Background

HF MP Surprises

FG and LSAPs

Structural VAR

Results

Conclusions

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

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Background ●ooo	HF MP Surprises	FG and LSAPs	Structural VAR	Results 0000000000	Conclusions o
Motivati	on				

- 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)

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This Pa	ner				

- 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

Background oo●o	HF MP Surprises	FG and LSAPs	Structural VAR	Results 0000000000	Conclusions o
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



- 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 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)

- Background HF MP Surprises of G and LSAPs Structural VAR Results conclusions of Structural VAR Results concl
- 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



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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Stocks Finish Lower After Fed Signals Higher Rates

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

Index performance





Stocks Finish Lower After Fed Signals Higher Rates

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





Stocks Finish Lower After Fed Signals Higher Rates

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



Background	HF MP Surprises	FG and LSAPs	Structural VAR	Results	Conclusions
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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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Five Types of Monetary Policy Announcements

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• Speeches and Congressional Testimony by Fed Vice Chair (310 total)

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.)

Fed Chair and Vice Chair Speeches (non-testimony)

- Start times from several sources
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Fed Chair and Vice Chair Congressional testimony

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

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Intradai	lv 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
- Iog of S&P 500 index

Background	HF MP Surprise	es F	G and LSAF		Structural VAF	2	Results		Conclusions o		
Importance of Different Announcement Types											
	ED1	ED2	ED3	ED4	2yr	5yr	10yr	30yr	S&P500		
(A) Sum of Absolu	ite Changes	s (in pp)									
FOMC Annound	e 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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- Fed Chair speeches and testimony are the most important for all assets except the very shortest-maturity interest rate futures

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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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(B) Mean Absolute	e Change p	er Annou	incement	(in bp)							
FOMC Annound	ce 2.97	3.46	3.74	3.96	2.76	2.98	2.28	1.92	35.2		
Chair Speeches	s 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		
Vice Chair Sps.	0.77	1.28	1.40	1.52	1.24	1.35	1.14	1.20	25.1		

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• Press conferences more comparable to FOMC announcements

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- Press conferences more comparable to FOMC announcements
- Suggests press conferences are almost as important as FOMC announcements going forward

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Importance of	Differ	ent A	nnou	ncem	ent 7	Гурез	5	
ED1	ED2	ED3	ED4	2yr	5yr	10yr	30yr	S&P500
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B) Mean Absolute Change p	per Annou	ncement	(in bp)					
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Press conferences more comparable to FOMC announcements

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- Suggests press conferences are almost as important as FOMC announcements going forward
- Even per announcement, Fed Chair speeches are most important except for short-maturity interest rate futures

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e of C	Differ	ent Ar	nnou	ncem	ent	Турез	5	
ED1	ED2	ED3	ED4	2yr	5yr	10yr	30yr	S&P500
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9.60 6.42 0.33 1.30 0.78	11.19 10.46 0.55 2.47 1.31	12.07 13.43 0.75 3.28 1.43	12.80 15.05 0.91 3.67 1.56	8.91 10.65 0.91 3.09 1.26	9.63 12.17 1.14 3.38 1.38	7.37 9.87 0.91 2.68 1.17	6.20 9.48 0.76 2.44 1.23	113.7 162.6 17.2 49.0 25.6
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Importar	ice of I	Differ	ent A	nnou	ncen	nent [.]	Types	5	
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(B) Mean Absolut	e Change p	er Annou	uncement	(in bp)					
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(C) Explanatory F	² for Month	ly Chang	ges						
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Minutes Vice Chair Sps.	.006 .013	.007 .008	.005 .007	.005 .004	.002 .002	001 .006	002 .007	.001 .008	011 006

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Importar	nce of	Differ	ent A	nnou	ncen	nent ⁻	Турез	5	
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(C) Explanatory F	R ² for Mont	hly Chang	ges						
FOMC Annound Chair Speeches Press Conf Minutes Vice Chair Sps.	ce .123 .036 .002 .006 .013 .179	.096 .071 .001 .007 .008	.066 .078 .000 .005 .007	.046 .080 .000 .005 .004	.016 .064 .001 .002 .002	.022 .065 .005 001 .006	.022 .051 .003 002 .007	.020 .051 .001 .001 .008	.039 .073 .009 011 006

