ONLINE APPENDIX: Reputation for Confidence*

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Contents

*The views expressed herein are our own and do not necessarily reflect those of the ECB or the Eurosystem.

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A Proofs

A.1 Equilibrium Message Space Construction

To derive the equations that characterize the equilibrium message space, we will follow Moscarini (2007) in denoting the private sector expectation that is induced when the CB makes an announcement corresponding to interval k by $\bar{\theta}^k$. In other words, when the CB says $\theta \in [\theta^{k-1}, \theta^k)$, that is, that "we observed θ in an interval between two cutoffs θ^{k-1} and θ^k," then the private sector expects that the signal the CB saw corresponds to $\bar{\theta}^k$. Note that for simplicity, we suppress time indices throughout this section.

We first substitute the equilibrium relationships for inflation and inflation expectations from Equation 14 and Equation 15 into the incentive compatibility condition $\mathcal{L}^{CB}(\cdot, \bar{\theta}_t) \leq \mathcal{L}^{CB}(\cdot, \bar{\theta}'_t)$.[1] This leads to the following equation:

$$(\bar{\theta} - \bar{\theta}')(\bar{\theta} + \bar{\theta}' - 2\frac{H}{\bar{H}}\theta + \frac{q}{\bar{H}}) \leq 0, \tag{1}$$

where

$$q \equiv 2b\left(\frac{s}{\lambda} + \frac{1}{s}\right). \tag{2}$$

Distinguishing between the case when the alternative statement is below the equilibrium statement from the case where it is above, and imposing that the CB is indifferent at the boundary between two candidate messages, we get

$$\bar{\theta}^{k+1} = 2\frac{H}{\bar{H}}\theta^k - \frac{q}{\bar{H}} - \bar{\theta}^k. \tag{3}$$

Equation 3 establishes a relationship between two neighboring messages and the cutoff that separates the two. Computing $\bar{\theta}^k \ \forall k$ using the definition of conditional expectations, the equilibrium message space is obtained by solving for the increasing sequence of cutoffs θ^k for $k = 1, \ldots, K-1$, where K is an initially unknown number.

[1] Since the steps in this section follow Moscarini (2007) closely, for more details, the reader is referred to that paper. For simplicity, we also omit time subscripts in the proofs.

A.2 Lemma 1: Message Space Independent of Signal

The claim follows from observing that the equilibrium message space is a solution of Equation 3 for the increasing cutoff sequence $\{\theta^k\}_{k=1}^{K-1}$. Given that all $\bar{\theta}^k$ are conditional expectations, they are independent of the signal, as are the composite parameter q, confidence H and reputation $\bar{H}$. □

A.3 Point Revelation

Suppose that $b = 0$. Then the central bank's expected loss can be written

$$\mathcal{L}^{CB}(\theta, \bar{\theta}, H, \bar{H}) = \frac{\lambda s^2}{s+\lambda}(H\theta - \bar{H}\bar{\theta})^2 + \lambda(1-H), \tag{4}$$

and the derivative with respect to $\bar{\theta}$ is given by

$$\frac{\partial \mathcal{L}^{CB}}{\partial \bar{\theta}} = \frac{2\lambda s^2}{s^2+\lambda}(H\theta - \bar{H}\bar{\theta}) - \bar{H}. \tag{5}$$

The first-order condition would thus require

$$\bar{\theta} = \frac{H}{\bar{H}}\theta. \tag{6}$$

Now the proof proceeds by cases. Suppose that the shock is nonzero ($\theta \neq 0$) and $\bar{H} \neq H$, and recall that by definition $H, \bar{H} > 0$.

1. If point revelation ("⇒"):

   If point revelation holds, that means that $\bar{\theta} = \theta$, and also that the message space is infinitely fine, so that the first-order condition of Equation 6 must hold. In other words, it must hold that $\bar{\theta} = H/\bar{H}\theta$. Combining the two conditions implies that $\theta \overset{!}{=} H/\bar{H}\theta$. Since $\theta \neq 0$, this requires that $H \overset{!}{=} \bar{H}$, which is a contradiction with $\bar{H} \neq H$. ↯

2. If no point revelation ("⇐"):

   If there is no point revelation, it holds that $\bar{\theta} \neq \theta$. If $H \neq \bar{H}$ and $\theta \neq 0$, then $\mathbb{E}^{CB}[\omega|\theta] = H\theta \neq 0$. Achieving the output target of 0 and the inflation target of π^* implies from the Phillips curve that $0 = s(\pi^* - x) \Rightarrow x^* = \pi^*$, where we are writing x^*

for the inflation expectation the CB wants to bring about. Together with the public's best response, $x = \pi^* + \bar{H}\bar{\theta}$, this implies that $\bar{H}\bar{\theta} \stackrel{!}{=} 0$. Making use of the fact that $\bar{H} \neq 0$ to divide through by $\bar{H}$, we get that $\bar{\theta} \stackrel{!}{=} 0 \neq \theta$, which completes the proof.

□

A.4 Confidence Not Learnable From Announcement

Here we show that the public cannot back out the central bank's confidence H from the observed announcement $[\theta^{k-1}, \theta^k]$. We do this in two steps. First, we show that P can only set identify H from the announcement. Then, we show that in a version of the model which we call "intermediate updating," where the Bayesian updating step happens based on the cutoffs of the announcement, the set of possible H-values contains P's priors most of the time.

Set identification: We start by gathering the information the public has when the bank makes the announcement. The public knows their own belief over confidence, $\bar{H}$, the model parameters summarized by the composite parameter q, the equilibrium announcement consisting of the interval $[\theta^{k-1}, \theta^k]$, the expectation induced by this message, $\bar{\theta}^k$, and the structure of the game, which means that they know that the message space solves Equation 3. They are also able to manipulate Equation 3 to obtain the following condition:

$$\theta^k - \theta^{k-1} > 2\left(\frac{\bar{H}}{H} - 1\right)\bar{\theta}^k + q, \tag{7}$$

which is a lower bound on the message width. Now we need to prove: given the equilibrium message $[\theta^{k-1}, \theta^k]$ and the corresponding expectation $\bar{\theta}^k$,

1. the public cannot point identify H from Equation 3,
2. and the public cannot point identify H from Equation 7.

The proofs for each point are as follows:

1. No identification from Equation 3:

   Equation 3 includes the six variables $H, \bar{H}, q, \theta^k, \bar{\theta}^{k+1}, \bar{\theta}^k$, of which four are known: $\bar{H}, q, \theta^k$, and $\bar{\theta}^k$. Thus the public cannot invert it to back out H. ✓

2. No identification from Equation 7:

   We will prove this with a counterexample. Suppose $q = 0, \bar{H} = 1$, and the message sent is $\theta^k = 2, \theta^{k-1} = 1$, implying the expectation $\bar{\theta}^k = 1.3832$. Equation 7 implies that $H > 0.7345$. There are infinite H values in $(0.7345, 1]$ that fulfill this, making point identification impossible. □

Intermediate updating: Consider an extension of the model where instead of using the equilibrium announcement $A = \theta \in [\theta^L, \theta^U]$ to infer the conditional expectation $\bar{\theta}$, the public uses the cutoffs of the announcement that they see, $[\theta^L, \theta^U]$, as observables in the Bayesian updating equation. (This is reminiscent of Cheng and Hsiaw (2022)'s "pre-screening" mechanism.) This gives two candidate updates for reputation, $\bar{H}^L$ and $\bar{H}^U$, with $\bar{H}^L < \bar{H}^U$. (Note that it is not necessarily the case that $\bar{H}^L$ corresponds to θ^L.) Let us call the set $\bar{H}^i \equiv [\bar{H}^L, \bar{H}^U]$ the "intermediate reputation update."

Now we compute the numerical solution of the model for $\theta \in [-7, 7]$, for $\bar{H} \in [0.1, 1]$ and for H either high (0.9) or low (0.5). Then we ask: for these values, what are the cutoffs of the equilibrium message ($[\theta^L, \theta^U]$), what is the corresponding intermediate reputation update $\bar{H}^i$, and how many times is the public's prior on reputation, $\bar{H}$, contained in the intermediate update? In other words, in what percent of cases is it true that $\bar{H} \in \bar{H}^i$?

Table A.1: Percent Prior Contained in Update

	$H = 0.5$	$H = 0.9$
$b = 0$	67.78%	79.33%
$b = 0.02$	64.44%	89.56%

As Table A.1 shows, for the majority of cases, but at least 64% of the state space, the intermediate update provides no extra information because it contains the public's prior.

A.5 Existence of Two-Message Equilibria

This proof follows Moscarini (2007)'s proof in Section D of the paper. The idea of the proof there is to rewrite the left-hand-side of the single IC constraint (in our setting,

Equation 3) as a monotonically increasing function of the single cutoff (invoking Moscarini (2007)'s Lemma 3), and the result obtains from this having to equal a constant on the right-hand side. Formally, Moscarini (2007) writes:

$$\phi(\theta^1) \equiv f(\theta^1) - g(\theta^1) = \frac{q}{H}, \tag{8}$$

where $f(\cdot)$ and $g(\cdot)$ are defined in Moscarini (2007)'s Lemma 3, and Moscarini (2007)'s definition of the composite parameter q differs from ours in that he includes the division by H in the definition of q. Because Moscarini (2007) shows in Lemma 3 that $f(\theta^1)$ is increasing in θ^1 and that $g(\theta^1)$ is decreasing in θ^1, it follows that $\phi(\theta^1)$ will cross the q/H line a single time.

Our proof follows the same argument, but for our IC constraint, Equation 3. This can be rewritten as

$$\phi^{GH}(\theta^1) \equiv \underbrace{\frac{H}{\bar{H}}\theta^1 - \bar{\theta}^2}_{\equiv f^{GH}(\theta^1)} - \underbrace{\left(\bar{\theta}^1 - \frac{H}{\bar{H}}\theta^1\right)}_{\equiv g^{GH}(\theta^1)} = \frac{q}{\bar{H}}, \tag{9}$$

where the functions with the "GH" superscript are our versions of Moscarini (2007)'s, and in the indexation of messages ($\bar{\theta}^1$ and $\bar{\theta}^2$), we follow our convention where messages are indexed from 1 to K instead from 0 to $K-1$.

What we need for the result to obtain is that $\phi^{GH}(\theta^1)$ be monotonically increasing in θ^1, which is the case if $f^{GH}(\cdot)$ and $g^{GH}(\cdot)$ have the same properties as $f(\cdot)$ and $g(\cdot)$. Given that, as a function of a cutoff, $f(\cdot)$, $g(\cdot)$ and $f^{GH}(\cdot)$ and $g^{GH}(\cdot)$ are all conditional expectations evaluating a normal pdf, albeit with difference variance terms ($\bar{H}$ instead of H in our case), the claim holds, and the result follows. □

B Shooting Algorithm

The objective of the shooting algorithm is to solve for the finest equilibrium message space with a finite number K of equilibrium messages.[2] In other words, from among the possible equilibria with $K < \infty$ we are looking for the one with the highest K.

[2]Thus, if point revelation of Proposition 1 holds, the algorithm will compute whatever coarse equilibrium message spaces that also exist.

We write the shooting algorithm problem as a problem of solving for an increasing sequence of $K-1$ cutoffs $\{\theta^k\}_{k=1}^{K-1}$, satisfying the indifference condition in Equation 3 and the "sanity-check" conditions that $\theta^{k-1} < \bar{\theta}^k < \theta^k$.[3] Given the cutoff sequence, one can compute the sequence of $\{\bar{\theta}^k\}_{k=1}^{K}$ from the definition of the conditional expectation

$$\bar{\theta}^k = \frac{\int_{\theta^{k-1}}^{\theta^k} \theta e^{-\bar{H}(\theta^2/2)} d\theta}{\int_{\theta^{k-1}}^{\theta^k} e^{-\bar{H}(\theta^2/2)} d\theta}, \tag{10}$$

where for the first expectation, $\bar{\theta}^1$, one replaces θ^1 with $-\infty$, and for the last expectation, one replaces θ^K with ∞.

Given this setup, the algorithm proceeds as follows.

1. Pick lower and upper bounds θ^{lb}, θ^{ub}.[4]

2. Specify a K^{max}. Set the iteration counter $n = 1$, and set $K_n^{guess} = K^{max}$. Assuming that the equilibrium number of messages equals the guess K_n^{guess}, guess an increasing sequence of $K_n^{guess} - 1$ cutoffs spanning the interval $[\theta^{lb}, \theta^{ub}]$.[5]

3. Given the guess for the cutoffs, use Equation 10 to compute the sequence of conditional expectations.

4. Given the guess for the cutoffs and the associated sequence of conditional expectations, compute errors to Equation 3.

5. Search for the cutoff sequence that sets the errors from Step 4 to zero (up to a user-specified precision), subject to the "sanity-check" conditions.

   - If the solver finds a solution, then $K^{eqb} = K_n^{guess}$, and stop.
   - If the solver finds no solution and $K_n^{guess} > 2$, let $K_{n+1}^{guess} = K_n^{guess} - 1$, and repeat.
   - If the solver finds no solution and $K_n^{guess} = 2$, set $K^{eqb} = 2$ and stop. In this case, only a two-message equilibrium exists with a single cutoff $\theta^1 \geq 0$ (see Section A.5).

[3] For expositional simplicity, we drop time indices in this section.

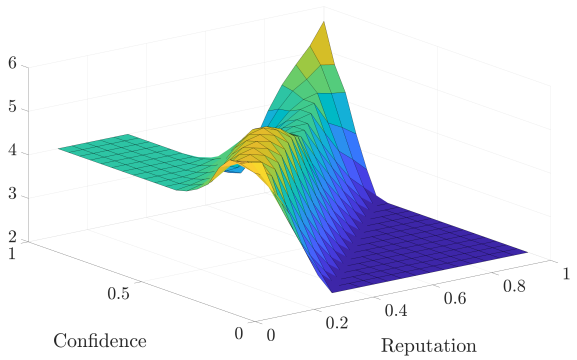
[4] We select these bounds as the cutoff values such that the probability that $\theta \notin [\theta^{lb}, \theta^{ub}] = 10^{-8}$, when $\theta \sim \mathcal{N}(0, H^{-1})$.

[5] Note that the maximum number of alternatives that the Fed has ever entertained is nine. In order not to be too restrictive, we set $K^{max} = 12$.

