Global risk and the dollar

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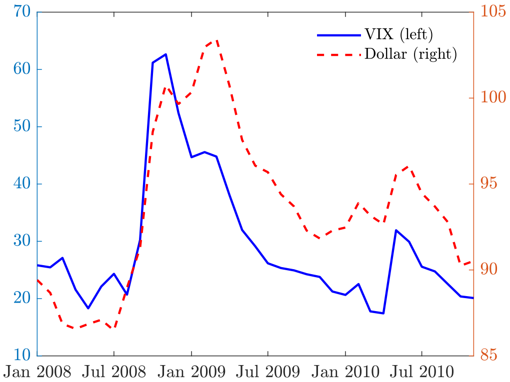
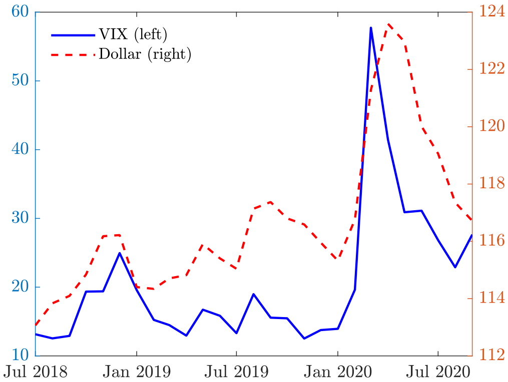
The views stated herein are those of the authors and are not necessarily those of the ECB.

Received wisdom: US$ appreciates when global risk spikes

Global Financial Crisis



COVID-19 crisis



Research question

When global risk spikes the US$ appreciates

- Extensive theory (resilience, safety and liquidity of US assets) $\longrightarrow$ US$ dominant currency

  Farhi and Gabaix (2016); Bianchi et al. (2021); Jiang et al. (2021a); Kekre and Lenel (2021)

- Role of US$ for transmission of global risk shocks theoretically & empirically complex

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Dollar appreciation triggered by global risk shock could in theory

- **Dampen** effects on RoW through
  - Expenditure switching away from US towards RoW goods
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  - Increasing the value of RoW US$ denominated assets → Insurance channel
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How does US$ shape transmission of global risk shocks in the data?

This paper

Approach

- Identify global risk shocks using intra-daily gold price changes on narratively selected dates
  Bloom (2009); Piffer and Podstawski (2018); Ludvigson et al. (2021)
- Bayesian proxy SVAR on US and RoW data for 1990m1 to 2019m12
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- Estimate effect of US$ by comparing IRFs against 3 counterfactuals without US$ appreciation
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Findings

- Global risk shock induces US$ appreciation and a global recession
- Without US$ appreciation: Global slowdown reduced **by $\approx$ 30 - 50 %**
- Across all counterfactuals: amplifying effects $>$ dampening effects

VAR specification and estimation

Specification

- Augment Gertler and Karadi (2015) model by: VXO, US-NEER, RoW IP, RoW policy & 5Y-Tbill rate
- **Global risk shock proxy** (m_t^r): Intra-daily gold price changes on narratively selected days
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Identifying assumptions

- **Goal**: Jointly identify global risk (ϵ_t^r), conventional MP (ϵ_t^{cmp}), Forward guidance (ϵ_t^{fg}) shock
- $E[m_t^{r,3m,5y}, \epsilon_t^{r,cmp,fg}] = V, \quad E[m_t^{r,3m,5y}, \epsilon_t^{o}] = 0 \rightarrow$ Relevance & Exogeneity conditions

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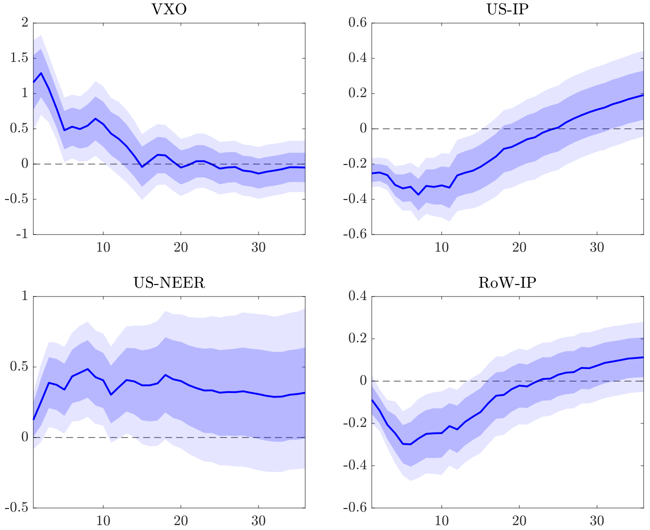
Estimation

- **Sample**: 1990m2 to 2019m12, **Priors**: Flat, **Algorithm**: Arias et al. (2021) Details

Effects of a global risk shock



CMP shock | FG shock | Jarocinski (2021) MP proxies | Swanson (2021) MP proxies | Lewis (2023) MP proxies

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Global risk shock induces

- Increase in VXO and US$ appreciation
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Robustness

- Replace proxy exogeneity assumption by weaker covariance restrictions ▸ IRFs
- Use US$-€ futures instead of gold price ▸ IRFs
- Replace narrative proxy by textual analysis based one (Caldara and Iacoviello (2022)) ▸ IRFs
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Extensions

- Show: IRFs resemble shock to price (risk aversion) than quantity of risk (uncertainty) ▸ IRFs
  Bekaert et al. (2022)
- Test predictions for IRFS to global risk (aversion) shock from theory ▸ IRFs
- Large VAR with optimal hyperpriors ▸ IRFs
  Giannone et al. (2015)

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Solution: Conduct 3 different counterfactual experiments (ordered by least to most structural)

- SVAR: What's the **most likely path of the endogenous variables** if $\epsilon^r_{t+0} = 1,\ US\$_{t+h} = 0\ \forall h$?
  Antolin-Diaz et al. (2021); Breitenlechner et al. (2022)
- SVAR: What if the **structural FED rule** would be such that it **stabilizes US$**?
  McKay and Wolf (forthcoming); Wolf (2023)
- DSGE: What if the US$ does not appreciate because it is **no longer the dominant currency**?
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Hope: All counterfactuals tell a similar story for the role of the US$.

