

Financial Shocks, Credit Spreads, and the International Credit Channel

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IAAE 2018

Montréal, 27 June 2018

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Motivation

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 - Foreign-currency denominated assets/liabilities
 - Highly integrated international financial markets

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- ▶ Monetary policy in the US affects monetary and financial conditions in the rest of the world through an **international credit channel** (Rey, 2016)
 - Credit market imperfections
 - Foreign-currency denominated assets/liabilities
 - Highly integrated international financial markets
- ▶ However...
 - Large monetary policy shocks are rare, and MP shocks typically only explain a fraction of the variation in macro variables
 - Literature still in its infancy

This paper

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 - Arguably at the core of at least two of the last three recessions in the US
 - Financial sector at the heart of the international credit channel
- ▶ Revisit the evidence of monetary policy shocks in a richer empirical model of international transmission
- ▶ Specific questions:
 1. Are financial shocks transmitted through an international credit channel?
 2. How do they compare to monetary policy shocks?
 3. Does the international credit channel matter for the international transmission of shocks?

Related literature

Approach and Preview of Results

- ▶ **Approach** Two-country structural VAR framework for the US and UK
 - Identification of monetary policy and financial shocks in the US
 - ▶ **Methodological innovation:** combine external instruments and sign restrictions approaches
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- ▶ **Main findings**

Even more than monetary policy shocks, financial shocks:

 1. Induce comovement of economic activity, credit spreads, and policy rates across countries
 2. Have significant contractionary effects on the UK

Outline

1. **Empirical model and identification strategy**
2. Set identification of financial shocks
3. International transmission of monetary and financial shocks
4. Inspecting the international transmission mechanism

Empirical framework

- ▶ Reduced-form VAR for the $n \times 1$ vector of endogenous variables y_t

$$y_t = \Phi(L) y_{t-1} + u_t$$

- ▶ Residuals (u_t) are related to the structural shocks (e_t)

$$u_t = B e_t$$

where B is the (unknown) structural impact matrix.

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- ▶ Identification strategy (novel): combine two widely used approaches
 1. External instruments
 2. Sign restrictions

Identification

- ▶ Assume without loss of generality that
 - First structural shock (e_{1t}) is identified with external instruments
 - ▶ See Mertens and Ravn (2012) and Stock and Watson (2008)
 - Remaining structural shocks (e_{2t}, \dots, e_{nt}) are identified with sign restrictions

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- ▶ Partition the structural matrix B as

$$B = \left[\begin{array}{c|c} \underbrace{b}_{n \times 1} & \underbrace{\mathcal{B}}_{n \times (n-1)} \end{array} \right]$$

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- ▶ Column vector b captures the impact of the first shock, matrix \mathcal{B} captures the impact of the remaining shocks
- ▶ We generate a large number of candidate matrices B_j that satisfy

$$B_j = [b \quad \mathcal{B}_j]$$

and keep those where a column of \mathcal{B}_j also satisfies the required sign restrictions for a financial shock

Gram-Schmidt process

A Two-country Structural VAR

- ▶ 2 countries

$$\begin{bmatrix} y_t^F \\ y_t^H \end{bmatrix} = \begin{bmatrix} \Phi_{11}(L) & \Phi_{12}(L) \\ \Phi_{21}(L) & \Phi_{22}(L) \end{bmatrix} \begin{bmatrix} y_{t-1}^F \\ y_{t-1}^H \end{bmatrix} + \begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix} \begin{bmatrix} e_t^F \\ e_t^H \end{bmatrix}$$

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- ▶ 2 countries: H is small, F is large

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- ▶ Identification of US shocks

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- ▶ B_{12} , the impact of US shocks on UK variables, can be recovered by regressing the residuals of the UK block on the structural shocks of the US block

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Set identification of Financial Shocks

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 - Credit Spread (\uparrow), GDP (\downarrow), CPI (\downarrow), Policy rate (\downarrow)
- ▶ **Solution** Pick a workhorse model with financial frictions (costly state verification) and nominal rigidities, and exploit differential responses to demand and financial shocks to achieve identification
 - Bernanke et al (1999), Christiano et al (2014)

Set Identification of Financial Shocks (cont'd)

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 - Credit spread endogenously responds in a countercyclical fashion ($x \uparrow$)
 - Sign of the response of the borrowing rate is thus a priori ambiguous ($i_B \uparrow \downarrow$)

