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Dimitrios Kanelis
Deutsche Bundesbank

Lars H. Kranzmann
University of Münster

Pierre L. Siklos
Wilfrid Laurier University
Centre for Applied Macroeconomic Analysis, ANU

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Keywords

explainable artificial intelligence, financial stability, FOMC deliberations, monetary policy communication, natural language processing

JEL Classification

E44, E52, E58

Address for correspondence:

(E) cama.admin@anu.edu.au

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Dimitrios Kanelis[1], Lars H. Kranzmann[2], Pierre L. Siklos[3]

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[1]Deutsche Bundesbank, Wilhelm-Epstein-Str. 14, 60431 Frankfurt am Main, Germany

[2]Corresponding author: Department of Economics, University of Münster, Am Stadtgraben 9, 48143 Münster, Germany. E-mail: lars.kranzmann@wiwi.uni-muenster.de

[3]Department of Economics, Wilfrid Laurier University, Balsillie School of International Affairs, and the Centre for Applied Macroeconomic Analysis (CAMA)

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1. Introduction

"Clean the mess afterward" is a famous expression referring to a policy that rejects central bank intervention regardless of financial imbalances or increasing financial risks (Bernanke and Gertler, 2001; Stein, 2013). If a boom ultimately turns out to be unsustainable, the central bank can intervene and stimulate the economy. Following the Great Financial Crisis (GFC), this position earned its fair share of controversy between proponents who consider monetary policy an inefficient crisis prevention tool and critics who argue against crisis-induced welfare losses by leaning against the wind (Svensson, 2017). This shift in thinking has intensified scholarly efforts to explore how monetary policy interacts with financial stability. Recent work by Boyarchenko et al. (2022) and Kashyap and Stein (2023) has intensified debates on the financial stability risks posed by monetary policy.

A similar policy discussion relates to how risks to financial instability may constrain the central bank's ability to react to an increasing inflation rate. A central bank could delay an interest rate rise or feel pressured to reduce it despite an inflation rate not in line with its mandate. The literature defines such a situation where the central bank loses control of the price level, due to vulnerabilities within the financial system, as financial dominance (Brunnermeier, 2016). The fact that this situation is more than just a theoretical possibility was demonstrated by the bank failures following the insolvency of Silicon Valley Bank in the spring of 2023 (Acharya et al., 2023). Another example occurred during the unexpected decline in international stock prices, triggered by a falling interest rate differential between the US and Japan in the summer of 2024. In both cases, the market participants expected the Federal Reserve to take this turmoil into account and they speculated on an interest rate cut even though inflation was above target.

Despite the growing interest in potential financial stability trade-offs there is a lack of explicit focus on how concerns over financial instability shape a central bank's monetary policy reaction function. This is also the case for the Federal Open Market Committee (FOMC), where the intellectual evolution and understanding of financial stability is yet to be fully understood. Therefore, our research is guided by the following questions: How does the FOMC

seminar at the Deutsche Bundesbank for their helpful remarks. We are grateful to Niklas Humann, Idir Chader, and Kessalia Süllau for their excellent research assistance. Part of the research for the paper was conducted while the second author was a visiting scholar at the Balsillie School of International Affairs. He is grateful for the hospitality. This paper represents the authors' personal opinions and does not necessarily reflect the views of the Deutsche Bundesbank or the Eurosystem.

integrate financial stability considerations into its policy discussions? Is there an identifiable relationship between the Fed's dual mandate and financial stability in implementing interest rate and balance sheet policies? Do concerns about financial stability influence the monetary policy communication of the Fed?

To address these questions, we leverage a rich repository of information - the minutes of FOMC meetings - that provides a detailed summary of the Committee members' deliberations and thought processes. Minutes are a better choice for understanding the position of central bankers within the FOMC because they are the only source that consistently reflects the committee-wide decisions on monetary policy. While speeches can provide insights, they often represent individual views or a mix of individual and broader consensus opinions. Additionally, minutes are structured consistently over time, which aligns well with the methodology used in this paper. Furthermore, the publication of minutes is widely followed and interpreted by the media, unlike speeches, which are not always reported.[1] To properly measure and understand the content of these sophisticated documents, we fine-tune a Large Language Model (LLM) and verify the results with an explainable AI (xAI) approach from the area of natural language processing (NLP).

Our research design consists of two steps. First, we use topic modeling (Roberts et al., 2016) to extract textual information from FOMC minutes, explicitly focusing on the mandate-related objectives of price stability and full employment, as well as financial stability. Second, we apply a fine-tuned version of the language model Robustly Optimized Bidirectional Encoder Representations from Transformers Pretraining approach (RoBERTa) (Liu et al., 2019) to measure the sentiment expressed by policymakers on these topics. This two-stage approach enables us to generate indicators that measure the optimism or pessimism of the FOMC regarding these respective topics. Our analysis reveals that financial stability has been a key focus of FOMC discussions since the GFC.

Next, we implement an event study framework using unrevised real-time data at the meeting frequency of the FOMC to estimate the impact of financial stability concerns on interest rate policies and monetary policy communication. We incorporate our newly derived indicators into forward-looking Taylor rules (Coibion and Gorodnichenko, 2012) and sentiment regression models to assess how the perceived state of financial stability influences the actions and words of the Fed chair, conditional on other controls.

[1]There is a well-known link between the publication of Fed minutes and financial market responses (e.g., Rosa (2013), Jung (2016)).

Our study makes several contributions to the literature. First, our analysis confirms that discussions on mandate objectives directly influence interest rate decisions and monetary policy communications announced after meetings. More optimistic discussions about mandate objectives are linked to higher interest rates and positive messaging in the subsequent press conference. However, this relationship changes during the zero lower bound (ZLB) phase, when the policy rate remains unchanged. Using Wu and Xia (2016) shadow rate estimates, we find that financial stability discussions impact the implementation of unconventional monetary policies and lead to more tightening consistent with the theoretical prediction of Kashyap and Stein (2023).[2] However, this relationship is not visible in the communication accompanying the monetary policy announcements, which leads to an asymmetry between what is communicated and what drives the Fed's policy decision. To look deeper into this relationship, we implement a narrative approach inspired by Romer and Romer (2023) to analyze whether the transcripts provide evidence for such a relationship, and anecdotal evidence affirms this.

Second, as a methodological contribution, we introduce a fine-tuned LLM based on RoBERTa to interpret the sophisticated language of the minutes. One criticism leveled at this machine learning methodology, compared to the dictionary approach, which remains the primary text measurement technique (Aruoba and Drechsel, 2024), is its opacity. To address this limitation, we employ xAI using SHapley Additive exPlanations (SHAP) values (Shapley (1953), Lundberg and Lee (2017)) to elucidate the model's reasoning. This strategy allows us to harness the advantages of language modeling over hand-crafted dictionaries while maintaining transparency. As part of our explainability approach, we develop a dictionary that replicates the sentiment measurement of our advanced LLM while remaining transparent and intuitive, making it suitable for further research. Our machine learning approach, therefore, reduces the risk of subjectivity bias inherent in handcrafted dictionaries.

Third, as a by-product of our fine-tuning approach, we create a new labeled dataset to make the Fed's language comprehensible to LLMs. This manually labeled dataset ought to be a valuable resource for researchers to fine-tune or prompt models. Utilizing this dataset is especially useful to enhance the accuracy of mid-sized and small LLMs that otherwise lack this task-specific capability.

The remainder of the study is structured as follows. Section 2 offers a literature review,

[2]We use the shadow rate estimates from Krippner (2013) as a robustness check, which are presented in the Appendix D.

highlighting the most relevant studies for our research. Section 3 details our textual data, machine learning models, and the labeled dataset we developed. Section 4 presents the regression framework, followed by the results in section 5. The final section concludes.

2. Literature Review

Monetary policy and financial stability are closely intertwined, leading to the central bank having "a natural role to play in ensuring financial stability" (Schinasi, 2003). Indeed, as Adrian and Liang (2018) point out, recent research has emphasized a link between accommodative monetary policy and an increase in risks to financial stability. This raises the question: to what extent should financial stability considerations be embedded within the central bank's policy objectives (Smets, 2014)? This is especially true for communication about financial stability (Born et al., 2014) since this instrument allows central banks to preempt financial instabilities through warnings (Svensson, 2003) or, conversely, provoke market disturbances (Cukierman, 2009).

To address our research questions, we draw on two related strands of literature. The first examines minutes and transcripts of deliberations to understand the reasoning behind FOMC monetary policy decisions. A seminal study by Hansen et al. (2018) utilizes the natural experiment created by the 1993 release of all FOMC transcripts. Since FOMC members initially expected these deliberations to remain private, the study analyzes how this newfound transparency influenced their behavior. As part of their research design, Hansen et al. (2018) apply Latent Dirichlet Allocation (LDA), a topic modeling approach of Blei et al. (2003), to identify text sections containing information on the policy preferences of the FOMC members. The authors find that transparency amplifies the effect of career concerns. Shapiro and Wilson (2022) apply sentiment analysis to the transcripts to determine the implicit inflation target of the FOMC for the period 2000 until 2011.[3] The authors conclude that the implicit inflation target was lower than the publicly assumed target of 2%. The central insight of this literature strand is that FOMC deliberations document information about US monetary policy beyond the information that deviations of macroeconomic variables from target values provide.

The second strand of the literature examines various central bank publications to determine how central bankers prioritize financial stability. Human-based or automated sentiment

[3]The Fed introduced an official numerical inflation target of 2% in 2012.

analysis techniques are employed to measure optimism or pessimism. The resulting indicators are often added to the standard inflation and output or unemployment gaps found in Taylor rules. For example, Peek et al. (2016) analyze FOMC meeting transcripts before the GFC and find that the frequent use of financial instability-related terms indicates a significant impact of financial stability considerations on the Fed's policy decisions. Similarly, Oet and Lyytinen (2017) classify FOMC minutes into topics, demonstrating that incorporating a broader range of discussed topics, especially financial stability, into a Taylor rule refines the modeling of the Fed's monetary policy. Wischnewsky et al. (2021) extract textual information from Humphrey-Hawkins hearings transcripts to integrate financial stability sentiments into a Taylor rule. Their findings suggest that negative sentiment towards financial stability correlates with a more accommodative monetary policy, thereby improving the Taylor rule's explanatory power. Istrefi et al. (2023) identify the financial stability content of Fed speeches using LDA and measure the negativity of the tone based on the financial stability dictionary by Correa et al. (2021). By incorporating topic proportion and sentiment measurement into a Taylor rule framework, they conclude that both indicators can explain a more accommodative monetary policy before the GFC but not after.

More recent studies go beyond the bag-of-words approach and leverage the advances in language modeling that enable a more comprehensive understanding of document context. Kanelis and Siklos (2025) use a financial adaptation of the widely used Bidirectional Encoder Representations from Transformers (BERT) model to measure sentiment in the ECB Executive Board's price and financial stability-related speeches to analyze the usefulness of these topics in explaining tone variations in the introductory statement during monetary policy announcements. The authors find that inter-meeting speeches on monetary policy and inflation can explain changes in the sentiment of the introductory statement of the following press conferences. In contrast, financial stability speeches offer no additional explainability. Bertsch et al. (2024) examine how senior Fed officials interpret the dual mandate. Using BERT and RoBERTa to analyze speeches, they find that financial stability is the most frequently discussed topic outside the dual mandate. That said, financial stability considerations are discussed in the context of fulfilling the Fed's mandate, influencing policy adjustments toward a more accommodative stance.

3. Topic and Sentiment Analysis on FOMC Minutes

3.1. Textual Data

To understand how the FOMC discusses financial stability in relation to their mandate, we utilize the minutes of the meetings. We prefer to use the minutes instead of the transcripts since this document reflects the position of the entire FOMC and is less susceptible to noise from the opinions of individual participants. Furthermore, the minutes offer a detailed summary of the deliberations, capturing the diverse perspectives of the Board of Governors and Reserve Bank presidents on monetary policy (Meade et al., 2015). Using the minutes ensures consistency in content, language, and document structure across our corpus. As highlighted by Danker and Luecke (2005), the uniformity in language and structure aids in understanding policy communication. Compared to the more detailed transcripts of FOMC meetings, which the Fed publishes with a five-year delay, the minutes are published three weeks after each meeting. Acosta (2023) demonstrates that the similarity between the minutes and the transcripts has grown over time, reaching a relatively high level during our study period. This is not surprising because participants are aware that transcripts will eventually be published. Concurrently, the minutes have substantially increased in length, suggesting a potential enhancement in the degree of detail provided (Meade et al., 2015). Our sample includes all FOMC meeting minutes from January 1993 to December 2022. We choose this period since, starting in 1993, the "Record of Policy Actions" was combined with the "Minutes of Actions", resulting in the minutes in their current form (Danker and Luecke, 2005).

The second text corpus in our analysis consists of the monetary policy statements and the Fed chair's responses during Q&A sessions. The first press conference took place in April 2011, following an FOMC meeting. During our study period, press conferences were not held after every meeting. Until the end of 2018, they were conducted only with the publication of the Summary of Economic Projections (SEP). Since then, the Fed has held press conferences after every meeting. Our corpus comprises 62 press conferences consisting of introductory statements and Q&A sessions.[4]

When applying NLP to documents like the FOMC minutes, it is important to note that the language used in these documents can be more complex than everyday language or standard

[4]We obtained all textual data directly from the Federal Reserve Board of Governors website. Last access: 14.08.2023.

economics and financial communication (Hernández-Murillo and Shell, 2014). To illustrate this complexity, we calculate an average complexity score based on four different readability measures: Automated Readability Index, Gunning-Fog, Coleman-Liau, and Flesch-Kincaid (Siklos et al., 2018). These measures aim to capture text complexity as it relates to the US educational system. We divided the transcripts into the staff report and the discussion sections. Figure 1 shows that the complexity of the staff reports and discussions develops similarly in terms of textual complexity, with the discussions being the most complex. According to the readability measures, only university graduates can understand the discussions. This motivates our methodological contribution of training a LLM to handle the sophisticated protocol language of the minutes that we introduce in section 3.3.

- Figure (1) around here -

3.2. Topic Identification and Analysis

To identify the topics of interest, we focus on the sections titled *Members' View of the Economic Situation* and *Policy Decision* since these sections provide information on the actual debates and the evaluation of the different economic and political developments by the whole committee. To achieve topic identification choosing the appropriate textual level within the document is essential. Given the structure of the published minutes it is natural to focus the analysis on the paragraph level. The reason is that the protocol's structure purposely uses one paragraph for one topic.[5] Few studies, such as Jegadeesh and Wu (2017) and Oet and Lyytinen (2017), exploit this critical characteristic of the minutes. However, they do not perform automated classification, even though the document structure is ideal for this purpose.[6]

Now, we use the Structural Topic Model (STM) by Roberts et al. (2016) that categorizes the individual paragraphs of the minutes into different topics and ensures a consistent classification. The STM has become an established unsupervised learning approach in economics for topic classification due to its robustness and the possibility to consider additional document information as metadata (Dybowski and Kempa (2020), Ferrara et al. (2022), Bohl et al. (2023)). For this purpose, we perform the following preprocessing steps on the individual paragraphs: converting all words to lowercase, removing all numbers, eliminating stop

[5]In Appendix H, we provide several examples for illustration.

[6]Topic modeling performs best when the input is as monothematic as possible, as the algorithm classifies documents into the most likely topic based on word probabilities.

words, and performing word stemming. Typical for an unsupervised classification method, we need to provide the number of topics the model needs to identify as a prior for which we apply the best practice approach in the literature[7] and identify 21 topics for our analysis as adequate.[8] Appendix A lists the 15 most relevant words for each topic in the minutes.

Of the 21 topics identified, we focus on the topics relating to the mandate objectives of price stability and maximizing employment and merge these into one aggregate *mandate topic*.[9] Regarding financial stability, we identify three topics that focus on different aspects of this broad topic: *financial conditions*, *financial stability risks*, and the *housing market*. Examples of paragraphs for each topic are provided in Appendix H. Although discussions on financial conditions can be viewed as a concept distinct from financial stability and more related to monetary policy transmission, in practice, they are interrelated (Adrian and Liang, 2018). Also, Stein (2013), a former FOMC member, who, like many other central bankers, has argued that changes in monetary policy conditions (e.g., a change in the policy rate) "gets into all the cracks" of the financial system. Consequently, we include financial conditions as one of the components in the broader framework of financial stability.[10] Again, we combine the individual financial stability topics into one overarching *financial stability topic*.[11] Having these aggregated topics, we calculate the topic proportions by using equation (1).

$$\mathrm{TP}_t^T = \frac{\#Sentences_t^{D_T}}{\#Sentences_t^{All}} \tag{1}$$

TP_t^T for $T \in \{$*Mandate, Financial Stability*$\}$ on a given meeting date t is calculated by

[7]To select the number of topics, we follow Roberts et al. (2019) and train STMs with 4 to 60 different topics to choose the models that are Pareto efficient and generate the best balance between semantic coherence (Mimno et al., 2011) and topic exclusivity (Bischof and Airoldi, 2012). Ensuring a clear distinction between at least the topics price stability, economic growth and employment, and financial stability requires the total number of topics to be sufficiently large. We provide more details in Appendix A.

[8]In Appendix A, we provide robustness checks using different prior topic numbers from an interval of fitting topics. The results remain robust.

[9]In selecting topics focused on employment, we also consider more general discussions on output, as current and expected unemployment trends are closely tied to economic growth. During her tenure, Fed chair Yellen (2013) stated in a speech that "[t]he general development of output is also considered when assessing unemployment indicators."

[10]If the financial conditions topic is excluded from the analysis, our results remain robust, as shown in Appendix A.

[11]Our topic aggregation approach is inspired by Moschella and Pinto (2019).

dividing the total number of sentences in paragraphs labeled with topic T by the total number of sentences in the same document. The numerator represents the sum of sentences from paragraphs associated with topic T, where D_T represents the set of topic IDs linked to T. The denominator represents the total number of sentences from all paragraphs discussed on meeting date t. Figure (2) illustrates the progression of topic proportions over time.

- Figure (2) around here -

Figure (2) visualizes the topic proportions for the mandate topic (upper panel) and the financial stability topic (lower panel) from January 1993 until December 2022. The dots represent the topic proportions in the minutes of each meeting. To aid in describing the trend, we add a best fit kernel function to the individual meeting estimates. Visual inspection allows us to derive some stylized facts about how the FOMC discusses these topics. A direct comparison shows that the FOMC focuses significantly more on the mandate objectives than financial stability. An exception happened during the GFC, where the financial stability topic proportion surpassed the mandate objectives primarily due to a high focus on the housing market and mortgage defaults. Since the GFC, the topic proportion dealing with mandate objectives surpassed the financial stability topic proportion and gained greater importance during FOMC meetings. A detailed analysis of the document content shows that unemployment is a primary reason for this change. Before the GFC, the FOMC views unemployment partly as a structural problem due to the effects of globalization and international trade. Following the financial crisis, the FOMC assigns monetary policy a higher priority in reducing unemployment even after taking into account the output gap. This observation is consistent with the results of Bohl et al. (2023), who analyzed the Board of Governors' communication on unemployment via speeches.

The lower panel of figure (2) illustrates the significant rise in the proportion of financial stability discussions in FOMC minutes since the GFC. In contrast, during the 1990s and early 2000s, financial stability was only of minor relevance in many meetings. A minor exception occurred during the financial turmoil in the early 2000s, particularly due to the dot-com bubble. However, the proportion of discussions on financial stability reached a local low in the years between the dot-com bubble and the housing crisis that triggered the GFC.[12] The GFC marked a structural shift in communication density and led to the lasting integration of the topic into FOMC discussions. Since 2011, the proportion of this topic in

[12]The low level of discussions on financial stability just before the historic financial crisis reflects the "this time is different" narrative, as described by Reinhart and Rogoff (2009).

meeting minutes has remained around 20%, with the highest increase occurring during the COVID-19 pandemic.

3.3. Developing a Federal Reserve Minutes Sentiment Classifier

Consistent with the literature (Bohl et al. (2023), Istrefi et al. (2023)), we implement sentiment analysis only after categorizing the individual topics to ensure that the sentiment indicators are not biased by content without any connections to either the mandate objectives or financial stability. For the sentiment analysis, we choose the Positive-Negative metric since this metric offers relevant information about how the FOMC frames their narratives and allows comparison between different topics.[13] Furthermore, we resort to language modeling for the sentiment analysis instead of relying on dictionary methods due to their capability to consider the context of the text as well as being less susceptible to noise (Mishev et al. (2020), Huang et al. (2023)).

