Estimating the Fed's unconventional policy shocks

Marek Jarociński (2024, JME)

HKUST Macro Reading Group

Question: What are we talking about when we talk about monetary policy shocks?

Monetary Policy Innovations

- Undergrad Textbook:
  1. Current federal rate change

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  1. Current federal rate change ("Target Factor")
  2. Forward guidance ("Path Factor")

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- Swanson (2021, JME):
  1. Current federal rate change
  2. Forward guidance
  3. Large scale asset purchase ("LSAP")

Forward Guidance

- Before financial crisis (1983-: Vote at each meeting on FOMC's views about future policy rate
  - 1983-1994: information not revealed until the following meeting
  - Feb 1994-: statement issued immediately after each meeting
  - May 1999-: explicit language about the future stance of policy
- After financial crisis:
  - "The Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time."
    — December 2008 FOMC statement
  - "Economic conditions ... are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013."
    — August 2011 FOMC statement
  - "... late 2014. "
    — January 2012 FOMC statement

Monetary Policy Innovations

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- Campbell et al. (2012, Brookings) on forward guidance:
  1. *Odyssean* forward guidance: a commitment to a future course of policy rates
  2. *Delphic* forward guidance: a statement about likely or intended monetary policy actions based on the policymaker's a forecast of macroeconomic performance with *potentially superior information*

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- This paper: decompose MP innovations into
  1. Current federal rate change
  2. *Odyssean* forward guidance
  3. Large scale asset purchase
  4. *Delphic* forward guidance

Preview: Effects from 4 identified shocks

1. Current federal rate change:
   - raises the near-term fed funds futures, with a diminishing effect on longer maturities
   - depresses the stock prices
2. *Odyssean* forward guidance:
   - increases the 2-year Treasury yield the most
   - depresses the stock prices
3. Large scale asset purchase
   - increases the 10-year Treasury yield the most
   - plays a large role in some of the most important asset purchase announcements
4. *Delphic* forward guidance:
   - increases the 2-year Treasury yield the most
   - triggers an increase in the stock prices (information effects)

How could this paper distinguish four main shocks, while others identify at most three?

Data

1. Current federal rate change ("Target Factor"):
   - raises the near-term fed funds futures, with a diminishing effect on longer maturities
   - depresses the stock prices (S&P 500).
2. *Odyssean* forward guidance:
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Data and Identification

- Swanson (2021, JME): high-frequency responses of
  1. First federal funds future adjusted for the number of the remaining days of the month (MP1)
  2. 2-year Treasury yield (ONRUN2)
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- Neglected feature of the data: High-frequency responses are non-Gaussian (fat-tailed).
  - Why fat tailed?