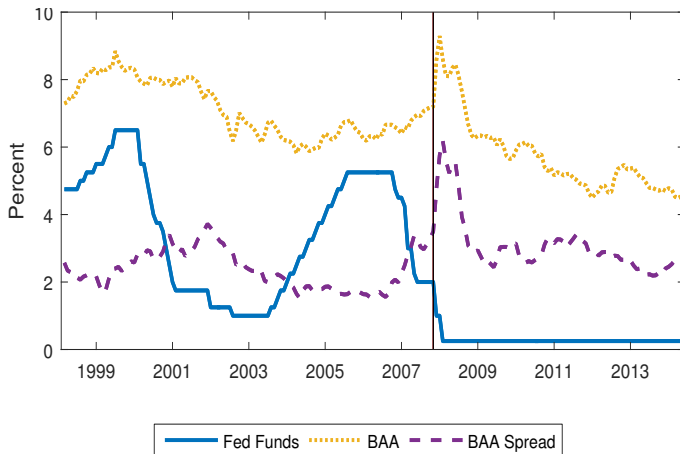
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- ▶ We exploit the ambiguous response of i_B to achieve identification

The borrowing rate, policy rate and credit spread in the data



NOTE. The chart reports the Fed Funds rate (solid line), the yield on BAA-rated corporate debt (dotted line), and its spread over a safe interest rate of the same maturity (a 10-year government bond) over the period 1999:M1 to 2015:M3. The vertical line shows 2008:M9, when Lehman brothers collapsed.

Financial shocks in a theoretical model with financial frictions

- ▶ Model: Christiano Motto and Rostagno (2014, AER) [CMR]
 - 'Modern' version of BGG (adjustment costs, capital utilization, etc,...)
 - Many financial shocks
 - Estimated with Bayesian techniques

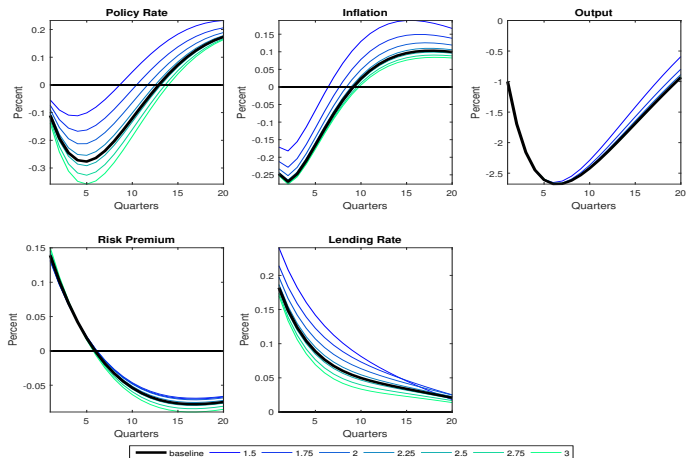
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 1. For broad class of (negative) financial shocks $\uparrow i_B$
 - ▶ External finance premium shocks, risk shocks, equity (net worth) shocks, etc...
 2. For broad class of (negative) demand shocks $\downarrow i_B$
 - ▶ Consumption preference shocks, government spending, etc...

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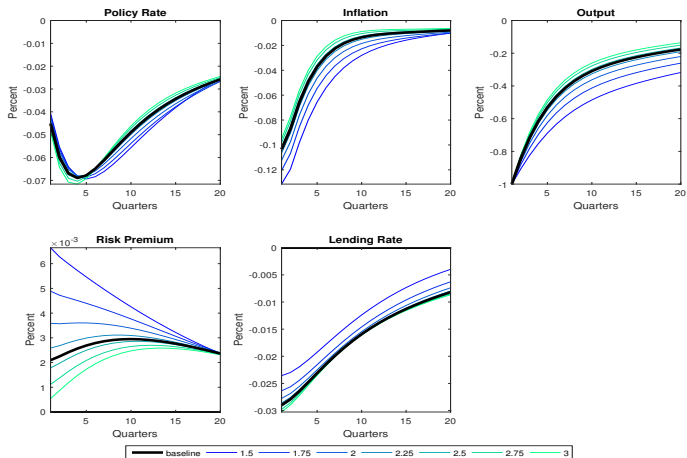
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 - ▶ Consumption preference shocks, government spending, etc...
 3. Robust to different specifications of the monetary policy rule

A shock to the External Finance Premium



NOTE. The thick dark line is computed using the parametrization in the baseline estimated model of CMR. The thin colored lines are obtained by varying the coefficient on inflation in the Taylor Rule. We consider values from 1.5 to 3. The size of the shock is normalized so that it generates a fall in output of 1 percent.

