The Global Transmission of U.S. Monetary Policy

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3rd Annual Meeting of CEBRA's International Finance and Macroeconomics Program
5 December 2019, Ciudad de México

Spillovers from US Monetary Policy?

How Does U.S. MP Affect the Rest of the World?

- ▶ **Demand Channel** – demand-augmenting effect
- ▶ **Exchange Rate Channel** – expenditure-switching effect
- ▶ **Financial Channels** – 'risk taking' channel, 'credit' channel

Implications:

- ▶ **Dilemma vs Trilemma** / Monetary Sovereignty
- ▶ Global Financial Cycle
- ▶ **Policy spillovers** / Policy Coordinations / Currencies Wars

Important question ... yet **limited empirical literature!**

What do we know?

Paper	Countries	Identification	CPI	IP/GDP	Short-term rates
Dedola et al. (2018)	18 EME, 18 AE	Sign restriction	−	−	AE: −; EME: mixed
Iacoviello, Navarro (2019)	50 countries	Cholesky	na	−	+
Kim (2001)	G7	Cholesky	insign.	−	+
Canova (2005)	Latin America	Sign restriction	+	mixed	+
Mackowiak (2007)	EME	Sign restriction	+	mixed	+
Miniane, Rogers (2007)	26 countries	Zero restrictions	−∗	−	+
Di Giovanni, Shambaugh (2008)	IFS countries	none	na	− for peggers	na
Bluedorn, Bowdler (2011)	AE	Romer and Romer	−∗	−∗	+
Akinci (2013)	6/10 EME	panel VAR + Cholesky	na	−∗	na
Rey (2015)	UK, CAN, SWE, NZ	IV SVAR	mixed	mixed	mixed
Passari, Rey (2015)	UK	IV SVAR	insign.	insign.	insign.
Georgiadis (2016)	EME and AE	Sign restriction	na	−	na
Bhattarai et al. (2017)	15 EME	Cholesky	insign.	−	+
Vicondoa (2019)	13 EME	Cholesky	+	−	+
Miranda-Agrippino, Rey (2019)	US, EU, UK	IV SVAR	−	−	−

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Challenges to Measuring US MP Global Spillovers

Bernanke, Mundell-Fleming Lecture (2015)

1. **Policy actions** are a **signal** about **US and global fundamentals**

2. **Large heterogeneity across countries** both in terms of **cyclical position**, financial markets conditions and **'structural features'**

3. Need of high frequency **data on leverage, risk appetite, capital flows, ...**

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Challenges to Measuring US MP Global Spillovers

Our Approach

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   $\implies$ **High Frequency Identification** for **conventional MP shocks** ...
   $\implies$ ... **robust to signalling effects** of MP actions

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   - $\Longrightarrow$ **Rich monthly dataset** of **15 ADV** and **15 EME**
   - $\Longrightarrow$ Efficient big data techniques with **bilateral Large BVARs**
   - $\Longrightarrow$ Global macro and financial aggregates

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   - $\implies$ **Bayesian Local Projections** and direct study of asymmetries

Our Results

- ▶ Strong **nominal effects** and **real effects**

- ▶ Global response of **capital flows** and **risk appetite**

- ▶ Oil and commodities play an important role in CPI movements

- ▶ Some evidence on **capital controls** and **exchange rate regimes**

Related Literature

▷ **HF Identification MP Shocks:** Rudebush (1989), Kuttner (2001), Gürkaynak et al (2005), Gertler and Karadi (2015), Caldara and Herbst (2016), Jarociński and Karadi (2018), Cieslak and Schrimpf (2018), Andrade and Ferroni (2016), Miranda-Agrippino and Ricco (2015)

▷ **Global Effects US MP:** Kim (2001), Canova (2005), Mackowiak (2007), Miniane, Rogers (2007), Di Giovanni, Shambaugh (2008), Bluedorn, Bowdler (2011), Akinci (2013), Miranda-Agrippino, Rey (2019), Rey (2015, 2016), Passari, Georgiadis (2016), Bhattarai et al. (2017), Gerko and Rey (2017), Stravakeva and Tang (2018), Dedola et al. (2018), Iacoviello, Navarro (2019), Vicondoa (2019), Gilchrist et al. (2019), Kalemli-Özcan (2019)

▷ **Spillovers through Banks:** Correa and Murry (2009), Cetorelli and Goldberg (2012), Temesvary et al. (2017), Correa et al. (2015), Buch et al. (2018), International Banking Research Network (IBRN)

▷ **Dominant Currency:** Gourinchas and Rey (2007), Rey (2015), Bernanke (2015), Casas et al. (2017), Gourinchas et al (2017)

The Identification of US MP Shocks

The HFI of Monetary Policy Shocks
Kuttner (2001), Sack (2004), Gürkaynak, Sack, Swanson (2005)

- ▶ Interest rates futures for agents' expectations

$$p_t^{(h)} = \mathbb{E}_t\left(i_{t+h}\right) + \zeta_t^{(h)}$$

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- Revision in **30 min window** price around **announcements**

SSF Dec1999 [M0]

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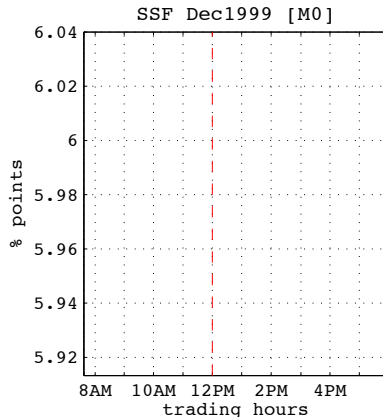
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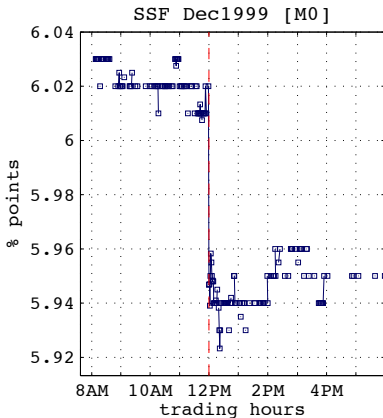
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▶ Revision in **30 min window** price around **announcements**
$\implies$ **MP surprise**
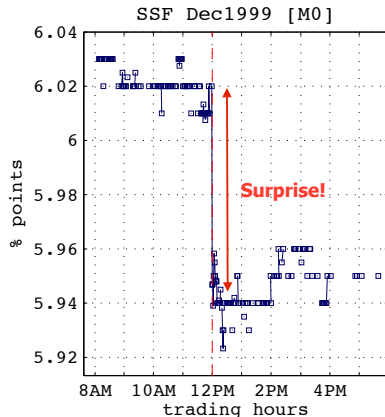
SSF Dec1999 [M0]

Surprise!

% points

trading hours

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Kuttner (2001), Sack (2004), Gürkaynak, Sack, Swanson (2005)

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$$p_t^{(h)} = \mathbb{E}_t\left(i_{t+h}\right) + \zeta_t^{(h)}$$

- Revision in **30 min window** price around **announcements**
- Information or MP shock?

SSF Dec1999 [M0]

Surprise!

