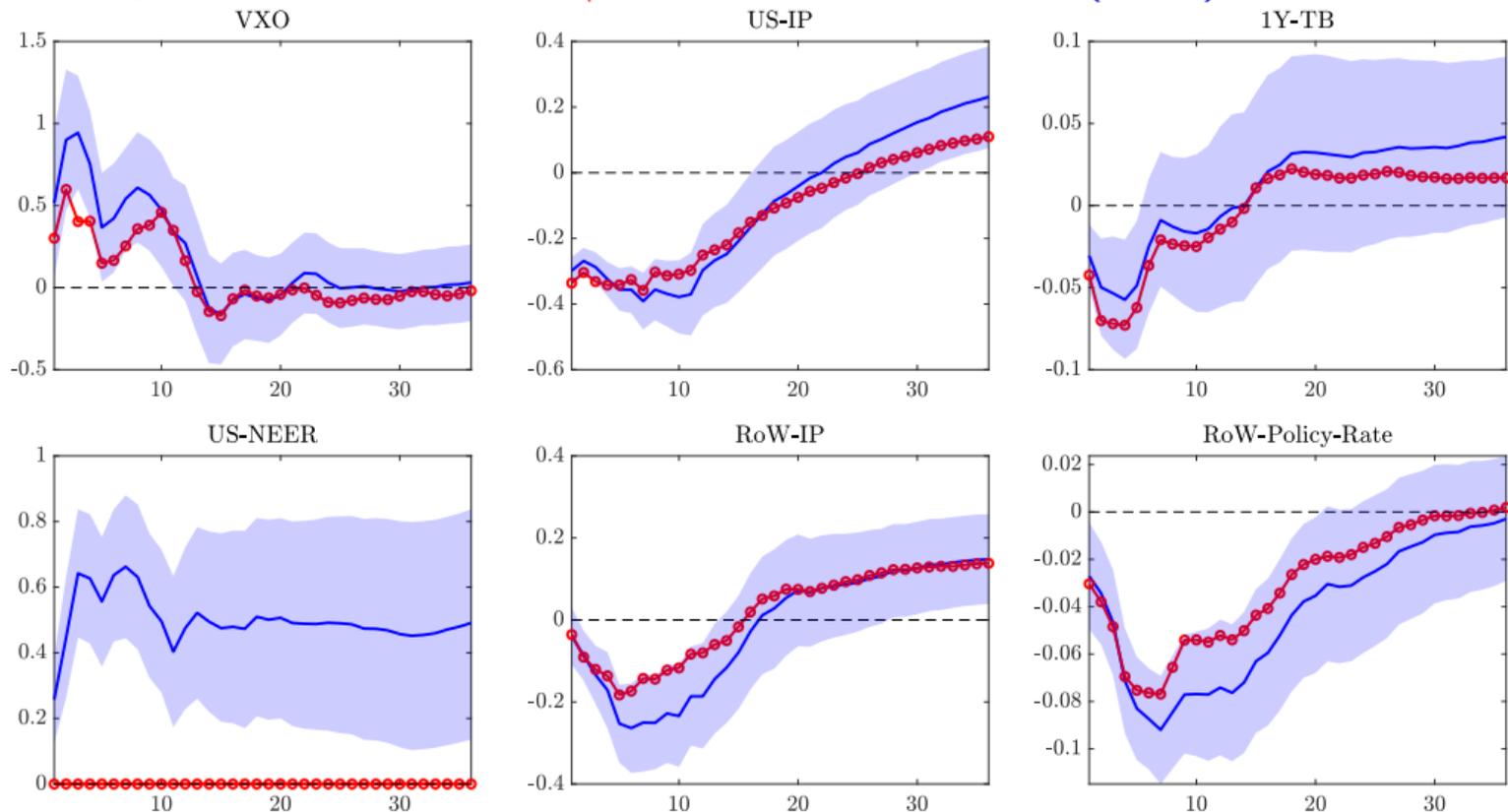
Is US\$ cross-border bank credit special?



Note: See the notes to fig: entropy counterfactual. Because the data are only available from 2002, the BPSVAR model with non-dollar/exchange rate-adjusted cross-border credit is estimated with informative Minnesota-type priors and optimal hyperpriors/prior tightness as suggested by Giannone et al. (2015) and—to obtain a stable model—six instead of twelve lags.