As described in section 3.1, the protocol language used in the minutes is formal and structured, differing significantly from the diverse language styles typically encountered by LLMs. To prevent the higher textual complexity and the unique protocol and central bank communication styles from biasing our analysis, we follow the literature on supervised textual machine learning and fine-tune a pre-trained model for this specific context. This brings us back to the question of the appropriate document level to focus on. Shifting our focus from paragraphs to individual sentences, we recognize that sentences are meaningful units that can be easily comprehended and evaluated by a human reader (Maibaum et al., 2024), and they serve as particularly effective units of observation in central bank documents (Kanelis and Siklos, 2025). Therefore, we create a novel dataset consisting of 2000 manually labeled sentences randomly chosen from the discussion section of the minutes.

To ensure accuracy and objectivity, each sentence was independently classified by the first two authors, with the third author reviewing the classifications and deciding in case of disagreement. The process involved systematically categorizing each sentence based on its overall sentiment tone from a central bank's perspective. Each sentence was evaluated in isolation, to create a versatile dataset that can be used in various applications. We assessed the degree of agreement between the first two authors by using Cohen's kappa and calculate

[13] An alternative would be to use a Hawk-Dove metric. Despite its relevance in the literature (Apel et al., 2022), this metric works best on discussions about inflation or unemployment but is less useful for topics like financial stability. A Positive-Negative metric is more intuitive for financial stability analyses (Correa et al., 2021).

a value of 0.64, which signals a substantial agreement (Cohen (1960), Landis and Koch (1977)).[14] The labeled dataset comprises a total of 793 neutral sentences, 648 negative sentences, and 559 sentences labeled as positive. The creation of this dataset is a notable contribution on its own, independent of our research questions, as it can be valuable for researchers looking to fine-tune or prompt LLMs for future research.

We choose the pre-trained RoBERTa model for our further analyses. Liu et al. (2019) introduce RoBERTa by building on the BERT model from Devlin et al. (2019). Pre-training of BERT is conducted unsupervised via two techniques in parallel: Masked Language Modeling (MLM), in which random words are masked, and the model predicts them based on the preceding and following words, and Next Sentence Prediction (NSP), which evaluates whether two sentences follow each other. It is trained on a general language corpora such as the English Wikipedia (Devlin et al., 2019). RoBERTa is a modification of BERT with important changes: it omits the NSP component, uses a larger dataset for training, and extends the sequence length of the sentences in the pre-training for improved model performance. Like BERT, RoBERTa is also trained in general language but performs better than BERT due to these changes (Liu et al., 2019). We conducted fine-tuning using 70% of our dataset for training, 15% for validation, and 15% for testing. The model evaluation is conducted using precision, recall, and F1 score.[15] We performed the same procedure with FinBERT (Huang et al., 2023) but ultimately selected RoBERTa due to its superior results.[16] Nevertheless, our conclusions remain robust when choosing FinBERT for the further analysis.[17]

A common criticism of using AI approaches for the classification of qualitative data is the resulting opacity of the model. Consequently, and despite the significant advances in language modeling, researchers continue to use manually crafted lexicographic approaches (Cieslak and McMahon (2023), Aruoba and Drechsel (2024), Chadha et al. (2024)). However, this does not align with the current state of knowledge in machine learning (Ali et al., 2023). A proven approach to overcoming the opacity of AI models is the use of SHAP values. These

[14]Cohen's kappa is a statistical measure that evaluates inter-rater reliability. Cohen's kappa has a value of 1 when there is perfect agreement, 0 when the agreement is equivalent to chance, and -1 when there is complete disagreement (Cohen, 1960).

[15]We provide detailed description of the RoBERTa fine-tuning process including hyperparameter selection in Appendix B.

[16]Our findings align with those of Pfeifer and Marohl (2023), who also identified RoBERTa as superior in a comparative analysis of how well different machine learning models perform on central bank speeches.

[17]See Appendix B.

are based on the game-theoretical concept introduced by Shapley (1953) and provide a means to make the contribution of each individual input variable to a model's prediction comprehensible. SHAP values allow for the quantification of a variable's influence on the model by considering all possible sequences in which the variable could be added to the model. This not only identifies the individual contribution of each variable to the prediction but also accounts for how this contribution is affected by the presence of other variables. SHAP provides both local explanations, which highlight the significance of variables for a specific prediction, and global explanations, which summarize the importance of the variables across all predictions.[18]

In our context, the LLM takes an input sentence and predicts the probability of different sentiment classes - in our case, positive, neutral, and negative sentiment. Each token in the sentence contributes differently to these predictions, and SHAP values help quantify the influence of each token. Each sentence has a base score that represents the model's expected prediction if the entire sentence were masked, with all tokens unknown. This base value serves as a reference point, indicating what the model would predict in the absence of any contextual information. SHAP values illustrate, in an additive manner, how revealing each word influences the model's output, shifting from the base value to the final predicted value (Lundberg and Lee, 2017). Following this procedure, table (1) shows the most relevant words in the minutes that contribute to the sentiment classification of the FOMC minutes.[19]

- Table (1) around here -

With our model framework in place, we calculate the sentiment for the narratives on the mandate objectives and financial stability using the following formula:

$$Sentiment_t^T = \frac{\#Sentences_t^{Positive,T} - \#Sentences_t^{Negative,T}}{\#Sentences_t^{Positive,T} + \#Sentences_t^{Neutral,T} + \#Sentences_t^{Negative,T}} \quad (2)$$

We calculate the sentiment for each topic $T \in \{Mandate,\ Financial\ Stability\}$ discussed during the FOMC meeting on date t by taking the difference between the number of positive

[18]SHAP values are used both in regression analyses in economics using machine learning (Beckmann et al., 2023) and for enhancing interpretability in automatic image recognition.

[19]In figure E1, we provide the results of the Shapley decomposition on an extensive number of classification examples from the minutes during different time periods.

and negative sentences related to T and dividing it by the total number of sentences on that topic.[20] The sentiment series for both, the mandate objectives and financial stability discussions, are visualized in figure (3).

- Figure (3) around here -

Sentiment analysis provides further stylized facts about the FOMC deliberations. Figure 3 illustrates the evolution of sentiment in the mandate discussions (upper panel) and financial stability discussions (lower panel). In the 1990s, sentiment regarding mandate objectives was generally balanced, with only a brief downturn during the early 2000s recession. Sentiment rose significantly in the mid-2000s but then plummeted during the GFC, indicating heightened pessimism. This trend gradually improved throughout the 2010s, only to sharply decline again with the onset of the COVID-19 pandemic and the rising inflation since 2021.

The lower panel presents the sentiment of discussions dealing with financial stability. Before the GFC, it is important to note that the overall sentiment value is influenced by a limited number of sentences due to the low or even non-existent proportion of this topic. This results in greater volatility compared to the period following the GFC, when financial stability became a regular discussion topic in meetings. As anticipated, we observe increased pessimism during the dot-com bubble and the GFC, where the sentiment indicator hits an all-time low. Since then, discussions on financial stability have remained more balanced and gradually positive until the onset of the COVID-19 pandemic.

4. Taylor Rule Estimation Framework

After quantifying the information in the minutes, we analyze how it helps us understand monetary policy decisions and communication. We do so by implementing an event study framework that simulates the sequence of the FOMC meeting from the deliberations until the publication of the decisions. The FOMC meeting process begins with extensive preparation, where economic data and regional reports are analyzed. Members create economic projections and consider alternative scenarios. During the meeting, the chair opens with key topics, followed by a detailed presentation of the current economic situation. Members then discuss policy options and vote on the proposed measures.[21] We use unrevised data

[20] We divide by the total number of sentences to account for variations in document length over time.

[21] Three weeks later, detailed minutes are published, excluding any information revealed after the meeting (Danker and Luecke, 2005). This delay is irrelevant to our analysis because, unlike studies such as Tadle

available at the time of deliberations for our estimations to ensure that data revisions do not impact the results, focusing solely on the FOMC's real-time information set (Orphanides, 2001). The core assumption of our event study framework is that there is an empirical connection between the discussions during the meeting and the resulting monetary policy decisions and communications.[22] We have previously documented how the literature has concluded that central bank texts have separate influence on setting the stance of monetary policy. While traditional Taylor rule determinants focus attention on how staff or market expectations, and past economic and inflation performance impact FOMC decisions, the sentiment expressed in FOMC minutes, a latent variable, likely also enters the mix when policy rate announcements are made.

First, we aim to analyze whether FOMC discussions on mandate objectives can explain monetary policy, even after accounting for inflation and output gaps.[23] Second, we seek to understand how discussions on financial stability influence these decisions. We first estimate the following regression model based on a Taylor rule framework at the FOMC schedule frequency:

$$i_t = \rho i_{t-1} + (1-\rho)\Big(\alpha + \beta E_t(\pi_{t+h}) + \gamma E_t(y_{t+h}) + \theta_{TP^M} TP_t^M + \theta_{TP^{FS}} TP_t^{FS} + \theta_{Sent^M} Sentiment_t^M + \theta_{Sent^{FS}} Sentiment_t^{FS}\Big) + u_t \tag{3}$$

As the dependent variable i_t, we use the effective Federal Funds Rate (FFR), and we model interest rate movements as influenced by an interest rate smoothing component and the variables of interest. Regarding the latter, $E_t(\pi_{t+h})$ and $E_t(y_{t+h})$ are the four-quarter averages of the Greenbook forecasts for core inflation and output gap, respectively. We use the Greenbook forecasts, as they are widely recognized in the literature as the most important for the FOMC, with short-term forecasts considered exogenous (Coibion and Gorodnichenko, 2012). TP_t^M and $Sentiment_t^M$ are the topic proportion and the sentiment indicator for mandate

(2022), we do not focus on market reactions to the minute but rather use the content to better understand whether, ex-post, FOMC deliberation influence the setting of monetary conditions.

[22]It is not plausible to assume that the FOMC already knows the outcome in advance and that the entire discussion is merely a formality preceding the announcement.

[23]In Appendix C, we demonstrate that the results remain robust when replacing the output gap with the unemployment gap.

objectives discussions. Analogously, TP_t^{FS} and $Sentiment_t^{FS}$ are the topic proportions and the sentiment indicator for financial stability discussions within the minutes, respectively. Following Oet and Lyytinen (2017), we anticipate a negative effect for θ^{TP^M} and $\theta^{TP^{FS}}$, as a higher topic proportion suggests a greater need to address underlying issues. In contrast, we expect a positive effects for both, $\theta^{Sentiment^M}$ and $\theta^{Sentiment^{FS}}$, since a more positive sentiment implies less concerns when increasing interest rates. We estimate the specification using ordinary least squares (Carvalho et al., 2021).

A limitation when estimating Taylor rules to model monetary policy behavior is the ZLB, which compelled the Fed to implement unconventional policies to influence long-term interest rates. Although shadow rates are often used for this period, it is important to recognize that these rates are estimates, not policy parameters directly controlled by the FOMC. In any event, we estimate a second specification to assess the impact of content and sentiment variables on monetary policy across these two different regimes. We introduce interaction terms for the content and sentiment variables in equation (5) by introducing the dummy variable D_t^{ZLB} that equals one during the ZLB period.[24]

$$\begin{aligned} i_t = \rho i_{t-1} + (1-\rho)\Bigg(\alpha + \beta E_t(\pi_{t+h}) + \gamma E_t(y_{t+h}) + \theta_{ZLB} D_t^{ZLB} + (1 + \theta_{ZLB} D_t^{ZLB}) * \\ \Big[\theta_{TP^M} TP_t^M + \theta_{TP^{FS}} TP_t^{FS} + \theta_{Sent^M} Sentiment_t^M + \theta_{Sent^{FS}} Sentiment_t^{FS}\Big]\Bigg) + u_t \end{aligned} \tag{4}$$

We rewrite equation (4) by multiplying the coefficients of the interaction terms to simplify the specification.

$$\begin{aligned} i_t = \rho i_{t-1} + (1-\rho)\Bigg(\alpha + \beta E_t(\pi_{t+h}) + \gamma E_t(y_{t+h}) + \Big[\theta_{TP^M} TP_t^M + \theta_{TP^{FS}} TP_t^{FS} + \\ \theta_{Sent^M} Sentiment_t^M + \theta_{Sent^{FS}} Sentiment_t^{FS}\Big] + \varphi_{ZLB} D_t^{ZLB} + D^{ZLB} * \Big[\varphi_{TP^M} TP_t^M + \\ \varphi_{TP^{FS}} TP_t^{FS} + \varphi_{Sent^M} Sentiment_t^M + \varphi_{Sent^{FS}} Sentiment_t^{FS}\Big]\Bigg) + u_t \end{aligned} \tag{5}$$

Where $\varphi_{ZLB} \equiv \theta_{ZLB}$ and $\varphi_{TP^M} \equiv \theta_{ZLB}\theta_{TP^M}$ and $\varphi_{TP^{FS}} \equiv \theta_{ZLB}\theta_{TP^{FS}}$ and $\varphi_{Sent^M} \equiv \theta_{ZLB}\theta_{Sent^M}$ and $\varphi_{Sent^{FS}} \equiv \theta_{ZLB}\theta_{Sent^{FS}}$. Finally, we analyze how the interaction between

[24]The ZLB period is from December 2008 until December 2015.

the mandate objectives and financial stability influences the Fed chair's monetary policy communication during the press conference following the FOMC meeting by implementing sentiment regression, that is, using sentiment variables on the LHS and RHS of the regression specification (Kanelis and Siklos, 2025). Therefore, we use RoBERTa to measure sentiment from the introductory statement and the Q&A session. We use only the answers of the Fed chair for the latter.

$$SR_t^{Statement} = \frac{\#Positive_t^{Sentence} - \#Negative_t^{Sentence}}{\#Positive_t^{Sentence} + \#Neutral_t^{Sentence} + \#Negative_t^{Sentence}} \tag{6}$$

$$SR_t^{Answers} = \frac{\#Positive_t^{Answers} - \#Negative_t^{Answers}}{\#Positive_t^{Answers} + \#Neutral_t^{Answers} + \#Negative_t^{Answers}} \tag{7}$$

We calculate the sentiment of the introductory statement (equation (6)) by subtracting the number of positive sentences from the number of negative sentences and dividing the result by the sum of positive and negative sentences. We analogously calculate the sentiment of the Q&A session but use the count of answers instead of sentences (equation (7)). Now, we can use these indicators as dependent variables for the sentiment regression (SR) specifications:

$$\begin{aligned} SR_t^D = \alpha + \beta E_t(\pi_{t+h}) + \gamma E_t(y_{t+h}) + \theta_{TP^M} TP_t^M + \theta_{TP^{FS}} TP_t^{FS} + \\ \theta_{Sent^M} Sentiment_t^M + \theta_{Sent^{FS}} Sentiment_t^{FS} + \zeta SR_{t-1}^D + u_t \end{aligned} \tag{8}$$

Where $D \in \{Statement, Answers\}$. As in equations (3) and (5), we use inflation and output gap expectations from the Greenbook forecasts, along with topic and sentiment indicators for mandate objectives and financial stability discussions from the minutes.[25] Additionally, we include a lagged dependent variable to control for persistence. We expect the same signs as before, given that monetary policy communication aims to influence market interest rates in a manner similar to interest rate policies.

[25]We do not use interaction terms because the press conferences started in 2011 during the ZLB period.

5. Results

5.1. Monetary Policy Action

We first focus on the monetary policy actions in terms of interest rate setting from 2000 until 2018 since Greenbook forecasts for PCE core inflation are currently available only for this period. The sample contains 152 FOMC meetings. We estimate equation (3) using OLS (Carvalho et al., 2021) and provide the short-term estimation results in columns (1) - (3) of table (2).[26]

- Table (2) around here -

In column (1), we present the baseline Taylor rule and augment it stepwise with the topic proportion variables (column (2)) and the sentiment variables (column (3)) for the mandate objectives and financial stability, respectively. For all model specifications, we estimate a high interest rate smoothing parameter (ρ), as the vast literature on the subject typically reports, and confirm the validity of the Taylor principle, consistent with the literature (Carvalho et al., 2021).[27] Furthermore, the output gap also affects in most specifications the FFR in a direction consistent with theory.

Now, we consider the textual variables derived from the minutes to test our hypotheses. In specification (2), we find statistically significant negative effects of the topic proportions pertaining to mandate objectives (θ_{TP^M}) on the FFR. This is particularly interesting because the variable captures relative discussions shares. An increase in this variable is equivalent to a declining proportion of all other topics during the FOMC meeting. Specifically, on average, a marginal increase in TP^M leads to a decrease in the FFR by 0.75 basis points. When the FOMC places a stronger focus on mandate topics, it becomes more likely that the Fed will reduce interest rates.

The results become more mixed after augmenting the model with the sentiment indicators (specification (3)). On average, a more positive discussion of the mandate objectives (θ_{SentM}) generates a higher FFR. At the same time, we do not observe any significant effect of the content and sentiment variables for financial stability (θ_{SentFS}), suggesting that financial stability is less relevant for interest rate policy in this context. However, we must consider

[26]Because some of the right hand side variables in the regressions are externally generated we estimate bootstrapped standard errors. These standard errors are computed using 1.000 bootstrap simulations.

[27]The division of the inflation coefficient β by $(1-\rho)$ is greater than one.

that a significant part of financial stability discussions occurred following the GFC when monetary policymakers in the US were also confronted with the ZLB.

This raises the question of how this specific period influenced the FOMC's behavior. To account for the ZLB, we estimate equation (5) and present the results in column (4) of table (2). To ensure that we consider unconventional monetary policy instruments, we replace the dependent variable with the shadow rate of Wu and Xia (2016) and present the results in column (5). Controlling for the ZLB period confirms our previous findings: outside the ZLB, increases in the discussion shares regarding mandate objectives and financial stability lead, on average, to interest rate reductions consistent with the literature (Istrefi et al., 2023). However, the ZLB period (φ_{ZLB}) exerts some influence.

To evaluate the impact of textual variables during the ZLB period, we use Wald tests to analyze the effect of variables conditional that $D_t^{ZLB} = 1$ following the approach of Istrefi et al. (2023). Looking at column (4), the topic proportions and sentiment variables of the mandate objectives and financial stability lose their informational value in explaining interest rate movements. This aligns with our priors, as interest rates were downwardly rigid during the ZLB. Simultaneously, the FOMC was hesitant to raise interest rates prematurely despite post-GFC economic improvements indicated by positive sentiment in the minutes (see Figure (3)). Consequently, it is unsurprising that textual variables fail to explain changes in the FFR, as the FOMC intentionally kept the rate unchanged.

In contrast, when analyzing unconventional monetary policy instruments proxied by the shadow rate, we find that an increase in the proportion of financial stability topics discussed by the FOMC correlates with tighter financing conditions ($\theta_{TPFS}+\varphi_{TPFS}$). This relationship likely reflects concerns that prolonged periods of low interest rates and unconventional policy tools may undermine financial stability (Kashyap and Stein, 2023). As Yellen (2014) notes, persistently low rates can incentivize "reach for yield" behavior, leading investors to take on excessive risk and potentially destabilizing the financial system.[28] Importantly, our finding that financial stability topic proportions influence monetary policy decisions at the ZLB, independent of sentiment, is novel and was not identified by Istrefi et al. (2023) in their analysis of speeches. To ensure that our financial stability indicators derived from FOMC deliberations provide informational value beyond publicly available measures, we re-estimate equation (5) while controlling for established financial stability indicators such as the VIX

[28]Similar arguments are presented by Tarullo (2014).

and the NFCI. Even with these controls, our results remain robust, indicating that the textual variables capture a unique perspective of the FOMC.[29]

5.2. Monetary Policy Communication

After analyzing the monetary policy actions of the FOMC, we now examine to what extent immediate monetary policy communication is influenced. Since April 2011, the FOMC has held press conferences, initially four times a year, and eventually, starting in January 2019, after every FOMC meeting. In these press conferences, the FOMC chair addresses the media and international markets after the conclusion of the meeting and reads a prepared statement. In this statement, the Fed chair explains the monetary policy decisions and provides an overview of the current economic situation and the outlook. Afterward, journalists have the opportunity to ask questions.

We first investigate how the FOMC's discussions on the mandate goals and financial stability influence the communication of the statement. The assumption of our event study is that the discussions indeed influence the statement, and the statement is not written independently of the FOMC debates. We estimate equation (8) using the sentiment variable for the FOMC statement from Equation (6) and present the estimation results in table (3). Our sample includes all press conferences up until shortly before the increase in frequency in January 2019.

- Table (3) around here -

We find a statistically and economically significant effect only for the expected output. A higher positive output gap or a smaller negative output leads to increased optimism in the statement. Once again, rather than estimating these figures, we rely on the official values from the Greenbook forecasts to ensure that only information available at the time is used (Orphanides, 2001). At first glance, the lack of statistical and economic significance is surprising. Still, it is understandable in light of the observed period during which the FOMC was particularly focused on rising unemployment following the GFC, a period of significant economic upheaval. This is also consistent with Bohl et al. (2023), who similarly find that expectations regarding unemployment developments after the GFC influenced the tone of the speeches.