The HFI of Monetary Policy Shocks
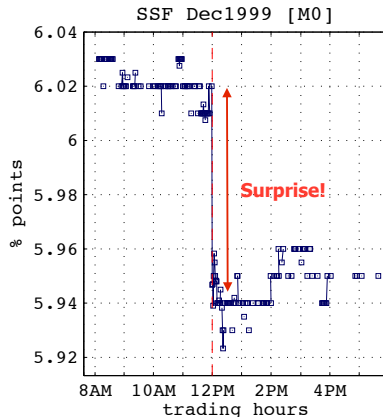
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▶ Information or MP shock?
Interest rate hike

- ▶ **MP shock**
  $\Longrightarrow$ lower output and inflation
- ▶ **Endogenous reaction** to demand shocks
  $\Longrightarrow$ higher output and inflation

SSF Dec1999 [M0]
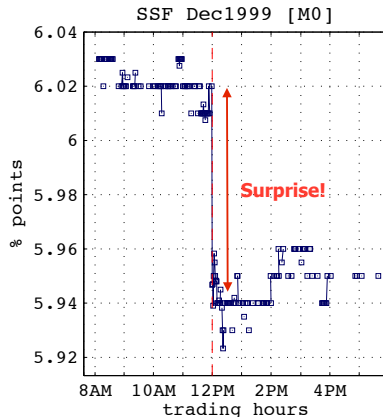
An Informationally Robust HFI

Miranda-Agrippino and Ricco (2018)

1. Control at FOMC frequency for Fed's Forecasts $\implies$ **Signaling Channel**

$$FF4_m = \alpha_0 + \sum_{j=-1}^{3} \theta_j F_t^{cb} x_{q+j} + \sum_{j=-1}^{2} \vartheta_j \left[F_t^{cb} x_{q+j} - F_{t-1}^{cb} x_{q+j} \right] + MPI_m$$

An Informationally Robust HFI

Miranda-Agrippino and Ricco (2018)

2. Monthly aggregation

$$\overline{MPI}_t = \sum_{m \in t} MPI_m$$

An Informationally Robust HFI

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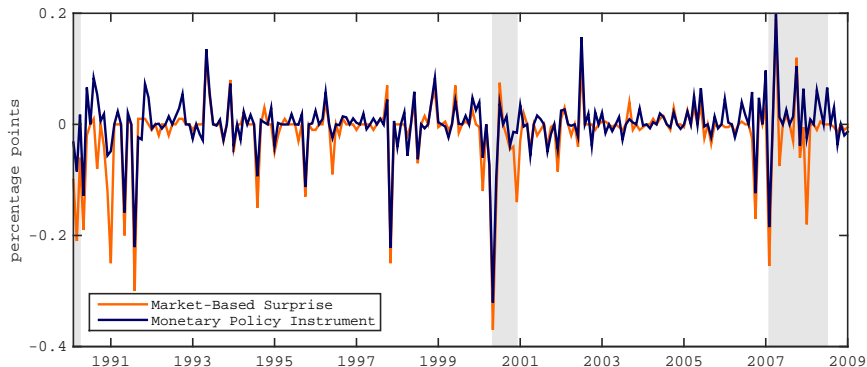
Global Spillovers

Large Bayesian VARs

- ► Large **Bayesian VAR(12)**
  - ► 27 variables in global VAR
  - ► **Estimation Sample:** $\sim$ 1990-2018
    Instrument: 1990:2009
- ► **IV-SVAR** (Stock and Watson 2012, 2018, Mertens and Ravn 2013)

- ► **Standard macro priors** (Normal-Inverse-Wishart)

- ► **Asymmetric priors:** US monetary policy only respond to US variables
  (Carriero et al, 2019; Chan, 2019)

- ► **Optimal prior selection** (Giannone, Lenza, Primiceri, 2015)