A Shock to Government Spending



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Other demand shocks

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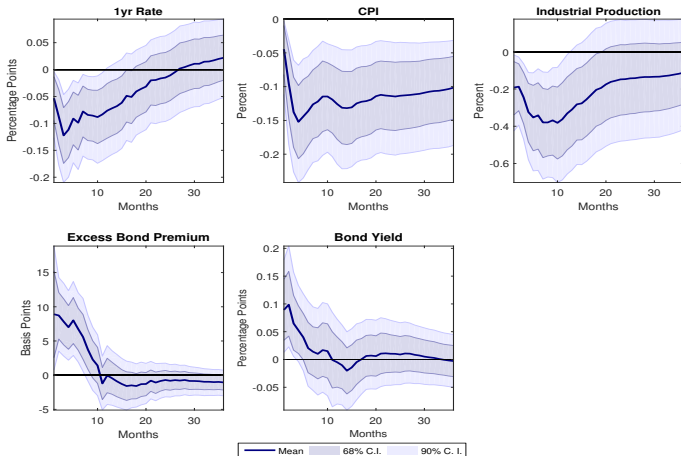
Two-country Structural VAR

- ▶ US block (extension of Gertler and Karadi, 2015)
 - Data: 1-year rate (RS), prices (CPI), industrial production (IP), Excess Bond Premium (EBP), corporate bond yield (RL)
 - Instrument: 3-months ahead future on Fed Funds ($FF4$)
 - Specification: 12 lags

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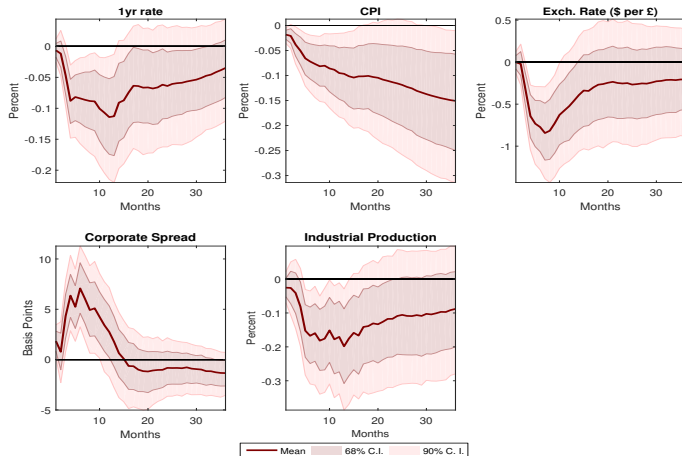
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- ▶ UK block
 - Data: 1-year rate (RS), prices (CPI), $\$/\pounds$ exchange rate (ER), corporate credit spread (SP), industrial production (IP)
 - Specification: 12 lags of UK variables, 3 lags of US variables (Akaike)
- ▶ Sample for estimation: 1979M7 to 2015M3

US Financial Shock: US Response



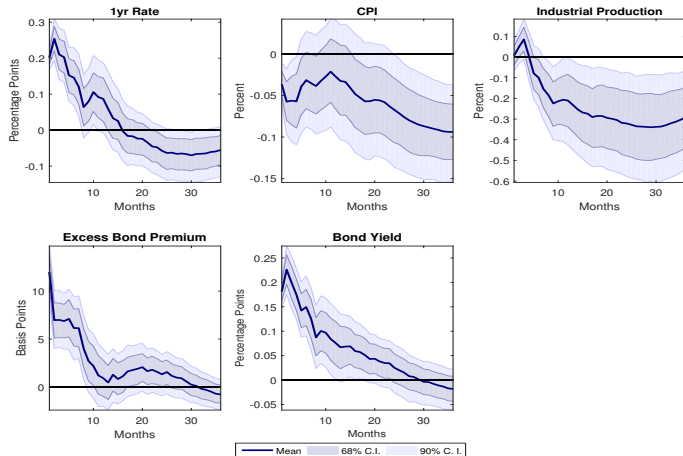
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US Financial Shock: Propagation to the UK



