

Interest Rate Surprises: A Tale of Two Shocks

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Motivation

- ▶ **What are the effects of monetary policy?**
- ▶ Identification 1.0:
 - ▶ Removing anticipated endogenous component of monetary policy and using only surprise component
VAR timing assumptions, narrative approach, high-frequency measures, etc.
 - ▶ However, surprises can contain multiple components that may have different effects
- ▶ Identification 2.0:
 - ▶ **Information (unanticipated endogenous component) vs “pure” monetary shocks**

This Paper

Key idea: Macro data releases provide information on state of the economy with no pure monetary policy shocks by design.

Strategy:

1. Identify information shocks from a VAR with external instruments: *interest rate movements around macro news events*.
 - ▶ Perceived future policy responses to exogenous information about the economy
2. *Use the identified information shocks to “clean” the information component* out of traditional FOMC announcement interest rate surprises to identify the effects of pure monetary shocks.

Related Literature

Empirical work on CB information shocks:

- ▶ Romer and Romer (2000), Gürkaynak, Sack, Swanson (2005a,b), Bodenstein, Hebden, Nunes (2012), Campbell et al (2012), Tang (2015), Campbell et al (2017), Nakamura and Steinsson (2018), Lakdawala (2019), Andrade et al (2019), Cieslak and Schrimpf (2019), Andrade and Ferroni (2020), Jarociński and Karadi (2020), Lunsford (2020), Stavrakeva and Tang (2021), Miranda-Agrippino and Ricco (2021), Bauer and Swanson (2023), ...

External Instrument VARs:

- ▶ Mertens and Ravn (2013), Gertler and Karadi (2015), Lunsford (2016), Lakdawala (2019), Montiel Olea, Stock, Watson (2021), ...

Macro data releases:

- ▶ Gürkaynak, Sack, Swanson (2005), Faust et al. (2007), Swanson and Williams (2014), Tang (2019), Ozdagli and Velikov (2019), ...

Outline of the Talk

1. Model, Estimation Method, and Data
2. Results
3. Robustness Checks

Model, Estimation Method, and Data

Model

- ▶ Identification of monetary shocks is complicated by systematic policy responses:

$$i_t = \phi_t' E_t X_{t+h} + \varepsilon_t^{MP}. \quad (1)$$

- ▶ Focusing on the interest rate change around certain events:

$$\Delta_F i_t = \phi_t' \Delta_F E_t X_{t+h} + \Delta_F \phi_t' E_t X_{t+h} + \varepsilon_t^{MP} \quad (2)$$

- ▶ In general, an FOMC announcement may contain a macro information component or a surprise to the policy rule coefficients in addition to the pure monetary shock.

Model

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$$i_t = \phi_t' E_t X_{t+h} + \varepsilon_t^{MP}. \quad (1)$$

- ▶ Focusing on the interest rate change around certain events:

$$\Delta_D i_t = \phi_t' \Delta_D E_t X_{t+h} + \Delta_D \phi_t' E_t X_{t+h} \quad (2)$$

- ▶ In general, an FOMC announcement may contain a macro information component or a surprise to the policy rule coefficients in addition to the pure monetary shock.
- ▶ On data release days, the ε_t^{MP} shock is absent by design. Movements in market interest rates are due to the data surprise and *endogenous* surprises in policy rule coefficients.

Identification Method

Key idea:

- ▶ Macro releases: $Z_{D,t} \equiv \Delta_D i_t$ is a valid instrument to identify info shocks.
 - ▶ Note that we're using the interest rate change around macro announcements and not the more commonly used announcement surprises (actual minus forecast).
 - ▶ More flexibly captures the *market perceived* systematic response without estimating/imposing response function
 - ▶ Also captures the effect of all relevant info revealed (revisions of past data, subcomponents, etc), not just headline numbers
- ▶ FOMC announcements: After cleaning out the part correlated with the info shock, the remaining variation is only correlated with pure monetary policy shocks.

Identification Method

Comparison with existing identification methods in the literature:

- ▶ Versus sign restrictions: We do not assume the direction of the effect of info or traditional monetary shocks on any variables.

Andrade and Ferroni (2020), Jarociński and Karadi (2020)

- ▶ Problem that we avoid: Stock price responses to macro announcements have been shown to be of ambiguous sign or state-dependent due to competing cash flow and discount rate effects.