Domestic Effects of U.S. Monetary Policy
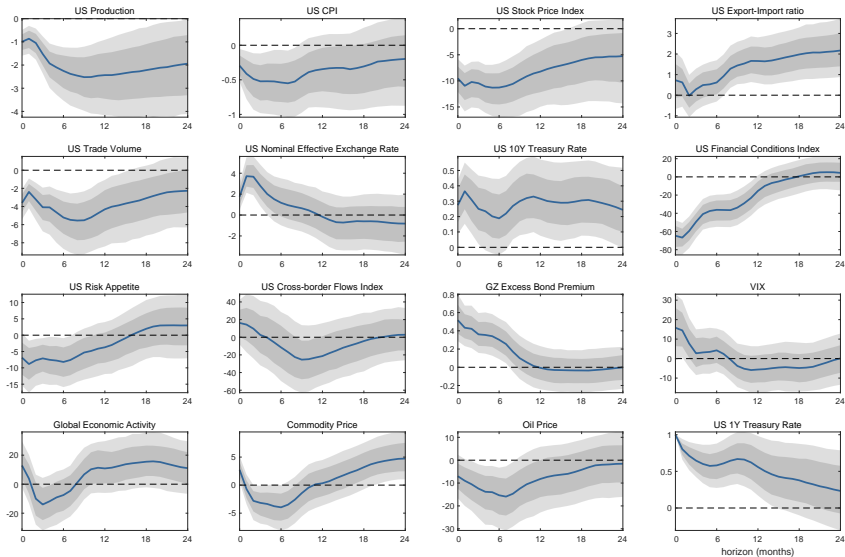
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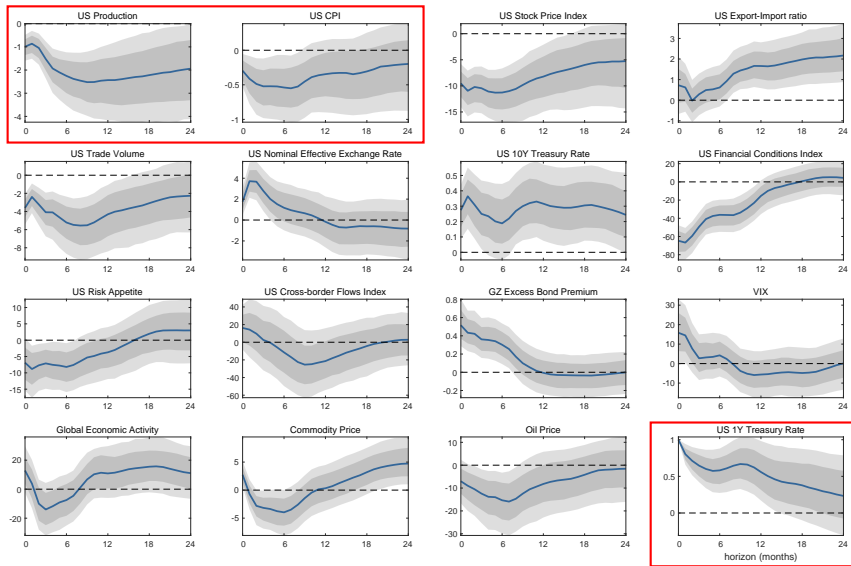
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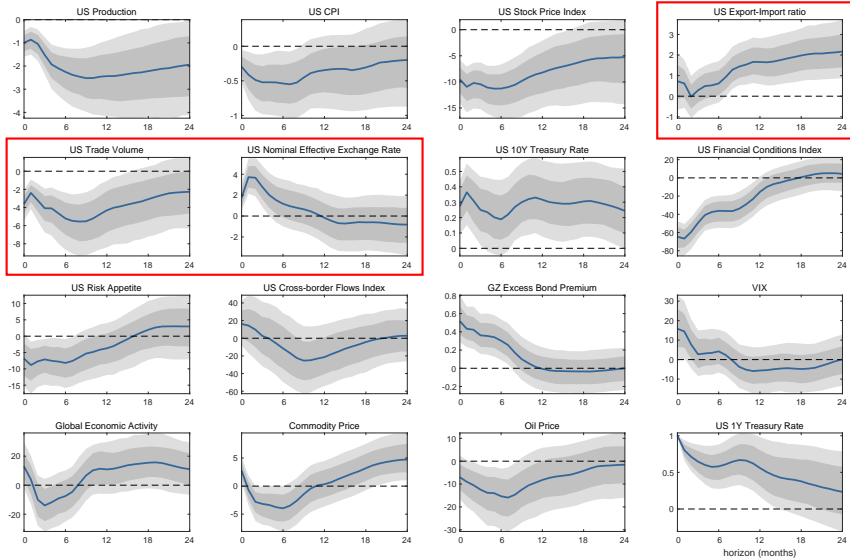
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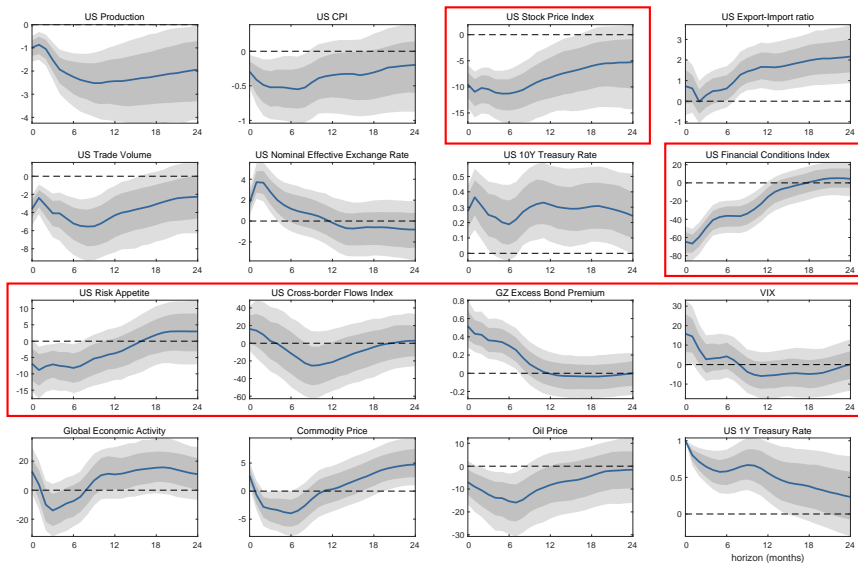
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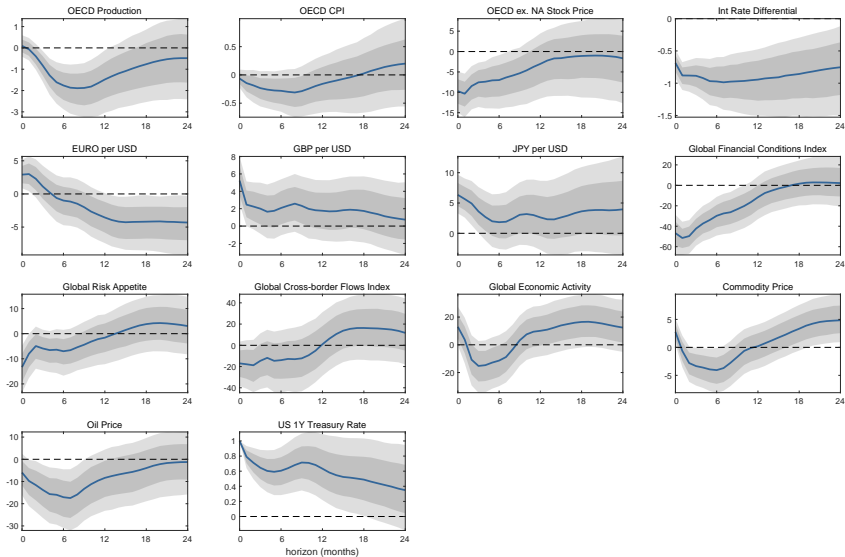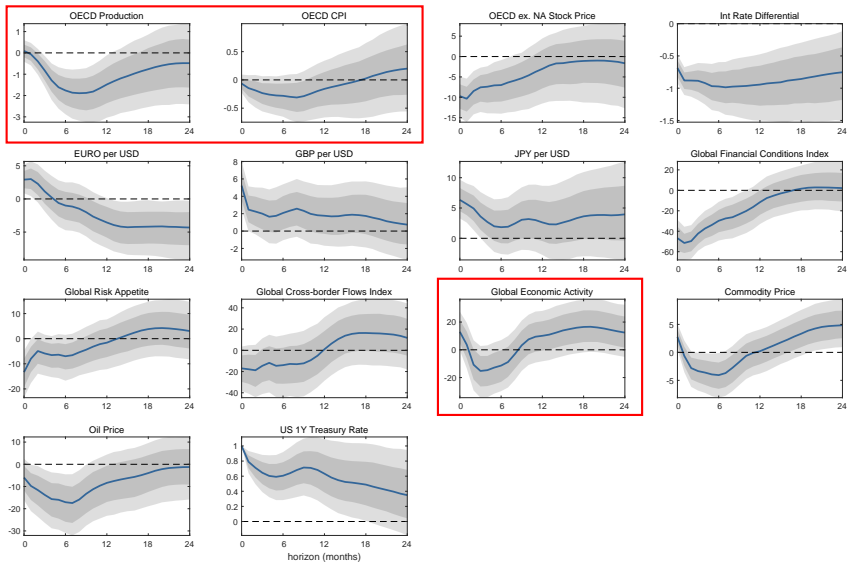
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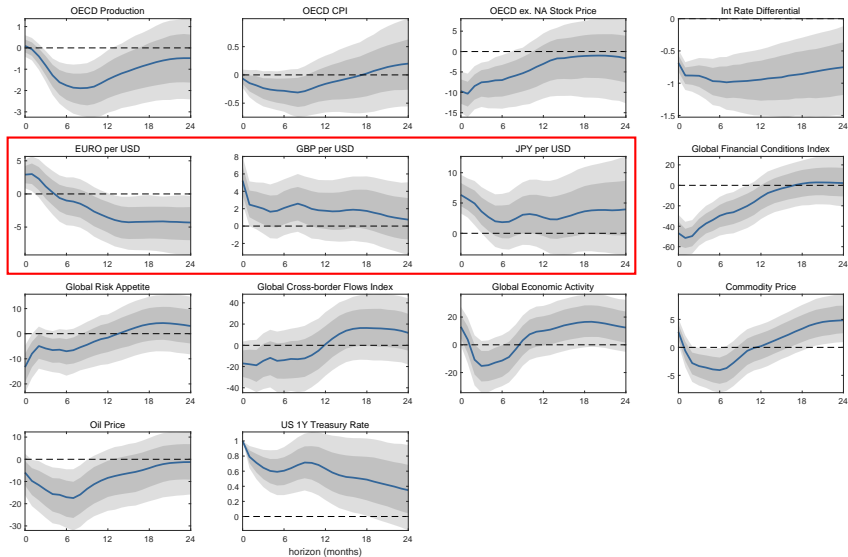
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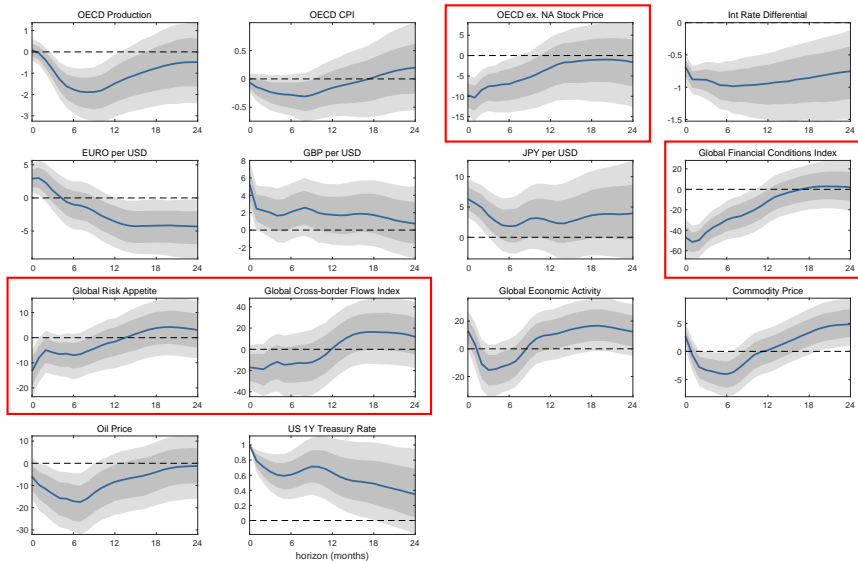
Global Spillovers

