Dollar Trinity

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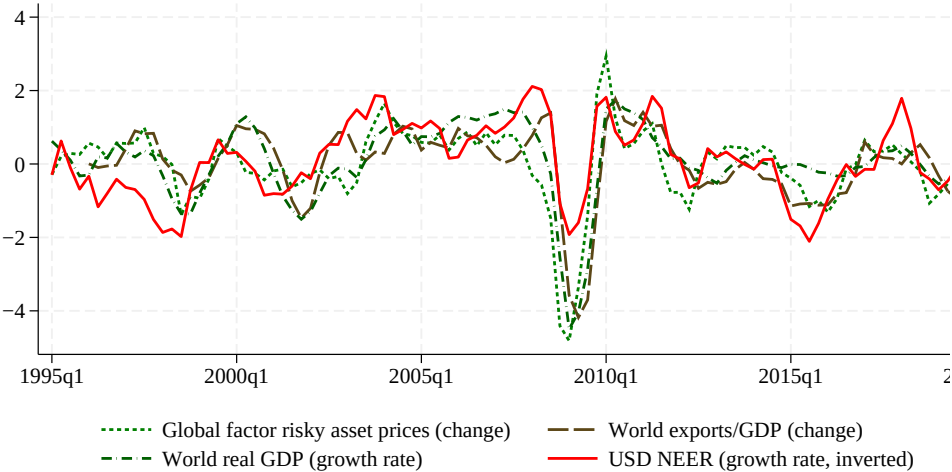
U.S. dollar central to world economy

Standardized year-on-year changes



The question

Global financial cycle, global business cycle, global trade cycle

- Highly correlated with each other
- Co-move strongly with U.S. dollar

Does the dollar—and, if so, how—synchronize global cycles?

1. New time-series evidence on effects of 'main dollar shock'
2. Structural interpretation based on VAR model
3. Two country model of the world economy: trinity model

Time-series evidence

VAR model of U.S. and global economy: identify 'main dollar shock' (MDS)

- Max share of dollar vola as in business-cycle anatomy (Angeletos et al 2020)
- Accounts for more than 60% of dollar fluctuations **and** cycle co-movement
- Dollar appreciation comes with simultaneous contraction of all three cycles

MDS linear combination of structural shocks

- Global risk and U.S. monetary policy shocks identified via high-frequency proxies
- Explain MDS very well, in shock space and impulse-response space
- Common pattern in global transmission of $-appreciation, independent of source

Asymmetric two-country model of world economy: U.S. & Rest of World

Asymmetry due to 3 dimensions of dollar dominance: dollar trinity

- DCP: trade prices sticky in dollar
- DCD: international debt/credit intermediated in dollar
- DCA: U.S. assets particularly safe and liquid

Effects of global risk and U.S. monetary policy shocks

- Same pattern as in data, also unconditionally (Itskhoki Mukhin 2021 2024)
- Counterfactual w/o trinity misses all key aspects
- Interaction of DCD & DCA makes $-appreciation induce global contraction

Related literature

Global financial cycle & dollar

- Global risk shocks appreciate dollar: Georgiadis et al 2024
- GFC as dollar cycle: Obstfeld Zhou 2023, Jiang et al 2024, Rey 2024

Dollar dominance (selection)

- DCD: Bocola Lorenzoni 2020, Chahrour Valchev 2022; Eren Malamud 2022
- DCA: He et al 2019, Coppola et al 2023, Bianchi et al 2021, Kekre Lenel 2024
- DCP: Devereux Shi 2013, Gopinath et al 2020, Mukhin 2022

Failure of UIP (selection)

- Balance sheet of fin. intermediaries: Gabaix Maggiori 2015, Avdjiev et al 2019
- Convenience yield: Engel Wu 2023, Deveurex et al 2023
- Global financial accelerator: Akinci Queralto 2024

2. Time-series evidence

11 monthly time series (1990:2–2019:12)

- US: US IP, CPI, 1-Y Treasury-bill rate, EBP
- RoW: $-NEER, RoW IP, RoW Policy rate, Macroeconomic uncertainty
- Global: indicators for trade and global financial cycle

