One Fed, Many Voices

Coordinated Communication vs. Transparent Debate

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Outline

Introduction

- Central banks rarely speak with one voice. At the Federal Reserve, for instance, each official brings a distinct perspective, and markets parse every speech for hints of where policy is headed.

- Different views may help make better decisions, but do they also help when explaining those decisions to the public? And what happens when voices diverge?

- Should a committee sound like a choir–harmonised and coordinated–or like a chamber group with distinct parts?

What do we do

- Pair 481 time-stamped speeches by FOMC members since 2007 with intraday movements in short-maturity interest-rate futures, $\rightarrow$ 'monetary policy speech' (MPS) surprise.
- Compute an index of text similarity between each speech and the Chair's most recent post-meeting press conference, $\rightarrow$ the more a speech echoes the Chair's message, the higher its similarity score.
- Measure the effects of MPS surprises on daily macro-financial variables, (un) conditional on the similarity with the conference press.
- Rationalize the results with a NK model with dispersed information.

Preview of the results

- Coordinated communications are not dismissed as redundant, suggesting that a plurality of voices reinforces the impact of monetary policy communication.

- Dissonant voices create noise that weakens the central bank's ability to steer inflation expectations and stabilize the economy.

- NK model with private agents expectations about forward-looking central bank speeches can rationalize these findings.

Literature Review

- Merge two important empirical strands of literature.
  - Linguistics. Text based analysis of Monetary policy: Hansen, McMahon and Prat (2017); Aruba and Drechsel (2025); Handlan (2022).
  - Financial Markets. HF identification of monetary policy surprises: Cook and Hahn 1989, Kuttner 2001, Cochrane and Piazzesi 2002, Gürkaynak et al. 2005, Nakamura and Steinsson 2018.

Outline

Data Sources

- ## FOMC meeting transcript.

  Since 2007, the Federal Reserve has published verbatim transcripts of Federal Open Market Committee (FOMC) meetings with a five-year lag. We collect these transcripts from the Federal Reserve Board's official archive and convert them from PDF into a structured format.

- ## FOMC Press Conferences.

  Beginning in 2011, the Fed Chair has held press conferences following FOMC meetings. We obtain the full text of these conferences from the same Federal Reserve archive.

- ## Public Speeches by FOMC Participants.

  Compile a corpus of public speeches by FOMC participants—including Board members and Presidents of the twelve regional Federal Reserve Banks—delivered between 2007 and 2018. Time (date and time) stamped.

- ## Eurodollar (ED) futures at one- to four-quarter maturities.

  Period 2011–2022. Trimming: U.S. equity-market hours on business days; exclude any events when two or more FOMC members speak simultaneously. For each qualifying speech, we define an event window from ten minutes before delivery to twenty minutes after conclusion.

Outline

Text Similarity

- Text pre-processing.

  (i) Convert all text to lowercase and remove punctuation and non-alphanumeric characters; (ii) lemmatize words to their base forms to account for inflectional variation; (iii) remove common stopwords using the standard English dictionary from the Natural Language Toolkit (NLTK); and (iv) manually harmonize the names of FOMC participants.

- TF-IDF Transformation.

  Represent each statement numerically using the Term Frequency–Inverse Document Frequency (TF-IDF) method. Word weight: term frequency, which reflects how often a word appears in a given document, and inverse document frequency, which downweights words that are common across many documents.

- Cosine Similarity.

  Cosine similarity captures the angular distance between two TF-IDF vectors (statements), with values closer to one indicating greater semantic similarity. Higher score $\rightarrow$ more coordinated message.

Toy Corpus

We have three very short documents ($N = 3$):

D1: the Fed raises rates
D2: the Fed cuts rates
D3: the economy grows

D1 and D2 (D3) have 3(2) tokens after stop-word removal.

$$\text{Vocabulary} = \{\texttt{fed}, \texttt{raises}, \texttt{cuts}, \texttt{rates}, \texttt{economy}, \texttt{grows}\}$$

Term Frequency (TF)

For each doc, $\mathrm{TF}(w, d) = \frac{\#(w \text{ in } d)}{\text{total tokens in } d}$.

Word	D1	D2	D3
fed	0.333	0.333	0
raises	0.333	0	0
cuts	0	0.333	0
rates	0.333	0.333	0
economy	0	0	0.5
grows	0	0	0.5

Inverse Document Frequency (IDF)

$$\mathrm{IDF}(w) = \log\left(\frac{N}{\mathrm{df}(w)}\right), \quad N = 3$$

Word	**df**	$\log\left(\frac{3}{\mathrm{df}}\right)$
`fed`	2	≈ 0.176
`raises`	1	≈ 1.099
`cuts`	1	≈ 1.099
`rates`	2	≈ 0.176
`economy`	1	≈ 1.099
`grows`	1	≈ 1.099

TF–IDF = TF × IDF

$$\text{TF-IDF}(w, d) = \text{TF}(w, d) \times \text{IDF}(w)$$

Word	D1	D2	D3
`fed`	$0.333 \times 0.176 = 0.059$	0.059	0
`raises`	$0.333 \times 1.099 = 0.366$	0	0
`cuts`	0	$0.333 \times 1.099 = 0.366$	0
`rates`	$0.333 \times 0.176 = 0.059$	0.059	0
`economy`	0	0	$0.5 \times 1.099 = 0.55$
`grows`	0	0	$0.5 \times 1.099 = 0.55$

Each document is now a weighted vector over the vocabulary.

Vector Representation

Order the vocabulary as: `[fed, raises, cuts, rates, economy, grows]`.

$$\mathbf{D1} = [0.059,\ 0.366,\ 0,\ 0.059,\ 0,\ 0]$$
$$\mathbf{D2} = [0.059,\ 0,\ 0.366,\ 0.059,\ 0,\ 0]$$
$$\mathbf{D3} = [0,\ 0,\ 0,\ 0,\ 0.55,\ 0.55]$$

Observation: D1 and D2 only share `fed` and `rates`; D3 is disjoint.

Step 7: Cosine Similarity (D1 vs D2)

$$\cos\theta = \frac{\mathbf{D1} \cdot \mathbf{D2}}{\|\mathbf{D1}\| \, \|\mathbf{D2}\|}$$

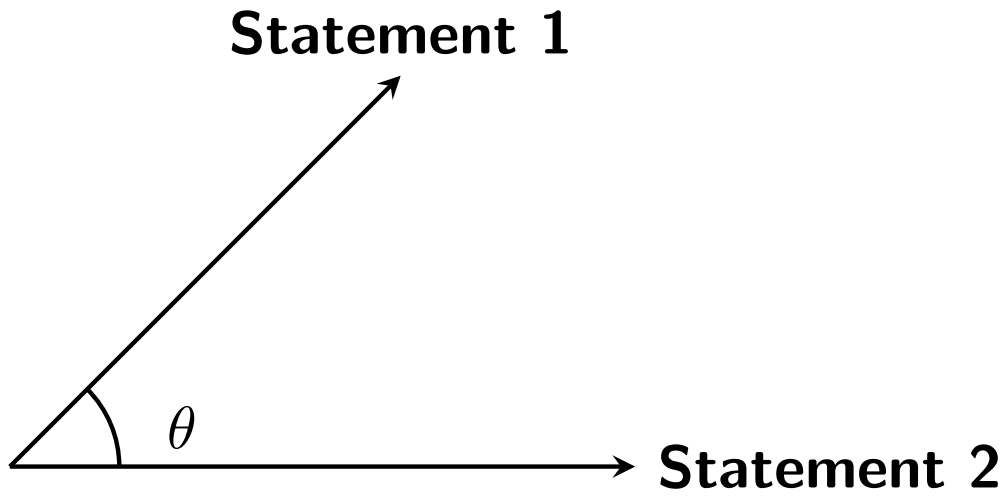
$$\mathbf{D1} \cdot \mathbf{D2} = (0.059)(0.059) + (0)(0) + (0)(0.366) + (0.059)(0.059) = 0.00696$$

$$\|\mathbf{D1}\| = \|\mathbf{D2}\| = \sqrt{0.059^2 + 0.366^2 + 0.059^2} \approx 0.378$$

$$\Rightarrow \quad \cos\theta \approx \frac{0.00696}{0.378 \times 0.378} \approx 0.048$$

Low similarity—despite shared terms, the distinctive words (`raises` vs `cuts`) dominate the weighting.

Cosine Similarity



$$\text{cosine similarity} = \cos(\theta)$$

High Similarity

Stanley Fischer (2016/02/01)

Janet Yellen (2015/12/16)

Score: 0.8133

Speech

- "...decided to raise the target range for the federal funds rate by $\frac{1}{4}$ percentage point, to $\frac{1}{4}$ to $\frac{1}{2}$ percent."
- "...confidence that inflation would return to our 2 percent goal over the medium term."
- "...monetary policy remains accommodative after the small increase in the federal funds."