Background: Structural Scenario Analysis (SSA)

Goal: Estimate most likely path of endogenous variables if $\epsilon^r_{t+0} = 1,\ US\$_{t+h} = 0\ \forall h$

Approach: Structural Scenario analysis of Antolin-Diaz et al. (2021)

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Intuition

- "Identify the system" $\rightarrow$ back out all (identified and unidentified) orthogonal shocks
- Use "minimal" (most likely) combination of shocks to enforce constraint on path of US$
- Calculate implied path for other endogenous variables if $\epsilon^{r}_{t+0} = 1$ and $\epsilon^{-r}_{t+0:t+h} = \epsilon^{minimal}_{t+0:t+h}$

Background: Policy Rule counterfactual

Goal: Estimate the IRFs to global risk shock if (agents know that) **FED will stabilize US$**

Approach: "Best Lucas critique-robust approximation" of counterfactual IRFs (Wolf (2023))

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Intuition

- McKay and Wolf (forthcoming): Under mild assumptions on the true structural model
  - Possible to **back out true policy rule counterfactual from the underlying structural model**
  - using **only IRFs to identified conventional monetary policy and forward guidance shocks**
- Why? In most DSGEs, agents care about equilibrium path of instrument not rule per se
  - MW(2023): Sufficient to "replicate" path of instrument under CF rule with policy (news) shocks (ϵ_{t+0}^{MP})

Background: DSGE counterfactual

Intro: **US$ appreciates** in times of elevated global risk **because its the dominant currency**

Goal: Estimate the IRFs of variables if $\epsilon^r_{t+0} = 1$ and **US$ is not the dominant currency**

Approach: “Dollar Trinity” DSGE model of Georgiadis et al. (2023)

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- US-RoW model with US$ dominance in
  - (i) Safe asset supply (ii) Cross border bank credit (iii) Global trade
- Increases in global risk (aversion) $\rightarrow$
  - **Dominance in safe assets**: US$ appreciates due to special status of US$ assets

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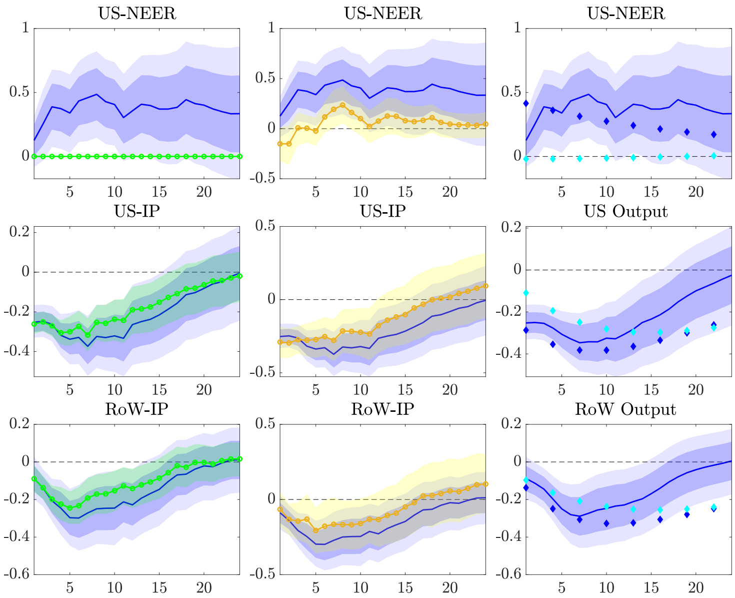
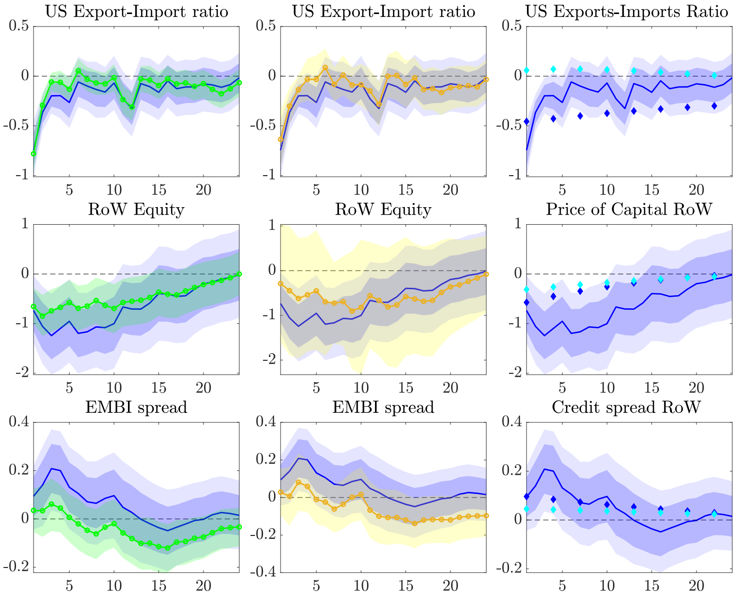
  - **Dominance in CB credit**: Global financial conditions tighten due to US$ liabilities
  - **Dominance in trade**: Rising import prices and less expenditure switching
- Model matches empirical IRFs to global risk (and CMP) shock $\rightarrow$
  - **Model without US$ dominance** $\rightarrow$ no US$ appreciation
  - **Informative about** sign and strength of **US$ channels**

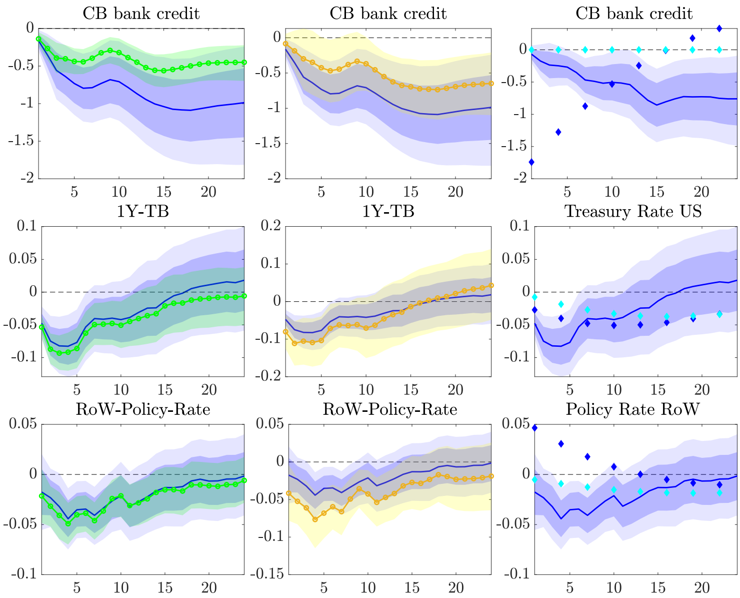
No US$ appreciation results, SSA, Policy Rule CF, DSGE



Amplifying and dampening channels, SSA, Policy Rule CF, DSGE



Further variables, SSA, Policy Rule CF, DSGE



Conclusion

Identified global risk shocks induces

- US$ appreciation and a global recession
- patterns in financial variables responses consistent with theoretical risk shocks

How does US$ appreciation shape effects of global risk shocks?