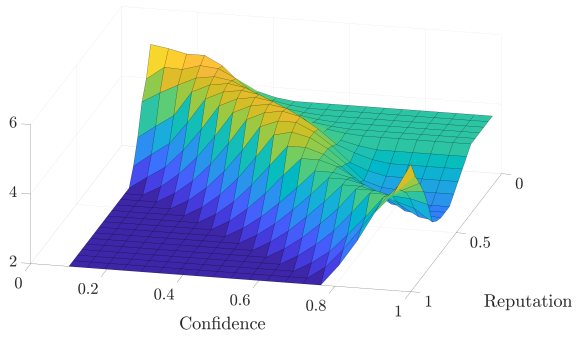
C Supplementary Model Plots

Figure C.1: Count of Messages, $b = 0.02$

(a) View 1



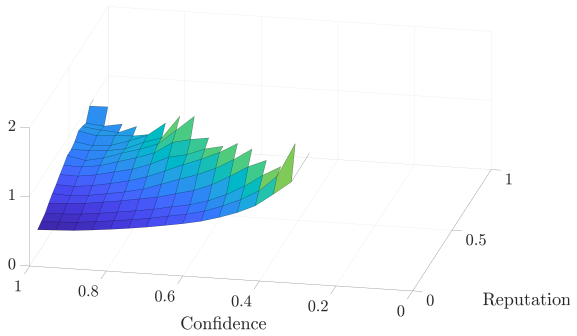
(b) View 2



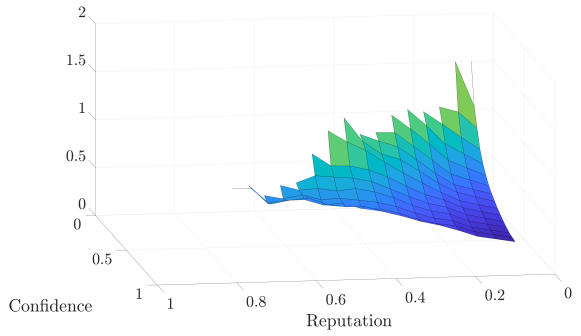
Note: The figure is a stylized representation of the equilibrium number of alternative statements for varying levels of confidence (H_{t-1}) and reputation ($\bar{H}_{t-1}$).

Figure C.2: Span, $b = 0.02$

(a) View 1



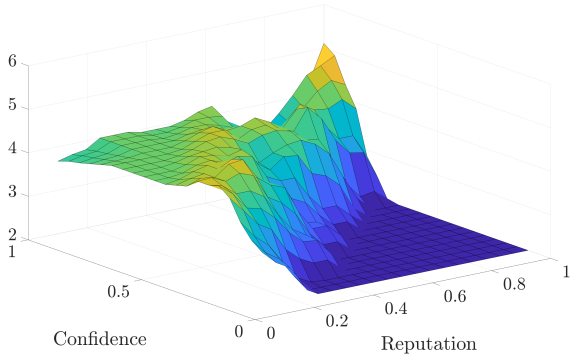
(b) View 2



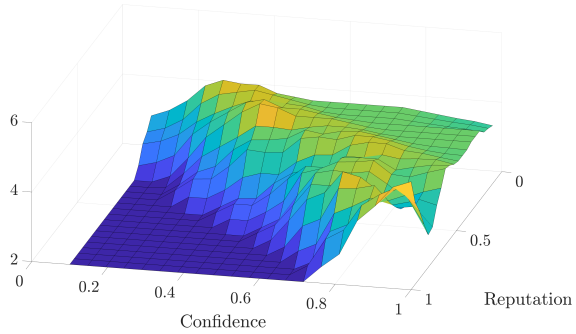
Note: The figure shows the span for various values of confidence and reputation. The model output has been smoothed using a moving average with a window length of 5 along both dimensions.

Figure C.3: Count of Messages, Smoothed Measures

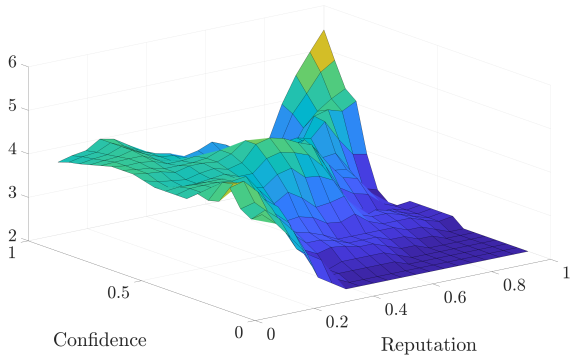
(a) View 1, $b = 0$



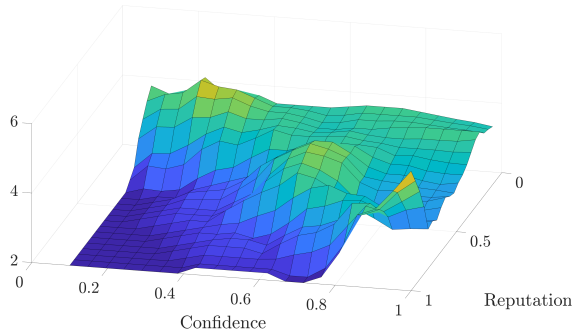
(b) View 2, $b = 0$



(c) View 1, $b = 0.02$



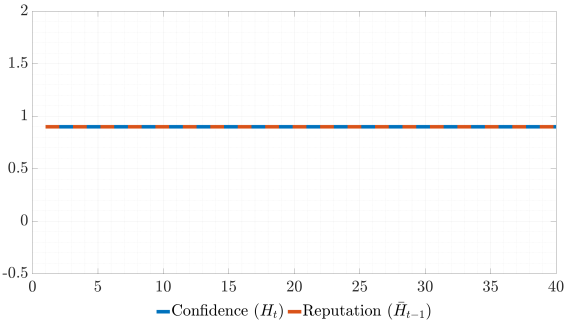
(d) View 2, $b = 0.02$



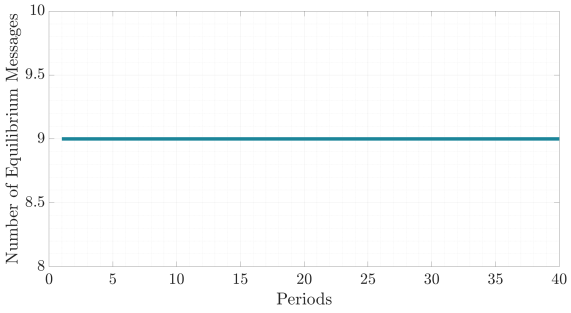
Note: The figure shows the equilibrium number of alternative statements for varying levels of confidence (H_{t-1}) and reputation ($\bar{H}_{t-1}$). The model output has been smoothed using a moving average with a window length of 5 along both dimensions.

Figure C.4: Simulation with H constant, $\bar{H} = H, b = 0$

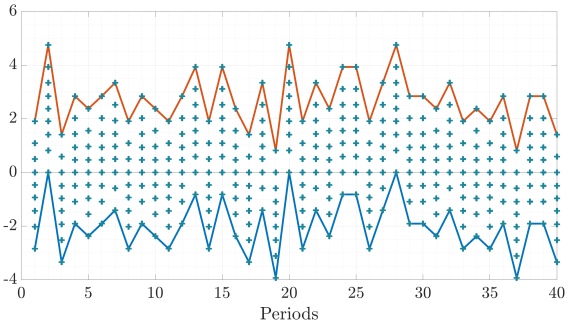
(a) Confidence and Reputation



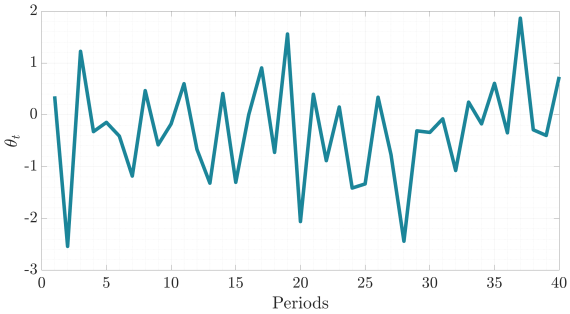
(b) Count of Messages



(c) Message Space



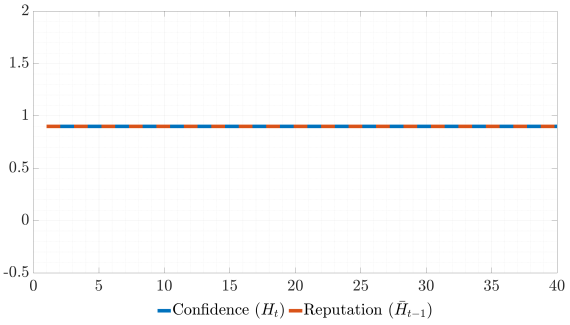
(d) Signals (θ_t)



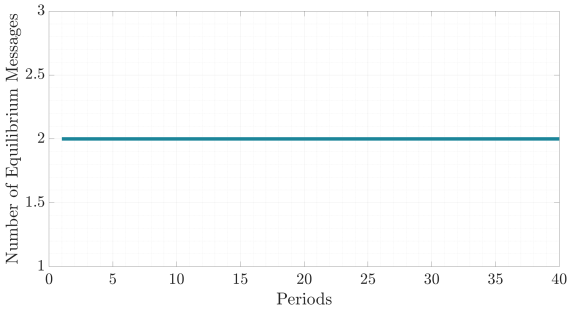
Note: The figure shows the evolution of the equilibrium message space over time. The teal crosses designate the alternative statements in every period. The blue line connects the lowest candidate messages across the periods, and the red line connects the highest candidate messages. The alternatives are normalized so that the chosen alternative lies on the zero line.

Figure C.5: Simulation with H constant, $\bar{H} = H, b = 0.02$

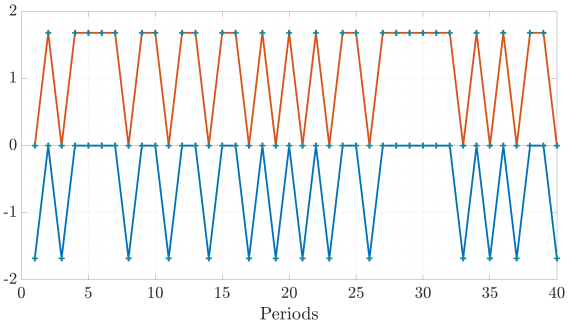
(a) Confidence and Reputation



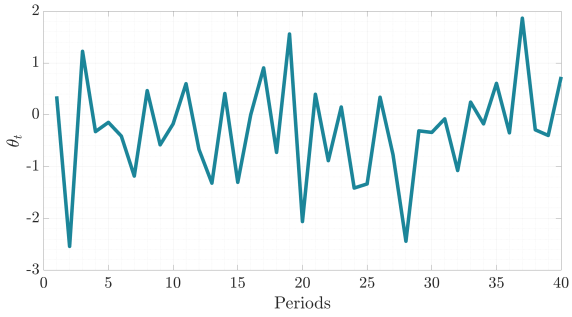
(b) Count of Messages



(c) Message Space



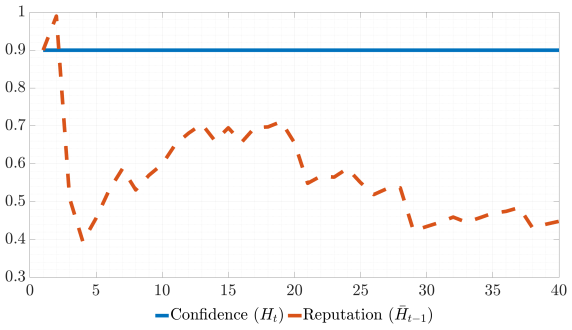
(d) Signals (θ_t)



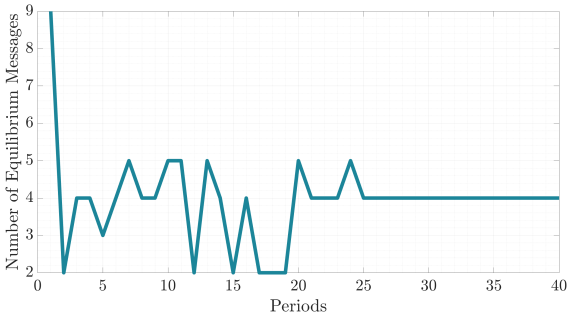
Note: See Figure C.4.

Figure C.6: Simulation with H constant, $\bar{H}$ evolving, $b = 0$

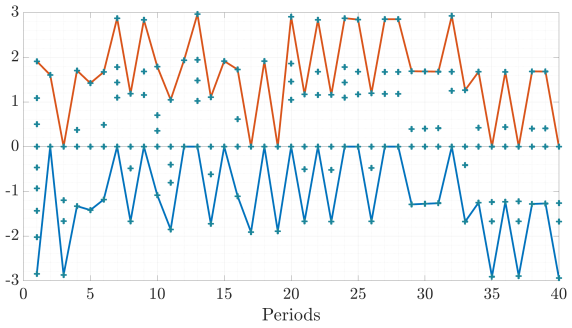
(a) Confidence and Reputation



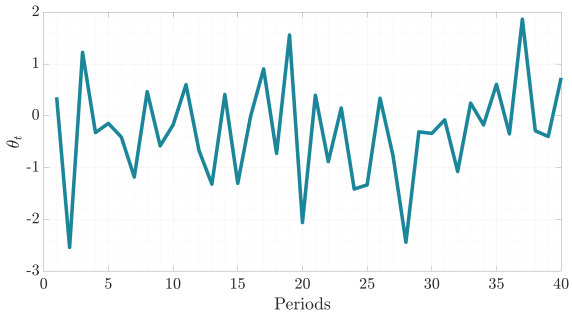
(b) Count of Messages



(c) Message Space



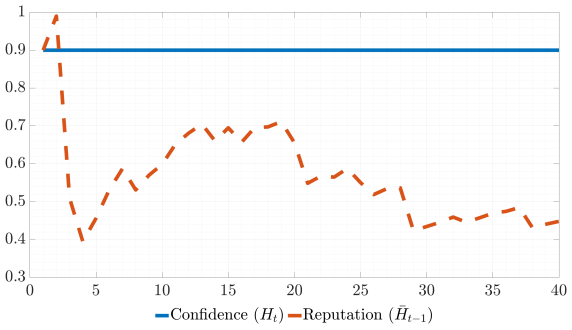
(d) Signals (θ_t)



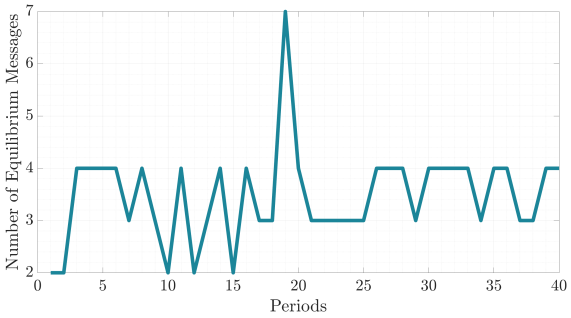
Note: See Figure C.4.

