Did I make myself clear? The Fed and the market under the 2020 monetary policy framework

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Abstract: We study the impact of the Federal Reserve's communication on financial markets following the adoption of its revised policy framework in 2020. We propose a channel whereby market uncertainty stemming from perceived policy errors can raise risk premia. Post-framework communication introduced uncertainty about the Fed's reaction function. Market concerns about policy mistakes amid incoming economic data drove up term premia, undermining easy financial conditions the Fed initially sought. While short-rate expectations were anchored by forward guidance, term premium sensitivity to inflation news increased. The subsequent shift in Fed's words and then actions helped stabilize premia, mitigating adverse macroeconomic news.

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I. Introduction

Central banks set the policy interest rate, but it is financial markets that translate policy actions and policymakers' words into borrowing costs and broader financial conditions. Financial conditions thus determine much of the policy's impact. This makes central bank communication not merely a transparency obligation but a policy instrument, whose effectiveness depends on whether markets are convinced by policymakers' arguments.

The Federal Reserve's "Statement on Longer-Run Goals and Monetary Policy Strategy" highlights the central role of communication and long-term interest rates in achieving its dual mandate:

> "The Federal Open Market Committee (FOMC) is firmly committed to fulfilling its statutory mandate from the Congress of promoting maximum employment, stable prices, and moderate long-term interest rates. The Committee seeks to explain its monetary policy decisions to the public as clearly as possible. Such clarity facilitates well-informed decisionmaking by households and businesses, reduces economic and financial uncertainty, increases the effectiveness of monetary policy, and enhances transparency and accountability, which are essential in a democratic society."

This emphasis on clear communication and long-term interest rates is warranted. Today's inflation and output gap depend on expected future real interest rate gaps. Thus, the Fed's ability to stabilize the economy hinges on how its policy stance—through both actions and communication—affects longer-term interest rates. In practice, however, long-term rates reflect not only expectations about future policy and the economy but also market pricing of risks surrounding those paths. Communication thus matters beyond anchoring expectations by impacting risk premia. Clarity in communication is especially valuable during periods of structural change and when policymakers adapt the framework guiding their decisions.

At the Jackson Hole Symposium on August 27, 2020, during the height of the Covid-19 pandemic, Chair Powell announced a significant revision to the Federal Reserve's monetary policy framework aimed at extending the Fed's support of the economy in zero lower bound episodes. In this paper, we analyze the Fed's policy stance and the financial market response following the 2020 announcement through the inflationary surge in 2021–2022 and the policy tightening response.

Figure 1 shows the main motivating fact by superimposing paths of short-rate expectations two and ten years out against the ten-year term premium based on Federal Reserve Board's estimates. Although short-rate expectations remained well-anchored at the effective lower bound (ELB) through most of 2021, in line with the Fed's inten-

Figure 1. Short-rate expectations and term premia, 2020-2023. The figure reports the ten-year term premium, and two- and ten-year short-rate expectations components of the nominal yield curve. The estimates are based on the Kim and Wright (2005) model and are available at the Federal Reserve Board website. Vertical lines mark selected events (JH denotes Jackson Hole Economic Symposium). Cumulative changes are normalized to be zero on Aug 27, 2020, at the time of the framework announcement.

tions, financial conditions started to tighten already in late 2020 as term premia saw pronounced increases, rising by 71 basis points (bps) from August 26, 2020 through the end of March 2021. In March 2021, participants in the Survey of Primary Dealers identified a mix of fiscal policy, improved Covid outlook, and the Fed's reaction function as the main factors behind rising premium. By July 2021, changes in perceptions of the FOMC's framework or reaction function emerged as the most important factor behind then moderating premia as policymakers start shifting away from their so far dovish communication.[1] Overall, between August 2020 announcement and the 75 bps hike in June 2022, term premia increased in total by 137 bps, the biggest such move since 1994.

To explain the observed yield dynamics, we propose and empirically test a channel through which market uncertainty about the Fed's reaction function and concerns over the appropriate policy stance can raise term premia, counter to policymakers' intentions. We begin by reviewing the motives and the assumptions embedded within the 2020 framework. Against this backdrop, we document that the Fed's communication introduced uncertainty about its reaction function. We support this claim with a range

[1]The New York Fed Survey of Primary Dealers in March 2021 and November 2021 asked participants to rate the importance of various factors in explaining intermeeting changes in long-term rates (question 7).

of evidence, including market and Fed forecasts, survey-based dispersion, and textual analysis of both Fed communication and media coverage.

The 2020 framework introduced two key new elements: (1) emphasis on shortfalls from maximum employment rather than two-sided deviations, and (2) flexible average inflation targeting (FAIT).[2] Both elements were framed around the complementarity of the Fed's inflation and employment objectives in demand-driven downturns. Together, they implied an asymmetric reaction function, with a delayed liftoff from the ELB.

This design marked a significant departure in the Fed's approach to policymaking from the earlier one under which the Fed, going back to Greenspan, had favored pre-emptive tightening to guard against inflation tail risk (Greenspan, 2004; Cieslak et al., 2024). In the FAIT regime, the Fed instead aimed to "make up" for past undershoots with modest overshoots so that inflation would average 2% over time.[3] These new aspects of the framework grew out of the experience of the previous decade as the Fed confronted persistently low inflation and the challenge of supporting the economy at the ELB after the Global Financial Crisis (GFC; Clarida, 2020, 2022). The 2015–2018 tightening cycle additionally reinforced the view that inflation overshoots could be beneficial, as many believed the tightening to have unnecessarily restrained the economy.

The effectiveness of the new asymmetric framework depended on market participants understanding the mechanism and adjusting expectations accordingly. The FOMC clearly signaled willingness to overshoot the inflation target to make up for the past low inflation. However, we argue that those past inflation misses and the low r^* have concerned the Fed more than they did the market (see also Levy and Plosser, 2024). Ultimately, the framework was tested on a scenario different from the one it was designed for.

The framework was by design unspecific about its implementation. Its nuanced logic made it hard to explain to the public. We document a lack of agreement on how different officials interpreted the elements of the new strategy starting already prior to the announcement. As the public and market participants sought clarification, and before the fragility became evident, the FOMC was challenged to answer questions about the FAIT modifiers. Forceful forward guidance added in late 2020 successfully communicated

[2] The statement reads: "In order to anchor longer-term inflation expectations at this level, the Committee seeks to achieve inflation that averages 2 percent over time, and therefore judges that, following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time." The conditions for starting policy normalization were stipulated in the September 2020 FOMC statement.

[3] Theoretical work has highlighted the advantages of such strategies in low interest-rate environments (Krugman et al., 1998; Eggertsson and Woodford, 2003; Bernanke et al., 2019; Bernanke, 2020), and, if credible, FAIT can generate 25–50 basis points of additional stimulus at the ELB by raising inflation expectations when inflation falls below target (e.g. Krane et al., 2023).

the intention of lower-for-longer at a time when such a policy was warranted by the economic recovery. However, it reinforced the Fed's one-sided focus and made it harder to invoke the framework's escape clauses when it became necessary (e.g., Eggertsson and Kohn, 2023; Meade, 2023).

Ex post, the Fed appears to have been constrained by the framework and the forward guidance (e.g., Summers, 2022; Bowman, 2022), even though perhaps not perceived as such by policymakers in real time. The need to build credibility for the new strategy and to respect commitments de-emphasized risk management of the kind the Fed historically embraced (Greenspan, 2004). Using the Fed's own projections, we show that the Fed became less sensitive to upper-inflation tail risks relative to its past behavior, delaying action as the data started to diverge from the dominant scenario it assumed. At the same time, financial markets were closely attuned to the details of the Fed's communication. The lack of specificity around the framework sowed seeds of uncertainty and the Fed's communication through 2021 fostered confusion about the Fed's reaction function in the face of incoming data, especially its inflation response.

We illustrate the interactions between the Fed's stance and the market's perceptions within a stylized model. In the model, the asymmetry in the Fed's reaction function under the new framework creates an inflationary easing bias which is amplified by the amount of economic uncertainty. The markets may disagree with the Fed about the interpretation of incoming shocks, and importantly, are uncertain about the degree of asymmetry in the Fed's reaction function. Both disagreement and beliefs about the reaction function are sources of perceived monetary shocks which markets can interpret as policy mistakes. The Fed-induced uncertainty increases with the degree of market concerns about policy mistakes, raising premia on long-term bonds.

We then explore empirically how the term structure of interest rates evolved after the framework announcement. Our analysis of market events uses decompositions of yield movements into four factors that drive short-rate expectations and term premia, following Cieslak and Pang (2021, CP). This decomposition allows us to isolate the effect of Fed-driven uncertainty on the term premium. We conduct the analysis at high-frequency focusing on Fed communication events, which we supplement with the daily frequency to further explore the mechanism.

We document a sharp change in the term premium dynamics from before to after the Fed's hawkish policy pivot in May 2022. From August 2020 through April 2022, we estimate that the Fed-induced uncertainty contributed about a quarter of the overall increase in the long-term interest rates. Specifically, the Fed communications added about 55 bps (24%) to the overall ten-year yield increase (231 bps), while constituting less than 7% of the sample observations. Importantly, we show that most of the term premium accrued in the hours before the Fed event, suggesting a buildup of uncertainty that the Fed's communication itself failed to resolve. We fail to find similar dynamics around macroeconomic events in this period in line with the view that the term premium was specific to the Fed.

The hawkish turn in policy stance in 2022 saw a striking reversal in the term premium pattern on the Fed events. We estimate that the direct effect of Fed communication (less than 1% of the sample observations) now pushed term premia nearly 40 bps lower, countering part of the ongoing long-term yield increase. Importantly, the Fed's offsetting effect accrued almost entirely via speeches that followed the same-day macro announcements. As such, the Fed's shift toward consistently hawkish communication, focused on fighting inflation, helped stabilize term premia and neutralize the effect of incoming macroeconomic data on long-term yields from mid-2022.

We also show that the Fed's forward guidance anchors markets' short-rate expectations through early 2022, making them unresponsive to incoming inflation news. Instead, long-term yields react to inflation news via increased term premium sensitivity. This risk premium effect abates and short-rate expectations become newly responsive to inflation news in 2022, after policymakers' clearly acknowledge the risks and start to actively counteract inflation.

Finally, we rely on textual data to measure public perceptions of the Fed's policy and the content of the Fed's communication. To connect the premium dynamics to the changing market perceptions of the Fed's policy mistakes, we construct a textual index of the perceived policy mistakes based on the Wall Street Journal articles covering the Fed. We document that term premia, but not short-rate expectations, co-move positively with our perceived mistakes proxy. Analyzing the content of the Fed official speeches, we also show that determinate hawkish language post-pivot contributes significantly to lowering term premia on long-term bonds.

Related literature

The paper belongs to recent literature studying the financial market perceptions of the Fed's policy in the inflationary post-2020 episode, including the contributions by Bocola et al. (2024), Bauer et al. (2024), Hazell and Hobler (2025), and Kroner (2025). Using asset prices and survey expectations, this work also documents a perceived weakening of the Fed's reaction to inflation before liftoff. We emphasize the interplay between the Fed's communication and market risk perceptions due to the pricing of Fed-induced uncertainty. Our results show that Fed-induced uncertainty can have an economically meaningful effect on financial conditions via term premium. The evidence therefore helps quantify the statement of Cecchetti and Schoenholtz (2021) that "in conducting policy, there is one uncertainty that policymakers can and should reduce: the uncertainty they themselves create."

To the extent that the Fed-induced uncertainty creates additional volatility in long term rates, it undermines the Fed's ability to promote stable and moderate long-term interest rates. Stein and Sunderam (2018) analyze the challenges associated with the Fed's control over long-term interest rates. They show how the Fed's desire to smooth long-term rates is unwound by investors' increased sensitivity to the Fed's actions. In their model, the presence of term premium shocks, which the Fed tries to offset, additionally weakens policy effectiveness, even when these shocks are exogenous to the Fed. Our results suggest that the uncertainty that the Fed unintentionally creates can further worsen the Fed's control over financial conditions.

The paper is structured as follows. Section II discusses the Fed's motivation for the 2020 framework review, lays out the key events' timeline, and documents markets' uncertainty about the Fed's policy stance and its inconsistent communication. Section III develops model predictions. Section IV describes our data. We examine the model predictions empirically in Section V. In the text, we substantiate some claims referring to quotes from Fed officials, documents, and media (e.g., Quote N), which we compile in an Internet Appendix. The Internet Appendix also contains auxiliary results and a detailed model setup.

II. Macroeconomic and policy context

II.A. Complex macroeconomic environment

In the years leading to the framework announcement, the Fed and the market largely agreed about inflation forecasts. In 2015–2019, the Fed's expectations of core PCE inflation were just a few basis points below the market forecasts.[4] Despite agreeing on the most likely outcomes for inflation, Fed officials increasingly emphasized the risk of inflation persistently undershooting 2%, while the market did not appear to be as

[4] Appendix Figure A-1 compares forecasts of core PCE inflation for one and two years ahead from the FOMC's Summary of Economic Projections (SEP) vis-a-vis corresponding expectations from the New York Fed's Survey of Primary Dealers (SPD). The figure compares median, low- and high-end forecasts.

worried about this possibility.[5] As a result, the market may not have viewed the Fed's stated commitment to overshooting the 2% inflation target, on concerns about low r^*, as warranted (see also Levy and Plosser, 2024).

The framework announcement in August 2020 came amid the Covid-19 pandemic, a period of multiple overlapping shocks and extraordinary uncertainty.[6] The initial shock induced high unemployment and low inflation: unemployment peaked at 14.8% in April 2020 and core CPI inflation fell to 1.2% by May 2020. Both monetary and fiscal policy responded aggressively. In March 2020, interest rates were cut to the ELB, and asset purchases began. In September 2020, after the introduction of the new framework, interest rate forward guidance removed preemption on inflation. Fiscal measures totaled more than $5tr by 2021Q1.

Inflation picked up in 2021 as economies reopened, supply disruptions persisted, and fiscal stimulus generated excess demand (Cochrane, 2022; Bianchi et al., 2023; Di Giovanni et al., 2023). Macroeconomic signals were mixed throughout: higher-than-expected inflation coincided with disappointing nonfarm payrolls alongside rising JOLTS vacancies.[7] Inflation continued rising, further fueled by energy prices following Russia's invasion of Ukraine in February 2022, and peaked in June 2022 at 6.8% (PCE) and 9.1% (CPI). It gradually returned to around 3% by spring 2024 as supply constraints eased, energy costs fell, and the Fed tightened. The sources of the inflation surge and the appropriate policy response were widely debated throughout this period.

II.B. Reaction function uncertainty

The newly adopted FAIT framework, in theory, provided a solution to the FOMC's concerns about low r^* and undershooting of the inflation target. However, in practice, the main idea was complex compared to other inflation-targeting frameworks, as summarized by "temporary price-level targeting (TPLT, at the ELB) that reverts to flexible inflation targeting (once the conditions for liftoff have been reached)" (Clarida, 2020). The challenges with executing and communicating such a framework were earlier recognized by Bernanke (2017, Quote 2) in the face of supply shocks, and Sack (2019),

[5] For example, the New York Fed's Survey of Primary Dealers shows that the perceived probability of CPI inflation falling below 2% remained low and stable, whereas the Fed's own projections placed more weight on downside inflation scenarios (see Appendix Figure A-2).

[6] Appendix Figure A-3 and the associated text situates the monetary policy events within the complex macroeconomic, fiscal policy, and geopolitical environment from the pandemic outbreak through late 2023. Appendix Table A-1 presents the chronology of key policy events.

[7] Appendix Figure A-4 shows the macroeconomic surprises.

when the central bank seeks to preserve flexibility. Early assessments expressed concern that the framework "adds confusion and lacks clarity" (Levy and Plosser, 2020).[8]

Although the new framework was well sign-posted, the announcement provided limited specifics on how the Fed would operationalize FAIT. Chair Powell emphasized that there would be no formulaic rule to define "average" inflation or "moderate" overshooting (Quote 17). Statements from various Fed officials post-announcement reveal no consensus on what overshooting entailed (Quotes 14, 15, and 16). Initially, the lower-for-longer policy facilitated by the framework held support among Fed officials (Quotes 13, 18, and 22). However, with increasing inflation pressures, the views evolved and the heterogeneity of policy stances expressed in individuals' communications became apparent (Quotes 30, 31, and 32).

We begin by documenting inconsistent Fed communication about the framework. To this end, we use Goldman Sachs's Chatterbox publication, which collects notable comments from Fed officials during intermeeting periods as filtered for investor relevance. We identify 47 mentions of inflation overshooting across our sample.[9] The admissible inflation figures cited range from 2.25% to 3%, with different officials quoting different numbers around the same time, suggesting no consensus on this central aspect of the framework. Notably, mentions of overshooting cease after November 2021, by which point inflation was already surging (see Appendix Figure A-5).