- Depending on CF: Fall in RoW real activity about $\approx 30 - 50\%$ smaller without US$ appreciation
- US$ appreciation not epiphenomenon of global risk shocks, has first-order effects

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Subject to Equation (2) estimate 'augmented VAR'

$$\widetilde{\boldsymbol{A}}_0 \begin{bmatrix} \boldsymbol{y}_t \\ m_t \end{bmatrix} = \widetilde{\boldsymbol{A}}_1 \begin{bmatrix} \boldsymbol{y}_{t-1} \\ m_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_t \\ \nu_t \end{bmatrix} \tag{3}$$

Allows flexible relationship between proxy variable and structural shocks

$$m_t = \boldsymbol{B}_y \boldsymbol{y}_{t-1} + b_m m_{t-1} + \boldsymbol{B}_\epsilon \epsilon_t + b_\nu \nu_t$$

▶ Return

Bayesian proxy SVAR of Arias et al. (2021)

Structural shocks in the VAR $\boldsymbol{A}_0 \boldsymbol{y}_t = \boldsymbol{A}_1 \boldsymbol{y}_{t-1} + \epsilon_t$ are

$$\epsilon_t = \begin{bmatrix} \epsilon_t^{\star\prime} & \epsilon_t^{o\prime} \end{bmatrix}' \tag{1}$$

Identifying assumptions with proxy variable m_t

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

Subject to Equation (2) estimate 'augmented VAR'

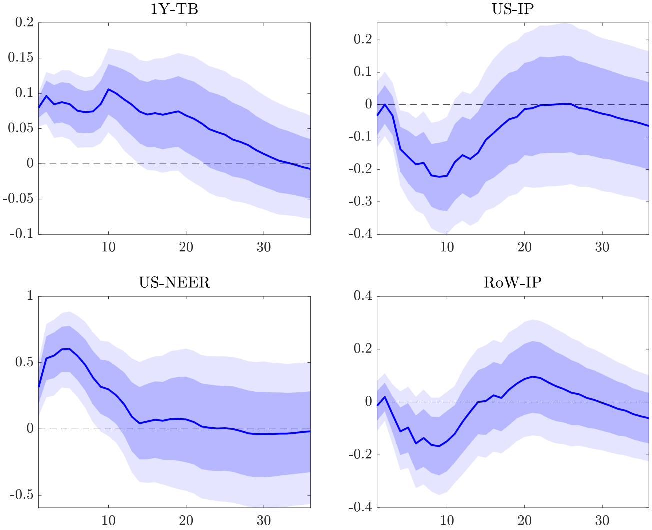
$$\widetilde{\boldsymbol{A}}_0 \begin{bmatrix} \boldsymbol{y}_t \\ m_t \end{bmatrix} = \widetilde{\boldsymbol{A}}_1 \begin{bmatrix} \boldsymbol{y}_{t-1} \\ m_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_t \\ \nu_t \end{bmatrix} \tag{3}$$

Allows flexible relationship between proxy variable and structural shocks

$$m_t = \boldsymbol{B}_y \boldsymbol{y}_{t-1} + b_m m_{t-1} + [\boldsymbol{v}, \boldsymbol{0}] \begin{bmatrix} \epsilon_t^{*} \\ \epsilon_t^{o} \end{bmatrix} + b_\nu \nu_t \tag{4}$$