Incorporating text variables derived from the minutes leads to interesting results. The expected inflation gap and output gap lose explanatory power for the statement's sentiment

[29]The results are presented in Appendix F.

once we control for the content of the minutes. However, the sentiment of the discussions regarding the mandate goals (θ_{Sent^M}) has a statistically and economically significant effect. A 1% increase in optimism during the FOMC meeting leads to a 0.47% increase in optimism in the statement. This result makes sense, as the discussions during the conference are much more in-depth than just setting interest rates based on expected changes in specific macroeconomic variables.

Our analysis of monetary policy decisions and communication reveals an interesting difference concerning financial stability discussions. While an increase in such discussions clearly influences monetary policy behavior, monetary policy communication remains unaffected. This asymmetry reflects a certain dilemma: although financial stability is not an immediate component of the mandate and should primarily be ensured through micro- and macroprudential instruments, it nevertheless affects monetary policy through various channels (Kashyap and Stein, 2023).

Finally, we examine the impact of the discussion content during the FOMC meeting on the Q&A session during the press conference. We once again estimate equation (8) with the sentiment indicator from equation (7) as the dependent variable and present the results in column (3) and (4) of table (3). We measure no systematic relationships between the expected and discussed macroeconomic developments during the FOMC meeting and the sentiment of the responses. This is likely because, unlike the statement, the answers are not prepared by the staff of the Board of Governors and are, therefore, much more situational.

5.3. Anecdotal Evidence from the Transcripts

To contextualize our results on financial stability discussions and the change in the sign of the TP^{FS} coefficient during the ZLB period, we conduct a narrative approach in the spirit of Romer and Romer (2023). We read the FOMC transcripts from our sample period to examine how these discussions evolved. These transcripts, published with a five-year lag, provide a nearly verbatim account of the Committee's deliberations. Table (4) contains some examples of how the FOMC members discuss financial stability aspects during the meetings. While financial stability is not formally part of the dual mandate, it is considered in the FOMC's deliberations on setting the FFR and holds a prominent position, as reflected in examples (8) and (13) of table (4).

- Table (4) around here -

In 2007, the FOMC adopted an accommodative policy in response to weaknesses in the real

estate sector and liquidity problems in the financial sector, raising concerns about fulfilling its mandate (table (4), example (1)). This policy approach aligned with the FOMC's prevailing view that financial instability was conventionally addressed by easing the FFR, as Bernanke noted in the discussions (table (4), example (2)). However, this perspective shifted during the ZLB period, as the prolonged accommodative policy itself became a source of concern for financial stability.

At the beginning of the ZLB period, potential risks to financial stability were acknowledged in a context of accommodative monetary policy, but no negative effects on monetary policy were initially observed (table (4), examples (3) and (4)). However, as the ZLB period progressed, concerns about financial stability risks stemming from persistently low interest rates became more pronounced. For instance, one member expressed unease over the consequences of large-scale asset purchases, particularly their role in incentivizing risk-taking in financial markets (table (4), example (5)). Similarly, another member warned in early 2014 that rising asset prices and increased leverage in high-risk financial segments could pose long-term threats to financial stability, highlighting growing concerns within the committee (table (4), example (6)). In his remarks (table 4), example (8)), Stanley Fischer emphasizes that while the FOMC does factor financial stability into its considerations, it cannot, for legal reasons, convey the impression that financial stability holds the same status as the dual mandate. This underscores the practical significance of financial stability, even as it clarifies that the official statement cannot treat it as an equivalent objective.

Later in the ZLB period, the debate shifted further, as financial stability concerns began to influence discussions about the appropriate timing for policy normalization. By this stage, risks were no longer seen as stemming solely from an overly accommodative stance—there were also concerns that tightening policy too soon or too aggressively could itself create financial instability, as demonstrated in discussions on policy exit strategies (table (4), examples (9–12)).

5.4. Analysis with Explainable AI Approach and further Robustness Checks

The use of sophisticated models goes along with a loss of explainability and interpretability of the inner workings of the model. This criticism is widespread with deep learning-based models. In this study, we address this criticism and introduce, as a further methodological contribution, an xAI approach to understand the evaluation of sentiment analysis. With this approach, we generate a new dictionary that can replicate the results of our model and thus provide explainability. Furthermore, the dictionary can be used for future research on

FOMC meeting minutes and is a robustness check for the analysis that has already been conducted.

We use the calculated SHAP values to build a dictionary that estimates sentiment similarly to our fine-tuned RoBERTa model. Each word is assigned a single SHAP value based on a word-level tokenizer. This approach simplifies interpretation, as each word corresponds to one SHAP value rather than aggregating values from multiple tokens. The dataset is lemmatized to reduce words to their base forms. We then calculate the average SHAP value for each word across all its occurrences. To ensure reliability, words that appear fewer than ten times are excluded, and stopwords are removed. As a result, each word in the dictionary is assigned an average SHAP value for the positive, negative, and neutral sentiment categories.

Each word is assigned to a sentiment category based on its highest average SHAP value. Words with a higher average positive SHAP value are classified as positive, while those with a higher average negative SHAP value are classified as negative. From these two lists, only words in the top 20th percentile based on the average contribution of each word are included, ensuring that only the words with the highest contributions to each sentiment category are used. This process improves the dictionary's accuracy in estimating sentiment while highlighting the limitations of static dictionaries compared to the context-aware capabilities of LLMs.

Table (5) presents the estimation results using our constructed dictionary in columns (1) and (2), alongside those from the fine-tuned RoBERTa model in columns (3) and (4). The results remain robust and show that we can replicate the results of the LLM with a dictionary that is transparent and easily replicable.

- Table (5) around here -

We implement several additional robustness checks. First, we vary the number of topics in the STM model, conducting the entire analysis across a range of plausible alternative topic numbers (see figure A2). Second, we replace the output gap with the unemployment gap from the Greenbook forecast to control for macroeconomic differences between these variables. Third, we replaced the shadow rate estimates of Wu and Xia (2016) with those of Krippner (2013) (see table D1). Fourth, to address the small sample size in our sentiment regression due to the five-year publication lag of the Greenbook forecasts, we conduct a robustness check by replacing the Greenbook forecasts with SPF data, despite the different

data frequency of the SPF forecasts (see figure G1). Fifth, instead of using RoBERTa, we apply a fine-tuned FinBERT model, specifically designed for sentiment analysis in economic and financial texts. Sixth, we use forecasts for two quarters ahead, rather than four quarters ahead, in our estimations. The results remain robust.

6. Conclusion

Our findings demonstrate how the discussions during the FOMC meetings summarized in the minutes influences monetary policy decisions and subsequent policy communications. Specifically, more discussions on mandate objectives are associated with reductions in the FFR. Additionally, sentiment analysis of these discussions provides further key insights. As evidenced by the Taylor rule and sentiment regression, more positively framed discussions on inflation and unemployment correlate with increases in the FFR and a more optimistic tone in the press conferences immediately following the meetings. In contrast, discussions on financial stability tend to be followed by interest rate reductions.

While these results hold in periods of positive interest rates, distinguishing between conventional and unconventional monetary policy offers a shift in perspective. When examining monetary policy through the lens of shadow rates instead of the FFR, we find that during the ZLB period, an increase in the proportion of financial stability discussions is associated with an increase in the shadow rate. This suggests heightened concerns within the FOMC that prolonged low interest rates may encourage excessive risk-taking by financial market participants, potentially sowing the seeds for future financial instability-induced recessions. We support this interpretation with anecdotal evidence from FOMC speeches and transcripts. However, these decision-relevant topics do not shape monetary policy communication, creating an asymmetry between actions and words—potentially leading to misconceptions about the key drivers of the Fed's policy decisions.

Methodologically, our research advances the field by constructing a novel dataset of annotated sentences from FOMC minutes, which we use to fine-tune and evaluate RoBERTa for sentiment analysis. Additionally, we introduce SHAP values to the study of central bank deliberations, offering new insights into the explainability of AI-based text analysis. By leveraging advancements in LLMs, our approach surpasses traditional bag-of-words methods while maintaining transparency and interpretability.

Our results contribute to the expanding literature on the role of financial stability considerations in shaping the FFR. Future research should harness modern NLP techniques

to more precisely capture how various topics within FOMC discussions influence monetary policy decisions. A more granular understanding of these topic-specific effects could provide deeper insights into how financial stability and other considerations inform the FOMC's policy-setting behavior. Beyond NLP-driven approaches, future studies could explore complementary methodologies to deepen our understanding of how financial stability concerns manifest in central bank decision-making. One promising avenue is market reaction analysis, assessing how financial markets interpret the asymmetry between monetary policy actions and communication, particularly regarding financial stability. Additionally, comparing central banks, such as the Eurosystem or the Bank of England, could also shed light on whether similar communication-policy asymmetries exist in different institutional frameworks.

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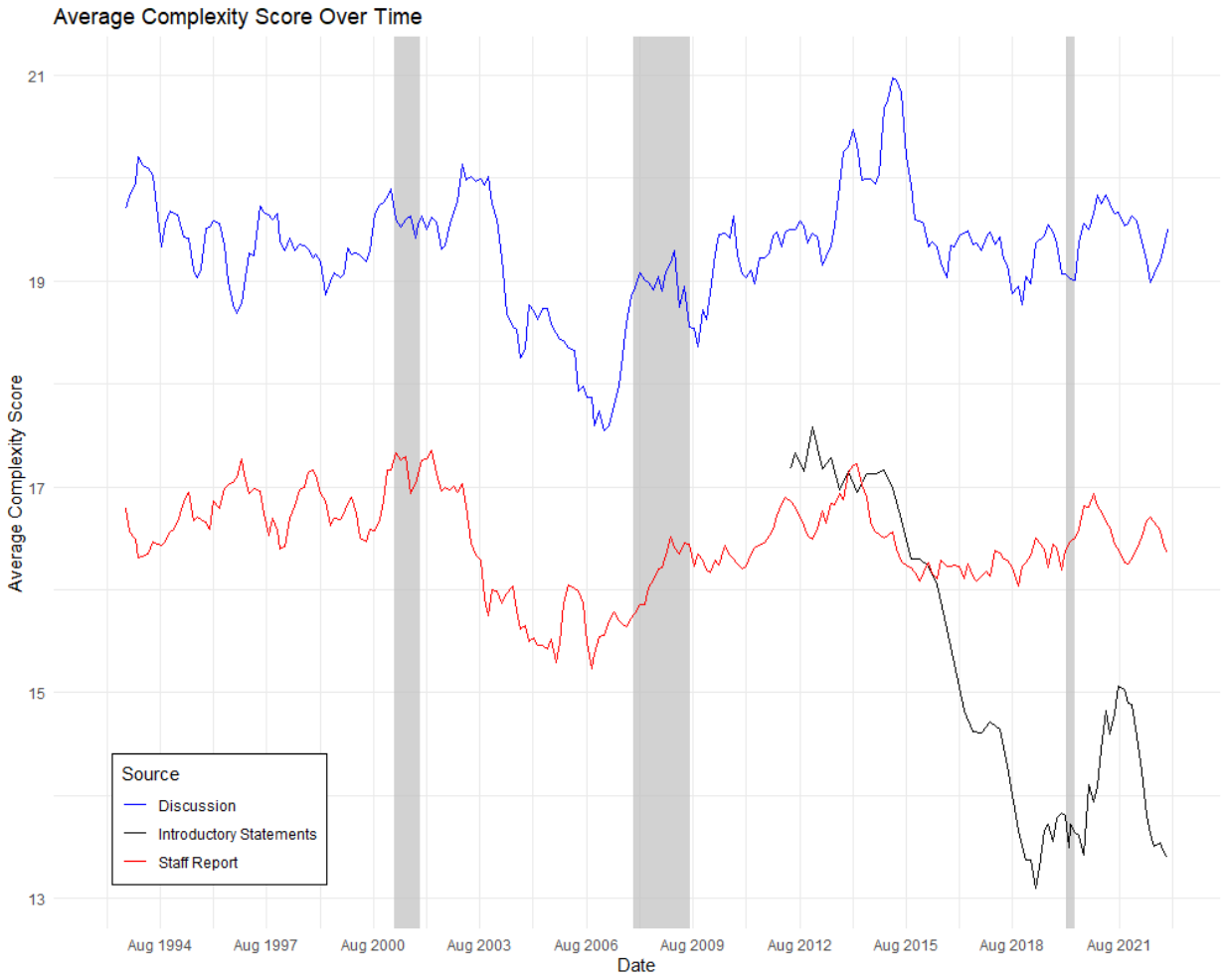
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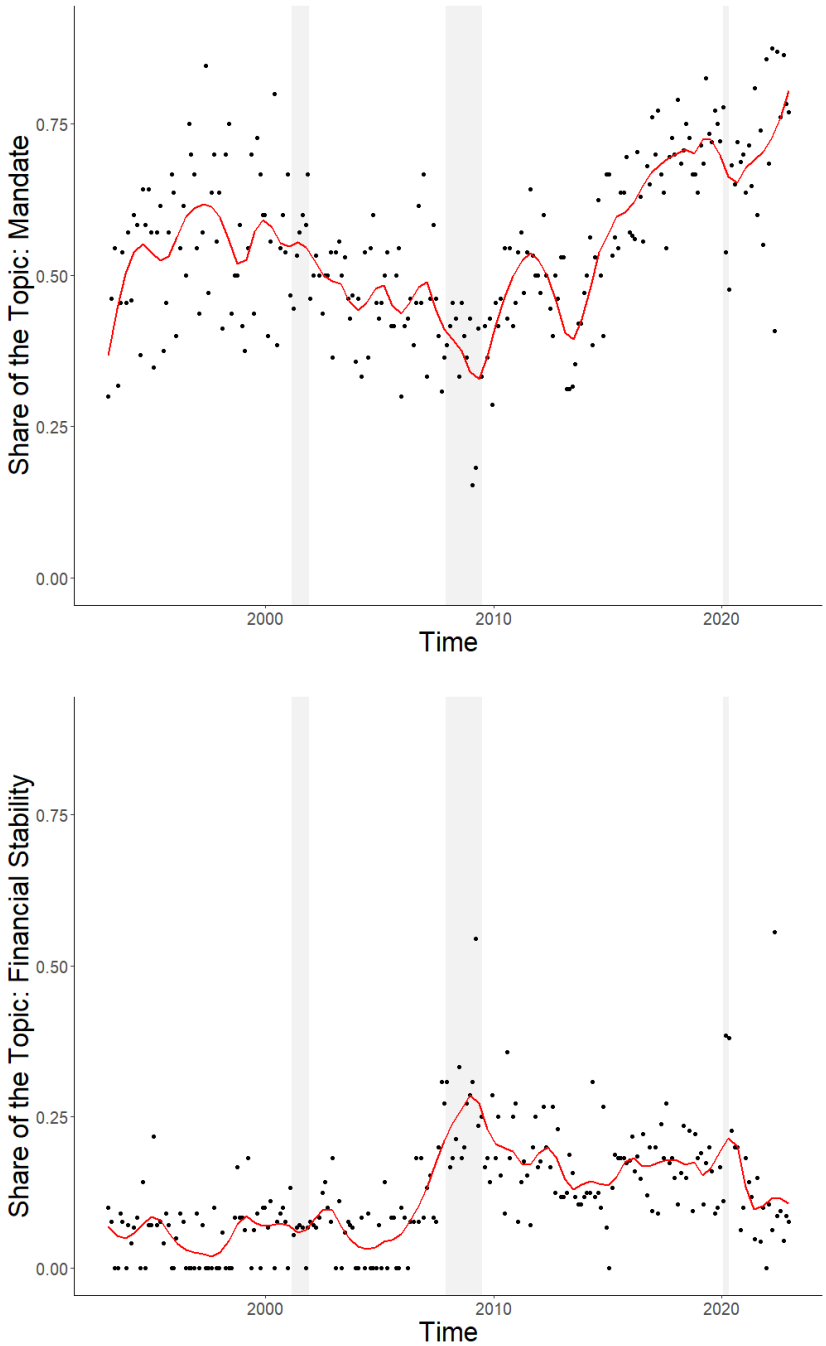
Tables and Figures

Figure 1: Complexity Measures for FOMC Documents 01.1993-12.2018



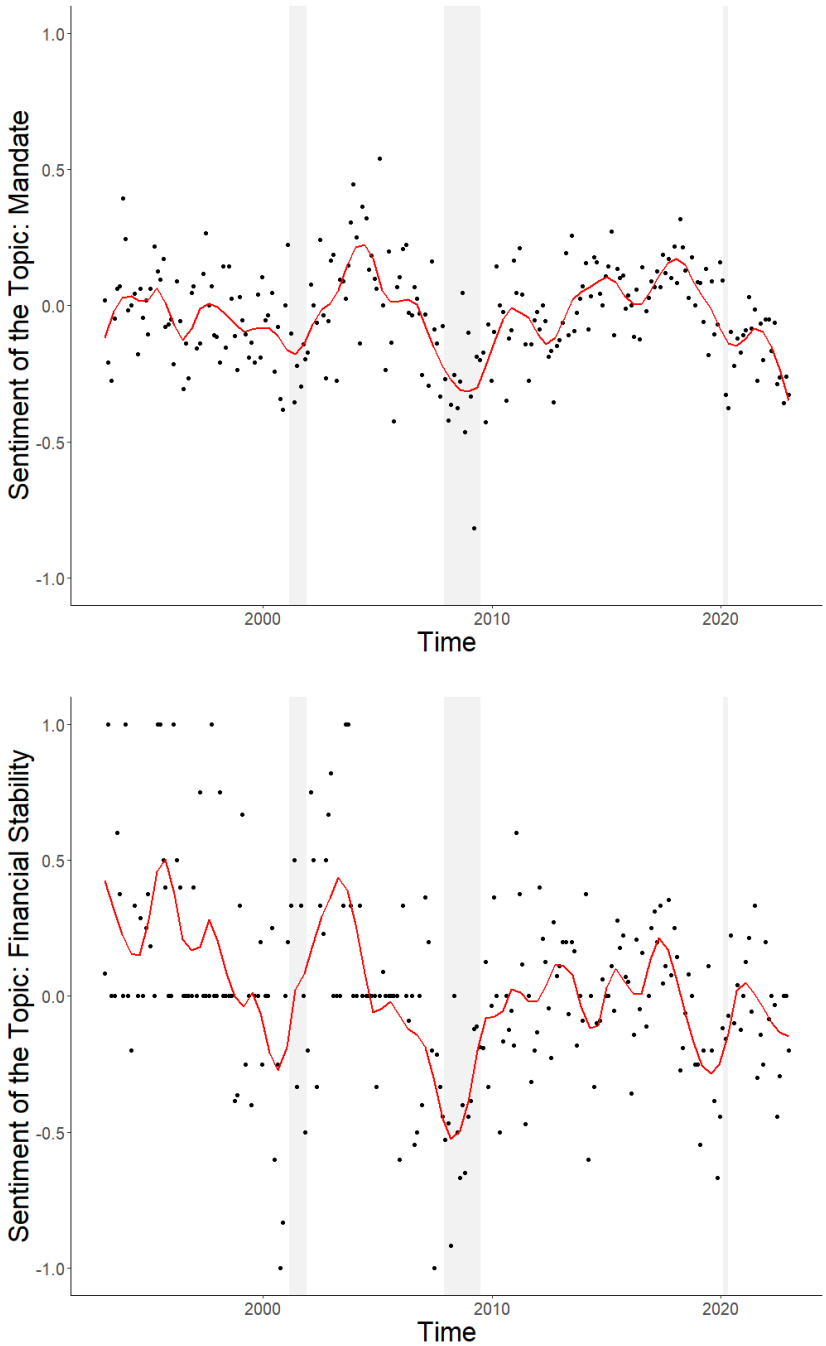
Note: The figure shows the average complexity of staff reports, FOMC minutes discussions, and the introductory statements of press conferences following FOMC meetings from January 1993 to December 2022. The complexity score is calculated using the Automated Readability Index, Gunning-Fog Score, Coleman-Liau Score, and Flesch-Kincaid Grade Score. Recession periods, as defined by NBER, are indicated by shaded areas.

Figure 2: Proportions of Mandate-Related and Financial Stability Topics in FOMC Minutes (1993–2022)



Note: The upper figure displays the proportion of mandate-related topics identified by the Structural Topic Model (STM) in the FOMC meeting minutes from January 1993 to December 2022, while the lower figure shows the proportion of financial stability-related topics over the same period. Both are based on meeting frequency, with topic proportions calculated as explained in section 3.2. The red line represents a locally estimated scatterplot smoothing (LOESS) curve, illustrating the underlying trend in the data. Recession periods are indicated by shaded areas.