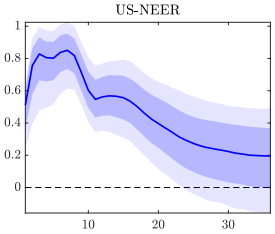
Estimation

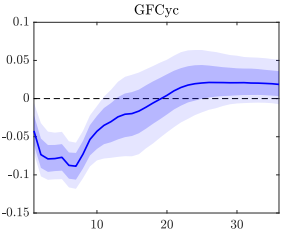
- Bayesian algorithm of Arias et al 2021
- Minnesota-type priors, optimal hyperpriors/prior tightness (Gianonne et al 2015)

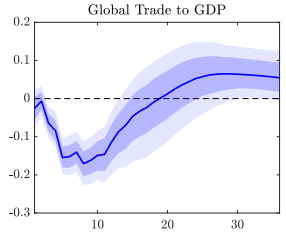
Identification

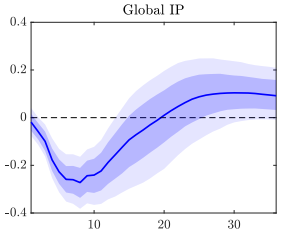
- Identify **MDS** similar to 'main business cycle shock' of Angeletos et al 2020
- MDS explains maximum share of volatility of dollar at business-cycle frequency

Adjustment to main dollar shock (MDS)









Fraction of variance/covariance explained by MDS

Average over horizon 1-36; brackets span 68% credible sets

	US-NEER	Global BC	G-trade	GFC
US-NEER	0.61 [0.58, 0.70]			
Global BC	0.72 [0.64, 0.76]	0.24 [0.19, 0.25]		
G-trade	0.74 [0.70, 0.79]	0.27 [0.21, 0.29]	0.24 [0.19, 0.26]	
GFC	0.62 [0.56, 0.80]	0.32 [0.29, 0.44]	0.33 [0.30, 0.45]	0.25 [0.22, 0.29]

Structural interpretation

MDS linear combination of k identified structural shocks

$$\widehat{\theta}^{MDS} = \sum_{i=1}^{k<N} \alpha_i \widehat{\theta}^i + E$$

Sources of dollar fluctuations—UIP perspective

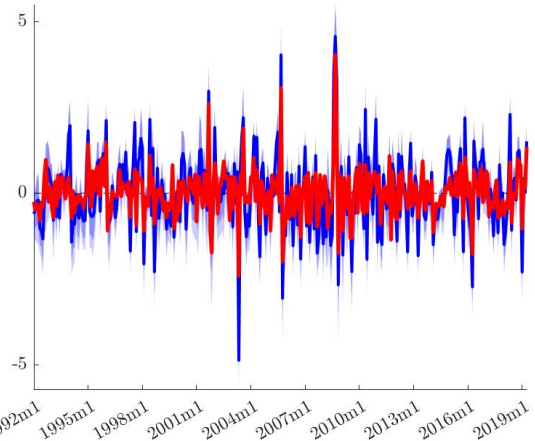
$$\mathbf{E}_t[\$_{t+1} - \$_t] = (i_t - i_t^\star) - \eta_t$$

Identify jointly shocks to U.S. monetary policy, price & quantity of risk

- Proxy variables (Jarociniski Karadi 2020, Georgiadis et al 2024)
- FEVD restrictions on EBP and macroeconomic uncertainty (Francis et al 2014)

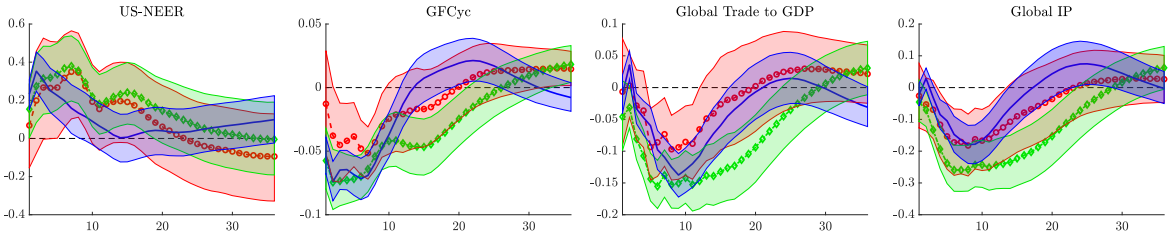
MDS vs $\widehat{MDS}$

Correlation 0.82, contribution: 1/3 U.S. MP, 2/3 Risk shocks



Common pattern in global transmission of $-appreciation

Global risk aversion, global uncertainty, and U.S. monetary policy shock



3. Trinity model: $-dominance along 3 dimensions

Two-country model of world economy: U.S. and Rest of World

- Households: symmetric
- Monetary policy: symmetric
- Firms / multi-layered production structure: different bc of DCP **($-dominance I)**