Non-Gaussian Responses

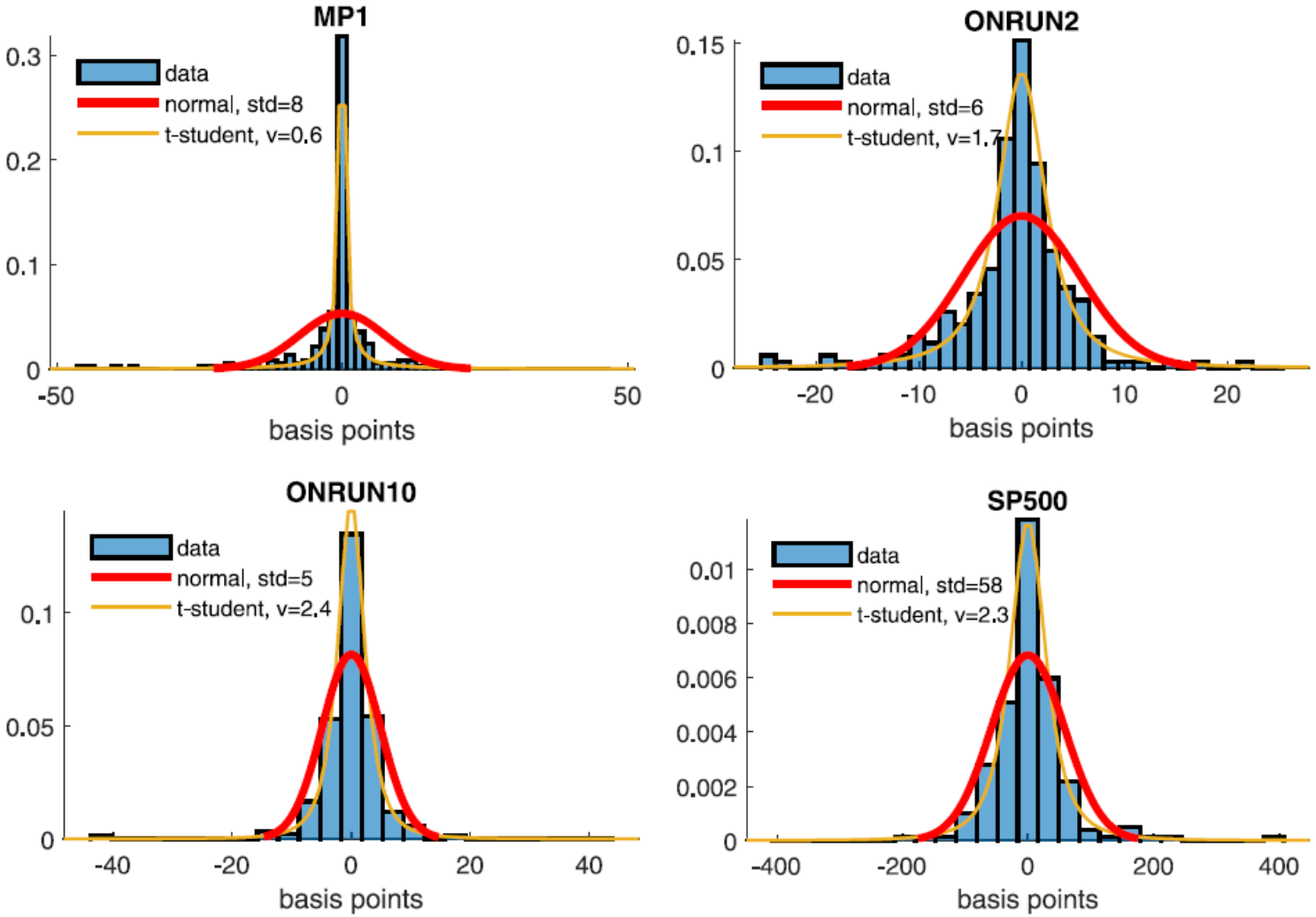


Figure: The empirical distributions of the baseline variables.

Intuition: Stylized example

Model 1: flat demand schedule and steep supply curve

$$\begin{pmatrix} \Delta Q \\ \Delta P \end{pmatrix} = C'_{i\in\{1,2\}} \begin{pmatrix} u^s \\ u^d \end{pmatrix}, \text{ with } C'_1 = \begin{pmatrix} 0.94 & 0.33 \\ -0.14 & 0.99 \end{pmatrix}, \quad (1)$$

Model 2: steep demand curve and flat supply curve

$$\begin{pmatrix} \Delta Q \\ \Delta P \end{pmatrix} = C'_{i\in\{1,2\}} \begin{pmatrix} u^s \\ u^d \end{pmatrix}, \text{ with } C'_2 = \begin{pmatrix} 0.14 & 0.99 \\ -0.94 & 0.33 \end{pmatrix}, \quad (2)$$

Issue: If u^s and u^d are Gaussian, we cannot identify the slopes from the data on ΔQ and ΔP.

- If u^s and u^d are drawn from independent standard normal distributions, ΔQ and ΔP are Gaussian with the same first two moments (the samples look the same!)