Global Spillovers

Channels of Transmission

Advanced Economies

Bilateral VARs

$$Y_{it} = c_i + \sum_{j=1}^{p} A_{ij} Y_{i,t-j} + u_{it}, \quad p = 12$$

$$Y_{it} = \begin{bmatrix} y_{i,t} \\ y_{US,t} \\ x_t \end{bmatrix}, \quad y_{i,t} = \begin{bmatrix} IP_{i,t} \\ CPI_{i,t} \\ \vdots \end{bmatrix}, \quad x_t = \begin{bmatrix} POIL_t \\ GEAI_t \end{bmatrix}$$

Bilateral VAR for country *i*:

- ▶ **Asymmetric Normal-Inverse Wishart priors** – i.e. no 'spillback'
- ▶ **Optimal prior selection** (Giannone et al, 2015)
- ▶ **IV-SVAR** identification
- ▶ **15 Advanced Economies**/ (15 Emerging Economies)
- ▶ Aggregation into **Median Economy** response

Countries and Data Coverage

Countries	Data coverage
Australia	Jan 1990 - Aug 2018
Austria	Jan 1990 - Aug 2018
Belgium	Jan 1990 - Aug 2018
Canada	Jan 1990 - Aug 2018
Denmark	Jan 1990 - Aug 2018
Finland	Jan 1990 - Aug 2018
France	Jan 1990 - Aug 2018
Germany	Jan 1990 - Aug 2018
Italy	Jan 1990 - Aug 2018
Japan	Jan 1990 - Aug 2018
Netherlands	Jan 1990 - Aug 2018
Norway	Jan 1990 - Aug 2018
Spain	Jan 1990 - Aug 2018
Sweden	Jan 1990 - Aug 2018
UK	Jan 1990 - Aug 2018