Financial intermediaries / banks: different

- DCD: international debt/credit intermediated in dollar **($-dominance II)**
- DCA: U.S. assets (treasuries) particularly safe and liquid **($-dominance III)**

Financial intermediaries in RoW

Balance sheet reflects DCD ($-dominance II)

$$Q_{R,t}K_{R,t} + RER_t Treas_{R,t} = D_{R,t} + RER_t \$Credit_{R,t} + N_{R,t}$$

Value of bank and (regulatory) constraint reflect DCA ($-dominance III)

$$\begin{aligned} V_{R,t} &= \max \mathbb{E}_t \sum_{s=0}^{\infty} (1-\theta_B)\Theta_{R,t,t+s} N_{R,t+1+s} \\ V_{R,t} &\geq \delta_{R,t}(Q_{R,t}K_{R,t} + \Gamma_R^{Treas} RER_t Treas_{R,t}) \\ \delta_{R,t} &= \overline{\delta}_R \left[1 - \kappa_1 \alpha_{R,t}^{Treas} + \kappa_2 \left(\alpha_{R,t}^{Treas} - \ell_{R,t}^{\$Credit}\right)^2\right] + \epsilon_t \end{aligned}$$

where ϵ_t global risk aversion shock

Financial intermediaries in U.S.

Balance sheet different: only domestic funding

$$Q_{U,t}K_{U,t} + \$Credit_{U,t} = D_{U,t} + N_{U,t},$$

Value of bank and (regulatory) constraint

$$\begin{aligned} V_{U,t} &\geq \delta_{U,t}(Q_{U,t}K_{U,t} + \Gamma_{U,t}^{\$Credit}\$Credit_{U,t}), \text{ with } \delta_{U,t} = \overline{\delta}_U + \epsilon_t \\ \Gamma_{U,t}^{\$Credit} &= \bar{\Gamma}_U^{\$Credit} + \Phi_{U,\phi}\frac{Q_{R,t}K_{R,t} + RER_t Treas_{R,t}}{N_{R,t}} \end{aligned}$$

Risk weight on cross-border loans adjusts with leverage of RoW banks

- Global financial accelerator

Convenience yield on treasuries drives wedge in UIP

Uncovered interest rate parity (assuming $\Gamma_R^{Treas} = 0$)

$$\underbrace{\mathbf{E}_t\left[\Omega_{R,t,t+1}\left(D\mathcal{E}_{t+1}R_{U,t}^{Treas} - R_{R,t}\right)\right]}_{\text{excess return on \$<0 in steady state}} + CY_{R,t} = 0$$

Convenience yield

$$CY_{R,t} = \underbrace{-\frac{\partial\delta_{R,t}/\partial\alpha_{R,t}^{Treas}}{\delta_{R,t}}}_{\text{Freed up leverage} >> 0} \cdot \underbrace{(1-\alpha_{R,t}^{Treas})E_t\left[\Omega_{R,t,t+1}\left(R_{R,t+1}^K - R_{R,t}^D\right)\right]}_{\text{Returns from freed up leverage}}$$

4. Quantitative analysis

Calibration strategy

- Set most parameters in line with literature + BoP moments
- Pin down trinity parameters by targeting key facts in steady state

Moment	Value	Source
US-RoW export DCP shares	0.97, 0.93	Boz et al 2022
Intra RoW exports DCP share	0.37	Boz et al 2022
Exorbitant privilege	1%	Bertaux et al 2024
Treasury convenience yield	1.5%	Jiang et al 2021
US Foreign-Liabilities/GDP	86%	sample average
RoW-Bank $-Liabilities/Total Assets	25%	Aldasoro et al 2021
RoW-Bank $-Assets/Total Assets	15%	Adrian Xie 2020