Boyd, Hu, Jagannathan (2005), Galí and Gambetti (2015), Law, Song, Yaron (2020), Gardner, Scotti, Vega (2021)

- ▶ Versus projection on forecast differences: the interest rate surprises we use on macro announcement days more accurately reflect the expectations of financial market participants, namely the same individuals whose expectations are captured in measures of interest rate surprises around policy announcements.

Campbell et al (2017), Lakdawala (2019), Miranda-Agrippino and Ricco (2021)

Estimation

- ▶ We estimate a reduced-form VAR (using Bayesian methods):

$$y_t = \lambda_1 y_{t-1} + \dots + \lambda_p y_{t-p} + u_t, \quad \Sigma \equiv E [u_t u_t'] \quad (3)$$

whose residuals are linear in the structural shocks,

$$u_t = [B_p \quad B_{-p}] [\varepsilon_t^{p'} \quad \varepsilon_t^{-p'}]'. \quad (4)$$

- ▶ We assume a set of instruments Z_t that satisfy relevance and exclusion conditions:

$$E [Z_t \varepsilon_t^{p'}] = \psi \text{ and } E [Z_t \varepsilon_t^{-p'}] = 0. \quad (5)$$

- ▶ Key assumption: $E[Z_{D,t} \varepsilon_t^{MP}] = 0$.
- ▶ $E[Z_{F,t} \varepsilon_t^{Info}]$ and $E[Z_{F,t} \varepsilon_t^{MP}]$ are unrestricted.

Estimation

This can be implemented as a two-step proxy SVAR:

1. Use $Z_{D,t}$ to identify ε_t^{Info} by standard methods. [Montiel Olea, Stock, Watson \(2021\)](#)
 - ▶ Under our assumptions, $E[Z_{D,t}\varepsilon_t^{Info}] \neq 0$ and $E[Z_{D,t}\varepsilon_t^{-Info}] = 0$.
2. Use a “cleaned” FOMC announcement surprise $\tilde{Z}_{F,t}$ (residual from regressing the usual overall surprise onto our estimate of ε_t^{Info}) to identify ε_t^{MP} .
 - ▶ Under our assumptions, $E[\tilde{Z}_{F,t}\varepsilon_t^{MP}] \neq 0$ and $E[\tilde{Z}_{F,t}\varepsilon_t^{-MP}] = 0$.

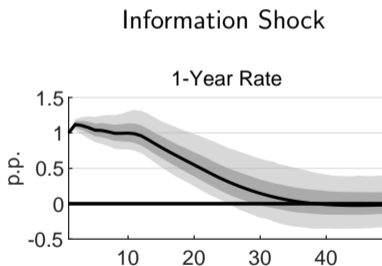
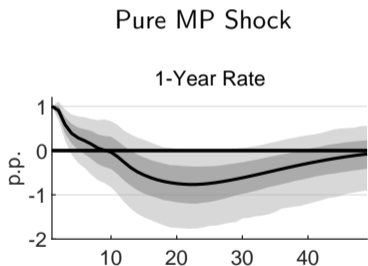
Data

- ▶ Monthly VAR from 1980:1 through 2019:1
- ▶ Instrument sample from 1990:2 through 2019:1
- ▶ Variables: 1-year rates, PCE, IP, EBP (Gilchrist and Zakrajšek 2012), and S&P 500 cumulative returns.
- ▶ Measure of interest rate surprises (IV): FF4.
- ▶ FOMC surprises: One-hour surprises around FOMC announcements.
- ▶ Macro news surprises: One-day surprises around releases of the BLS employment report and jobless claims. Also includes consumer confidence, industrial production, new home sales, leading indicators index, ISM manufacturing report, CPI, PPI, BEA advance estimate of GDP, and retail sales in some specifications.
- ▶ Macro news that overlap FOMC announcements are excluded. Surprises are aggregated to monthly frequency using GK2015 weighted sum.