Background	HF MP Surprises	FG and LSAPs ●○	Structural VAR	Results 00000000000	Conclusions o
Forward	l Guidance				

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



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

- 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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For announcements of other types, extract first principal component:

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

Background	HF MP Surprises	FG and LSAPs ○●	Structural VAR	Results 00000000000	Conclusions O
LSAPs					

Define LSAP component of each announcement to be

Background	HF MP Surprises	FG and LSAPs ○●	Structural VAR	Results 00000000000	Conclusions o
LSAPs					

Define LSAP component of each announcement to be

• before 2009: 0



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- before 2009: 0
- after 2009: change in the 10-year Treasury yield, orthogonalized with respect to changes in the federal funds rate and forward guidance


Define LSAP component of each announcement to be

- before 2009: 0
- after 2009: change in the 10-year Treasury yield, orthogonalized with respect to changes in the federal funds rate and forward guidance
- 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

Background	HF MP Surprises	FG and LSAPs	Structural VAR •000000	Results 00000000000	Conclusions o
VAR Sp	ecification				

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

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VAR Sp	ecification				

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

Y_t includes:

- log Industrial Production
- Iog CPI
- log Commodity Price index
- Gilchrist-Zakrajsek (2012) credit spread
- Wu-Xia (2016) shadow federal funds rate
- 2-year Treasury yield
- 10-year Treasury yield

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

Background	HF MP Surprises	FG and LSAPs	Structural VAR	Results 0000000000	Conclusions o
Structu	iral Shocks	in the VA	R		

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Background	HF MP Surprises	FG and LSAPs oo	Structural VAR	Results 00000000000	Conclusions o
Structur	al Shocks i	n the VAR	ł		

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Reduced-form residuals related to structural shocks:

 $u_t = S\varepsilon_t,$

Background	HF MP Surprises	FG and LSAPs oo	Structural VAR	Results 00000000000	Conclusions o
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Reduced-form residuals related to structural shocks:

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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: $\varepsilon_t^{\rm ff}$
- forward guidance shock: ε_t^{fg}
- LSAP shock: ε_t^{lsap}



For each monetary policy tool $i \in \{ff, fg, Isap\}$, 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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High-frequency instruments z_t^i plausibly satisfy all of these conditions



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High-frequency instruments z_t^i plausibly satisfy all of these conditions

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



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

Reduced-form residuals related to structural shocks:

 $u_t = S\varepsilon_t,$



Reduced-form VAR:

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

Reduced-form residuals related to structural shocks:

$$u_t = S\varepsilon_t,$$

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):

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



Reduced-form VAR:

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Reduced-form residuals related to structural shocks:

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$$u_t = \gamma + \mathbf{s}_i u_t^i + \eta_t$$

Equivalently, estimate via 2SLS:

$$Y_t = \tilde{\alpha} + \tilde{B}(L)Y_{t-1} + s_iY_t^i + \tilde{u}_t$$



Reduced-form VAR:

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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 Background HF MP Surprises FG and LSAPs Structural VAR Results Conclusions

Predictability of Monetary Policy Surprises

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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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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)

Rolling-window Taylor Rule regressions:



- 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

$$\mathbf{z}_t^i = \delta + \psi' \mathbf{X}_{t^-} + \mathbf{z}_t^{i\perp}$$



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

$$\mathbf{z}_t^i = \delta + \psi' \mathbf{X}_{t^-} + \mathbf{z}_t^{i\perp}$$

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

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 Response to Federal Funds Rate, Different Samples