Median Advanced Economy
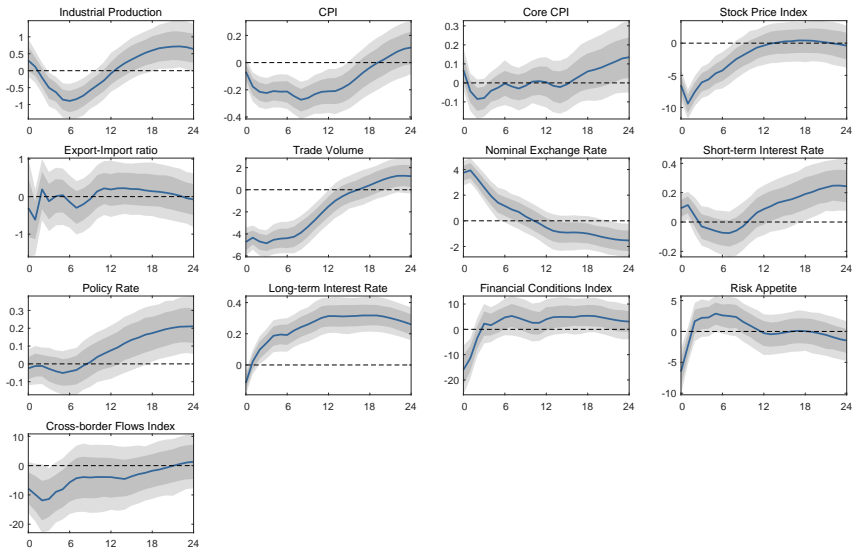
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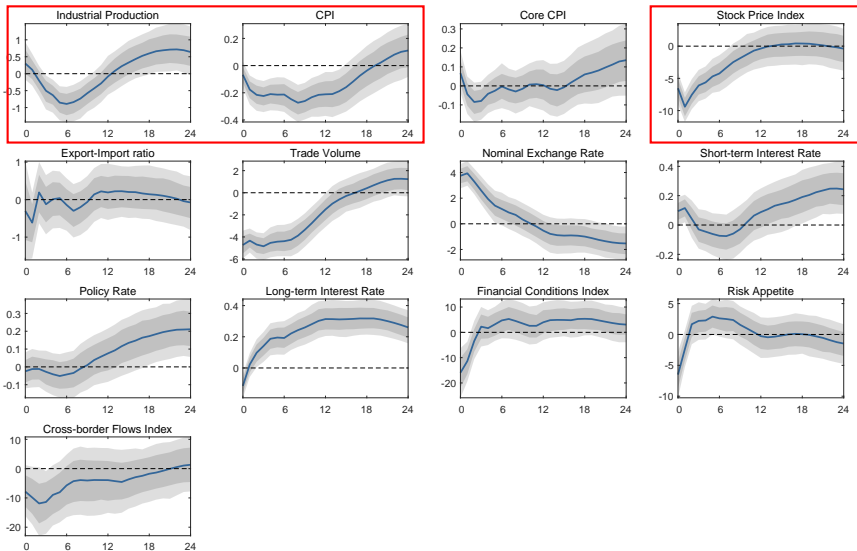
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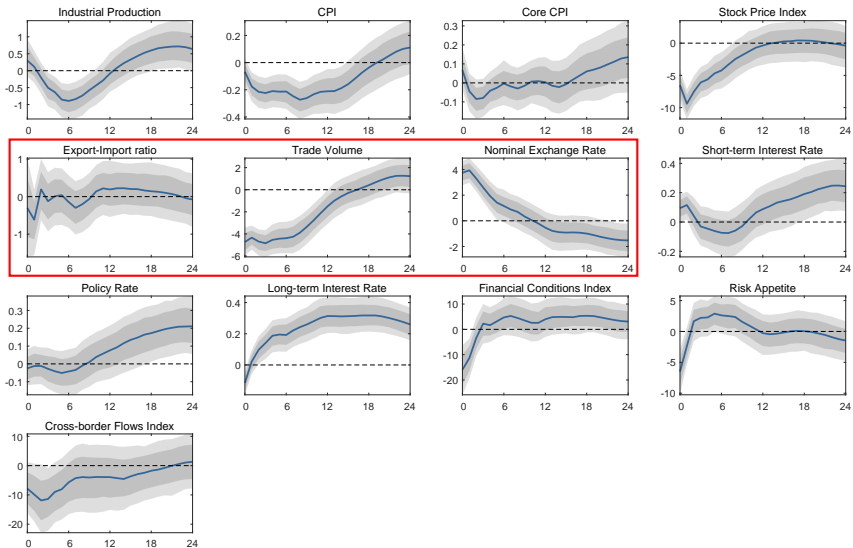
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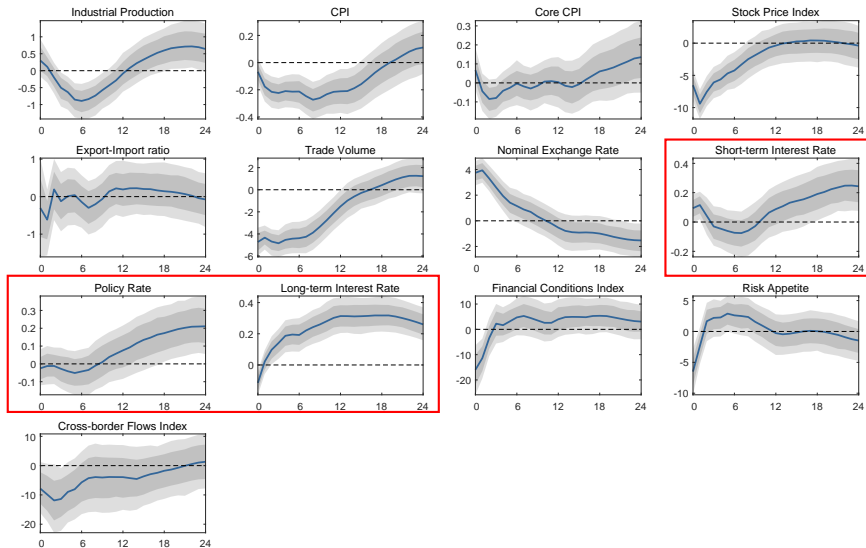
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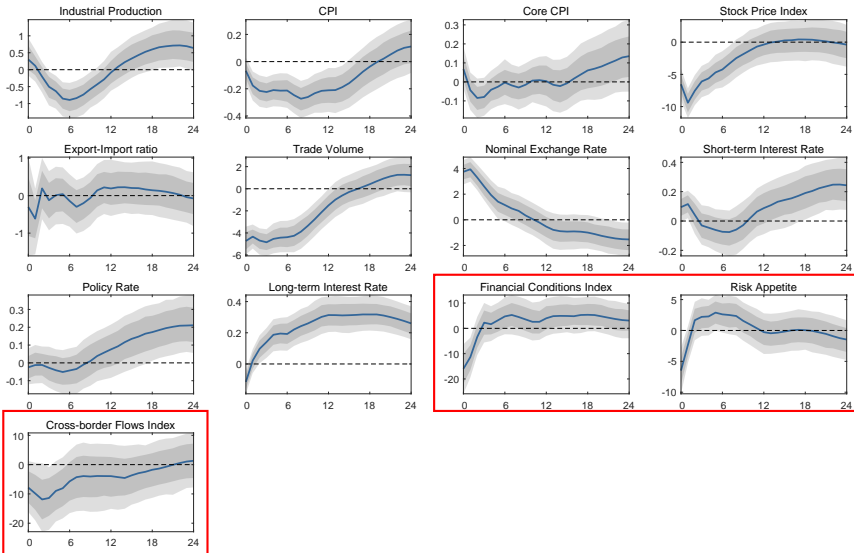
Individual Countries – CPI
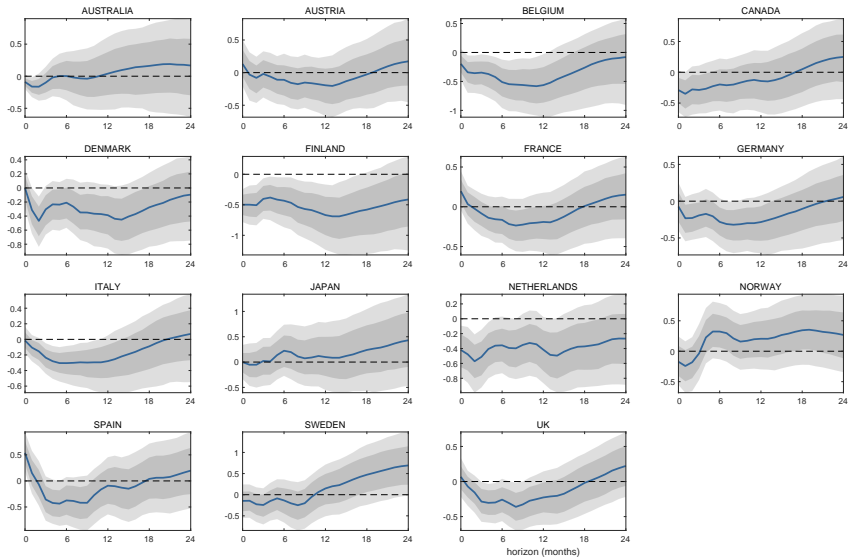
Individual Countries – Cross-border Flows