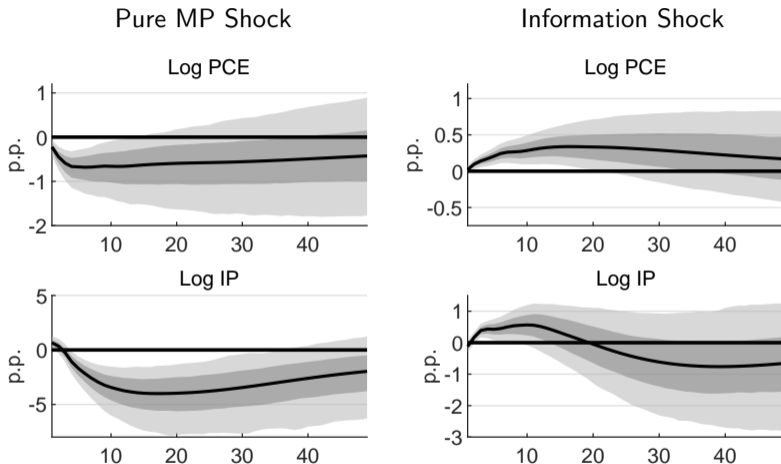
Results

Impulse Responses

- ▶ First-stage F-stat of employment news FF4 surprise: 163.3
- ▶ First-stage F-stat of cleaned FOMC announcement FF4 surprise: 16.4

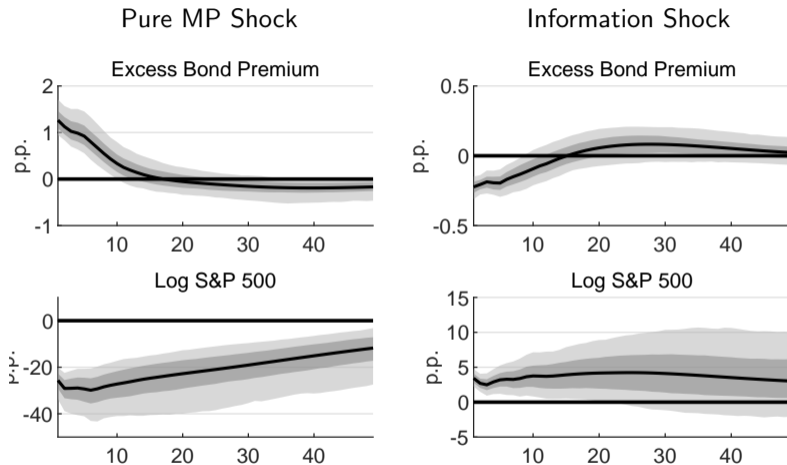


Impulse Responses



- ▶ Prices and production respond negatively to pure MP shocks and positively to info shocks.

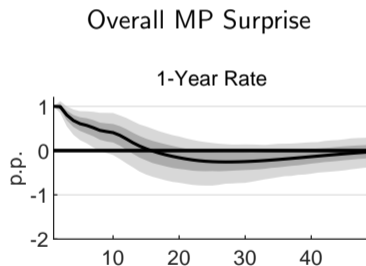
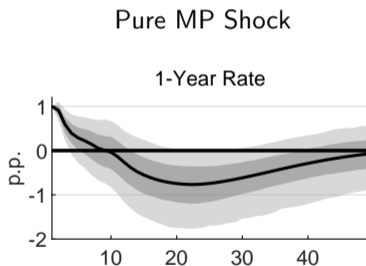
Impulse Responses



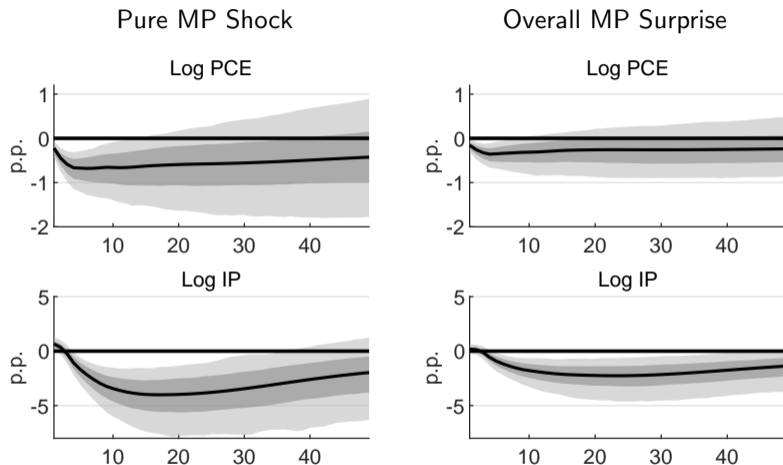
- ▶ EBP rises sharply in response to MP shocks and falls with info shocks.
- ▶ Stock prices fall with MP shocks and rise with info shocks.