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



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

Macroeconomic News

Nonfarm payrolls surprise	1.39** (.570)	GDP surprise	-0.09 (.120)
Unemployment surprise	-0.31 (.369)	Core CPI surprise	-0.09 (.487)
Financial News			
$\Delta \log S\&P 500 (3m)$	0.26 (.999)	Δ 10-year Treasury (3m)	-0.15 (.192)
Δ shadow fed funds rate (3m)	0.52*** (.200)	Δ Baa spread (3m)	-0.33* (.190)
Δ 2-year Treasury (3m)	0.16 (.242)	$\Delta \log$ Commodity prices (3m)	0.43 (.962)
Lagged Monetary Policy Surprises	6		
Z_{t-1}^{ff}	-0.17* (.104)	z_{t-2}^{ff}	-0.26*** (.096)
B^2	0.18		

	Designed to Federal Funda Data							
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Response to Federal Funds Rate



Orthogonalized Federal Funds Rate Instrument



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Response to Federal Funds Rate



Orthogonalized Federal Funds Rate Instrument



first-stage F-stat: 11.0

8.9

Background

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Response to Federal Funds Rate (cont.)



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Fed Res	sponse to Ne	ews: Forv	vard Guida	ance	
		$z_t^{fg} = \delta + \psi'.$	$X_{t-} + \zeta_t$		
Macroecond	omic News				
Nonfarm	payrolls surprise	-0.018 (.034)	GDP surprise		-0.003 (.007)
Unemplo	yment surprise	-0.009 (.023)	Core CPI surpri	se	-0.035 (.032)
Financial Ne	ews				
$\Delta \log S\&$	P 500 (3m)	0.118** (.049)	Δ 10-year Treas	sury (3m)	-0.025*** (.010)
Δ shadow	w fed funds rate (3m)	-0.022** (.011)	Δ Baa spread (3m)	0.020* (.012)
∆ 2-year	Treasury (3m)	0.053*** (.014)	$\Delta \log$ Commodi	ty prices (3m)	0.151*** (.052)
Lagged Mor	netary Policy Surprises	S			
z_{t-1}^{fg}		-0.198** (.078)	z_{t-2}^{fg}		-0.115* (.063)
R^2		0.12			

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Background	HF MP Surprises	FG and LSAPs	Structural VAR	Results	Conclusions		

Response to Forward Guidance



Orthogonalized Fwd Guidance Instrument



Response to Forward Guidance



Orthogonalized Fwd Guidance Instrument



35.0

Response to Forward Guidance



3.4

(using only FOMC):

Orthogonalized Fwd Guidance Instrument



35.0 1.7
Background HF MP Surprises

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Response to Forward Guidance (cont.)





Background	HF MP Surprises	FG and LSAPs	Structural VAR	Results ooooooooooooo	Conclusior O			
Fed Response to News Predictability: LSAPs								
		$z_t^{lsap} = \delta + \psi' z_t^{lsap}$	$X_{t-} + \zeta_t$					
Macroecono	mic News							
Nonfarm	payrolls surprise	0.007 (.015)	GDP surprise		0.003 (.003)			
Unemploy	ment surprise	-0.013 (.010)	Core CPI surpr	ise	-0.017 (.015)			
Financial Ne	WS							
$\Delta \log S\&I$	P 500 (3m)	0.027 (.022)	Δ 10-year Trea	sury (3m)	-0.001 (.005)			
Δ shadow	v fed funds rate (3m)	-0.001 (.004)	Δ Baa spread ((3m)	0.005 (.005)			
Δ 2-year	Treasury (3m)	-0.002 (.006)	Δ Chicago Fed	ANFCI (1m)	-0.022** (.009)			
			$\Delta \log Commod$	ity prices (3m)	0.032 (.025)			
Lagged Mon	etary Policy Surprise	S						
z_{t-1}^{lsap}		-0.098* (.053)	z_{t-2}^{lsap}		0.037 (.053)			

Background	HF MP Surprises	FG and LSAPs	Structural VAR	Results ○○○○○○○○●○	Conclusions o

Response to LSAPs





Background	HF MP Surprises	FG and LSAPs	Structural VAR	Results ○○○○○○○○●○	Conclusions o

Response to LSAPs





first-stage F-stat: 3.7

6.4

months

Background HF MP Surprises FG and LSAPs Structural VAR Results Conclusions

Response to LSAPs (cont.)





- Federal funds rate, forward guidance, and LSAPs all had significant effects on macro variables
- 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