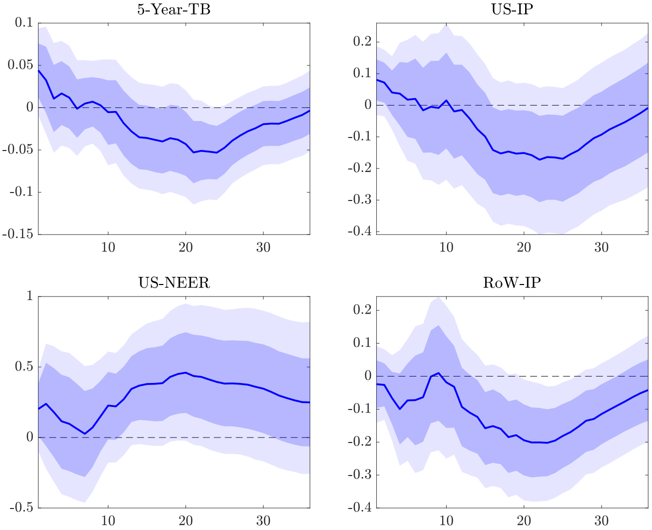
Return

Effects of a conventional MP shock



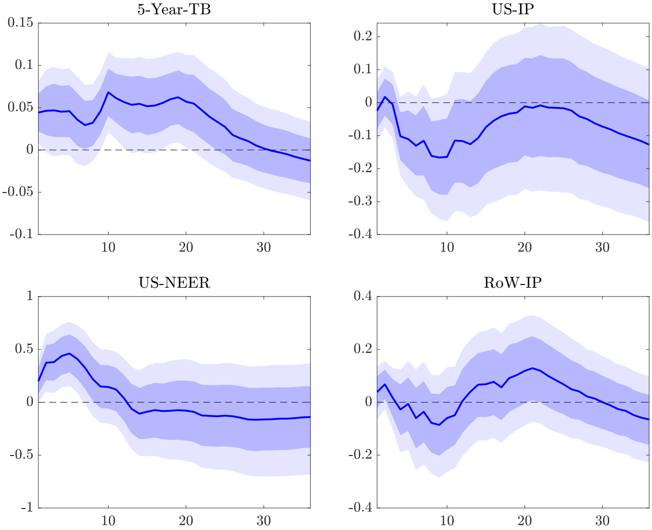
▶ Return

Effects of a forward guidance MP shock



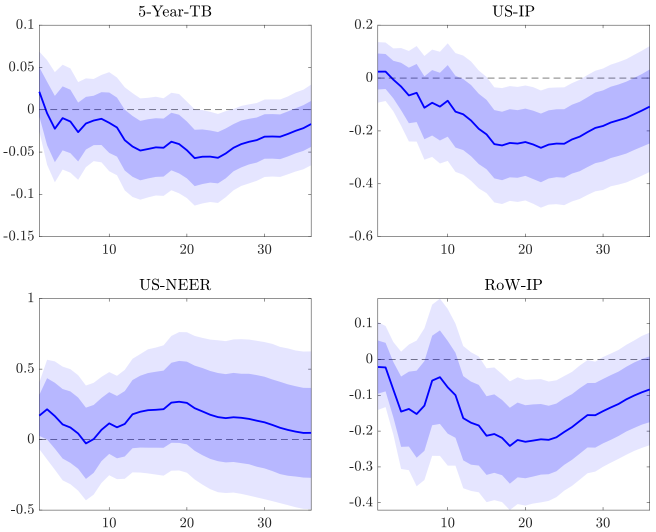
Return

Effects of a conventional MP shock with Jarociński (2021) CMP proxy

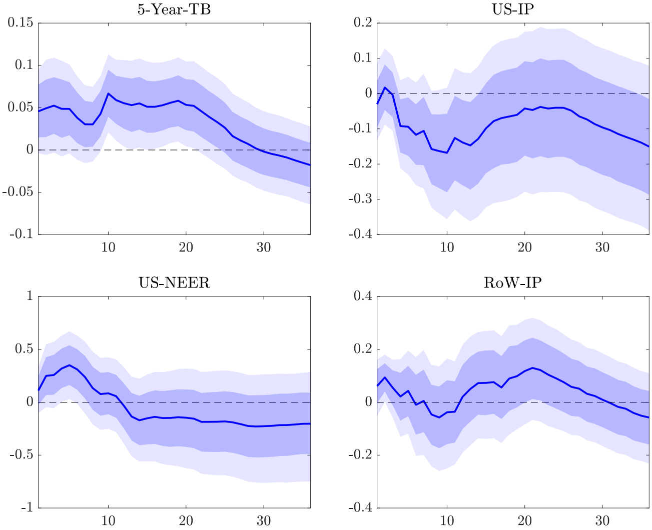


Return

Effects of a forward guidance MP shock with Jarociński (2021) FG proxy



Effects of a conventional MP shock with Swanson (2021) CMP proxy



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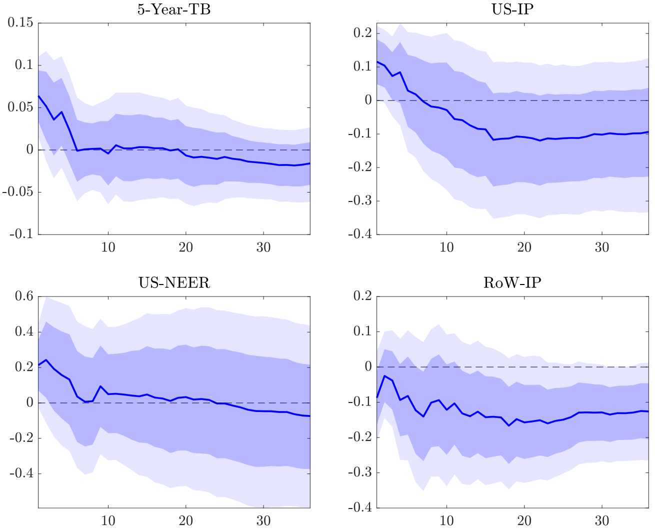
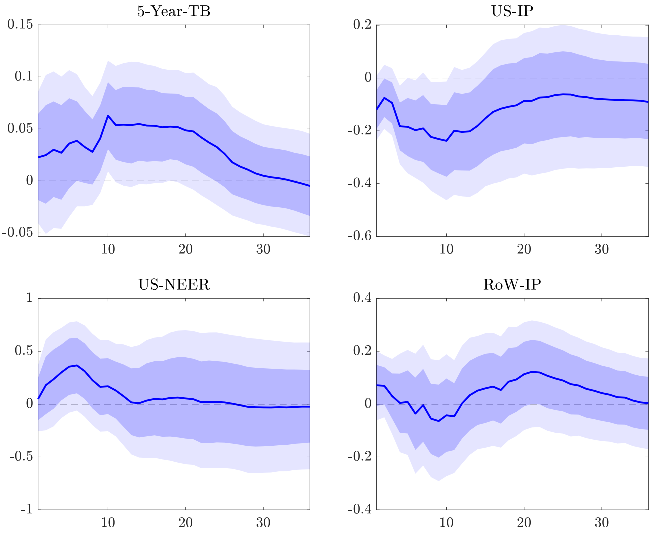
Effects of a forward guidance MP shock with Swanson (2021) FG proxy

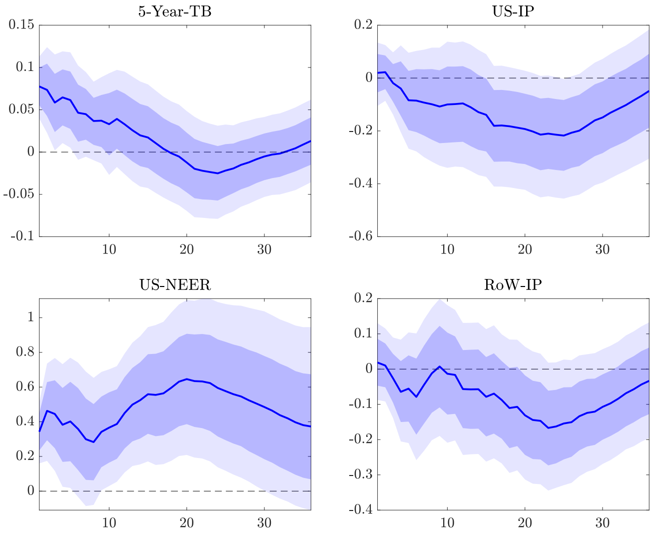


Return

Effects of a conventional MP shock with Lewis (forthcoming) CMP proxy



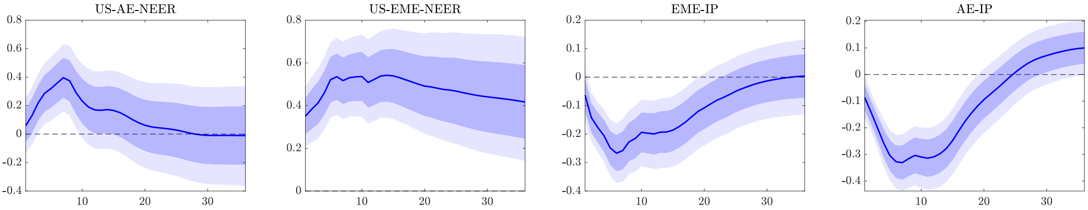
Effects of a forward guidance MP shock with Lewis (forthcoming) FG proxy