Comparison to Overall FOMC Announcement Surprise

- ▶ First-stage F-stat of cleaned FOMC announcement FF4 surprise: 16.4
- ▶ First-stage F-stat of overall FOMC announcement FF4 surprise: 38.3

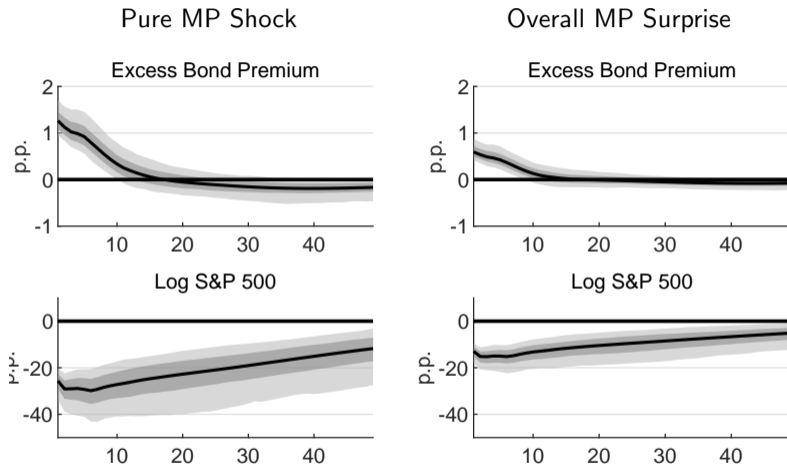


Comparison to Overall FOMC Announcement Surprise



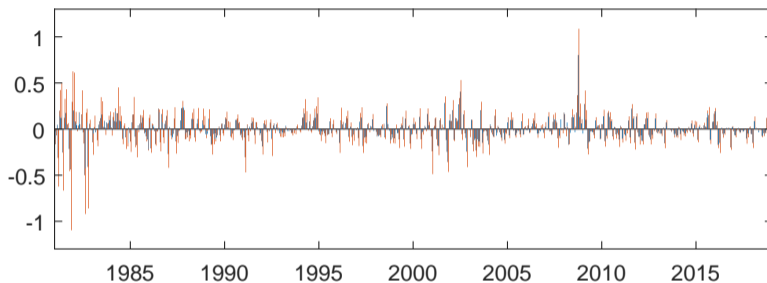
- ▶ Prices and production responses to a pure MP shock are twice as large and more statistically significant than those identified using the overall FOMC announcement surprise.

Comparison to Overall FOMC Announcement Surprise



- ▶ EBP and stock price responses are also about twice as large as those identified using the overall FOMC announcement surprise.

Comparison of Identified MP Shocks

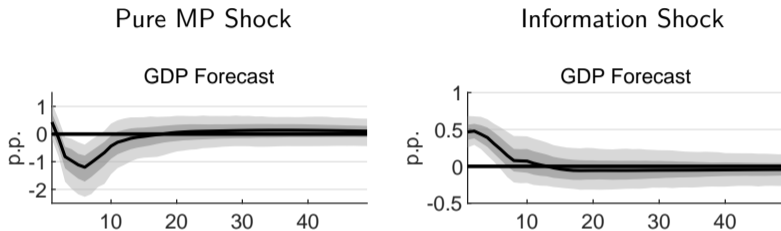


Blue = Pure MP shock, Orange = "Shock" identified using the overall MP surprise

- ▶ The pure MP shock is about 60% smaller than the "shock" identified using the overall MP surprise.
- ▶ The overall MP surprise identifies a shock that has a correlation of 0.3 with the information shock.

Robustness Checks

Robustness Check: Responses of Other Variables



- ▶ Professional forecasts of GDP also respond negatively to pure MP shocks and positively to info shocks.
- ▶ (Not pictured) Using hours instead of production also yields a strong negative response to pure MP shocks and a positive response to info shocks.

