The Macroeconomic Effects of the Federal Reserve's Conventional and Unconventional Monetary Policies

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Motivation

- During and after the Great Recession, the Fed and other central banks conducted unconventional monetary policy on a large scale
- Extensive evidence that forward guidance, LSAPs had significant financial market effects (Swanson, 2021)
- But there is very little evidence on the macroeconomic effects of these policies
- Main problem: there are only about 8 FOMC announcements per year, interest rate changes around FOMC announcements are typically small (2–3bp)

This Paper

- Measures monetary policy innovations using high-frequency interest rate changes around:
  - FOMC announcements
  - post-FOMC press conferences
  - FOMC meeting minutes releases
  - speeches, testimony by Fed Chair
  - speeches, testimony by Fed Vice Chair
- Decomposes these innovations into news about:
  - federal funds rate
  - forward guidance
  - large-scale asset purchases (LSAPs)
- Uses these components as external instruments in a monetary policy VAR to estimate effects of federal funds rate, forward guidance, and LSAPs on macroeconomic variables

Related Literature

Swanson (2021 JME)

- decomposes HF interest rate changes around FOMC announcements into federal funds rate, forward guidance, and LSAP components
- finds unconventional policies about equally effective as fed funds rate

Swanson and Jayawickrema (2023 WP)

- measure HF interest rate changes around FOMC announcements, press conferences, minutes, Chair speeches, Vice Chair speeches
- decompose them into federal funds rate, forward guidance, and LSAP components

Bauer-Swanson (2023 NBERMA)

- use SJ data to estimate effects of "monetary policy shock" in SVARs, LPs
- monetary policy shock is a hybrid of fed funds rate, forward guidance

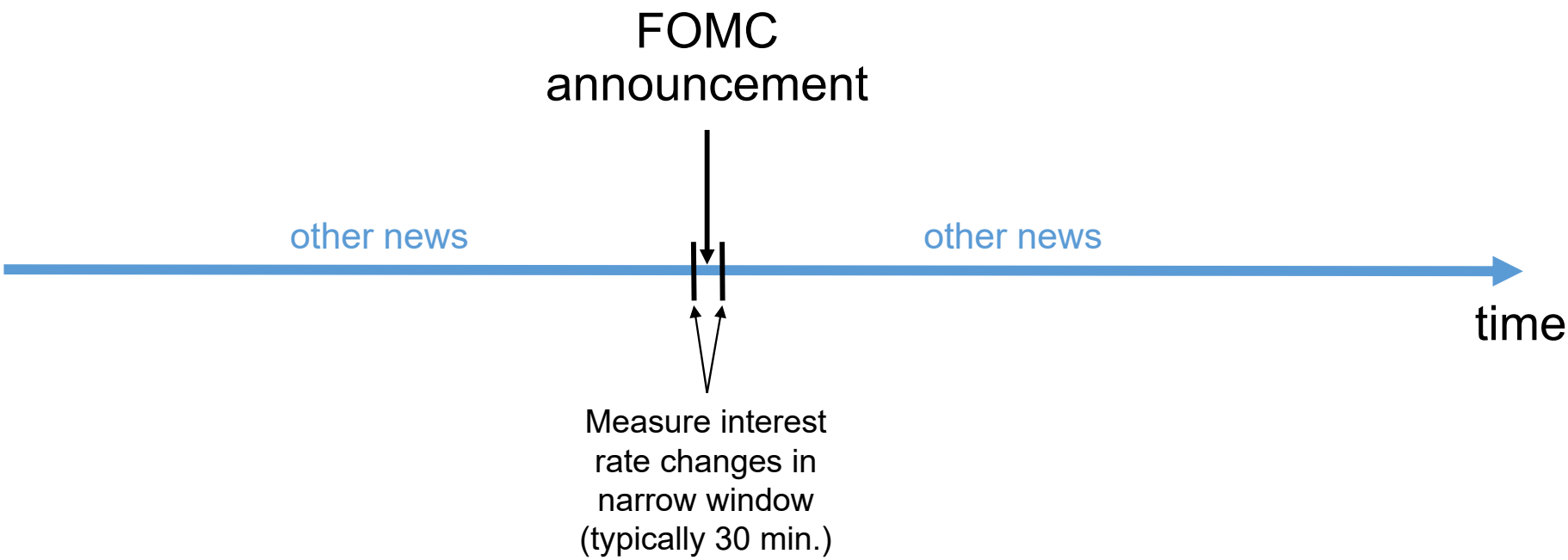
Miranda-Agrippino and Ricco (2023 JME)

- use Swanson (2021) data to estimate effects of fed funds rate, forward guidance, LSAPs in a VAR
- weak instruments, robustness problems for unconventional policies

Preview of Results

- Federal funds rate, forward guidance, and LSAPs all had significant effects on macro variables
- Federal funds rate effects are the largest and most robust — suggests that short-term interest rates should continue to be central banks' primary monetary policy tool going forward
- FOMC announcements alone are a weak instrument, especially for forward guidance and LSAPs
- There is a significant Bauer-Swanson (2023) "Fed Response to News" effect/bias in the data for all three monetary policy tools — important to correct for this bias in IRF estimates from VARs

High-Frequency Monetary Policy Surprises



High-frequency monetary policy surprises are an important tool for estimating effects of monetary policy on asset prices and macroeconomic variables:

- asset prices: high-frequency OLS regressions
- macro variables: monetary policy surprises used as external instrument in structural VAR or LP

Problems with Monetary Policy Surprises

- Surprises around FOMC announcements have become much smaller over time, are typically only 2–3bp
- Fed has become more transparent, tends to communicate decisions before FOMC meeting
- This trend accelerated after 2008, due to ZLB
- Many authors focus on changes in futures rates a few months or quarters ahead to better capture changes in overall stance of monetary policy around FOMC announcements

  Gürkaynak, Sack, Swanson (2005), Gertler-Karadi (2015), Nakamura-Steinsson (2018), Miranda-Agrippino-Ricco (2021), Swanson (2021), Bauer-Swanson (2023a,b)

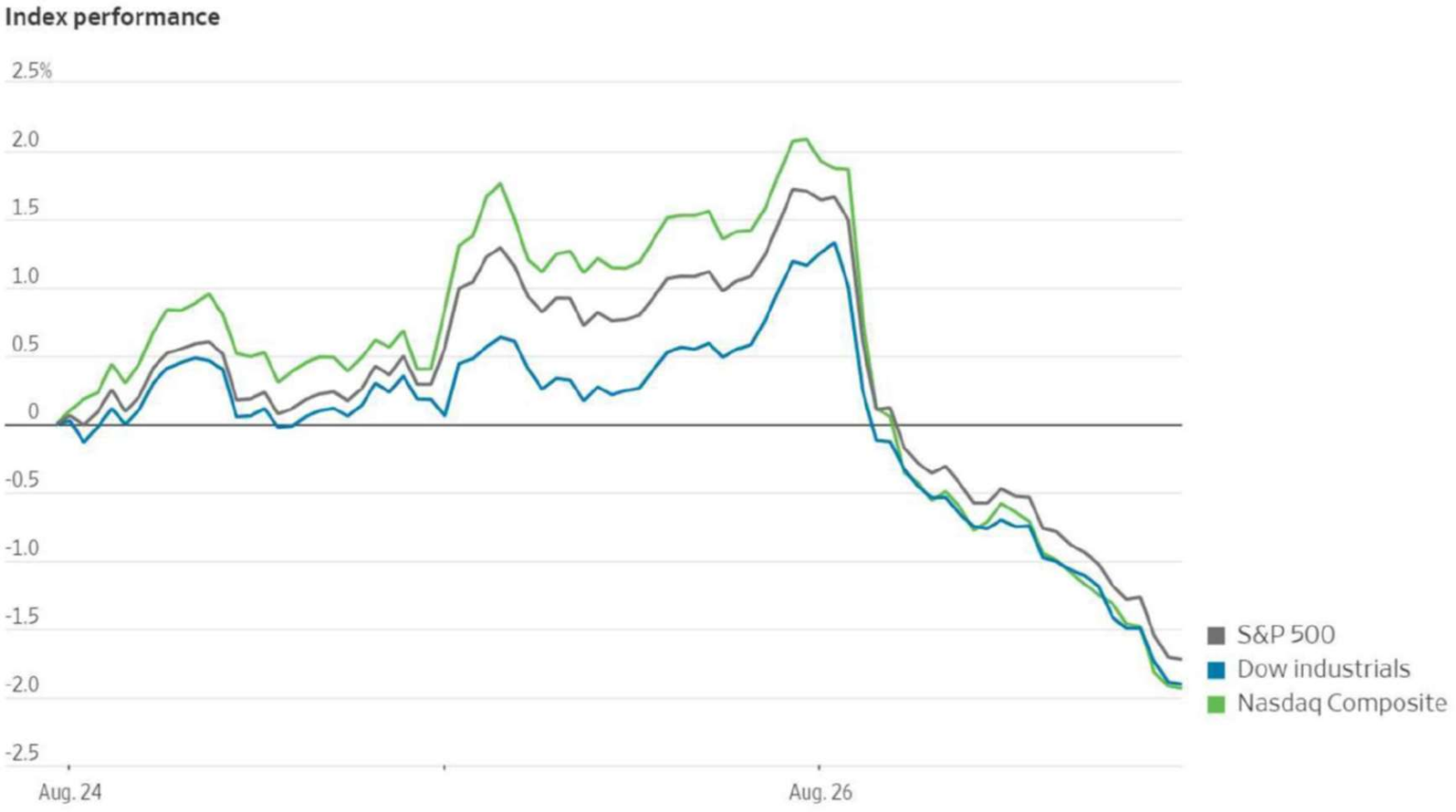
Swanson-Jayawickrema (2023)

- Show that speeches and testimony by the Fed Chair are more important than FOMC announcements for stocks, bonds, and all but the very shortest-maturity interest rate futures
- Post-FOMC press conferences have also become increasingly important over time
- Vice Chair speeches and FOMC minutes releases are less important, but still non-negligible
- Thus, previous studies' focus on FOMC announcements alone has ignored the most important source of changes in U.S. monetary policy
- Systematically compare these different types of announcements and how their importance has changed over time
- More comprehensive sample: 1988–2019
- Compute federal funds rate, forward guidance, and LSAP components for all of these announcements

Examples in 2022

Dow Falls More Than 1,000 Points After Powell Speech

Markets decline in broad selloff led by tech as hawkish remarks by Fed chief disappoint investors