AEs and EMEs

Baseline

With AE and EME variables



Return

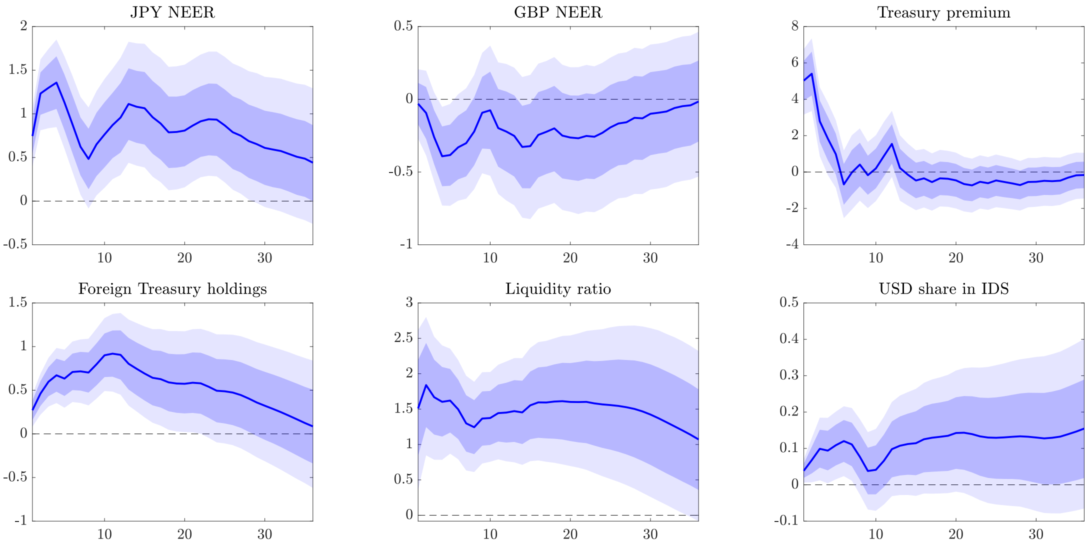
Are we truly identifying a global risk shock?

Goal: Conceive our shock primarily as exo. increase in aversion of global investors towards risk

Test theoretical predictions and benchmark against existing evidence

- Other safe haven currencies appreciate?
  Farhi and Gabaix (2016); Lilley et al. (2022); Hassan et al. (2021)
- Treasury premium increases?
  Jiang et al. (2021a,0)
- Safe-haven flows into US Treasury securities?
  Maggiori (2017); Jiang et al. (2021a); Krishnamurthy and Lustig (2019)
- Banks increase US$ buffers?
  Bianchi et al. (2021)
- Share of US$ in international bond issuance increases?
  Jiang et al. (2021a); Liao (2020); Caramichael et al. (2021)

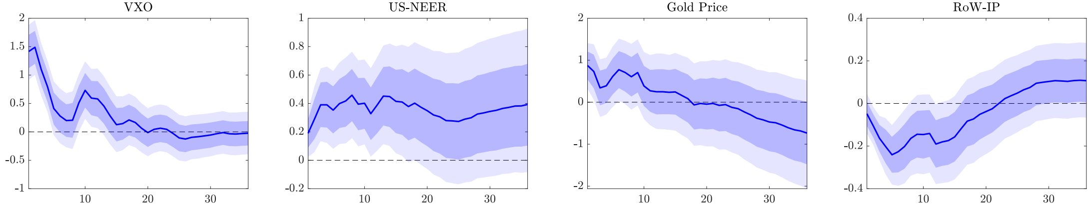
Are we identifying a 'unified' global risk aversion shock?