Press Conference

- "...raise the target range for the federal funds rate by $\frac{1}{4}$ percentage point, bringing it to $\frac{1}{4}$ to $\frac{1}{2}$ percent."
- "...reasonably confident that inflation would move back to its 2 percent objective over the medium term."
- "...after today' s increase, the stance of monetary policy remains accommodative."

High Similarity II

Jerome Powell (2013/06/27)

Ben Bernanke (2013/06/19)

Score: 0.7945

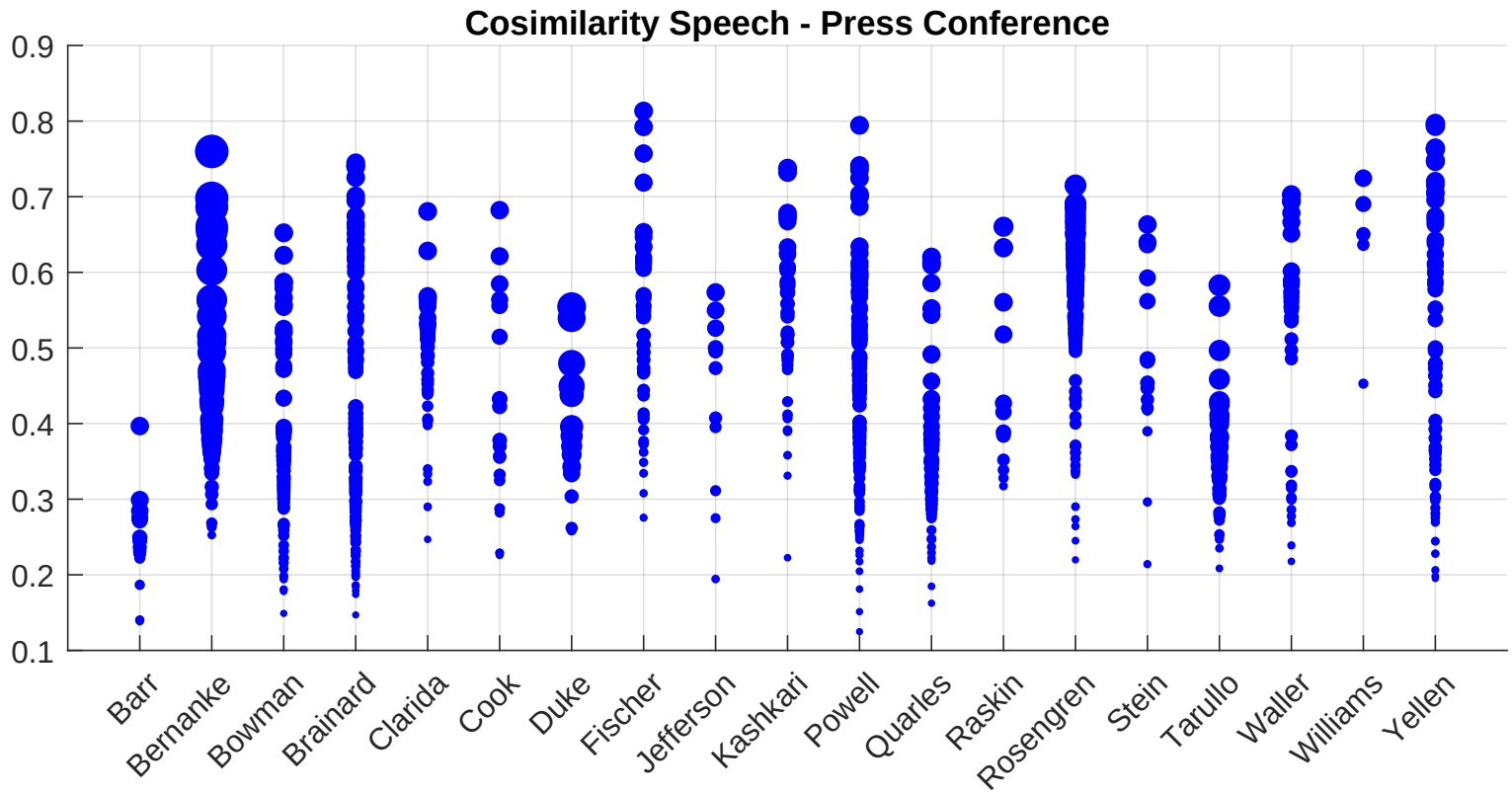
Speech

- "Inflation is currently running below the FOMC's 2 percent long-term objective."
- "...purchased assets will remain on the Fed's balance sheet for some time and continue to put downward pressure on rates."

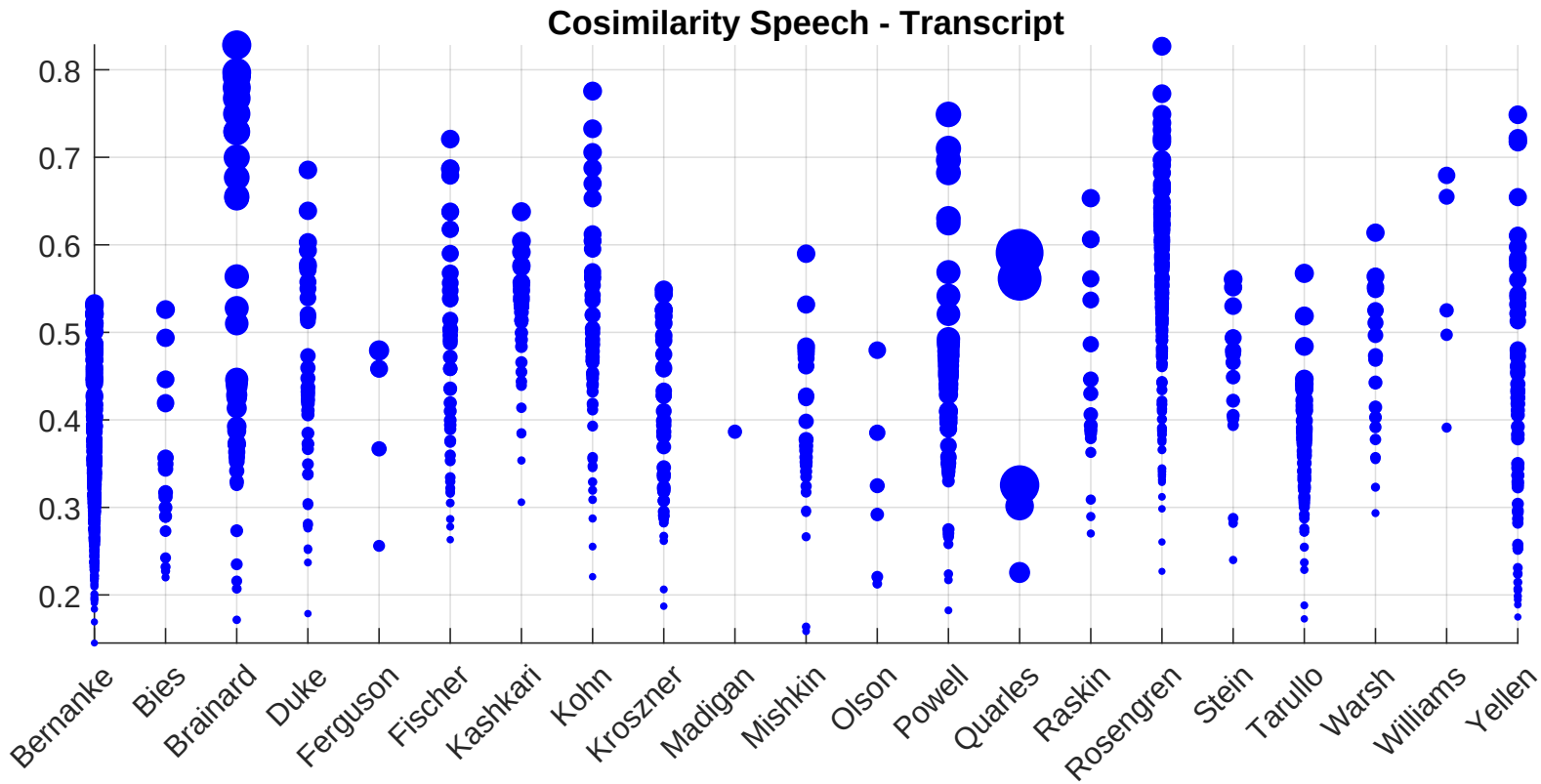
Press Conference

- "Inflation has been running below the Committee's longer-run objective of 2 percent."
- "...adjusting the pace of asset purchases and its forward guidance regarding the target for the federal funds rate."