Model assessment I: exchange rate moments

Not targeted in calibration

		Trinity Model			W/o trinity (all shocks)			
	Data	Risk	US MP	All shocks	No Trinity	DCP	DCD	DCA
			Exchange rate disconnect					
$\rho(\Delta\mathcal{E})$	≈ 0	-0.08	-0.10	-0.09	0.41	0.39	-0.08	-0.11
$\sigma(\Delta\mathcal{E})/\sigma(\Delta Z_R)$	5.93	7.42	13.33	8.00	0.46	0.45	1.65	8.67
			Backus-Smith and forward premium					
$corr(\Delta RER, \Delta C_F - \Delta C_U)$	-0.1	-0.81	-0.55	-0.75	0.17	0.17	0.11	0.24
Fama β	< 0	-2.86	2.22	-1.16	1.00	1.00	0.97	0.62
Fama R^2	0.00	0.05	0.06	0.01	0.46	0.45	0.07	0.05
$\sigma(R_R - R_U)/\sigma(\Delta\mathcal{E})$	0.03	0.04	0.09	0.05	0.15	0.14	0.17	0.25

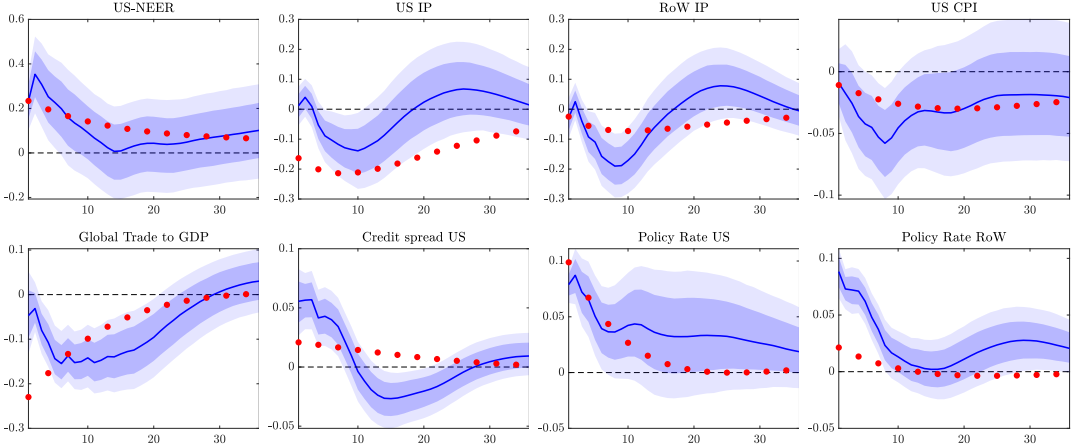
Model assessment II: the dollar and the cycles

Not targeted in calibration

		Trinity Model			W/o trinity (all shocks)			
	Data	Risk	US MP	All Shocks	No Trinity	DCP	DCD	DCA
			Correlation of Global Cycles					
$corr(\Delta Z_G, \Delta GFCyc)$	0.71	0.49	0.60	0.50	0.42	0.39	0.27	0.47
$corr(\Delta Z_G, \Delta T_G^G/Z_G)$	0.80	0.60	0.62	0.60	-0.95	-0.39	0.02	-0.77
$corr(\Delta GFCyc, \Delta T_G^G/Z_G)$	0.62	0.99	1.00	0.98	-0.54	-0.93	-0.02	-0.51
			Correlation of Global Cycles and Dollar					
$corr(\Delta \mathcal{E}, \Delta GFCyc)$	-0.47	-0.93	-0.95	-0.92	0.62	0.67	0.38	-0.78
$corr(\Delta \mathcal{E}, \Delta Z_G)$	-0.49	-0.76	-0.78	-0.76	-0.01	-0.05	0.03	-0.62
$corr(\Delta \mathcal{E}, \Delta T_G^G/Z_G)$	-0.49	-0.97	-0.96	-0.97	-0.16	-0.78	0.76	0.45