Intuition: Gaussian Shocks

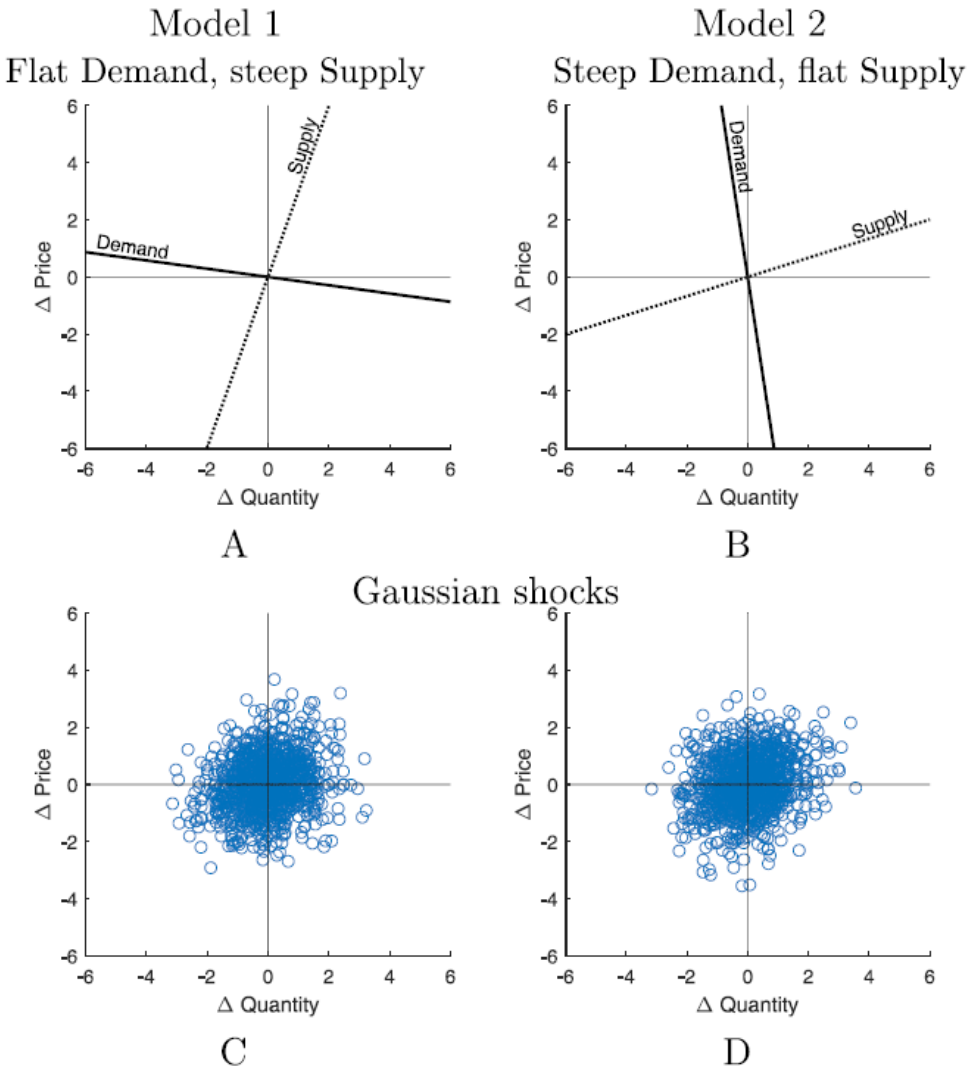


Figure: Demand and supply of good A if shocks are Gaussian.

Intuition: Non-Gaussian Shocks

If u^s and u^d are non-Gaussian, i.e. are independent Student-t:

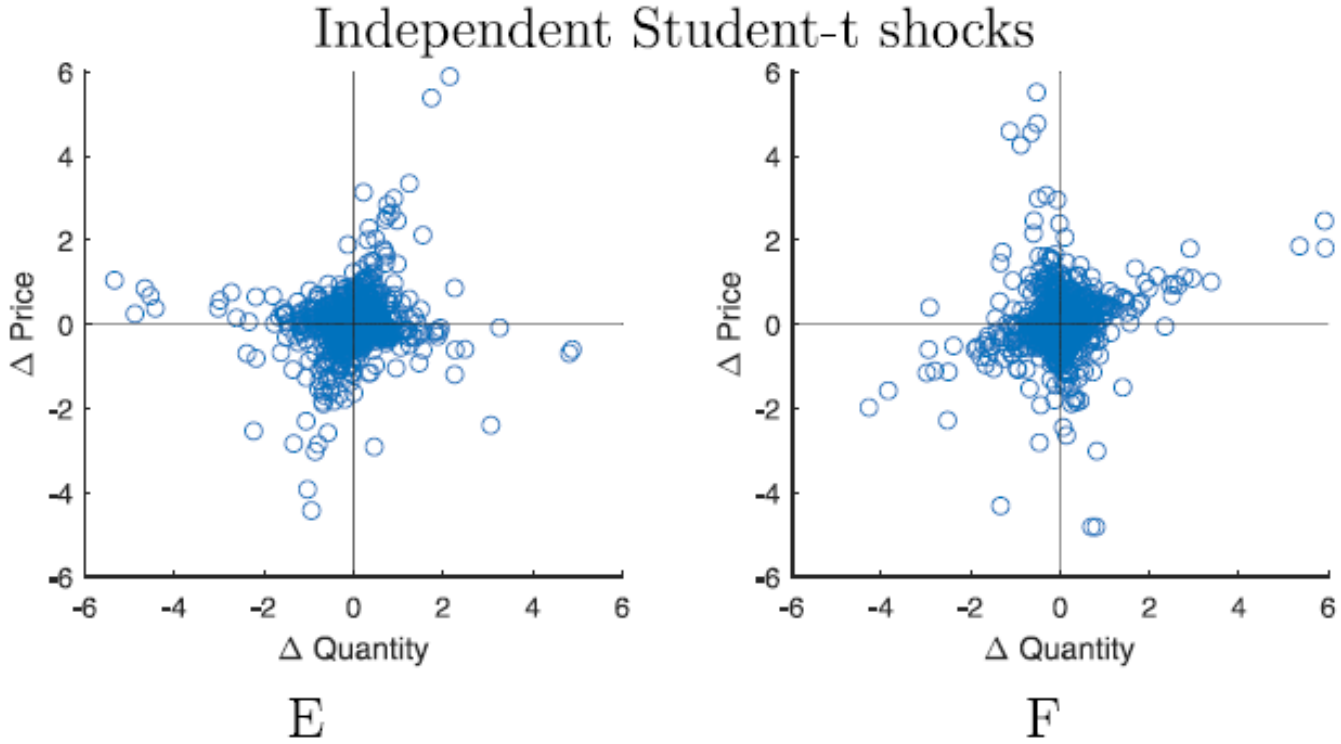


Figure: Demand and supply of good A if shocks are non-Gaussian.

Model

Assume that market responses to FOMC announcements are generated by the following simple model driven by potentially fat-tailed shocks:

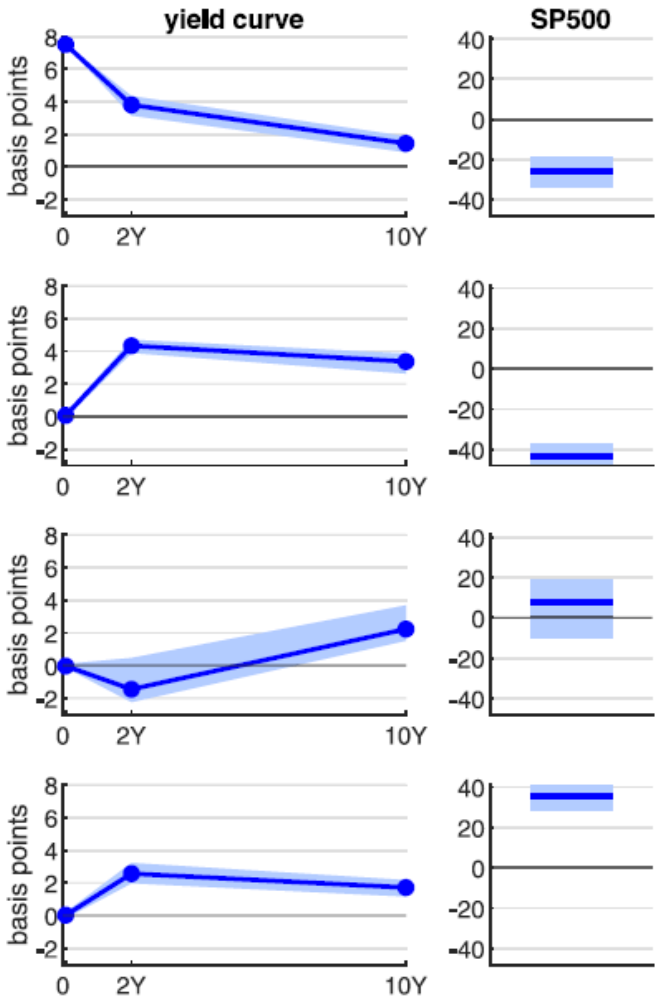
$$y_t = C' u_t, \quad u_t \sim \text{ i.i.d. } p(u_t).$$

- $y_t = (y_{1,t}, \ldots, y_{N,t})'$: vector of N variables observed at time t
- $u_t = (u_{1,t}, \ldots, u_{N,t})'$: vector of unobserved, structural (i.e. uncorrelated) shocks coming from a density $p(u_t)$ which may exhibit fat tails.
- C: $N \times N$ matrix whose i,j-th element $C(i,j)$ contains the effect of shock i on variable j.