We show this by classifying all 1,278 Chatterbox quotes by communicated policy stance, from dovish to hawkish. Figure 2 reports the average and standard deviation of those scores within each intermeeting period.[10] Until early 2021, views were cohesively dovish. From around June 2021, following several positive inflation surprises and tightening labor market conditions, officials shifted hawkish on average, and decisively so by January 2022. Yet this hawkish turn was accompanied by elevated dispersion across individuals. Communication became significantly more uniform only after the Fed's hawkish pivot in June 2022, signaling a return to managing upside inflation risks (see Quotes 54 and 55).

[8] Jia and Wu (2023) argue that this ambiguity in communication may allow the Fed to build credibility and improve welfare, especially given that FAIT is inherently time-inconsistent.

[9] Our sample covers 762 unique intermeeting speaking events (speeches, testimonies, interviews, webinars, etc.) over 2019:12–2023:12. Appendix Figure A-5 shows the distribution of communication events over the post-2020 period.

[10] The appendix contains a full discussion of the scoring as well as a robustness check using ChatGPT scoring.

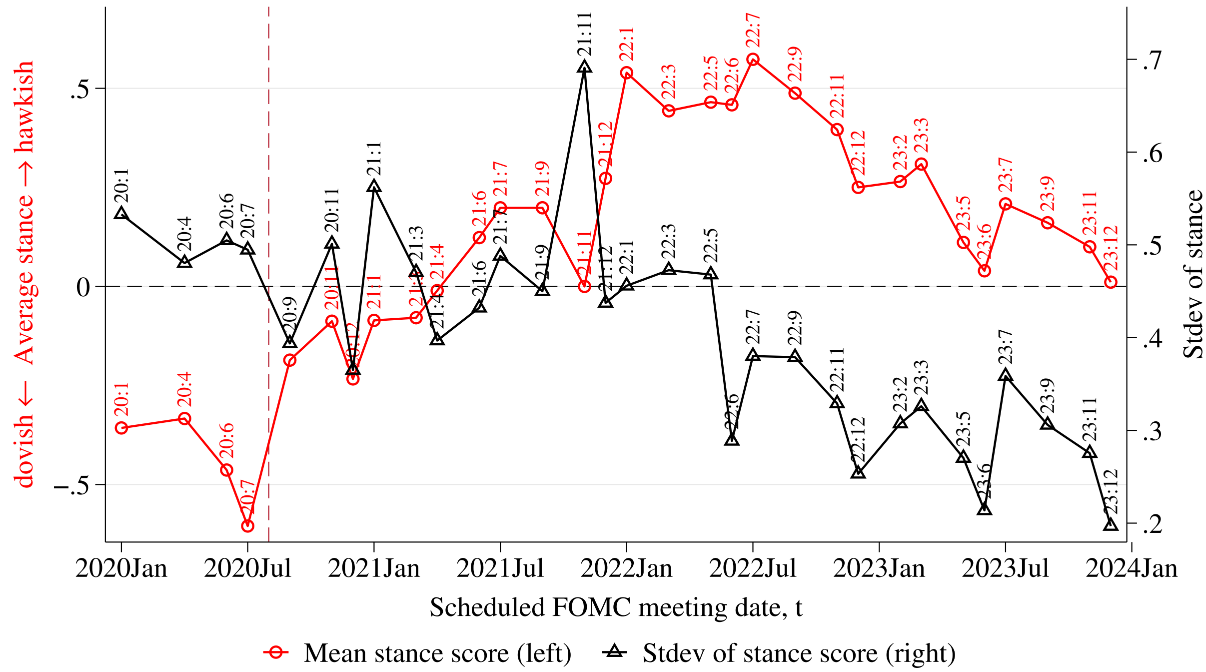

Figure 2. Fed officials' policy stance communication. The figure summarizes the mean and standard deviation of the Fed officials' policy stances coded from loose to tight on a scale $\{-1, -0.5, 0, 0.5, 1\}$ that are communicated over the intermeeting period based on the key quotes highlighted in Goldman Sachs' Chatterbox. The averages and standard deviations of scores are calculated across key quotes over the intermeeting period from $t-1$ to t. Markers indicate year and month (yy:mm). For example, "22:6" data point covers intermeeting communication before the June 2022 meeting.

Against this background, we document that the public uncertainty about the Fed's reaction function increased. We use two proxies: survey forecast disagreement about the policy path and news media narratives.

Turning to disagreement first, Figure 3 shows the interquartile range (IQR) of investors' FFR forecasts eight quarters ahead in the Survey of Primary Dealers, as well as the dispersion of two-year ahead forecasts for headline PCE and real GDP growth. Despite the rising disagreement about the macroeconomic outlook, from around July 2020 through early 2021 the forecasters agree on the policy path, consistent with the Fed clearly communicating its lower-for-longer intention. The situation changes in the first half of 2021 when forecasters diverge on the longer-term policy path, whereas macroeconomic disagreement normalizes. It is only in 2023 that FFR disagreement begins to decline. Macroeconomic disagreements explain little of FFR forecast dispersion beyond next

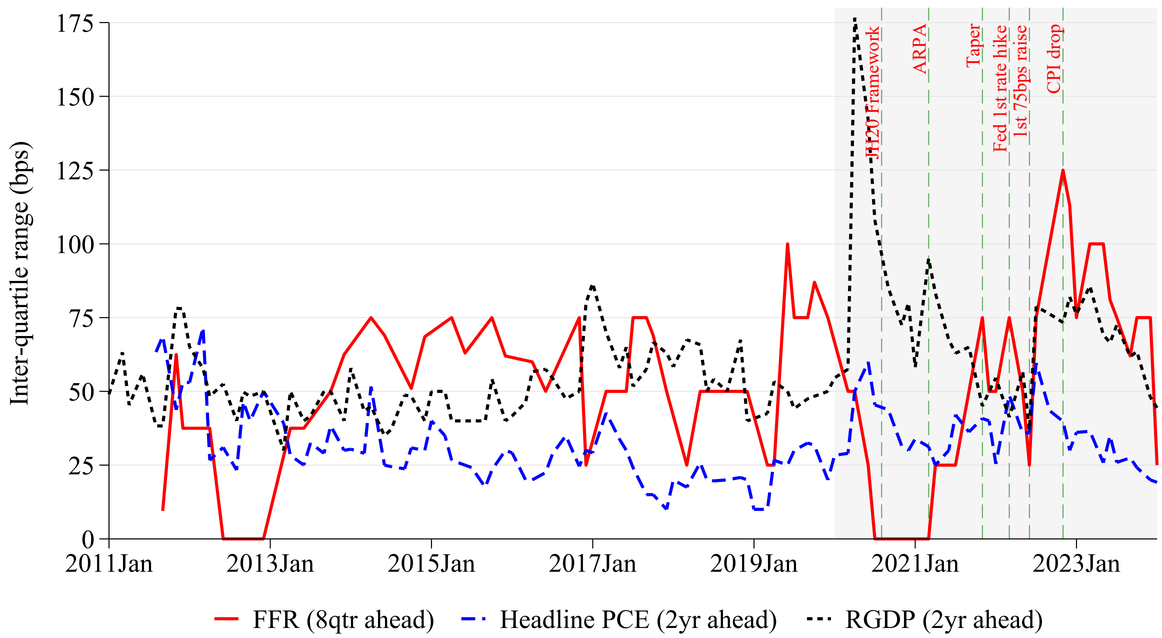

Figure 3. FFR forecast against macro variables dispersion in the SPD. The figure plots the FFR (eight-quarter ahead), the headline PCE (2yr ahead), and the RGDP (2yr ahead) forecast dispersion from the NY Fed Survey of Primary Dealers (SPD). Dispersions are measured as the interquartile (75th-25th) range across participants. The gray shaded area highlights the 2020:1-2023:12 period. There are, on average, 24 participants in the survey.

quarter, suggesting the FFR dispersion at longer horizons reflects in large part policy-related uncertainty.[11]

Media coverage of the Fed suggests that the public became increasingly uncertain about the Fed's response to inflation. As a second proxy, we create a novel textual indicator of markets' perceived uncertainty based on the Wall Street Journal (WSJ) articles. We analyze the content of news articles published by the WSJ from January 2020 to December 2023 containing Fed-related keywords. The sample covers 7784 articles from Factiva. We classify the content using a large language model to determine if an article indicates uncertainty about the Fed's policy stance and its specific source (response to inflation or the real economy, Fed communication or other; uncertainty types can be overlapping).[12] Of all articles, 38% are classified as indicating some form of uncertainty about the Fed.

[11] In Appendix Table A-2, we report regressions of IQR of FFR forecasts on the IQR of Core PCE, Headline PCE, real GDP growth and unemployment rate forecasts. Appendix Table A-3 shows similar results for Blue Chip forecasts. See also Feldman and King (2026) for related evidence.

[12] We use the following prompt on ChatGPT's GPT-4 Turbo model:

> *Does the article suggest uncertainty about Fed's policy stance and what is the uncertainty about?*
> Write answer as: {Yes/No} {response to inflation / response to real economy / inflation targets / communication / Fed's macroeconomic projections / Fed policy framework / dot plots} {explanation less than 25 words}

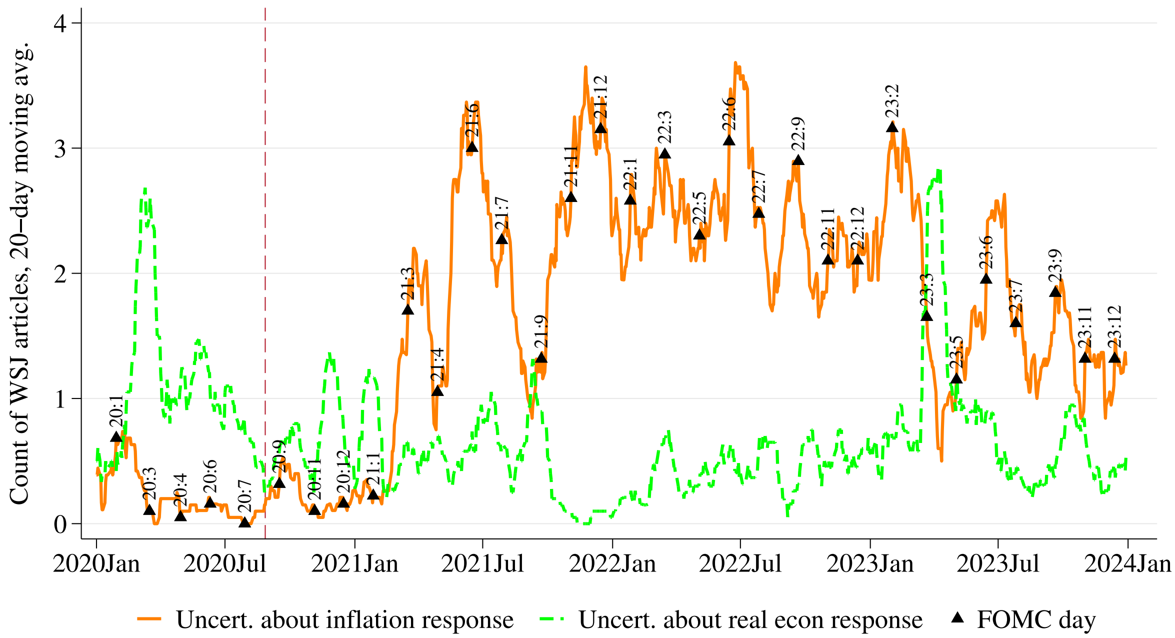

Figure 4. Public perceptions of reaction function uncertainty. The figure presents proxies for public perceptions of uncertainty about the Fed's reaction function. The indices are daily counts of WSJ articles that are classified as suggesting uncertainty about the Fed's response to inflation and the real economy, respectively. The daily counts are smoothed with a 20-day moving average for the purpose of the graph. The triangles mark the FOMC meeting days.

Uncertainty about the Fed's inflation response is the largest category (23% of all articles), followed by uncertainty about the response to the real economy (10% of all articles).

To measure how perceptions changed over time, we count articles per day that indicate uncertainty about the Fed's inflation and real-economy responses, respectively. Figure 4 displays those indices smoothed with a 20-day moving average. The Fed's inflation response appears to be of little concern until early 2021, absent large inflationary shocks. However, from early 2021 onward, uncertainty about the inflation response rapidly rises and is strongly positively correlated with the level of inflation and inflation surprises around CPI announcements.[13] Over the same period, uncertainty about the real-economy response shows much less increase until the 2023 Silicon Valley Bank failure.

Given randomness in GPT classification, the same article could be assessed differently each time the prompt is launched. We thus run the GPT classification twice. The results from both runs are highly correlated (0.88 for uncertainty about inflation response and 0.83 for the real-economy response). Figure A-6 compares the indices from the two runs, showing nearly identical time-series variation.

[13] A regression of the Fed's inflation-response uncertainty index on the level of the core CPI inflation and inflation surprises (at the CPI announcements) yields strongly significant positive coefficients and explains around 50% of the variation in the inflation response uncertainty index.

In summary, the evidence thus far suggests that the Fed's communication about the framework, combined with unconditional forward guidance, created conditions for fragility. Public uncertainty about the Fed's reaction function rose markedly already in 2021, as economic shocks diverged from the baseline scenario policymakers had assumed. While the Fed's guidance was credible in the near term, it introduced uncertainty about the future policy path. This evidence corroborates contemporaneous findings by Bauer et al. (2024), Bocola et al. (2024), and Pflueger (2025), who also document perceptions of a weakening Fed's inflation response. Additionally, we highlight the importance of reaction function uncertainty, which was fostered by the FOMC's own dispersed views revealed in their communications.

III. Conceptual framework

We begin with a simple model to examine how the 2020 framework can interact with market perceptions of the Fed's policy stance and the underlying state of the economy. The monetary policy block builds on Eggertsson and Kohn (2023), who introduce asymmetry in the Fed's objective function consistent with the 2020 framework. To clarify how the Fed-induced uncertainty influences risk premia, we extend the model by incorporating market beliefs about the Fed's policy preferences and disagreements over the economic outlook to reflect the uncertainty and disagreement just discussed. This section highlights its key components and implications most relevant to our empirical analysis. The complete model is detailed in Appendix C.

III.A. Model environment

There are two agents: the Fed (superscript f) and the market (superscript m). The model is static, representing any period t.

Timing assumption. The key friction stems from imperfect information. Specifically, the market trades financial assets and the Fed determines its policy before shocks are realized and before economic activity takes place. We label this pre-shock window as t'. This timing assumption introduces a "lag" whereby the Fed and the market can only react to their expectations of time t variables. The Fed sets the nominal interest rate $i_{t'}$. The market conducts economic activities at time t. Because all expectations are taken at t', we omit the time subscript from the expectations operator, writing $E^j[z_t], j \in \{m, f\}$; we drop the superscript j whenever the Fed's and the market's expectations agree.

Structure of the economy. The economic environment is described by the inflation rate (π_t) and the employment gap ($l_t - l^*$) and is subject to two shocks at time t—a cost-push shock u_t and a net demand shock d_t. The Phillips curve and the IS equation are:

$$\pi_t = E^m[\pi^*] + \kappa(l_t - l^*) + u_t \quad (1)$$

$$l_t - l^* = -\chi(i_{t'} - E^m[\pi^*] - r^*) + d_t, \quad (2)$$

where π^* is the Fed's inflation target, r^* is the natural rate of interest, and l^* is the maximum employment rate consistent with inflation at the target, $\pi_t = \pi^*$. Inflation is anchored by the market's perceptions of the Fed's inflation target, $E^m[\pi^*]$. The Fed's policy rate $i_{t'}$ affects employment via equation (2), which then affects inflation via equation (1).

The Fed's objective function. Reflecting the 2020 framework, we assume that the Fed selects $i_{t'}$ to minimize a loss function that is asymmetric with respect to employment (Eggertsson and Kohn, 2023):

$$L_t = \begin{cases} (\pi_t - \pi^*)^2 + \lambda_B(l_t - l^*)^2 & \text{if} \quad l_t \leqslant l^* \\ (\pi_t - \pi^*)^2 + \lambda_G(l_t - l^*)^2 & \text{if} \quad l_t > l^*, \end{cases} \quad (3)$$

where $\lambda_B > \lambda_G$. We use the subscript B to denote "bad" times and G to denote "good" times. Given the timing assumption, the Fed chooses $i_{t'}$ to minimize the expected value of the loss, $E^f[L_t]$.

III.B. Information assumptions

Unlike the standard model which assumes common and full information, we make information assumptions that allow us to capture diverging views between the Fed and the market. Importantly, in assuming the Fed-market disagreement about the shocks driving the economy (assumption 2 below) and the market's uncertainty about the Fed's reaction function (assumption 4), we build on the evidence presented in the last section. The key assumptions are:

1. The market and the Fed have perfect knowledge of the timing in the model, the Fed's optimization problem, and the parameters κ and χ.