Effect of U.S. monetary policy shock: trinity v VAR

Not targeted in calibration



Effect of global aversion risk shock: trinity v VAR

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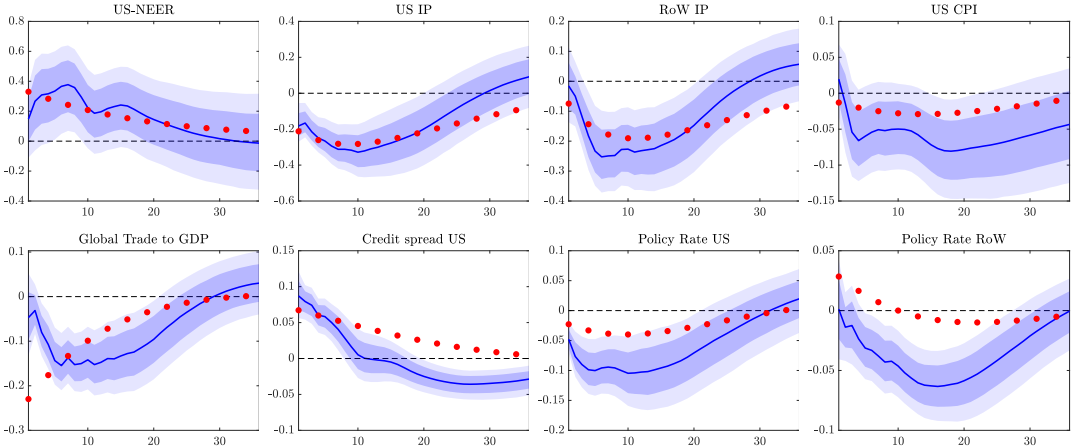
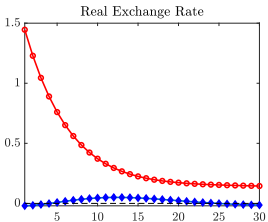
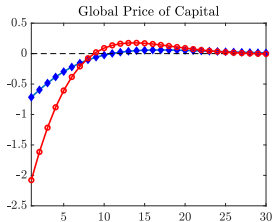
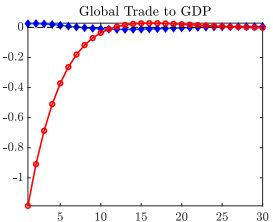


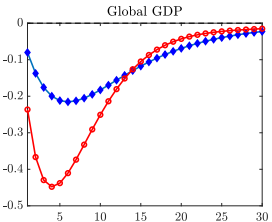
5. Understanding trinity

Responses to global risk aversion shock in **trinity model** and nested **no-trinity counterfactual**









Overall effect of trinity and decomposition

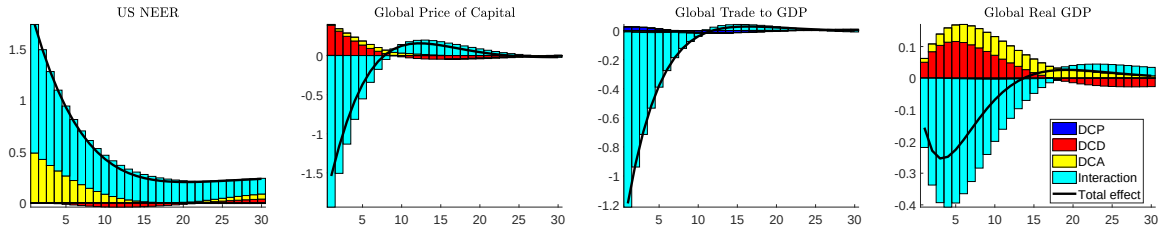
Global risk aversion shock w/o trinity

- Dollar does not appreciate
- No contraction of trade cycle, contraction global and financial cycle much weaker

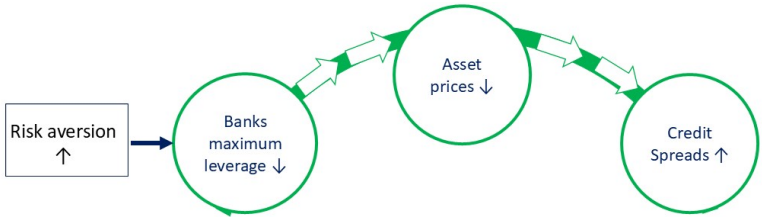
Decomposition

$$\underbrace{\theta^{\text{Trinity}}_{\eta_t^{\delta_G}} - \theta^{\text{CF}}_{\eta_t^{\delta_G}}}_{\text{Total Effect}} = \underbrace{(\theta^{+\text{DCP}}_{\eta_t^{\delta_G}} - \theta^{\text{CF}}_{\eta_t^{\delta_G}})}_{\text{DCP Effect}} + \underbrace{(\theta^{+\text{DCD}}_{\eta_t^{\delta_G}} - \theta^{\text{CF}}_{\eta_t^{\delta_G}})}_{\text{DCD Effect}} + \underbrace{(\theta^{+\text{DCA}}_{\eta_t^{\delta_G}} - \theta^{\text{CF}}_{\eta_t^{\delta_G}})}_{\text{DCA Effect}} + \underbrace{\mathcal{I}}_{\text{Interaction}}$$