Robustness Checks: Broader Definition of Info Shock Instrument

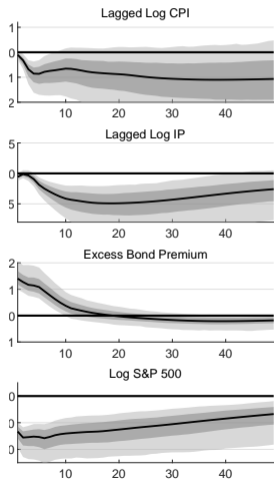
- ▶ Using ED4 instead of FF4 changes on macro announcement days: Identifies more of an information “path” shock
- ▶ Using a broader set of macro announcements (including inflation, production, and confidence indicators): Includes more types of info that the Fed also responds to.
- ▶ In both cases, the first-stage F-stat of the cleaned FOMC announcement FF4 surprise becomes smaller because we are removing more variation from this MP shock instrument.
- ▶ Estimated IRFs are qualitatively the same with the MP shock responses being estimated with more noise.

Other robustness checks

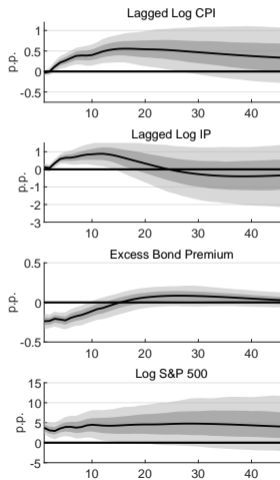
- ▶ Excluding the ZLB period delivers similar results
- ▶ Bayesian local projections also produce IRFs that are qualitatively the same

Robustness Check: Alternate Timing Accounting for Info Set

Pure MP Shock

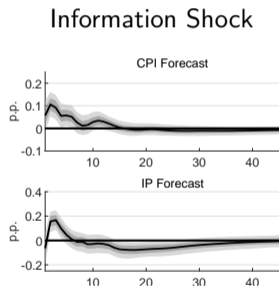
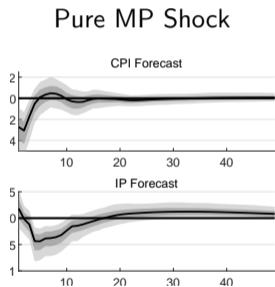


Information Shock



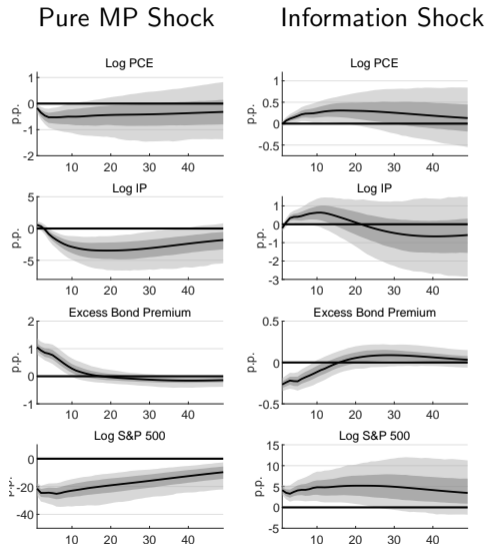
- ▶ Include all financial variables contemporaneously, but inflation and production with a lag.
- ▶ Control for the latest forecast of the current month's inflation and production releases.
- ▶ Results are qualitatively similar for all variables.
- ▶ Forecasts of the current month's inflation and production variables also respond negatively to MP shocks and positively to infl shocks.

Robustness Check: Alternate Timing Accounting for Info Set



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Robustness Check: Further cleaning instruments



- ▶ Further residualize the macro surprise instrument wrt lagged VAR residuals
- ▶ Results are again qualitatively similar for all variables.

Conclusions

- ▶ This paper builds an external instruments SVAR separately identifying information shocks and MP shocks.
- ▶ Key idea: Use macro information revealed outside of FOMC announcements to identify information shocks.
 - ▶ Interest rate expectations move due to expected policy response, but not traditional monetary policy shocks.
- ▶ Effects are robust and economically meaningful:
 - ▶ MP shock (where $i_t \uparrow$): Prices and production \downarrow , EBP \uparrow , Stock prices \downarrow
 - ▶ Info shock (where $i_t \uparrow$): Prices and production \uparrow , EBP \downarrow , Stock prices \uparrow
- ▶ Results are in line with theoretical predictions and existing estimates for information and MP shocks, but are identified with arguably weaker assumptions.