2. They agree on the distribution of cost-push shocks $u_t \sim$ i.i.d. $N(E[u_t], \sigma_u^2)$, but may have different beliefs about the demand shocks $d_t \sim$ i.i.d. $N(E^j[d_t], \sigma_d^2)$, $j \in \{m, f\}$.

3. The Fed knows the policy parameters λ_G, λ_B and π^* and the market's expectation of the inflation target $E^m[\pi^*]$. It does not know the natural rate of interest r^* and the maximum employment rate l^* and forms expectations $E^f[r^*]$ and $E^f[l^*]$.

4. The market knows r^* and l^* (or behaves as if its views are correct), but is uncertain about the Fed's asymmetry parameters λ_G and λ_B (as specified below), and only knows the average policy preference $\lambda = \frac{\lambda_B + \lambda_G}{2}$. It also forms expectations about the policy-relevant inflation target, $E^m[\pi^*]$, which captures the idea that the market's belief could deviate from the Fed's official target.[14]

III.C. The optimal policy stance in the model

The focus on employment shortfalls, $\lambda_B > \lambda_G$ in loss function (3), is an integral part of FAIT. In terms of optimal policy, the loss function asymmetry interacts with the uncertainty that the Fed faces in a novel way. The Fed forms expectations of how the employment gap $(l_t - l_t^*)$ will evolve, but it must now also assess whether $(l_t - l_t^*)$ will be positive or negative. The stochastic component in employment gap, denoted θ_t, arises from the Fed's forecast errors about demand and the r^*, $\theta_t = \epsilon^f_{d,t} + \chi \epsilon^f_{r*}$, where $\epsilon^f_{d,t} = d_t - E^f[d_t]$ and $\epsilon^f_{r*} = r^* - E^f[r^*]$. We assume that θ_t is uniformly distributed on $[-\Sigma_t, \Sigma_t]$, where Σ_t summarizes the Fed's uncertainty.[15]

The Fed's forecast errors determine whether the employment gap is positive or negative, with the latter having a larger impact on the losses due to asymmetry in (3). The Fed takes this into account when setting the optimal policy rate $i_{t'}$:

$$\underbrace{i_{t'} - E^m[\pi^*] - E^f[r^*]}_{\text{Real rate gap}} = \chi^{-1}\left(E^f[d_t] + \frac{\kappa}{\tilde{\kappa}}(E[u_t] + (E^m[\pi^*] - \pi^*)\right) + \underbrace{i_{t'}^{bias}}_{<0}, \tag{4}$$

where $\tilde{\kappa} \equiv \kappa^2 + \lambda$ and $\lambda = \frac{\lambda_G + \lambda_B}{2}$ is the average employment weight. Considering the trade-off between employment and inflation, the Fed chooses an expected real rate gap to optimally offset expected demand and cost-push shocks, $E^f[d_t]$ and $E[u_t]$. Additionally, the Fed accounts for the extra inflation arising from the market's belief about the inflation target, $E^m[\pi^*] - \pi^*$, by tightening when market-perceived inflation target exceeds π^*.

[14] Following Schorfheide (2005); Bianchi et al. (2023); Evans and Honkapohja (2009), we assume that expectations are formed through external learning processes, i.e., exogenously, and ignore the general equilibrium effects of decisions on expectations. Eusepi and Preston (2010) study the role of communication in anchoring expectations when beliefs are formed using external learning.

[15] The assumption of a uniform distribution, following Eggertsson and Kohn (2023), ensures a tractable model solution and captures the complexity of the forecasting task. In practice, forecasts are often formed using large-scale models. Policymakers face significant uncertainty about the distribution of their forecast errors. While they seek to avoid extreme errors, they also know that such errors are bounded and cannot take arbitrarily large values. Within this bounded support, the uniform distribution maximizes entropy, representing a worst-case scenario in which uncertainty about forecast errors is at its highest.

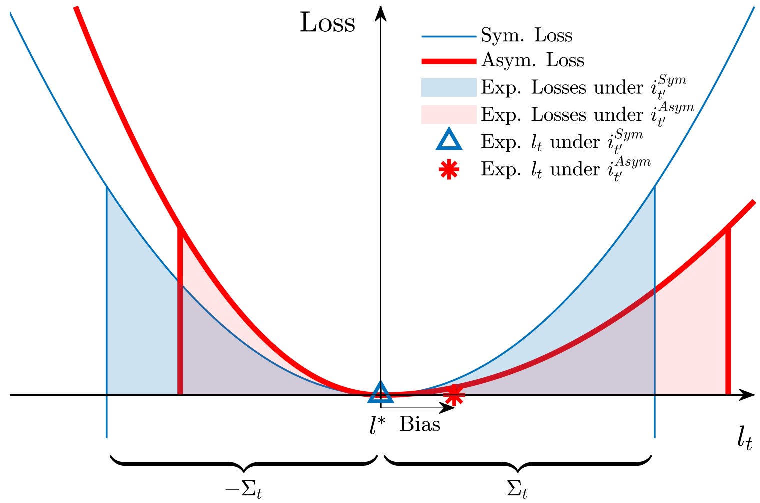

Figure 5. Illustration of the policy bias under an asymmetric loss function. The figure plots the Fed's losses as a function of the employment gap $l_t - l^*$. The curves depict the quadratic loss under symmetric loss function (*Sym*, with weights $\lambda_G = \lambda_B = \lambda$, blue thin line) and asymmetric loss function (*Asym*, $\lambda_B = \frac{3}{2}\lambda$ and $\lambda_G = \frac{1}{2}\lambda$, red thick line), respectively. The triangle and star indicate the optimal expected employment level chosen by the Fed under each policy. The bias due to asymmetry is the distance between these two optimal employment levels. The shaded regions correspond to the expected losses, given the optimal policy choices. Vertical lines mark the support of the uniform distribution of employment outcomes around the expected value. The graph is constructed assuming the absence of cost-push shocks.

As highlighted by Eggertsson and Kohn (2023), the asymmetric loss function implies that policy is dovishly biased:[16]

$$i_{t'}^{bias} = -(\lambda_B - \lambda_G) \cdot g(\Sigma_t) + B_{t'}. \quad (5)$$

The policy bias increases with the Fed's uncertainty, $\frac{\partial g}{\partial \Sigma_t} > 0$.[17] The bias means that the Fed will set a rate lower than in the symmetric case to account for the risk that a negative employment gap could open up and inflation could fall below the target. The greater the Fed's forecast uncertainty, Σ_t, the more expansionary bias is required to optimally reduce the likelihood of a shortfall.

Figure 5 illustrates this asymmetric mechanism from the Fed's perspective in the pre-shock period. The graph compares the optimal policy minimizing employment losses under a symmetric loss function with weight $\lambda_B = \lambda_G = \lambda$ (depicted by the solid blue line) and an asymmetric loss function with $\lambda_B > \lambda_G$ (the red solid line). Under certainty

[16] If the loss function is symmetric, i.e., $\lambda_G = \lambda_B = \lambda$, then λ determines the response of the optimal policy rate to inflation, resulting in a Taylor rule-like optimal policy rate, where the coefficients depend on λ and other model parameters (see, e.g., Clarida et al. (1999)). Specifically, a larger λ leads to a smaller response to inflation, as it reflects the Fed placing greater weight on employment relative to inflation.

[17] The term $B_{t'}$ is a second-moment term that arises from the quadratic form of the loss function and the trade-off between employment and inflation but is not our primary focus.

($\Sigma_t = 0$), losses in both cases are minimized by choosing i_t such that $l_t = l^*$, and there is no loss in either case at this value. However, the policies differ under uncertainty ($\Sigma_t > 0$). With symmetry, the Fed's optimal policy rate, $i_{t'}^{\text{Sym}}$, is still set such that in expectation $E^f[l_t] = l^*$. While the expected employment gap is zero, the realized value of l_t may fall anywhere within the interval $[l^* - \Sigma_t, l^* + \Sigma_t]$ due to forecast uncertainty. The expected loss is the area under the loss function within this interval (shaded blue region). Absent realized forecast errors, $l_t = l^*$ and *realized* loss is zero.

In contrast, under an asymmetric loss function, it becomes optimal for the Fed to be more expansionary. It chooses $i_{t'}^{\text{Asym}} < i_{t'}^{\text{Sym}}$ such that expected employment will be above l^*, $E^f[l_t] > l^*$. This approach reduces the likelihood of severe shortfall losses, even though it implies a positive loss from $l_t > l^*$, even absent forecast errors. See Appendix C.4 for details.

Importantly, the Fed's uncertainty interacts with the asymmetric loss function. Under symmetry, $i_{t'}^{\text{Sym}}$ remains optimal regardless of the level of uncertainty, because the marginal losses associated with shortfalls and overshoots are always identical. In contrast, with asymmetry, an increase in Σ_t amplifies the marginal losses on the shortfall side relative to the overshooting side, so the Fed optimally has an even greater dovish bias — lower $i_{t'}^{\text{Asym}}$ to generate even higher l_t and steer the economy further from the more extreme losses from undershooting employment.

III.D. Market-perceived policy surprises and asset pricing

Monetary policy surprises, as seen by the market, can arise from two broad sources. One is the market's perception that the Fed may differently assess economic conditions (strength of demand shock and level of r^*) relative to the market's belief. Alternatively, the surprise can arise from the market's updating about the Fed's stance (reaction function parameters). The Fed could be viewed as too hawkish or too dovish in responding to inflation, given what the market deems appropriate. These differences between the Fed and the market provide a basis for interpreting surprises as market-perceived policy mistakes.

The market knows the optimal policy problem and, subject to their information, forms expectations of the policy rate, $E^m[i_{t'}]$. Belief differences between the Fed and the market drive the market-perceived interest rate surprise, $\epsilon_{i_{t'}}^m = i_{t'} - E^m[i_{t'}]$, through the following channels: (*i*) beliefs about the size of the demand shock ($\epsilon_d^{f,m} = (E^f - E^m)[d_t]$),[18] (*ii*)

[18] Caballero and Simsek (2022a,b) study this form of disagreement. In the post-Covid period, one source of it stemmed from the Fed underestimating the impact of fiscal stimulus (e.g., Bianchi et al., 2023; Hazell

the Fed's estimate of the natural rate of interest ($\epsilon^f_{r*} = r^* - E^f[r^*]$), *(iii)* the market's belief of the inflation target ($\epsilon^m_{\pi*} = \pi^* - E^m[\pi^*]$), and *(iv)* the market's perception of the asymmetric policy stance ($\epsilon^m_\lambda = [\lambda_G - \lambda_B] - E^m[\lambda_G - \lambda_B]$). We assume that the market knows the average employment weight λ, but they don't know whether the Fed's asymmetry is moderate (most likely) or severe (less likely):

$$\lambda_B - \lambda_G \sim \begin{cases} \Delta & \text{w.p. } (1-p_{t'}) \quad \text{(moderate asymmetry)} \\ 2\Delta & \text{w.p. } p_{t'} \quad \text{(severe asymmetry)} \end{cases} \tag{6}$$

where $\Delta > 0$, and $p_{t'} < 0.5$. The market's uncertainty about the degree of asymmetry is given by $p_{t'}(1-p_{t'})\Delta^2$ and is the largest when $p_{t'} = 0.5$.

Given the sources of market-perceived Fed surprises, the Fed-induced uncertainty can be expressed as the variance ($Var(.)$) stemming from these components of $\epsilon^m_{i_{t'}}$:[19]

$$Var^m(\epsilon^m_{i_{t'}}) = h(Var^m(\epsilon^f_{r*}), Var^m(\epsilon^{f,m}_d), Var^m(\epsilon^m_{\pi*}), p_{t'}(1-p_{t'})\Delta^2\Sigma^2_t) \tag{7}$$

The Fed-induced uncertainty affects conditional risk premia that the market charges on financial assets exposed to the perceived monetary policy shocks. The market trades assets at time t' before shocks realize, and prices assets with the real log SDF, $sdf_t - E^m[sdf_t] = -\gamma\tilde{l}_t, \gamma > 0$, where $\tilde{l}_t \equiv d_t - E^m[d_t] - \chi\epsilon^m_{i_{t'}}$ is the shock to l_t from the market's perspective in period t'. This reduced-form SDF captures the idea that investors' marginal utility increases with employment shortfalls, which, by Okun's law, are proportional to negative output gap shocks.

The extent to which asset payoffs comove with the SDF determines their conditional risk premiums. To illustrate risk premium properties, we focus on the claim to end of period consumption ("stock," paying real cash flow proportional to $\exp(l_t)$) and a two-period nominal bond (paying $\exp(-i_{t'} - \tilde{\pi}_t)$ in real terms). The ex-ante risk premiums on the stock ($rp^s_{t'}$) and bond ($rp^b_{t'}$) are:

$$\begin{aligned} rp^{\text{stock}}_{t'} &= \gamma(\quad \sigma^2_d + \chi^2\, Var^m[\epsilon^m_{i_{t'}}]) \\ rp^{\text{bond}}_{t'} &= \gamma(-\kappa\sigma^2_d + (1-\kappa\chi)\chi\, Var^m[\epsilon^m_{i_{t'}}]), \end{aligned} \tag{8}$$

where $rp_{t'}$ denotes the expected excess log return plus a standard Jensen's inequality adjustment (see Appendix C.6 for details).

and Hobler, 2025). Separately, Sastry (2024) argues that disagreement between the market and the Fed about the precision of public information has large effects on market beliefs.

[19] Equations (A.19) and (A.20) in Appendix C.5 report expressions for the surprise and variance terms.

The market prices the demand shock uncertainty (σ_d) as well as the Fed-induced uncertainty ($Var^m[\epsilon^m_{i_{t'}}]$). The Fed-induced uncertainty drives a positive risk premium on both stocks and bonds—the "common" risk premium effect. This effect operates through a heightened real premium rather than inflation premium.[20] The demand shock uncertainty, exogenous to the Fed, instead increases the risk premium on the stock but reduces the risk premium on the bond, similar to a flight-to-safety.

By equation (8), premiums on bonds and equities rise with policy communication or actions that induce market's concerns about policy mistakes, $Var^m[\epsilon^m_{i_{t'}}]$. The effect of the Fed's signals depends on the direction of policy mistakes perceived by the market. If the market is concerned about a too-dovish Fed, hawkish signals can lower premiums by revealing to the public willingness change course as needed.[21]

III.E. Model predictions for risk premia

The model explains why the Fed delayed the tightening action. The bias in the policy rate implies a less preemptive policymakers' behavior against rising inflation in the face of positive demand shocks especially when economic uncertainty is high. This is consistent with the Fed maintaining an easy policy stance through 2021 and policymakers' downplaying the impact of fiscal shocks on demand (Quote 24, 25, and 27).

But to examine empirically how Fed-induced uncertainty influences financial assets, we now highlight three specific predictions. These comparative statics will guide our empirical analysis and our interpretation of the results.

Prediction 1. Lack of clarity about the reaction function drives up risk premiums.

The Fed's confusing messaging following the framework announcement suggests an increased market's uncertainty about the policy-relevant inflation target $Var^m[\epsilon^m_{\pi*}]$ and how much asymmetry and inflation overshoot the Fed would allow, captured by Δ and probability $p_{t'}$ in equation (6) and (7). Both sources increase $Var^m[\epsilon^m_i]$.

[20] In the model, by stimulating demand, the Fed contributes to making inflation procyclical which commands a negative risk premium, consistent with Campbell et al. (2020), Bekaert et al. (2021), Ermolov (2022). Since here we focus on the Fed-induced uncertainty, we abstract from the pricing of the supply side risks. In the data, inflation risk premia measured using ten-year inflation swaps remained either negative or near zero for most of the post-2020 period (Cieslak and Pflueger, 2023; Cieslak, 2024). See also Pflueger (2025) for a related analysis.

[21] Cieslak and McMahon (2024) examine the pre-Covid from 1987 and argue that the market's main concern was tilted toward the Fed being too dovish, such that hawkish communication reduced premiums by signaling the Fed's readiness to act should the need arise. Below, we rely on the empirical methodology of Cieslak and Pang (2021) to separate the Fed-induced uncertainty from the flight-to-safety component based on sign restrictions and stock-bond comovement.

Prediction 2. Uncertainty over the Fed's asymmetric policy preferences drives up risk premiums more acutely when economic uncertainty is high.

The last term in equation (7), $p_{t'}(1 - p_{t'})\Delta^2\Sigma_t^2$, indicates that the degree to which the market is uncertain about the asymmetry of the Fed's reaction function, $p_{t'}$ and Δ, interacts with the Fed's uncertainty about the state of the economy, Σ_t:

$$\frac{\partial Var^m[\epsilon^m_{i_{t'}}]}{\partial p_{t'} \partial \Sigma_t} > 0 \qquad\qquad \frac{\partial Var^m[\epsilon^m_{i_{t'}}]}{\partial \Delta \partial \Sigma_t} > 0$$

When the Fed becomes more uncertain about the economy, Σ_t rises and the dovish bias in its policy stance (5) strengthens, as illustrated in Figure 5. This effect gets amplified as the market becomes concerned about the Fed excessively overweighting employment shortfalls and tolerating too high inflation overshoots.