Figure C.7: Simulation with H constant, $\bar{H}$ evolving, $b = 0.02$

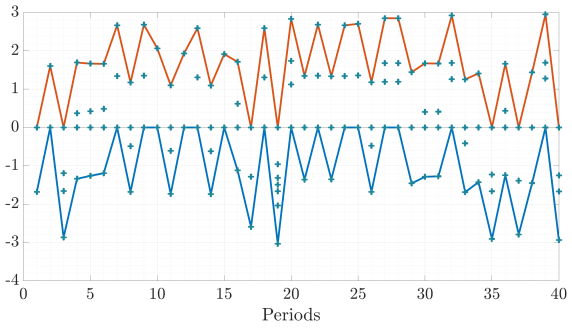
(a) Confidence and Reputation



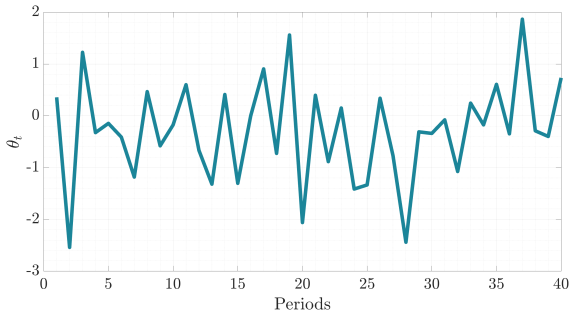
(b) Count of Messages



(c) Message Space



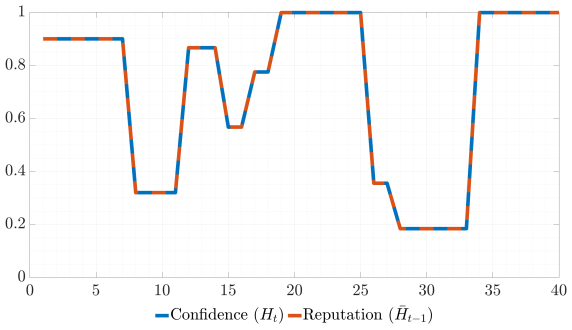
(d) Signals (θ_t)



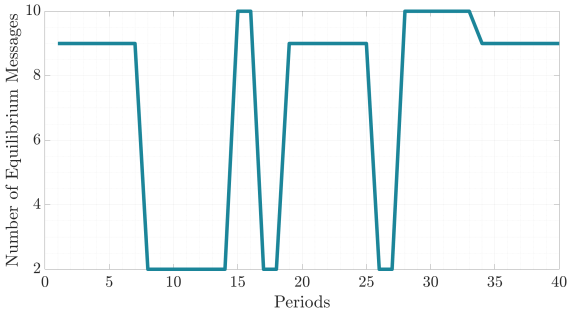
Note: See Figure C.4.

Figure C.8: Simulation with H varying, $\bar{H} = H, b = 0$

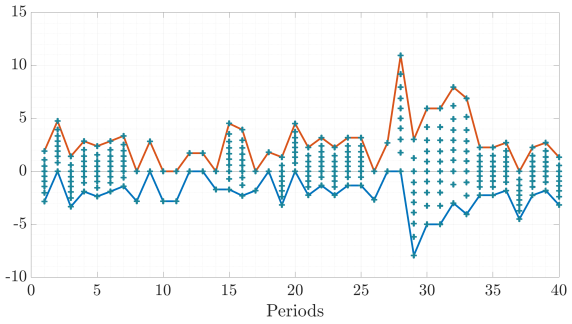
(a) Confidence and Reputation



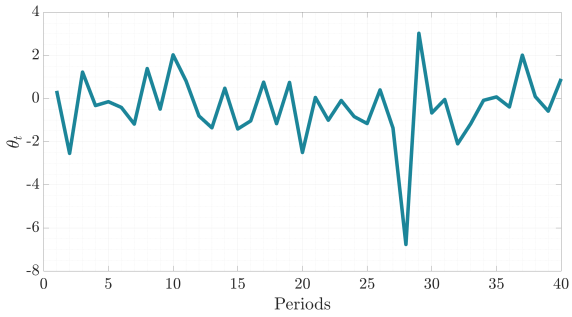
(b) Count of Messages



(c) Message Space



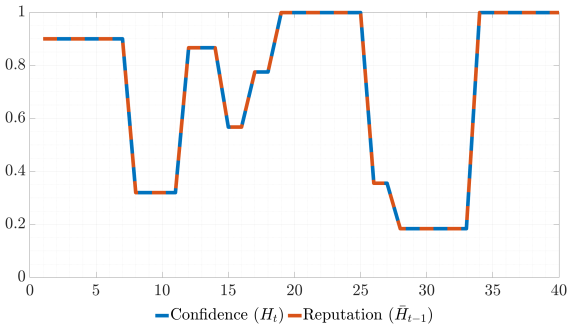
(d) Signals (θ_t)



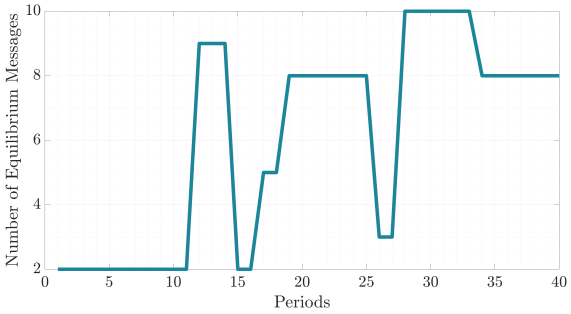
Note: See Figure C.4. Note that when H varies, this rescales the θ_t sequence.

Figure C.9: Simulation with H varying, $\bar{H} = H, b = 0.02$

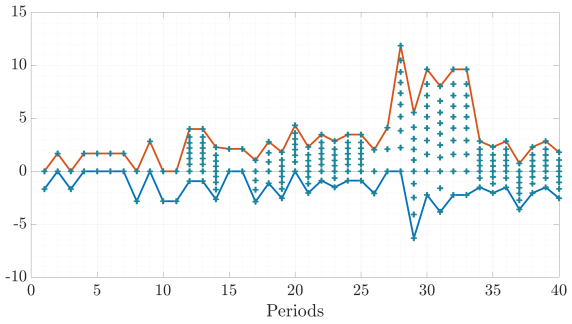
(a) Confidence and Reputation



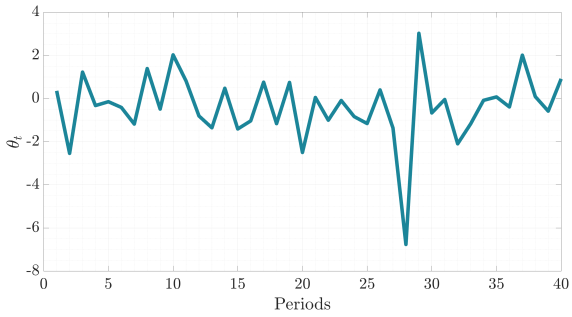
(b) Count of Messages



(c) Message Space



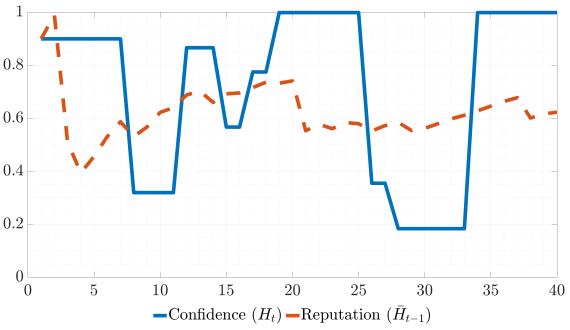
(d) Signals (θ_t)



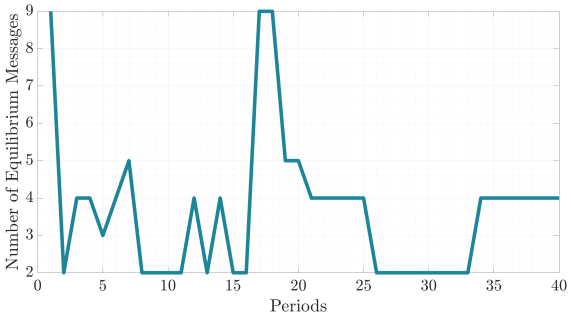
Note: See Figure C.4. Note that when H varies, this rescales the θ_t sequence.

Figure C.10: Simulation with H varying, $\bar{H}$ evolving, $b = 0$ (specification in main text)

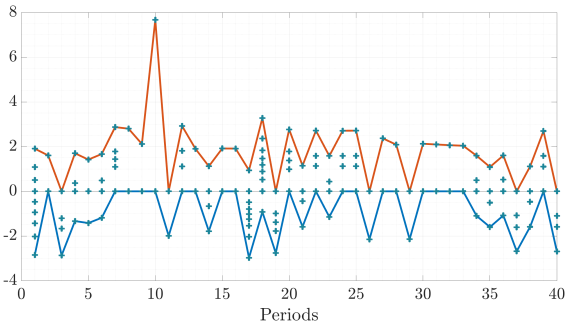
(a) Confidence and Reputation



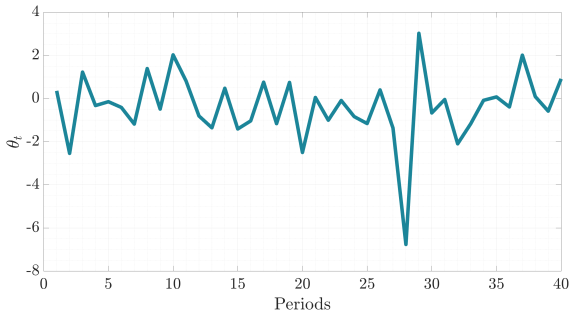
(b) Count of Messages



(c) Message Space



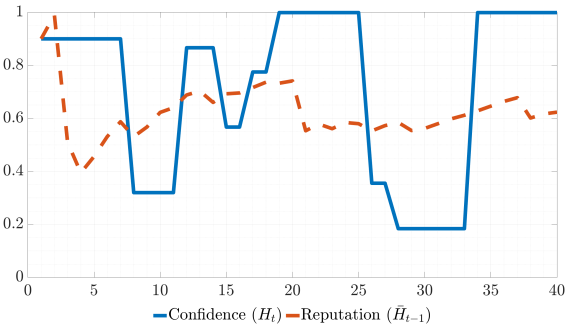
(d) Signals (θ_t)



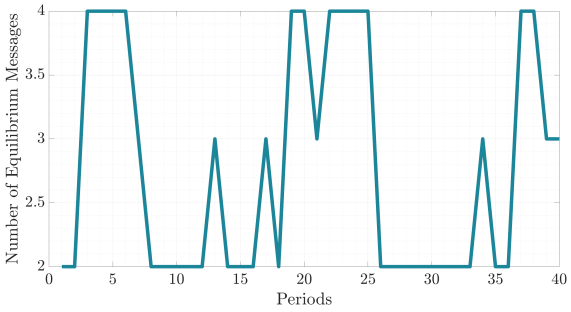
Note: See Figure C.4. Note that when H varies, this rescales the θ_t sequence.

Figure C.11: Simulation with H varying, $\bar{H}$ evolving, $b = 0.02$

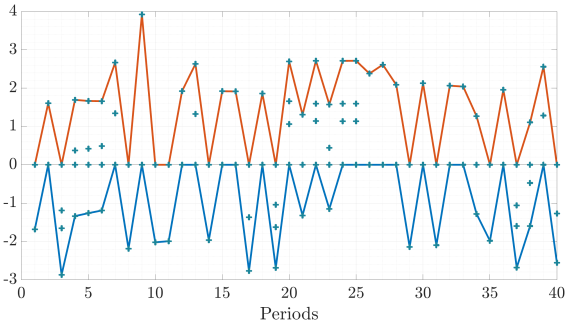
(a) Confidence and Reputation



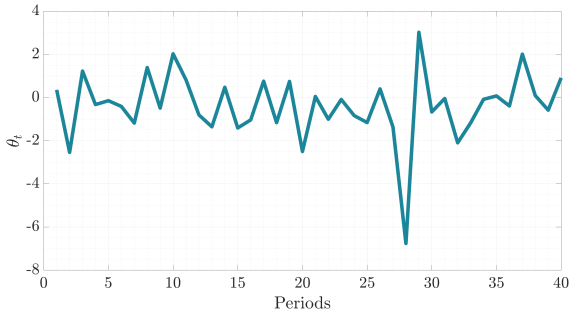
(b) Count of Messages



(c) Message Space



(d) Signals (θ_t)



Note: See Figure C.4. Note that when H varies, this rescales the θ_t sequence.

D Variable Definitions

In this section we define the variables used in the empirical analysis and provide the summary statistics for those variables.

Count: This variable is the count of the number of alternative statements within an FOMC meeting. We count each newly proposed phrasing as a distinct potential message. More information and examples of counting alternatives are in Appendix E. We then take the natural log of the count, and standardize/z-score for the regressions.

Span: This variable captures the distance spanned by the alternatives at a given date. We construct the message space by stitching together the distances between neighboring alternative statements with alternative B as the center point of zero, and the span measures the sum of those distances. We use Euclidean distance between embeddings of the alternatives. More information is in Appendix F. We also provide robustness of the measure in Appendix G. We then take the natural log of the span, and standardize/z-score for the regressions.

Confidence, H: The variable is

$$H = -log\left(\text{FOMC Uncertainty Index}\right).$$

The FOMC Uncertainty Index is the share of uncertainty words used by FOMC members in policy meeting transcripts and scaled so that the average share for 1985 to 2010 is equal to 100. We use the same uncertainty words and scaling strategy as Baker et al. (2016). More detail is explained in Appendix F. We take the log of this measure and multiply it by -1 to create confidence, standardize/z-score, and take the one meeting lag for the regressions.