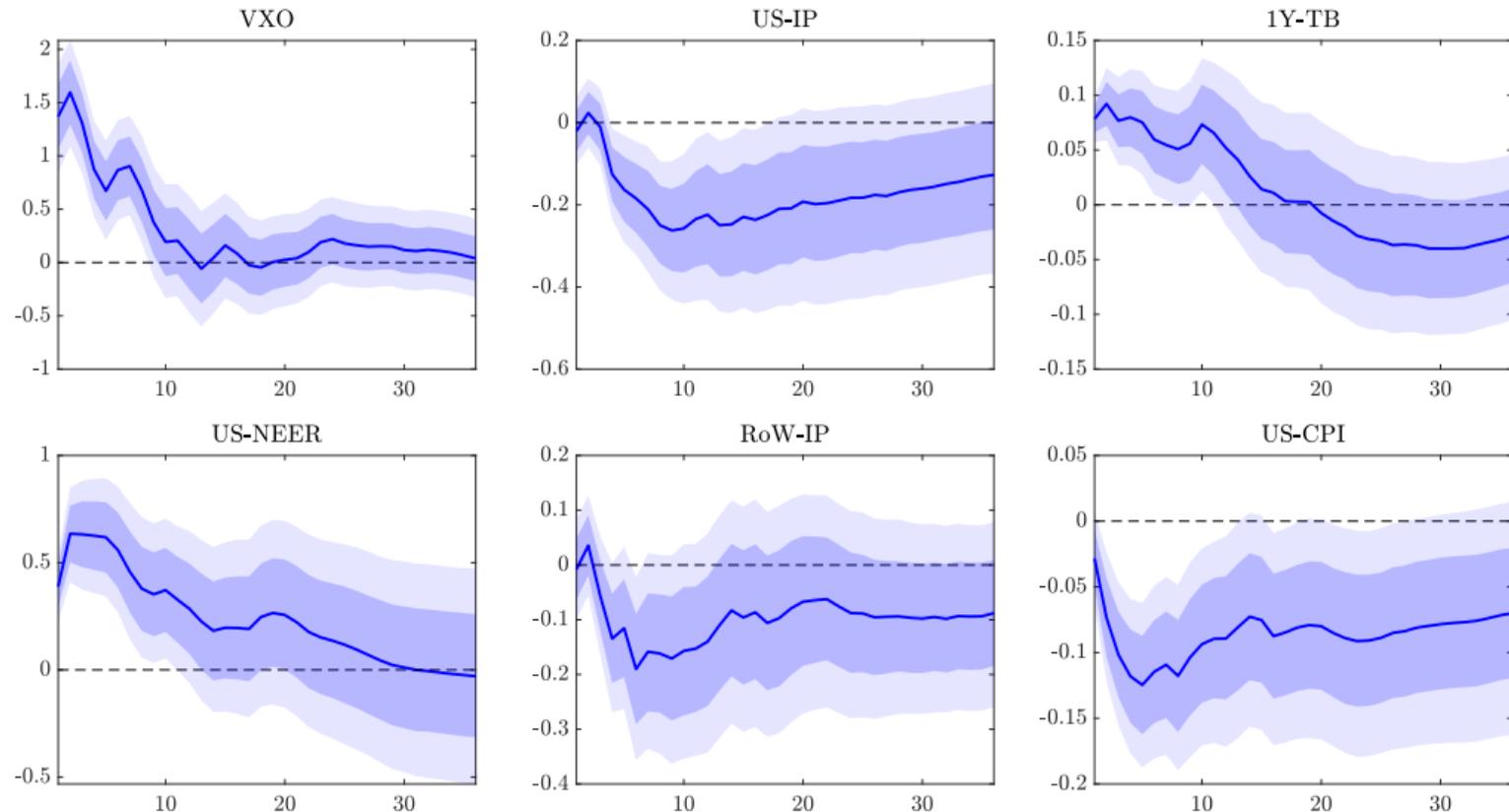
▶ Return

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



[Return](#)

Effect of US monetary policy shock



[Return](#)