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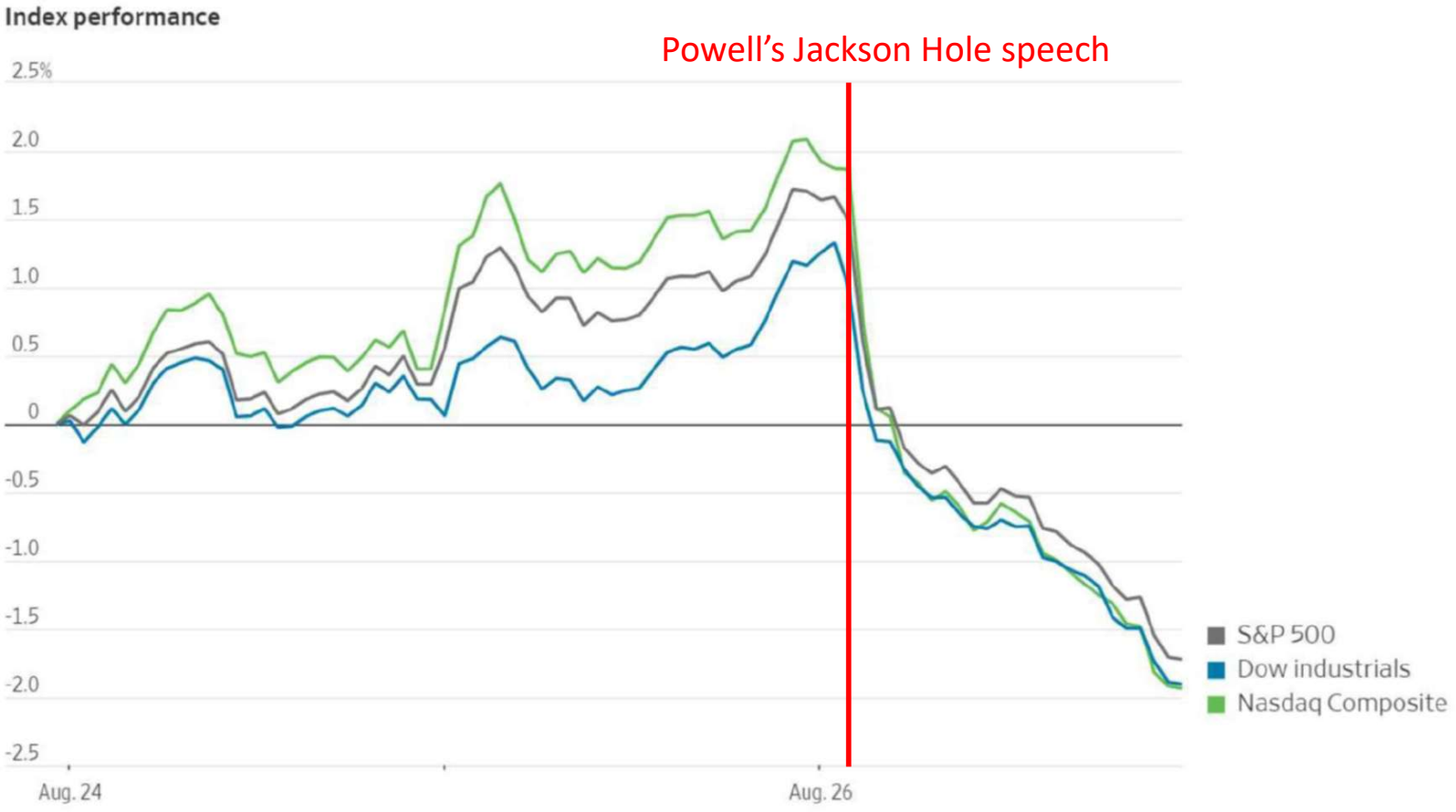

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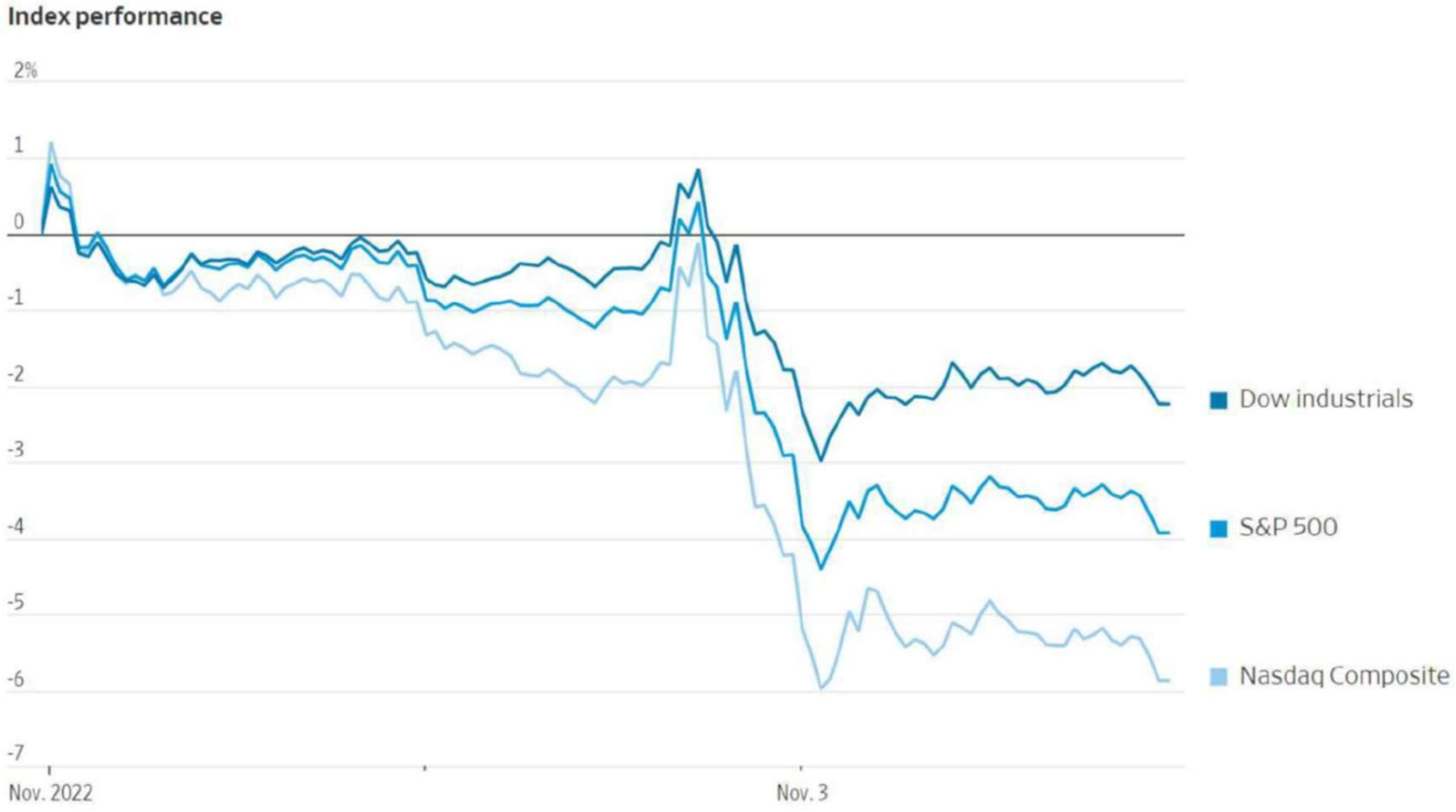
Stocks Finish Lower After Fed Signals Higher Rates

'The market is starting to come to terms with the fact that Powell said no dessert'



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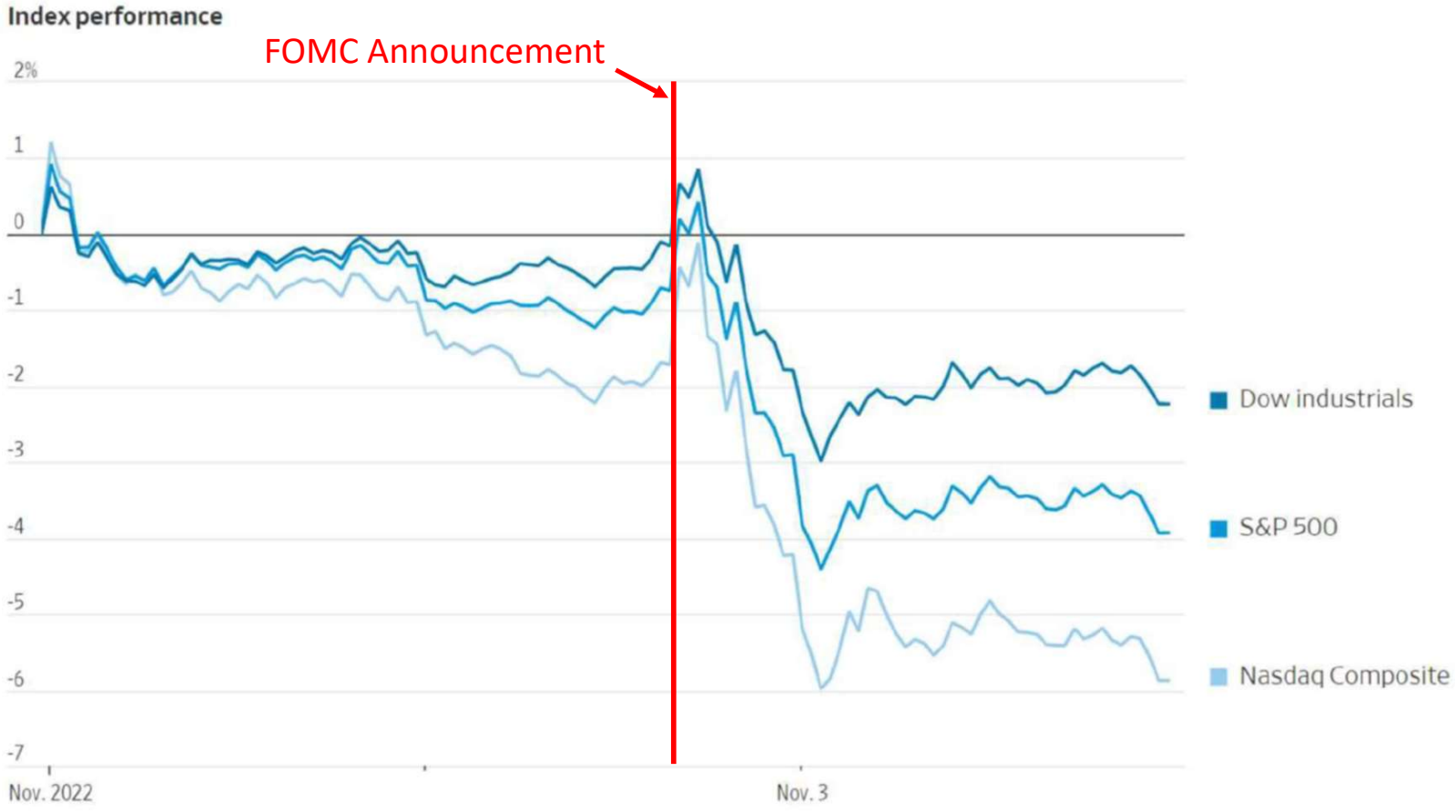