Decomposing effect of global risk aversion shock: interaction dominates



The global transmission mechanism in the trinity model



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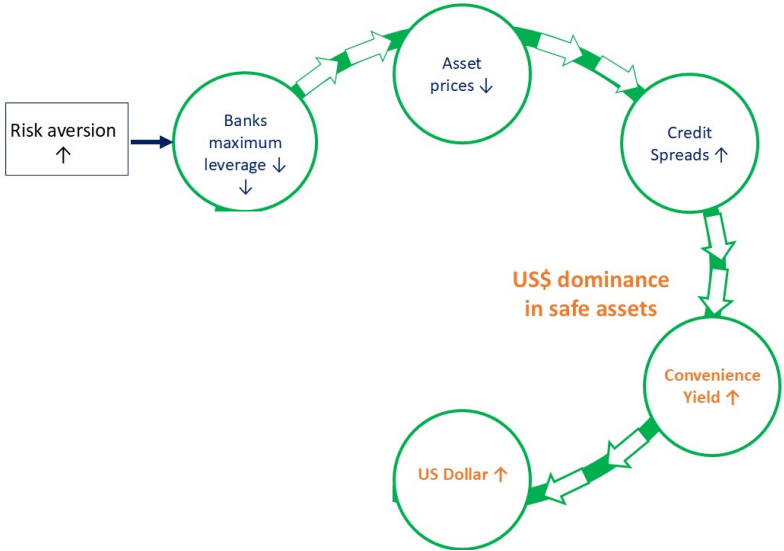

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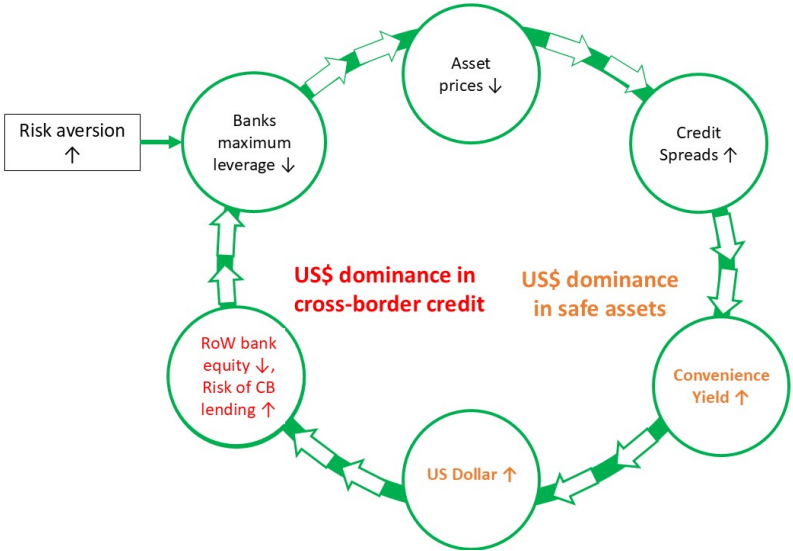