Reputation, $\bar{H}$: The variable is

$$\bar{H} = -log\left(\text{Baker et al. (2016) MPU Index}\right).$$

The Baker et al. (2016) MPU Index is share of articles from top 10 daily newspapers in the US about monetary policy and uncertainty, scaled so that the average share for 1985 to 2010 is equal to 100. More detail is explained in Appendix F. We take the log of this measure and multiply it by -1 to create reputation, standardize/z-score, and take the one month lag for the regressions.

Reputation/Confidence, h: The variable is

$$h = 2 - log\left(\frac{\text{Baker et al. (2016) MPU Index}}{\text{FOMC Uncertainty Index}}\right).$$

We take the ratio of newspaper uncertainty to transcript uncertainty, take the log transformation and multiply by negative 1 to create a measure so that higher values represent greater reputation/confidence. We add two to the measure to shift if up so that $h = 1$ represents equal confidence and reputation, and standardize/z-score for the regressions.

VIX: For the VIX measure, we proceed in multiple steps: first we log transform the VIX Index downloaded from the FRED api. We then create a rolling average of two months to smooth the series. Then we lag and first difference the series to make it stationary and in line with the timing assumptions for the estimation. We also standardize/z-score for the regressions.

Target Federal Funds Rate, $tffr$: We download the target federal funds rate series from the FRED api. For years where there is a range to the target rate, we take the midpoint. This series is stationary on its own, and standardize/z-score for the regressions.

Table D.2: Summary Statistics

	$count$	$count$	$span$	$span$	$\frac{span}{count}$	h	h	H	H	$\bar{H}$	$\bar{H}$	vix	Δvix	$tffr$
Log	No	Yes	No	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
count	119	119	119	119	119	119	119	119	119	119	119	119	119	119
mean	3.61	1.24	0.48	-0.85	-2.09	-1.32	-0.14	-117.70	-4.64	-134.44	-4.79	2.84	-0.00	1.43
std	1.17	0.27	0.23	0.49	0.42	0.69	0.54	59.17	0.51	72.99	0.46	0.35	0.12	1.74
min	2.00	0.69	0.12	-2.13	-3.23	-3.80	-1.34	-317.92	-5.76	-491.06	-6.20	2.33	-0.25	0.12
25%	3.00	1.10	0.28	-1.28	-2.44	-1.72	-0.54	-143.14	-4.96	-161.09	-5.08	2.60	-0.09	0.12
50%	3.00	1.10	0.44	-0.81	-2.13	-1.23	-0.20	-104.74	-4.65	-117.68	-4.77	2.78	-0.02	0.38
75%	4.00	1.39	0.65	-0.44	-1.73	-0.80	0.23	-73.11	-4.29	-88.27	-4.48	3.05	0.07	2.19
max	9.00	2.20	1.16	0.15	-1.24	-0.18	1.69	-26.85	-3.29	-44.87	-3.80	4.13	0.39	5.25

E Alternative FOMC Statements Sample

E.1 Overview of Alternative Statements

In preparation for the FOMC policy meeting, there are policy recommendations presented in the Bluebook/Tealbook B. In addition to recommending target interest rates, since 2005 they have also provided clear recommendations for the post-meeting statement. The recommendations are drafts of alternative phrasings of the post-meeting statement that the FOMC may choose from, either as a whole or by mixing-and-matching phrases.

The Bluebook/Tealbook are released to the public on a 5-year lag in their full PDF format. Handlan (2022) collected the text of the alternative statements from those pdfs for analysis. The alternatives are loosely ordered on a scale of dovish (A) to hawkish (C), with the most "likely" alternative in the middle (B). Note that these labels are always changing over time. What it means to be the hawkish alternative in 2018 may actually be similar to the dovish alternative from 2005. So the definition is always relative to the baseline of the time.

Furthermore, the baseline policy recommendation and "likely" statement also evolves. In our companion paper, Gáti and Handlan (2025) we model the communication strategy of the FOMC as a systematic rule. This means that as the economy changes, the FOMC's announcement language will also change. In this paper we abstract from this and focus more on the cross-sectional differences between alternatives at a given meeting.

E.2 Counting Alternatives

The original documents start with text from the last FOMC meeting and then in subsequent pages propose the alternatives for the current meeting. With the introduction of the Tealbooks in 2010, the new alternatives are presented with track-changes to show what is new for this alternative at this meeting. While helpful for FOMC members, this requires additional cleaning to ensure the representation of the alternatives does not include stricken text.

Second, an alternative in the Tealbook may include multiple phrase options. There are

Figure E.12: Examples of Alternatives with Track-Changes

(a) Example 1

FOMC STATEMENT—APRIL 2014 ALTERNATIVE A

1. Information received since the Federal Open Market Committee met in ~~January~~ **March** indicates that growth in economic activity slowed **sharply** during the winter ~~months~~, in part reflecting adverse weather conditions**, but suggests that it is picking up**. Labor market indicators were mixed but on balance showed further improvement. The unemployment rate, however, remains elevated. Household spending and business fixed investment continued to advance, while the recovery in the housing sector remained slow. Fiscal policy is restraining economic growth, although the extent of restraint is diminishing. Inflation ~~has been running~~ **continues to run well** below the Committee's longer-run objective~~, but~~ **even though** longer-term inflation expectations have remained stable.

(b) Example 2

FOMC STATEMENT—APRIL 2014 ALTERNATIVE C

1. Information received since the Federal Open Market Committee met in ~~January~~ **March** indicates that growth in economic activity ~~slowed during the winter months, in part reflecting adverse weather conditions~~ **is picking up as the effects of unusually severe winter weather and other transitory factors fade**. Labor market indicators ~~were mixed but on balance~~ showed further improvement **with payroll employment expanding at a solid pace**. ~~The unemployment rate, however, remains elevated.~~ Household spending **appears to be rising more quickly.** ~~and~~ Business fixed investment ~~continued~~ **continues** to advance, while the recovery in the housing sector ~~remained~~ **remains** slow. Fiscal policy is restraining economic growth, although the extent of restraint is diminishing. Inflation has been running below the Committee's longer-run objective, but longer-term inflation expectations have remained stable.

Note: These are screenshots of the first paragraph of the Alternative A and Alternative C statements from the Tealbook B for the April 2014 FOMC meeting. It shows the stricken text from the January 2014 statement to not be included in the April 2014 alternatives. Black text is the same as January 2014. The red text is new language for April 2014.

multiple ways one could incorporate these optional phrases into the FOMC alternatives message space. We take two approaches in this paper. Our baseline approach incorporates these optional phrases as creating different messages. Our robustness exercise treats these optional phrases as equivalent if they are under the same header, and then only pick the first phrase option.

Figure E.13: Examples of Optional Phrases in Alternatives

(a) Single Optional Phrase

4. In determining ~~how long to maintain this~~ **the timing and size of future adjustments to the** target range, the Committee will assess ~~progress—both~~ realized and expected~~—toward~~ **economic conditions relative to** its objectives of maximum employment and 2 percent inflation **[, and will take a balanced approach to pursuing those objectives]**. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation

(b) Multiple Optional Phrases

5. The Committee is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and of rolling over maturing Treasury securities at auction**; the Committee anticipates doing so | until normalization of the level of the federal funds rate is well under way | at least during the early stages of normalization of the level of the federal funds rate**]. This policy, by keeping the Committee's holdings of longer-term securities at sizable levels, should help maintain accommodative financial conditions.

Note: These are screenshots of the fourth and fifth paragraphs from Alternative C from the September 2015 FOMC meeting's Tealbook B. They show examples of optional phrases: the phrase(s) in red in parentheses. Multiple phrases in parentheses are separated by a vertical bar: [phrase 1 | phrase 2].

E.3 Two Examples of Differences in Alternatives

Table E.3 includes a table summarizing the differences between the most hawkish, most dovish, and most "likely" alternative statements for two meeting: December 2008 and April

2014. These are the two examples described in the main text. The full text for the alternatives are in the following subsections.

Table E.3: Comparison of Statement Alternatives from Two FOMC Meetings

		Information Across Statement Alternatives		
Date	**Topic**	**Most Dovish (A)**	**Middle/Likely (B)**	**Most Hawkish (C/D)**
2008-12	Inflation	Below target	Below target	Consistent with target
	Real Economy	Bad and further weakening	Bad and further weakening	Bad but responding to policy
	Policy rate	Lower without a new target	Lower to 0-1/4 percent	Keep at 1 percent
2014-04	Inflation	Below target, less confident will return to target over the medium run	Below target, and will monitor developments	Below target, but anticipates a return to target over the medium run
	Real Economy	Growth slowed, but picking up	Picked up recently, after having slowed	Growth picking up as transitory slowing factors fade
	Policy rate	Keep at 0-1/4 percent	Keep at 0-1/4 percent	Keep at 0-1/4 percent

Note: This table highlights key features of FOMC statement alternatives from two policy meetings: 2008-12 and 2014-04. The most dovish alternative (usually Alt A) is in the left column, the most hawkish alternative (usually Alt C/D) is in the right column, and the middle or "likely" alternative (Alt B) is in black in the middle.

E.4 Set of Alternatives and Actual Statement, 2008

In this section we provide the entire text from the FOMC post-meeting statement and the alternative statements associated with the FOMC meeting in December 2008. Example 1 is the FOMC statement that was released to the public on December 16, 2008. The teal text is from alternative A (Example 2, the dovish alternative), the black text is from alternative B (Example 3, the likely alternative), and the orange text is not from any alternative.

This FOMC meeting represents a period of great uncertainty for monetary policymakers.

We can see this represented within each alternative statement, but also based on the differences between them. For instance, in alternative A they propose not even setting a non-zero target federal funds rate. Whereas in alternative D (Example 5, the most hawkish alternative), they do not even lower the interest rate target at all. It is this cross-sectional variation that motivates our equilibrium concept that connects the message space to precision of the central bank's information.

Example 1 (Actual Statement, 12/2008) *The Federal Open Market Committee decided today to establish a target range for the federal funds rate of 0 to 1/4 percent.*

Since the Committee's last meeting, labor market conditions have deteriorated, and the available data indicate that consumer spending, business investment, and industrial production have declined. Financial markets remain quite strained and credit conditions tight. Overall, the outlook for economic activity has weakened further.

Meanwhile, inflationary pressures have diminished appreciably. In light of the declines in the prices of energy and other commodities and the weaker prospects for economic activity, the Committee expects inflation to moderate further in coming quarters.

The Federal Reserve will employ all available tools to promote the resumption of sustainable economic growth and to preserve price stability. In particular, the Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time.

The focus of the Committee's policy going forward will be to support the functioning of financial markets and stimulate the economy through open market operations and other measures that sustain the size of the Federal Reserve's balance sheet at a high level. As previously announced, over the next few quarters the Federal Reserve will purchase large quantities of agency debt and mortgage-backed securities to provide support to the mortgage and housing markets, and it stands ready to expand its purchases of agency debt and mortgage-backed securities as conditions warrant. The Committee is also evaluating the potential benefits of purchasing longer-term Treasury securities. Early next year, the Federal Reserve will also implement the Term Asset-Backed Securities Loan Facility to facilitate the extension of credit to households and small businesses. The Federal Reserve will continue to consider ways of using its balance sheet to further support credit markets and economic activity.

Example 2 (Alternative Statement A, 12/2008) *Since the Committee's last meeting, labor market conditions have deteriorated, and the available data indicate that consumer spending, business investment, and industrial production have declined. Overall, the outlook for economic activity has weakened further.*

Meanwhile, inflationary pressures have diminished quickly. In light of the declines in the prices of energy and other commodities and the weaker prospects for economic activity, the Committee expects inflation to moderate in coming quarters and sees some risk that inflation could decline for a time below rates that best foster economic growth and price stability in the longer term. [In support of its dual mandate, the Committee will seek to achieve a rate of inflation, as measured by the price index for personal consumption expenditures, of about 2 percent in the medium term.]

In current circumstances, the Committee judged that it was not useful to set a specific target for the federal funds rate. As a result of the large volume of reserves provided by the Federal Reserve's

various liquidity facilities, the federal funds rate has declined to very low levels, and the Committee anticipates that weak economic conditions are likely to warrant federal funds rates near zero for some time.

The focus of policy going forward will be to continue to support the functioning of financial markets and stimulate the economy through open market operations and other measures that entail the use of the Federal Reserve's balance sheet. In particular, as previously announced, over the next few quarters the Federal Reserve will purchase large quantities of agency debt and mortgage-backed securities to provide support to the mortgage and housing markets, and it stands ready to expand its purchases of agency debt and mortgage-backed securities as conditions warrant. The Committee is also evaluating the potential benefits of purchasing longer-term Treasury securities. Early next year, the Federal Reserve will also implement the Term Asset-Backed Securities Loan Facility to facilitate the extension of credit to households and small businesses. The Federal Reserve will continue to actively consider ways of using its balance sheet to further support credit markets and economic activity.

In related actions, the Board of Governors today approved a 75 basis point decrease in the primary credit rate to 1/2 percent and established interest rates on required and excess reserve balances of 1/4 percent. In approving the reduction in the discount rate, the Board acted on requests submitted by the Federal Reserve Banks of . . .

Example 3 (Alternative Statement B, 12/2008) *The Federal Open Market Committee decided today to establish a target range for the federal funds rate of 0 to 1/4 percent.*

Since the Committee's last meeting, labor market conditions have deteriorated, and the available data indicate that consumer spending, business investment, and industrial production have declined. Overall, the outlook for economic activity has weakened further.

Meanwhile, inflationary pressures have diminished quickly. In light of the declines in the prices of energy and other commodities and the weaker prospects for economic activity, the Committee expects inflation to moderate in coming quarters and sees some risk that inflation could decline for a time below rates that best foster economic growth and price stability in the longer term.

The Federal Reserve will employ all available tools to promote the resumption of sustainable economic growth and to preserve price stability. In particular, as previously announced, over the next few quarters the Federal Reserve will purchase large quantities of agency debt and mortgage-backed securities to provide support to the mortgage and housing markets, and it stands ready to expand its purchases of agency debt and mortgage-backed securities and as conditions warrant. The Committee is also evaluating the potential benefits of purchasing longer-term Treasury securities. Early next year, the Federal Reserve will also implement the Term Asset-Backed Securities Loan Facility to facilitate the extension of credit to households and small businesses. The Federal Reserve continues to consider possible additions to and expansions of its liquidity facilities, as well as other means of using its balance sheet to further support credit markets and economic activity.

In a related action, the Board of Governors unanimously approved a 75-basis-point decrease in the discount rate to 1/2 percent. In taking this action, the Board approved the requests submitted by the Boards of Directors of the Federal Reserve Banks of . . . The Board also established interest rates on required and excess reserve balances of 1/4 percent.