Prediction 3. Disagreements between the Fed and the market in their assessments of the state of the economy drive up the risk premiums.

The Fed-induced uncertainty as seen by the market, $Var^m[\epsilon^m_i]$, rises with uncertainty stemming from both disagreement about the r^*, $Var^m[\epsilon^f_{r*}]$, and the divergent views on the relative strength of demand shocks, $Var^m[\epsilon^{f,m}_d]$. The design of FAIT reflected the Fed's concerns about persistently low r^*, not fully shared by the market. When implemented, the policy stance was reinforced by forward guidance and an apparent Fed underestimation of the strength of the fiscally driven demand. As incoming data began to diverge from the Fed's baseline scenario in early 2021, both sources of market uncertainty plausibly rose, raising $Var^m[\epsilon^m_i]$ and, in turn, the risk premium—despite the Fed still maintaining an easy policy stance.

Predictions 1–3 imply that markets can undermine the Fed's desired stance by pricing in the Fed-induced uncertainty, especially at times of higher economic uncertainty. A higher market-perceived probability of the Fed becoming too dovish tightens financial conditions via the risk premium. Conversely, Fed actions or communication that clarify the policy stance can reduce the market-perceived mistakes probability and thus stabilize the risk premiums.

IV. Market event study data

Our empirical analysis focuses on the 2020–2024 period. Using event studies, we examine changes in asset prices around Fed communication events and decompose these changes into underlying channels. We first use high-frequency event studies to support causal interpretation of the Fed's effects on premia, and then turn to daily-frequency analysis to investigate the economic mechanisms. This section describes the data and empirical approach for both layers of the analysis.

IV.A. Fed and macro events

Table I summarizes the full set of Fed and macroeconomic events used in our analyses. We consider a comprehensive list of Fed communication events including monetary policy decision announcements, Chair's press conferences, minutes releases, as well as communications by individual Fed officials via speeches, media interviews, testimonies, etc. The communication by individuals is important, given that a significant part of noteworthy Fed communications followed by the market happen outside the scheduled FOMC announcements (e.g, Cieslak et al., 2019; Swanson and Jayawickrema, 2023; Bianchi et al., 2025). Our main source of individual communications is the FOMC Speak database, which is available through August 30, 2023.[22] To reduce noise, we only use events that have exact time stamps in the FOMC Speak and that were mentioned in the WSJ up to two days following the event. This leaves us with 479 individual "key speaker" events. Appendix Table A-5 summarizes the types of events by the speaker.

Additionally, we consider the most relevant time-stamped macroeconomic announcements from the Bloomberg Economic Calendar. In the daily analysis, when studying Fed communication days, we exclude days that also contain macroeconomic announcements; that is, we focus on clean Fed days. In the high-frequency analysis, we exclude any macroeconomic announcement windows that overlap with Fed communication event windows.

IV.B. Asset price data

We use high-frequency data on Treasury futures with underlying bond maturities of two and ten years from TickData.com. We convert log futures price changes into yield changes using the duration of the underlying notional bond available from Bloomberg.[23] At the daily frequency, we use zero-coupon Treasury yields from Gurkaynak et al. (2007).

[22]The FOMC Speak website was retired at the end of 2023 and the records end in August 30, 2023. We thank Genevieve Podleski from FRASER for her help in making the original FOMC speak dataset available from archival records. The archive is now accessible at `https://fraser.stlouisfed.org/timeline/fomc-speak-archive`.

[23]The futures' duration is shorter than the time to maturity because the underlying is a coupon bond, and the deliverable basket admits a range of bond maturities. Therefore, we use the "ultra" versions of the ten-year Treasury futures contracts, which specify a relatively narrower range of deliverable maturities

FOMC events			Macro events		
Type	Count†	Window (minutes)	Type	Count†	Window (minutes)
Monetary policy decisions (MPD)	24	−10,+20	CPI	37	−10,+20
Chair press conferences (PC)	24	−10,+120	PPI final demand	37	−10,+20
Minutes	25	−10,+20	Nonfarm payroll	37	−10,+20
Speeches and other intermeeting comms (FOMC Speak)⋆	479	0,+120	GDP	37	−10,+20
			Initial jobless claims	161	−10,+20
			ISM manufacturing	37	−10,+20
			Consumer confidence	37	−10,+20
			Advance retail sales	37	−10,+20

Table I. Summary of events. The table summarizes the FOMC communication events and macro announcements used for the event-study analysis.
†The event counts are reported for the 2020:08–2023:08 sample when the FOMC Speak database ends. The sample covers 24 MPDs and PCs over this period and 25 releases of FOMC minutes (including the August 2020 release of minutes from the July 2020 meeting). Macro releases are monthly, except for weekly initial jobless claims. We include all GDP releases, i.e., advanced, second, and third.
⋆The following filters are applied to the individual communication events over the intermeeting period: (1) Event window: 0 to +120min trading window; (2) Drop non-trading day entries (12 events happened on non-trading days, weekends, etc.); (3) Speakers included are Barkin, Bostic, Brainard, Bullard, Clarida, Daly, Evans, George, Harker, Kaplan, Kashkari, Mester, Powell, Waller, Williams (see Appendix Table A-5 for details); (4) Keep events when the speakers' name was mentioned by WSJ on day 0, +1, or +2 of the event; (5) Manually check big moves (e.g., exclude Nov 9, 2020 vaccine announcement; include Jun 13, 2022 WSJ Timiraos' tweet).

Table I reports the high-frequency windows around different types of announcements and Fed communication events. For announcements, we use a narrow window from 10 minutes before to 20 minutes after the announcement. For press conferences and other speaking events, we measure the window from the start of the event to +120 minutes, but the conclusions are robust to considering shorter windows of 60 or 90 minutes. We use the same comprehensive set of Fed events in the daily-frequency analysis.

High-frequency windows around macro and Fed events account for more than 30% of daily variation in short-rate expectations (especially monetary news component), and about 20% of daily variation in the term premium. The results in Bauer et al. (2023) suggest that narrow event windows do not fully capture risk premium response to monetary policy news. Hence, daily frequency helps account for slow adjustment. The daily frequency also allows us to examine the underlying economic mechanisms more directly by testing the predictions of the conceptual framework, given the broader availability of relevant daily variables.

($9\frac{5}{12}$ to 10 years for the ten-year contract) compared to the standard ten-year futures. This gives the duration of the two- and ten-year futures of 1.9 and 8.0 years, respectively, during 2020:08–2023:12 period.

IV.C. Yield decompositions

Figure 1 shows that there was a pronounced increase in term premium since late 2020, relying on the decomposition of daily yields into term premia and short-rate expectations from Kim and Wright (2005, KW). However, as illustrated in equation (8), the term premium reflects both exogenous economic uncertainty and Fed-induced uncertainty, with the latter being our primary focus. To isolate these components, we follow Cieslak and Pang (2021, CP) by exploiting sign restrictions on daily innovations in stock market returns and yield changes in a structural VAR framework.

The decomposition provides four labeled orthogonal factors by splitting short-rate expectations news into monetary news (*MP*) and expected growth news (*G*), and risk premium news into common premium (*CRP*) news and hedging premium (*HRP*) news. The *MP* and *G* factors move primarily the short end of the yield curve, where *MP* news induces positive comovement between stock and bond returns, in line with discount rate news, while *G* news induces a negative comovement, akin to cashflow growth news. Term premium news, *HRP* and *CRP* components, instead, proxy for σ_d^2 and $Var^m[\epsilon_{i'}^m]$ terms in equation (8), respectively. *CRP* is of particular interest as capturing the effect of Fed-induced uncertainty. We identify this component as news that dominantly impacts the long end of the yield curve and moves stock and bond returns in the same direction. The *HRP* news is instead identified from news moving stocks and bonds in opposite directions, as in flight-to-safety episodes, aiming to reflect economic uncertainty exogenous to the Fed.

To extend the logic of the daily CP decomposition to non-consecutive high-frequency event windows, we apply analogous sign restrictions at the intraday level. Specifically, we divide each high-frequency trading window of interest into non-overlapping ten-minute intervals and compute equity returns and changes in two- and ten-year Treasury yields within each interval. We then classify each ten-minute interval into one of the four shock categories. A CRP window is one in which equity returns and ten-year yield changes move in opposite directions and the ten-year yield moves by at least as much as the two-year yield (in absolute value terms). A MP window also features opposite-sign equity-bond moves, but with the two-year yield response being larger than the ten-year yield response. G and HRP windows are identified from the same-sign equity-bond moves, again distinguished by whether the two-year (G) or the ten-year (HRP) yield change is larger in absolute value. Windows with overlapping events in Table I are tagged using a majority rule based on which event covers the majority of the window's constituent minutes. All remaining windows capture ordinary trading activity outside any identified event.

Throughout the empirical analysis in the main text, we focus on the CP decomposition. However, the results reported for the CRP component are also robust to using the term premium component from the KW decomposition, and the results reported for the MP component are similarly robust to using the expectations hypothesis component from KW. In the appendix, we report the corresponding tables and figures based on the KW decomposition.

V. Empirical analysis

The motivating evidence so far broadly aligns with the model predictions. Uncertainty drives rising term premium through mid-2021 (Figure 1) against the backdrop of the Fed's accommodative stance, large fiscal shocks, and mixed macroeconomic signals. The subsequent term-premium stabilization coincides with the Fed's changing communication from mid 2021 toward more hawkish (Figure 2), foreshadowing the tightening ahead. We now explore the model predictions in more detail using the combination of high-frequency and daily event studies.

V.A. Yield curve drivers on the Fed event days

We first zoom in on the underlying yield dynamics in Figure 1 on the Fed event days. Specifically, Figure 6 plots the cumulative daily changes in the ten-year yield on the Fed event days attributable to the four news factors in the CP decomposition. The monetary-news component (left panel orange line) shows that policy-rate expectations remained very stable until late 2021, while the growth-news component (left panel navy line) started recovering from first half of 2021, consistent with the economic contours of this period described in Section II.

Importantly, our proxy for the Fed-driven uncertainty, the common risk premium (orange line of the right panel of Figure 6), starts rising on the Fed event days soon after the August 2020 framework announcement. *CRP* then peaks at 84 bps on April 19, 2022, as multiple Fed officials intensify communication about upcoming rate rises from mid-April. The timing aligns with the shift from dovish to consistently hawkish communications recorded in Figure 2 (see also Quotes 45, 46, 47, and 48). The overall peak of *CRP* across all days occurs on June 16, 2022, the day after the first 75 bps hike. In Figure 7 below, we further analyze this pattern with the high-frequency event study.

The hedging premium component, *HRP*, also displays significant variation over this period. *HRP* is expected to raise yields as the economy strengthens and recession-hedging properties of bonds become less valuable, as seen through mid-2021 (navy line

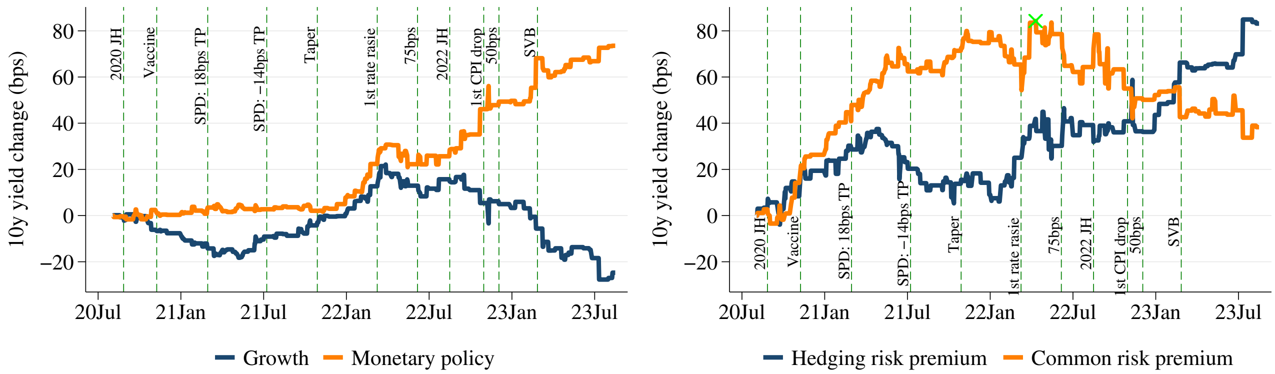

Figure 6. Fed event days news decomposition. The figure presents the cumulative changes (starting from August 1, 2020) in the ten-year yield on Fed event days attributed to four orthogonal factors: monetary news (*MP*), growth news (*G*), common premium (*CRP*) news, and hedging premium (*HRP*) news. The yield decomposition comes from Cieslak and Pang (2021). Fed event days are defined as days with FOMC events listed in Table I, excluding days with macroeconomic releases. The green cross marks the peak in CRP on Fed event days, which occurs on April 19, 2022.

of the right panel of Figure 6). Conversely, it is expected to depress yields as economic uncertainty increases, as seen in late 2021.

V.B. Prediction 1: Lack of clarity about the Fed's reaction function

Prediction 1 points to lack of clarity about the Fed's reaction function manifesting in tighter financial conditions via the risk premium. The period following the introduction of the framework offers an environment in which to test this channel.

We examine the high-frequency impact of Fed communication on term premia splitting the sample into two periods: initial episode from August 2020 to April 2022 of elevated reaction function uncertainty, and a subsequent interval from May 2022 to August 2023 after the Fed had made its hawkish pivot. Although the Fed began hiking in March 2022, the decisive shift in communication occurred ahead of the June 2022 meeting (Figure 2). We therefore date the hawkish pivot to May 2022.

Figure 7 decomposes the cumulative CRP contribution to the ten-year yield on Fed event days into two components: (i) CRP changes realized within high-frequency event windows ("Fed event windows") and (ii) CRP changes realized over the remainder of the event day outside these windows. The latter is further divided into before-event and after-event windows.[24]

[24] In rare cases with multiple events on the same day, the post-event period is defined as the period after the first event of the day, excluding any other high-frequency event windows on that day. As a robustness check, we also verify that the period outside event windows between the first and last events accounts for only a very small component.

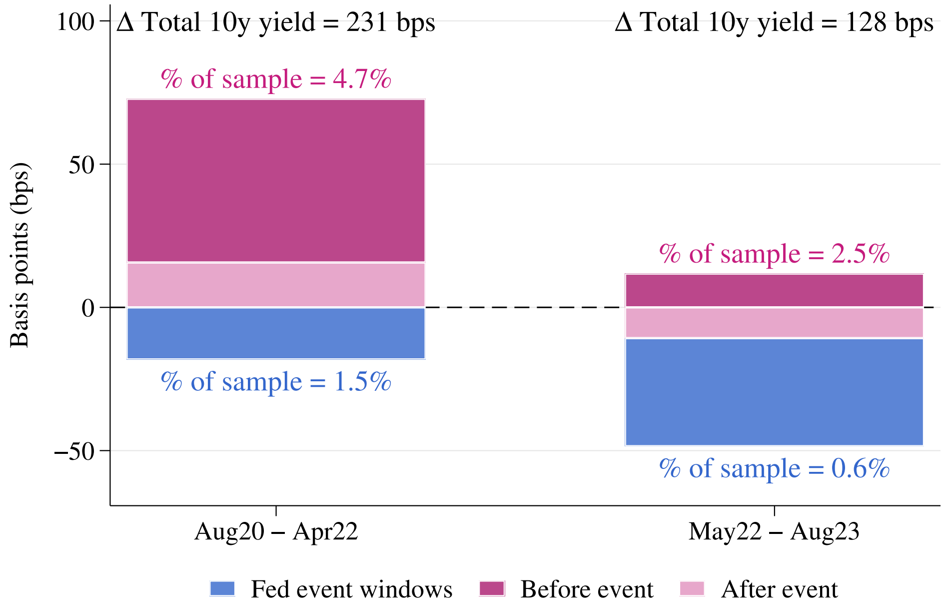

Figure 7. CRP contribution to the ten-year yield on Fed event days. Cumulative CRP changes split into Fed event windows vs. remainder of Fed event days (and pre/post event), before and after the May 2022 hawkish pivot. The magenta "% of sample" labels above the bars report the share of total trading minutes in each subperiod that occur on Fed days outside high-frequency event windows ("Before event" + "After event") and are classified as CRP windows. The blue "% of sample" labels below the bars report the corresponding share of total trading minutes that occur within high-frequency Fed event windows and are classified as CRP windows.

The high-frequency decomposition reveals a striking fact. Before the hawkish pivot, from August 2020 to April 2022, the CRP within the narrow Fed event windows was modestly negative (-18 bps), indicating that the Fed's communication resolved some uncertainty. Crucially, the CRP accumulated on the same Fed event days but outside the event windows is large and positive ($+73$ bps), producing a sizable net premium increase.