Figure 3: Sentiment Analysis of FOMC Discussions Using a Fine-Tuned RoBERTa Model (1993–2022)



Note: The upper figure displays sentiment analysis results for mandate-related discussions from January 1993 to December 2022, while the lower figure shows sentiment analysis for financial stability discussions in the FOMC meeting minutes during the same period. Both analyses utilize a fine-tuned RoBERTa model applied at the sentence level, as explained in section 3.3. The red line represents a locally estimated scatterplot smoothing (LOESS) curve, illustrating the underlying trend in the data. Recession periods are indicated by shaded areas.

Table 1: Top 20 Positive and Negative Sentiment Tokens Based on SHAP Values

Positive Words	**Score**	**Negative Words**	**Score**
recede	0.5868	unacceptably	-0.5414
subside	0.4391	uncomfortably	-0.5319
bright	0.4237	worrisome	-0.4828
optimistic	0.3781	sluggishness	-0.4614
upbeat	0.3673	deteriorate	-0.4007
lessen	0.3613	concerned	-0.3912
resilient	0.3446	inconsistent	-0.3825
positive	0.3328	falter	-0.3786
optimism	0.3307	worried	-0.3648
beneficial	0.3254	uncertainty	-0.3566
improve	0.3188	uneven	-0.3491
buoy	0.3112	unsettle	-0.3407
mute	0.3073	weaken	-0.3381
check	0.2803	pessimistic	-0.3376
benign	0.2472	mislead	-0.3367
favorable	0.2424	subpar	-0.3325
favorably	0.2380	unsustainable	-0.3293
rebound	0.2372	disappointing	-0.3259
encourage	0.2367	depressed	-0.3258
abate	0.2354	hardship	-0.3172

Note: This table presents the top 20 words ranked by their SHAP scores, calculated using our fine-tuned RoBERTa model. The concept of SHAP values is explained in detail in section 3.3. Each word has a SHAP value for each sentiment category of the RoBERTa model. We calculate the score by measuring the difference between a word's contribution to positive sentiment and its contribution to negative sentiment across all its occurrences in the text corpus. Thus, the SHAP score is defined as $Score = PositiveSentiment - NegativeSentiment$. Words with the highest positive scores exert the greatest influence in classifying sentences as positive, while those with the highest negative scores most strongly impact negative sentiment classification. Words that appeared fewer than 10 times were excluded from the analysis.

Table 2: Regression Results: Taylor Rule Estimations (2000 - 2018)

	FFR	FFR	FFR	FFR	Shadow Rate
	(1)	(2)	(3)	(4)	(5)
β	0.069	0.133	0.173*	0.294***	0.188*
	(0.085)	(0.095)	(0.101)	(0.112)	(0.104)
γ	0.034***	0.041***	0.022	0.052**	0.080***
	(0.012)	(0.014)	(0.017)	(0.025)	(0.025)
ρ	0.947***	0.929***	0.950***	0.952***	0.979***
	(0.022)	(0.025)	(0.024)	(0.030)	(0.026)
α	0.023	0.526**	0.284	0.341	0.500
	(0.134)	(0.249)	(0.283)	(0.372)	(0.368)
θ_{TP^M}		-0.755**	-0.641**	-0.926*	-1.012**
		(0.300)	(0.322)	(0.459)	(0.433)
$\theta_{TP^{FS}}$		-0.682*	-0.343	-1.281**	-1.168**
		(0.368)	(0.338)	(0.546)	(0.509)
θ_{Sent^M}			0.439**	0.678***	0.670***
			(0.184)	(0.223)	(0.221)
$\theta_{Sent^{FS}}$			0.031	0.049	0.075
			(0.092)	(0.109)	(0.107)
φ_{ZLB}				-0.538	-0.959**
				(0.340)	(0.393)
φ_{TP^M}				0.780*	1.414***
				(0.456)	(0.499)
$\varphi_{TP^{FS}}$				1.678**	2.512***
				(0.721)	(0.808)
φ_{Sent^M}				-0.969***	-0.726**
				(0.284)	(0.311)
$\varphi_{Sent^{FS}}$				-0.103	-0.059
				(0.167)	(0.184)
Wald Tests (χ^2)					
$\theta_{TP^M} + \varphi_{TP^M} = 0$				0.55	1.51
$\theta_{TP^{FS}} + \varphi_{TP^{FS}} = 0$				1.33	6.56**
$\theta_{Sent^M} + \varphi_{Sent^M} = 0$				1.98	0.05
$\theta_{Sent^{FS}} + \varphi_{Sent^{FS}} = 0$				0.19	0.01
Sample	2000-2018	2000-2018	2000-2018	2000-2018	2000-2018
N	152	152	152	152	152
R^2	0.971	0.973	0.974	0.979	0.985
RMSE	0.341	0.333	0.327	0.304	0.322

Note: The table shows the Taylor rule estimation results, derived by the OLS regression of equation (5), covering the period from January 2000 to December 2018. The specified variables are regressed on the effective federal funds rate (FFR). In column (5), the FFR is replaced with the estimated shadow rates from Wu and Xia (2016) during the ZLB period. β represents the four-quarter forecast of the inflation gap and γ represents the four-quarter forecast of the output gap, both derived from the Greenbook forecasts. ρ denotes the lagged FFR, and α represents the constant. TPM, TPFS, SentM, and SentFS are the sentiment (Sent) and topic proportion (TP) variables related to mandate objectives (M) and financial stability (FS). θ represents the period outside the zero lower bound (ZLB), while φ captures the interaction of these variables with the ZLB dummy variable. The ZLB dummy is set to one for the period from December 2008 to December 2015. Statistical significance at the 90%, 95%, and 99% levels is indicated by *, **, and ***, respectively. Bootstrapped standard errors are reported in parentheses. Sentiment is measured using the fine-tuned RoBERTa model, as described in section 3.3.

Table 3: Sentiment Regression: Introductory Statement and Q&A Session (2011 - 2018)

	Statement		Q&A Session	
	(1)	(2)	(3)	(4)
ζ	0.014	-0.224	-0.243	-0.186
	(0.251)	(0.167)	(0.191)	(0.212)
β	-0.040	-0.033	0.037	0.045
	(0.125)	(0.105)	(0.052)	(0.068)
γ	0.027**	0.006	0.008*	0.004
	(0.011)	(0.013)	(0.005)	(0.007)
α	0.209	0.015	-0.041	-0.093
	(0.225)	(0.222)	(0.086)	(0.161)
θ_{TP^M}		0.304*		0.063
		(0.170)		(0.177)
$\theta_{TP^{FS}}$		-0.255		-0.055
		(0.213)		(0.214)
θ_{Sent^M}		0.475***		0.007
		(0.105)		(0.090)
$\theta_{Sent^{FS}}$		-0.017		0.061
		(0.050)		(0.043)
Sample	2011-2018	2011-2018	2011-2018	2011-2018
N	31	31	31	31
R^2	0.438	0.733	0.153	0.224
RMSE	0.084	0.063	0.062	0.064

Note: The table shows the sentiment regression results of equation (8), covering the period from April 2011 to December 2018. In columns (1) and (2), the specified variables are regressed on the sentiment of the Introductory Statement delivered during the press conference immediately following the FOMC meeting. Columns (3) and (4) show the regression results where the dependent variable is the sentiment of the Fed Chair's responses during the Question and Answer session of the same press conference. Sentiment is measured using the fine-tuned RoBERTa model, as described in section 3.3. Statistical significance at the 90%, 95%, and 99% levels is denoted by *, **, and ***, respectively. Bootstrapped standard errors are shown in parentheses.

Table 4: Quotes from the FOMC Transcripts

Example	Date	FOMC Member	Quote
1	September 18, 2007	Eric S. Rosengren	"So we have a situation of a very weak housing sector, some evidence of slowing employment growth, and a period of extended illiquidity that may get worse before it gets better. The tail risk of liquidity problems and economic problems has grown, and we clearly want to avoid outcomes by which declines in prices for houses and for financial assets tied to the housing sector could create more-severe economic outcomes. The fact is that we do not have much experience with periods of extended illiquidity, especially when the housing sector is so weak. So taking out insurance against these risks seems entirely appropriate. The decision is made easier, in my view, because I see the risk of unacceptably high inflation resulting from such an action as being quite low. My hope is that with appropriate easing of policy the liquidity issues will abate as we start the fourth quarter."
2	October 30-31, 2007	Ben Bernanke	"For what it is worth, 75 basis points of easing has been pretty much the standard Fed medicine for financial crises ever since 1970 or so; in that respect we are in good company."
3	March 16, 2010	Donald L. Kohn	"I don't see, so far, low rates as having greatly adverse consequences for financial stability, though I agree we need to monitor it. The bond spreads, equity prices, I think, are still in line with fundamentals. And given my expectation that both inflation and output and employment will remain below our objectives for a long period of time, I would have a very strong preference for using supervision and regulation to counter any hints of instability in financial markets or dangerous situations in financial markets rather than have those measures fall even further below our objectives."
4	March 16, 2010	Thomas M. Hoenig	"The reason to begin tightening policy soon is not simply or even primarily to prevent the issues around inflationary pressures immediately. That's longer term and important. Rather it is to prevent future buildup of financial imbalances and reduce the risks to longer-run macroeconomic and financial stability that come from maintaining a commitment to exceptionally low rates for an extended period of time."
5	October 23-24, 2012	Daniel K. Tarullo	"I have concerns about more purchases. As others have pointed out, the dealer community is now assuming close to a $4 trillion balance sheet and purchases through the first quarter of 2014. I admit that is a much stronger reaction than I anticipated, and I am uncomfortable with it for a couple of reasons. [...] Second, I think we are actually at a point of encouraging risk-taking, and that should give us pause. Investors really do understand now that we will be there to prevent serious losses. It is not that it is easy for them to make money but that they have every incentive to take more risk, and they are doing so. Meanwhile, we look like we are blowing a fixed-income duration bubble right across the credit spectrum that will result in big losses when rates come up down the road. You can almost say that that is our strategy."
6	January 28-29, 2014	Narayana Kocherlakota	"In the meantime, our policy settings continue to facilitate incentives that pose potential risks to long-term financial stability. Asset prices and froth in various pockets of the financial sector deserve our ongoing monitoring, particularly in high-yield bond issuance and leveraged lending. I recognize that identifying these risks to financial stability and quantifying their impact today remain difficult for sure, but we should not underestimate their potential effects or their ability to surprise."

(continued)

Example	Date	FOMC Member	Quote
7	October 28-29, 2014	Lael Brainard	"It would also be a mistake to confine the use of monetary policy to being a last resort, for a variety of reasons. First and most obvious is because there have been instances of extreme financial stress in which monetary policy has been the tool of first resort, and we should remember that. Moreover, we may need to rely more heavily on monetary policy relative to macroprudential tools, compared with some other central banks, for several reasons. First of all, we operate in a highly fragmented regulatory environment and in a system in which the capital markets play a bigger role in the financial markets than they do in many other systems. And, second, we have somewhat limited macroprudential tools relative to some other central banks."
8	October 28-29, 2014	Stanley Fischer	"On financial stability, that's a very tough one indeed. The current constitutional document is based in the legal system, in laws relating to our mandate. I don't think financial stability is equally based. There's a slight problem there. Nonetheless, I liked a lot of what I heard around the table. I think that the key issue here is not how the Fed deals with financial stability but how the FOMC deals with financial stability. And that means we control the interest rate, and do we ever use the interest rate to deal with financial-stability issues? Now, President Evans used the Greenspan line: "Well, if you were just going to use the interest rate when the situation becomes untenable, you'd have to do so much to raise the interest rate that you'd destroy the economy." That prejudged the answer. We can't do it. We wait for the bubble to pop, and then we mop it up. The issue is, do we take financial-stability considerations into account in our interest rate decisions? We sometimes do, and then Lael pointed out that sometimes we do it right at the beginning and not right at the end. I think we ought to work a little bit more on that, but we cannot develop the statement that implies it's on the same level as inflation and unemployment."
9	December 16-17, 2014	Daniel K. Tarullo	"The final thing I wanted to say is, the analytic issue of whether the greater risk lies in falling behind an inflation increase, on the one hand, or a premature liftoff, on the other, is one to which many people have alluded, but we haven't actually discussed it very much. People have more given their conclusions, either based on faith or based on some reference to past circumstances. I'm inclined to think that the risk of premature liftoff in current circumstances is greater than the risk of falling behind the inflation curve. In fact, as I sit here today, I think it's at least as likely that I'll ultimately be motivated to favor liftoff for financial-stability reasons as for inflation reasons."
10	April 28-29, 2015	Narayana Kocher-lakota	"As I've indicated in the past, I believe that it is important for monetary policy decisions to take account of the macroeconomic risks created by potential financial instability. My own reading of the QS report is that the main financial stability risk we face right now is actually associated with higher, not lower, interest rates. This will build on some of the work that Thomas was showing us earlier this morning."
11	July 28-29, 2015	Janet L. Yellen	"In light of our experience of conducting large-scale asset purchases over recent years, we need to give some thought to the long-run structure of our assets and liabilities that best supports our macroeconomic and financial-stability objectives."
12	December 15-16, 2015	Stanley Fischer	"Why move now? Why not wait longer? First, as the Chair has emphasized, our actions become effective with a lag. Second, there are some signs of accumulating financial stability problems. And, third, the signal we will be sending will reinforce the fact that our economic situation is continuing to normalize."

(continued)

Example	Date	FOMC Member	Quote
13	December 15-16, 2015	Stanley Fischer	"So, to conclude, we're setting out on a new journey with the same goals we've always had—maximum employment, stable prices, and financial stability. The journey is difficult and daunting, but we can take some comfort from the successes of Federal Reserve policy since the end of 2008, even while we need to remember the warning sent by the fact that there was a global financial crisis that began in September 2008"

Note: The table shows examples of how financial stability concerns were discussed in the context of monetary policy. All examples are taken from the FOMC transcripts.

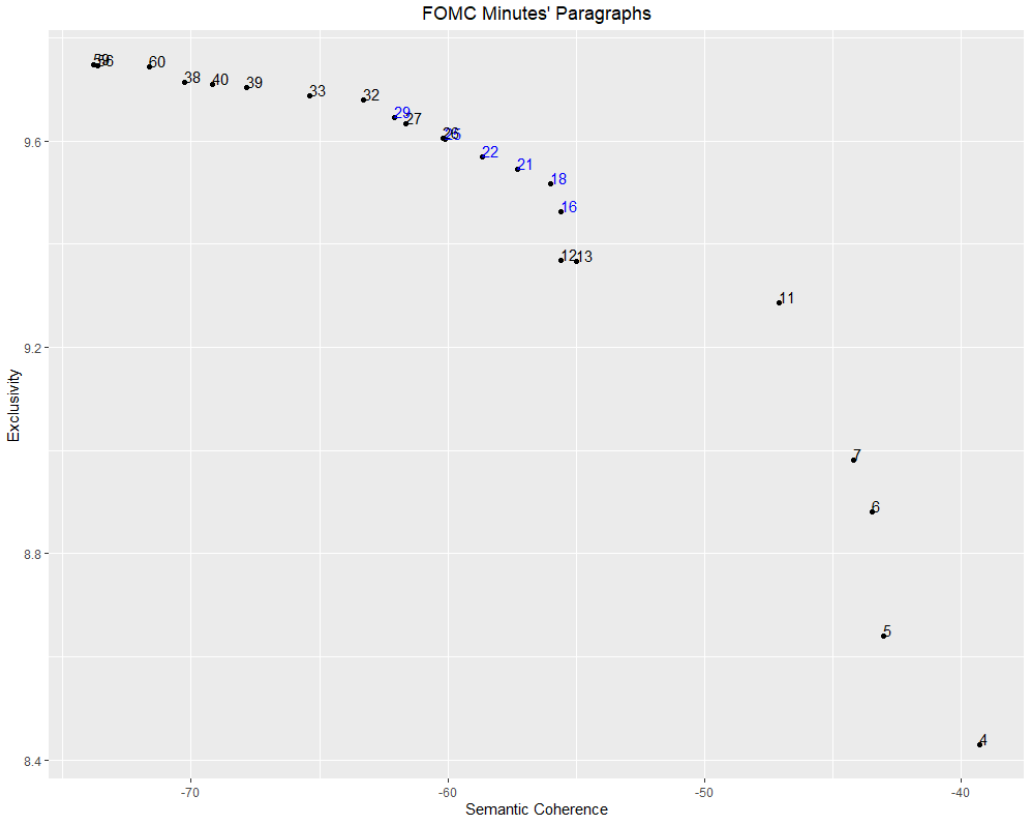
Table 5: Regression Results: Taylor Rule Estimations with SHAP dictionary (2000 - 2018)

	SHAP Dictionary		RoBERTa Model	
	FFR	Shadow Rate	FFR	Shadow Rate
	(1)	(2)	(3)	(4)
β	0.369***	0.245**	0.294***	0.188*
	(0.134)	(0.122)	(0.112)	(0.104)
γ	0.059**	0.090***	0.052**	0.080***
	(0.025)	(0.026)	(0.025)	(0.025)
ρ	0.935***	0.968***	0.952***	0.979***
	(0.027)	(0.023)	(0.030)	(0.026)
α	0.253	0.409	0.341	0.500
	(0.418)	(0.406)	(0.372)	(0.368)
θ_{TP^M}	-1.024**	-1.101***	-0.926*	-1.012**
	(0.430)	(0.410)	(0.459)	(0.433)
$\theta_{TP^{FS}}$	-1.319**	-1.140*	-1.281**	-1.168**
	(0.649)	(0.600)	(0.546)	(0.509)
θ_{Sent^M}	0.509**	0.551**	0.678***	0.670***
	(0.241)	(0.243)	(0.223)	(0.221)
$\theta_{Sent^{FS}}$	0.106	0.131	0.049	0.075
	(0.138)	(0.136)	(0.109)	(0.107)
φ_{ZLB}	-0.474	-0.872**	-0.538	-0.959**
	(0.345)	(0.384)	(0.340)	(0.393)
φ_{TP^M}	0.807*	1.455***	0.780*	1.414***
	(0.445)	(0.499)	(0.456)	(0.499)
$\varphi_{TP^{FS}}$	1.914**	2.489***	1.678**	2.512***
	(0.857)	(0.888)	(0.721)	(0.808)
φ_{Sent^M}	-0.705**	-0.812***	-0.969***	-0.726**
	(0.326)	(0.356)	(0.284)	(0.311)
$\varphi_{Sent^{FS}}$	-0.144	0.075	-0.103	-0.059
	(0.215)	(0.274)	(0.167)	(0.184)
Wald Tests (χ^2)				
$\theta_{TP^M} + \varphi_{TP^M} = 0$	0.73	1.00	0.55	1.51
$\theta_{TP^{FS}} + \varphi_{TP^{FS}} = 0$	1.96	6.29**	1.33	6.56**
$\theta_{Sent^M} + \varphi_{Sent^M} = 0$	0.69	0.93	1.98	0.05
$\theta_{Sent^{FS}} + \varphi_{Sent^{FS}} = 0$	0.05	0.73	0.19	0.01
Sample	2000-2018	2000-2018	2000-2018	2000-2018
N	152	152	152	152
R^2	0.977	0.984	0.979	0.985
RMSE	0.315	0.330	0.304	0.322

Note: The table shows the Taylor rule estimation results, derived by the OLS regression of equation (5), covering the period from January 2000 to December 2018. The specified variables are regressed on the effective federal funds rate (FFR). In columns (2) and (4), the FFR is replaced with the estimated shadow rates from Wu and Xia (2016) during the ZLB period. β represents the four-quarter forecast of the inflation gap, and γ represents the four-quarter forecast of the output gap, both derived from Greenbook forecasts. ρ denotes the lagged FFR, and α represents the constant. TP^M, TP^{FS}, $Sent^M$, and $Sent^{FS}$ are the sentiment (Sent) and topic proportion (TP) variables related to mandate objectives (M) and financial stability (FS). θ represents the period outside the zero lower bound (ZLB), while φ captures the interaction of these variables with the ZLB dummy variable. The ZLB dummy is set to one for the period from December 2008 to December 2015. Statistical significance at the 90%, 95%, and 99% levels is indicated by *, **, and ***, respectively. Bootstrapped standard errors are reported in parentheses. Sentiment based on the RoBERTa model is measured using the fine-tuned RoBERTa model, as described in section 3.3 and the SHAP Dictionary is constructed as explained in section 5.4.