The log-likelihood of sample Y:

$$\begin{aligned} \log p(Y \mid W, v) &= T \log |\det W| - \sum_{t=1}^{T} \sum_{n=1}^{N} \frac{v_n + 1}{2} \log\left(1 + u_{n,t}^2 / v_n\right) \\ &+ T \sum_{n=1}^{N} \log c(v_n), \quad \textit{where} \quad u_{n,t} = y_t' w^n \end{aligned}$$

Four Identified Shocks



$\leftarrow u_1 =$ Standard monetary policy

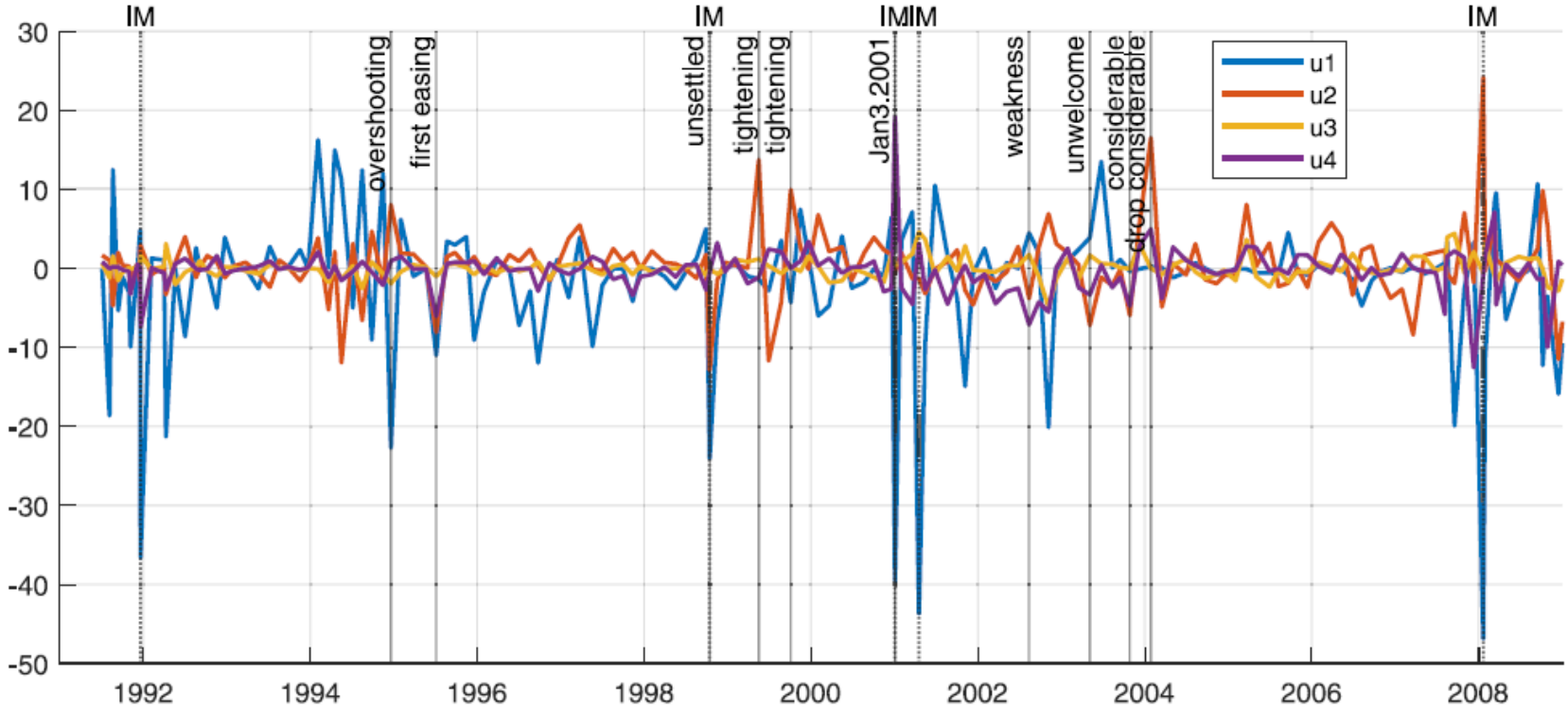
$\leftarrow u_2 =$ Odyssean forward guidance

$\leftarrow u_3 =$ Long term rate shock (LSAP)

$\leftarrow u_4 =$ Delphic forward guidance (information)

Figure: Responses of the variables to standardized shocks, w. 95% bands.