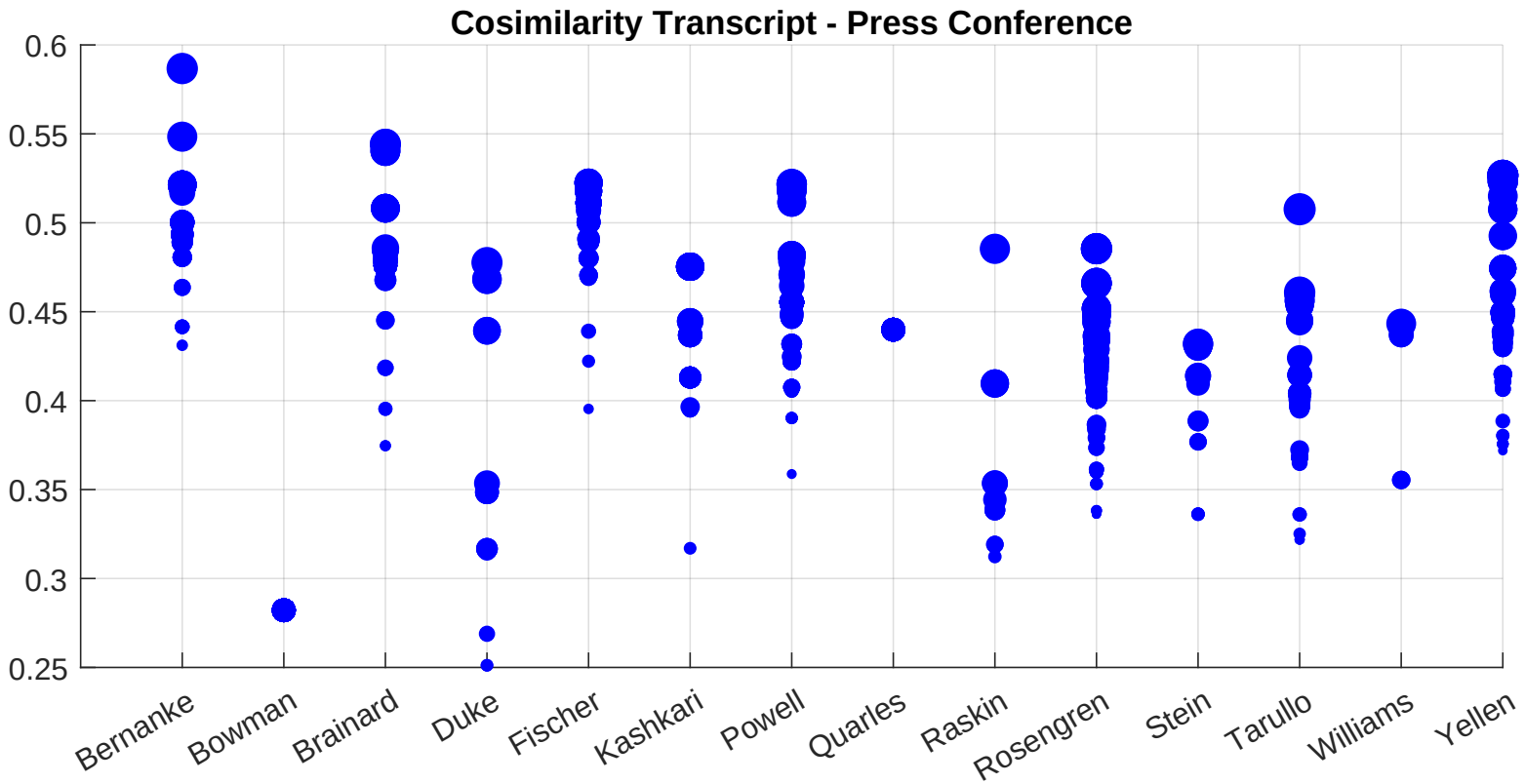
The dispersion of views, S-PC



The dispersion of views, S-T



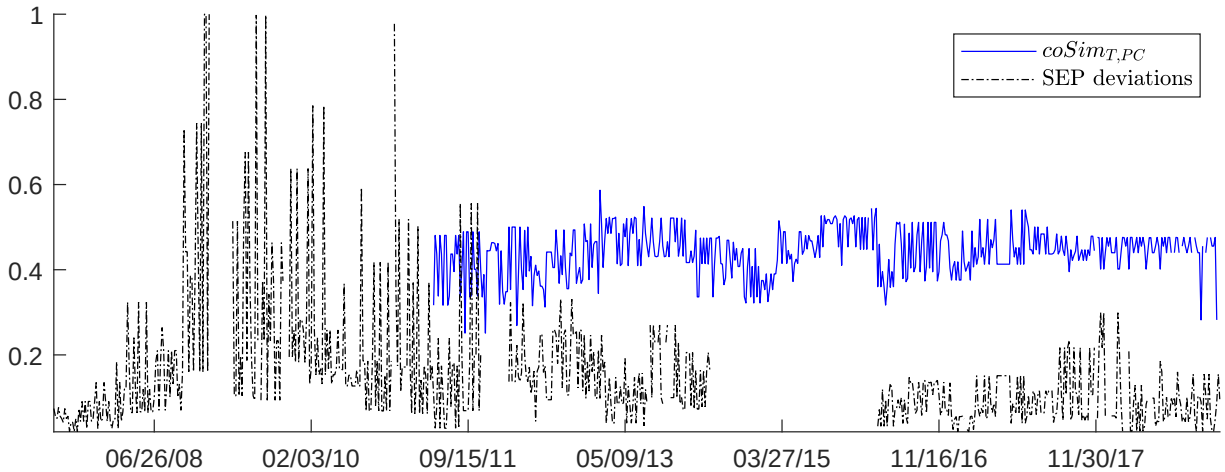
The dispersion of views, T-PC

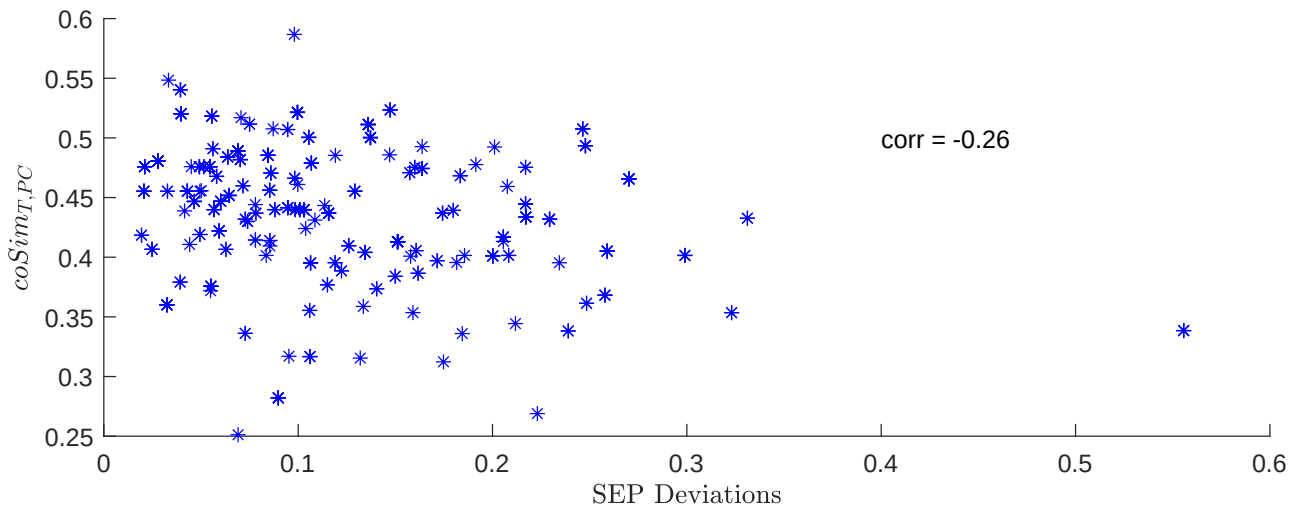


Not a one-man show, but not egalitarian either

- T–PC distribution is relatively tight, (0.25-0.60). This narrow band suggests that the Chair's public remarks take into account different views. Also that there is heterogeneity.
- S–PC panel spans nearly the full possible range (0.10–0.90), $\rightarrow$ heterogeneity. Individual members sometimes reproduce the Chair's language almost verbatim but at other times diverge markedly.
- The S–T panel falls between these extremes (roughly 0.20–0.80), implying that speeches only sometimes mirror the internal discussion.