A. Alternative Topic Selection Procedure

Figure A1: Topic Alternatives



Note: This figure illustrates the trade-off between exclusivity and semantic coherence for the discussion corpus of the minutes. We estimate Structural Topic Models (STM) for $K \in \{4, \ldots, 60\}$ and remove all models strictly dominated in metrics. We focus on the topic numbers $K \in \{16, 18, 21, 22, 25, 29\}$ as possible classifiers based on interpretability.

Table A1: Structural Topic Model Results

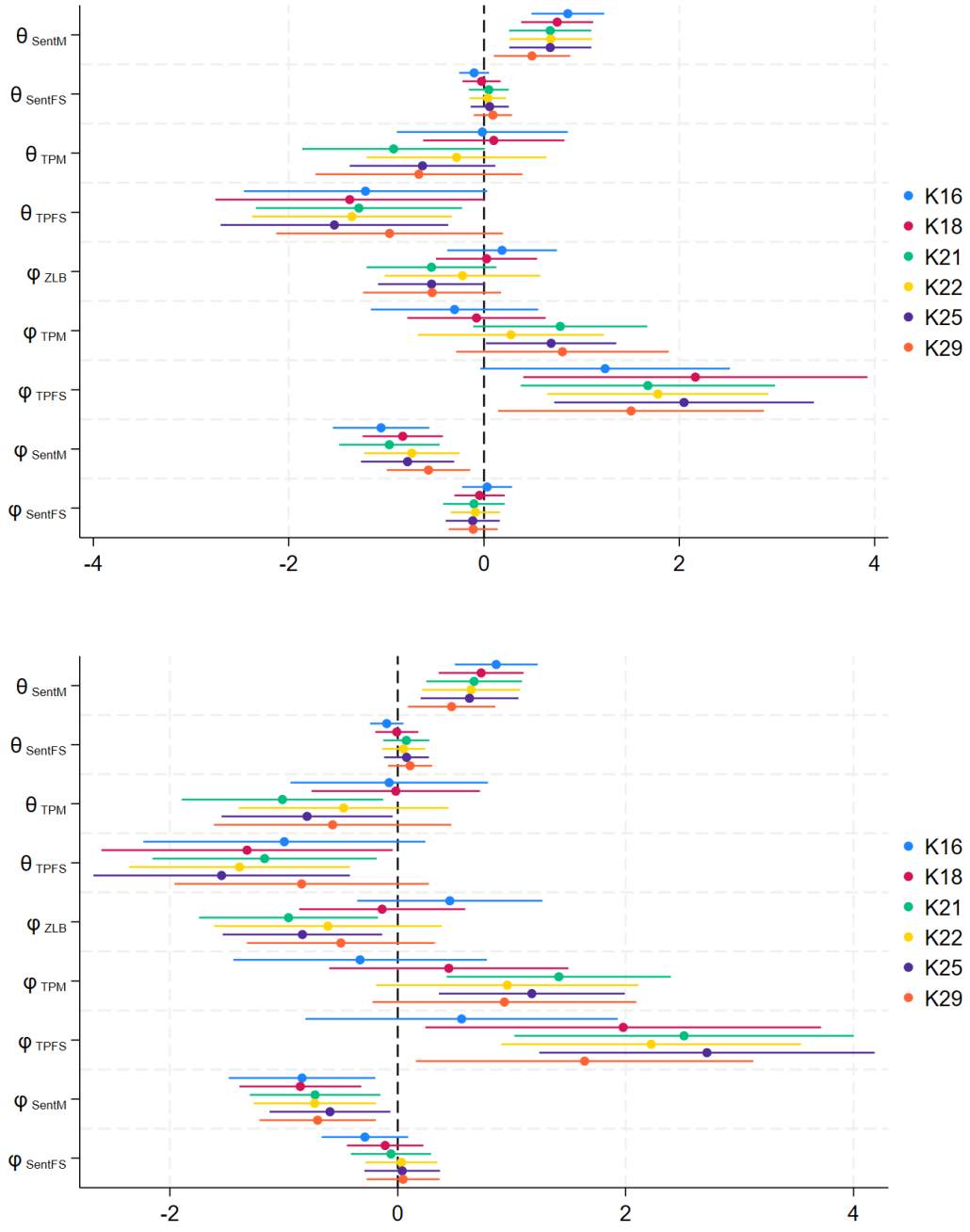
Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7
releas	secur	financi	busi	labor	particip	consum
statement	feder	market	invest	particip	committe	spend
vote	reserv	particip	capit	market	polici	household
short	agenc	credit	report	rate	rate	incom
approv	hold	bank	spend	unemploy	inflat	recent
encompass	committe	risk	firm	employ	monetari	growth
p.m	treasuri	condit	contact	wage	goal	increas
meet	polici	note	equip	worker	feder	effect
inclus	agre	term	product	job	guidanc	support
press	term	increas	continu	increas	percent	confid
sentenc	support	loan	industri	condit	time	fiscal
paragraph	market	yield	construct	growth	run	sale
text	level	equiti	increas	forc	employ	gain
percentag	maintain	rate	profit	continu	maximum	factor
unanim	condit	remain	expenditur	remain	achiev	retail

Topic 8	Topic 9	Topic 10	Topic 11	Topic 12	Topic 13	Topic 14
u.	hous	inflat	direct	growth	committe	purchas
foreign	sector	expect	reserv	expans	statement	asset
export	particip	particip	feder	econom	meet	committe
economi	activ	term	polici	economi	polici	pace
econom	price	measur	committe	inventori	agre	program
growth	report	run	conclus	activ	econom	particip
domest	mortgag	percent	bank	demand	discuss	market
trade	home	market	domest	prospect	languag	econom
dollar	continu	committe	instruct	current	decis	outlook
demand	construct	month	author	develop	chang	progress
effect	contact	remain	accord	quarter	futur	addit
global	rate	continu	execut	moder	risk	condit
abroad	district	recent	transact	rate	postmeet	continu
develop	sale	price	york	outlook	announc	reduct
market	recent	object	discuss	busi	communic	improv

Topic 15	Topic 16	Topic 17	Topic 18	Topic 19	Topic 20	Topic 21
rang	particip	project	rate	polici	inflat	econom
growth	econom	rate	fund	tighten	price	growth
committe	risk	gdp	feder	risk	increas	particip
reserv	activ	real	inflat	economi	pressur	risk
monetari	note	forecast	rang	committe	cost	outlook
econom	suppli	percent	committe	monetari	labor	pace
aggreg	economi	growth	target	action	product	continu
period	polici	run	condit	period	rise	expect
price	pandem	unemploy	outlook	economi	expect	meet
debt	continu	polici	polici	move	resourc	recent
condit	outlook	particip	expect	eas	energi	activ
consist	support	feder	percent	view	recent	downsid
accept	remain	assess	market	stanc	core	quarter
slight	fiscal	inflat	assess	intermeet	remain	moder
intermeet	uncertainti	monetari	direct	direct	market	anticip

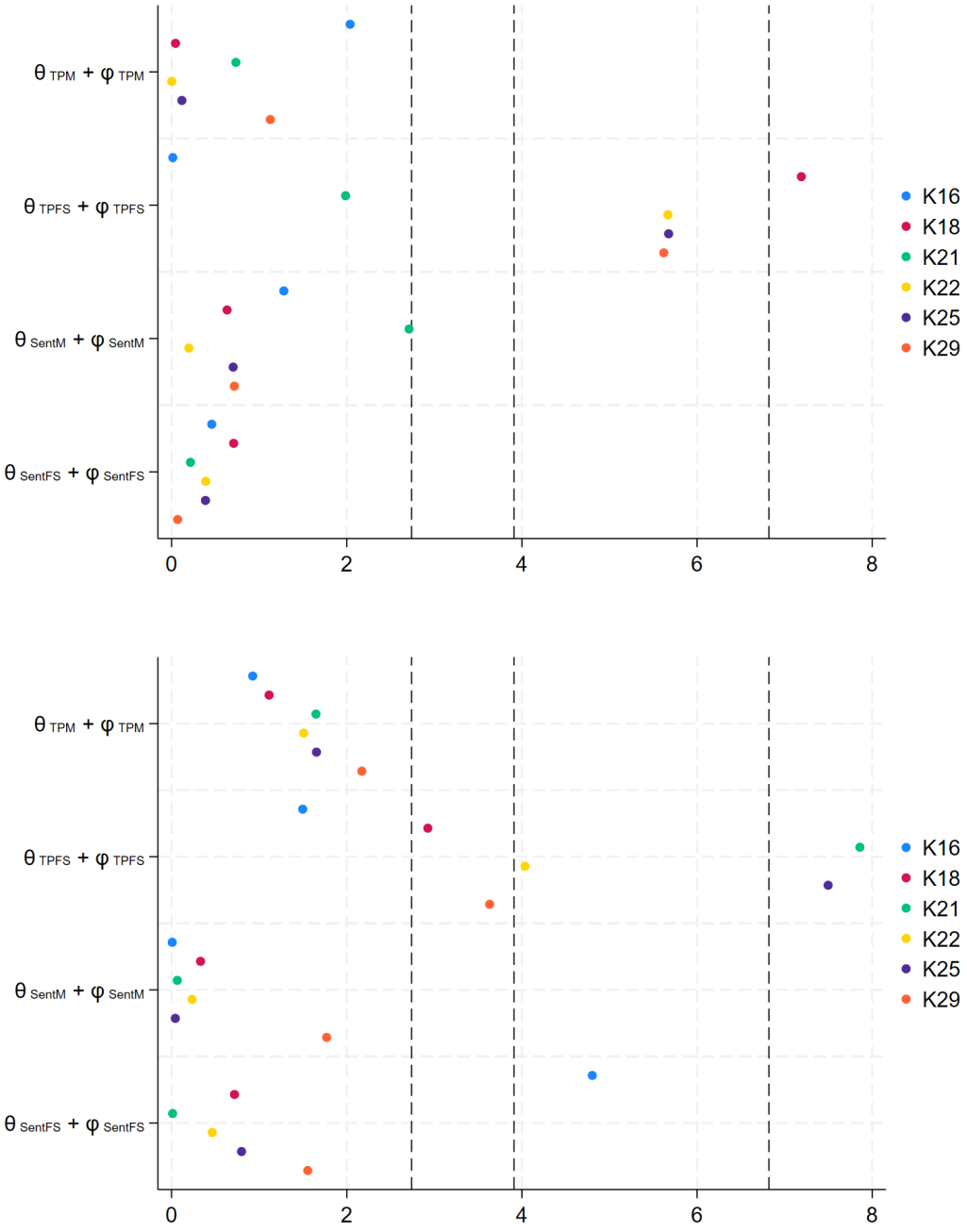
Note: The table presents the 15 most influential word stems for each of the 21 topics generated by the topic model, ranked by their beta values. We selected 21 topics to maximize interpretability and clarity in our main results. We categorize topics 2, 3, and 9 as relating to financial stability, while topics 4, 5, 6, 10, 12, 16, 18, 19, 20, and 21 are classified as mandate-related topics. A detailed explanation of the STM is provided in section 3.2.

Figure A2: Robustness Check: Topic Proportions and Sentiment Indicators



Note: The figures shows the regression coefficients for different topic selections $K \in \{16, 18, 21, 22, 25, 29\}$ derived from the Structural Topic Model (STM). The coefficients correspond to the topic proportions (θ_{TPM}, θ_{TPFS}) and sentiment indicators (θ_{SentM}, θ_{SentFS}) associated with the mandate and financial stability topics, respectively. Interaction effects between these variables and the ZLB dummy are denoted by φ. The ZLB dummy is set to one for the period from December 2008 to December 2015. The specification in the first figure corresponds to the results shown in Table 2, column (4), while the specification in the second figure uses shadow rates for the ZLB period with the same specification (column (5)).

Figure A3: Robustness Check: Wald Tests



Note: This figure presents the Wald test statistics for different topic selections, $K \in \{16, 18, 21, 22, 25, 29\}$, estimated using the Structural Topic Model (STM). The test assesses whether the effects of the topic proportions for mandate and sentiment indicators are jointly equal to zero, conditional on $D_t^{ZLB} = 1$. The coefficients correspond to the topic proportions (θ_{TPM}, θ_{TPFS}) and sentiment indicators (θ_{SentM}, θ_{SentFS}) associated with the mandate and financial stability topics, respectively. Interaction effects between these variables and the ZLB dummy are denoted by φ. The ZLB dummy is set to one for the period from December 2008 to December 2015. The specification in the first figure corresponds to the results shown in Table 2, column (4), while the specification in the second figure uses shadow rates for the ZLB period with the same specification (column (5)). From left to right, the three vertical lines indicate statistical significance at the 90%, 95%, and 99% levels, respectively.

Table A2: Regression Results: Taylor Rule Estimations without Financial Conditions in the aggregated Financial Stability Topic (2000 - 2018)

	FFR	FFR	FFR	FFR	Shadow Rate
	(1)	(2)	(3)	(4)	(5)
β	0.069	0.160	0.213**	0.286**	0.182*
	(0.085)	(0.098)	(0.103)	(0.112)	(0.104)
γ	0.034***	0.035***	0.012	0.055**	0.076***
	(0.012)	(0.013)	(0.017)	(0.025)	(0.026)
ρ	0.947***	0.927***	0.949***	0.953***	0.982***
	(0.022)	(0.025)	(0.024)	(0.030)	(0.026)
α	0.023	0.440*	0.161	0.371	0.474
	(0.134)	(0.233)	(0.279)	(0.369)	(0.368)
θ_{TP^M}		-0.649**	-0.507	-0.952**	-0.970**
		(0.276)	(0.305)	(0.447)	(0.424)
$\theta_{TP^{FS}}$		-0.917*	-0.616	-1.321**	-1.168**
		(0.480)	(0.412)	(0.566)	(0.537)
θ_{Sent^M}			0.496**	0.671***	0.691***
			(0.199)	(0.225)	(0.224)
$\theta_{Sent^{FS}}$			0.012	0.041	0.062
			(0.080)	(0.107)	(0.105)
φ_{ZLB}				-0.662*	-1.012**
				(0.349)	(0.420)
φ_{TP^M}				0.915**	1.521***
				(0.463)	(0.516)
$\varphi_{TP^{FS}}$				2.143***	2.610***
				(0.809)	(0.933)
φ_{Sent^M}				-1.154***	-0.772**
				(0.303)	(0.328)
$\varphi_{Sent^{FS}}$				-0.006	-0.122
				(0.144)	(0.192)
Wald Tests (χ^2)					
$\theta_{TP^M} + \varphi_{TP^M} = 0$				0.04	2.90*
$\theta_{TP^{FS}} + \varphi_{TP^{FS}} = 0$				4.12**	5.09**
$\theta_{Sent^M} + \varphi_{Sent^M} = 0$				4.12**	0.09
$\theta_{Sent^{FS}} + \varphi_{Sent^{FS}} = 0$				0.14	0.14
Sample	2000-2018	2000-2018	2000-2018	2000-2018	2000-2018
N	152	152	152	152	152
R^2	0.971	0.973	0.975	0.979	0.985
RMSE	0.341	0.332	0.324	0.303	0.325

Note: The table shows the Taylor rule estimation results, derived by the OLS regression of equation (5), covering the period from January 2000 to December 2018. The specified variables are regressed on the effective federal funds rate (FFR). In column (5), the FFR is replaced with the estimated shadow rates from Wu and Xia (2016) during the ZLB period. β represents the four-quarter forecast of the inflation gap, and γ represents the four-quarter forecast of the output gap, both derived from Greenbook forecasts. ρ denotes the lagged FFR, and α represents the constant. TPM, TPFS, SentM, and SentFS are the sentiment (Sent) and topic proportion (TP) variables related to mandate objectives (M) and financial stability (FS). θ represents the period outside the zero lower bound (ZLB), while φ captures the interaction of these variables with the ZLB dummy variable. The ZLB dummy is set to one for the period from December 2008 to December 2015. Statistical significance at the 90%, 95%, and 99% levels is indicated by *, **, and ***, respectively. Bootstrapped standard errors are reported in parentheses. Sentiment is measured using the fine-tuned RoBERTa model, as described in section 3.3.

Table A3: Sentiment Regression: Introductory Statement and Q&A Session without Financial Conditions in the aggregated Financial Stability Topic (2011 - 2018)

	Statement		Q&A Session	
	(1)	(2)	(3)	(4)
ζ	-0.155	-0.164	-0.243	-0.184
	(0.185)	(0.182)	(0.191)	(0.216)
β	-0.069	-0.026	0.037	0.019
	(0.096)	(0.109)	(0.052)	(0.077)
γ	0.020*	0.009	0.008*	0.009
	(0.010)	(0.012)	(0.005)	(0.006)
α	0.246	0.085	-0.041	-0.035
	(0.176)	(0.203)	(0.086)	(0.155)
θ_{TP^M}		0.193		0.020
		(0.150)		(0.150)
$\theta_{TP^{FS}}$		-0.444		0.115
		(0.300)		(0.281)
θ_{SentM}		0.450***		-0.032
		(0.112)		(0.090)
θ_{SentFS}		-0.013		0.090**
		(0.052)		(0.040)
Sample	2011-2018	2011-2018	2011-2018	2011-2018
N	31	31	31	31
R^2	0.642	0.715	0.153	0.264
RMSE	0.070	0.065	0.062	0.062

Note: The table shows the sentiment regression results of equation (8), covering the period from April 2011 to December 2018. In columns (1) and (2), the specified variables are regressed on the sentiment of the Introductory Statement delivered during the press conference immediately following the FOMC meeting. Columns (3) and (4) show the regression results where the dependent variable is the sentiment of the Fed Chair's responses during the Question and Answer session of the same press conference. Sentiment is measured using the fine-tuned RoBERTa model, as described in section 3.3. Statistical significance at the 90%, 95%, and 99% levels is denoted by *, **, and ***, respectively. Bootstrapped standard errors are shown in parentheses.

B. Fine-tuning Approach

To train the LLMs, we created a dataset consisting of 2,000 randomly selected sentences from the discussion sections of the Minutes spanning the years 1993 to 2022. These sentences were independently classified by two experts into three sentiment categories—Negative, Neutral, and Positive—from the perspective of the Federal Reserve. To ensure uniform classification, each sentence was evaluated based solely on the information contained within it. This approach implies that sentences about rising or falling inflation rates are classified as positive or negative only if it is explicitly clear that the direction of the inflation rate aligns with the mandate. Otherwise, these sentences are classified as neutral. After classification, the dataset comprised 793 neutral sentences, 648 negative sentences, and 559 positive sentences. This dataset was used to train two different LLMs: FinBERT and RoBERTa.

The fine-tuning process for the RoBERTa model is described here, with the same approach applied to the FinBERT model. The dataset was split into training (70%), validation (15%), and test (15%) sets using stratified sampling to preserve the distribution of sentiment labels across the splits. A pre-trained RoBERTa model (`roberta-base`) was selected for adaptation to classify three sentiment classes. The tokenizer and model were obtained from the Hugging Face library. The text data was tokenized using the `RobertaTokenizer` with a maximum sequence length of 512 tokens. Padding and truncation were applied to ensure uniform sequence lengths compatible with the RoBERTa model's input requirements.

A comprehensive grid search was conducted across multiple combinations of hyperparameters, with a particular focus on optimizing the learning rate and batch size. A range of values for the learning rate was tested, from $1e^{-7}$ to $1e^{-4}$. In addition, four values for the batch size were tested: 16, 32, 64, and 128. Each hyperparameter combination was subjected to a systematic evaluation using a weighted F1 score and accuracy on the validation dataset, thereby ensuring a comprehensive search for the optimal configuration. An evaluation was conducted at the conclusion of each epoch to ascertain the accuracy and F1 score on the validation set. The final evaluation metrics were logged, and the best model was selected based on the lowest validation loss and highest F1 score.

Once the optimal hyperparameters were identified, the model was retrained using the best settings: a learning rate of $4e^{-5}$, a batch size of 64, and 8 epochs, with 50 warm-up steps. To maximize training data, the training and validation sets were merged, and the model was fine-tuned again. The final fine-tuned model was saved for subsequent evaluation on the test set. The performance of the model was then assessed on the test dataset. The results

of the model performance, based on the 300 test sentences, are presented in Table B1.