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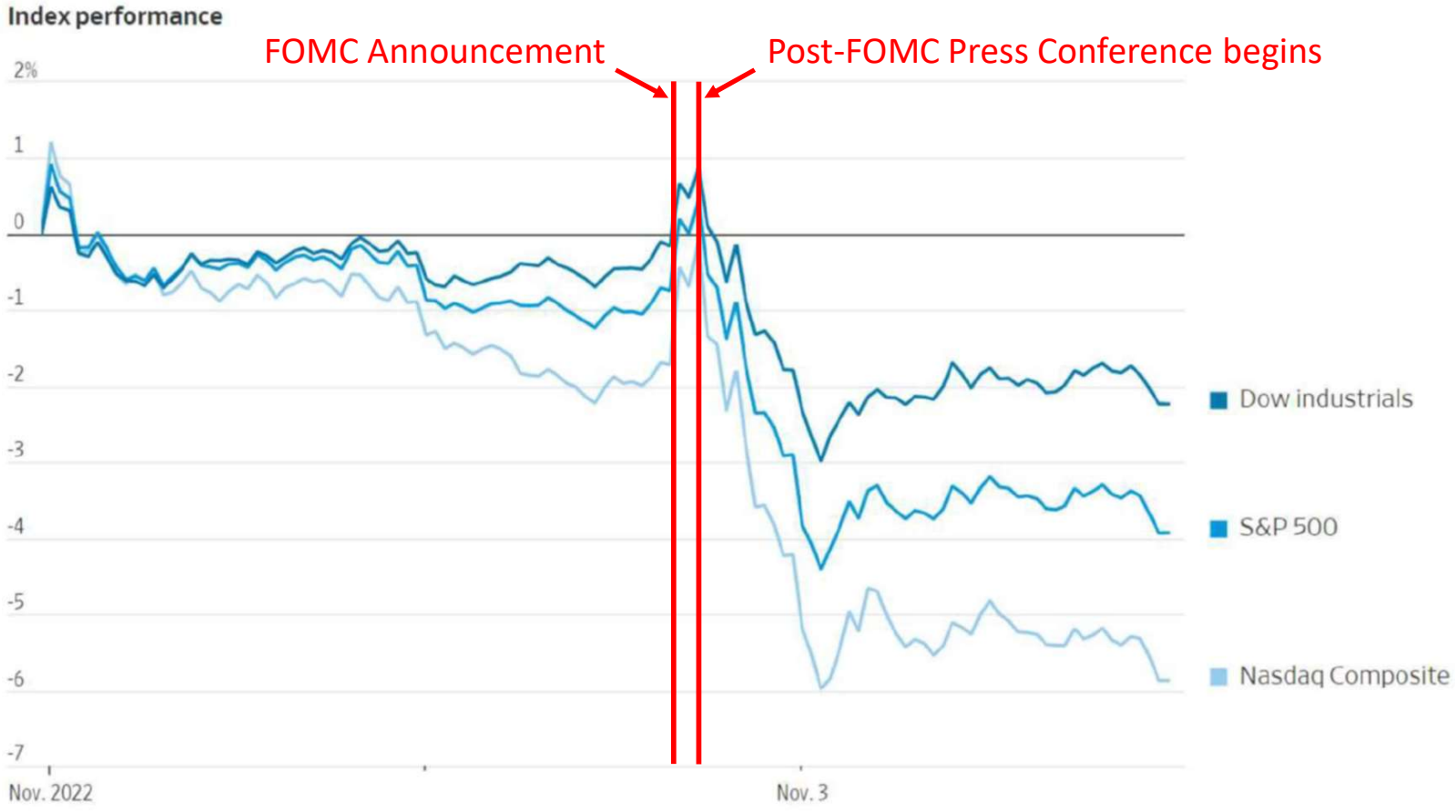

Five Types of Monetary Policy Announcements

From 1988 to 2019, Swanson and Jayawickrema collect all:

- **FOMC Announcements** (323 total)
  8 scheduled meetings per year, plus unscheduled intermeeting changes
- **Post-FOMC Press Conferences** (40 total)
  4 per year from 2011–18, 8 per year beginning in 2019
- **FOMC Meeting Minutes Releases** (184 total)
  8 per year from 1997–2019
- **Speeches and Congressional Testimony by Fed Chair** (847 total, not including press conferences)
- **Speeches and Congressional Testimony by Fed Vice Chair** (310 total)

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However, many Fed Chair, Vice Chair speeches, testimony are on other topics (ceremonial, bank regulation, fiscal policy, stock market, etc.)

According to market commentary in *WSJ* & *NYT,* 364 speeches and tesitmony by Fed Chair and 102 by Vice Chair had possible implications for interest rates; restrict attention to these

Financial Market Response Windows

FOMC Announcements

- beginning in 1994, made via press release
- pre-1994, typically made via size and type of open market operation the following morning
- Use 30-minute window around each FOMC announcement, as in Gürkaynak, Sack, and Swanson (2005)

Post-FOMC Press Conferences

- Start times of press conferences from Board's website
- Use 90-minute window around each press conference

FOMC Meeting Minutes Releases

- Release times from Fed Board
- Use 60-minute window around each minutes release

Financial Market Response Windows (cont.)

Fed Chair and Vice Chair Speeches (non-testimony)

- Start times from several sources
- Use 2-hour window

Fed Chair and Vice Chair Congressional testimony

- Start times from several sources
- Use 3.5-hour window

Financial Market Response Windows (cont.)

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In some cases, need to adjust event windows to avoid major macroeconomic data releases or other news

Intradaily Data

Intradaily financial market data from TickData

Compute changes in:

- current-quarter and 1-, 2-, 3-quarter-ahead Eurodollar futures rates (ED1, ED2, ED3, ED4)
- 2-, 5-, 10-, and 30-year Treasury yields
- log of S&P 500 index

Importance of Different Announcement Types

	ED1	ED2	ED3	ED4	2yr	5yr	10yr	30yr	S&P500
(A) Sum of Absolute Changes (in pp)									
FOMC Announce	9.60	11.19	12.07	12.80	8.91	9.63	7.37	6.20	113.7
Chair Speeches	6.42	10.46	13.43	15.05	10.65	12.17	9.87	9.48	162.6
Press Conf	0.33	0.55	0.75	0.91	0.91	1.14	0.91	0.76	17.2
Minutes	1.30	2.47	3.28	3.67	3.09	3.38	2.68	2.44	49.0
Vice Chair Sps.	0.78	1.31	1.43	1.56	1.26	1.38	1.17	1.23	25.6

- First measure: sum of absolute changes in financial market responses to all announcements of each type from 1988–2019

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- First measure: sum of absolute changes in financial market responses to all announcements of each type from 1988–2019
- Fed Chair speeches and testimony are the most important for all assets except the very shortest-maturity interest rate futures
- Post-FOMC press conferences are the least important, because there are so few of them

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Chair Speeches	1.77	2.87	3.69	4.13	2.93	3.34	2.71	2.60	44.7
Press Conf	0.83	1.38	1.87	2.28	2.29	2.84	2.27	1.91	43.0
Minutes	0.71	1.34	1.78	1.99	1.68	1.84	1.46	1.32	26.6
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- Even per announcement, Fed Chair speeches are most important except for short-maturity interest rate futures

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Press Conf	.002	.001	.000	.000	.001	.005	.003	.001	.009
Minutes	.006	.007	.005	.005	.002	−.001	−.002	.001	−.011
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Vice Chair Sps.	.013	.008	.007	.004	.002	.006	.007	.008	−.006
All of the Above	.179	.183	.159	.142	.090	.099	.082	.082	.111

Forward Guidance

For FOMC announcements, follow Gürkaynak, Sack, Swanson (2005):

$$\underbrace{X^{FOMC}}_{T\times N} = \underbrace{F}_{T\times 2}\ \underbrace{\Lambda}_{2\times N} + \underbrace{\varepsilon}_{T\times N}$$

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- Estimate 2 factors F by principal components
- Rotate F so that only the first affects current federal funds rate
- First factor then corresponds to surprise change in fed funds rate, second factor to forward guidance

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- First factor then corresponds to surprise change in fed funds rate, second factor to forward guidance

For announcements of other types, extract first principal component:

$$\underbrace{X^{type}}_{T_{type}\times N} = \underbrace{F^{type}}_{T_{type}\times 1}\ \underbrace{\Lambda^{type}}_{1\times N} + \underbrace{\varepsilon^{type}}_{T_{type}\times N}$$

Forward Guidance

For FOMC announcements, follow Gürkaynak, Sack, Swanson (2005):

$$\underbrace{X^{FOMC}}_{T\times N} = \underbrace{F}_{T\times 2}\ \underbrace{\Lambda}_{2\times N} + \underbrace{\varepsilon}_{T\times N}$$

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- Define federal funds rate changes to be 0
- Principal component corresponds to changes in forward guidance

LSAPs

Define LSAP component of each announcement to be

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This definition is essentially the same as Rogers, Scotti, Wright (2018) and Gilchrist, Yue, Zakrajsek (2019) but different from Swanson (2021) due to few observations for some announcement types before 2009

VAR Specification

Reduced-form VAR:

$$Y_t = \alpha + B(L)Y_{t-1} + u_t$$

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12 monthly lags, estimated from 1973:1–2020:2

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There are potentially many structural shocks in ε_t. Define first three elements of ε_t to be:

- federal funds rate shock: ε_t^{ff}
- forward guidance shock: ε_t^{fg}
- LSAP shock: ε_t^{lsap}

High-Frequency Identification of Structural Shocks

For each monetary policy tool $i \in \{ff, fg, lsap\}$, define monthly instrument z_t^i to be the sum each month of all the high-frequency innovations in policy tool i

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Caveat: Fed Information Effect and Fed Response to News bias, discussed below, violate exogeneity

High-Frequency Identification of Structural Shocks

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Identify impact effect of ε_t^i on u_t by regressing u_t on u_t^i by 2SLS using z_t^i as an external instrument (sample 1988:1–2019:12):

$$u_t = \gamma + s_i u_t^i + \eta_t$$

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First-stage F-statistic for Y_t^i on instrument z_t^i measures instrument strength

Predictability of Monetary Policy Surprises

Under standard assumptions of Full Information and Rational Expectations, high-frequency monetary policy news should be uncorrelated with any data that predates the announcement

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Several recent papers find evidence against this hypothesis: Cieslak (2018 RFS), Miranda-Agrippino (2017 WP), Miranda-Agrippino and Ricco (2021 AEJM), Karnaukh and Volkata (2022 JFE), Bauer and Swanson (2023 AER, NBERMA), Bauer and Chernov (2023 JF), Sastry (2022 WP)

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Note: this is not a Fed Information Effect, it is a violation of FIRE

The Fed Response to News Channel

Bauer and Swanson (2023 AER, NBERMA): financial markets seem to have underestimated how aggressively the Fed would respond to incoming data (see also Cieslak, 2018, Schmeling et al, 2022)

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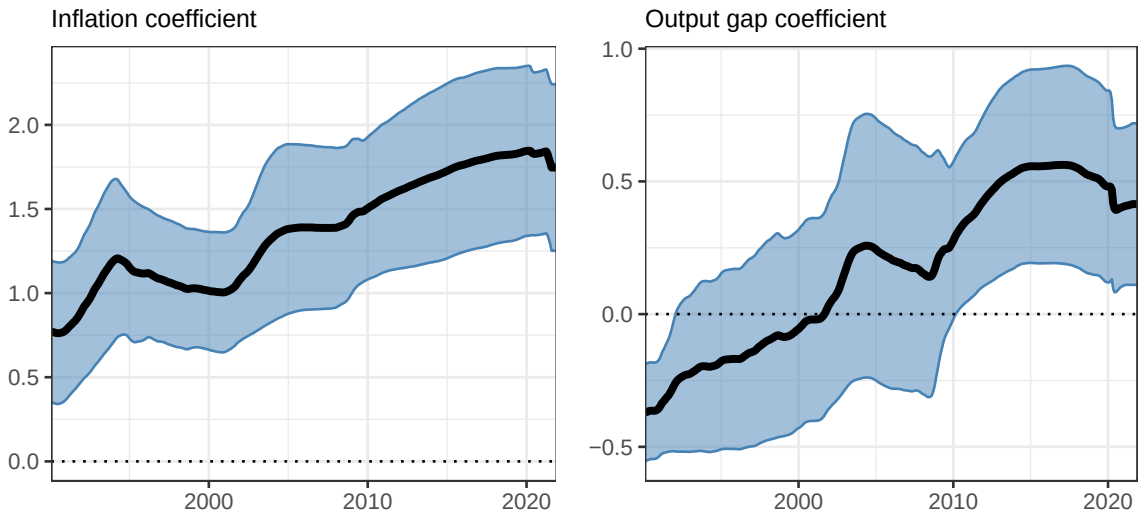
Rolling-window Taylor Rule regressions:



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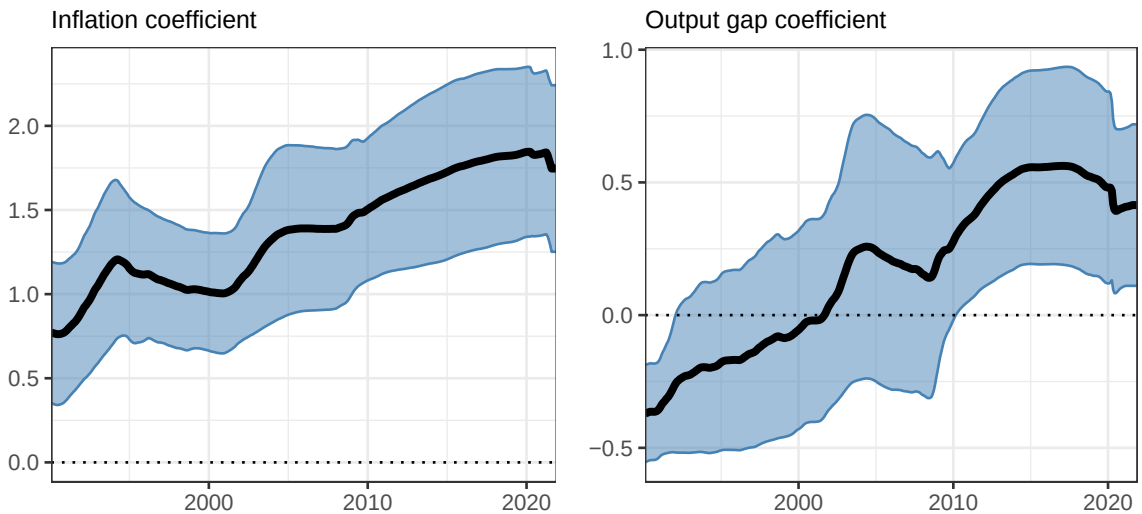

- Greenspan: “The Federal Reserve has seen the need to respond more aggressively than had been our wont in earlier decades” (March 2001)
- Bernanke: “By way of historical comparison, this policy response stands out as exceptionally rapid and proactive” (December 2008)

Correcting for Fed Response to News Bias

Orthogonalize the instruments z_t^i with respect to economic, financial data released in the weeks leading up to the announcements

$$z_t^i = \delta + \psi' X_{t-} + z_t^{i\perp}$$

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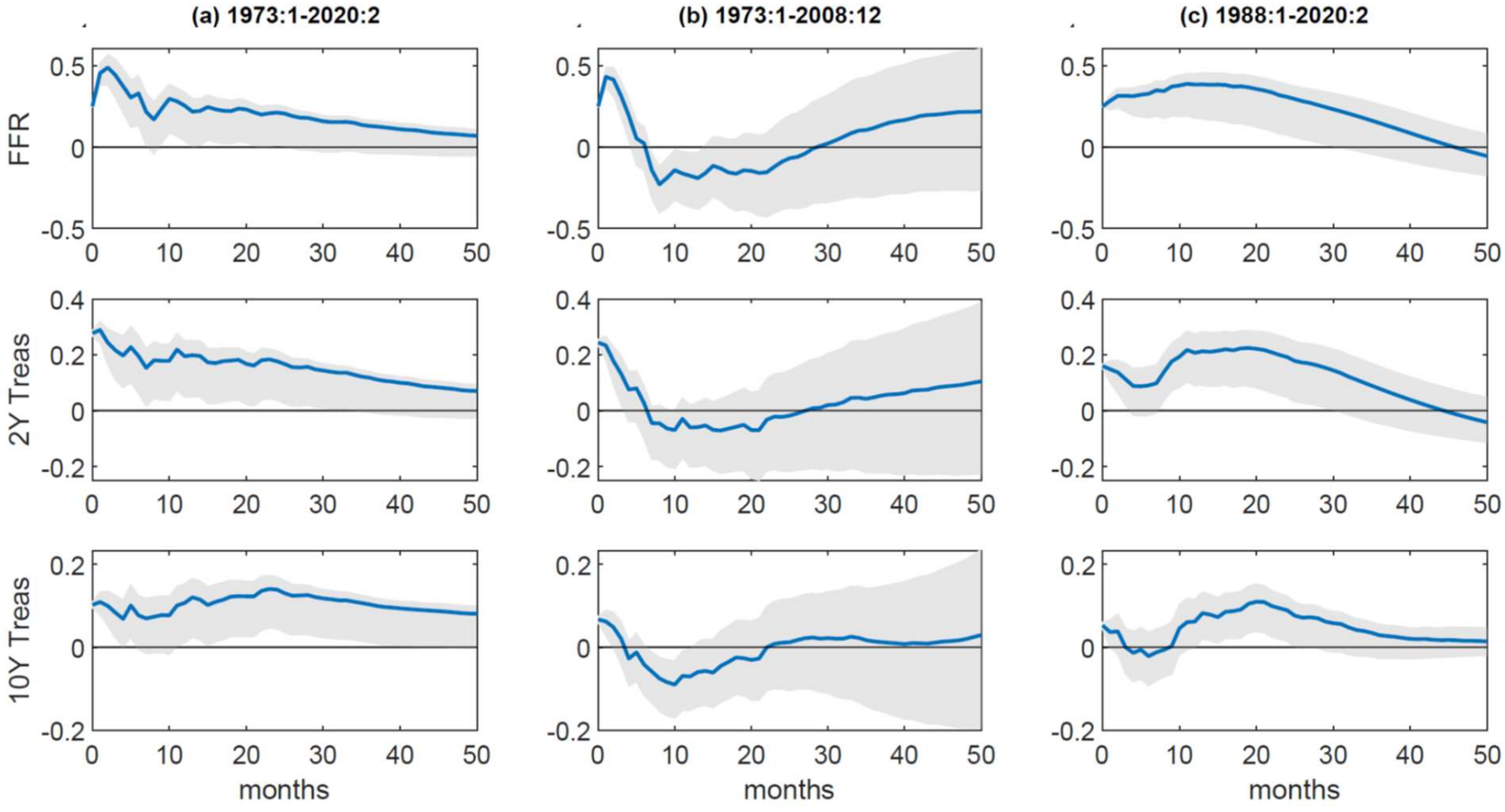
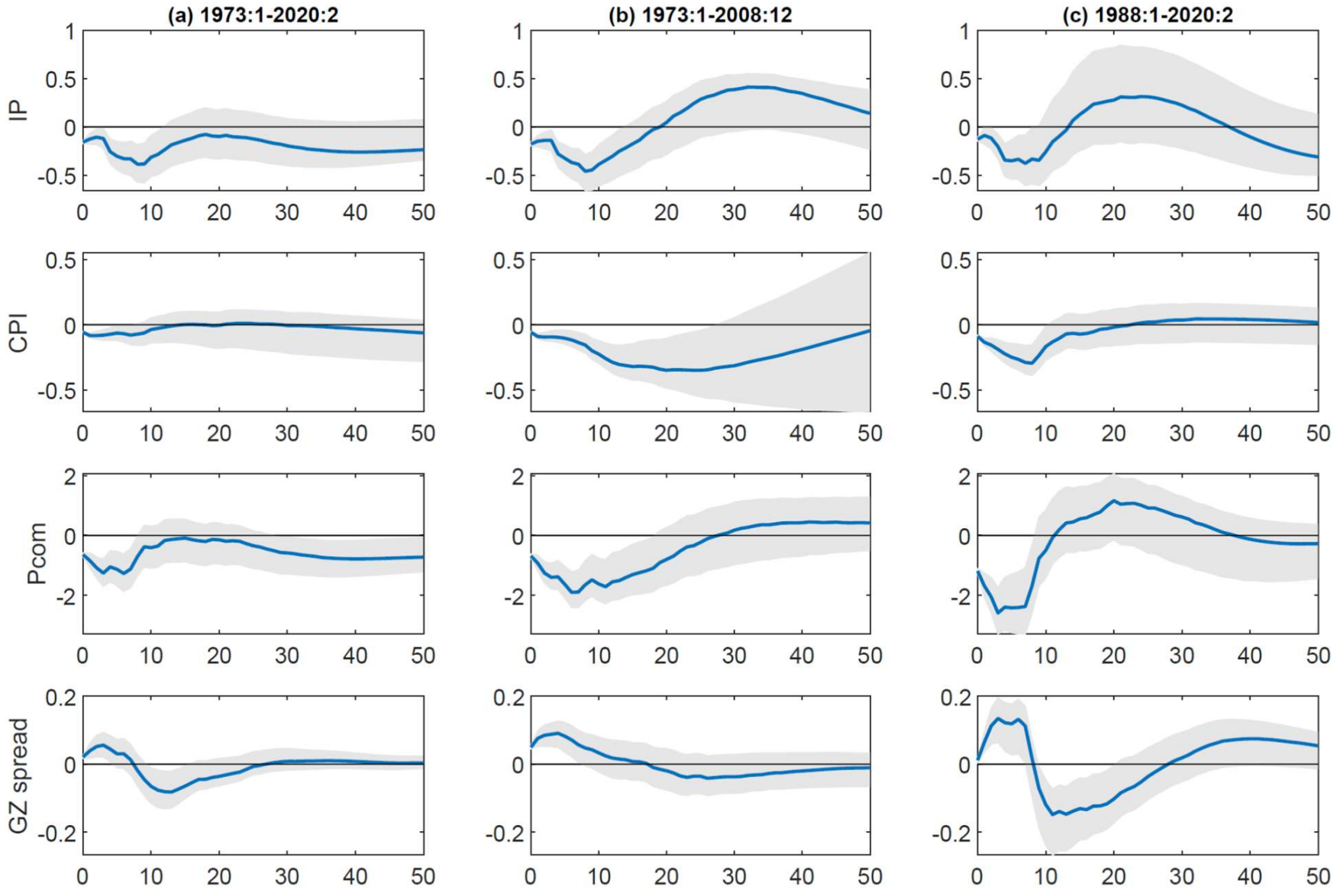
Instrument $z_t^{i\perp}$ should still be relevant, but now orthogonalized with respect to X_{t-}, more exogenous

Response to Federal Funds Rate, Different Samples



Response to Fed Funds Rate, Diff Samples (cont.)