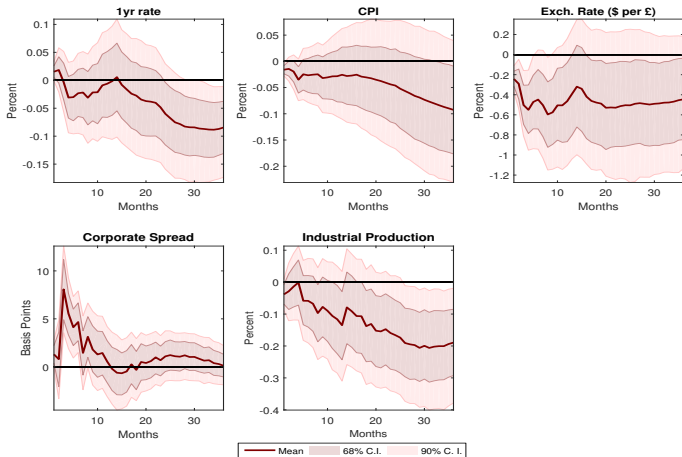
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US Monetary Policy Shock: US Response



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Inspecting the international transmission mechanism

- ▶ How important is the international credit channel for the transmission of shocks?
- ▶ **Theory** With financial integration, movements in foreign asset prices directly relax/tighten borrowing constraints both abroad and at home
 - Agents hold both H and F assets and liabilities
 - Foreign shocks \Rightarrow Foreign asset prices $\Rightarrow F$ and H net worth $\Rightarrow F$ and H borrowing capacity (credit spreads)

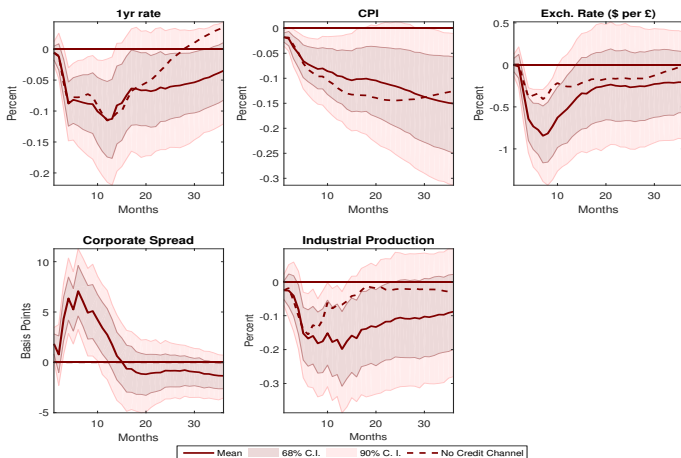
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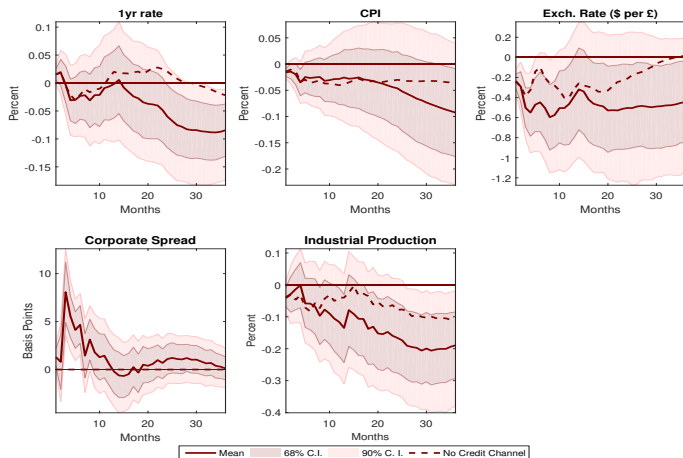
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- ▶ Credit spreads \Leftrightarrow Frictions in domestic and international financial contracting
- ▶ A (crude) counterfactual exercise: “close the channels” associated with financial frictions and look at the counterfactual impulse

UK Response to US Financial Shock: Closing the Credit Channel



NOTE. The solid line and shaded areas report the mean, 68% and 90% confidence intervals computed using wild bootstrap with with 1000 replications and 100 rotations per bootstrap draw.

UK Response to US Monetary Policy Shock: Closing the Credit Channel



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Conclusion

- ▶ We provide novel empirical evidence on the existence of an international credit channel for the transmission of both US monetary policy and financial shocks
- ▶ US financial shocks (relative to monetary policy shocks)
 - Explain a similar share of forecast error variance of US variables [Go to FEVDs](#)
 - Are quickly transmitted internationally
 - Have larger real effects in the short run
 - Lead to comovement of macro variables and policy rates
- ▶ The international credit channel can act as a powerful “spillover amplifier”
- ▶ Our findings corroborate the predictions of open economy models with a high degree of financial integration and financially constrained investors

Thank you

Related Literature (subset!)