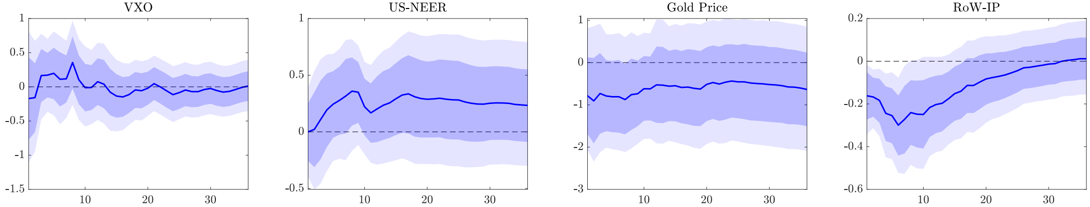
▸ Return

Global risk shock vs global demand shock

Baseline (with gold price added in VAR): Global risk shock



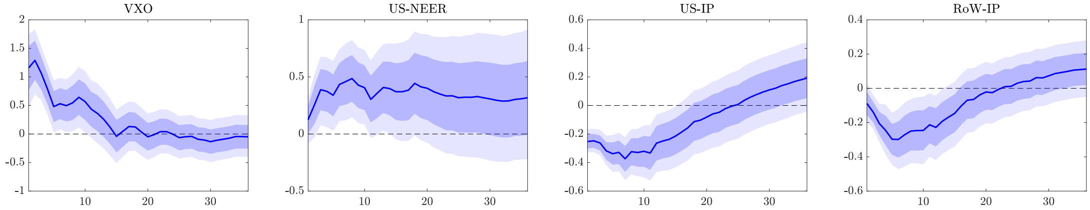
Global demand shock



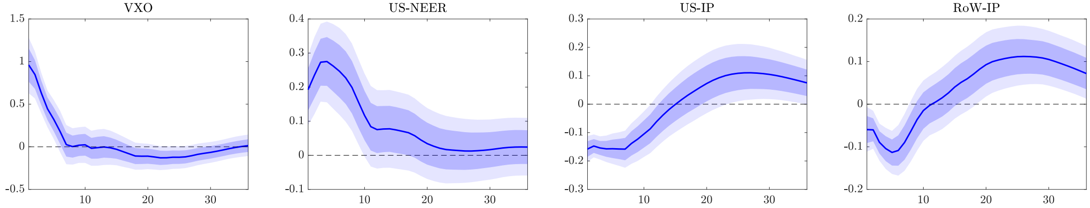
▶ Return

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

Baseline

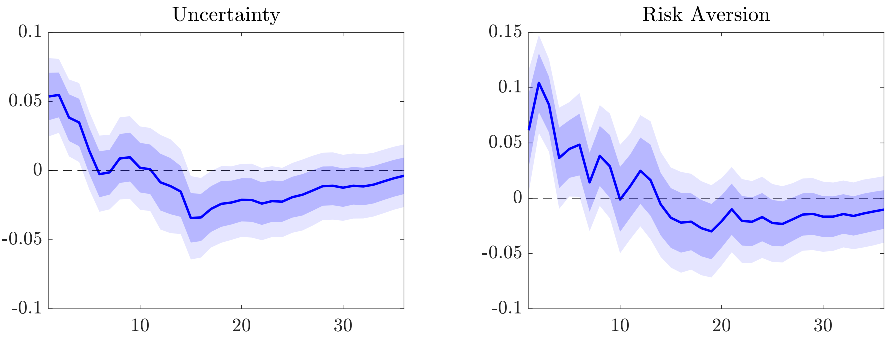


Large VAR



▶ Return

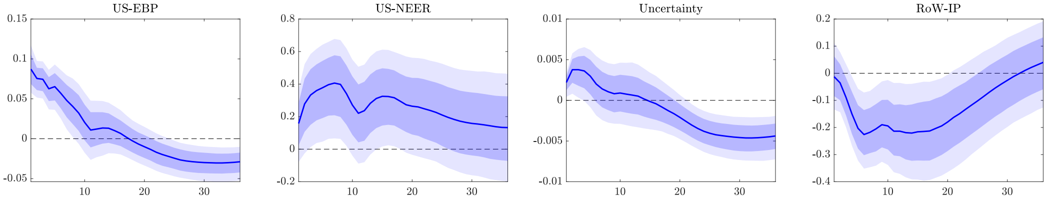
IRFs of the quantity and price of risk



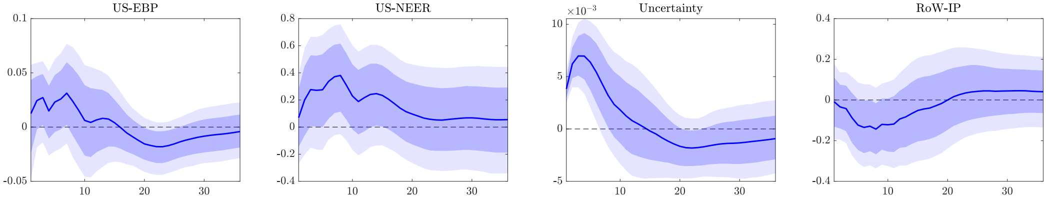
Return

Global risk aversion shock vs global uncertainty shock

Identified Risk Aversion Shock of Georgiadis et al. (2023)



Identified Uncertainty Shock of Georgiadis et al. (2023)



▶ Return

Identification: Robustness

Choice of proxy variable m_t^r

- Intra-daily gold price changes on narratively selected days

Relevance and exogeneity conditions

$$E[m_t^r \epsilon_t^r] = v \neq 0, \qquad E[m_t^r \epsilon_t^{o\prime}] = \mathbf{0} \tag{5}$$

Possible violations of identification assumptions in (5)

- Other shocks relevant because intra-daily window too wide ($E[m_t^r \epsilon_t^{o\prime}] \neq \mathbf{0}$)
  $\Longrightarrow$ Use surprises in US$-EUR exchange rate available for narrower windows ▸ IRFs
- Other shocks relevant on narratively selected events ($E[m_t^r \epsilon_t^{o\prime}] \neq \mathbf{0}$)
  $\Longrightarrow$ Relax $E[m_t^r \epsilon_t^{o\prime}] = \mathbf{0}$ to $|E[m_t^r \epsilon_t^r]| > |E[m_t^r \epsilon_t^\ell]|$ for $\ell \neq r$ ▸ IRFs
- Selected events incomplete/convoluted ($E[m_t^r \epsilon_t^r] \approx 0$, $E[m_t^r \epsilon_t^{o\prime}] \neq \mathbf{0}$)
  $\Longrightarrow$ Use Geopolitical Risk Index of Caldara and Iacoviello (2022) instead ▸ IRFs

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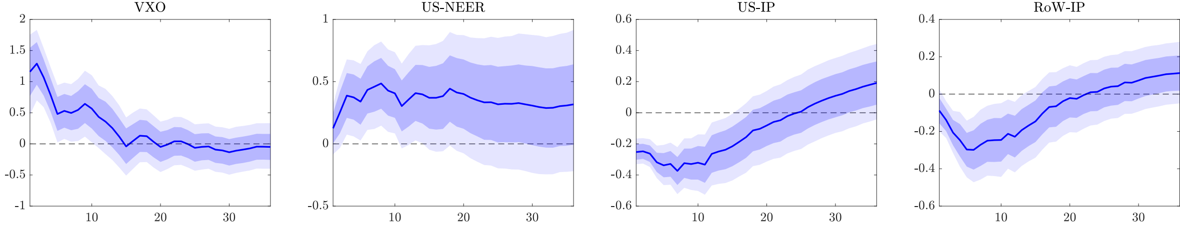
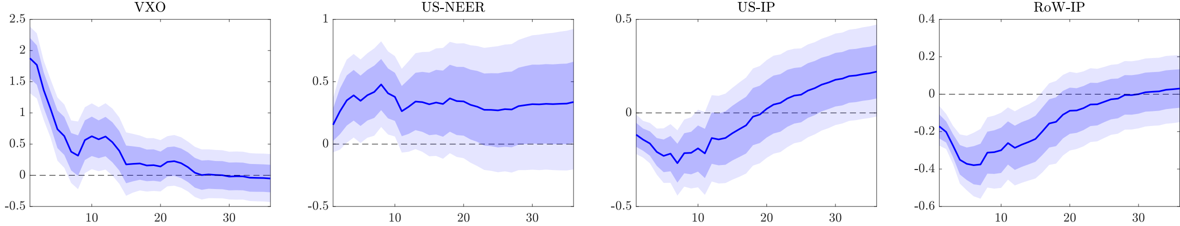
- Selected events incomplete/convoluted ($E[m_t^r \epsilon_t^r] \approx 0$, $E[m_t^r \epsilon_t^{o\prime}] \neq \mathbf{0}$)
  $\implies$ Use Geopolitical Risk Index of Caldara and Iacoviello (2022) instead ▸ IRFs

Use intra-daily US$-EUR changes

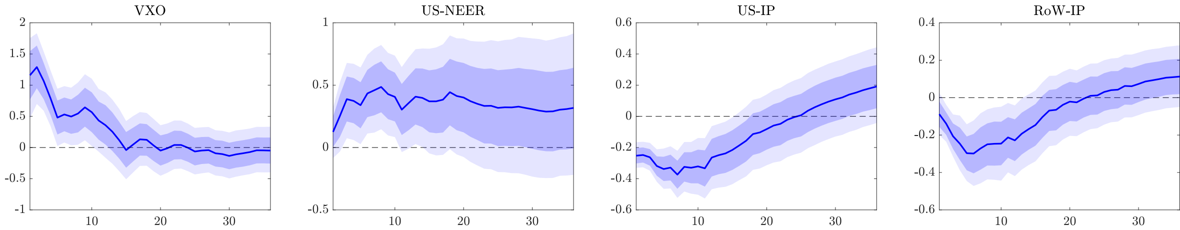
Baseline with gold price changes as instrument



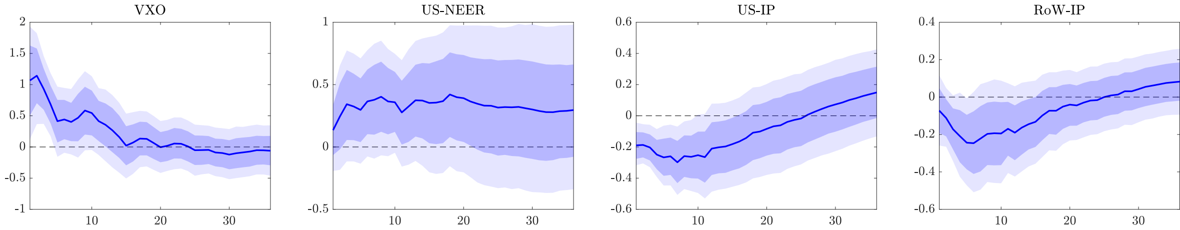
With surprises in US$-Euro futures as proxy