The narrow Fed event windows attributed to CRP shocks account for only about 1.5% of total trading minutes, and the remainder of Fed event days—outside the event windows—accounts for about 4.7%. Despite this small combined share of total trading time, the net CRP increase on Fed days accounts for about a quarter, $(73-18)/231 \approx 24\%$, of the total ten-year yield change of 231 bps through April 2022.

How should we interpret this pattern? The positive CRP on Fed event days but outside the narrow event windows plausibly reflects the market's uncertainty in anticipation of the Fed communications. Indeed, decomposing the day further, trading minutes prior to the Fed event account for $+57$ bps of the increase. If investors expect an upcoming Fed speech or announcement to clarify the policy stance, uncertainty may build up ahead of the event, raising the CRP.[25] When the event itself provides only partial resolution—consistent with the ambiguous and dispersed communication documented above—the net effect on the day is an increase in the risk premium. The fact that such a disproportionate share of CRP changes concentrates on the Fed event days, despite their small share of total trading time, suggests that the Fed-induced uncertainty is a major driver of the term premium over the pre-pivot period.

The picture changes sharply after the pivot. From May 2022 to August 2023, the narrow Fed event windows contribute −38 bps of CRP, while the remainder of Fed event days contributes essentially zero. By this time, the Fed's communication had become consistent and decisively hawkish, with both the mean and the dispersion of policy stance scores converging (Figure 2). The high-frequency evidence supports the interpretation that once the market perceived the Fed as credibly committed to fighting inflation, individual Fed communications effectively resolved uncertainty, reducing the term premium. Figure 8 additionally decomposes the effect by the Fed event type and shows that FOMC speeches are the main source of the CRP declines.[26]

V.B.1. A media-based measure of public-perceived policy mistakes

In our model, risk premia are affected by policy mistakes assessed from the market's perspective. Those mistakes stem either from disagreements between the public and the Fed about the state of the economy or what the appropriate policy response to the economy should be.

To complement the high-frequency analysis, we thus connect the common premium (CRP) variation to the fluctuations in the policy mistake probability as perceived by the public. We measure those perceptions from the WSJ news articles covering the Fed. Using the same corpus of articles as in Section II.B, we infer with a large language model

[25] A related literature documents significant uncertainty resolution before scheduled announcements; see, for example, Ai and Bansal (2018); Ai et al. (2021); Hu et al. (2022); Johannes et al. (2023); Ai et al. (2026). In contrast, we find uncertainty buildup ahead of Fed events during this period. This pattern highlights the special role of Fed event days and supports the causal argument that Fed-induced uncertainty contributed to the increase in risk premia during this period.

[26] The net value of the bars within each subperiod, i.e., the sum of all positive and negative bars, always equals the total CRP change on Fed event days. However, because the windows are split differently across figures, the magnitudes of the positive and negative bars may differ. This explains, for example, the visually different magnitudes of the positive and negative bars in Figures 7 and 8, even though both figures are based on the same set of Fed days and differ only in how the windows are split.

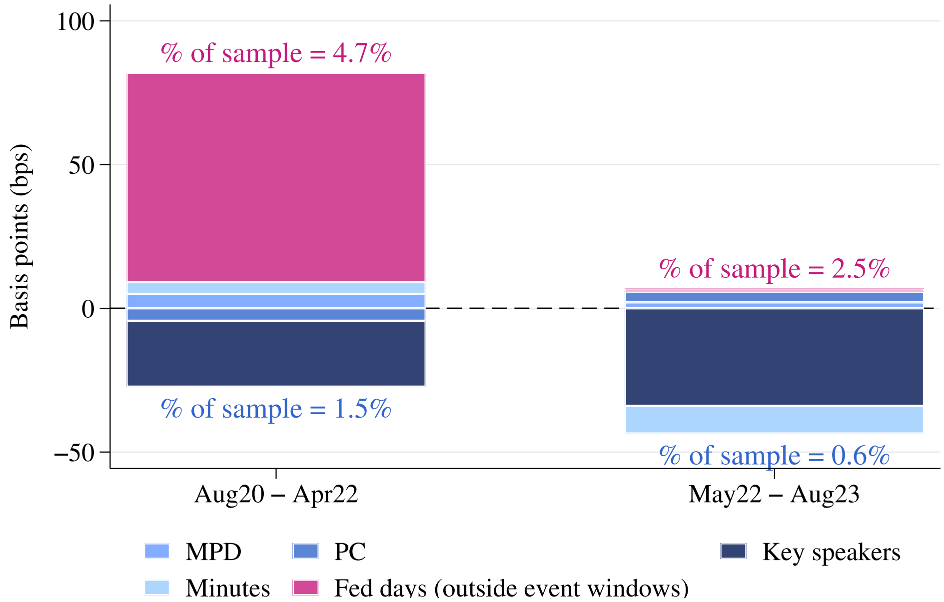

Figure 8. CRP contribution to the ten-year yield on Fed event days by event types. Cumulative CRP changes split into Fed event windows (further split by event types) vs. remainder of Fed event days, before and after the May 2022 hawkish pivot. The magenta "% of sample" labels above the bars report the share of total trading minutes in each subperiod that occur on Fed days outside high-frequency event windows and are classified as CRP windows. The blue "% of sample" labels below the bars report the corresponding share of total trading minutes that occur within all types of high-frequency Fed event windows ("MPD"+"PC"+"Key speakers"+"Minutes") and are classified as CRP windows.

whether an article indicates the public's concern about a potential Fed policy mistake, error, or incorrect decision.[27]

We construct a perceived mistakes index counting the number of articles per day that are classified as "Yes" (17.5% of all Fed-related articles during 2020:01–2023:12). Figure 9 plots the 20-day moving average of the mistakes index, marking selected dates when turning points occurred. Since newspaper articles are usually ex-post narratives on past events and can appear several days after an event, we treat the mistakes index as the dependent variable. To account for lags in reporting and smooth out noise, we predict a 20-day change in the average mistakes index with a 20-day change in yields, lagged by three days. We experiment with other smoothing windows and lags, and find that they do not qualitatively change the conclusions (see also Appendix Table A-6).[28]

[27] We provide the following prompt to GPT4: "*Q: Does the article suggest that the public is concerned about possible Fed's policy mistake, error, incorrect decision?* Write answer as: {Yes/No/not possible to determine} {explanation less than 25 words}.

[28] The dependent variable is the change in the average index between time t and $t-20$. Denoting the mistakes index as MI_t, we calculate its K-day moving average $\overline{MI}_{t,t-K+1} = \frac{1}{K}\sum_{i=0}^{K-1} MI_{t-i}$. Then we take

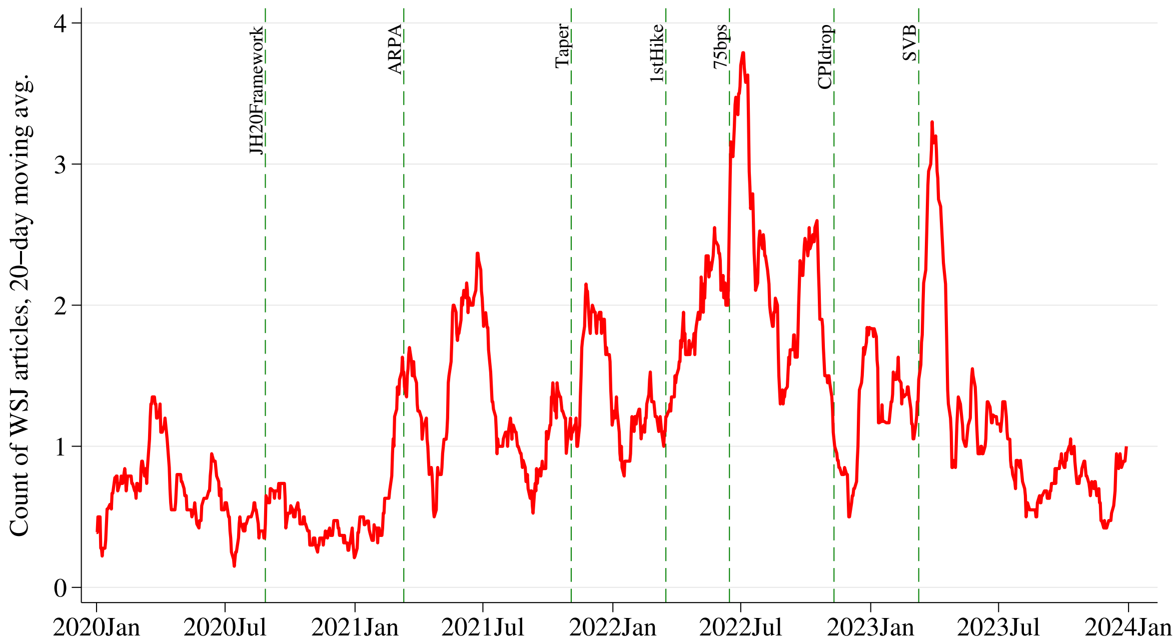

Figure 9. Mistakes index from WSJ articles. The figure plots the 20-day moving average of the mistakes index from 2020:01 to 2023:12. The mistakes index on a day t is the count of WSJ articles of that day classified as suggesting that the public is concerned about possible Fed policy mistake, error, or incorrect decision (count of "Yes" answered by GPT-4 to the prompt in footnote 27). We plot the average mistakes index between day t and $t-19$. The vertical lines mark the dates of selected turning points in the mistakes index.

In Table II, columns (1) to (4), we project changes in the mistakes index onto ten-year yield changes disaggregated into CP news components one at a time. The results document a positive link between mistake perceptions and term premia via the CRP. A one-standard-deviation increase in the ten-year yield due to CRP news is associated with a 0.37 standard deviation higher mistakes index. There is no relationship between the mistakes index and the news driving short-rate expectations (monetary and growth news factors). Columns (5) to (7) project the mistakes index on all four components jointly, using window sizes ranging from 10 to 40 days as a robustness check. The significance of the CRP remains consistent across specifications. The coefficient on the hedging premium component (HPR) is marginally significantly negative, suggesting that Fed policies over this period may have increased economic uncertainty, for example, by raising concerns about financial stability. This, in turn, would increase demand for safe bonds relative to stocks and lower the hedging premium.

the K-day difference ($\Delta\overline{MI}_{t,t-K} = \overline{MI}_{t,t-K+1} - \overline{MI}_{t-K,t-2K+1}$) as our dependent variable. In the baseline specification, we set $K = 20$ and regress $\Delta\overline{MI}_{t,t-20}$ on yield changes between $t-5$ and $t-25$.

Dependent variable: n-day change $(t-n,t)$ in the WSJ-based index of perceived policy mistakes

	(1) $(t-20,t)$	(2) $(t-20,t)$	(3) $(t-20,t)$	(4) $(t-20,t)$	(5) $(t-10,t)$	(6) $(t-20,t)$	(7) $(t-40,t)$
$\Delta y^{10}(MP)$	0.018				0.107	0.070	0.011
	(0.11)				(0.89)	(0.58)	(0.07)
$\Delta y^{10}(G)$		-0.131			-0.059	-0.107	-0.153
		(-1.28)			(-0.65)	(-0.99)	(-1.01)
$\Delta y^{10}(CRP)$			0.371***		0.233**	0.382***	0.324**
			(4.28)		(2.33)	(4.56)	(2.56)
$\Delta y^{10}(HRP)$				-0.231	-0.170*	-0.296**	-0.189
				(-1.64)	(-1.71)	(-2.46)	(-1.41)
R^2	0.00	0.02	0.14	0.05	0.09	0.23	0.14
N	890	890	890	890	890	890	890

Table II. Term premia and perceptions of policy mistakes. The table reports regressions of changes in the WSJ-based policy mistakes index on changes in yield components. The dependent variable is the change from $t-n$ to t in the n-day average mistakes index ($n = 20$ is plotted in Figure 9). The explanatory variables are components of yield changes between $t-5$ and $t-5-n$. Columns (1)–(4) are for the univariate regression of the ten-year yield changes from Cieslak and Pang (2021) ("CP decomposition") with a benchmark window of 20 days and columns (5)–(7) are for all four-factor decomposition of different window sizes. The sample period is 2020:08–2023:12. The regressions are estimated at a daily frequency. HAC t-statistics with $2n-4$ lags are reported in parentheses.

V.C. Prediction 2: Interaction between macroeconomic conditions and reaction function uncertainty

Figure 8 reveals that Fed communication events were associated with an initial increase in CRP before the hawkish pivot, and then subsequently with its reduction. According to our model Prediction 2, market-perceived uncertainty about the Fed's reaction function interacts with macroeconomic news and uncertainty. The 2020–2023 period combined elevated economic uncertainty with market concerns that the Fed was too dovish, i.e., precisely the conditions under which the model suggests credible anti-inflation signals should have outsized effects on premia.

V.C.1. The changing effect of macroeconomic news on yields

We now examine how high-frequency short-rate expectations and term premia react differently to macroeconomic news, specifically inflation news, during periods of different market concerns regarding the Fed's reaction function. We consider three subsamples: 2020:05–2020:12 (early Covid recovery and framework review), 2021:01–2022:04 (large inflation surprises), and 2022:05–2023:12 (active rate hikes and uniformly hawkish communication).

We focus on sensitivity to core CPI surprises. The CPI is the inflation indicator most followed by investors according to Bloomberg's relevance index and the core inflation component is relevant for policy. Core CPI surprises are plotted in Figure A-4.[29] During the 2016–2023 period, surprises have a standard deviation of 0.15 annualized percentage points (pp), a maximum of 0.7 pp, and a minimum of −0.3 pp. From 2021 to the policy pivot, inflation surprises are unusually large relative to the rest of the sample.

Figure 10 separately plots monetary policy news (left panel) and common premium news (right panel) against inflation surprises for three subperiods. Despite the large positive inflation surprises before the pivot (red diamonds), the market generally did not expect policy tightening (left panel), and instead priced the news via a higher *CRP* component (right panel). The relative insensitivity of short-rate expectations in 2021 echoes the findings of Swanson and Williams (2014) who analyzed the effect of forward guidance after the GFC. The post-pivot period (green triangles in Figure 10), is instead associated with a strong response of monetary news indicating that the Fed was once again viewed as reactive to inflation. In this period, only one occasion (2022:5) shows a significant response of *CRP*, which occurs exactly at the point when we split the sample based on the hawkish turn in communication. The most aggressive policy actions were followed in June 2022.

V.C.2. The role of the Fed's communication for yield movements on macro days

To further explore the role of Fed communication around macroeconomic news, we document an important interaction between macro news and the Fed's events. We show that the CPR declines around Fed communication events since the hawkish policy turn, seen in the right panel of Figure 8, accrue almost entirely following macroeconomic news.

Figure 11 decomposes high-frequency CRP contributions on macro announcement days into three components: the CRP realized within the narrow macro announcement windows themselves, the CRP realized in Fed event windows that occur on the same day after the macro announcement, and the CRP from all remaining Fed event windows.

Two patterns stand out. First, even after the hawkish pivot in May 2022, macro announcement windows generate a large cumulative CRP increase of +47 bps, indicating

[29] In unreported results, we study the sensitivity of yields to a broader set of inflation news (core PCE price index, PPI, in addition to CPI). The results are qualitatively unchanged. We exclude two months of Covid outbreak, 2020:03 and 2020:04, given extreme volatility in Treasuries attributed to dash for cash (Vissing-Jorgensen, 2021). As a robustness check, we find that yields did not respond significantly to core CPI news in this episode.