- ▶ International transmission of shocks with fin frictions (theory)
 - Krugman (2008), Deveraux and Yetman (2010), Dedola and Lombardo (2012), Deveraux and Sutherland (2011),...
 - [Bernanke et al (1999); Kiyotaki and Moore (1996)]

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 - *Monetary policy*: Gurkaynak et al (2005); Gertler and Karadi (2015),...
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 - *Financial shocks*: Eickmeier and Ng (2015), Helbling et al (2011), Chudik and Fratzscher (2011),...

How to construct the Q_j matrix

1. Find a normal vector q of dimension $n \times 1$ that rotates the first column of C , the Cholesky decomposition of Σ_u , into the vector b , so that

$$Cq = b$$

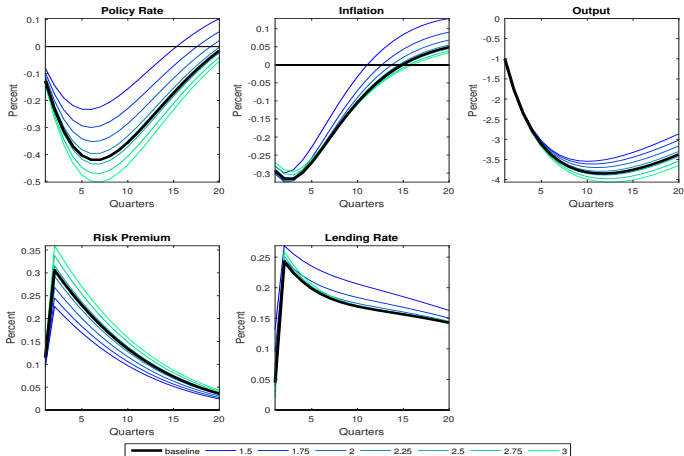
2. Given q , use a standard Gram-Schmidt process to build a $(n \times n - 1)$ matrix Q such that

$$[q \quad Q] [q \quad Q]' = QQ' = I$$

- Let j index the columns of Q . Let Q_{j-1} denote the first $j - 1$ columns of Q , such that $Q_{2-1} = Q_1 = q_1$. Let x_j be a draw from a Normal distribution on \mathbb{R}^N . Then the j^{th} column of Q can be constructed as:

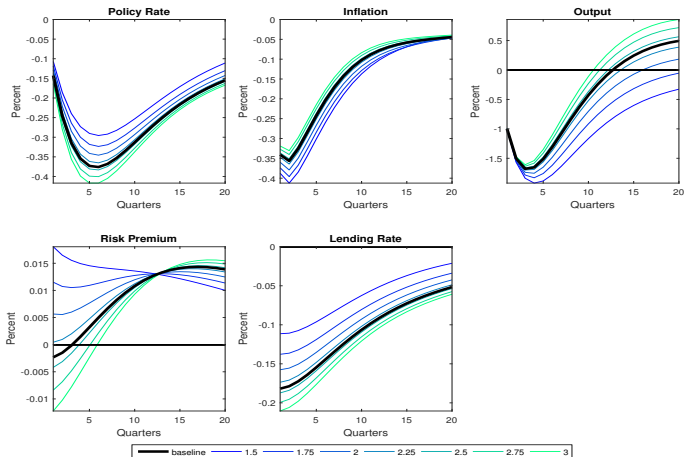
$$q_j = \frac{(I_N - Q_{j-1}Q_{j-1}')x_j}{\|(I_N - Q_{j-1}Q_{j-1}')x_j\|}$$

Risk Shock



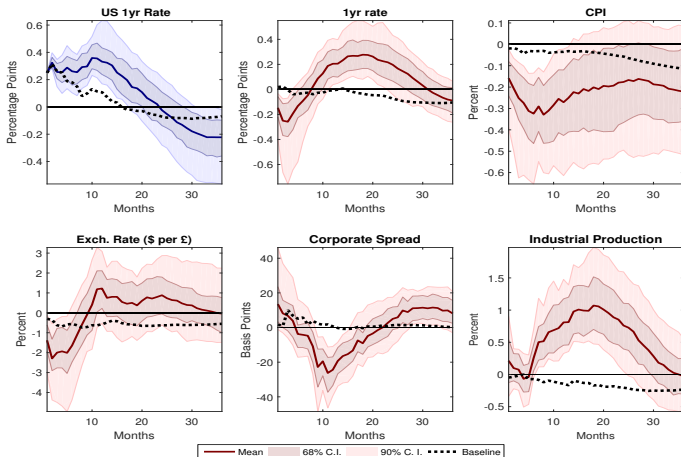
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Preference Shock