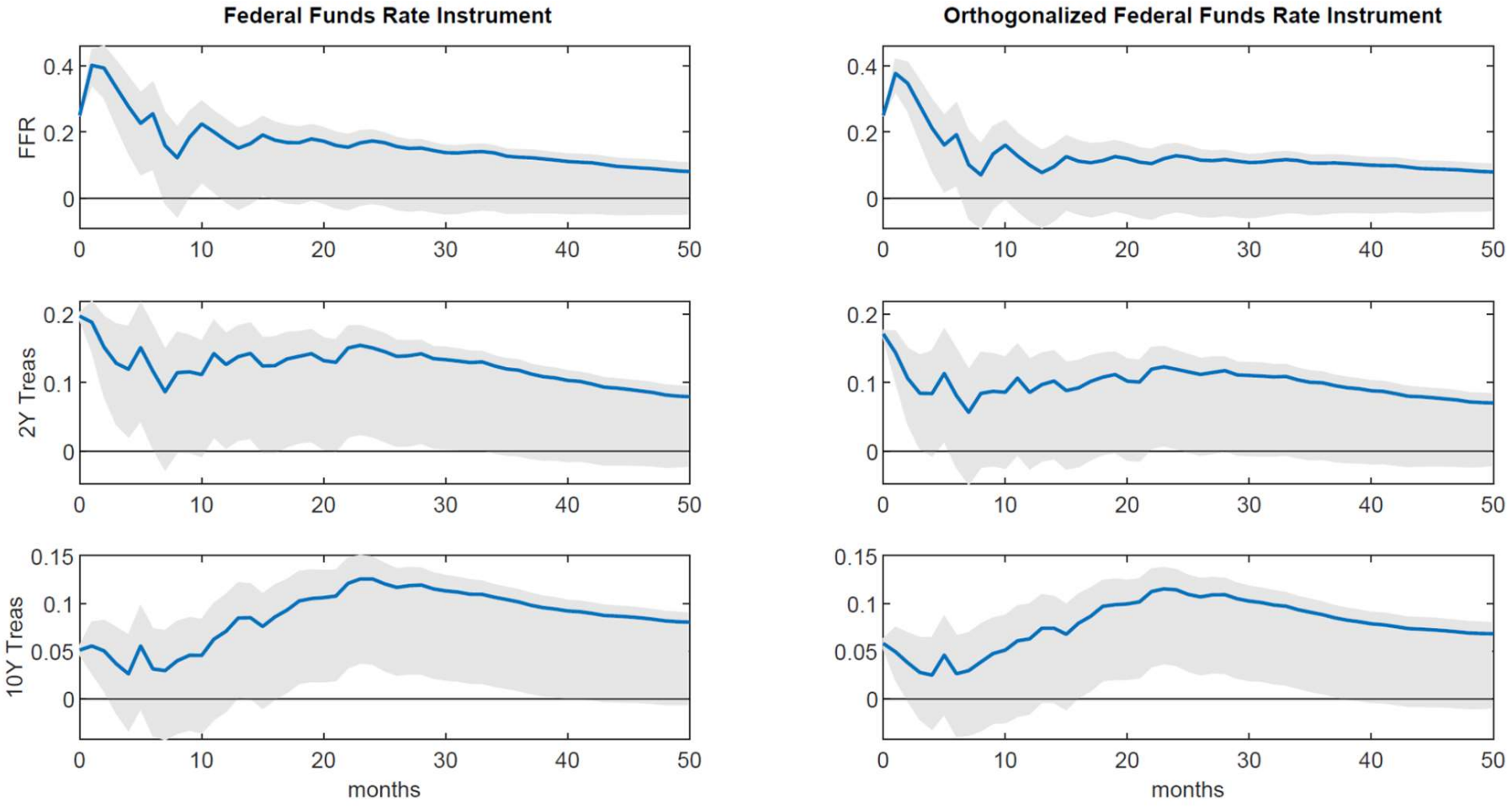


Fed Response to News Predictability: Funds Rate

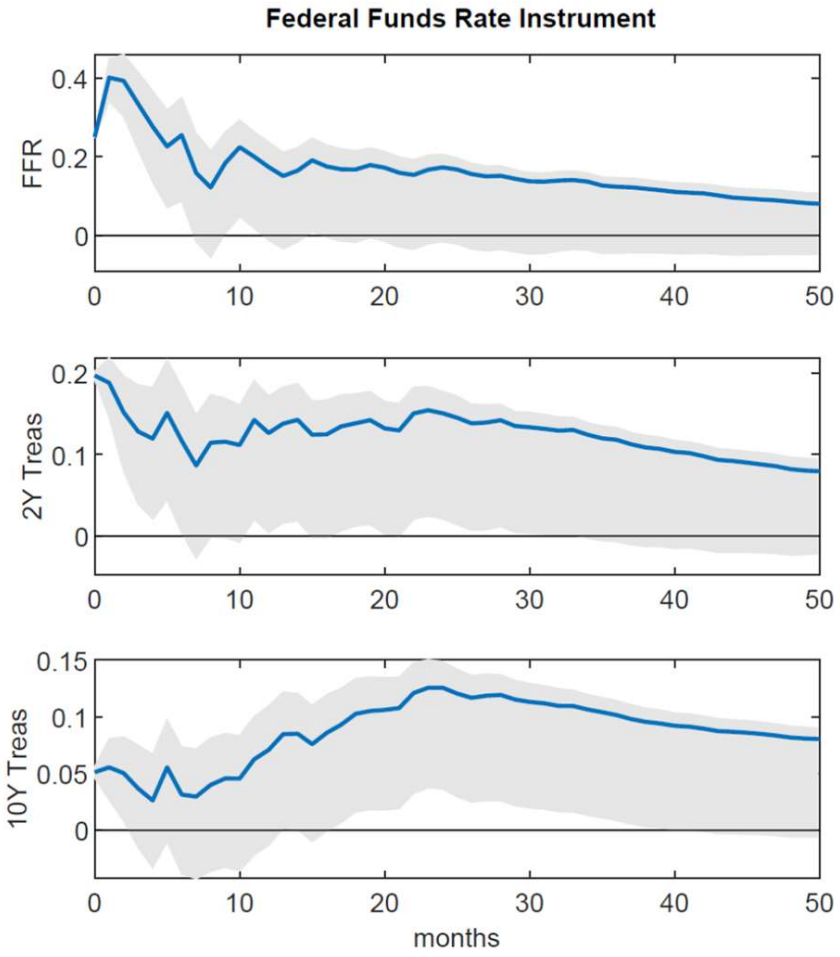
$$z_t^{ff} = \delta + \psi' X_{t-} + \zeta_t$$

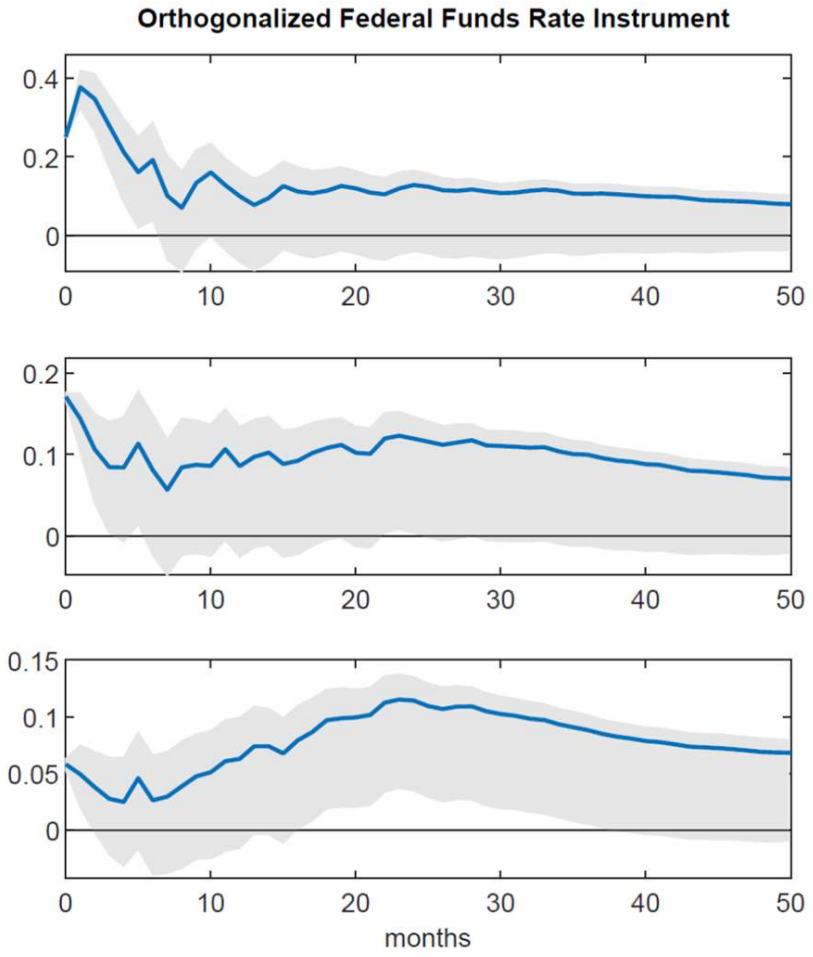
Macroeconomic News			
Nonfarm payrolls surprise	1.39**	GDP surprise	−0.09
	(.570)		(.120)
Unemployment surprise	−0.31	Core CPI surprise	−0.09
	(.369)		(.487)
Financial News			
Δ log S&P 500 (3m)	0.26	Δ 10-year Treasury (3m)	−0.15
	(.999)		(.192)
Δ shadow fed funds rate (3m)	0.52***	Δ Baa spread (3m)	−0.33*
	(.200)		(.190)
Δ 2-year Treasury (3m)	0.16	Δ log Commodity prices (3m)	0.43
	(.242)		(.962)
Lagged Monetary Policy Surprises			
z_{t-1}^{ff}	−0.17*	z_{t-2}^{ff}	−0.26***
	(.104)		(.096)
R^2	0.18		