Link with SEP

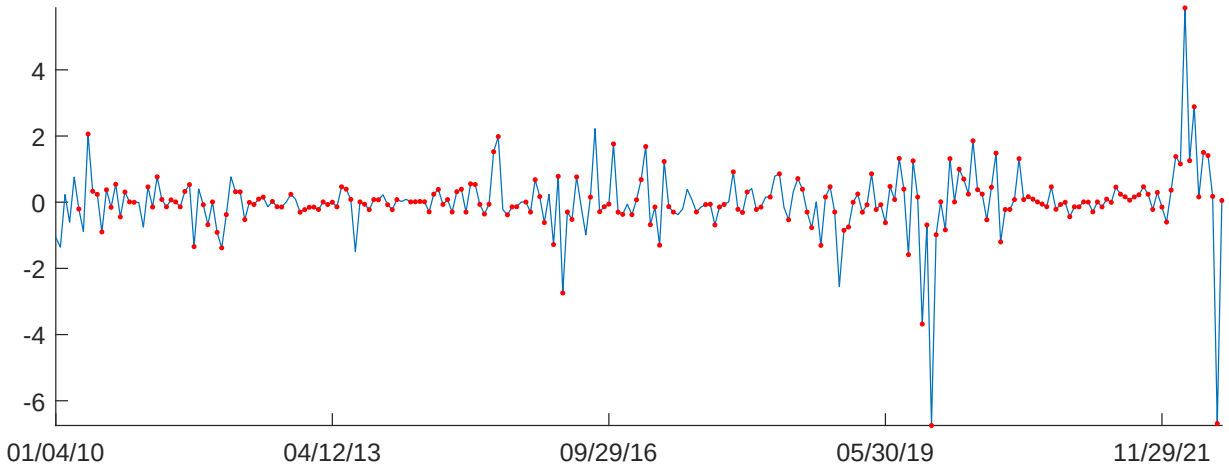




Outline

Monetary Policy Speech (MPS) surprise

- five-minute averages of eurodollar (ED) futures at one- to four-quarter maturities over the period 2011–2022
- Within each 30-minute window, we compute intraday changes in all four maturities and extract their first principal component (PC1).
- We then rescale PC1 to have unit variance in the ED4 contract;


4
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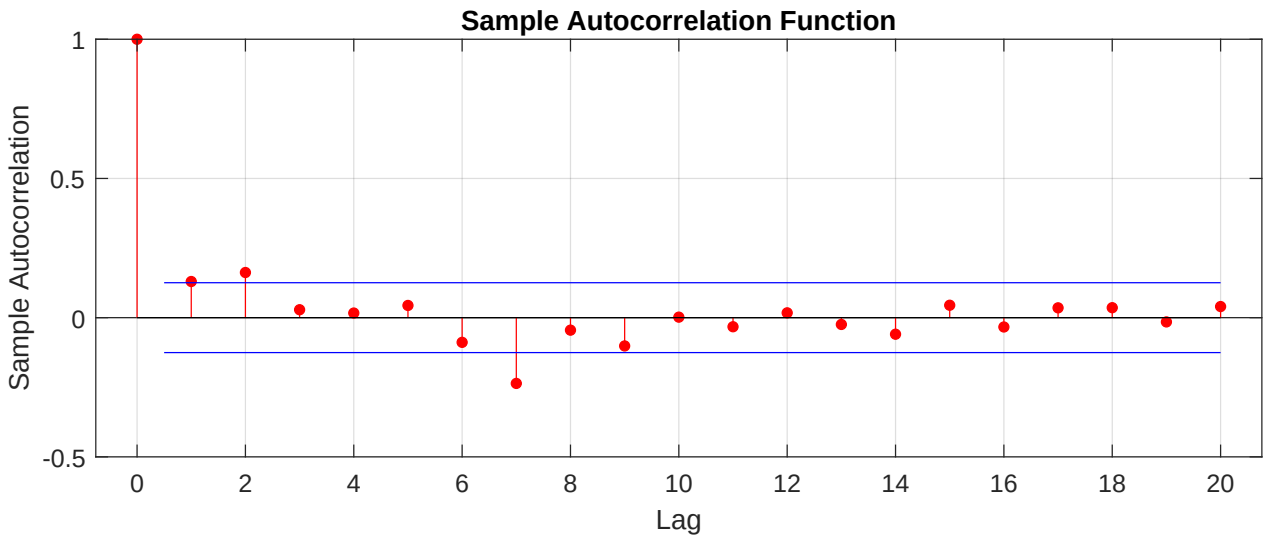
11/29/21


Sample Autocorrelation Function
Sample Autocorrelation
1
0.5
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0
2
4
6
8
10
12
14
16
18
20
Lag

Market Response.

We assess how markets react to the FOMC member speech by running the following regression:

$$y_{t+h} - y_{t-1} = \alpha_h + \beta_h MPS_t + u_{h,t} \tag{1}$$

financial data: the 3- and 6-month Treasury Bill (TBill), the yield on U.S. Treasury Securities at 3-Month, 1-, 5- and 10-Year Constant Maturity (GBY), Breakeven (BE) Inflation at five and ten year horizons, SP500,

Unconditional Market response

	β_1	adj R2	β_3	adj R2	β_5	adj R2
3M TBill	0.44***	0.07	0.28*	0.01	0.34*	0.00
6M TBill	0.49***	0.09	0.53***	0.03	0.62**	0.02
3M GBY	0.42***	0.07	0.32**	0.01	0.31*	0.00
1Y GBY	0.94**	0.19	0.95***	0.07	1.08**	0.05
5Y GBY	1.07***	0.07	1.03***	0.04	1.33***	0.04
10Y GBY	0.95***	0.05	0.95***	0.03	1.20***	0.03
10Y BE Inflation	-0.02	-0.00	-0.13	-0.00	0.07	-0.00
5Y BE Inflation	0.00	-0.00	-0.16	-0.00	0.05	-0.00
SP500	0.08	0.01	-0.01	-0.00	-0.03	-0.00

Similarity to Consensus

We define two complementary measures of textual similarity to the Chair's post-meeting press conference:

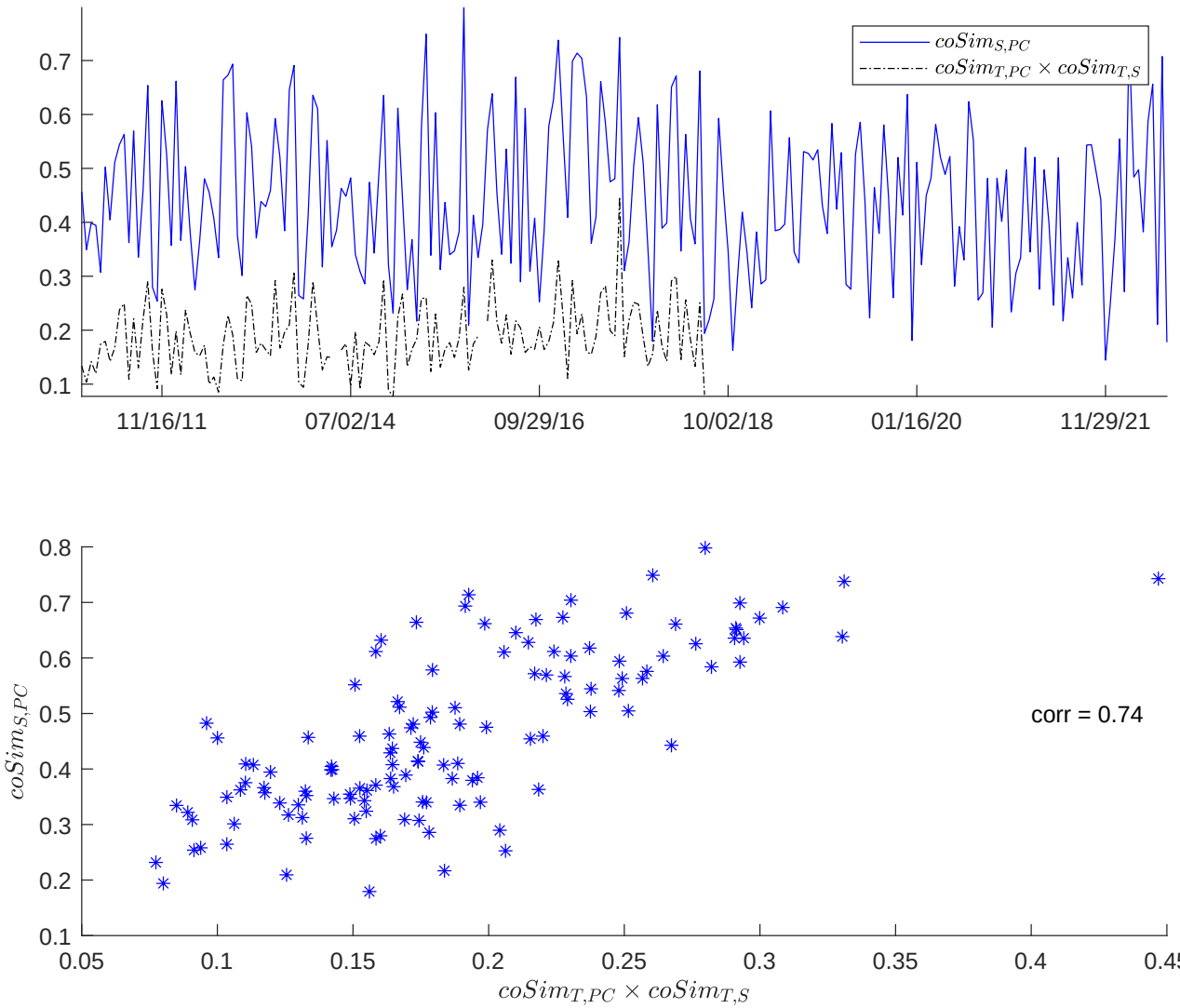
$$\ell_t^1 = \mathit{CosSim}\big(S_t, PC_t\big), \tag{2}$$