Four Identified Shocks Over History



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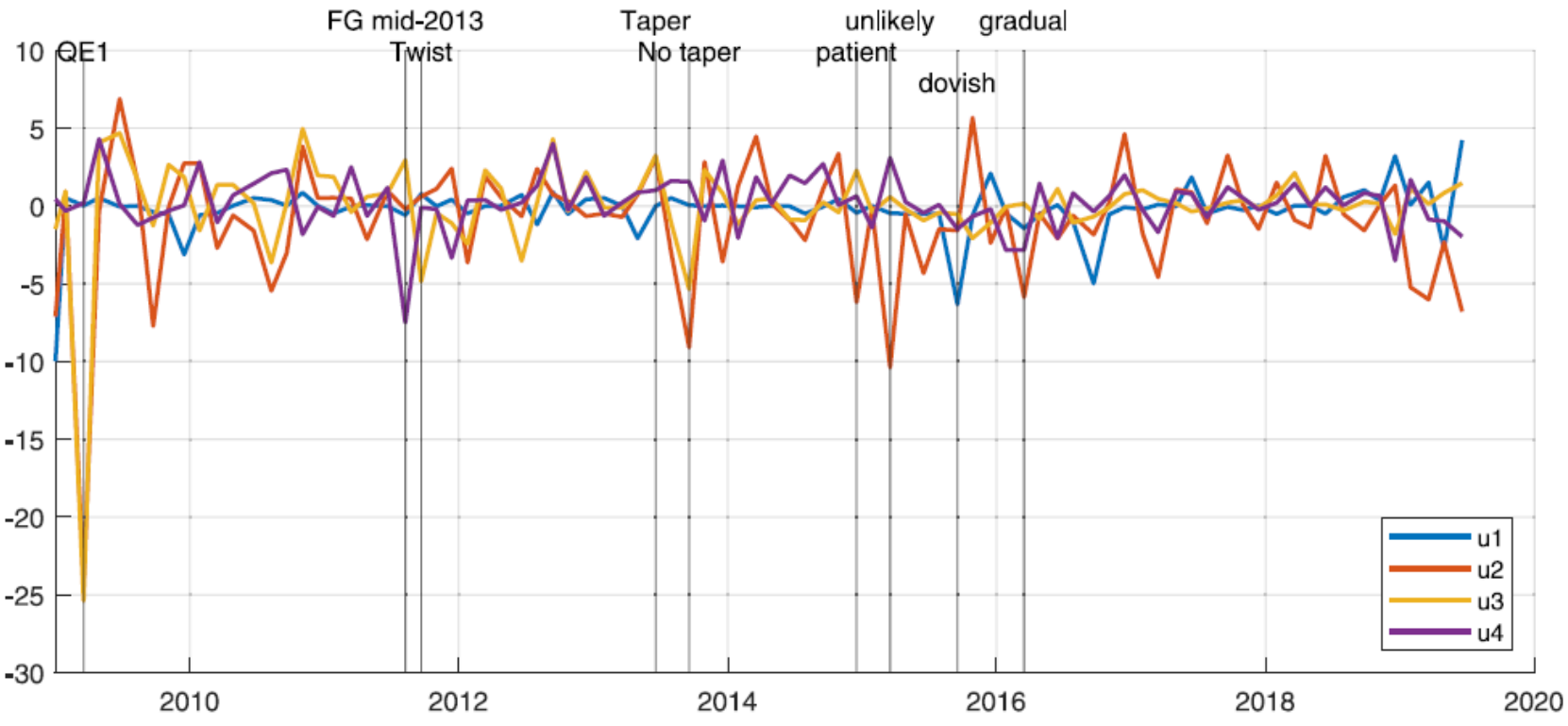

Correlation w. Existing Findings

Table 1
Pairwise rank and linear correlations with baseline shocks u_1, u_2, u_3 and u_4.