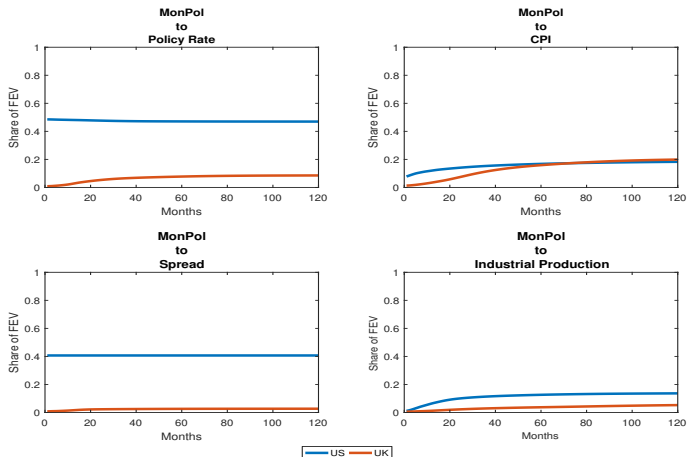
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US Monetary Policy Shock – Comparison with Rey (2016)



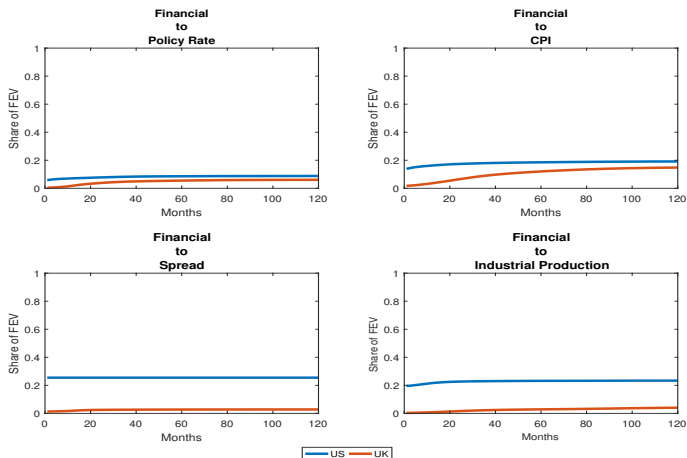
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Contribution of Monetary Policy Shocks to the FEVD of selected Variables



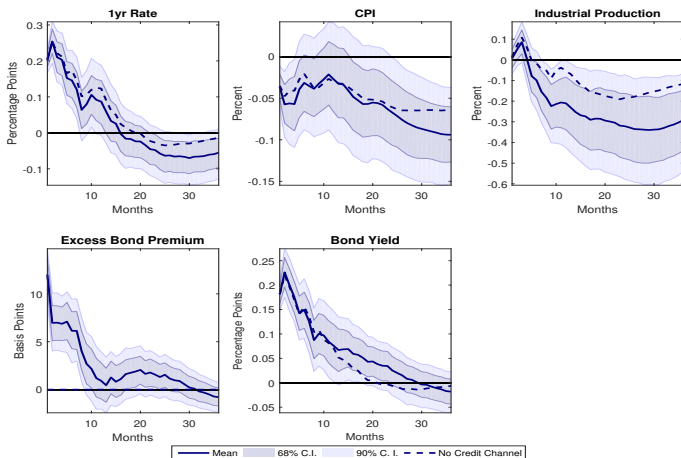
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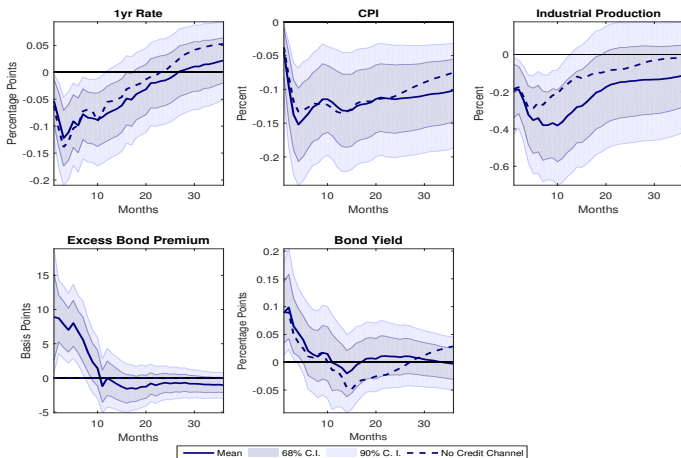
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