$$\ell_t^2 = \mathit{CosSim}\big(S_t, T_t\big) \times \mathit{CosSim}\big(T_t, PC_t\big), \tag{3}$$

where S_t, T_t, and PC_t are the TF–IDF vector representations of the speech, meeting transcript, and press-conference text for meeting t, and $\mathit{CosSim}(\cdot,\cdot)$ denotes cosine similarity.

Both ℓ^1 and ℓ^2 lie in the unit interval, with values near zero indicating low similarity and values near one indicating high similarity.

Similarity to Consensus



Conditional Response

To assess how variation in speech content relative to the Chair's message influences the market impact of speech-induced surprises, we estimate the following interaction specification.

$$y_{t+h} - y_{t-1} \;=\; \alpha_h \;+\; \beta_h \,\mathrm{MPS}_t \;+\; \gamma_h \,\ell_t^j \;+\; \delta_h \left(\mathrm{MPS}_t \times \ell_t^j\right) \;+\; u_{j,h,t}, \qquad (4)$$

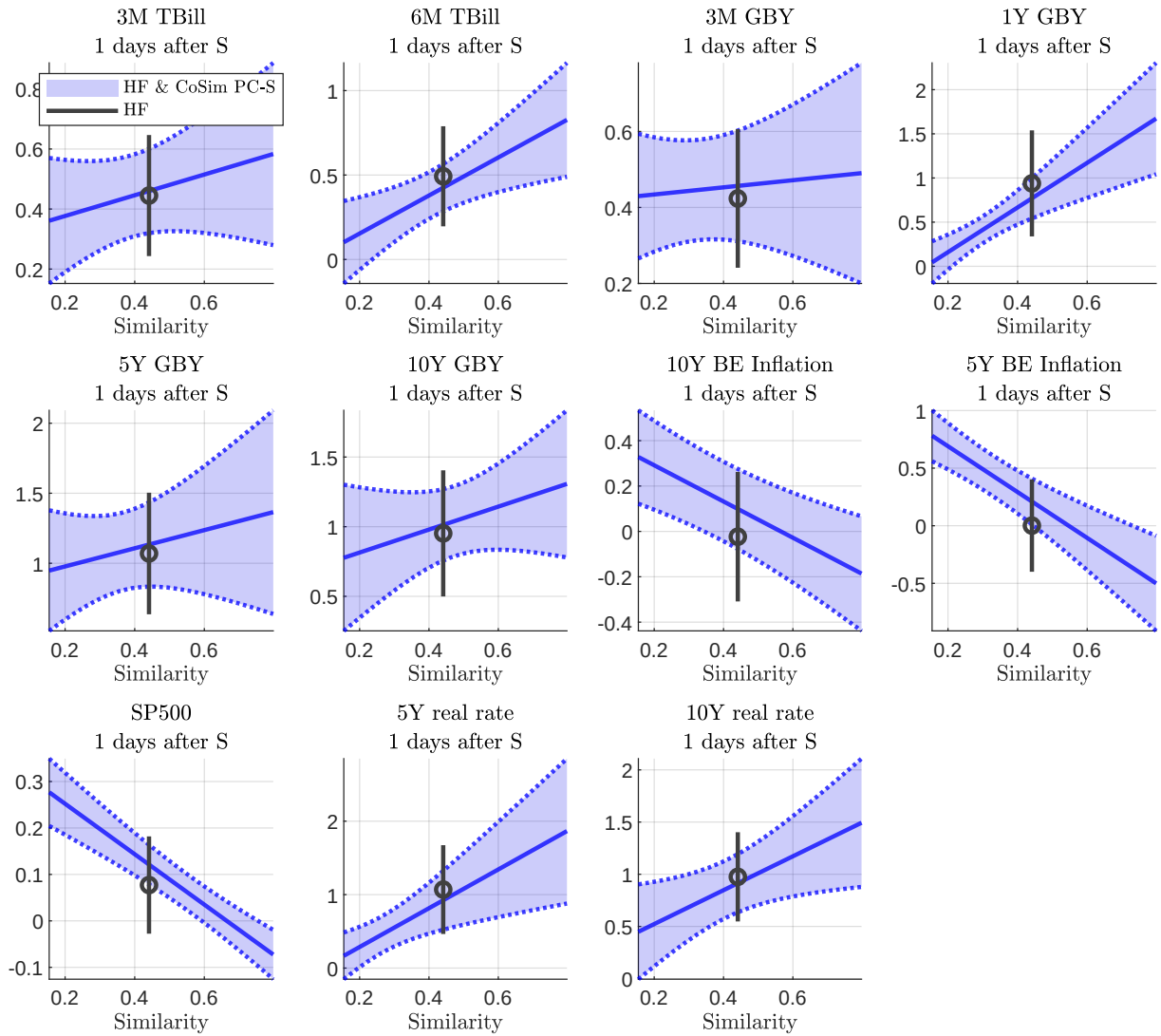
for horizons $h = 0, 1, \ldots, H$ and distance measures $j \in \{1, 2\}$.

Here, ℓ_t^1 is the direct speech–press-conference cosine similarity, and ℓ_t^2 is the compounded transcript–speech and transcript–press-conference similarity.

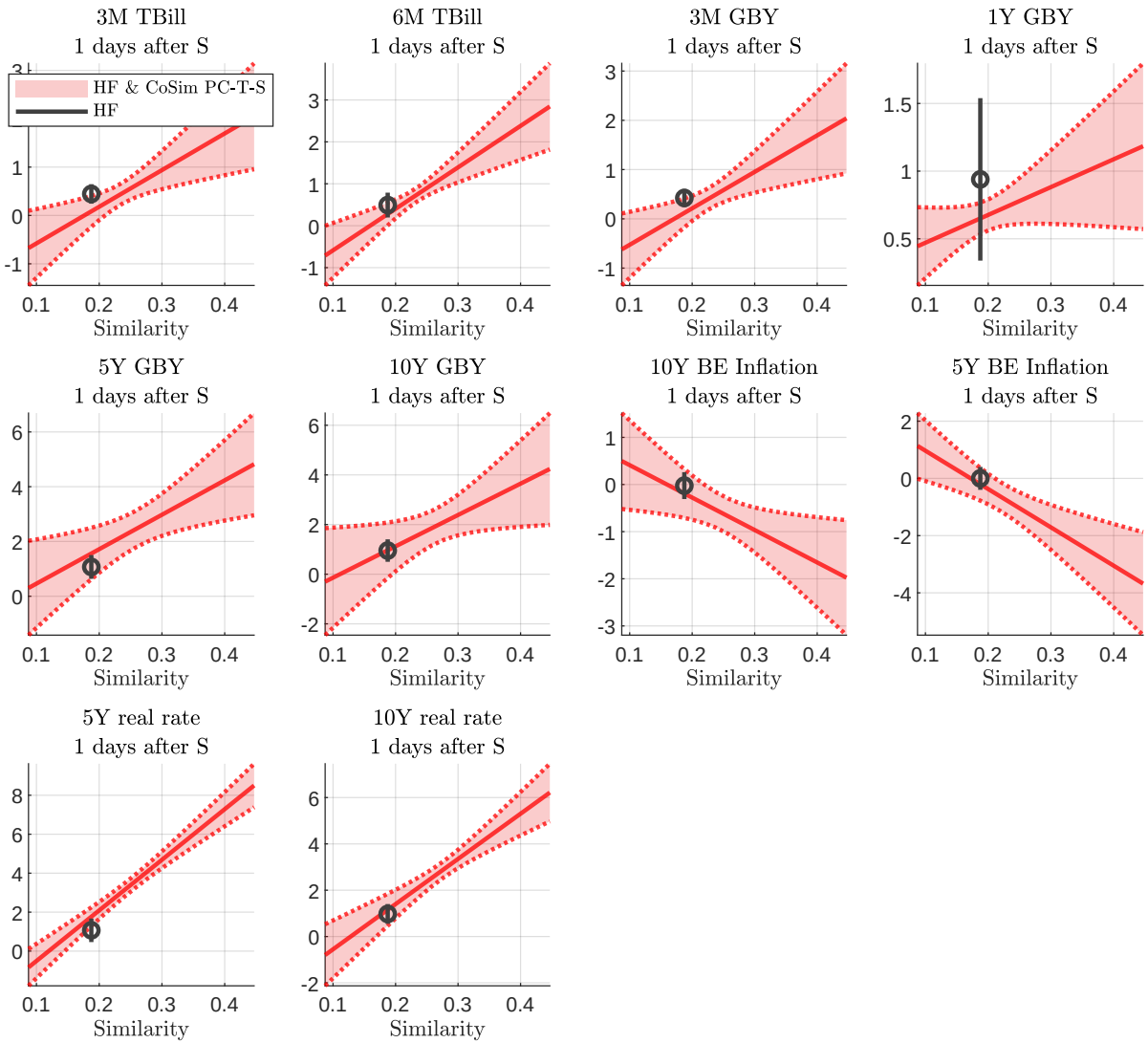
By allowing ℓ_t^j to vary continuously in $[0, 1]$, we trace how the marginal effect of the speech surprise,