Example 4 (Alternative Statement C, 12/2008) *The Federal Open Market Committee decided today to lower its target for the federal funds rate 50 basis points to 1/2 percent.*

Reflecting in part the intensification of the financial strains earlier in the fall, the pace of economic activity has slowed further and the near-term outlook has worsened. Labor market conditions have continued to deteriorate, and consumer spending, business investment, and industrial production have declined.

In light of the declines in the prices of energy and other commodities and the weaker prospects for economic activity, the Committee expects inflation to moderate in coming quarters and sees some risk that inflation could decline for a time below rates that best foster economic growth and price stability in the longer term.

In these circumstances, the Committee's primary concern is the downside risks to the economy. The Committee will monitor economic and financial developments carefully and will use all available tools to promote the resumption of sustainable economic growth and to preserve price stability.

In particular, as previously announced, over the next few quarters the Federal Reserve will purchase large quantities of agency debt and mortgage-backed securities to provide support to the mortgage and housing markets, and it stands ready to expand its purchases of agency debt and mortgage-backed securities as conditions warrant. The Committee is also evaluating the potential benefits of purchasing longer-term Treasury securities. Early next year, the Federal Reserve will implement the Term Asset-Backed Securities Loan Facility to facilitate the extension of credit to households and small businesses. The Federal Reserve continues to consider possible additions to and expansions of its liquidity facilities, as well as other means of using its balance sheet to further support credit markets and economic activity.

In a related action, the Board of Governors unanimously approved a 50-basis-point decrease in the discount rate to 1/2 percent. In taking this action, the Board approved the requests submitted by the Boards of Directors of the Federal Reserve Banks of ...

In view of the large volume of reserves provided by the Federal Reserve's various liquidity facilities, the Committee recognizes that the federal funds rate is likely to average somewhat below the $\frac{1}{2}$ percent target.

Example 5 (Alternative Statement D, 12/2008) *The Federal Open Market Committee decided today to keep its target for the federal funds rate at 1 percent.*

Reflecting in part the intensification of the financial strains earlier in the fall, the pace of economic activity appears to have slowed further, and the near-term outlook for growth has deteriorated. Moreover, the downside risks are significant. However, policy actions taken in recent months, including reductions in short-term interest rates to very low levels, extraordinary liquidity measures, and official steps to strengthen the financial system, should help over time to improve credit conditions and promote a return to moderate economic growth. As announced previously, the Federal Reserve will purchase a large volume of agency debt and mortgage-backed securities to provide support to the mortgage and housing markets and thus to broader economic activity. Early next year, the Federal Reserve will also implement the Term Asset-Backed Securities Loan Facility to help facilitate the extension of credit to households and small businesses.

In light of the declines in the prices of energy and other commodities and the weaker prospects for economic activity, the Committee expects inflation to moderate in coming quarters to levels consistent with price stability.

In view of the large volume of reserves provided by the Federal Reserve's various liquidity facilities, the Committee recognizes that the federal funds rate is likely to average significantly below the target rate for some time. The Committee will monitor economic and financial developments carefully in light of recent policy actions and will act as needed to promote sustainable economic growth and price stability.

E.5 Set of Alternatives, 2014

Example 6 (Alternative Statement A, 4/2014) *Information received since the Federal Open Market Committee met in March indicates that growth in economic activity slowed sharply during the winter, in part reflecting adverse weather conditions, but suggests that it is picking up. Labor market indicators were mixed but on balance showed further improvement. The unemployment rate, however, remains elevated. Household spending and business fixed investment continued to advance, while the recovery in the housing sector remained slow. Fiscal policy is restraining economic growth, although the extent of restraint is diminishing. Inflation continues to run well below the Committee's longer-run objective even though longer-term inflation expectations have remained stable. Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee expects that, with appropriate policy accommodation, economic activity will expand at a moderate pace and labor market conditions will continue to improve gradually, moving toward those the Committee judges consistent with its dual mandate. The Committee sees the risks to the outlook for the economy and the labor market as nearly balanced. The Committee anticipates that inflation will gradually return to 2 percent. However, it recognizes that inflation persistently below its 2 percent objective could pose risks to economic performance, and it is monitoring inflation developments carefully for evidence that inflation will move back toward its objective over the medium term. The Committee has become somewhat less confident that there is sufficient underlying strength in the broader economy to support ongoing improvement in labor market conditions and to return inflation to 2 percent over the medium run. For this reason, the Committee decided to maintain the current pace of its asset purchases and await additional information bearing on the outlook for economic activity, the labor market, and inflation. The Committee will continue to add to its holdings of agency mortgage-backed securities at a pace of $25 billion per month and to its holdings of longer-term Treasury securities at a pace of $30 billion per month. The Committee is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and of rolling over maturing Treasury securities at auction. The Committee's sizable and still-increasing holdings of longer-term securities should maintain downward pressure on longer-term interest rates, support mortgage markets, and help to make broader financial conditions more accommodative, which in turn should promote a stronger economic recovery and help to ensure that inflation, over time, is at the rate most consistent with the Committee's dual mandate. The Committee will closely monitor incoming information on economic and financial developments in coming months and will continue its purchases of Treasury and agency mortgage-backed securities, and employ its other policy tools as appropriate, until the outlook for the labor market has improved substantially in a context of price stability. If incoming information broadly supports the Committee's expectation of ongoing improvement in labor market conditions and inflation moving back toward its longer-run objective, the Committee will likely reduce the pace of asset purchases in further measured steps at future meetings. However, asset purchases are not on a preset course, and the Committee's decisions about their pace will remain contingent on the Committee's outlook for the labor market and inflation as well as its assessment of the likely efficacy and costs of such purchases. To support continued progress toward maximum employment and price stability, the Committee today reaffirmed its view that a highly accommodative stance of monetary policy remains appropriate. In determining how long to maintain the current 0 to 1/4 percent target range for the federal funds rate, the Committee will assess progress-both realized and expected-toward its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments. The Committee anticipates, based on its assessment of these factors, that it will be appropriate to maintain the current target range for the federal funds rate for a considerable time after the asset purchase program ends, and at least as long as inflation between one and two years ahead is projected to be below 2 percent, provided that longer-term inflation expectations remain well anchored. When the Committee decides to begin to remove policy accommodation, it will take a balanced approach consistent with its longer-run goals of maximum employment and inflation of 2 percent. The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.*

Example 7 (Alternative Statement B, 4/2014) *Information received since the Federal Open Market Committee met in March indicates that growth in economic activity has picked up recently, after having slowed during the winter in part because of adverse weather conditions. Labor market indicators were mixed but on balance showed further improvement. The unemployment rate, however, remains elevated. Household spending appears to be rising more quickly. Business fixed investment continues to advance, while the recovery in the housing sector remains slow. Fiscal policy is restraining economic growth, although the extent of restraint is diminishing. Inflation has been running below the Committee's longer-run objective, but longer-term inflation expectations have remained stable. Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee expects that, with appropriate policy accommodation, economic activity will expand at a moderate pace and labor market conditions will continue to improve gradually, moving toward those the Committee judges consistent with its dual mandate. The Committee sees the risks to the outlook for the economy and the labor market as nearly balanced. The Committee recognizes that inflation persistently below its 2 percent objective could pose risks to economic performance, and it is monitoring inflation developments carefully for evidence that inflation will move back toward its objective over the medium term. The Committee currently judges that there is sufficient underlying strength in the broader economy to support ongoing improvement in labor market conditions. In light of the cumulative progress toward maximum employment and the improvement in the outlook for labor market conditions since the inception of the current asset purchase program, the Committee decided to make a further measured reduction in the pace of its asset purchases. Beginning in May, the Committee will add to its holdings of agency mortgage-backed securities at a pace of $20 billion per month rather than $25 billion per month, and will add to its holdings of longer-term Treasury securities at a pace of $25 billion per month rather than $30 billion per month. The Committee is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and of rolling over maturing Treasury securities at auction. The Committee's sizable and still-increasing holdings of longer-term securities should maintain downward pressure on longer-term interest rates, support mortgage markets, and help to make broader financial conditions more accommodative, which in turn should promote a stronger economic recovery and help to ensure that inflation, over time, is at the rate most consistent with the Committee's dual mandate. The Committee will closely monitor incoming information on economic and financial developments in coming months and will continue its purchases of Treasury and agency mortgage-backed securities, and employ its other policy tools as appropriate, until the outlook for the labor market has improved substantially in a context of price stability. If incoming information broadly supports the Committee's expectation of ongoing improvement in labor market conditions and inflation moving back toward its longer-run objective, the Committee will likely reduce the pace of asset purchases in further measured steps at future meetings. However, asset purchases are not on a preset course, and the Committee's decisions about their pace will remain contingent on the Committee's outlook for the labor market and inflation as well as its assessment of the likely efficacy and costs of such purchases. To support continued progress toward maximum employment and price stability, the Committee today reaffirmed its view that a highly accommodative stance of monetary policy remains appropriate. In determining how long to maintain the current 0 to 1/4 percent target range for the federal funds rate, the Committee will assess progress-both realized and expected-toward its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments. The Committee continues to anticipate, based on its assessment of these factors, that it likely will be appropriate to maintain the current target range for the federal funds rate for a considerable time after the asset purchase program ends, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal, and provided that longer-term inflation expectations remain well anchored. When the Committee decides to begin to remove policy accommodation, it will take a balanced approach consistent with its longer-run goals of maximum employment and inflation of 2 percent. The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.*

Example 8 (Alternative Statement C, 4/2014) *Information received since the Federal Open Market Committee met in March indicates that growth in economic activity is picking up as the effects of unusually severe winter weather and other transitory factors fade. Labor market indicators showed further improvement with payroll employment expanding at a solid pace. Household spending appears to be rising more quickly. Business fixed investment continues to advance, while the recovery in the housing sector remains slow. Fiscal policy is restraining economic growth, although the extent of restraint is diminishing. Inflation has been running below the Committee's longer-run objective, but longer-term inflation expectations have remained stable. Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee expects that, with appropriate policy accommodation, economic activity will expand at a moderate pace and labor market conditions will continue to improve gradually, moving toward those the Committee judges consistent with its dual mandate. The Committee sees the risks to the outlook for the economy and the labor market as nearly balanced. The Committee recognizes that inflation persistently below its 2 percent objective could pose risks to economic performance, and it is monitoring inflation developments carefully; however, the Committee continues to anticipate that inflation will move back toward its objective over the medium term. The Committee currently judges that there is sufficient underlying strength in the broader economy to support ongoing improvement in labor market conditions. In light of the cumulative progress toward maximum employment and the improvement in the outlook for labor market conditions since the inception of the current asset purchase program, the Committee decided to make a further measured reduction in the pace of its asset purchases. Beginning in May, the Committee will add to its holdings of agency mortgage-backed securities at a pace of $15 billion per month rather than $25 billion per month, and will add to its holdings of longer-term Treasury securities at a pace of $20 billion per month rather than $30 billion per month. The Committee is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and of rolling over maturing Treasury securities at auction. The Committee's sizable and still-increasing holdings of longer-term securities should maintain downward pressure on longer-term interest rates, support mortgage markets, and help to make broader financial conditions more accommodative, which in turn should promote a stronger economic recovery and help to ensure that inflation, over time, is at the rate most consistent with the Committee's dual mandate. The Committee will closely monitor incoming information on economic and financial developments in coming months and will continue its purchases of Treasury and agency mortgage-backed securities, and employ its other policy tools as appropriate, until the outlook for the labor market has improved substantially in a context of price stability. If incoming information broadly supports the Committee's expectation of ongoing improvement in labor market conditions and inflation moving back toward its longer-run objective, the Committee will likely reduce the pace of asset purchases further at future meetings. However, asset purchases are not on a preset course, and the Committee's decisions about their pace will remain contingent on the Committee's outlook for the labor market and inflation as well as its assessment of the likely efficacy and costs of such purchases. To support continued progress toward maximum employment and price stability, the Committee today reaffirmed its view that a highly accommodative stance of monetary policy remains appropriate. In determining how long to maintain the current 0 to 1/4 percent target range for the federal funds rate, the Committee will assess progress-both realized and expected-toward its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments. The Committee continues to anticipate, based on its assessment of these factors, that it likely will be appropriate to maintain the current target range for the federal funds rate for a considerable time after the asset purchase program ends, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal, and provided that longer-term inflation expectations remain well anchored. When the Committee decides to begin to remove policy accommodation, it will take a balanced approach consistent with its longer-run goals of maximum employment and inflation of 2 percent. The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.*

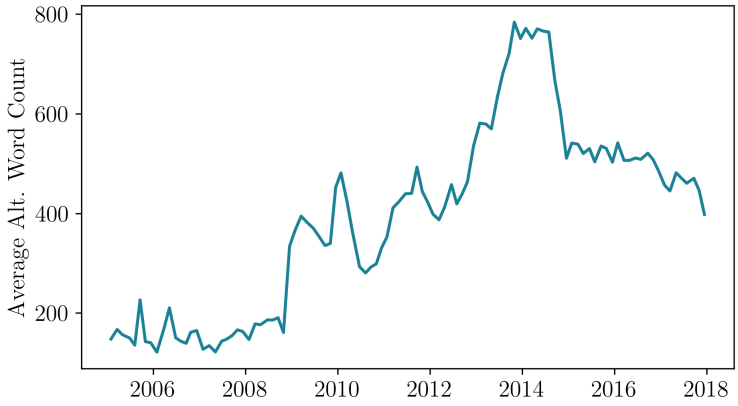
F Text Measurement

F.1 Distance Measures

The baseline specification in the paper uses an off-the-shelf, pre-trained large language model called Sentence BERT (SBERT). We use the version called distill-roberta. This model maps text into a single vector that captures the latent information encoded by the sequence of words in the text. It is that document vector that we use to compare texts numerically with euclidean distance. Regarding details of the implementation, first we will describe how we handle SBERT size limitations and then we will discuss distance metrics.

SBERT Details: SBERT has a size limitation for the text input of about 400 words (more precisely, 512 word pieces). When FOMC statements are longer than this threshold, we split the statement in two chunks that we encode separately and then pool the document embedding as a weighted average using the chunks' relative word length as the weights.