	Obs.	u_1		u_2		u_3		u_4
Other papers								
Swanson (2021)	241	ff:	0.79	fg:	0.75	lsap:	−0.66	fg:	0.47
			(0.95)		*(0.81)*		*(−0.84)*		*(0.48)*
Jarociński and Karadi (2020) FF4	221	MP:	0.43	MP:	0.63	MP:	−0.05	CBI:	0.59
			(0.69)		*(0.45)*		*(−0.04)*		*(0.66)*
Jarociński and Karadi (2020) 1stPC	241	MP:	0.39	MP:	0.71	MP:	−0.08	CBI:	0.77
			(0.67)		*(0.56)*		*(−0.02)*		*(0.81)*

Note. Rank (Spearman's) correlations on top, regular font; linear (Pearson's) correlations below, in brackets, italics. 'ff', 'fg' and 'lsap' stand for fed funds, forward guidance and large scale asset purchase shocks. 'MP' and 'CBI' stand for monetary policy and central bank information shocks.

Figure: Pairwise rank and linear correlations with baseline shocks

Long-term effects

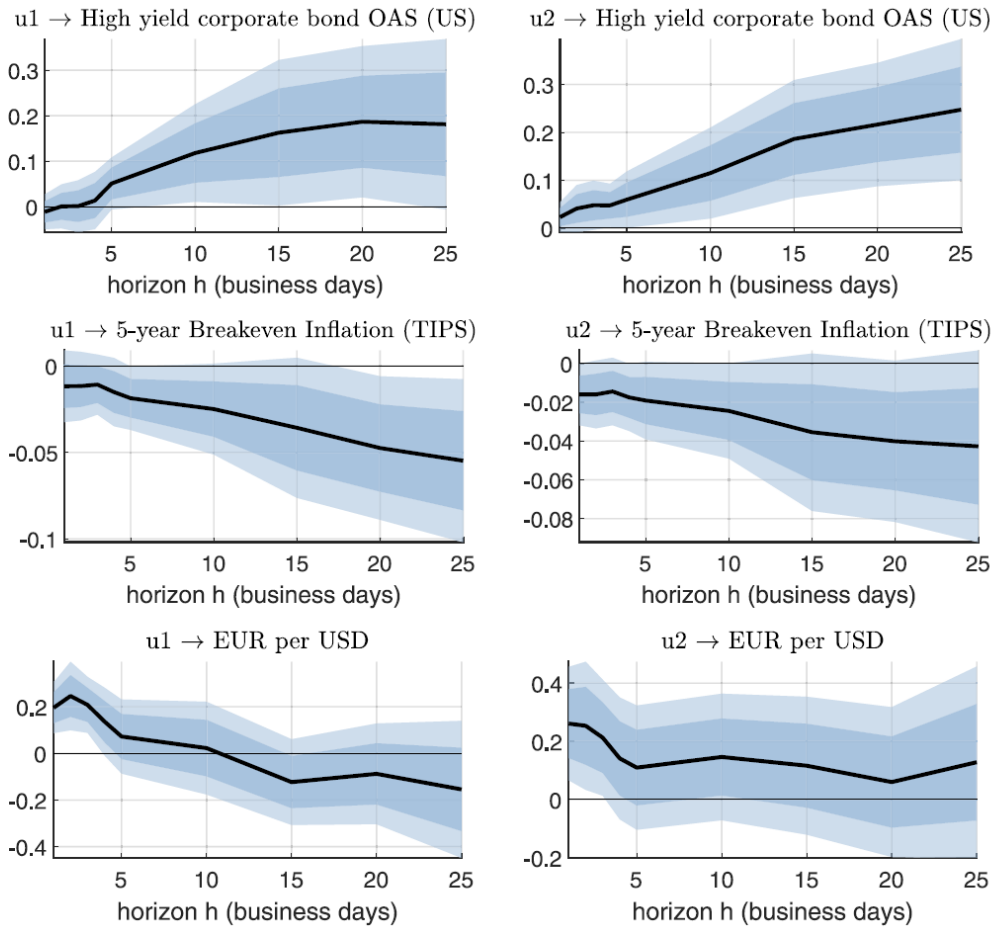

Figure: Long-term effects of standard monetary and forward guidance shock

Conclusion

This paper estimates four different types of Fed policy shocks:

1. Current federal rate change ("Target Factor")
2. *Odyssean* forward guidance
3. Large scale asset purchase ("LSAP")
4. *Delphic* forward guidance

These shocks

1. affect risk-free interest rates, stock prices and exchange rate on impact
2. affect corporate bond spreads and breakeven inflation rates with a delay