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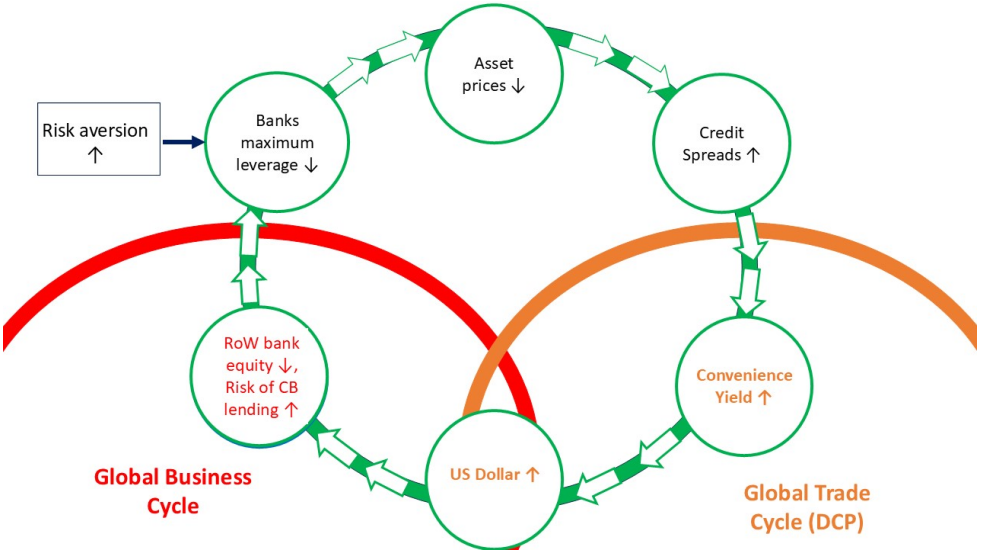


6. Conclusion

Dollar moves . . .

- Not only with global financial cycle
- Also w/ global business cycle and global trade cycle

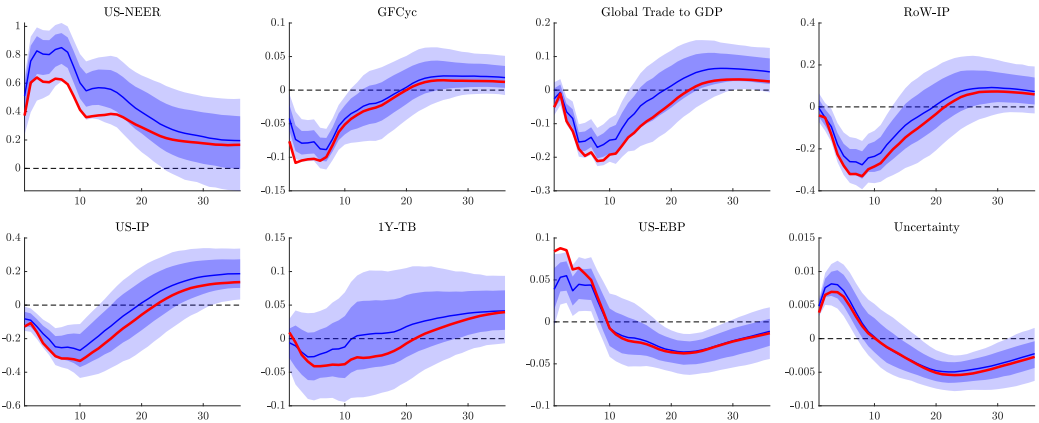
Dollar (trinity) causal for co-movement

- Shapes transmission of global risk shocks and U.S. monetary policy
- More than sum of parts (DCD, DCA, DCP): interaction effect dominates
- $-appreciation amplifies credit & trade contraction, and convenience yield

Additional material

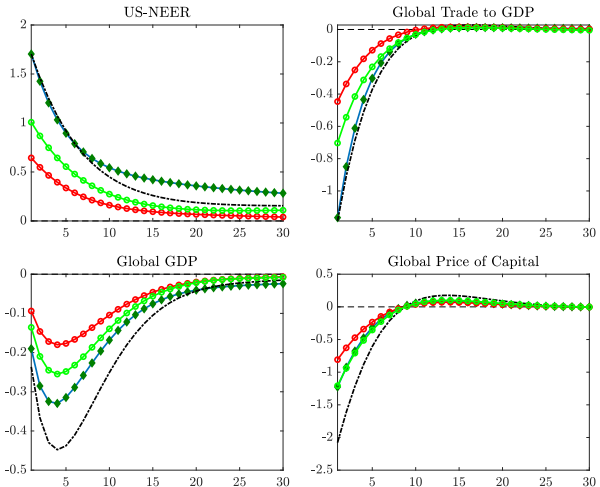
Effect of MDS v fitted value (IRF space)

$R^2 = 0.8$, contribution: 1/3 U.S. MP, 2/3 Risk shocks



Common pattern in global transmission of $-appreciation **w/ trinity**

Global risk aversion, US MP and **local RoW (US) risk aversion** shock



Common pattern in global transmission of $-appreciation **w/o trinity**

Global risk aversion, US MP and **local RoW (US) risk aversion** shock