$$\frac{\partial}{\partial\, \mathrm{MPS}_t}\left(y_{t+h} - y_{t-1}\right) \;=\; \beta_h \;+\; \delta_h \,\ell_t^j,$$

$h = 1$, conditional on CP-S



$h = 1$, conditional on CP-T-P



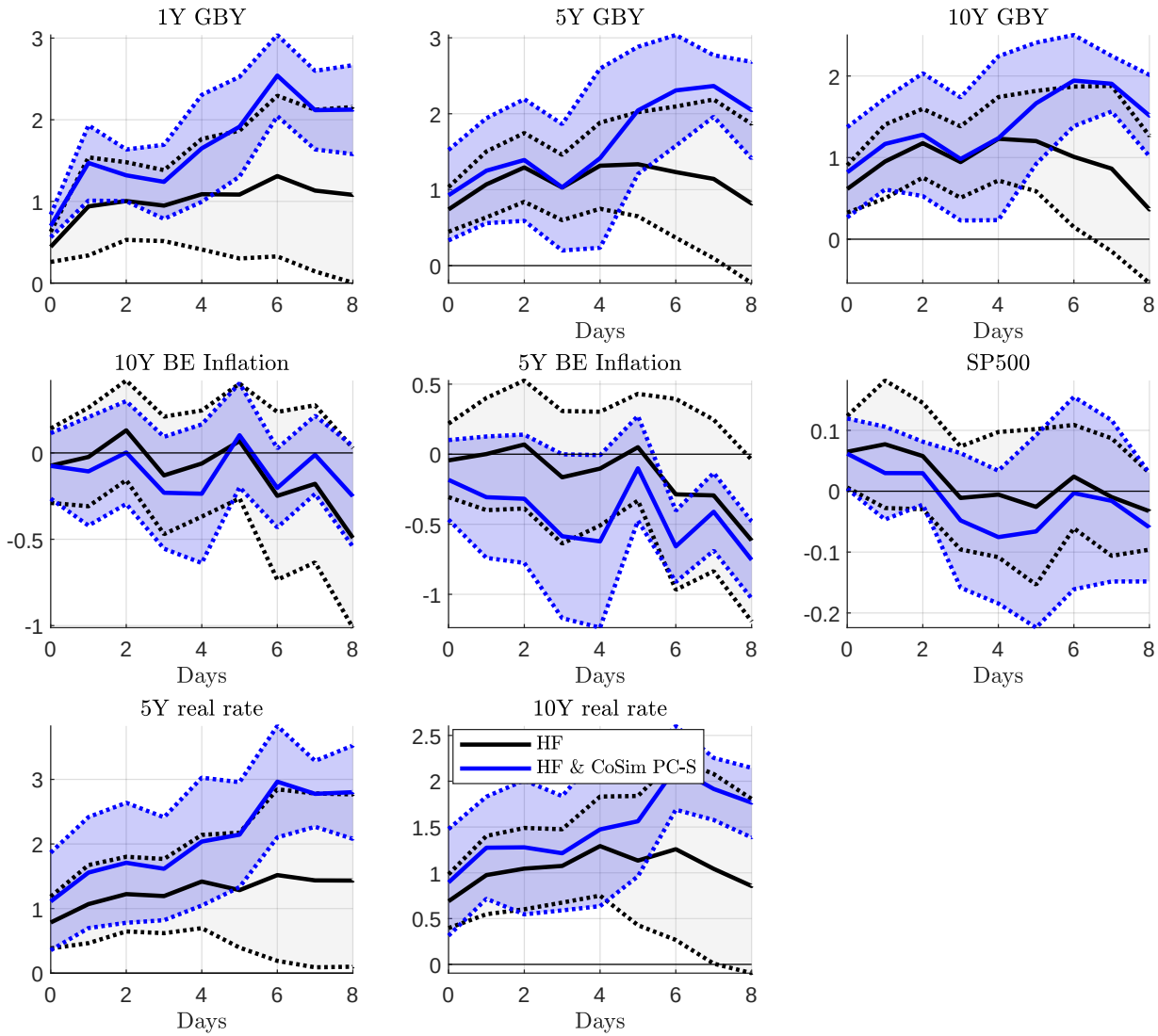
Daily Local Projections of aligned speeches

Restrict the sample to episodes in which the speech content exhibits a high degree of textual similarity to the post-meeting press conference.

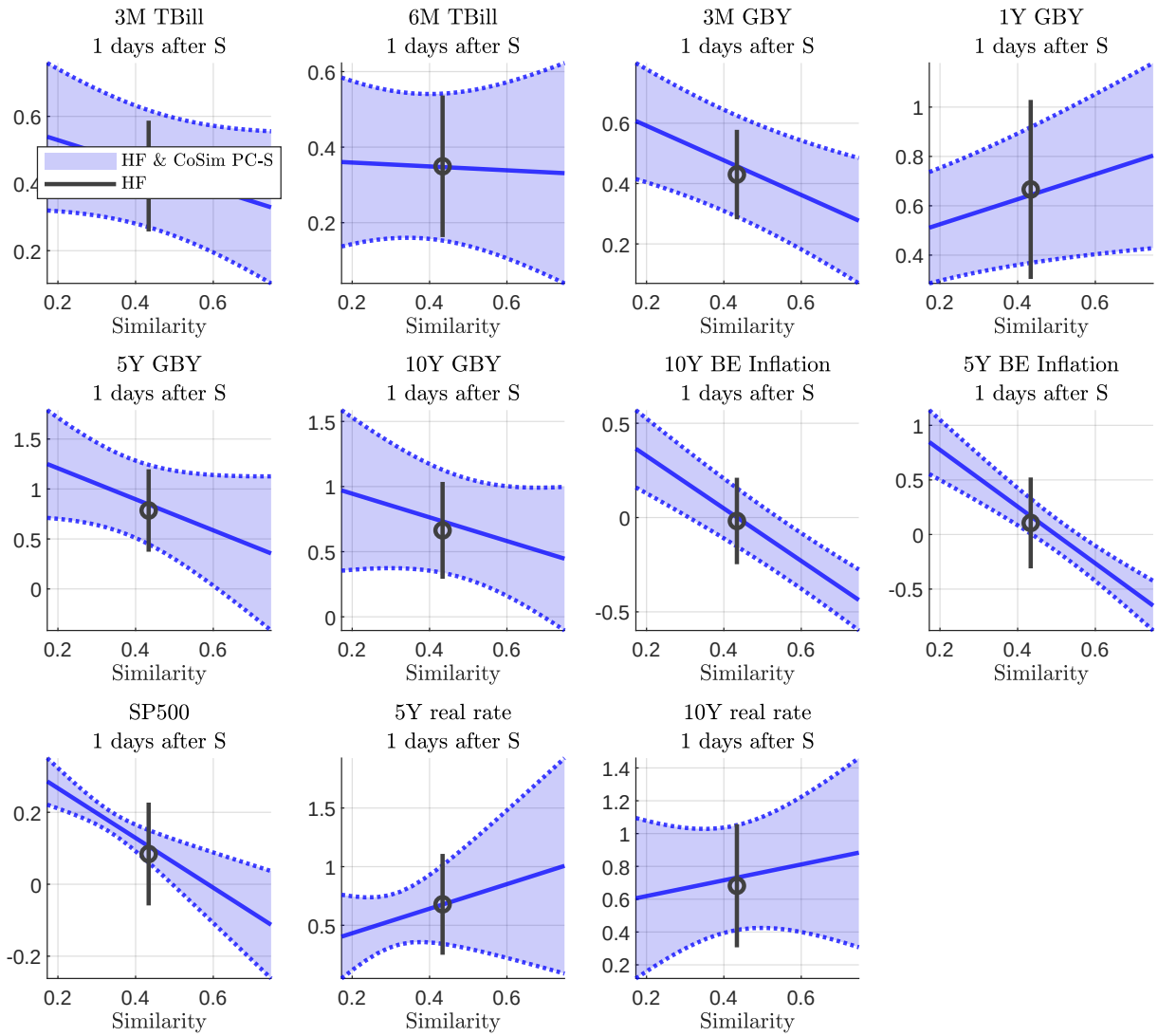
$$y_{t+h} - y_{t-1} = \alpha_h + \beta_h MPS_t^\star + u_{h,t},$$