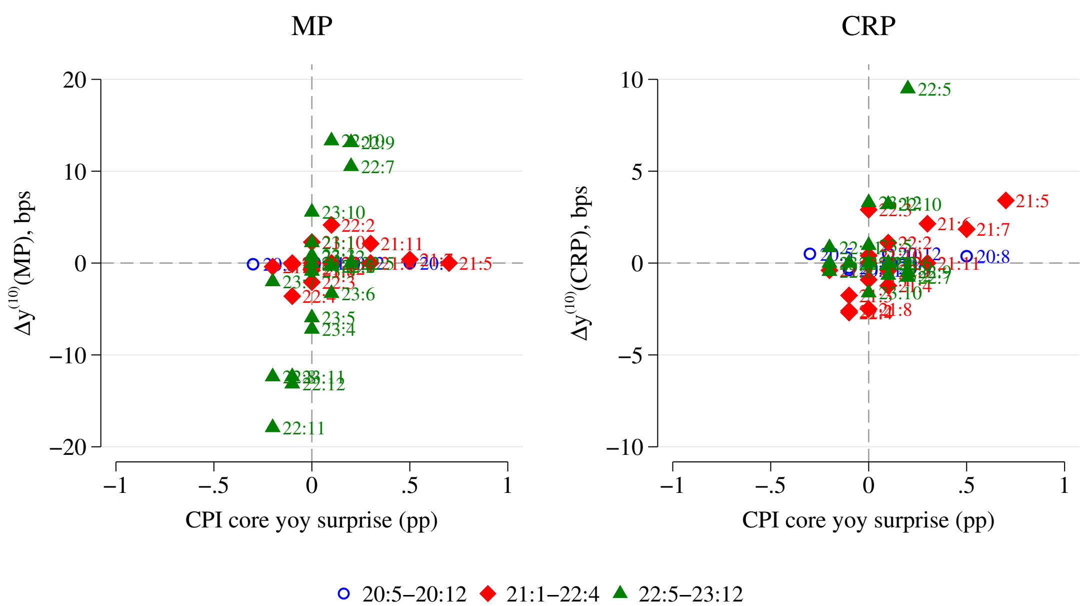

Figure 10. Sensitivity of yield components to core CPI surprises. The figure plots changes in the MP and the CRP components of the four-factor decomposition of the ten-year yield, measured over a 30-minute window around CPI announcements, against core CPI surprises. Blue dots correspond to 2020:08–2020:12, red diamonds to 2021:01–2022:04, and green triangles to 2022:05–2023:12.

markets' reassessment of how appropriate the policy stance is given incoming inflation and the labor market data. Strikingly, Fed event windows occurring on those same days—after the macro news—almost fully offset this increase, contributing -39 bps to the CRP decline. This offsetting pattern is both qualitatively and quantitatively consistent with Figure 7. As one interpretation, once the Fed's communicated stance became uniformly hawkish, individual communications credibly resolved the uncertainty that macro surprises had generated. When a strong jobs report or an inflation surprise raised questions about the adequacy of the tightening path, the same-day Fed speech or press conference reassured markets that policymakers were aware of and responding to the data (Quote 56 and Quote 57).

Second, before the pivot, the Fed events after macro announcements contribute just about -2 bps over the entire period. The absence of a systematic offset is consistent with the preceding evidence that the Fed's communication was ambiguous across officials. To the extent that individual speeches on macro days provided little incremental clarity about the policy reaction function, the uncertainty generating the risk premium remained unresolved.[30]

[30] Figure A-8 looks only at the behavior of CRP around CPI surprises. Consistent with the analysis of inflation surprises above, it is only *after* the Fed's pivot toward greater hawkishness that the CPI news contributed to reduced CRP. The cumulative decline of the CRP between October 2022 and September 2023

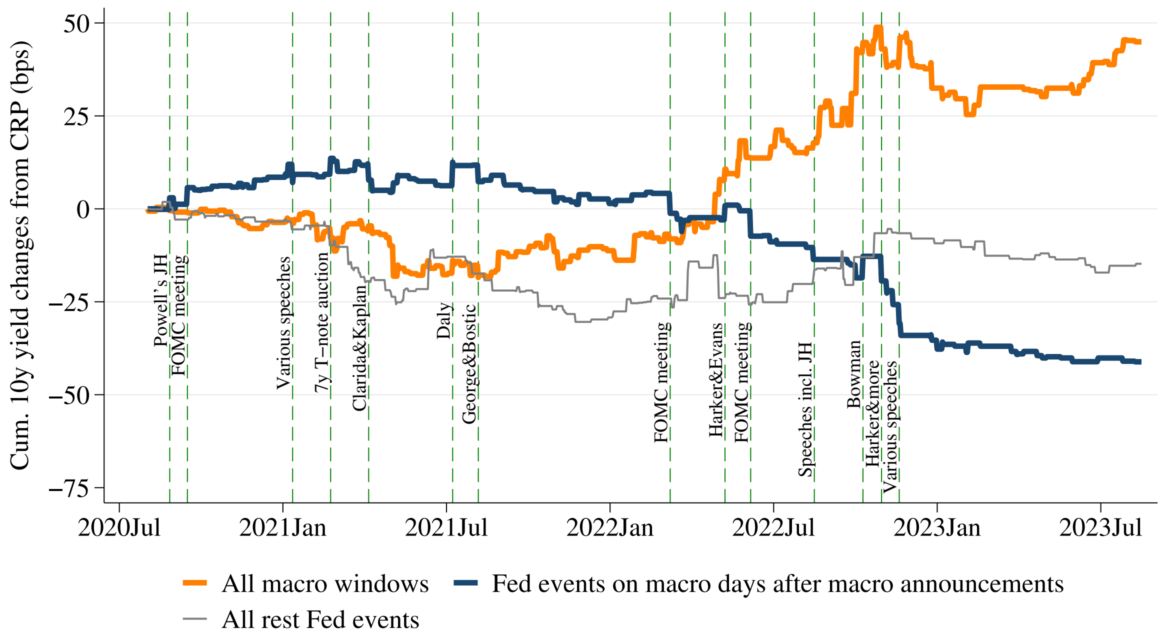

Figure 11. Cumulative 10-year yield common risk premium (CRP) changes on macro event days. The figure shows cumulative changes in the common risk premium (CRP) component of the 10-year yield since August 1, 2020, measured across different event windows. Orange line plots CRP changes within the 30-minute window surrounding macro announcements. Navy and gray lines plot CRP changes during FOMC-event windows, which are divided into windows occurring after a same-day macro announcement (navy line) and all other FOMC-event windows (gray line).

V.C.3. The effect of Fed speech signals

Finally, to understand how the Fed's communication contributed to changes in the markets' risk perceptions and the term premia across different environments, we explore the content of the speeches by the Chair, Vice Chair, and the governors over the 2012:01–2023:12 period. We follow Cieslak et al. (2024) and Cieslak and McMahon (2024) in constructing a text-based measure of policy stance from policymakers' language as a balance of hawkish and dovish words in a speech, scaled by the total number of words in that speech. We label this variable as Speeches-HD_t, with t indicating the day of the speech. If there is more than one speech in a day, we take the average of individual scores. An increase in Speeches-HD_t indicates an expression of a tighter policy stance. We also control for language that describes the policymakers' directional views ("sentiment") on inflation and the real economy.[31] To focus on intermeeting

in these tight windows is 15bps. Importantly, the effect of Fed communication events in high-frequency windows on these post-pivot days reinforces the inflation news and contributes to a similar-sized decline in CRP (-12bps). This too points to a pivotal role for FOMC communication and how it is interpreted by the market.

[31]See Cieslak et al. (2024) for details of the text-based measures.

communication, we exclude three days around the FOMC announcement (days -1, 0, and $+1$ around the announcement). Since speeches may reiterate the content of the previous FOMC announcement, we proxy for the announced policy stance using the Chair's opening remarks at the press conference, which we denote as PC-HD_{t-}, with $t-$ subscript indicating that we refer to the most recently available press conference before a day-t speech.

In Table III, we project changes in yield components from day $t-1$ to $t+3$ on Speeches-HD_t and controls (sentiment and latest PC-HD_{t-}) over the 2016:01–2023:12 sample. We use a longer window for yield changes to ensure we capture the total effects which, under different economic environments, are likely heterogeneous. A tighter stance in speeches is associated with investors' updating upward beliefs about the policy path (the *MP* component in column (1)) and revising downward the term premium (via the *CRP* component in column (3)). A one standard deviation more hawkish communication reduces the premium via the *CRP* component by about 0.15 standard deviations.

According to Prediction 2, policy signals should have the largest impact on term premia when uncertainty is high. The evidence in Table III supports this view: hawkish communication during the post-framework period consistently countered risk premium increases. Signals were mixed early on, but communication became more uniform over time as officials coalesced around the Fed's commitment to fighting inflation (Section III.B). As equation (7) makes clear, term premia can rise when markets perceive policy as either excessively dovish or excessively hawkish. The post-Covid evidence suggests that concerns were tilted toward the former, and the Fed assuaged them through hawkish signaling. According to the model, the term premium reflects market's assessment of the Fed's strategy, captured by the probability p_t and the reaction function asymmetry Δ. Initially, markets perceived the FOMC as unresponsive to inflation despite readings already above target, inferring high probability that the reaction function asymmetry is excessive. The Fed's signals of a tougher stance that followed served to realign the Fed's stance with the market's assessment of the appropriate policy response.

V.D. Prediction 3: The effect of dispersed economic assessments on term premia

Finally, beyond the reaction function uncertainty, Prediction 3 highlights that financial conditions tighten as the Fed-market disagreement about economic conditions rises. We test this prediction with survey data. We first pair the Fed's Summary of Economic Projections (SEP) with the Survey of Primary Dealers (SPD), both conducted shortly before each FOMC meeting. These data span 2016–2023, including the post-COVID

Dependent variable: Change in yield components from $t-1$ to $t+3$ days

	CP decomposition, $\Delta y^{10}(\text{news}_i)$			
	(1)	(2)	(3)	(4)
	MP	*G*	*CRP*	*HRP*
Speeches-HD_t Pre 2020:08	-0.009	0.036	-0.010	0.020
	(-0.33)	(0.90)	(-0.22)	(0.55)
Speeches-HD_t Post 2020:08	0.196**	-0.011	-0.149***	0.088*
	(2.31)	(-0.19)	(-3.63)	(1.85)
Sentiment$_t$	Yes	Yes	Yes	Yes
PC-HD_{t-}	Yes	Yes	Yes	Yes
R^2	0.06	0.01	0.02	0.01
N	554	554	554	554

Table III. Term premia sensitivity to the Fed's communication. The table reports regressions of yield changes on the Fed's hawkish/dovish policy stance in Fed official's speeches. The dependent variables are changes from $t-1$ to $t+3$ in yield components from Cieslak and Pang (2021). The independent variable is the text-based measure of policy stance (Speeches-HD_t), which is further split into pre-framework period (2016:01-2020:08) and the post-framework period (2020:08-2023:12). An increase in Speeches-HD_t indicates an expression of a tighter policy stance. Sentiment$_t$ and PC-HD_{t-} control for policymakers' directional views on inflation and the real economy and the announced policy stance from the previous Chair's press conference, respectively. The sample period is 2016:01-–2023:12, excluding three days around the FOMC announcement. HAC t-statistics with 20 lags are reported in parentheses.

period of particular interest. To obtain a longer sample, we also pair the Fed's Greenbook (GB) forecasts with Blue Chip (BC) forecasts. Since GB forecasts are typically prepared about one week before each FOMC meeting and BC forecasts are published monthly on the first day of the month, we match each GB forecast to the BC release from the same month. We then measure Fed–market disagreement as the absolute difference between their four-quarter ahead forecasts for inflation and real economic activity.

Table IV reports regressions of inter-survey ten-year yield changes attributed to *CRP* news on changes in the Fed–market disagreement between surveys. An increase in disagreement over the inflation outlook is unambiguously associated with higher risk premia. The estimated coefficients are economically meaningful: a one standard deviation increase in inflation disagreement (about 14 bps for the SEP–SPD pair and 18 bps for the GB–BC pair) implies roughly an 8 bps increase in the 10-year yield via *CRP* in the SEP–SPD sample, and about a 4 bps increase in the GB–BC sample. The estimates are especially significant for the SEP–SPD survey pair, consistent with the sample period being dominated by concerns about the Fed's reaction to inflation. However, the results hold more broadly outside this episode as seen for the GB–BC pair available over a longer sample.

	Inter-survey $\Delta y^{(10)}(CRP)$			
	SEP-SPD (2016-2023)		GB-BC (1990-2019)	
	(1)	(2)	(3)	(4)
Δ | Fed-Mkt | Infl	0.61***	0.60***	0.23***	0.24***
	(10.40)	(4.30)	(2.69)	(3.20)
Δ | Fed-Mkt | Eco	-0.045	-0.063	0.002	-0.001
	(-0.82)	(-0.59)	(0.03)	(-0.01)
Δ Mkt Disp Infl		0.015		0.029
		(0.07)		(0.23)
Δ Mkt Disp Eco		0.007		0.067
		(0.14)		(0.70)
R^2	0.37	0.37	0.03	0.03
N	31	31	239	239

Table IV. Fed-market dispersion and the risk premium. The table reports regressions of changes in the ten-year yield attributed to the common risk premium (CRP) on changes in forecast dispersion between the Fed and market participants regarding economic conditions. Columns (1)–(2) use forecasts from the Summary of Economic Projections (SEP) and the Survey of Primary Dealers (SPD) as proxies for the Fed's and the market's beliefs, respectively, while columns (3)–(4) use Greenbook forecasts and Blue Chip survey forecasts. Fed–market dispersion is measured as the absolute difference between the two sets of forecasts. Dispersion within the market is measured by the interquartile range in the SPD and the Blue Chip survey. For economic growth (Eco), the forecast variable is the unemployment rate in the SEP and SPD, and real GDP growth in the Greenbook and Blue Chip survey. For inflation (Infl), the forecast variable is core PCE inflation in the SEP and SPD and CPI inflation in the Greenbook and Blue Chip survey. All forecasts are four-quarter-ahead (one-year-ahead). All independent variables are also in percentage points. HAC t-statistics are reported in parentheses.

The above pattern is also consistent with Prediction 2: the risk premium channel of monetary policy strengthens as the economic environment becomes more uncertain, in line with the larger effects observed in the more recent sample. Columns (2) and (4) further control for disagreement within the market, measured by the IQR of SPD and Blue Chip forecasts. The results remain significant, suggesting that the channel operates through Fed–market disagreement rather than the market's own uncertainty about economic conditions.

VI. Conclusion

We analyze the dynamics of interest rates in the post-2020 period, focusing on the effects of the Federal Reserve's communication and actions after the adoption of the revised monetary policy framework in August 2020. We emphasize the channel through which markets' uncertainty about the policymakers' reaction function and concerns about potential policy errors can lead to tightening financial conditions against policymakers' intentions.

The premium in yields conveys information about the policy stance that policymakers should care about. As Governor Kohn explained, "[n]eglecting or grossly misestimating risk premiums will lead to misperceptions of the market's outlook and thus potentially to market moves that we did not anticipate" (Kohn, 2005). One might argue that a higher premium when tightening is needed does the job for the Fed without the Fed needing to act. However, this argument ignores the fact that the market's reaction via risk premium might, on other occasions, undermine the goals that policymakers aim to achieve. The Fed should strive to achieve outcomes with instruments it can control best, and controlling long-term rates is undoubtedly hard (Stein and Sunderam, 2018). Yield curve fluctuations due to uncertainty that the Fed induces are clearly undesirable with negative consequences for Fed's credibility and ultimately monetary transmission. Even when term premia amplify policy and therefore appear to help its course, policymakers' "grip on the steering wheel is not as tight as it otherwise might be" (Stein, 2013).

On August 22, 2025 at Jackson Hole, Chair Powell announced a newly revised framework acknowledging the communication challenges that the Fed faced in the post 2020 period and that we document in this study:

> "[W]e discussed how the 2020 statement's focus on the ELB may have complicated communications about our response to high inflation. We concluded that the emphasis on an overly specific set of economic conditions may have led to some confusion... [O]ur use of the term "shortfalls" was not always interpreted as intended, raising communications challenges." – Powell (2025).

As a result, the Fed abandoned the key elements of the 2020 framework, returning to flexible inflation targeting, eliminating the "makeup" strategy, and removed "shortfalls" from the statement.

The post-2020 episode offers pertinent lessons for central banks. Despite the delay in 2021, the Fed was able to stabilize term premia by first shifting its communication and then actions. As part of a broader risk-management approach to policy making (Greenspan, 2004; Blinder and Reis, 2005), effective communication that recognizes risks and explains how the Fed would respond to those risks has historically proven effective in reducing the likelihood of undesirable market outcomes (Cieslak and McMahon, 2024). Risk management remains a sensible guiding strategy for institutional policy design and communication. In 2025 Jackson Hole speech, Chair Powell embraced the risk management idea saying: "Of course, preemptive action would likely be warranted if tightness in the labor market or other factors pose risks to price stability."