Channels of Transmission

Industrial Production · CPI · Stock Price Index

Legend:
— No Policy action
- - - No Oil Price
-·-·- No Exchange Rates
······ No Credit (CBC, VIX, EBP)
— baseline
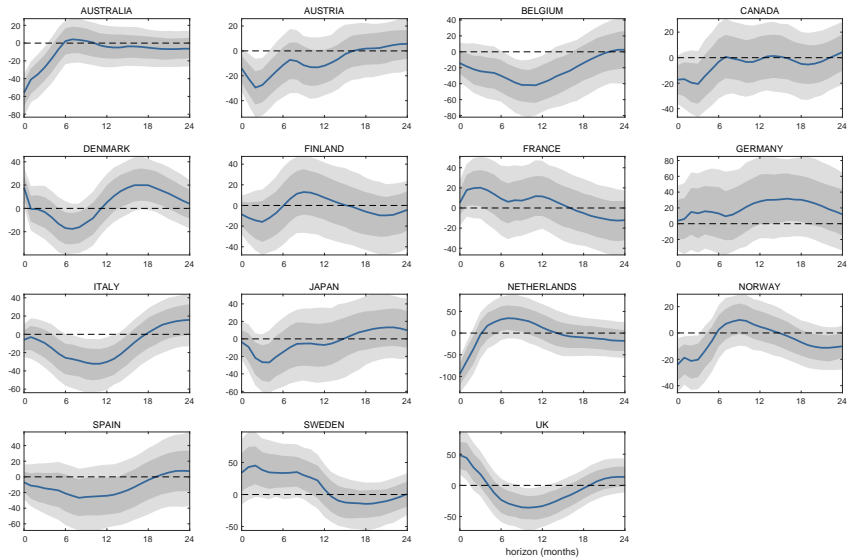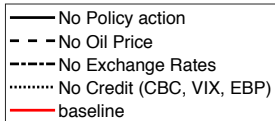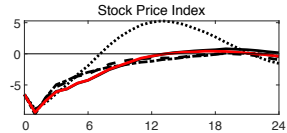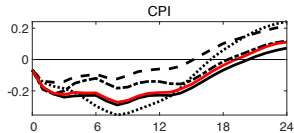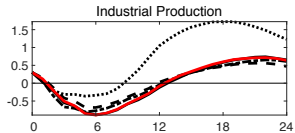
Emerging Economies

Countries and Data Coverage

Country	Data coverage w/ Core CPI	Data coverage w/o Core CPI
Brazil	Dec 1999 - Aug 2018	Dec 1999 - Aug 2018
Chile	May 1995 - Nov 2013	May 1995 - Nov 2013
China		Aug 1994 - Aug 2018
Colombia	Sep 2002 - Aug 2018	Sep 2002 - Aug 2018
Czech Republic	Apr 2000 - Aug 2018	Apr 2000 - Aug 2018
Hungary	Feb 1999 - Aug 2018	Feb 1999 - Aug 2018
India		May 1994 - Apr 2018
Malaysia		Jan 1996 - Dec 2017
Mexico	Nov 1998 - Feb 2018	Nov 1998 - Feb 2018
Philippines	Jan 2000 - Feb 2018	Feb 1999 - Feb 2018
Poland	Jan 2001 - Aug 2018	Jan 2001 - Aug 2018
Russia	Jan 2003 - Jun 2018	Jan 1999 - Jun 2018
South Africa	Jan 2002 - Aug 2018	Jan 1990 - Aug 2018
Thailand	Jan 1999 - May 2018	Jan 1999 - May 2018
Turkey	Jun 2000 - Aug 2018	Jun 2000 - Aug 2018

Median Emerging Economy
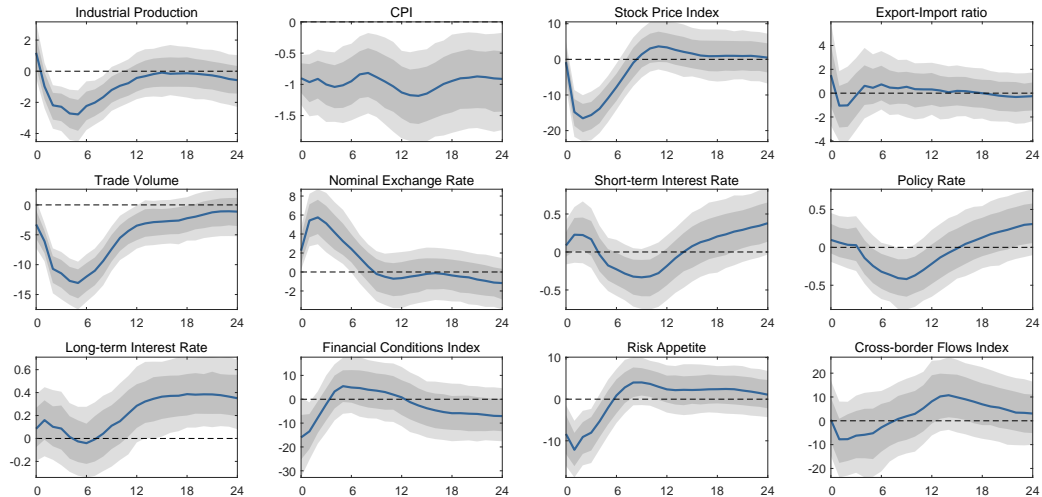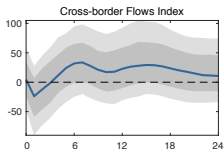
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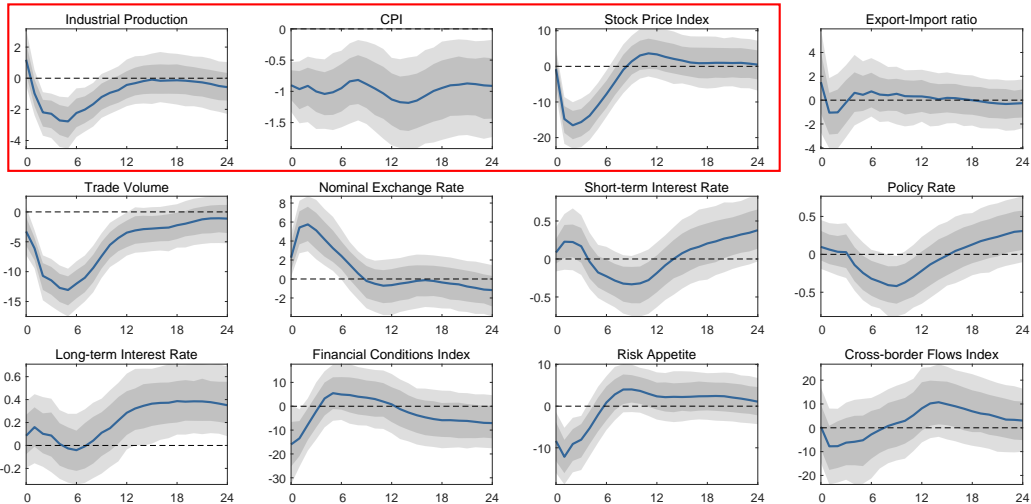
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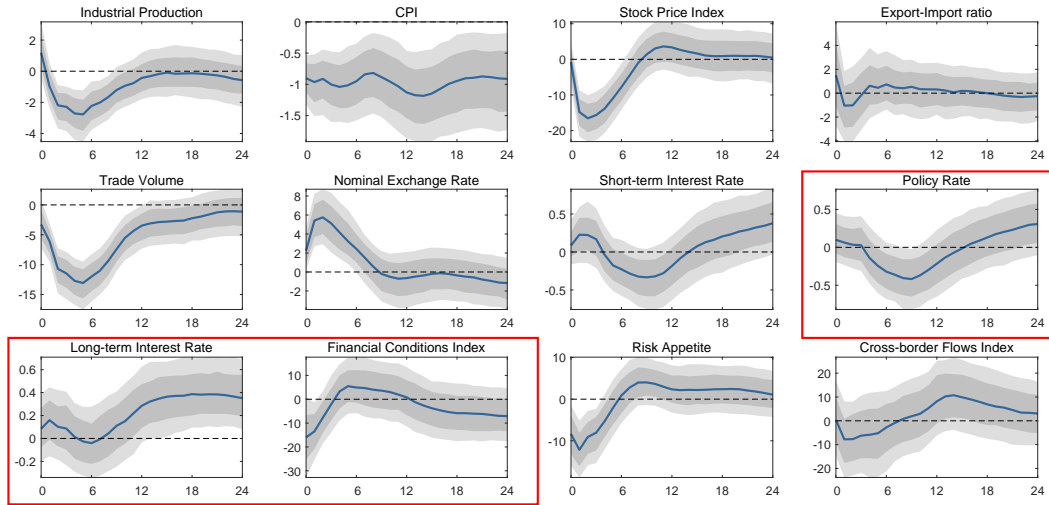
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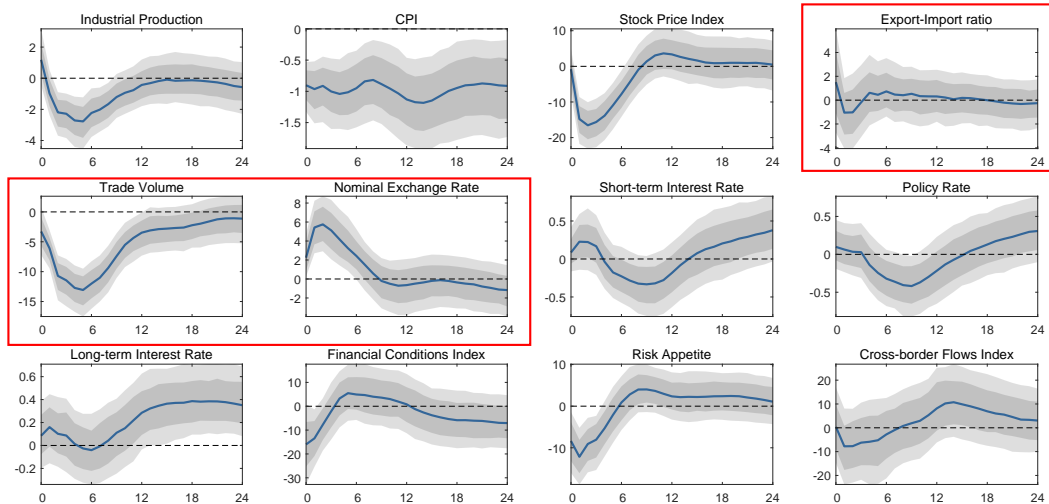
Median Emerging Economy