for $h = 0, 1, \ldots$, where $MPS_t^\star$ captures the high-frequency variation in interest rates associated with speeches classified as highly similar to the Chair's press conference (+1 STD).

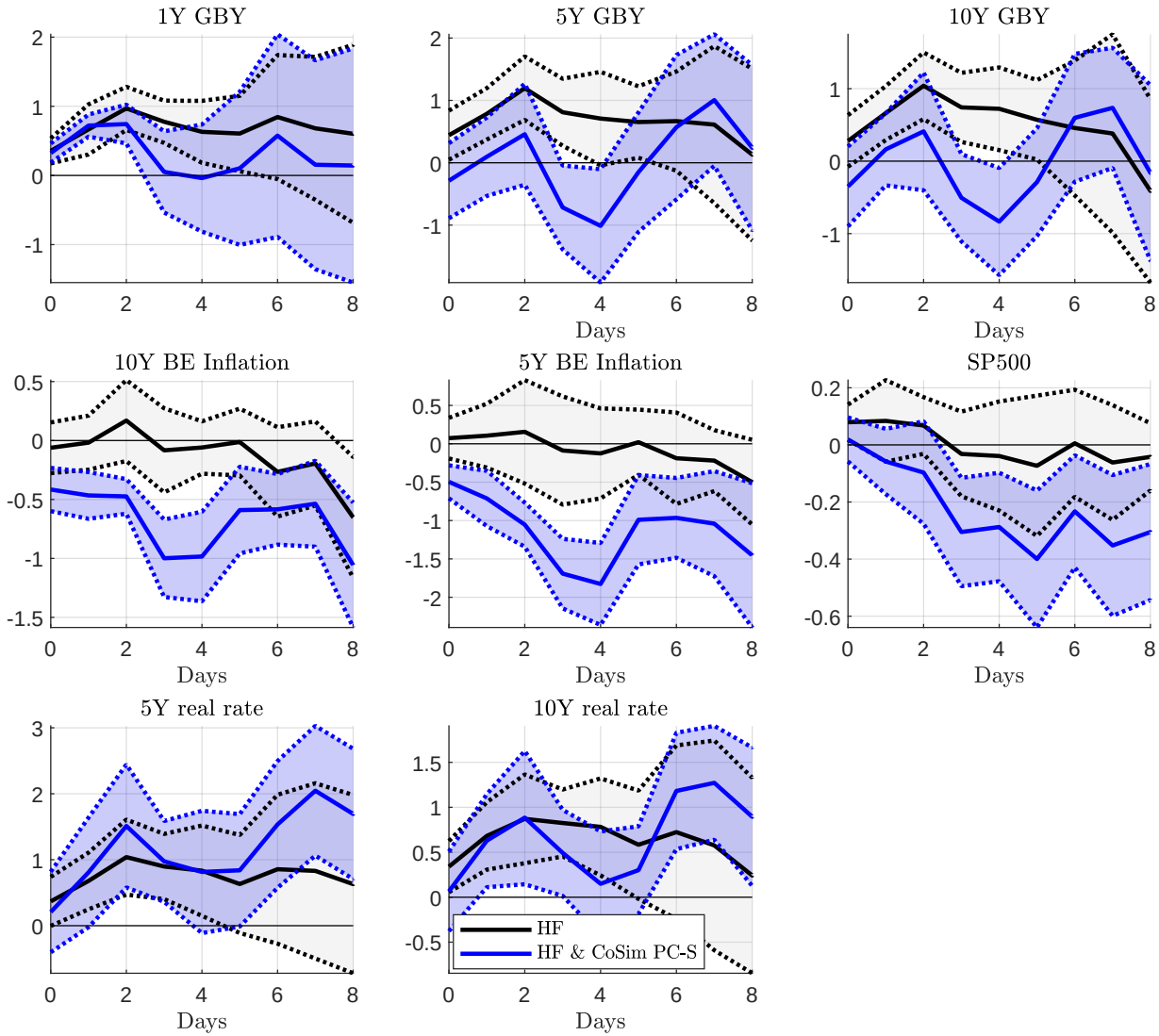
Dynamic Impact of Aligned Speeches



Remove the Chairman Speeches



Remove the Chairman Speeches



Outline

NK model with Speech-Driven Expectations

$$
\begin{aligned}
&\text{IS curve:} && x_t = \widehat{\mathbb{E}}_t[x_{t+1}] - \tfrac{1}{\sigma}\left(i_t - \widehat{\mathbb{E}}_t[\pi_{t+1}] - r_t^n\right), \\
&\text{NKPC:} && \pi_t = \beta\widehat{\mathbb{E}}_t[\pi_{t+1}] + \kappa x_t + u_t, \\
&\text{Taylor rule:} && i_t = \psi_\pi \pi_t + \psi_x x_t + \theta_t,
\end{aligned}
$$

where x_t indicates output gap, π_t inflation, i_t the nominal rate, r_t^n the natural real rate, u_t a cost-push shock, and θ_t a monetary-policy shock.

The unobserved fundamentals (θ_t, r_t^n, u_t) follow known AR(1):

$$
\begin{aligned}
\theta_{t+1} &= \rho_\theta \theta_t + \varepsilon_{t+1}^\theta, \\
r_{t+1}^n &= \rho_n r_t^n + \varepsilon_{t+1}^n, \\
u_{t+1} &= \rho_u u_t + \varepsilon_{t+1}^u,
\end{aligned}
$$

with $\varepsilon_t \sim \mathcal{N}(0, \Sigma)$.

Information Structure

Agents at each date t observe a scalar speech signal s_t that provides noisy information about the next-period fundamental monetary policy shock:

$$s_t = \zeta_t \varepsilon^{\theta}_{t+1} + \eta_t, \quad \eta_t \sim \mathcal{N}(0, \sigma_s^2),$$

where $\zeta_t \sim \text{Beta}(\alpha, \beta)$, so that $\zeta_t \in [0, 1]$, captures the speech's similarity to the Chair's press conference.

A higher ζ_t indicates that the speech is more informative about the upcoming policy shock, in the sense that it reinforces the message of the press conference, reduces uncertainty, and increases investor confidence in the expected policy path.

Intuitively, ζ_t captures the "policy-focus" of central-bank communication: a high ζ_t means speeches closely echo—and thus reinforce—the Fed's imminent rate decision.

Expectations

Agents form expectations given four linear forecasting rules:

$$\widehat{\mathbb{E}}_t[\pi_{t+1}] = \alpha_0^{\pi} + \alpha_1^{\pi}\pi_t + \alpha_2^{\pi}x_t + \alpha_3^{\pi}i_t + \alpha_4^{\pi}s_t + \alpha_5^{\pi}\widehat{\zeta}_t,$$
$$\widehat{\mathbb{E}}_t[x_{t+1}] = \alpha_0^{x} + \alpha_1^{x}\pi_t + \alpha_2^{x}x_t + \alpha_3^{x}i_t + \alpha_4^{x}s_t + \alpha_5^{x}\widehat{\zeta}_t,$$
$$\widehat{\mathbb{E}}_t[\theta_{t+1}] = \alpha_0^{\theta} + \alpha_1^{\theta}\theta_t + \alpha_2^{\theta}s_t + \alpha_3^{\theta}\widehat{\zeta}_t,$$
$$\widehat{\mathbb{E}}_t[r^n_{t+1}] = \alpha_0^{n} + \alpha_1^{n}r^n_t + \alpha_2^{n}s_t + \alpha_3^{n}\widehat{\zeta}_t,$$

which depend on the speech signal s_t and the speech similarity $\widehat{\zeta}_t = \zeta_t - \bar{\zeta}$ expressed in linear deviation from a steady-state value $\bar{\zeta}$.