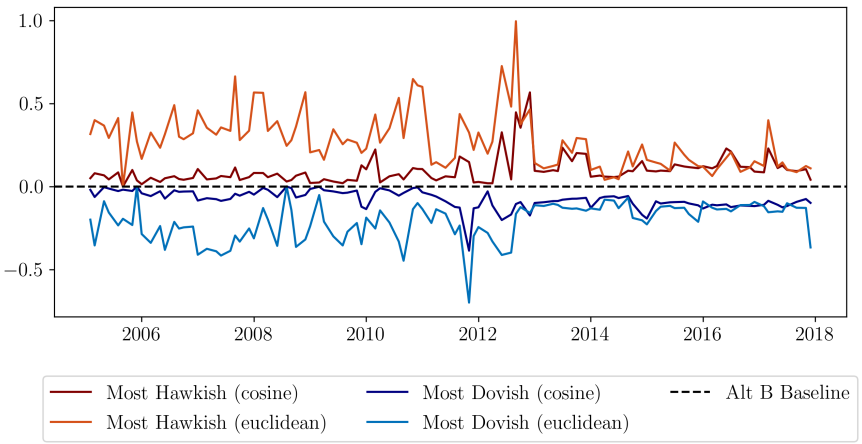
Figure F.14: Average Length of Statement Alternatives



Distance Metrics: There are two popular methods for measuring distance between text embeddings: euclidean distance and cosine similarity. We use euclidean distance to measure the spacing between alternatives because it is consistent with our theoretical measure of the message space. Figure F.15 shows the differences in cosine similarity distance versus

euclidean distance over the sample. Cosine similarity measures imply the message space has increased over the sample, whereas euclidean distance shows a decrease in span after 2013. In the end, the measures are strongly correlated with each other, with a Pearson correlation coefficient of 0.721.

Figure F.15: Comparison of Distance Metrics between Statement Alternatives



Discussion of other text measures: SBERT is one of many text analysis options to quantify text. We saw this model as the ideal middle ground in terms of approachability and its ability to capture latent information. SBERT is easily implementable and widely used in natural language processing for text comparison tasks (like what we do here). Additionally, because it encodes the words of the sentence and their order it is able to numerically represent the information behind the words. This is more than what would be possible with word counts (a bag of words approach) because that focuses only on what words appear.

We see this as an important distinction for mapping to our theoretical analysis. FOMC statements often use very similar words over time and across alternatives at a given meeting. This is because they are all talking about monetary policy in the US: a similar discussion from the same source requires similar words. However, the meaning of FOMC statements may change dramatically due to the order of words. For example, in 2014-04 one alternative statement talks about "growth is picking up" despite the economic slowdown over winter. Putting the statement about growth picking up first sends a more positive signal about the

economic outlook. Another alternative from that same meeting highlights the severity of the economic slowdown first and then states that incoming information "suggests growth is picking up." This change in order presents a slightly more negative economic outlook. In our measure, this language shows up as similar but different. If we were to use word-count methods on the statements, then ordering would not be factored into the measure and our measure would would miss this type of strategic ordering of language.

This subtle phrasing decisions is something we see as important for Fed communication precisely because of the strategic concerns explored in this paper. Thus we need the more complex language model here. However, for information communicated in newspapers and the FOMC transcripts, we are willing to look at more streamlined word-count measures because information is explicitly and directly communicated without the strategic nuance (or at least less).

F.2 Uncertainty Measures

Reputation: We directly use the monetary policy uncertainty index from Baker et al. (2016) to approximate the public's belief over the Federal Reserves confidence. Namely, we think of confidence and uncertainty as inversely linked: when one goes up, the other must go down.

Baker et al. (2016) create their measure using the number of articles from the top 10 newspapers in the US that contain at least one keyword from each of the following sets:

- **E:** *economic, economy*
- **P:** *congress, legislation, white house, regulation, federal reserve, deficit*
- **U:** *uncertain, uncertainty*
- **M:** *federal reserve, the fed, money supply, open market operations, quantitative easing, monetary policy, fed funds rate, overnight lending rate, Bernanke, Volker, Greenspan, central bank, interest rates, fed chairman, fed chair, lender of last resort, discount window, European Central Bank, ECB, Bank of England, Bank of Japan, BOJ, Bank of China, Bundesbank, Bank of France, Bank of Italy*

The production of the index is described clearly on their website: "we sum the raw counts of articles that meet our E, P, U and M criteria across newspapers, and divide by the summed count of all articles in the same newspapers and month. We then normalize the scaled frequency count to have an average value of 100 from January 1985 through December 2010."

Confidence: We expand on the uncertainty measures from Baker et al. (2016) to create a monetary policy uncertainty measure from the FOMC transcripts as an approximation of FOMC's confidence. We use a similar keyword approach and normalization scheme, but applied to the FOMC transcripts (cleaned transcripts provided by Acosta (2023)).

We count the number of uncertainty words in the FOMC transcripts spoken by FOMC members (not Fed staff). We then normalize that uncertainty word count by the total number of words spoken by FOMC members. Finally, we scale this frequency to have an average value of 100 from Jan 1985 through Dec 2010. This produces an index of FOMC uncertainty for each FOMC meeting with a transcript released.

It is important to note that the frequency of the confidence measure (share of words across FOMC meetings) is slightly different from the reputation measure (share of articles across months). However, we take the timing of both into consideration with our identification strategy as described in the paper.

F.3 Validation

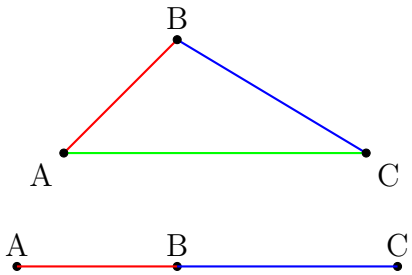
This section describes our validation of the text-based measures we create with this paper: distance between alternatives and FOMC confidence.

Distance Validation: To provide a validation of our distance measures, we leverage the ordering of alternative statements. We compare the pairwise distances of boundary alternatives (A vs C) to the pairwise distance of neighboring alternatives (A vs B, or B vs C). In short, the ordering imposed by the Fed staff create labels on the relative pairwise distances: AB and BC distances should be closer than AC.

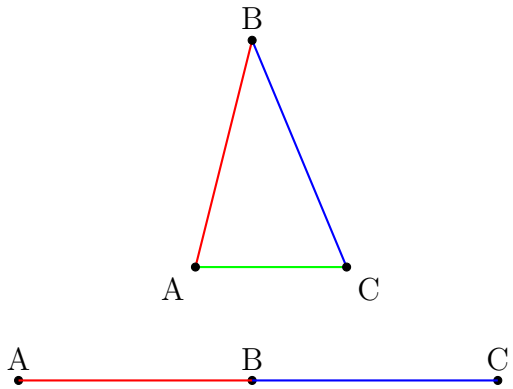
Figure F.16 provides a simplified illustration to provide intuition for measuring distances

Figure F.16: Comparison of Pairwise Distances Between Alternatives

(a) Largest Pairwise-Distance is AC



(b) Largest Pairwise-Distance is *not* AC



Note: Subfigure (a) shows the expected spacing where the boundary alternatives AC are further apart from each other than the pairwise distance of AB or BC. Alternatively, subfigure (b) is where the distance between the most extreme alternatives are closer than the the likely alternative, B.

between alternatives and how we project that down into a message space. For the message space in the paper, we rely heavily on the ordering setup by the Fed staff. The ordering from the most dovish (A) to the most hawkish (C) must go through alternative B. In the high dimensional space, this looks like going from the triangle to only considering the edges AB and then BC. The straight line under the triangle is our representation of the message space. However, we can use the concept of the triangle and the ordering of alternatives to evaluate our distance metric.

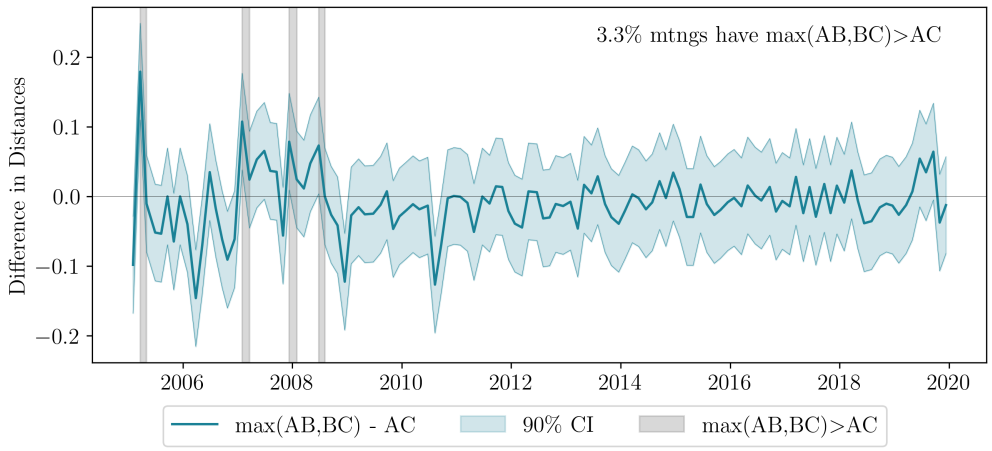
For this validation exercise, conceptually, the FOMC alternatives at the boundaries should be less similar than neighboring alternatives. Therefore, our distances, d, should have the ordering:

$$d(A, C) \geq \max\left[d(A, B), d(B, C)\right],$$

which is consistent with subfigure (a) in Figure F.16.

As shown on Figure F.17, we find that 32.5% of meetings in our sample have an AC distance that is smaller than AB or BC, and this gap is only statistically different from zero in 3.3% of cases at the 95% confidence level for a one-sided test. That means, for almost all meetings, we have a message space where the distances between messages follow the conceptual metrics implied by the ordering by the Fed staff.

Figure F.17: Pairwise Distance Comparisons



Note: A and C in the legend refers to the boundary messages, the most dovish and most hawkish. B is the first alternative labeled as alternative B in the Tealbooks. Plotted is the difference between the boundary messages d(A,C) directly measured minus the maximum distance between d(A,B) and d(B,C). The blue shaded region is the two-sided, 90% confidence intervals. The vertical gray bars identify when the boundary messages are closer to each other than message B, and it is statistically significant at 95% confidence (for one-sided test).

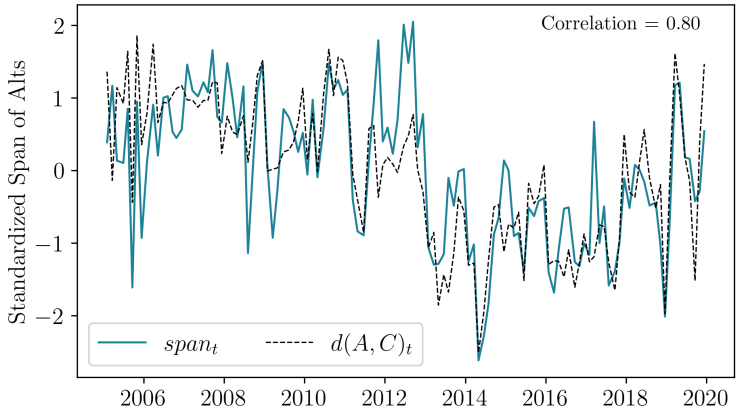
We investigate the four meetings where the we can reject this inequality from holding. These meetings were March 2005, January 2007, December 2007, and June 2008. At these meetings the non-likely alternatives seemed to be used more to test out new phrasings. Accordingly, this biases the boundary messages to seem more similar to each other (as they are both non-likely compared to alternative B) than to the middle alternative B.

As robustness, we provide analysis when the span measure is calculated directly as the distance between the boundaries compared to when we look at the sum of distances relative to message B (Figure F.18). In particular, we can see that these two measures are highly correlated with a Pearson correlation coefficient of 0.8.

Confidence Validation: To better understand the uncertainty-word-count approach applied to the transcripts, we introduce a new data source that has information on the FOMC's uncertainty. Ultimately, we have confidence in our transcript uncertainty measure because of its positive relationship to survey responses from the FOMC on their uncertainty.

We collect information from the Summary of Economic Projections (SEP) – a quarterly survey completed by FOMC members on their expectations and forecasts since 2007. We collect this data through 2019 to compare with our sample. As part of the SEP, FOMC mem-

Figure F.18: Comparison of Span Measures

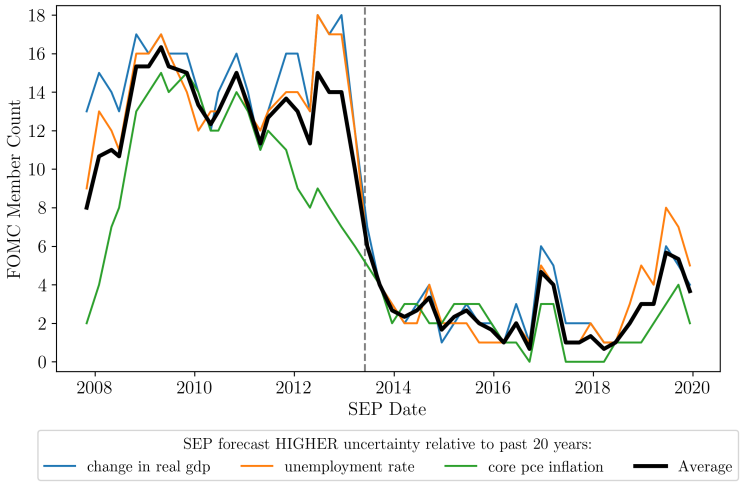


Note: $span_t$ is the baseline measure for the span of alternatives built around alternative B. $d(A,C)_t$ is the direct measure of distance between the boundary messages, the most dovish and most hawkish. Both measures are z-score, standardized.

bers note whether their forecasts are more uncertain, less uncertain, or similarly uncertain compared to the last 20 years. Figure F.19 shows this data over time based on the number of FOMC members who said their forecasts are more uncertain. We average the number of FOMC members reporting higher uncertainty across the forecasts for RGDP, unemployment, and core inflation.

The SEP uncertainty measure, importantly, is itself a communication tool. Accordingly, it is important to note that the survey measure itself will be affected by the FOMC's anticipation of the public's reaction. In particular, we see a structural break in the time series of Figure F.19 in mid-2013. This time is important as it was the end-date implied by the date-based forward guidance, which stated "conditions would likely warrant keeping the federal funds rate target near zero at least through mid-2013." Prior to mid-2013, the SEP was able to signal uncertainty without the public reading into it as a signal of future policy. Post-2013, when the public began seeing this as informative for the path of future policy, we see what our model would imply: FOMC claimed to have lower uncertainty (higher confidence). Then to use the SEP-uncertainty data as validation data, we need to include a time fixed effect to account for this strategic communication shift.