Allow gold price surprises to be correlated with all structural shocks



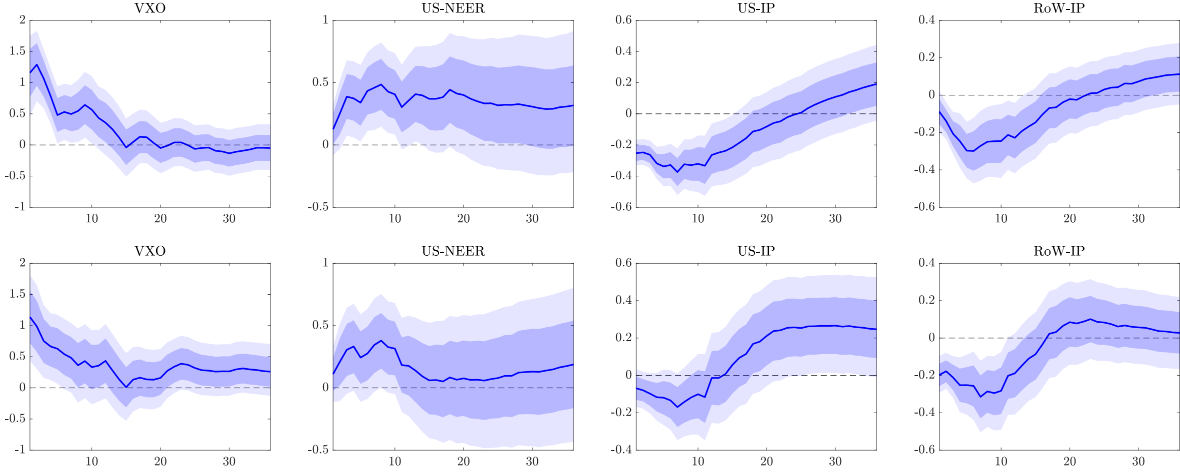
Weaker correlation restriction with $|E[m_t^r \epsilon_t^r]| > |E[m_t^r \epsilon_t^\ell]|$ **for** $\ell \neq r$



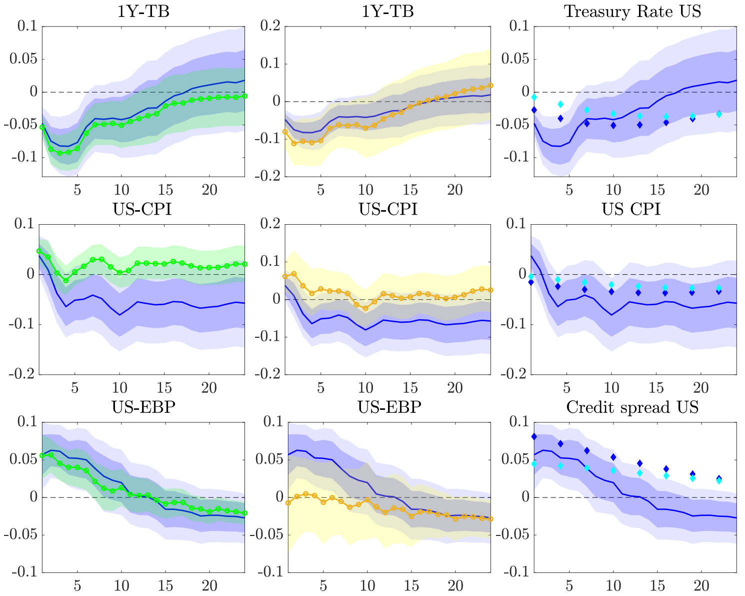
▸ Return

Use Geopolitical Risk Index of Caldara and Iacoviello (2022) as instrument

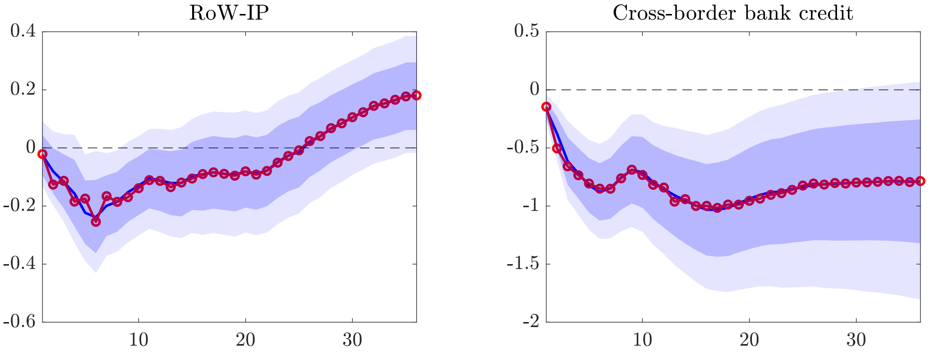
Baseline with gold price changes on narratively selected days as instrument



No US$ appreciation results II, SSA, Policy Rule CF, DSGE

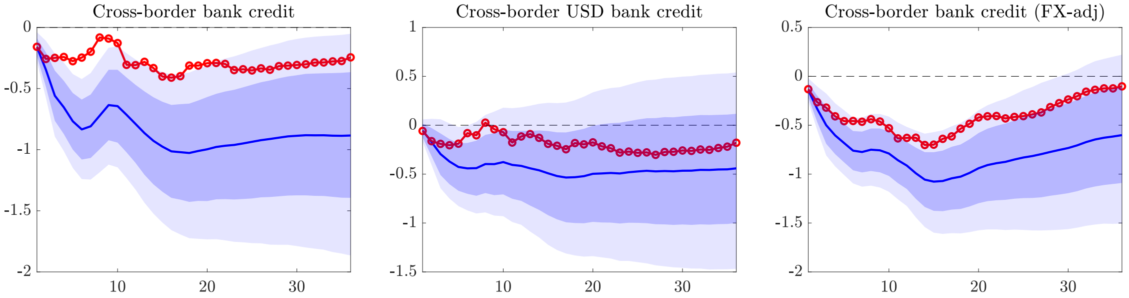


Is the US$ special? (Absence of) Yen appreciation inconsequential



Return

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



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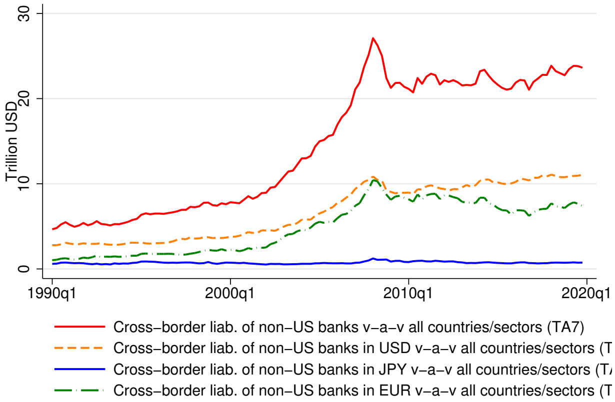
US$ special: (Absence of) Yen appreciation inconsequential