Plugging the four linear forecasting rules into the NK equilibrium yields a linear system $\Gamma_0(\alpha)\, z_t + \Gamma_1(\alpha)\, \widehat{\mathbb{E}}_t[z_{t+1}] + C(\alpha) = 0$, which we solve to get the perceived law

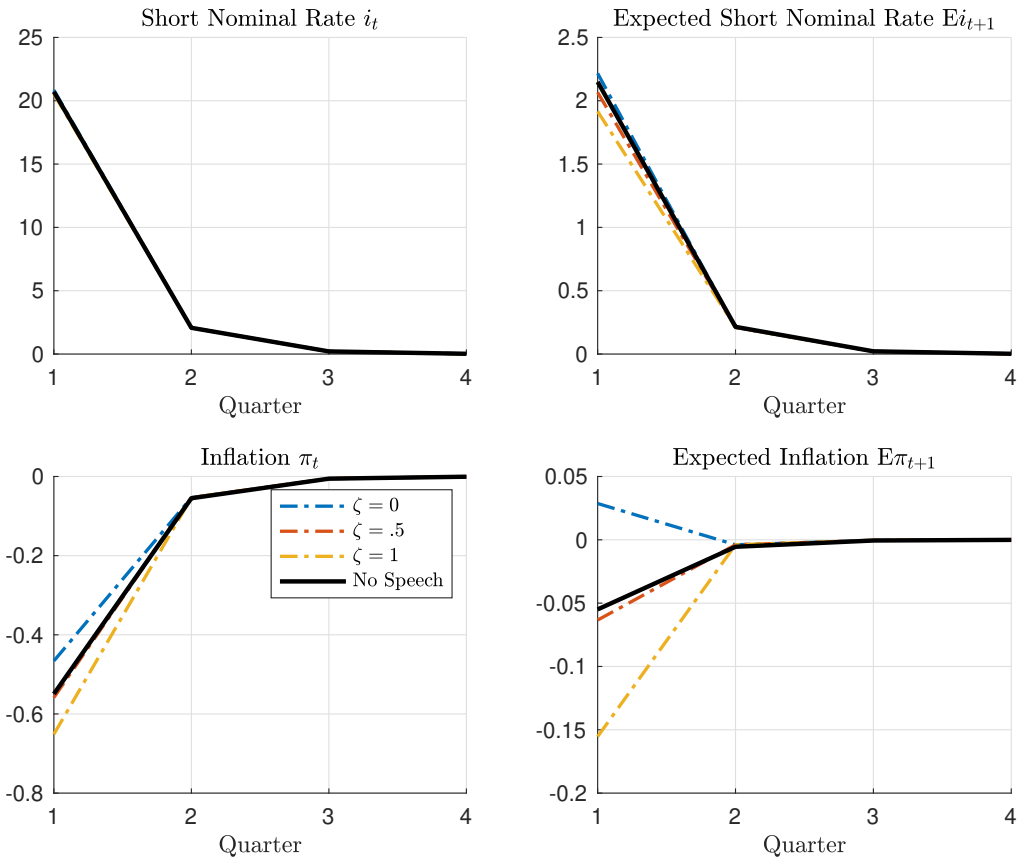
$$z_{t+1} = G(\alpha) z_t + M(\alpha)\varepsilon_{t+1}.$$

The fixed-point over (α) requires that when one simulates this system and regresses each LHS variable on the RHS regressors (including s_t), one recovers the same α.

Calibration

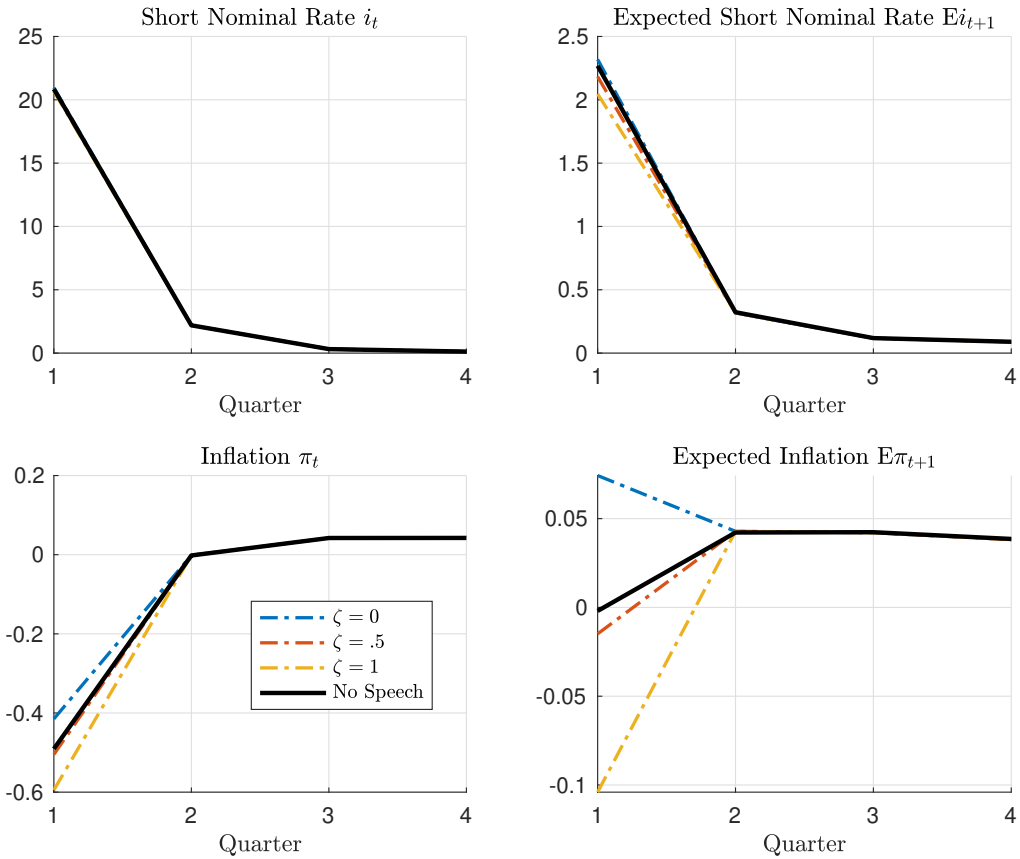
Parameter	Value	Description	Source/Target
σ	2.00	Intertemporal elasticity of substitution	Standard
ψ_π	1.50	Taylor rule coefficient on inflation	Taylor principle
ψ_x	0.30	Taylor rule coefficient on output gap	Standard
κ	0.0429	Slope of the NK Phillips curve	Average price duration of 4 quarters
β	0.99	Discount factor (quarterly)	4% annual return in steady-state
ρ_θ	0.10	Persistence of MP shock	Captures transitory policy shocks
σ_θ	0.0025	Std. dev. of MP shock	25bps quarterly shock
ρ_{rn}	0.9	Persistence of natural-rate shock	Reflects slow-moving fundamentals
σ_{rn}	0.002	Std. dev. of natural-rate shock	20bps quarterly shock
ρ_u	0.89	Persistence of cost-push shock	Smets and Wouters
σ_u	0.0014	Std. dev. of cost-push shock	Smets and Wouters
σ_s	0.01	Std. dev. of signals noise	100bps to capture high noise
a	5.176	First shape parameter of ζ_t	Calibrated to match $\mathbb{E}[\zeta_t] = \bar{\zeta} = 0.369$
b	8.859	Second shape parameter of ζ_t	Calibrated to match $\text{Std}(\zeta_t) = 0.124$

Coordinated Communication



Dynamic effects of a monetary policy tightening across three levels of initial speech similarity $\zeta_1 = 0, 0.5, 1$, relative to a no-speech counterfactual in which $\zeta_t = 0$ for all t.

Delphic Signals and Natural-Rate News



Speeches to convey information not only about future monetary policy shocks, but also about forthcoming movements in the natural rate. Specifically, the speech signal is modified as:

$$s_t = \zeta_t \varepsilon^{\theta}_{t+1} + (1 - \zeta_t)\varepsilon^{n}_{t+1} + \eta_t.$$

Outline

Conclusions

- FOMC communication is collective, not monolithic.
- Markets price both message and messenger. Internal alignment improves market transmission.
- Transparency still valuable but must be coherent.
- Central banks should manage communication heterogeneity.
- Framework applicable to ECB, BoE, and multi-member central banks.