Response to Federal Funds Rate



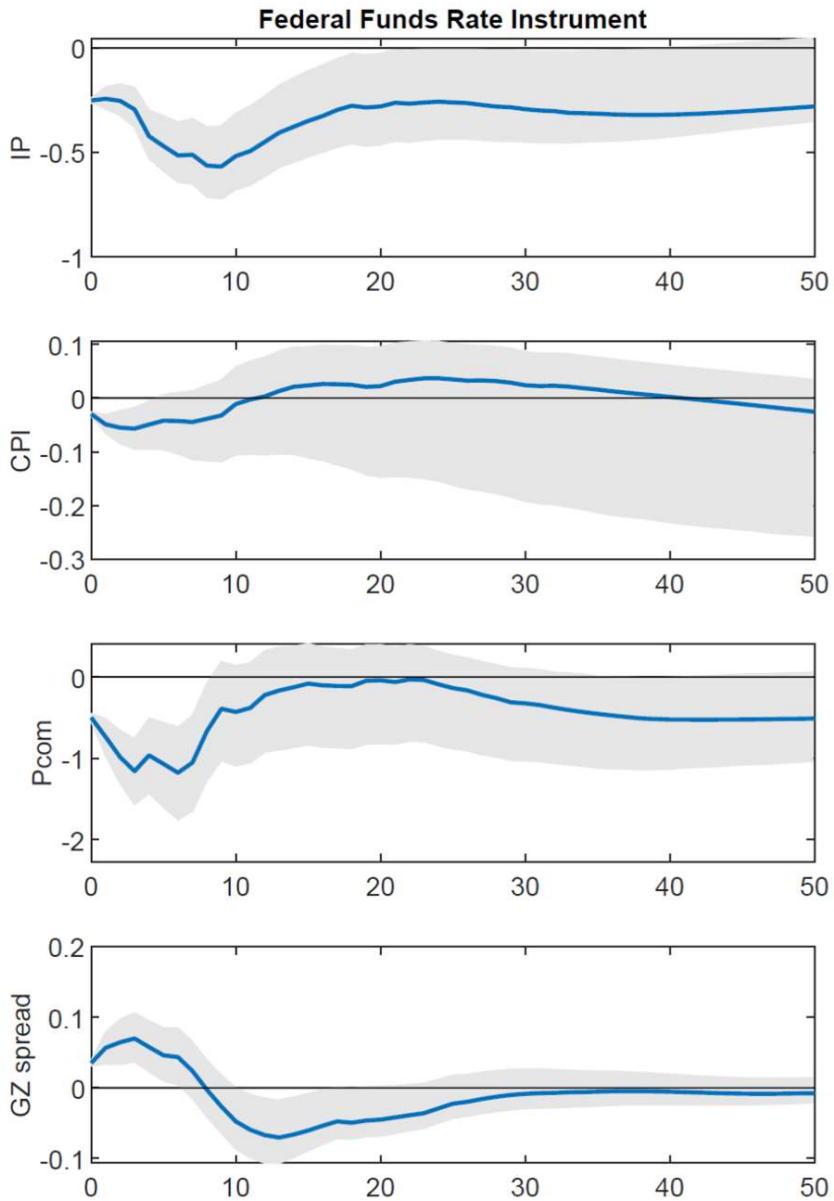
Response to Federal Funds Rate

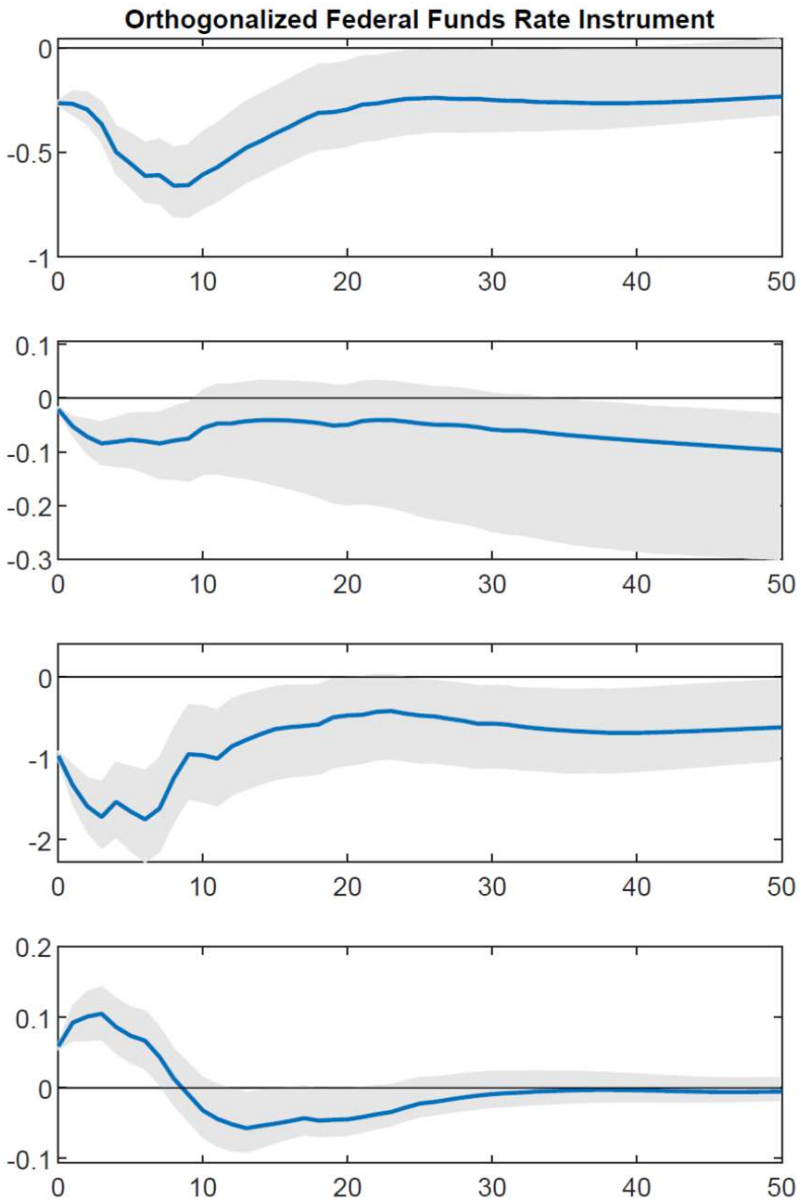




first-stage F-stat: 11.0 8.9

Response to Federal Funds Rate (cont.)



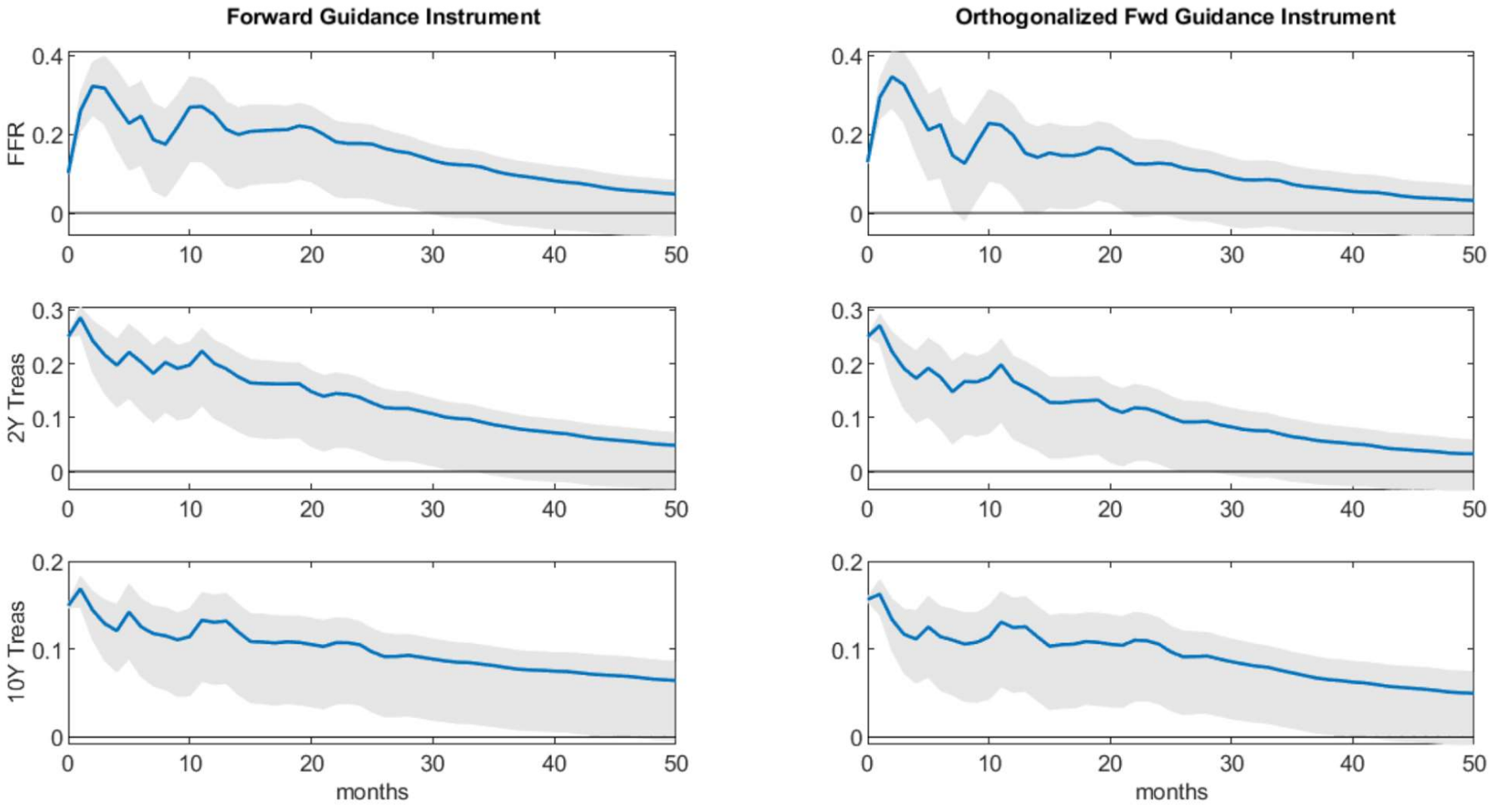


Fed Response to News: Forward Guidance

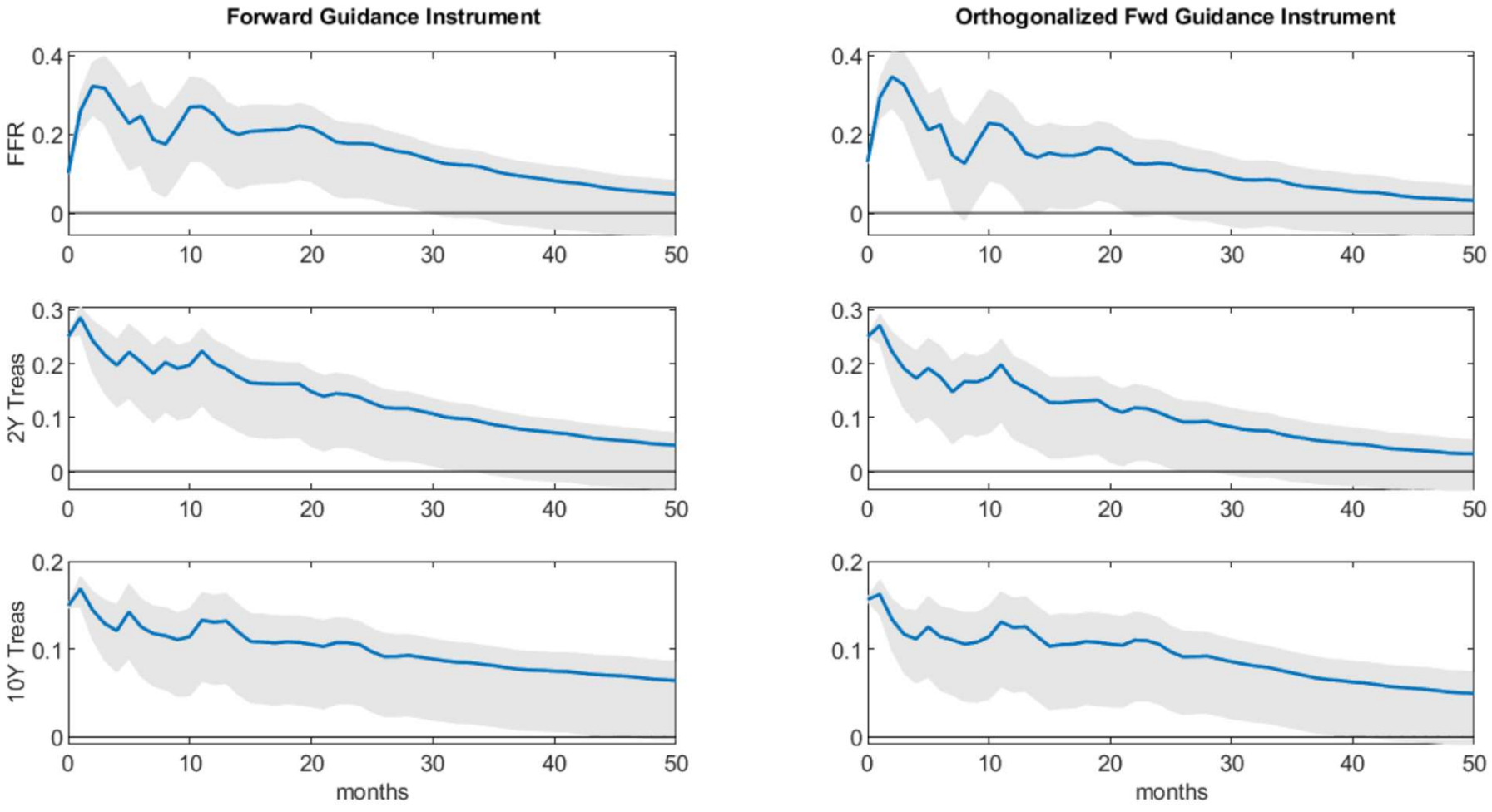
$$z_t^{fg} = \delta + \psi' X_{t-} + \zeta_t$$

Macroeconomic News			
Nonfarm payrolls surprise	−0.018	GDP surprise	−0.003
	(.034)		(.007)
Unemployment surprise	−0.009	Core CPI surprise	−0.035
	(.023)		(.032)
Financial News			
Δ log S&P 500 (3m)	0.118**	Δ 10-year Treasury (3m)	−0.025***
	(.049)		(.010)
Δ shadow fed funds rate (3m)	−0.022**	Δ Baa spread (3m)	0.020*
	(.011)		(.012)
Δ 2-year Treasury (3m)	0.053***	Δ log Commodity prices (3m)	0.151***
	(.014)		(.052)
Lagged Monetary Policy Surprises			
z_{t-1}^{fg}	−0.198**	z_{t-2}^{fg}	−0.115*
	(.078)		(.063)
R^2	0.12		