Table B1: Classification Reports and Hyperparameters

	Fine-tuned RoBERTa Model			
	Precision	Recall	F1-Score	Support
Neutral	0.84	0.73	0.78	119
Positive	0.72	0.81	0.76	84
Negative	0.81	0.86	0.83	97
Accuracy			0.79	300
Macro Avg	0.79	0.80	0.79	300
Weighted Avg	0.80	0.79	0.79	300

	Fine-tuned FinBERT Model			
	Precision	Recall	F1-Score	Support
Neutral	0.82	0.82	0.82	119
Positive	0.72	0.65	0.69	84
Negative	0.70	0.76	0.73	97
Accuracy			0.75	300
Macro Avg	0.75	0.74	0.75	300
Weighted Avg	0.75	0.75	0.75	300

	FinBERT Base Model			
	Precision	Recall	F1-Score	Support
Neutral	0.79	0.71	0.75	119
Positive	0.70	0.57	0.63	84
Negative	0.62	0.80	0.70	97
Accuracy			0.70	300
Macro Avg	0.70	0.69	0.69	300
Weighted Avg	0.71	0.70	0.70	300

	Best Parameters		
Model	Learning Rate	Batch Size	Num Epochs
FinBert	4×10^{-5}	64	3
RoBERTa	4×10^{-5}	16	4

Note: The table presents the evaluation scores for the LLMs and the parameters used during the fine-tuning process. The model evaluation is based on three key metrics: precision, recall, and F1-score, with the F1-score representing a harmonic mean of the first two. The "Support" column indicates the number of sentences labeled in each sentiment category. In total, the test dataset comprises 300 labeled sentences. For all metrics, higher values are preferable. The table also includes accuracy, which measures the overall proportion of correct predictions. Macro average treats each class equally by averaging the scores across categories, while weighted average accounts for the class size, giving more weight to larger categories. The parameters used to train the models include learning rate, batch size, and the number of epochs. The models were selected based on the minimization of training loss.

C. Unemployment Gap Results

Table C1: Regression Results: Taylor Rule Estimations (2000 - 2018)

	FFR	FFR	FFR	FFR	Shadow Rate
	(1)	(2)	(3)	(4)	(5)
β	0.085	0.157	0.213*	0.337***	0.205*
	(0.090)	(0.099)	(0.109)	(0.120)	(0.118)
γ	0.024**	0.027**	0.007	0.025	0.052**
	(0.010)	(0.012)	(0.015)	(0.018)	(0.020)
ρ	0.950***	0.932***	0.955***	0.952***	0.981***
	(0.022)	(0.025)	(0.024)	(0.031)	(0.027)
α	-0.017	0.417*	0.140	0.147	0.320
	(0.141)	(0.242)	(0.283)	(0.353)	(0.352)
θ_{TP^M}		-0.674**	-0.558*	-0.760*	-0.816**
		(0.292)	(0.312)	(0.437)	(0.410)
$\theta_{TP^{FS}}$		-0.698**	-0.335	-1.190**	-1.011**
		(0.374)	(0.342)	(0.544)	(0.513)
θ_{Sent^M}			0.496***	0.754***	0.758***
			(0.186)	(0.225)	(0.225)
$\theta_{Sent^{FS}}$			0.038	0.045	0.066
			(0.094)	(0.111)	(0.110)
φ_{ZLB}				-0.528	-0.895**
				(0.338)	(0.397)
φ_{TP^M}				0.675	1.247**
				(0.432)	(0.484)
$\varphi_{TP^{FS}}$				1.573**	2.304***
				(0.695)	(0.804)
φ_{Sent^M}				-0.958***	-0.752**
				(0.282)	(0.317)
$\varphi_{Sent^{FS}}$				-0.095	-0.060
				(0.163)	(0.184)
Wald Tests (χ^2)					
$\theta_{TP^M} + \varphi_{TP^M} = 0$				0.21	1.79
$\theta_{TP^{FS}} + \varphi_{TP^{FS}} = 0$				1.55	6.28**
$\theta_{Sent^M} + \varphi_{Sent^M} = 0$				1.15	0.00
$\theta_{Sent^{FS}} + \varphi_{Sent^{FS}} = 0$				0.19	0.00
Sample	2000-2018	2000-2018	2000-2018	2000-2018	2000-2018
N	152	152	152	152	152
R^2	0.971	0.972	0.974	0.978	0.984
RMSE	0.344	0.337	0.329	0.309	0.330

Note: The table shows the Taylor rule estimation results, derived by the OLS regression of equation (5), covering the period from January 2000 to December 2018. The specified variables are regressed on the effective federal funds rate (FFR). In column (5), the FFR is replaced with the estimated shadow rates from Wu and Xia (2016) during the ZLB period. β represents the four-quarter forecast of the inflation gap and γ represents the four-quarter forecast of the unemployment gap, both derived from the Greenbook forecasts. ρ denotes the lagged FFR, and α represents the constant. TP^M, TP^{FS}, $Sent^M$, and $Sent^{FS}$ are the sentiment (Sent) and topic proportion (TP) variables related to mandate objectives (M) and financial stability (FS). θ represents the period outside the zero lower bound (ZLB), while φ captures the interaction of these variables with the ZLB dummy variable. The ZLB dummy is set to one for the period from December 2008 to December 2015. Statistical significance at the 90%, 95%, and 99% levels is indicated by *, **, and ***, respectively. Bootstrapped standard errors are reported in parentheses. Sentiment is measured using the fine-tuned RoBERTa model, as described in section 3.3.

Table C2: Sentiment Regression: Q&A Session (2011 - 2018)

	Statement		Q&A Session	
	(1)	(2)	(3)	(4)
ζ	-0.021	-0.232	-0.243	-0.184
	(0.254)	(0.170)	(0.190)	(0.213)
β	-0.018	-0.030	0.043	0.051
	(0.115)	(0.094)	(0.048)	(0.067)
γ	0.029**	0.007	0.008*	0.004
	(0.011)	(0.013)	(0.004)	(0.007)
α	0.178	0.018	-0.052	-0.105
	(0.208)	(0.205)	(0.080)	(0.157)
θ_{TP^M}		0.293**		0.066
		(0.173)		(0.184)
$\theta_{TP^{FS}}$		-0.251		-0.059
		(0.210)		(0.216)
θ_{Sent^M}		0.470***		0.009
		(0.105)		(0.092)
$\theta_{Sent^{FS}}$		-0.020		0.060
		(0.049)		(0.043)
Sample	2011-2018	2011-2018	2011-2018	2011-2018
N	31	31	31	31
R^2	0.459	0.734	0.157	0.222
RMSE	0.082	0.063	0.062	0.064

Note: The table shows the sentiment regression results of equation (8), covering the period from April 2011 to December 2018. In columns (1) and (2), the specified variables are regressed on the sentiment of the Introductory Statement delivered during the press conference immediately following the FOMC meeting. Columns (3) and (4) show the regression results where the dependent variable is the sentiment of the Fed Chair's responses during the Question and Answer session of the same press conference. Sentiment is measured using the fine-tuned RoBERTa model, as described in section 3.3. Statistical significance at the 90%, 95%, and 99% levels is denoted by *, **, and ***, respectively. Bootstrapped standard errors are shown in parentheses.

D. Alternative Shadow Rate Estimates

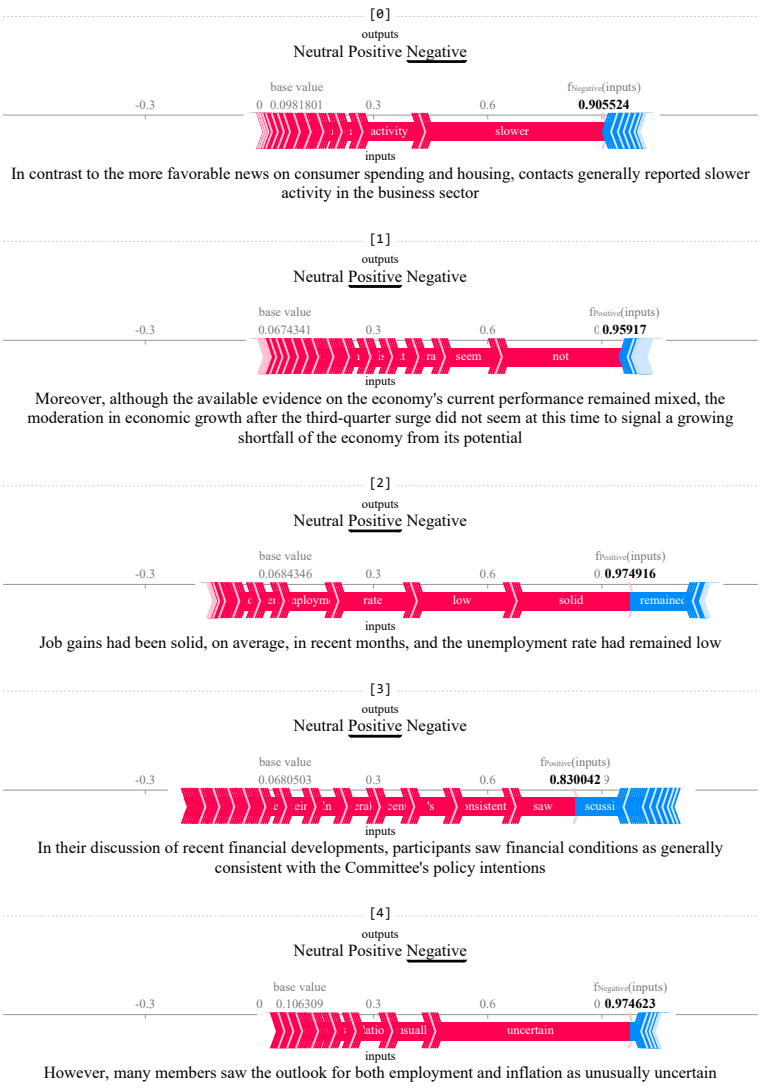
Table D1: Regression Results: Taylor Rule Estimations Using Shadow Rates from Krippner (2000–2018)

	Shadow Rate (Krippner)	
	(1)	(2)
β	0.223**	0.250**
	(0.111)	(0.119)
γ	0.085***	0.049**
	(0.027)	(0.021)
ρ	0.958***	0.967***
	(0.022)	(0.023)
α	0.573	0.311
	(0.392)	(0.371)
θ_{TP^M}	-1.106**	-0.848**
	(0.445)	(0.419)
$\theta_{TP^{FS}}$	-1.328**	-1.116**
	(0.521)	(0.521)
θ_{Sent^M}	0.602***	0.730***
	(0.220)	(0.223)
$\theta_{Sent^{FS}}$	0.060	0.058
	(0.106)	(0.110)
φ_{ZLB}	-0.473	-0.345
	(0.560)	(0.563)
φ_{TP^M}	0.394	0.155
	(0.734)	(0.735)
$\varphi_{TP^{FS}}$	2.943***	2.639***
	(0.953)	(0.923)
φ_{Sent^M}	0.464	0.436
	(0.466)	(0.476)
$\varphi_{Sent^{FS}}$	-0.275	-0.271
	(0.223)	(0.227)
Wald Tests (χ^2)		
$\theta_{TP^M} + \varphi_{TP^M} = 0$	1.38	1.27
$\theta_{TP^{FS}} + \varphi_{TP^{FS}} = 0$	5.12**	4.86**
$\theta_{Sent^M} + \varphi_{Sent^M} = 0$	6.65***	7.87***
$\theta_{Sent^{FS}} + \varphi_{Sent^{FS}} = 0$	1.16	1.09
γ	Output Gap	Unemployment Gap
Sample	2000-2018	2000-2018
N	152	152
R^2	0.984	0.984
RMSE	0.354	0.364

Note: The table shows the Taylor rule estimation results, derived by the OLS regression of equation (5), covering the period from January 2000 to December 2018. The specified variables are regressed on the effective federal funds rate (FFR). During the ZLB period, the FFR in columns (1) and (2) is substituted with the estimated shadow rates from Krippner (2013). β represents the four-quarter forecast of the inflation gap and γ represents the four-quarter forecast of the unemployment gap, both derived from the Greenbook forecasts. ρ denotes the lagged FFR, and α represents the constant. TP^M, TP^{FS}, $Sent^M$, and $Sent^{FS}$ are the sentiment (Sent) and topic proportion (TP) variables related to mandate objectives (M) and financial stability (FS). θ represents the period outside the zero lower bound (ZLB), while φ captures the interaction of these variables with the ZLB dummy variable. The ZLB dummy is set to one for the period from December 2008 to December 2015. Statistical significance at the 90%, 95%, and 99% levels is indicated by *, **, and ***, respectively. Bootstrapped standard errors are reported in parentheses. Sentiment is measured using the fine-tuned RoBERTa model, as described in section 3.3.

E. Sentiment Indicator Explanation

Figure E1: Shap Value Impact Examples



Note: The figure illustrates the influence of individual tokens on sentiment classification for various sentences, as determined by our fine-tuned RoBERTa model. For each sentence, we display the calculation only for the sentiment category to which the sentence was assigned. A sentence is classified into the category with the highest probability score. The base value represents the probability of a sentence being classified into a sentiment category when all tokens are masked. The contributions of each token are then added to this base value, yielding the $f_{LABEL_i}(inputs)$ value. The intensity of the color reflects the contribution of each token, with more intense colors indicating a greater contribution. Tokens highlighted in red increase the probability of the assigned class, while those in blue decrease it.

F. Taylor Rule Regression with Financial Stability and Condition Indicators

Table F1: Regression Results: Taylor Rule Estimations with Different Financial Indicators on FFR

	NFCI	VIX	FSI	KCFSI	NFCI	VIX	FSI	KCFSI
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
β	0.332***	0.182*	0.219*	0.273**	-0.038	-0.039	-0.041	-0.035
	(0.115)	(0.110)	(0.113)	(0.116)	(0.052)	(0.051)	(0.052)	(0.053)
γ	0.040	0.048*	0.041	0.042*	0.009	0.007	0.008	0.011*
	(0.026)	(0.026)	(0.026)	(0.025)	(0.007)	(0.007)	(0.006)	(0.007)
ρ	0.946***	0.961***	0.961***	0.960***	0.993***	0.998***	0.993***	1.005***
	(0.029)	(0.028)	(0.028)	(0.028)	(0.077)	(0.047)	(0.065)	(0.059)
α	0.070	0.874**	0.502*	0.339	0.387	0.418	0.399	0.368**
	(0.409)	(0.435)	(0.382)	(0.376)	(0.456)	(0.470)	(0.401)	(0.425)
θ_{TP^M}	-0.885*	-0.980**	-0.972**	-0.924**	-0.265	-0.261	-0.260	-0.210
	(0.463)	(0.474)	(0.463)	(0.459)	(0.492)	(0.489)	(0.489)	(0.537)
$\theta_{TP^{FS}}$	-0.699	-1.142**	-1.132**	-1.042**	-0.799	-0.798	-0.798	-0.826
	(0.544)	(0.511)	(0.504)	(0.511)	(0.540)	(0.531)	(0.531)	(0.532)
θ_{Sent^M}	0.444**	0.400*	0.381*	0.424*	0.826**	0.838***	0.822**	0.902***
	(0.211)	(0.210)	(0.217)	(0.225)	(0.346)	(0.309)	(0.337)	(0.337)
$\theta_{Sent^{FS}}$	-0.028	0.051	0.046	0.026	-0.116	-0.127	-0.122	-0.059
	(0.110)	(0.103)	(0.103)	(0.106)	(0.177)	(0.216)	(0.170)	(0.205)
$\theta_{Indicator}$	-0.314*	-0.018**	-0.066**	-0.125**	-0.037	-0.001	-0.011	0.064
	(0.168)	(0.008)	(0.028)	(0.061)	(0.566)	(0.012)	(0.085)	(0.189)
φ_{ZLB}	-0.341	-0.966**	-0.596*	-0.535*	-0.347	-0.346	-0.362	-0.293
	(0.332)	(0.384)	(0.326)	(0.324)	(0.469)	(0.470)	(0.408)	(0.427)
φ_{TP^M}	0.790*	0.803*	0.836*	0.831*	0.261*	0.278	0.271*	0.181
	(0.449)	(0.444)	(0.440)	(0.446)	(0.497)	(0.493)	(0.494)	(0.540)
$\varphi_{TP^{FS}}$	0.936	1.234**	1.287**	1.203*	1.018*	1.038*	1.032*	1.022*
	(0.663)	(0.595)	(0.601)	(0.623)	(0.552)	(0.545)	(0.544)	(0.543)
φ_{Sent^M}	-0.605**	-0.588**	-0.559**	-0.576**	-0.972***	-0.981***	-0.967***	-1.040***
	(0.281)	(0.253)	(0.249)	(0.270)	(0.350)	(0.314)	(0.340)	(0.340)
$\varphi_{Sent^{FS}}$	0.021	-0.042	-0.055	-0.026	0.156	0.160	0.163	0.096
	(0.160)	(0.148)	(0.147)	(0.153)	(0.183)	(0.220)	(0.175)	(0.210)
$\varphi_{Indicator}$	0.385**	0.234***	0.085**	0.165**	0.012	-0.001	0.001	-0.057
	(0.184)	(0.008)	(0.035)	(0.065)	(0.565)	(0.012)	(0.085)	(0.189)
Wald Tests (χ^2)								
$\theta_{TP^M} + \varphi_{TP^M} = 0$	0.24	0.90	0.53	0.26	0.00	0.08	0.03	0.18
$\theta_{TP^{FS}} + \varphi_{TP^{FS}} = 0$	0.52	0.10	0.25	0.27	3.89**	4.79**	4.58**	3.26*
$\theta_{Sent^M} + \varphi_{Sent^M} = 0$	0.61	1.11	0.90	0.63	5.14**	4.33**	4.82**	4.22**
$\theta_{Sent^{FS}} + \varphi_{Sent^{FS}} = 0$	0.00	0.01	0.01	0.00	1.11	0.80	1.20	0.91
Sample	2000-2018	2000-2018	2000-2018	2000-2018	2010-2018	2010-2018	2010-2018	2010-2018
N	152	152	152	152	72	72	72	72
R^2	0.980	0.980	0.981	0.980	0.991	0.991	0.991	0.991
RMSE	0.293	0.291	0.292	0.292	0.066	0.066	0.066	0.0662

Note: The table shows the Taylor rule estimation results, derived by the OLS regression of equation (5), covering the period from January 2000 to December 2018. The specifications include an additional variable controlling for a financial indicator, using the average of the indicators between two FOMC meetings. The specified variables are regressed on the effective federal funds rate (FFR). β represents the four-quarter forecast of the inflation gap, and γ represents the four-quarter forecast of the output gap, both derived from Greenbook forecasts. ρ denotes the lagged FFR, and α represents the constant. TP^M, TP^{FS}, $Sent^M$, and $Sent^{FS}$ are the sentiment (Sent) and topic proportion (TP) variables related to mandate objectives (M) and financial stability (FS). The financial *indicator* included as an additional control variable is specified in each column name. θ represents the period outside the zero lower bound (ZLB), while φ captures the interaction of these variables with the ZLB dummy variable. The ZLB dummy is set to one for the period from December 2008 to December 2015. Statistical significance at the 90%, 95%, and 99% levels is indicated by *, **, and ***, respectively. Bootstrapped standard errors are reported in parentheses. Sentiment is measured using the fine-tuned RoBERTa model, as described in section 3.3.