Channels of Transmission

Mexico

Capital Controls

Classification

	Advanced		Emerging	
	Open (Top 33%)	**Less Open** (Bottom 33%)	**Open** (Top 33%)	**Less Open** (Bottom 33%)
	CANADA	AUSTRALIA	CHILE	BRAZIL
	DENMARK	ITALY	CZECH REP.	CHINA
	GERMANY	NORWAY	HUNGARY	COLOMBIA
	NETHERLANDS	SPAIN	MALAYSIA	INDIA
	UK	SWEDEN	MEXICO	SOUTH AFRICA
Average	0.998	0.897	0.632	0.203

Relatively Financially Open vs Closed Emerging Economy

EME MoreOpen — EME LessOpen

Relatively Financially Open vs Closed Emerging Economy

Legend: EME_MoreOpen, EME_LessOpen
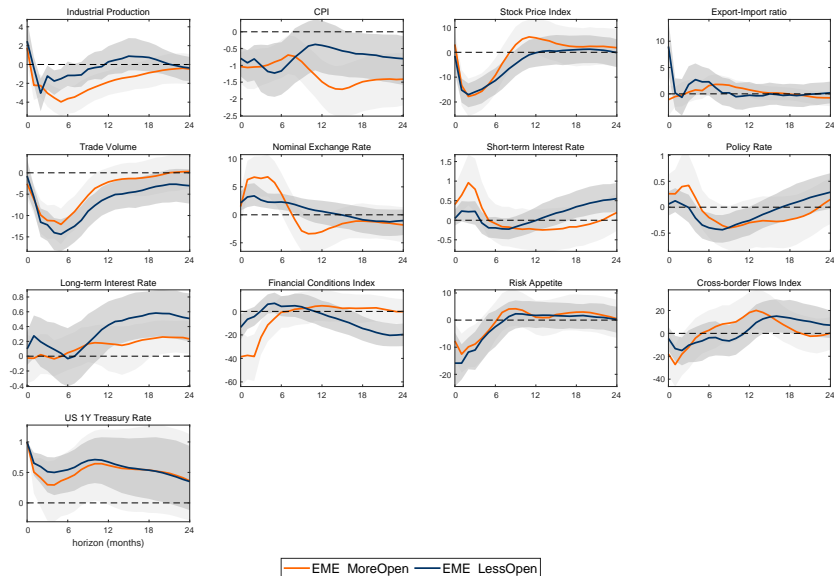
Relatively Financially Open vs Closed Advanced Economy

Relatively Financially Open vs Closed Advanced Economy

horizon (months)

ADV_MoreOpen   ADV_LessOpen
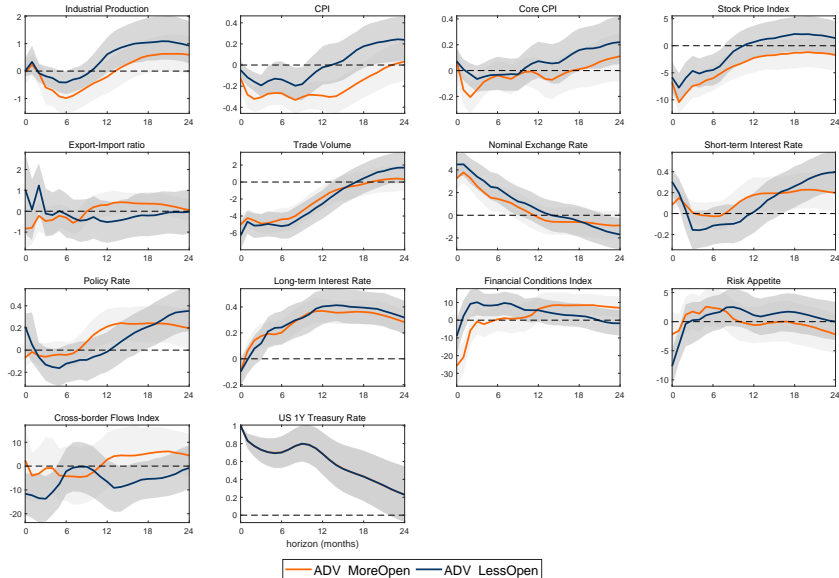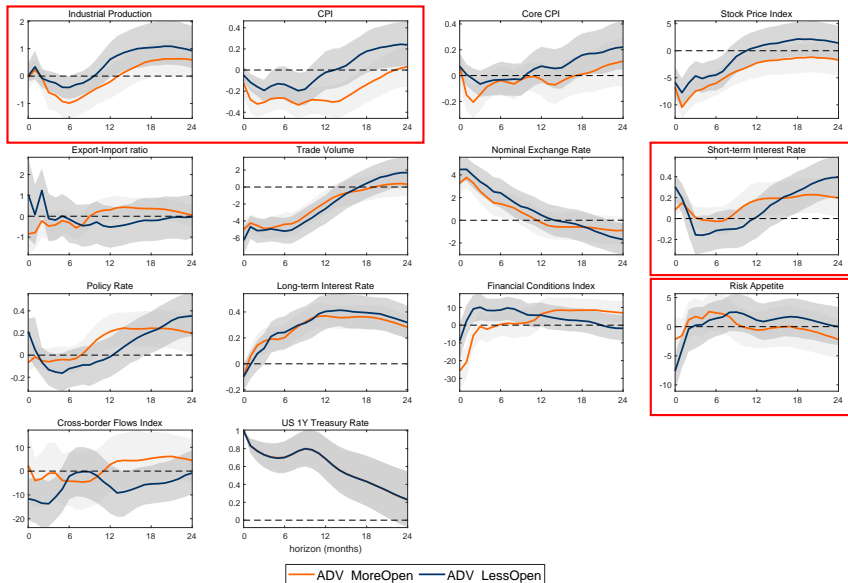
Exchange Rate Regimes