Response to Forward Guidance

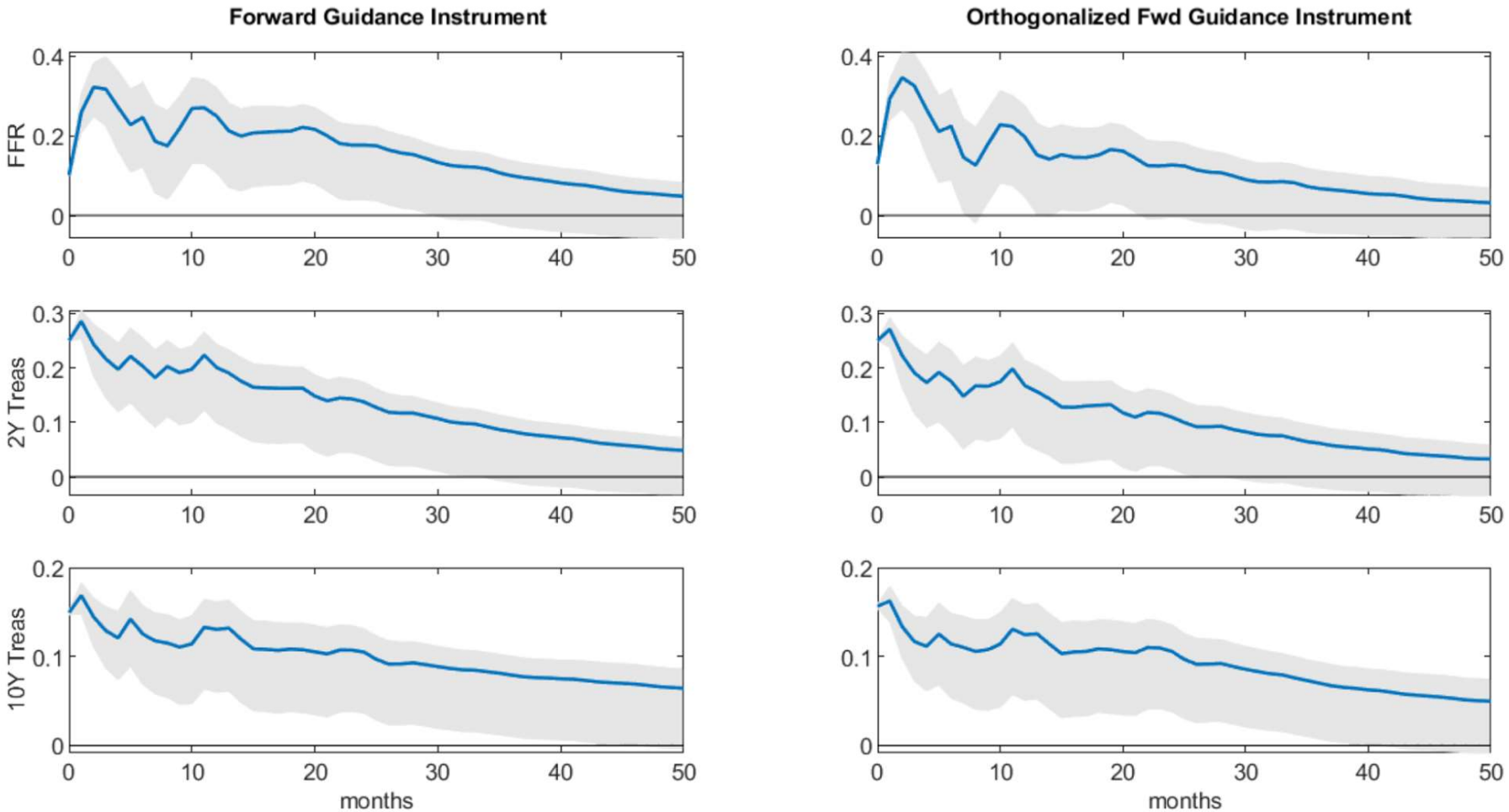


Response to Forward Guidance



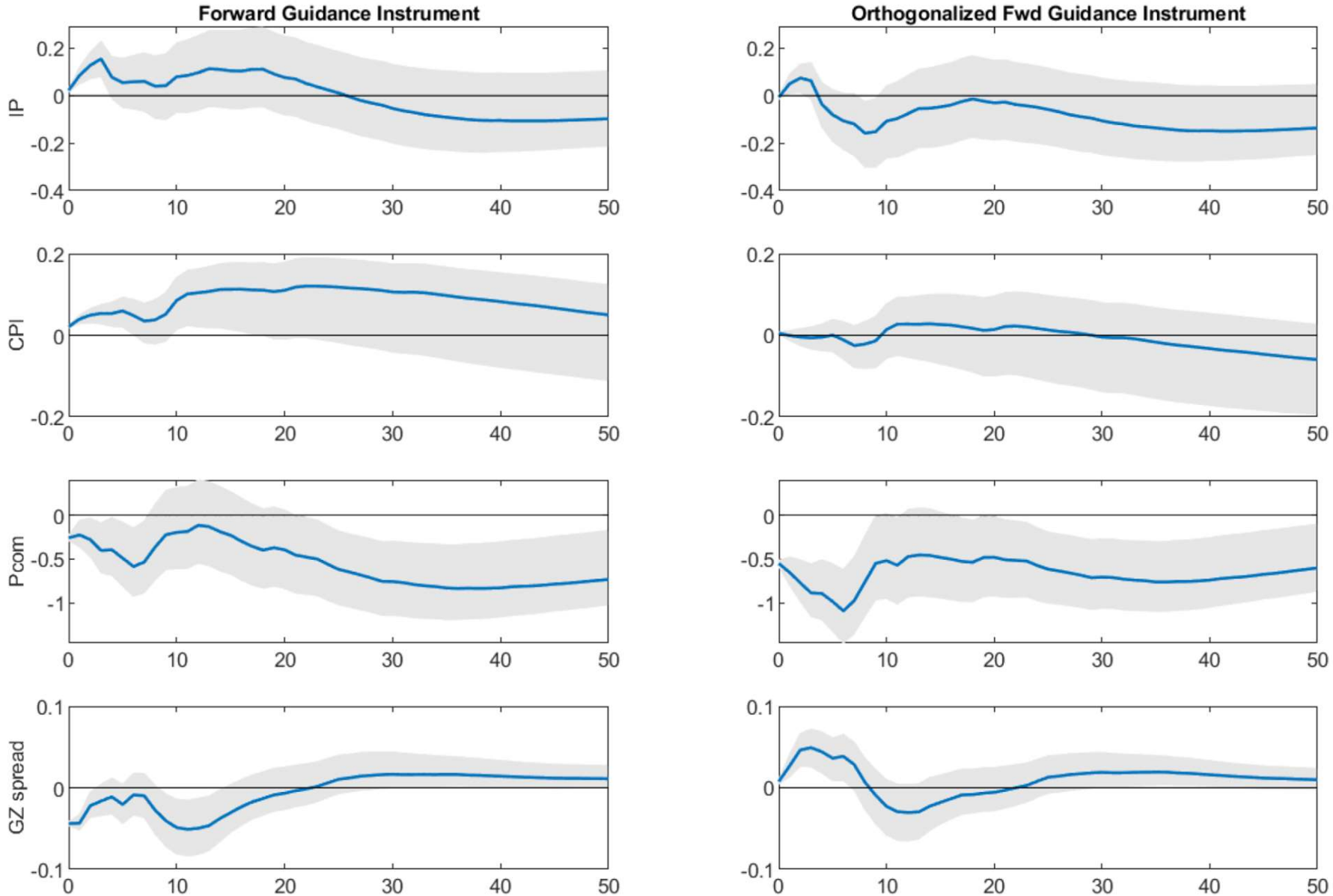
first-stage F-stat: 42.9 35.0

Response to Forward Guidance



first-stage F-stat:	42.9	35.0
(using only FOMC):	3.4	1.7

Response to Forward Guidance (cont.)

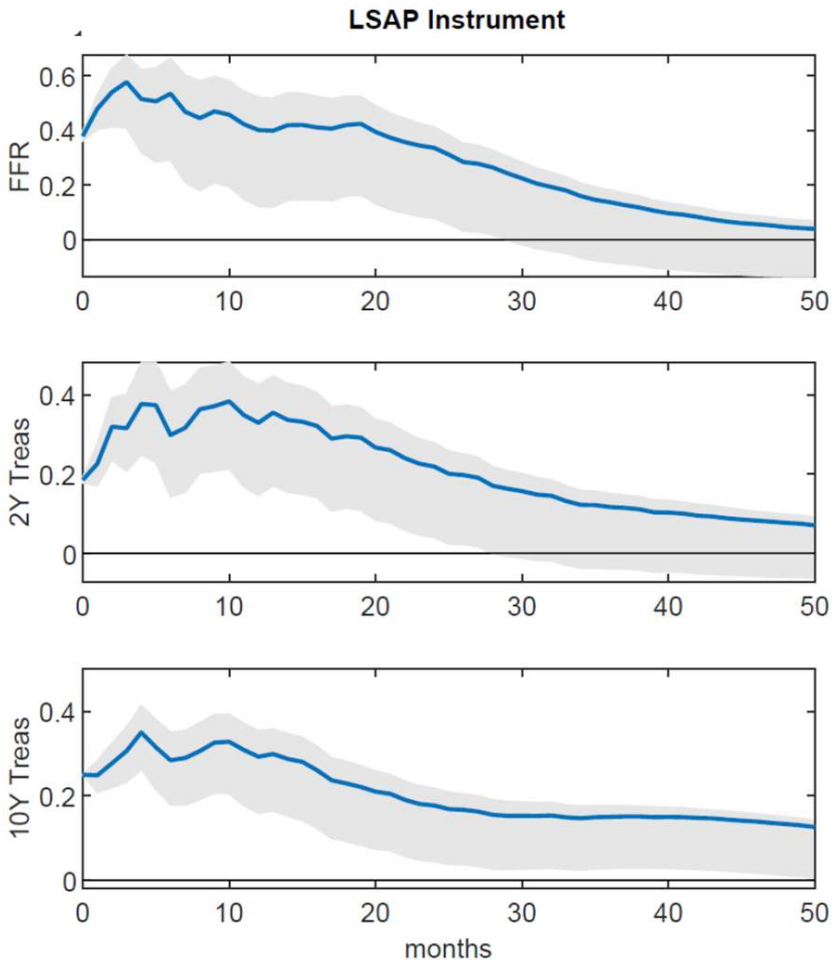


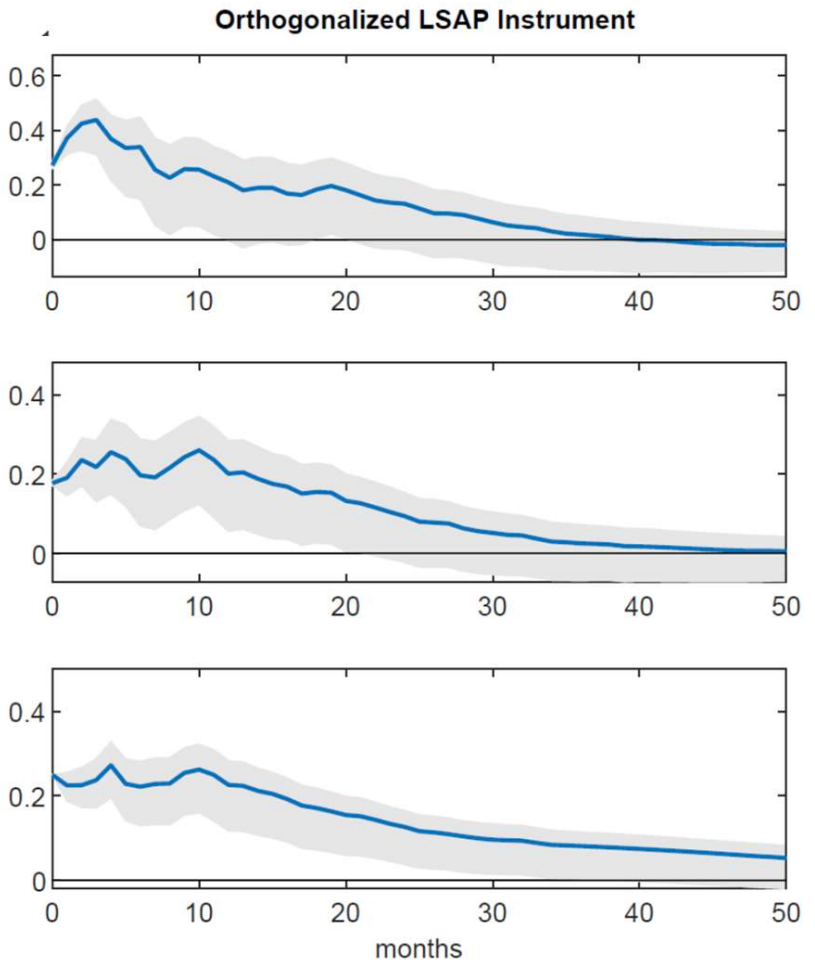
Fed Response to News Predictability: LSAPs