Table F2: Regression Results: Taylor Rule Estimations with Different Financial Indicators on FFR and Shadow Rates

	NFCI	VIX	FSI	KCFSI	NFCI	VIX	FSI	KCFSI
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
β	0.276**	0.146	0.188*	0.227**	-0.045	-0.076	-0.022	-0.041
	(0.111)	(0.108)	(0.109)	(0.112)	(0.120)	(0.131)	(0.120)	(0.120)
γ	0.068**	0.081***	0.073***	0.071***	0.076***	0.062**	0.074***	0.077***
	(0.027)	(0.026)	(0.027)	(0.026)	(0.024)	(0.026)	(0.024)	(0.025)
ρ	0.961***	0.970***	0.968***	0.971***	1.058***	1.053***	1.062***	1.048***
	(0.026)	(0.025)	(0.025)	(0.025)	(0.051)	(0.047)	(0.051)	(0.045)
α	0.243	0.995**	0.642*	0.489	0.791	0.597	0.581	0.472
	(0.398)	(0.433)	(0.377)	(0.370)	(0.490)	(0.651)	(0.518)	(0.518)
θ_{TP^M}	-1.022**	-1.153***	-1.134***	-1.068**	-0.425	-0.603	-0.559	-0.318
	(0.433)	(0.443)	(0.433)	(0.431)	(0.536)	(0.664)	(0.598)	(0.624)
$\theta_{TP^{FS}}$	-0.764	-1.202**	-1.198**	-1.080**	-1.085*	-1.230	-1.154*	-1.257**
	(0.516)	(0.471)	(0.468)	(0.477)	(0.572)	(0.761)	(0.650)	(0.611)
θ_{Sent^M}	0.437**	0.376*	0.370*	0.407*	0.893**	0.592*	0.810**	0.911***
	(0.207)	(0.206)	(0.214)	(0.224)	(0.348)	(0.334)	(0.355)	(0.338)
$\theta_{Sent^{FS}}$	0.005	0.075	0.072	0.052	0.162	0.140	0.198	0.258
	(0.109)	(0.101)	(0.102)	(0.105)	(0.191)	(0.250)	(0.200)	(0.218)
$\theta_{Indicator}$	-0.278*	-0.016**	-0.057**	-0.114**	0.821*	0.004	0.132	0.280**
	(0.162)	(0.008)	(0.027)	(0.058)	(0.536)	(0.014)	(0.095)	(0.198)
φ_{ZLB}	-0.783**	-1.519***	-1.007**	-1.020***	-0.442	-0.747	-0.438	-0.350
	(0.378)	(0.444)	(0.378)	(0.380)	(0.507)	(0.655)	(0.549)	(0.563)
φ_{TP^M}	1.471***	1.444***	1.477***	1.536***	0.800*	1.142	0.921	0.727
	(0.499)	(0.492)	(0.492)	(0.501)	(0.597)	(0.711)	(0.655)	(0.688)
$\varphi_{TP^{FS}}$	1.737**	2.001***	2.020***	2.053***	1.557**	1.863**	1.608**	1.802**
	(0.770)	(0.710)	(0.708)	(0.729)	(0.705)	(0.878)	(0.779)	(0.750)
φ_{Sent^M}	-0.288	-0.273	-0.247	-0.266	-0.415	-0.220	-0.377	-0.471
	(0.300)	(0.277)	(0.287)	(0.299)	(0.423)	(0.417)	(0.432)	(0.416)
$\varphi_{Sent^{FS}}$	0.116	0.071	0.047	0.054	-0.183	-0.101	-0.208	-0.263
	(0.175)	(0.165)	(0.160)	(0.167)	(0.226)	(0.277)	(0.235)	(0.253)
$\varphi_{Indicator}$	0.465**	0.030***	0.121***	0.193***	-0.371	0.003	-0.029	-0.082
	(0.194)	(0.009)	(0.039)	(0.074)	(0.554)	(0.015)	(0.099)	(0.206)
Wald Tests (χ^2)								
$\theta_{TP^M} + \varphi_{TP^M} = 0$	1.92	0.83	1.12	2.10	1.64	2.79*	1.35	1.80
$\theta_{TP^{FS}} + \varphi_{TP^{FS}} = 0$	3.68*	2.62	2.80*	3.86**	1.35	1.96	1.15	1.59
$\theta_{Sent^M} + \varphi_{Sent^M} = 0$	0.38	0.21	0.29	0.36	4.89**	2.61	3.86**	3.94**
$\theta_{Sent^{FS}} + \varphi_{Sent^{FS}} = 0$	0.79	1.22	0.92	0.66	0.04	0.13	0.01	0.00
Sample	2000-2018	2000-2018	2000-2018	2000-2018	2010-2018	2010-2018	2010-2018	2010-2018
N	152	152	152	152	72	72	72	72
R^2	0.986	0.986	0.986	0.986	0.990	0.988	0.990	0.990
RMSE	0.310	0.307	0.308	0.310	0.156	0.168	0.159	0.160

Note: The table shows the Taylor rule estimation results, derived by the OLS regression of equation (5), covering the period from January 2000 to December 2018. The specifications include an additional variable controlling for a financial indicator, using the average of the indicators between two FOMC meetings. The specified variables are regressed on the effective federal funds rate (FFR), which is replaced with the estimated shadow rates from Wu and Xia (2016) during the ZLB period. β represents the four-quarter forecast of the inflation gap, and γ represents the four-quarter forecast of the output gap, both derived from Greenbook forecasts. ρ denotes the lagged FFR, and α represents the constant. TP^M, TP^{FS}, $Sent^M$, and $Sent^{FS}$ are the sentiment (Sent) and topic proportion (TP) variables related to mandate objectives (M) and financial stability (FS). The financial *indicator* included as an additional control variable is specified in each column name. θ represents the period outside the zero lower bound (ZLB), while φ captures the interaction of these variables with the ZLB dummy variable. The ZLB dummy is set to one for the period from December 2008 to December 2015. Statistical significance at the 90%, 95%, and 99% levels is indicated by *, **, and ***, respectively. Bootstrapped standard errors are reported in parentheses. Sentiment is measured using the fine-tuned RoBERTa model, as described in section 3.3.

G. Sentiment Regression with SPF instead of Greenbook Forecasts

One caveat of our sentiment regression is the constrained sample size due to the five-year publication lag of the Greenbook forecasts. To analyze whether our results remain valid when considering COVID-19 and the inflation increase in 2021, we replace the Greenbook forecasts with the SPF data. Utilizing the SPF forecasts, we can double our sample size since the frequency of press conferences increased from January 2019 onwards.[30] Therefore, we estimate equation (8) with the sentiment variable for the press conference statement and the Q&A session but with the SPF forecasts and present the results in table (G1).

The estimations in table (G1) confirm the previous results and demonstrate further robustness even when extending the sample to include the COVID-19 pandemic and the rise in inflation since 2021. Accordingly, an increase in positive sentiment about mandate objectives leads to more positive communication in the introductory statement. At the same time, we estimate no effect on the Fed chair's answers to the journalists during the Q&A session. The inflation and output gap estimations are consistent with what one would expect.

[30]Because SPF forecasts are published quarterly, extending our time period introduces the limitation of using constant values within each quarter.

Table G1: Sentiment Regression with SPF: Introductory Statement and Q&A Session (2011-2022)

	2011-2022			
	PC	PC	Q&A	Q&A
	(1)	(2)	(3)	(4)
ζ	0.035	-0.077	-0.168	-0.134
	(0.144)	(0.112)	(0.128)	(0.125)
β	-0.200***	-0.116**	-0.018	-0.003
	(0.046)	(0.048)	(0.014)	(0.017)
γ	0.026***	0.012**	0.007***	0.003
	(0.006)	(0.005)	(0.002)	(0.002)
α	0.474***	0.252**	0.059*	-0.056
	(0.103)	(0.128)	(0.032)	(0.070)
θ_{TP^M}		0.117		0.120
		(0.108)		(0.082)
$\theta_{TP^{FS}}$		-0.139		0.026
		(0.108)		(0.095)
θ_{Sent^M}		0.436***		0.018
		(0.065)		(0.044)
$\theta_{Sent^{FS}}$		0.011		0.043**
		(0.036)		(0.020)
Sentiment	RoBERTa	RoBERTa	RoBERTa	RoBERTa
N	63	63	63	63
R^2	0.515	0.723	0.129	0.232
RMSE	0.093	0.073	0.052	0.050

Note: The table presents the sentiment regression results for equations (8) using SPF data, covering the period from April 2011 to December 2022. In columns (1) and (2), the specified variables are regressed on the sentiment of the Introductory Statement delivered during the press conference immediately following the FOMC meeting. Columns (3) and (4) show the regression results where the dependent variable is the sentiment of the Fed Chair's responses during the Question and Answer session of the same press conference. Sentiment is measured using the fine-tuned RoBERTa model, as detailed in section 3.3. Statistical significance at the 90%, 95%, and 99% levels is indicated by *, **, and ***, respectively. Bootstrapped standard errors are provided in parentheses.

H. Strutural Topic Model Examples

Table H1: Topic Examples: Financial Stability

Topic	Gamma	Date	Paragraph
2	0.64	2009-04-29	In these circumstances, the Federal Reserve will employ all available tools to promote economic recovery and to preserve price stability. The Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent and anticipates that economic conditions are likely to warrant exceptionally low levels of the federal funds rate for an extended period. As previously announced, to provide support to mortgage lending and housing markets and to improve overall conditions in private credit markets, the Federal Reserve will purchase a total of up to $1.25 trillion of agency mortgage-backed securities and up to $200 billion of agency debt by the end of the year. In addition, the Federal Reserve will buy up to $300 billion of Treasury securities by autumn. The Committee will continue to evaluate the timing and overall amounts of its purchases of securities in light of the evolving economic outlook and conditions in financial markets. The Federal Reserve is facilitating the extension of credit to households and businesses and supporting the functioning of financial markets through a range of liquidity programs. The Committee will continue to carefully monitor the size and composition of the Federal Reserve's balance sheet in light of financial and economic developments.
2	0.92	2011-09-21	Most members also supported a change in the Committee's reinvestment policy. To help support conditions in mortgage markets, the Committee decided to reinvest principal received from its holdings of agency debt and agency MBS in agency MBS rather than continuing to reinvest in longer-term Treasury securities as had been the Committee's practice for more than a year. The effect of this change will be to keep the SOMA's holdings of agency securities at an approximately constant level; under the previous practice, those holdings were declining on an ongoing basis. This change in reinvestment policy was expected to help reduce the spread between yields on mortgage-backed securities and those on comparable-maturity Treasury securities seen this year and so contribute to lower mortgage rates. Members also noted that the change in reinvestment policy could help prevent the shares of outstanding longer-term Treasury securities held by the Federal Reserve from reaching levels high enough to result in a deterioration in Treasury market functioning. One member who opposed the maturity extension program also opposed the change in reinvestment policy because he judged that it would not benefit housing markets. At the same time, the Committee decided to maintain its existing policy of rolling over maturing Treasury securities at auction.
2	0.93	2015-10-28	The Committee also maintained its policy of reinvesting principal payments from its agency debt and agency mortgage-backed securities in agency mortgage-backed securities and of rolling over maturing Treasury securities at auction. This policy, by keeping the Committee's holdings of longer-term securities at sizable levels, should help maintain accommodative financial conditions.
2	0.94	2016-03-16	The Committee also decided to maintain 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, and it anticipated doing so until normalization of the level of the federal funds rate is well under way. This policy, by keeping the Committee's holdings of longer-term securities at sizable levels, should help maintain accommodative financial conditions.

(continued)

Topic	Gamma	Date	Paragraph
2	0.72	2020-03-15	Participants also considered open market operations to purchase Treasury securities and agency MBS to support the smooth functioning of these securities markets, which in turn would help support the supply of credit to households and businesses. Participants generally agreed that, over the coming months, it would be appropriate to increase the Federal Reserve's holdings of Treasury securities by at least $500 billion and its holdings of agency MBS by at least $200 billion. Additionally, all principal payments from the Federal Reserve's holdings of agency debt and agency MBS would be reinvested in agency MBS. Those Treasury and agency MBS purchases would be in addition to the recently expanded overnight and term repo operations conducted by the Desk. Participants stressed that it was important to communicate that the Committee would be prepared to increase the size of the securities purchases, as needed, on the basis of its close monitoring of market conditions. Some participants noted that it was important to stress in communications that the primary purpose of these asset purchases was to support the smooth functioning of Treasury and agency MBS markets rather than to provide further monetary policy accommodation by pushing down longer-term yields. A couple of participants noted that because some of the purchases would be at longer maturities, the purchases could provide some accommodation by lowering longer-term yields.
2	0.93	2020-04-29	To support the flow of credit to households and businesses, members agreed that it was appropriate for the Federal Reserve to continue to purchase Treasury securities and agency RMBS and CMBS in the amounts needed to support smooth market functioning, thereby fostering effective transmission of monetary policy to broader financial conditions. In addition, the Desk would continue to offer large-scale overnight and term repo operations. Members agreed that they would closely monitor market conditions and be prepared to adjust their plans as appropriate.
3	0.82	2007-12-11	Participants discussed in detail the resurgence of stresses in financial markets in November. The renewed stresses reflected evidence that the performance of mortgage-related assets was deteriorating further, potentially increasing the losses that were being borne in part by a number of major financial firms, including money-center banks, housing-related government-sponsored enterprises, investment banks, and financial guarantors. Moreover, participants recognized that some lenders might be exposed to additional losses: Delinquency rates on credit card loans, auto loans, and other forms of consumer credit, while still moderate, had increased somewhat, particularly in areas hard hit by house price declines and mortgage defaults. Past and prospective losses appeared to be spurring lenders to tighten further the terms on new extensions of credit, not just in the troubled markets for nonconforming mortgages but, in some cases, for other forms of credit as well. In addition, participants noted that some intermediaries were facing balance sheet pressures and could become constrained by concerns about rating-agency or regulatory capital requirements. Among other factors, banks were experiencing unanticipated growth in loans as a result of continuing illiquidity in the market for leveraged loans, persisting problems in the commercial paper market that had sparked draws on back-up lines of credit, and more recently, consolidation of assets of off-balance-sheet affiliates onto banks' balance sheets.

(continued)

Topic	Gamma	Date	Paragraph
3	0.90	2008-10-29	Participants noted that financial conditions had worsened significantly over the intermeeting period. The failure or near failure of a number of major financial institutions had deepened market concerns about counterparty credit risk and liquidity risk. As a result, financial intermediaries had cut back on lending to some counterparties, particularly for terms beyond overnight, and in general were conserving liquidity and capital. Moreover, risk aversion of investors increased, driving credit spreads sharply higher. Survey results and anecdotal information also suggested that credit conditions had tightened significantly further for businesses and households. Equity prices had varied widely and were substantially lower, on net. Participants saw the potential for financial strains to intensify if some investors, such as hedge funds, found it necessary to sell assets and as lending institutions built reserves against losses. Participants were concerned that the negative spiral in which financial strains lead to weaker spending, which in turn leads to higher loan losses and a further deterioration in financial conditions, could persist for a while longer. While the global efforts to recapitalize banks and guarantee deposits had helped stabilize the situation, risk spreads remained higher, asset prices lower, and credit conditions tighter than prior to the recent disruptions. Moreover, some participants noted that the specifics and effectiveness of some government programs to support financial markets and institutions remained unclear.
3	0.81	2011-06-22	Changes in financial market conditions since the April meeting suggested that investors had become more concerned about risk. Equity markets had seen a broad selloff, and risk spreads for many corporate borrowers had widened noticeably. Large businesses that have access to capital markets continued to enjoy ready access to credit–including syndicated loans–on relatively attractive terms; however, credit conditions remained tight for smaller, bank-dependent firms. Bankers again reported gradual improvements in credit quality and generally weak loan demand. In identifying possible risks to financial stability, a few participants expressed concern that credit conditions in some sectors–most notably the agriculture sector–might have eased too much amid signs that investors in these markets were aggressively taking on more leverage and risk in order to obtain higher returns. Meeting participants also noted that an escalation of the fiscal difficulties in Greece and spreading concerns about other peripheral European countries could cause significant financial strains in the United States. It was pointed out that some U.S. money market mutual funds have significant exposures to financial institutions from core European countries, which, in turn, have substantial exposures to Greek sovereign debt. Participants were also concerned about the possible effect on financial markets of a failure to raise the statutory federal debt ceiling in a timely manner. While admitting that it was difficult to know what the precise effects of such a development would be, participants emphasized that even a short delay in the payment of principal or interest on the Treasury Department's debt obligations would likely cause severe market disruptions and could also have a lasting effect on U.S. borrowing costs.
3	0.90	2014-04-30	In their discussion of financial stability, participants generally did not see imbalances that posed significant near-term risks to the financial system and the broader economy, but they nevertheless reviewed some financial developments that pointed to potential future risks. A couple of participants noted that conditions in the leveraged loan market had become stretched, although equity cushions on new deals remained above levels seen prior to the financial crisis. Two others saw declining credit spreads, particularly on speculative-grade corporate bonds, as consistent with an increase in investors' appetite for risk. In addition, several participants noted that the low level of expected volatility implied by some financial market prices might also signal an increase in risk appetite. Some stated that it would be helpful to continue to explore the appropriate regulatory, supervisory, and monetary policy responses to potential risks to financial stability.
3	0.90	2017-05-03	With regard to financial stability, several participants emphasized that higher requirements for capital and liquidity in the banking system and other prudential standards had contributed to increased resilience in the financial system since the financial crisis. However, they expressed concerns that a possible easing of regulatory standards could increase risks to financial stability. In addition, it was noted that real estate values were elevated in some sectors of the CRE market, that a sharp decline in such valuations could pose risks to financial stability, and that potential reforms in the housing finance sector could have implications for such valuations.

(continued)

Topic	Gamma	Date	Paragraph
9	0.72	2001-06-27	Housing activity remained at a high level as attractive mortgage interest rates evidently continued to counterbalance the negative effects on consumer attitudes of somewhat weaker labor markets and reduced stock market wealth. While housing activity in a number of areas continued to be described as fairly robust, members noted that residential sales and construction had slipped in some parts of the nation. Even so, given existing backlogs and the continued availability of attractive mortgage rates, nationwide housing construction was expected to remain near its currently elevated level.
9	0.74	2007-06-28	Participants generally agreed that the housing sector was likely to remain a drag on growth for some time yet and represented the most significant downside risk to the economic outlook. Although starts of single-family homes had moved up, on balance, over recent months, permits for new construction continued to decline. A number of participants noted that inventories of new homes for sale remained quite elevated. Housing activity was seen as likely to continue to contract for several more quarters. Participants also identified a number of downside risks associated with their outlook for residential construction. The recent increase in interest rates for prime mortgages could further dampen the demand for housing. Moreover, a number of participants pointed to rising mortgage delinquency rates and related difficulties in the subprime mortgage market as factors that could crimp the availability of mortgage credit and the demand for housing.
9	0.93	2012-04-25	Recent housing-sector indicators, including sales and starts, suggested some upward movement, but some participants saw the improvement as likely related to unusually warm winter weather in much of the country. Overall, the level of activity in the sector remained depressed. House prices appeared to be stabilizing but had not yet begun to rise in most markets. Most participants anticipated that the housing sector was likely to recover only slowly over time, but a few were more optimistic about the potential for a more rapid housing recovery given reports of stronger demand in some regions and of improved sentiment among builders, as well as signs that recent changes to the Home Affordable Refinance Program were contributing to the refinancing of performing high loan-to-value mortgages.
9	0.80	2014-09-17	The recovery in housing activity remained slow according to most participants. Although mortgage rates were still low and housing appeared to be relatively affordable, various factors were seen as restraining demand, including low expected income and high levels of student debt as well as difficulty in obtaining mortgage credit, particularly for younger, first-time homebuyers. It was also noted that the weakness in homebuilding along with the continued rise in house prices suggested that supply constraints were also weighing on construction activity. A couple of participants indicated that some demand appeared to have shifted to rental properties. The rising demand for rentals was in part being satisfied by investors buying homes for the rental market; it was also providing support for multifamily construction. Some participants noted their concern that a number of the factors restraining residential construction might persist, damping the housing recovery for some time.
9	0.80	2015-09-17	Housing activity was improving, with sales and new construction trending higher. Solid gains in employment and favorable mortgage rates were anticipated to continue to underpin the recovery in housing. Contacts in a number of Districts were upbeat about prospects for the sector, citing strengthening sales, rising home prices, an upturn in household formations, and reports that buyers had accelerated purchases in anticipation of the possibility that mortgage rates might move higher in the near term. Multifamily construction was particularly strong in a couple of Districts, but in another a shortage of lots was constraining builders' ability to meet strong demand for new single-family homes.

Note: This table presents paragraphs categorized under financial stability topics, identified using a STM with 21 topics. An overview of all 21 topics in presented in table A1. The gamma value represents the probability that a paragraph belongs to a specific topic. Paragraphs are sorted by the topic with the highest gamma value.