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Internet Appendix

Did I make myself clear? The Fed and the market in the post-2020 framework period

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This version: June 11, 2026

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A. Additional tables and figures

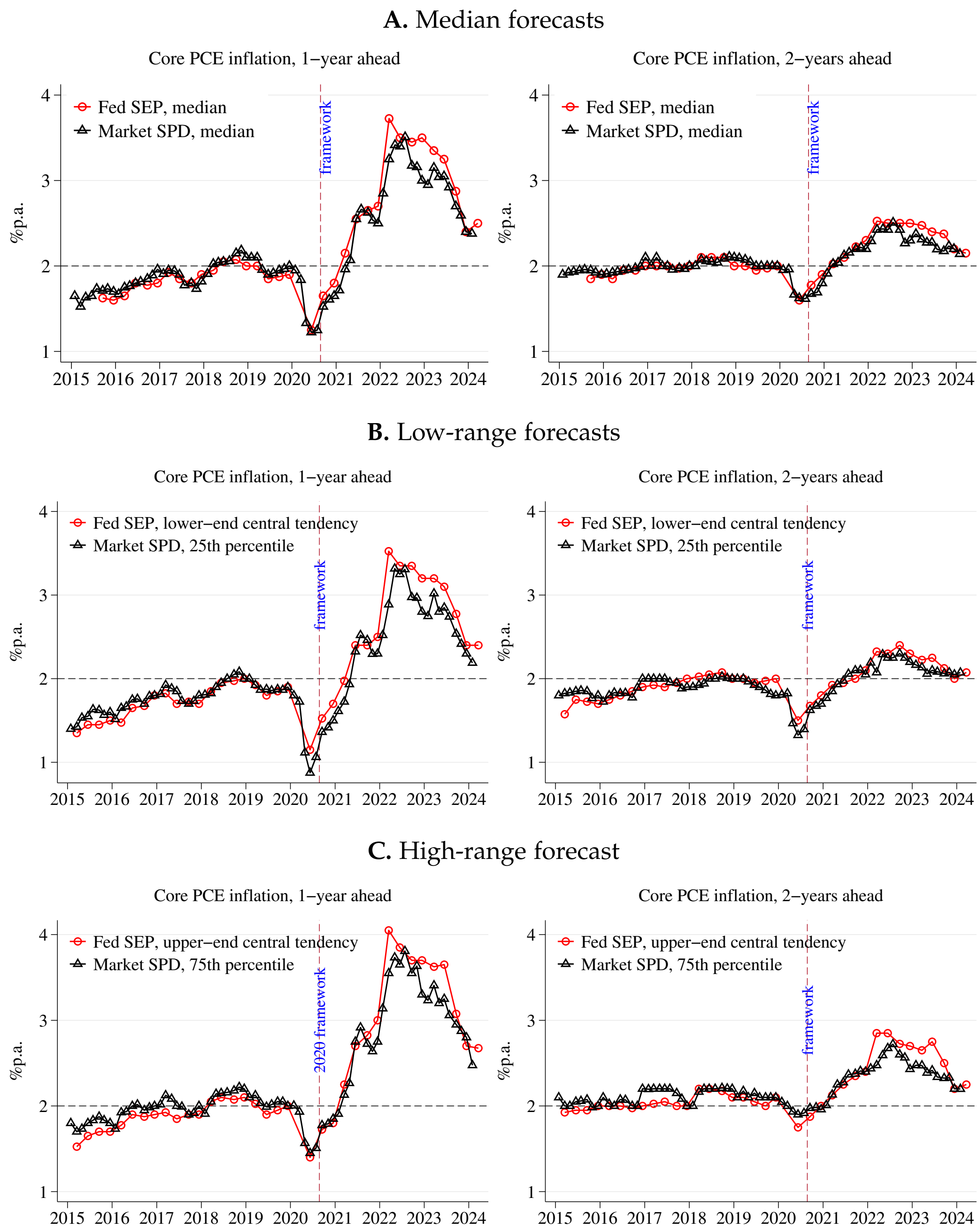

Figure A-1. Inflation expectations by the Fed and the market. The figure presents measures of inflation expectations from the FOMC's Summary of Economic Projections (SEP) and the NY Fed Survey of Primary Dealers (SPD). Panel A compares the median core PCE inflation forecasts in the SEP and the SPD one and two years ahead. Panel B reports low-range forecasts and Panel C reports high-range forecasts. For the SPD, these are the 25th and 75th percentile forecasts; for SEP, these are the minimum and maximum central tendency forecast after excluding the three lowest and highest individual forecasts. As there are typically 17 participants in the SEP, the low and high forecasts correspond to roughly 18th and 82th percentiles. The sample covers the period from 2015 to January 2024 (March 2024 for the SEP). The vertical lines indicate the framework announcement in August 2020. Horizontal dashed lines indicate 2% inflation target.

B. Inflation tails

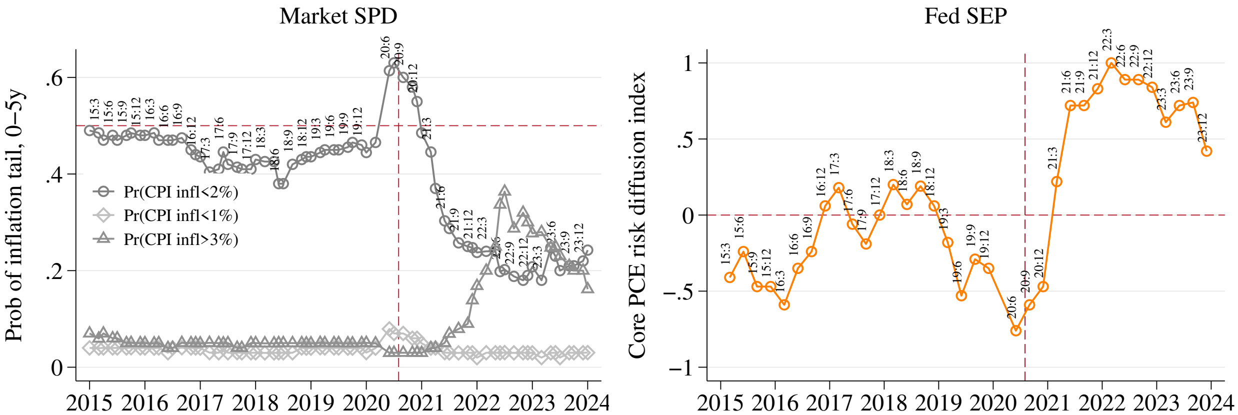

Figure A-2. Inflation expectations and tail risks perceived by the Fed and the market. The figure presents measures inflation tail risks from the FOMC's Summary of Economic Projections (SEP) and the NY Fed Survey of Primary Dealers (SPD). The left panel presents the CPI inflation tail risk perceived by SPD forecasters: probabilities of five-year average CPI inflation rate (0-5y) above 3%, below 2%, or below 1%. The right panel presents the core PCE risk diffusion index in the Fed's SEP constructed as the number of FOMC participants who deemed "risk weighted to the upside" minus those who deemed "weighted to the downside," divided by the total number of participants. The sample covers the period from 2015 to January 2024 (March 2024 for the SEP). The vertical lines indicate the framework announcement in August 2020. Horizontal dashed lines indicate 2% inflation target in Panel A, 50% probability in the left Panel B, and a diffusion index equal to 0 in the right Panel B.

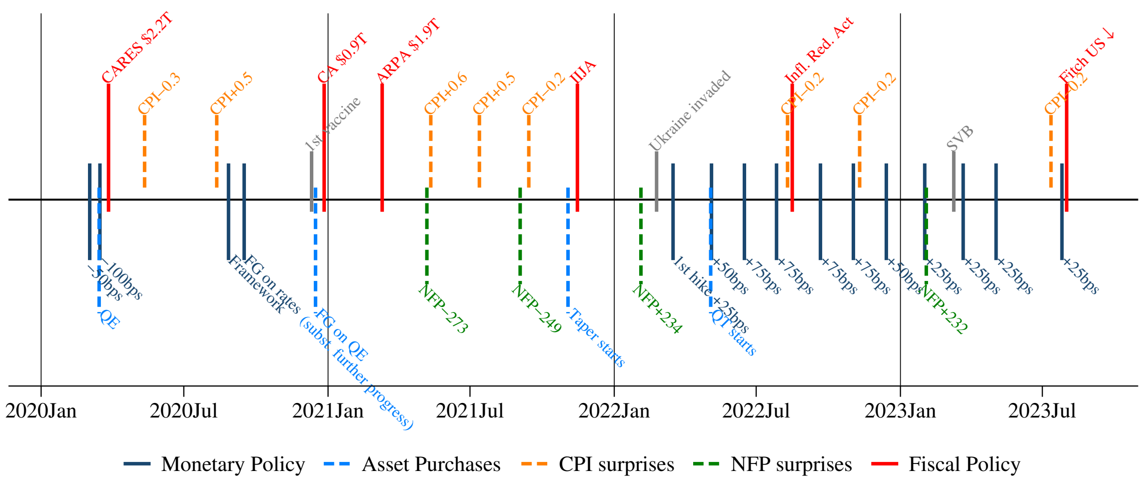

Figure A-3. Timeline of main events. The figure shows the key economic, policy and geopolitical events. The abbreviations are: CARES—the Coronavirus Aid, Relief, and Economic Security Act; CA—the Consolidated Appropriations Act; ARPA—the American Rescue Plan Act; IIJA—Infrastructure Investment and Jobs Act; FG—forward guidance; QE/QT—quantitative easing/tightening. CPI surprises are in annualized percentage points and non-farm payroll (NFP) surprises are in thousands.

Meeting	Policy type	Action	Notes
Mar 2020	Both	FFR cut twice (Mar 3 and 15); QE begins (Mar 23)	Mar 15: "The effects of the coronavirus will weigh on economic activity in the near term and pose risks to the economic outlook. In light of these developments, the Committee decided to lower the target range for the federal funds rate to 0 to 1/4 percent."
Aug 2020	Framework	New policy framework announced	"2020 Statement on Longer-Run Goals and Monetary Policy Strategy"
Sep 2020	FFR	Interest rate guidance that removed preemption	"The Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and expects it will be appropriate to maintain this target range until labor market conditions have reached levels consistent with the Committee's assessments of maximum employment and inflation has risen to 2 percent and is on track to moderately exceed 2 percent for some time."
Dec 2020	AP	AP guidance on tapering which is seen as necessary before rate rises can begin	"In addition, the Federal Reserve will continue to increase its holdings of Treasury securities by at least \$80 billion per month and of agency mortgage-backed securities by at least \$40 billion per month until substantial further progress has been made toward the Committee's maximum employment and price stability goals."
Sep 2021	AP	Tapering imminent	"If progress continues broadly as expected, the Committee judges that a moderation in the pace of asset purchases may soon be warranted."
Nov 2021	AP	Tapering announced and its pace was then doubled the next month	"In light of the substantial further progress the economy has made toward the Committee's goals since last December, the Committee decided to begin reducing the monthly pace of its net asset purchases..."
Jan 2022	AP	Tapering nearly done meaning rate rises could begin from March 2022	"The Committee decided to continue to reduce the monthly pace of its net asset purchases, bringing them to an end in early March.."
Mar 2022	Both	FFR +0.25; QT soon	"In addition, the Committee expects to begin reducing its holdings of Treasury securities and agency debt and agency mortgage-backed securities at a coming meeting."
May 2022	Both	FFR +0.50 & QT announced	"In support of these goals, the Committee decided to raise the target range for the federal funds rate to 3/4 to 1 percent and anticipates that ongoing increases in the target range will be appropriate. In addition, the Committee decided to begin reducing its holdings of Treasury securities and agency debt and agency mortgage-backed securities on June 1, as described in the Plans for Reducing the Size of the Federal Reserve's Balance Sheet that were issued in conjunction with this statement."
Jun 2022	FFR	FFR +0.75	"Clearly, today's 75 basis point increase is an unusually large one, and I do not expect moves of this size to be common. From the perspective of today, either a 50 basis point or a 75 basis point increase seems most likely at our next meeting. We will, however, make our decisions meeting by meeting, and we will continue to communicate our thinking as clearly as we can. Our overarching focus is using our tools to bring inflation back down to our 2 percent goal and to keep longer-term inflation expectations well anchored."
Jul 2022-Jul 2023	FFR	Three further +0.75 FFR increases followed by further increases of +0.50 and +0.25	Target range for FFR reached 5.25% to 5.5%.

Table A-1. Key Federal Reserve policy dates. The table presents the chronology of key policy events in 2020–2023. Policy type refers to policy implemented by asset purchases (AP), rate changes (FFR), or both.

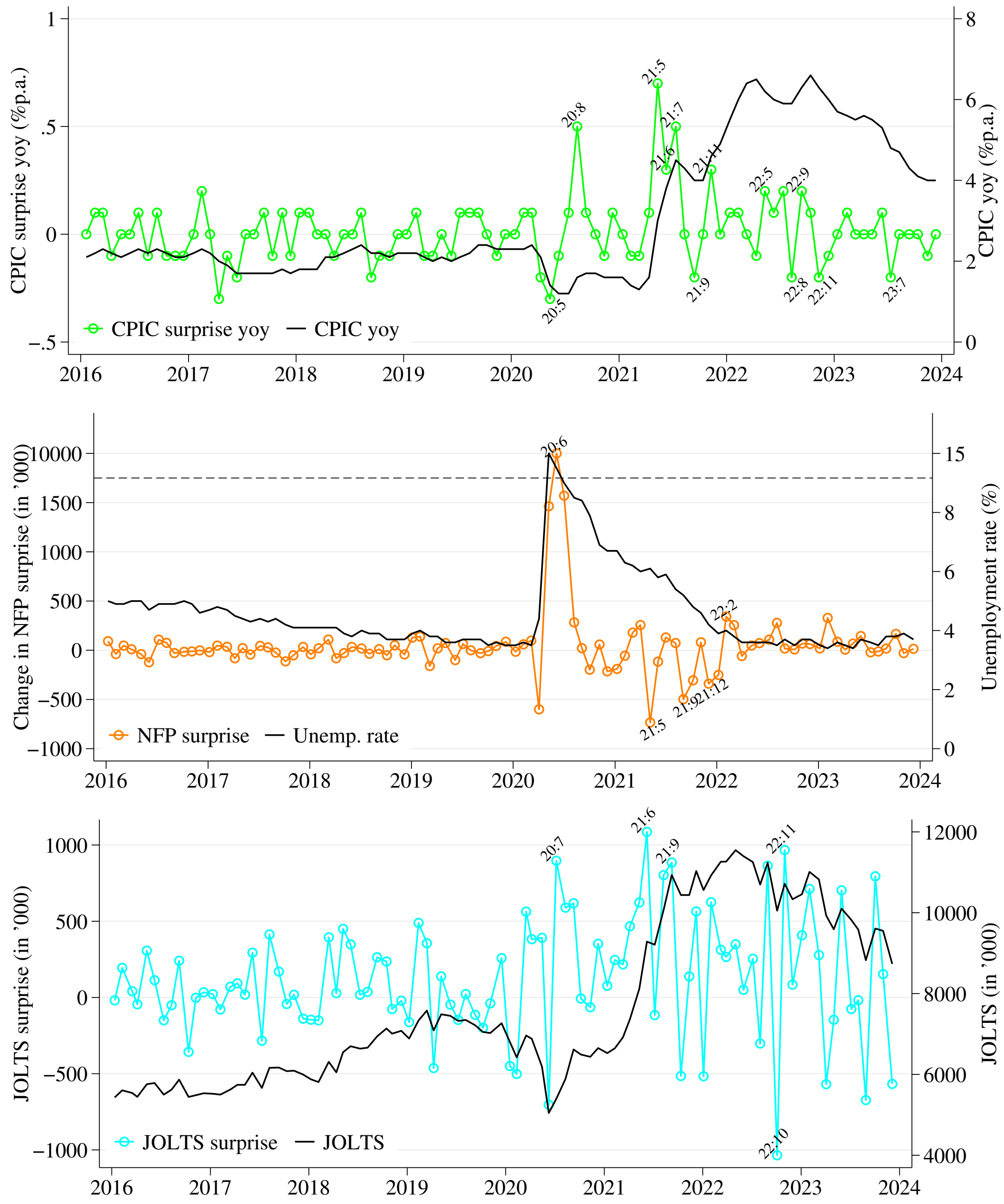

Figure A-4. Inflation, non-farm payroll, and JOLTS surprises. The figure presents the core CPI inflation surprises (upper panel), the non-farm payroll (NFP) change surprises (middle panel), and the job openings and labor turnover survey (JOLTS) surprises (lower panel). Surprises are measured as the actual release minus the survey forecast reported by Bloomberg. The figures also superimpose the actual release of the year-over-year core CPI inflation rate (upper panel right axis), the unemployment rate (middle panel right axis), and the actual release of the JOLTS (lower panel right axis). The sample is from 2016 to 2023.

	Dependent variable: FFR IQR, 2020:08–2023:12					
	1qtr ahead	4qtr ahead	8qtr ahead	1qtr ahead	4qtr ahead	8qtr ahead
Core PCE IQR	0.053	0.064	0.049			
	(0.31)	(0.39)	(0.29)			
Headline PCE IQR				0.407**	-0.038	0.157
				(2.77)	(-0.17)	(1.06)
RGDP IQR	-0.437*	-0.452**	0.084	-0.294	-0.490**	0.104
	(-1.94)	(-2.45)	(0.37)	(-1.34)	(-2.32)	(0.50)
Unemp IQR	0.232	-0.142	-0.251	0.032	-0.130	-0.290
	(0.83)	(-0.66)	(-0.94)	(0.13)	(-0.60)	(-1.19)
R2	0.080	0.33	0.047	0.23	0.32	0.067
N	27	27	27	27	27	27

Table A-2. SPD FFR forecast dispersion explained by dispersion of economic indicators. The table presents regressions of interquartile range (IQR) of Federal Funds rate (FFR) forecasts on the IQR of Core PCE, Headline PCE, real GDP growth (RGDP), and unemployment rate (Unemp) forecasts. Forecasts are from the NY Fed Survey of Primary Dealers (SPD). Three forecast horizons of the FFR are included, one-quarter, four-quarter, and eight-quarter ahead. The IQR of Core PCE, Headline PCE, RGDP, and unemployment rate are using the same forecast horizon as the dependent variable. The sample period is 2020:08–2023:12, representing periods after the introduction of the new framework. Regression coefficients are standardized. Robust *t*-statistics are in parentheses, and *, **, *** denote 10%, 5%, 1% significance levels, respectively.