Figure F.19: Summary of Economic Projections: Higher Uncertainty



Note: The Summary of Economic Projections (SEP) collects projections from FOMC member quarterly. Question 2(a) asks about their forecast uncertainty compared to the past 20 years. This figure plots the number of FOMC members reporting higher uncertainty for their forecasts.

To compare our text measure to the survey data, we run the following simple regression:

$$U^{SEP} = \beta_0 + \beta_1 U^{Transcript} + \tau^{2013} + \varepsilon \tag{11}$$

where U^{SEP} is the number of FOMC member reporting higher uncertainty averaged across the forecasts for RGDP, unemployment, and core inflation. $U^{Transcript}$ is the Baker et al. (2016) scaled uncertainty count of words spoken by FOMC members at the meetings where SEP is also produced (this corresponds to our H confidence measure). τ^{2013} is the time fixed effect account for before and after mid-2013. The sample includes 50 observations for the 50 FOMC meetings with SEP data leading up to 2019.

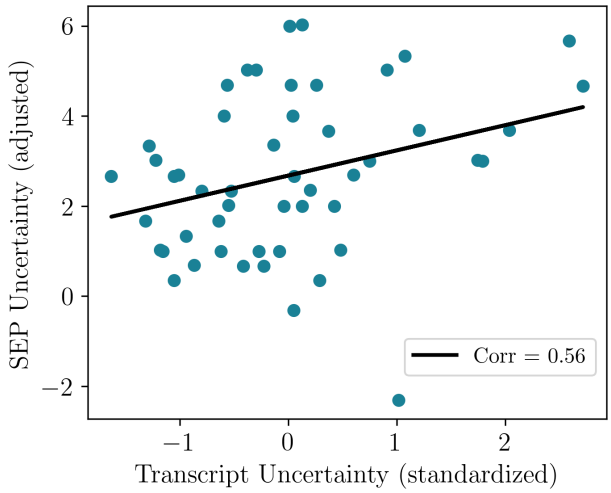
We find that a one standard deviation increase in transcript uncertainty is associated with 0.56 more FOMC members responding they have higher uncertainty regarding their SEP forecasts. This relationship is statistically significant, and shows that our uncertainty measure is capturing the FOMC uncertainty.

Table F.4: Uncertainty Validation Regression

	U^{SEP}
β_0	2.68***
	(0.31)
$U^{Transcript}$	0.56***
	(0.21)
τ^{2013}	10.31***
	(0.62)
R^2	0.90
R^2 Adj.	0.90
N	50

Notes: HAC-robust standard errors with small sample correction in parentheses. * p<.1, ** p<.05, *** p<.01.

Figure F.20: SEP Uncertainty vs. Transcript Uncertainty



Note: SEP forecasts are quarterly from 2007-2019, and are adjusted using the τ^{2013} estimated in the Equation 11. Transcript Uncertainty is the standardized (scored) index of uncertainty words used by FOMC members at FOMC meetings 2007-2019.

G Regressions: Robustness and Simulations

This section provides additional tables and analyses to complement the regressions in the main paper.

G.1 Simulated Data Regressions

This section presents the regressions for the simulated data from the repeated game. Table G.5 presents the count regressions for two cases: $b = 0$ in Panel A and $b > 0$ in Panel B. Table G.6 then presents the span regressions.

As in the visual numerical approximations in the paper, these regressions show that h (the reputation-to-confidence ratio) is important to understand the relationship between the message space and confidence and reputation. As we increase h, or as we increase reputation relative to confidence, then this is associated with a decrease in the number of alternatives. Either when confidence is low or when reputation is high, the model suggests coarser messages. In the regression, because we control for span, we see this as a negative coefficient between h and the count.

When we turn to the span, we also see an interesting relationship with h, but it is more subtle. For the portion of the reputation-confidence space where we we have more than 2 messages consistently, then this is a statistically significant relationship between h and the span. When h increases then we see an increase in the span. Again, this comes from the push for coarser messages when confidence is low and reputation is high.

For both the count and span, we find the tightest relationship between reputation and confidence and the message space is when confidence is greater than reputation ($H \geq \bar{H}$). Whether $b = 0$ or $b > 0$, this region has more variation in message measures and that variation is important for identifying statistical relationships. When we look at the full sample, or when confidence is less than reputation, we enter into the space of games with coarser and coarser messages such that marginal variation in h, H, or $\bar{H}$ have attenuated effects on the message space.

Although the effect of inflation bias is important theoretically, there is only a slight difference in the statistical relationships between the panels. When $b > 0$ (Panel B) we

introduce another driver for the coarseness of messages other than reputation and confidence: the inflation bias. Thus, variation in H, $\bar{H}$, and h does not trigger the same response in the message space, leading to slightly higher point estimates for Panel A. However, qualitatively the results are very similar.

Table G.5: Simulated Message Count, Reputation, and Confidence

Panel A: $\log(count)$ when $b = 0$

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Full	$H \geq \bar{H}$	$H < \bar{H}$	Full	$H \geq \bar{H}$	$H < \bar{H}$
h	-0.256***	-0.298***	-0.091			
	(0.071)	(0.061)	(0.110)			
H				0.699**	0.741***	1.827***
				(0.295)	(0.079)	(0.508)
$\bar{H}$				0.078	0.413***	0.532**
				(0.112)	(0.070)	(0.207)
$H \times \bar{H}$				-0.216	-0.619***	-1.719***
				(0.334)	(0.123)	(0.565)
$\log(span)$	0.565***	0.964***	0.418***	0.645***	1.065***	0.531***
	(0.071)	(0.061)	(0.110)	(0.060)	(0.024)	(0.106)
R^2	0.415	0.838	0.189	0.620	0.977	0.364
N	120	51	69	120	51	69

Panel B: $\log(count)$ when $b > 0$

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Full	$H \geq \bar{H}$	$H < \bar{H}$	Full	$H \geq \bar{H}$	$H < \bar{H}$
h	-0.254***	-0.219***	-0.090			
	(0.074)	(0.081)	(0.103)			
H				0.529	0.725***	0.888*
				(0.340)	(0.101)	(0.455)
$\bar{H}$				0.028	0.556***	0.382**
				(0.127)	(0.093)	(0.182)
$H \times \bar{H}$				-0.086	-0.689***	-0.558
				(0.384)	(0.160)	(0.506)
$\log(span)$	0.530***	0.976***	0.528***	0.621***	1.149***	0.629***
	(0.074)	(0.081)	(0.103)	(0.069)	(0.037)	(0.091)
R^2	0.359	0.772	0.294	0.498	0.959	0.523
N	120	51	69	120	51	69

Notes: HAC-robust standard errors with small sample correction in parentheses.
* p<.1, ** p<.05, *** p<.01. Series are all standardized (z-scored). Data is created from simulation of model with time-varying H and $\bar{H}$ evolving. Panel A includes simulated data without inflation bias, b=0. Panel B includes simulated data with inflation bias, b¿0. Samples in columns (2) and (4) include observations where confidence is greater than or equal to reputation, while columns (3) and (5) have the complement samples. Count and span measures are log transformed.

Table G.6: Simulated Message Span, Reputation, and Confidence

Panel A: $\log(span)$ when $b = 0$

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Full	$H \geq \bar{H}$	$H < \bar{H}$	Full	$H \geq \bar{H}$	$H < \bar{H}$
h	0.089	0.310***	-0.027			
	(0.078)	(0.055)	(0.111)			
H				-0.959***	-0.703***	-1.556***
				(0.317)	(0.070)	(0.518)
$\bar{H}$				-0.333***	-0.391***	-0.646***
				(0.119)	(0.064)	(0.201)
$H \times \bar{H}$				0.661*	0.595***	1.460**
				(0.360)	(0.112)	(0.572)
$\log(count)$	0.620***	0.869***	0.422***	0.767***	0.916***	0.524***
	(0.078)	(0.055)	(0.111)	(0.072)	(0.021)	(0.105)
R^2	0.358	0.854	0.181	0.548	0.980	0.372
N	120	51	69	120	51	69

Panel B: $\log(span)$ when $b > 0$

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Full	$H \geq \bar{H}$	$H < \bar{H}$	Full	$H \geq \bar{H}$	$H < \bar{H}$
h	0.110	0.303***	-0.006			
	(0.080)	(0.063)	(0.104)			
H				-0.903**	-0.625***	-1.470***
				(0.345)	(0.084)	(0.450)
$\bar{H}$				-0.282**	-0.443***	-0.614***
				(0.129)	(0.083)	(0.180)
$H \times \bar{H}$				0.626	0.551***	1.319**
				(0.393)	(0.139)	(0.504)
$\log(count)$	0.574***	0.767***	0.534***	0.664***	0.829***	0.677***
	(0.080)	(0.063)	(0.104)	(0.074)	(0.027)	(0.097)
R^2	0.306	0.821	0.286	0.463	0.970	0.486
N	120	51	69	120	51	69

Notes: HAC-robust standard errors with small sample correction in parentheses.
* p<.1, ** p<.05, *** p<.01. Series are all standardized (z-scored). Data is created from simulation of model with time-varying H and $\bar{H}$ evolving. Panel A includes simulated data without inflation bias, b=0. Panel B includes simulated data with inflation bias, b¿0. Samples in columns (2) and (4) include observations where confidence is greater than or equal to reputation, while columns (3) and (5) have the complement samples. Count and span measures are log transformed.

G.2 Robustness of Span Regressions

This section shows the results are robust to the type of span measure we use.

Table G.7: Robustness of Results to Span Measure

	$span_t$			$d(A,C)_t$		
	(1)	(2)	(3)	(4)	(5)	(6)
h_{t-1}	0.310***			0.320***		
	(0.076)			(0.087)		
H_{t-1}		-0.313***	-0.499		-0.341***	-0.705
		(0.083)	(0.682)		(0.091)	(0.871)
$\bar{H}_{t-1}$		0.236**	0.061		0.217*	-0.125
		(0.098)	(0.659)		(0.122)	(0.882)
$H_{t-1} \times \bar{H}_{t-1}$			-0.300			-0.588
			(1.053)			(1.415)
$count_t$	0.529***	0.516***	0.514***	0.076	0.049	0.045
	(0.059)	(0.055)	(0.057)	(0.069)	(0.065)	(0.066)
Δvix_{t-1}	0.095	0.085	0.086	0.048	0.028	0.029
	(0.088)	(0.087)	(0.087)	(0.097)	(0.100)	(0.100)
R^2	0.365	0.366	0.366	0.105	0.110	0.112
R^2 Adj.	0.348	0.344	0.339	0.082	0.080	0.073
N	119	119	119	119	119	119

Notes: HAC-robust standard errors with small sample correction in parentheses. * p<.1, ** p<.05, *** p<.01. Series are log-transformed and all standardized (z-scored). $\bar{H}$ reputation is -1(Monetary Policy Uncertainty (MPU) Index) from Baker et al. (2016). Using the top 10 U.S. newspapers, the MPU index is the frequency of articles containing terms related to "uncertainty" and "monetary policy" words, scaled so the 1985-2010 average is 100. The H is the Fed confidence measured as -1(FOMC Uncertainty Index). This index is the number of uncertainty words in the FOMC meeting transcripts spoken by FOMC members divided by total words and is scaled so the 1985-2010 average is 100. Then h_{t-1} is 2-1(MPU Index/FOMC Uncertainty Index). $t-1$ for monthly variables is the month prior to the FOMC meeting t, where as H_{t-1} is measured from the previous FOMC meeting. Regression sample covers 2005-2019.

G.3 Robustness for SVAR

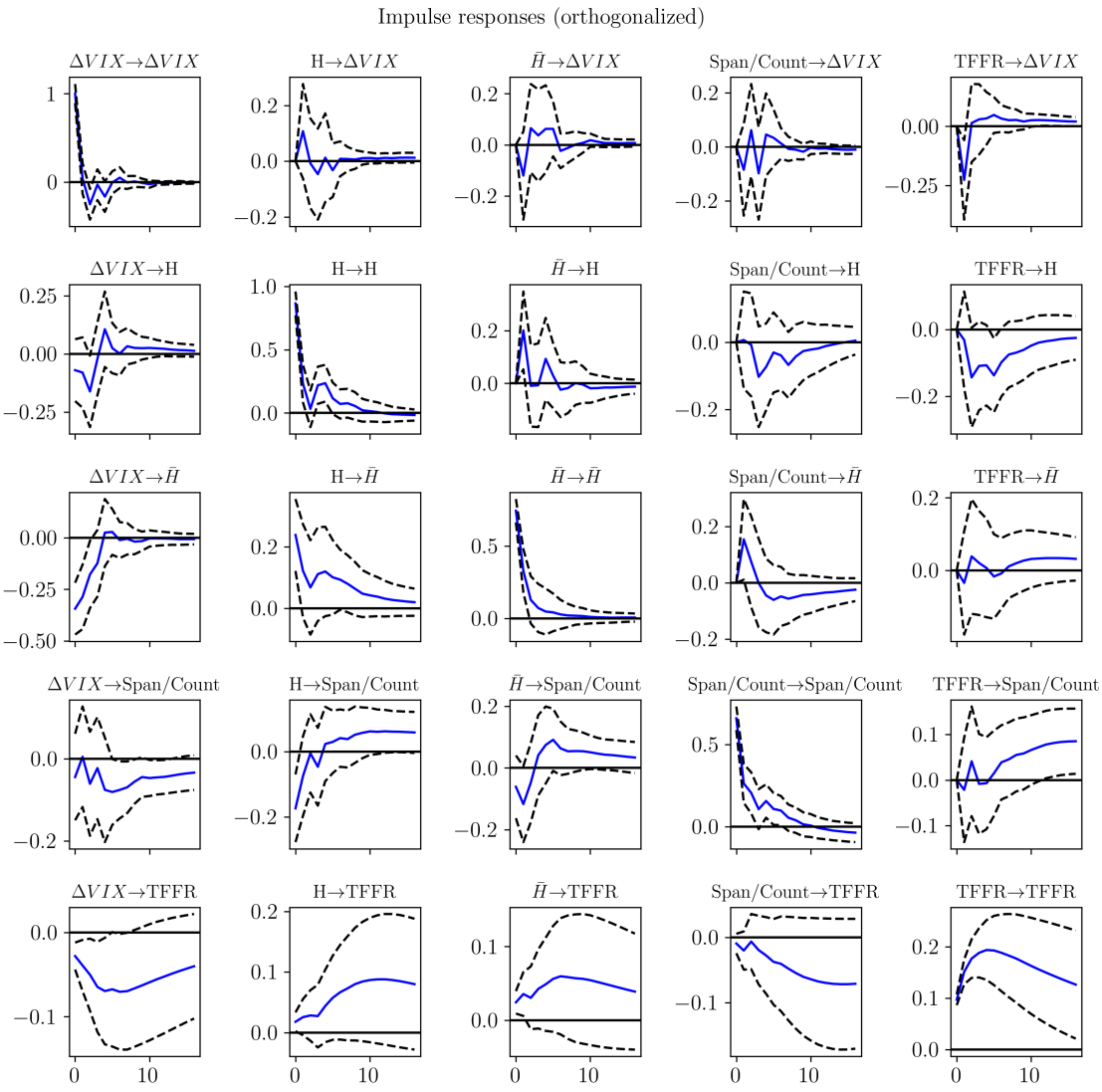
In this section we provide impulse response graphs and information for different specifications as robustness. In the baseline, we combine the message space measures into the average message width ($span_t/count_t$) and use four meetings as the lag (about 6 months).