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

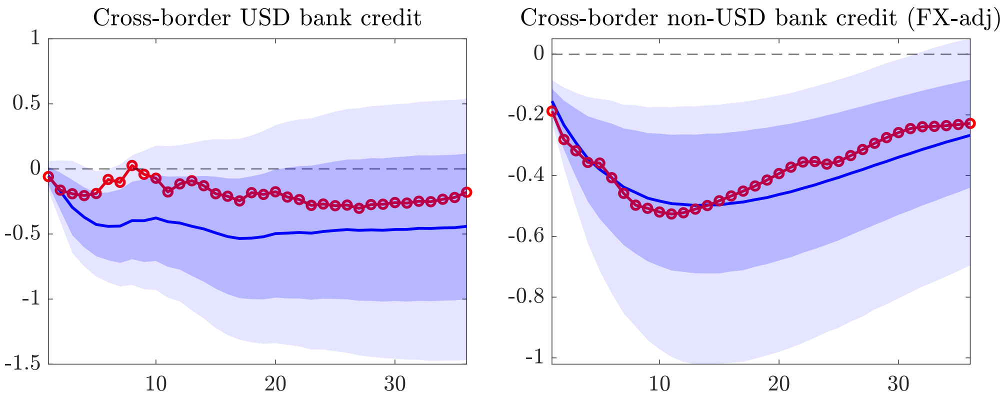
Ivashina et al. (2015) present a model in which globally active banks **cut US$ lending by more than EUR lending** in response to a credit quality shock

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 substit US$ by EUR funding**

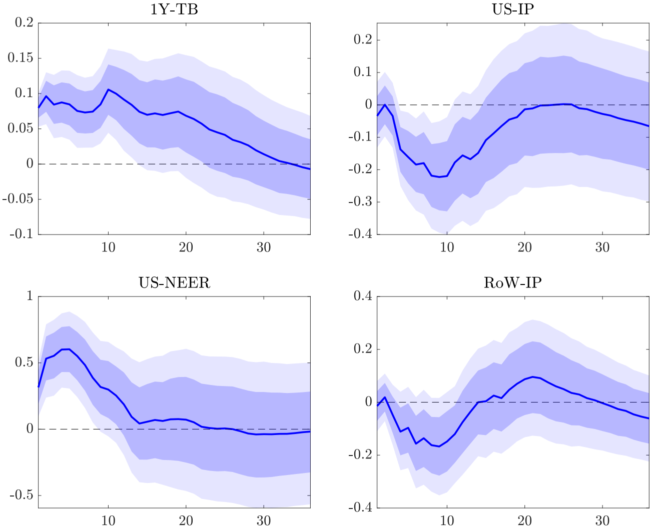
Avdjiev et al. (2019) document a 'triangular' relationship between (i) a stronger US$, (ii) larger CIP deviations, and (iii) contractions in cross-border US$ bank credit.

Is US$ cross-border bank credit special?



▶ Return

Effects of a conventional MP shock



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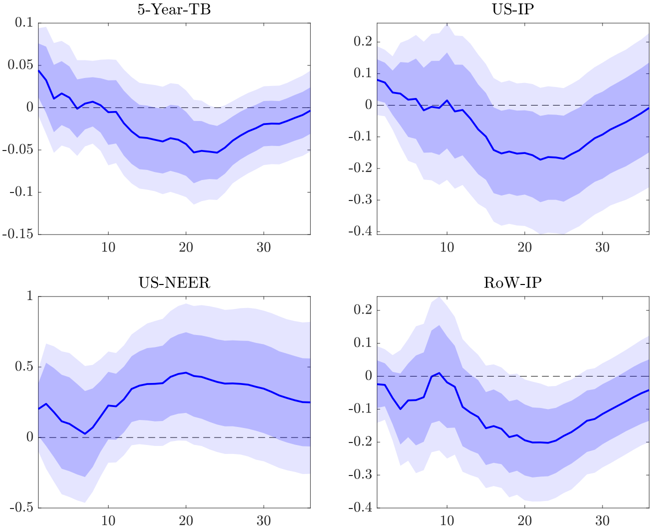
Effects of a forward guidance MP shock

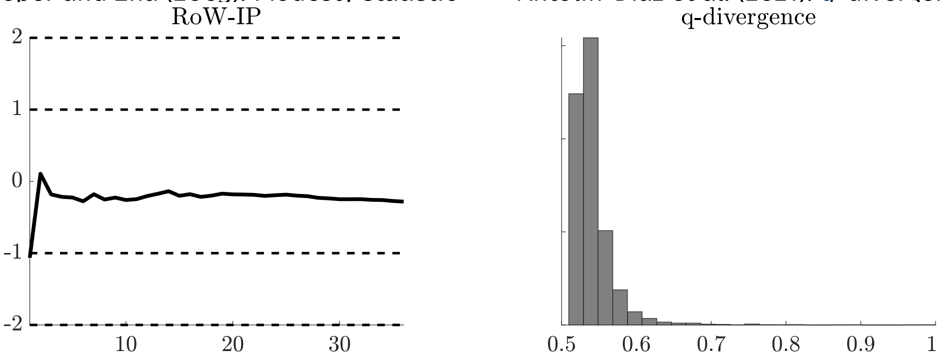


Return

Subject to Lucas critique?

Leeper and Zha (2003): Modesty statistic

Antolin-Diaz et al. (2021): q-divergence



Note: The left-hand side panel shows the 'modesty statistic' of Leeper and Zha (2003) for the required US monetary policy shocks that are needed to impose the counterfactual path of the US dollar NEER (point-wise mean). The offsetting shocks represent 'modest' policy interventions—meaning it would be unlikely to induce agents to adjust their expectations formation—if the statistic is smaller than two in absolute value; the test statistic is distributed as standard normal under the null of 'modest' policy interventions. The right-hand side panel shows the distribution of the q-divergence of Antolin-Diaz et al. (2021). The q-divergence indicates how unlikely a conditional forecast is in terms of comparing the implied distributions of shocks with their unconditional distributions, translated into a comparison of the binomial distributions of a fair and a biased coin.

▸ Return