Classification

Ilzetzki-Reinhart-Rogoff (2019) Fine Classification			
Managed floaters	**Median IRR**	**Crawling pegs**	**Median IRR**
BRAZIL	12	CHINA	5
COLOMBIA	12	INDIA	7
MEXICO	12	PHILIPPINES	10
SOUTH AFRICA	12	THAILAND	11

Notes: Medians across sample period of each country. 12: +/- 5% moving band; 11: +/- 2% moving band; 10: crawling band +/- 5%; 7: de facto crawling peg; 5: pre-announced crawling peg.

Floating vs Pegging Emerging Economy
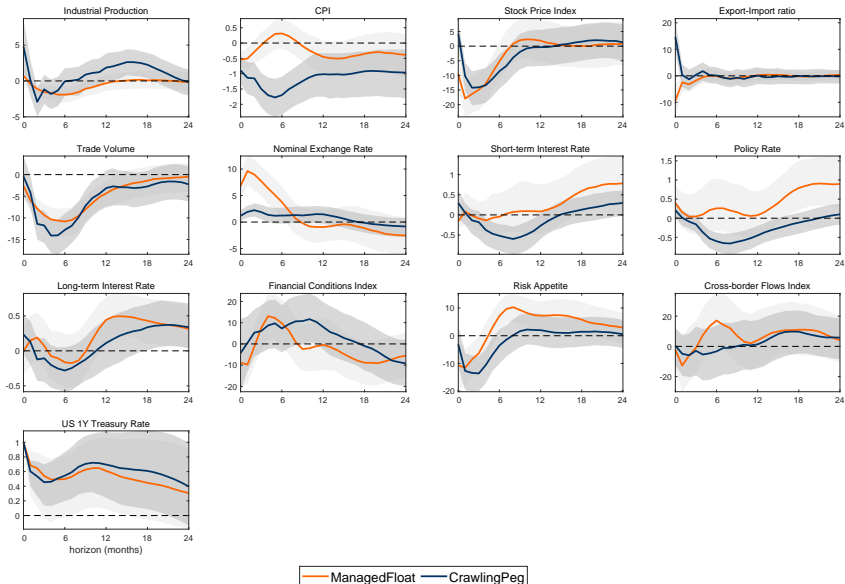
Floating vs Pegging Emerging Economy
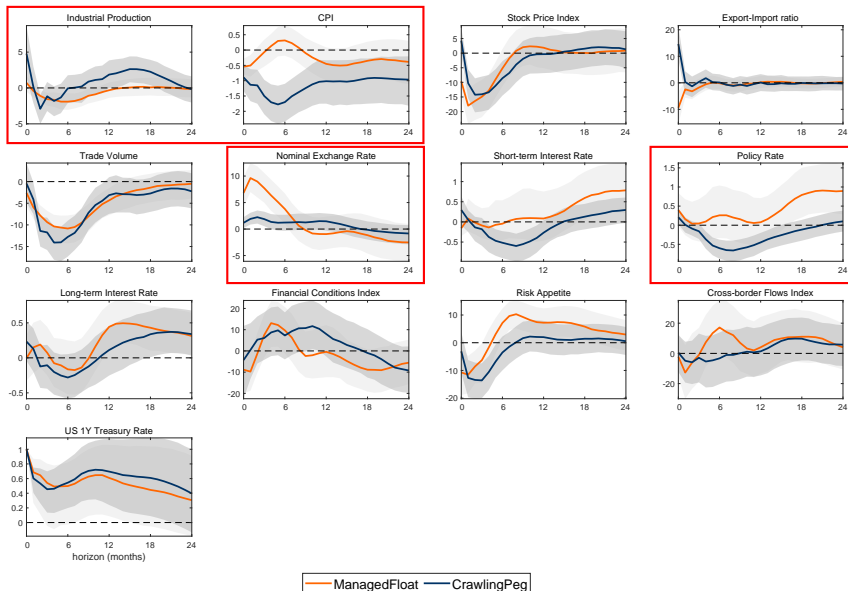
Conclusions – The Global effects of U.S. Monetary Policy

- US monetary policy has large and pervasive effects

- **Spillovers** to both **prices and real economy**

- Strong evidence of **financial channels**

- Affect both **Advanced Economies** and **Emerging Markets**

Appendix

Standardisation (z-scores)

Method is the 'standard' for Financial Stability Boards:

$$z_t = \frac{x_t - MA(x_t,\, 40)}{SD(x_t,\, entire\, period)}$$

- ▶ 40 months moving average trends
- ▶ SD over entire period to account for rare events
- ▶ Expressed in percentiles (50 is trend)

Financial Conditions Index

- AKA: Credit Spreads

- Index of very short-term credit spreads (e.g. deposit loan spreads)

- Derived from the z-scores of each sub-variable, which are equally weighted and then normalised

- Varies between 0 and 100 with 50 indicating 'neutral' relative to a 40-month MA

Back...

Policy Liquidity Index

- ► AKA: Central Bank Money

- ► Measures size of CB balance sheets and changes in their composition

- ► Derived from the z-scores of each sub-variable, which are equally weighted and then normalised

- ► Varies between 0 and 100 with 50 indicating 'neutral' relative to a 40-month MA

Back...

Cross-border Flows Index

- ► AKA: Foreign Liquidity

- ► Comprises all financial flows into a currency (incl. banking flows, bonds and equities)

- ► Estimated from national trade and current account data, foreign exchange reserve movements and (interpolated) quarterly data on net FDI flows

- ► Derived from the 'normalised' z-score of the value of cross-border flows. The resulting index varies between 0 and 100 with 50 indicating 'neutral' relative to a 40-month moving average

- ► **In the Global version, US weight is 24.81%**

Risk Appetite

- Difference between the Equity Exposure Index and the Bond Exposure Index

- **Equity Exposure Index:** AKA Equity Market Sentiment
  - Based on the balance sheet exposure of all investors (by type) in the asset class.
  - Derived from a z-score of the current portfolio share away from its 5-year trend, e.g. equity holdings as a percentage of all financial assets

- **Bond Exposure Index:** AKA Bond Market Sentiment
  - Equivalent of the equity exposure index for bonds