We show that using the same number of lags, but changing the message space so that span and count have separate equations generates similar results that are also consistent with the model. We use the same timing assumptions on the variables in the system, except we assume that the span is chosen before the count in place of the span/count variable:

$$Y_t = [\Delta vix_{t-1},\ H_{t-1},\ \bar{H}_{t-1},\ span_t,\ count_t,\ ffr_t]. \tag{12}$$

We also provide results with different lags. To identify the standard, optimal number of

Figure G.21: IRFs for Baseline (4 lags)



lags, we start with a maximum of 8 lags (corresponding to 1 year of FOMC meetings) and compare the information criterion to identify the optimal lags.

The optimal number of lags is between one to two lags, depending on the criterion.

In the main paper, we err on the side of caution against bias and impose a baseline with longer lags (4), in line with the recommendations from Olea et al. (2025). Going beyond eight lags increases beyond what we have statistical power for, and so we decided to double the information criterion selected number of lags.

For completeness, below we provide the full grid of impulse responses with lags of 2 for the baseline set of regressors.

Figure G.22: IRFs with Separate Span and Count (4 lags)

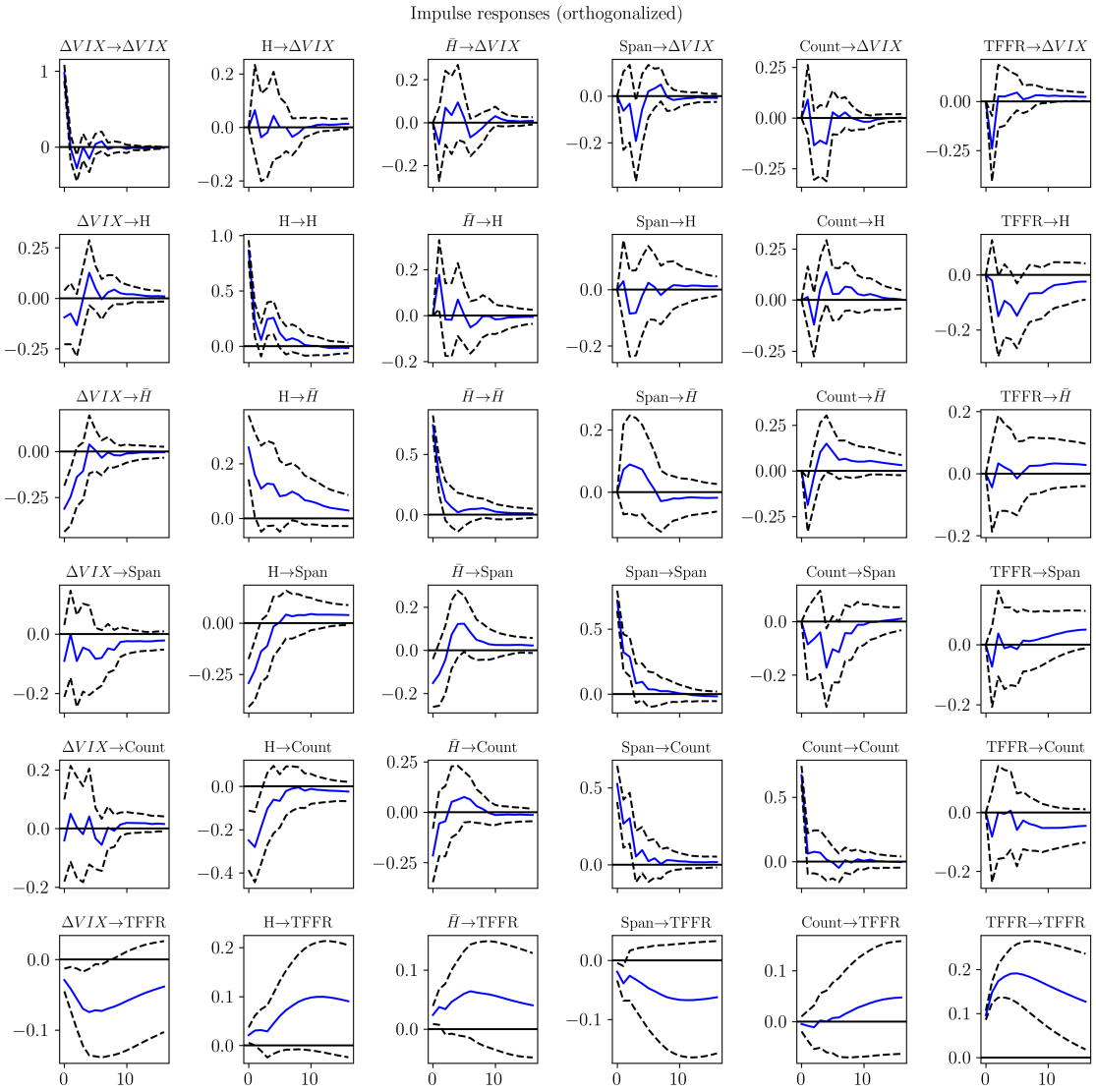


Table G.8: SVAR Lag Order Selection

Lag	AIC	BIC	FPE	HQIC
0	-1.521	-1.375	0.2184	-1.462
1	-6.486	**-5.460**	0.001527	**-6.070**
2	**-6.565**	-4.661	**0.001419**	-5.792
3	-6.430	-3.647	0.001646	-5.301
4	-6.166	-2.505	0.002200	-4.681
5	-6.155	-1.614	0.002327	-4.313
6	-5.885	-0.4656	0.003261	-3.686
7	-5.988	0.3101	0.003242	-3.433
8	-5.996	1.181	0.003679	-3.085

Note: bolded text highlights the minimum.

Figure G.23: IRFs with Span/Count (2 lags)

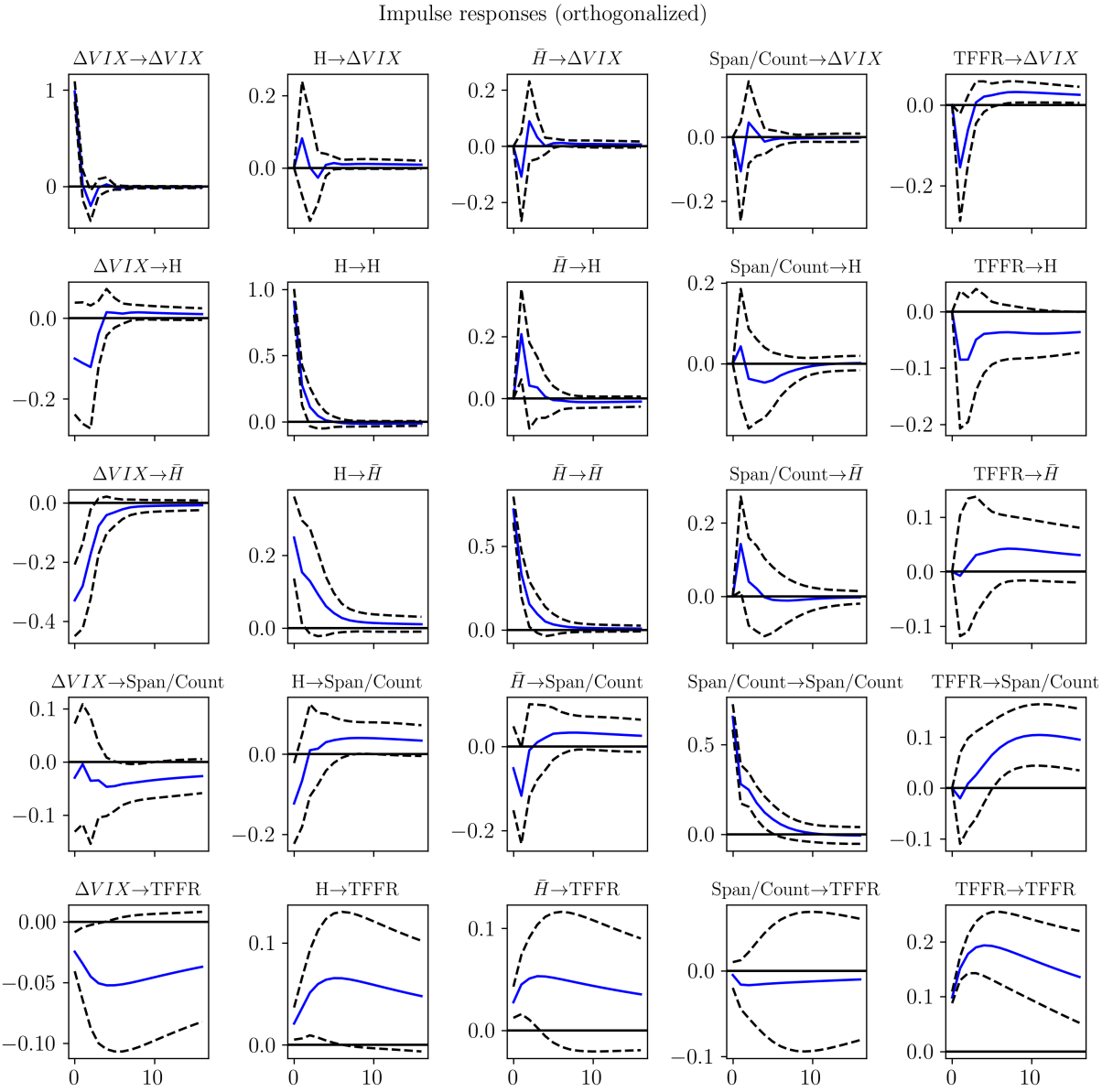
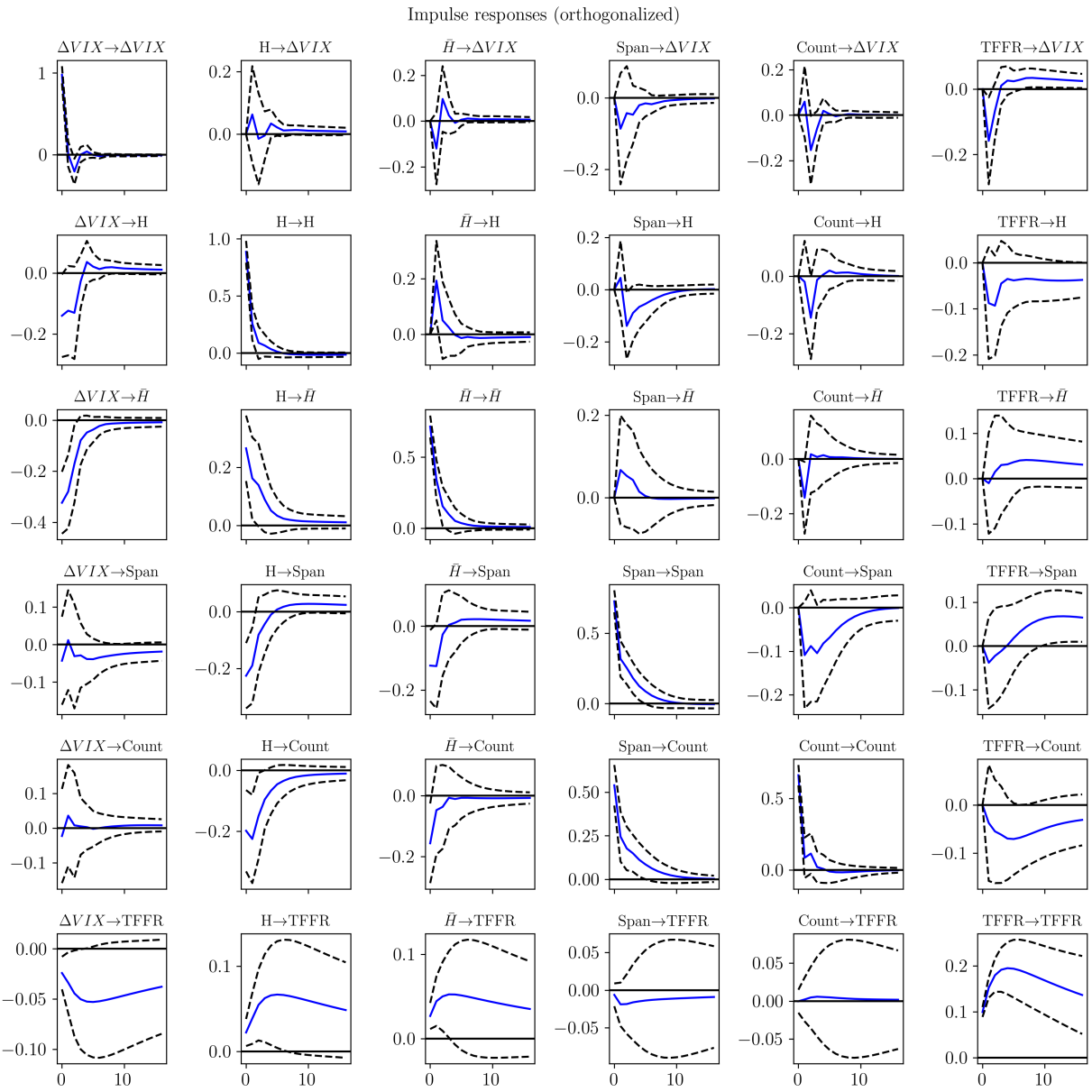


Figure G.24: IRFs with Separate Span and Count (2 lags)



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