Table H2: Topic Examples: Mandate

Topic	Gamma	Date	Paragraph
4	0.61	2006-09-20	Business investment spending generally was seen as expanding at a reasonably good pace. Meeting participants noted broad strength in manufacturing of capital goods. Nonresidential construction activity continued to strengthen, and in the process was absorbing some of the resources that were no longer employed in homebuilding. Although some survey evidence suggested that some firms were trimming capital spending plans, participants reported that their business contacts generally were quite positive about the economic outlook and the strength of demand for their products. In this environment, investment spending would likely continue to be supported by expansion of overall output, strong balance sheets and profits, and the ready availability of funding from financial markets and institutions.
4	0.56	2013-07-31	In the business sector, the outlook still appeared to be mixed. Manufacturing activity was reported to have picked up in a number of Districts, and activity in the energy sector remained at a high level. Although a step-up in business investment was likely to be a necessary element of the projected pickup in economic growth, reports from businesses ranged from those contacts who expressed heightened optimism to those who suggested that little acceleration was likely in the second half of the year.
4	0.81	2003-05-06	Business fixed investment remained a key factor in the prospects for overall economic activity, and persisting weakness in such spending in association with gloomy sentiment and a high degree of risk aversion among business decisionmakers did not bode well for the capital investment outlook, at least for the near term. Anecdotal reports by business contacts tended to emphasize widespread excess capacity as a reason for holding down business capital spending, including high vacancy rates in office and other business structures. In this atmosphere, most business decisionmakers evidently preferred to rely on the increasingly efficient or fuller utilization of existing producer facilities rather than expanding the latter to meet growth in demand. Indeed, according to business contacts, investment expenditures generally were limited to replacement and to some extent to upgrading of existing facilities rather than for expansion. In some cases, businesses reportedly were acquiring used capital equipment and unoccupied building space at greatly reduced costs, thereby holding down the current production of new capital but also relieving selling firms of some excess capacity.
5	0.85	2016-01-27	A broad range of indicators showed ongoing improvement in labor market conditions. Most notably, increases in nonfarm payroll employment were quite strong during the final three months of 2015. Although the unemployment rate, at 5.0 percent, was unchanged over that period, it was at a level close to or below most participants' estimates of its longer-run normal rate. Moreover, the labor force participation rate and the employment-to-population rate moved up toward year-end. Many viewed labor market underutilization as having been substantially reduced over the past year, and a few saw slack as having been largely eliminated. In their comments on labor market conditions, participants cited strong employment gains, low levels of unemployment in their Districts, reports of shortages of workers in various industries, or firming in wage increases. Most anticipated that employment would expand at a solid rate over the year ahead, although several saw the prospect of some moderation in employment gains from the particularly large increases in the fourth quarter of 2015.
5	0.77	2004-05-04	After a protracted period of meager gains in employment, conditions in the U.S. labor market evidently were improving in recent weeks. In addition to noting the substantial jump in payrolls in March, several members relayed anecdotal information from business contacts around the nation that hiring was continuing to pick up and that firms were planning further increases in workforces. Some temporary help firms reported rising demand, a possible precursor of a pickup in permanent hiring. A number of members cited reports of difficulties in hiring within certain job families in which specialized skills were in short supply together with indications that wage increases in those occupations tended to be larger than average. Even so, considerable slack seemed to remain in the labor market overall, and wage gains on the whole were moderate.

(continued)

Topic	Gamma	Date	Paragraph
5	0.97	2011-12-13	A number of recent indicators showed some improvement in labor market conditions: Payroll employment had posted moderate gains for five months, new claims for unemployment insurance had drifted lower, and the unemployment rate had turned down. One participant noted that the series of upward revisions to the initial estimates of payroll employment in recent months was an encouraging sign of sustained hiring, although several participants remarked that they saw the labor market as still improving only slowly. Others indicated that because part of the recent decline in the jobless rate was associated with a reduction in labor force participation, the drop in the unemployment rate likely overstated the overall improvement in the labor market. Moreover, unemployment, particularly longer-term unemployment, remained high, and the number of involuntary part-time workers was still elevated. Some participants again expressed concern that the persistence of high levels of long-duration unemployment and the underutilization of the workforce could eventually lead to a loss of skills and an erosion of potential output. Another participant suggested that the unemployment rate was a more useful indicator of cyclical labor market developments than the level of employment relative to the size of the population, which was more likely to be influenced by structural changes in labor demand and supply. Participants expressed a range of views on the current extent of slack in the labor market. It was noted that because of factors including ongoing changes in the composition of available jobs and workers' skills, some part of the increase in unemployment since the beginning of the recession had been structural rather than cyclical. Others pointed out that the very modest increases in labor compensation of late suggested that underutilization of labor was still significant.
6	0.70	2017-11-01	In view of the persistent shortfall of inflation from the Committee's 2 percent objective and questions about whether longer-term inflation expectations were consistent with achievement of that objective, a couple of participants discussed the possibility that potential alternative frameworks for the conduct of monetary policy could be helpful in fulfilling the Committee's statutory mandate. One question, for example, was whether a framework that generally sought to keep the price level close to a gradually rising path–rather than the current approach in which the Committee does not seek to make up for past deviations of inflation from the 2 percent goal–might be more effective in fostering the Committee's objectives if the neutral level of the federal funds rate remains low.
6	0.53	2021-12-15	In support of the Committee's goals of maximum employment and inflation at the rate of 2 percent over the longer run, participants judged that it would be appropriate for the Committee to keep the target range for the federal funds rate at 0 to 1/4 percent until labor market conditions had reached levels consistent with the Committee's assessments of maximum employment, a condition most participants judged could be met relatively soon if the recent pace of labor market improvements continued. A few participants remarked that maximum employment consistent with price stability evolves over time and that further improvements in labor markets were likely over subsequent years as the economy continued to expand. Some participants also remarked that there could be circumstances in which it would be appropriate for the Committee to raise the target range for the federal funds rate before maximum employment had been fully achieved—for example, if the Committee judged that its employment and price-stability goals were not complementary in light of economic developments and that inflation pressures and inflation expectations were moving materially and persistently higher in a way that could impede the attainment of the Committee's longer-run goals.
6	0.95	2021-07-28	In their consideration of the stance of monetary policy, participants reaffirmed the Federal Reserve's commitment to using its full range of tools to support the U.S. economy during this challenging time, thereby promoting the Committee's statutory goals of maximum employment and price stability. Participants judged that the current stance of monetary policy remained appropriate to promote maximum employment as well as to achieve inflation that averages 2 percent over time and longer-term inflation expectations that are well anchored at 2 percent. Participants also reiterated that the existing outcome-based guidance implied that the paths of the federal funds rate and the balance sheet would depend on actual progress toward reaching the Committee's maximum-employment and inflation goals.

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Topic	Gamma	Date	Paragraph
10	0.58	2011-03-15	Participants expected that the boost to headline inflation from recent increases in energy and other commodity prices would be transitory and that underlying inflation trends would be little affected as long as commodity prices did not continue to rise rapidly and longer-term inflation expectations remained stable. However, a significant increase in longer-term inflation expectations could contribute to excessive wage and price inflation, which would be costly to eradicate. Accordingly, participants considered it important to pay close attention to the evolution not only of headline and core inflation but also of inflation expectations. In this regard, participants observed that measures of longer-term inflation compensation derived from financial instruments had remained stable of late, suggesting that longer-term inflation expectations had not changed appreciably, although measures of one-year inflation compensation had risen notably. Survey-based measures of inflation expectations also indicated that longer-term expected inflation had risen much less than near-term inflation expectations. A few participants noted that the adoption by the Committee of an explicit numerical inflation objective could help keep longer-term inflation expectations well anchored.
10	0.70	2015-04-29	In their discussion of the economic situation and the outlook, meeting participants regarded the information received over the intermeeting period as suggesting that economic growth had slowed during the winter months, in part reflecting transitory factors. The pace of job gains had moderated, and the unemployment rate had remained steady, with a range of labor market indicators suggesting that underutilization of labor resources was little changed. Most participants expected that, following the slowdown in the first quarter, real economic activity would resume expansion at a moderate pace, and that labor market conditions would improve further. Inflation continued to run below the Committee's longer-run objective, partly reflecting earlier declines in energy prices and decreasing prices of non-energy imports. Market-based measures of inflation compensation remained low, while survey-based measures of longer-term inflation expectations had remained stable. Participants generally anticipated that inflation would rise gradually toward the Committee's 2 percent objective as the labor market improved further and the transitory effects of declines in energy prices and non-energy import prices dissipated. Participants judged that recent domestic economic developments had increased uncertainty regarding the economic outlook. While participants continued to see potential downside risks resulting from foreign economic and financial developments, most still viewed the risks to the outlook for economic growth and the labor market as nearly balanced.
10	0.95	2017-05-03	Inflation, measured as the 12-month change in the headline PCE price index, had been running close to the Committee's 2 percent longer-run objective. Core inflation continued to run somewhat below 2 percent. Both headline and core consumer price indexes fell in March. Market-based measures of inflation compensation had remained low, while survey-based measures of longer-term inflation expectations had changed little on balance.
12	0.72	2003-10-28	The recent strength in final sales was associated with sizable inventory liquidation by business firms, and recent surveys and anecdotal commentary suggested that inventories were at unusually low levels in relation to sales, notably in manufacturing. In the circumstances, a continuation of robust final demand could be expected to foster efforts to rebuild inventories, with potentially substantial short-run stimulus to the economy. However, the timing and extent of such restocking were subject to uncertainty, and for now available reports indicated that business firms were continuing to follow a highly cautious approach to inventory investment.

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Topic	Gamma	Date	Paragraph
12	0.52	2003-06-25	In the Committee's discussion of current and prospective economic developments, members referred to signs of improvement in some sectors of the economy, but they saw no conclusive evidence of an appreciable overall strengthening in the sluggish economic expansion. On the positive side, they pointed to reports of some pickup in retail sales, indications that labor and product markets might be stabilizing, continued robust activity in housing markets, and ongoing impetus from the federal government sector. Concurrently, however, weakness persisted in business capital expenditures, which members continued to view as the critical factor inhibiting the economic expansion. Looking ahead, they emphasized that favorable underlying conditions were in place to support a substantial acceleration of the expansion, though the timing and dimensions of a significantly improved economic performance remained uncertain. Positive factors bearing on the outlook mentioned by members included the accommodative stance of monetary policy and supportive financial conditions more generally, the persistence of rapid growth in labor productivity, sizable declines in energy prices from elevated levels earlier in the year, and indications of rising consumer confidence and of less negative business sentiment. Members also gave considerable emphasis to the anticipated effects of recent legislation that in short order would add substantially to the degree of fiscal stimulus.
12	0.87	1995-11-15	Ongoing efforts by many business firms to bring inventories into better alignment with sales had resulted in declining inventory investment since earlier in the year. Some further inventory adjustments, notably in stocks of motor vehicles, were expected over coming months, though not at a pace that would have a marked retarding effect on economic activity. Over much of 1996, inventory investment was projected to be a more neutral factor in the economy, with accumulation proceeding at a pace in line with growth in final sales, but the risks of unexpected developments in this sector of the economy were always substantial.
16	0.59	2018-09-26	Meeting participants noted that a number of communities suffered devastating losses associated with Hurricane Florence. Despite the magnitude of the storm-related destruction, participants expected the imprint on the level of overall economic activity at the national level to be relatively modest, consistent with the experience following several previous major storms.
16	0.53	2018-08-01	Participants commented on a number of risks and uncertainties associated with their outlook for economic activity, the labor market, and inflation over the medium term. They generally continued to see fiscal policy and the strengthening of the labor market as supportive of economic growth in the near term. Some noted larger or more persistent positive effects of these factors as an upside risk to the outlook. A few participants indicated, however, that a faster-than-expected fading of the fiscal impetus or a greater-than-anticipated subsequent fiscal tightening constituted a downside risk. In addition, all participants pointed to ongoing trade disagreements and proposed trade measures as an important source of uncertainty and risks. Participants observed that if a large-scale and prolonged dispute over trade policies developed, there would likely be adverse effects on business sentiment, investment spending, and employment. Moreover, wide-ranging tariff increases would also reduce the purchasing power of U.S. households. Further negative effects in such a scenario could include reductions in productivity and disruptions of supply chains. Other downside risks cited included the possibility of a significant weakening in the housing sector, a sharp increase in oil prices, or a severe slowdown in EMEs.
16	0.95	2021-06-16	In their discussion of current conditions, participants noted that progress on vaccinations had reduced the spread of COVID-19 in the United States. Amid this progress and strong policy support, indicators of economic activity and employment had strengthened. The sectors most adversely affected by the pandemic remained weak but had shown improvement. Inflation had risen, largely reflecting transitory factors. Overall financial conditions remained accommodative, in part reflecting policy measures to support the economy and the flow of credit to U.S. households and businesses. Participants generally noted that the path of the economy would depend significantly on the course of the virus. Progress on vaccinations would likely continue to reduce the effects of the public health crisis on the economy, but risks to the economic outlook remained.

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Topic	Gamma	Date	Paragraph
18	0.88	2013-03-15	After assessing current conditions and the outlook for economic activity, the labor market, and inflation, all but one member agreed to raise the target range for the federal funds rate to 3/4 to 1 percent. This increase was viewed as appropriate in light of the further progress that had been made toward the Committee's objectives of maximum employment and 2 percent inflation. Members generally noted that the increase in the target range did not reflect changes in their assessments of the economic outlook or the appropriate path of the federal funds rate, adding that the increase was consistent with the gradual pace of removal of accommodation that was anticipated in December, when the Committee last raised the target range.
18	0.64	2015-09-17	In assessing whether economic conditions had improved sufficiently to initiate a firming in the stance of policy, many members said that the improvement in labor market conditions met or would soon meet one of the Committee's criteria for beginning policy normalization. But some indicated that their confidence that inflation would gradually return to the Committee's 2 percent objective over the medium term had not increased, in large part because recent global economic and financial developments had imparted some restraint to the economic outlook and placed further downward pressure on inflation in the near term. Most members agreed that their confidence that inflation would move to the Committee's inflation objective would increase if, as expected, economic activity continued to expand at a moderate rate and labor market conditions improved further. Many expected those conditions to be met later this year, although several members were concerned about downside risks to the outlook for real activity and inflation.
18	0.97	2018-11-08	After assessing current conditions and the outlook for economic activity, the labor market, and inflation, members decided to maintain the target range for the federal funds rate at 2 to 2-1/4 percent. Members agreed that the timing and size of future adjustments to the target range for the federal funds rate would depend on their assessment of realized and expected economic conditions relative to the Committee's maximum employment and symmetric 2 percent inflation objectives. They reiterated that this assessment would 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 and international developments. More generally, members noted that decisions regarding near-term adjustments of the stance of monetary policy would appropriately remain dependent on the evolution of the outlook as informed by incoming data.
19	0.68	2004-01-28	In the Committee's discussion of policy for the intermeeting period ahead, all the members favored an unchanged policy stance that was directed toward maintaining reserve conditions consistent with a target federal funds rate of 1 percent. While the members were persuaded that a relatively vigorous economic expansion was now firmly established and was likely at some point to call for a move toward a more neutral policy stance, they concluded that such an adjustment was not warranted under current circumstances. In this regard they stressed that unused labor and other resources remained substantial, that inflation was at a very low level, and that inflation was not expected to change appreciably in either direction over the year ahead. Members acknowledged that there were risks in maintaining what might eventually prove to be an overly accommodative policy stance, but for now they judged that it was desirable to take risks on the side of assuring the rapid elimination of economic slack.

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Topic	Gamma	Date	Paragraph
19	0.55	2003-01-29	In the Committee's discussion of policy for the intermeeting period, all the members supported a proposal to maintain an unchanged policy stance. While the economy had continued to grow slowly, monetary policy and overall financial conditions had remained accommodative and the prospects for an appreciable strengthening of the economic expansion over time were favorable. As some of the prevailing uncertainties currently impairing spending began to lift, possibly in the near term with regard to military developments in the Middle East, the Committee should be in a much better position to assess the underlying strength of the economy and the appropriate policy response. At this point, the Committee could not rule out a range of plausible economic outcomes, including the possibility of a persisting subpar economic performance or a much stronger than forecast acceleration of the expansion. Indeed, the Committee could envision circumstances when it might find it desirable to adjust its policy stance substantially and promptly in one direction or the other in the months ahead. The members concluded that a wait-and-see policy stance was desirable pending an improved basis for judging the ongoing performance of the economy. They also agreed that the accommodative stance of policy, developments over the intermeeting period, and their current forecasts in the context of tensions abroad argued for retaining a balanced risks assessment to be included in the statement that would be made public shortly after this meeting.
19	0.86	1999-02-03	In light of the uncertainties and diversity of risks surrounding the economic outlook, most members were in favor of retaining the existing symmetry of the directive. In one view, however, the risks of rising inflation were strong enough to warrant consideration of an asymmetrical directive that was tilted toward restraint. Nonetheless, since inflation was difficult to predict and any needed adjustment to policy in the period ahead could readily be implemented even with a symmetrical directive, all the members indicated that they could accept such a directive.
20	0.64	2011-03-15	In contrast to headline inflation, core inflation and other measures of underlying inflation remained subdued, though they appeared to have bottomed out. A number of participants noted that, with significant slack in resource utilization and with longer-term inflation expectations stable, underlying inflation likely would remain subdued for some time. However, the importance of resource slack as a factor influencing inflation was debated. Some participants pointed to research indicating that measures of slack were useful in predicting inflation. Others argued that, historically, such measures were only modestly helpful in explaining large movements in inflation; one noted the 2003-04 episode in which core inflation rose rapidly over a few quarters even though there appeared to be substantial resource slack.
20	0.53	1993-11-16	With regard to the outlook for inflation over the year ahead, views did not vary greatly among the members. They ranged from expectations of some limited progress toward price stability to forecasts of a marginal increase in the core rate of inflation. Members who anticipated a relatively favorable inflation performance tended to underscore the likely persistence of appreciable slack in labor and other production resources on the assumption that growth in overall economic activity would remain on a moderate trend in line with their forecasts. Some also pointed to the absence of inflationary pressures in most commodity markets, the persistence of intense competition in local markets across the nation, and the outlook for relatively subdued increases in labor costs in part because of ongoing improvements in productivity. Other members gave more emphasis to the possibility that the economic expansion next year, especially if it turned out on the high side of the range encompassing the members' current projections, was more likely to be associated with some upward pressures on costs and prices. In this connection, relatively rapid growth in economic activity, should it persist into the early part of next year, probably would trigger attempts to raise prices and wages somewhat more rapidly even in the context of some continuing slack in overall capacity and labor utilization. At this point, however, there were no significant indications of accelerating inflation and business contacts around the nation did not currently see or seem to anticipate increasing inflationary pressures.

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Topic	Gamma	Date	Paragraph
20	0.86	2000-02-02	Concerning the outlook for inflation, the members continued to see the risks as primarily tilted toward rising inflationary pressures, though they anticipated that further gains in productivity would hold down increases in unit labor costs and prices, at least over the nearer term. A key issue was whether growth in aggregate demand would moderate sufficiently to at least avoid greater pressures on what were already very tight labor markets. In this regard, several cited recent statistical and anecdotal evidence of larger increases in labor compensation, although unit labor costs did not appear to be trending higher at this point. However, some nonlabor input prices already were rising faster. The prospects for energy prices were very difficult to predict, but even if such prices were to stabilize, the passthrough of the large earlier increases into inflation and wage expectations, as well as into the prices of products that were heavily energy dependent, was likely to exert some upward pressure on prices throughout the economy.
21	0.65	2009-12-16	In their discussion of the economic situation and outlook, meeting participants agreed that the incoming data and information received from business contacts suggested that economic growth was strengthening in the fourth quarter, that firms were reducing payrolls at a less rapid pace, and that downside risks to the outlook for economic growth had diminished a bit further. Although some of the recent data had been better than anticipated, most participants saw the incoming information as broadly in line with the projections for moderate growth and subdued inflation in 2010 that they had submitted just before the Committee's November 3-4 meeting; accordingly, their views on the economic outlook had not changed appreciably. Participants expected the economic recovery to continue, but, consistent with experience following previous financial crises, most anticipated that the pickup in output and employment growth would be rather slow relative to past recoveries from deep recessions. A moderate pace of expansion would imply slow improvement in the labor market next year, with unemployment declining only gradually. Participants agreed that underlying inflation currently was subdued and was likely to remain so for some time. Some noted the risk that, over the next couple of years, inflation could edge further below the rates they judged most consistent with the Federal Reserve's dual mandate for maximum employment and price stability; others saw inflation risks as tilted toward the upside in the medium term.
21	0.46	2018-12-19	After taking into account incoming economic data, information from business contacts, and the tightening of financial conditions, participants generally revised down their individual assessments of the appropriate path for monetary policy and indicated either no material change or only a modest downward revision in their assessment of the economic outlook. Economic growth was expected to remain above trend in 2019 and then slow to a pace closer to trend over the medium term. Participants who downgraded their assessment of the economic outlook pointed to a variety of factors underlying their assessment, including recent financial market developments, some softening in the foreign economic growth outlook, or a more pessimistic outlook for housing-sector activity.
21	0.68	2011-12-13	Members viewed the information on U.S. economic activity received over the intermeeting period as suggesting that the economy was expanding moderately. While overall labor market conditions had improved some in recent months, the unemployment rate remained elevated relative to levels that the Committee anticipated would prevail in the longer run. Inflation had moderated, and longer-term inflation expectations remained stable. However, available indicators pointed to some slowing in the pace of economic growth in Europe and in some emerging market economies. Members continued to expect a moderate pace of economic growth over coming quarters, with the unemployment rate declining only gradually toward levels consistent with the Committee's dual mandate. Strains in global financial markets continued to pose significant downside risks to economic activity. Members also anticipated that inflation would settle, over coming quarters, at levels at or below those consistent with the dual mandate.

Note: This table presents paragraphs categorized under financial stability topics, A1. The gamma value represents the probability that a paragraph belongs to a specific topic. Paragraphs are sorted by the topic with the highest gamma value.