$$z_t^{lsap} = \delta + \psi' X_{t-} + \zeta_t$$

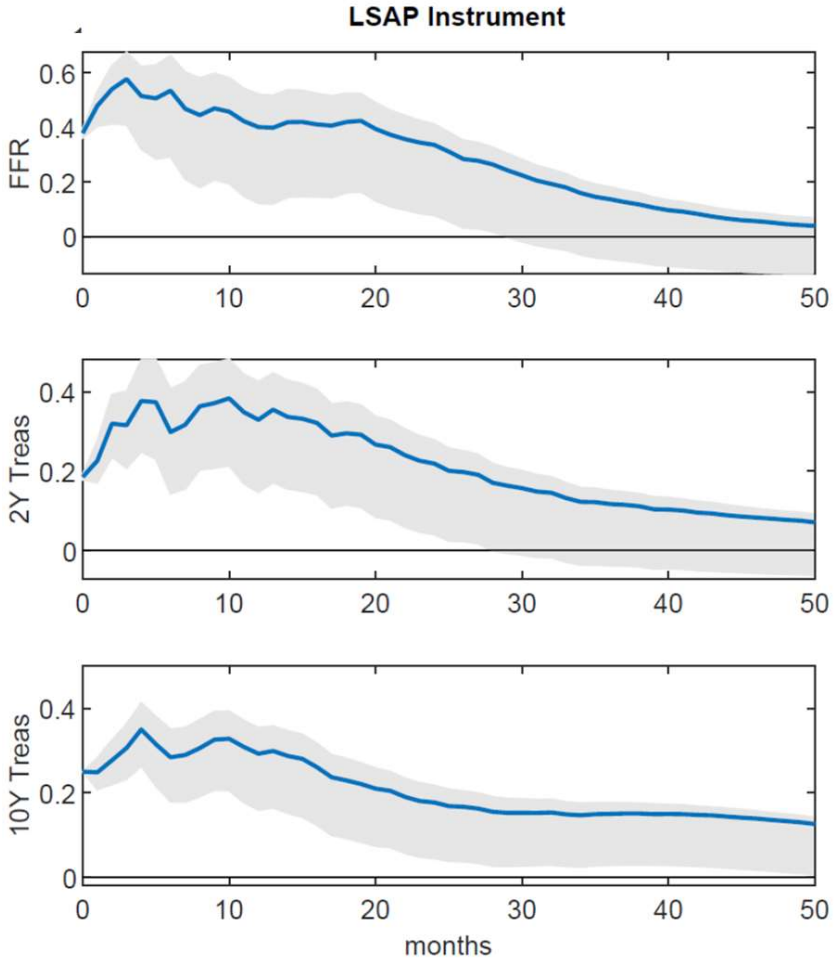
Macroeconomic News			
Nonfarm payrolls surprise	0.007	GDP surprise	0.003
	(.015)		(.003)
Unemployment surprise	−0.013	Core CPI surprise	−0.017
	(.010)		(.015)
Financial News			
Δ log S&P 500 (3m)	0.027	Δ 10-year Treasury (3m)	−0.001
	(.022)		(.005)
Δ shadow fed funds rate (3m)	−0.001	Δ Baa spread (3m)	0.005
	(.004)		(.005)
Δ 2-year Treasury (3m)	−0.002	Δ Chicago Fed ANFCI (1m)	−0.022**
	(.006)		(.009)
		Δ log Commodity prices (3m)	0.032
			(.025)
Lagged Monetary Policy Surprises			
z_{t-1}^{lsap}	−0.098*	z_{t-2}^{lsap}	0.037
	(.053)		(.053)
R^2	0.06		

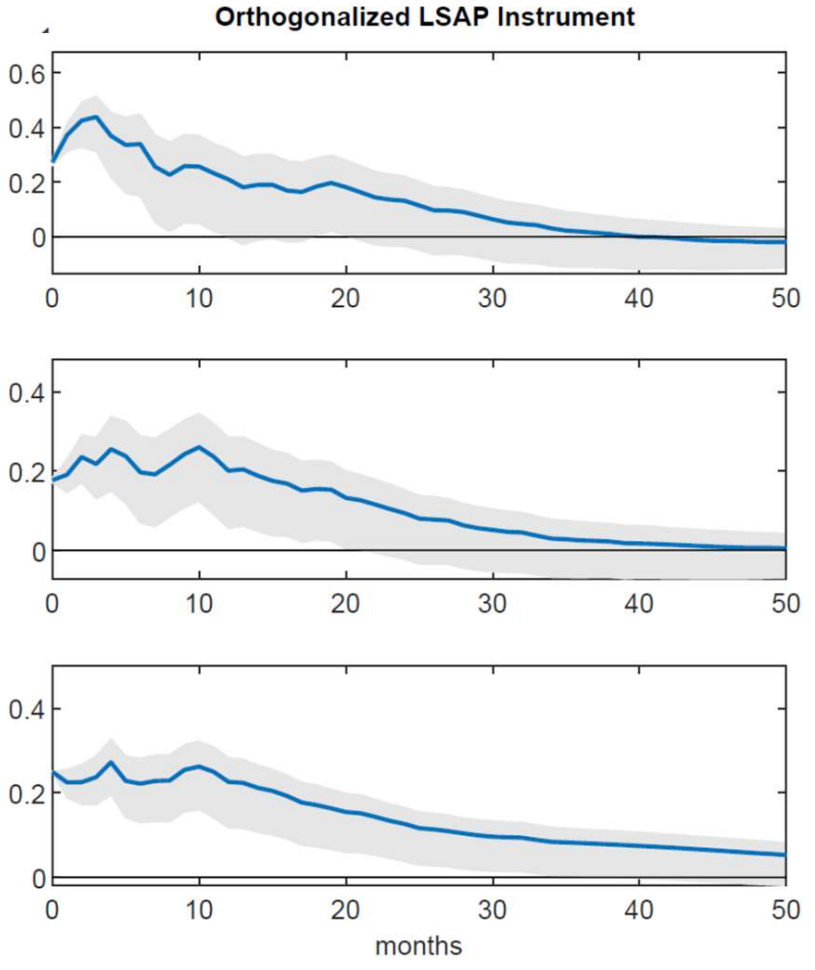
Response to LSAPs





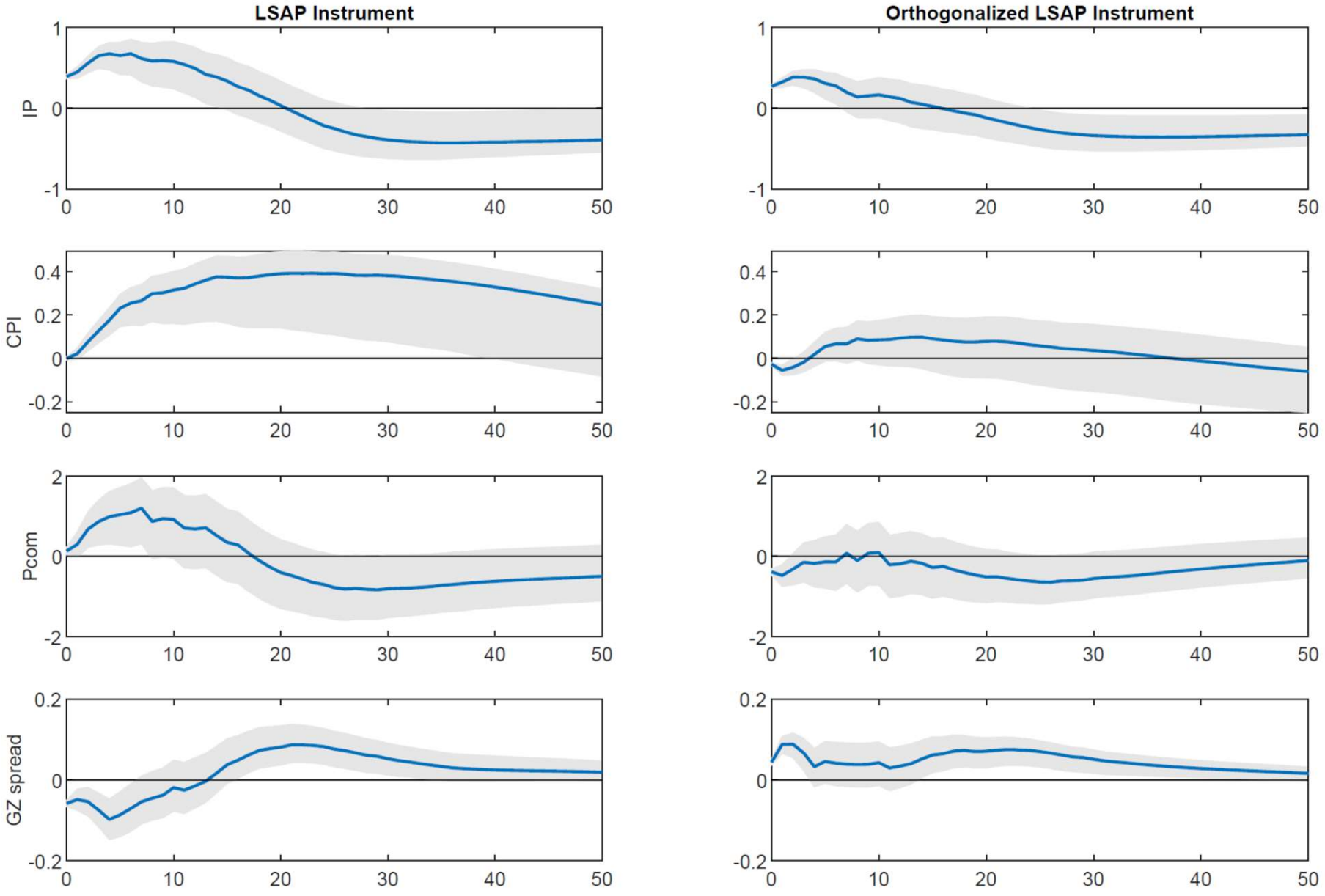
Response to LSAPs





first-stage F-stat: 3.7 6.4

Response to LSAPs (cont.)



Conclusions

- Federal funds rate, forward guidance, and LSAPs all had significant effects on macro variables
- Federal funds rate effects are the largest and most robust
  — suggests that short-term interest rates should continue to be the primary monetary policy tool going forward
  — contrasts with Swanson (2021), who found all three policies were about equally effective at moving financial markets
- FOMC announcements alone are a weak instrument, especially for forward guidance and LSAPs
- There is a significant Bauer-Swanson (2023) “Fed Response to News” effect/bias in the data for all three monetary policy tools
  — important to correct for this bias in IRF estimates