	Dependent variable: FFR IQR			
	1984:07-2019:12		2020:08-2023:12	
	1qtr ahead	4qtr ahead	1qtr ahead	4qtr ahead
CPI IQR	-0.055	0.427***	0.335***	0.077
	(-0.91)	(9.13)	(2.72)	(0.58)
RGDP IQR	0.504***	0.405***	-0.267**	-0.315**
	(8.36)	(8.65)	(-2.29)	(-2.22)
R2	0.23	0.60	0.26	0.11
N	425	426	41	41

Table A-3. Blue Chip survey FFR forecast dispersion explained by dispersion of economic indicators. The table presents regressions of interquartile range (IQR) of Federal Funds rate (FFR) forecasts on the IQR of CPI inflation rate and real GDP growth (RGDP) forecasts. Forecasts are from monthly Blue Chip surveys. Two forecast horizons of the FFR are included, one-quarter and four-quarter ahead. The IQR of CPI and RGDP are using the same forecast horizon as the dependent variable. There are two samples, 1984:07–2019:12 and 2020:08–2023:12, representing periods before and after the introduction of the new framework with the initial COVID period omitted. One-quarter ahead forecast is missing in the 1998:11 survey which leads to one observation less of that column. Regression coefficients are standardized. Robust *t*-statistics are in parentheses, and *, **, *** denote 10%, 5%, 1% significance levels, respectively.

	Dependent variable: FFR IQR, 2020:08-2023:12		
	1qtr ahead	4qtr ahead	8qtr ahead
Infl resp uncert	0.271**	0.258	0.554***
	(1.97)	(1.11)	(2.81)
Real-econ resp uncert	-0.088	0.115	0.134
	(-1.01)	(0.80)	(1.01)
R^2	0.10	0.056	0.26
N	27	27	27

Table A-4. FFR forecast dispersion and public uncertainty about the Fed's reaction function. The table presents regressions of the FFR forecast dispersion (measured as interquartile range) at different horizons (one, four, and eight quarters ahead) on public perceptions of uncertainty about the Fed's reaction function. FFR forecasts are from the NY Fed Survey of Primary Dealers (SPD). The SPD is available at the frequency of FOMC meetings. The uncertainty measures are constructed from daily counts of WSJ articles that are classified as suggesting uncertainty about the Fed's response to inflation ("Infl resp uncert") and the real economy ("Real-econ resp uncert"). To align the uncertainty and survey dispersion measures, we construct the 20-day trailing window average of the WSJ counts for each survey date. The survey dates intend to match the information set of the survey participants. We use the reported survey distribution date. We also verify that controlling for macro forecast dispersion does not affect the results. The sample period is 2020:08–2023:12. Regression coefficients are standardized. HAC t-statistics with 6 lags are reported in parentheses; *, **, *** denote 10%, 5%, 1% significance levels, respectively.

Speaker	Position (yy:mm)	Voting (2020+)	FOMC speak	WSJ mention	Speech	Interview	Remarks	Testimony	Other	Chatter box	Chatter box frac
Barkin	Rich (18:01-)	21	53	23	10	9	3		1	14	26%
Bostic	Atl (17:06-)	21	50	31	7	23	1			16	32%
Brainard	Gov (14:06-23:02), ViceCh (22:05-23:02)		42	30	23	1	5	1		13	31%
Bullard	STL (08:04-23:08)	22	104	70	27	30	13			42	40%
Clarida	Gov, ViceCh (18:09-22:01)		24	22	16	6				15	63%
Daly	SF (18:10-)	21	47	28	13	14	1			19	40%
Evans	Chi (07:09-23:01)	21,23	30	26	19	5	2			13	43%
George	Kans (11:01-23:01)	22	32	26	12	9	5			14	44%
Harker	Phil (15:07-)	20,23	62	37	27	9	1			27	44%
Kaplan	Dal (15:09-21:10)	20,23	59	39	1	29	9			10	17%
Kashkari	Min (16:01-)	20,23	19	8	1	6			1	3	16%
Mester	Clev (14:06-)	20,22	81	55	29	22	3		1	24	30%
Powell	Chair (18:02-)		30	30	13	4	7	6		18	60%
Waller	Gov (20:12-)		36	28	23	5	0			22	61%
Williams	NY (18:06-)		38	32	20	7	5			17	45%
Total			687	479						264	38%

Table A-5. Summary of individual Fed officials speaking events. The table reports communications by individual Fed officials, excluding FOMC meeting statements, press conferences, and minutes. Only events with exact time stamps are reported. The sample period is 2020:08–2023:08. The time time stamp and a WSJ mention of the event are required for the FOMC speak-Chatterbox match.

Dependent variable: n-day change $(t-n,t)$ in the WSJ-based index of perceived policy mistakes						
	KW decomposition			CP decomposition		
	(1)	(2)	(3)	(4)	(5)	(6)
	$(t-20,t)$	$(t-20,t)$	$(t-20,t)$	$(t-10,t)$	$(t-20,t)$	$(t-40,t)$
$\Delta EH2$	-0.077		-0.156			
	(-0.53)		(-0.94)			
$\Delta TP10$		0.192*	0.242*			
		(1.71)	(1.96)			
$\Delta y^{10}(MP)$				0.220	0.418**	0.433
				(1.39)	(2.13)	(1.34)
$\Delta y^{10}(G)$				-0.336***	-0.356***	-0.188
				(-4.05)	(-4.12)	(-1.28)
$\Delta y^{10}(CRP)$				0.177**	0.343**	0.217
				(1.97)	(2.45)	(0.88)
$\Delta y^{10}(HRP)$				-0.032	-0.069	-0.400
				(-0.20)	(-0.33)	(-1.26)
R^2	0.01	0.04	0.06	0.13	0.19	0.10
N	890	890	890	890	890	890

Table A-6. Term premia and perceptions of policy mistakes (contemporaneous). The table reports regressions of changes in the WSJ-based policy mistakes index on changes in yield components. The dependent variable is the change between $t-n$ and t in the n-day average mistakes index ($n = 20$ plotted in Figure 9). The explanatory variables are components of yield changes between $t-n$ and t. Columns (1)–(3) are for changes in two-year short-rate expectations and ten-year term premia using Kim and Wright (2005) estimates ("KW decomposition") and columns (4)-(8) are for the four-factor decomposition of the ten-year yield changes from Cieslak and Pang (2021) ("CP decomposition"). The sample period is 2020:08–2023:12. The regressions are estimated at the daily frequency. HAC t-statistics with 36 lags are reported in parentheses.

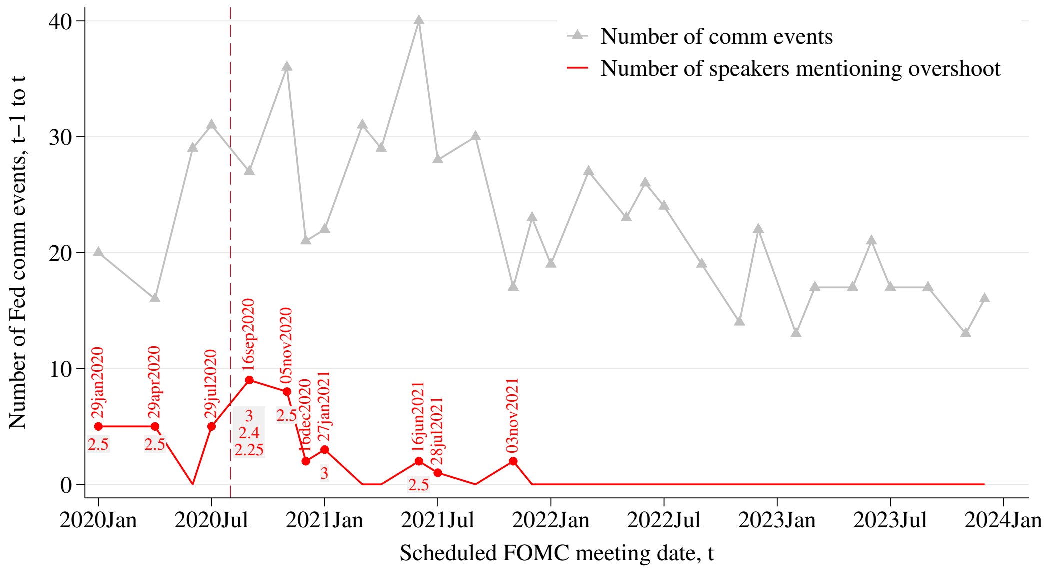

Figure A-5. The Fed's communication of inflation overshooting. The figure displays the number of Fed intermeeting communication events and the number of speakers mentioning inflation overshooting, highlighted in Goldman Sachs' Chatterbox. The reported degree of overshooting is marked on the graph whenever an explicit number is provided.

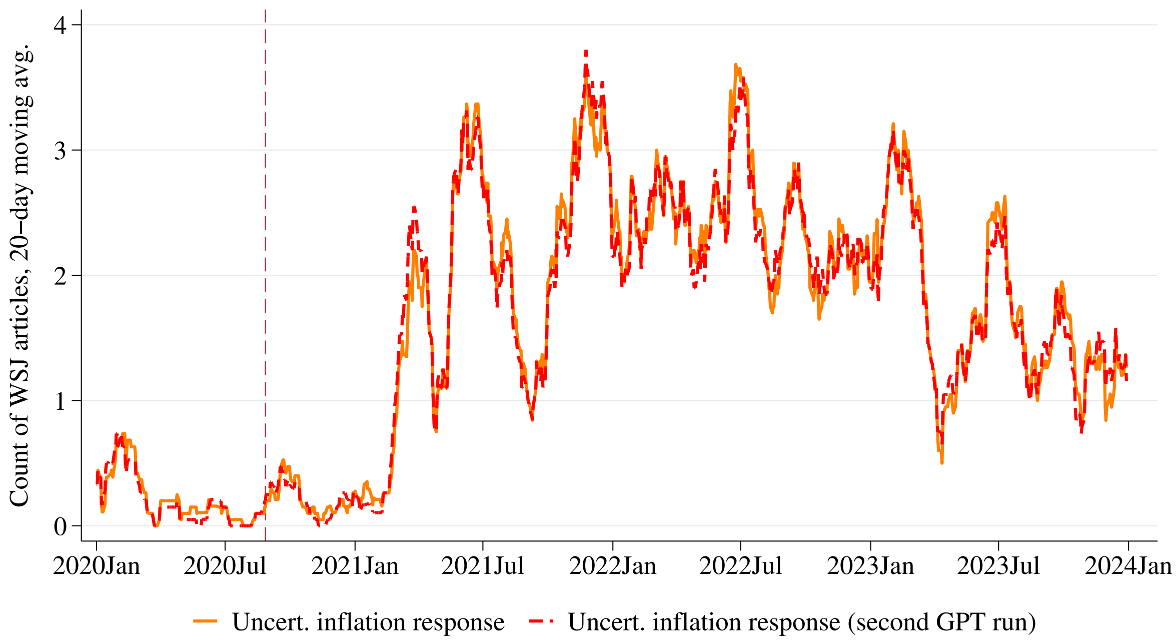

Figure A-6. Robustness: Public perceptions of reaction function uncertainty. The figure presents proxies for public perceptions of uncertainty about the Fed's reaction to inflation obtained from two independent runs of GPT. The solid line reports the inflation reponse uncertainty from Figure 4 in the main text. The indices are daily counts of WSJ articles that are classified as suggesting uncertainty about the Fed's response to inflation. The daily counts are smoothed with a 20-day moving average for the purposes of the graph.

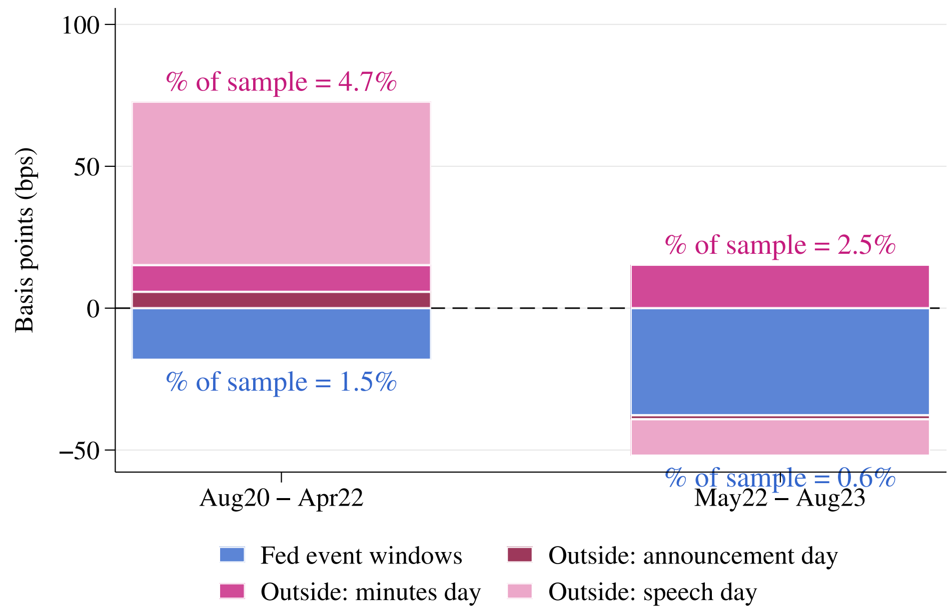

Figure A-7. CRP contribution to the ten-year yield on Fed event days. Cumulative CRP changes split into Fed event windows vs. remainder of Fed event days (further split by event types), before and after the May 2022 hawkish pivot.

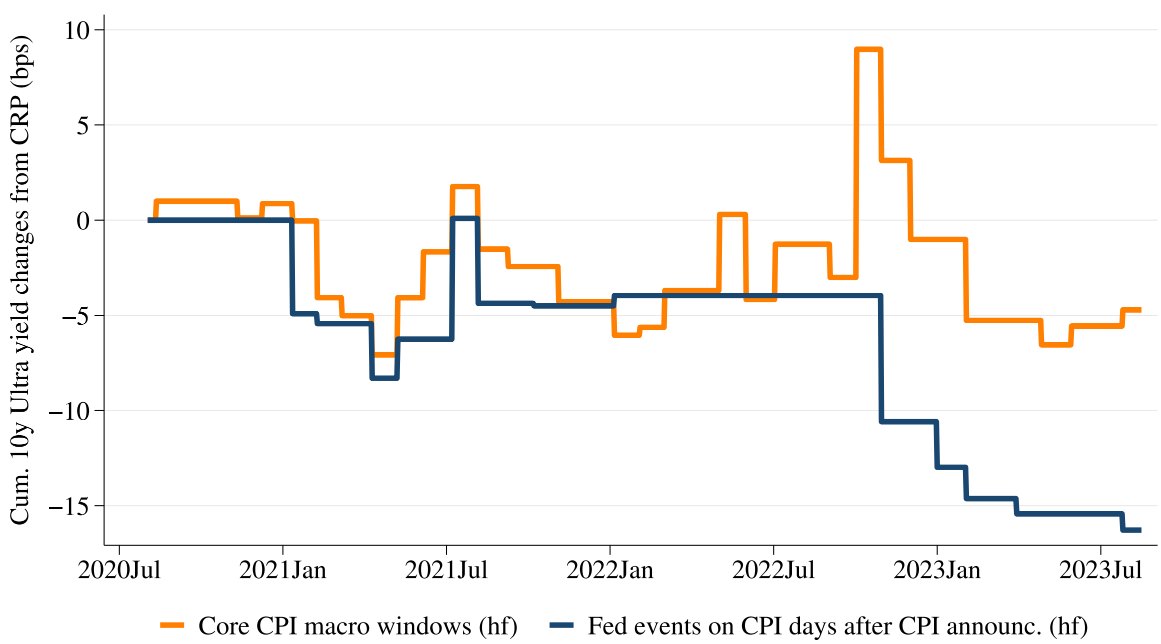

Figure A-8. Cumulative 10-year yield common risk premium (CRP) changes on CPI announcement days. The figure shows cumulative changes in the common risk premium (CRP) component of the 10-year yield since August 1, 2020, measured across different event windows. Orange line plots CRP changes within the 30-minute window surrounding CPI announcements. Navy line plot CRP changes during FOMC-event windows occurring after a same-day CPI announcement.

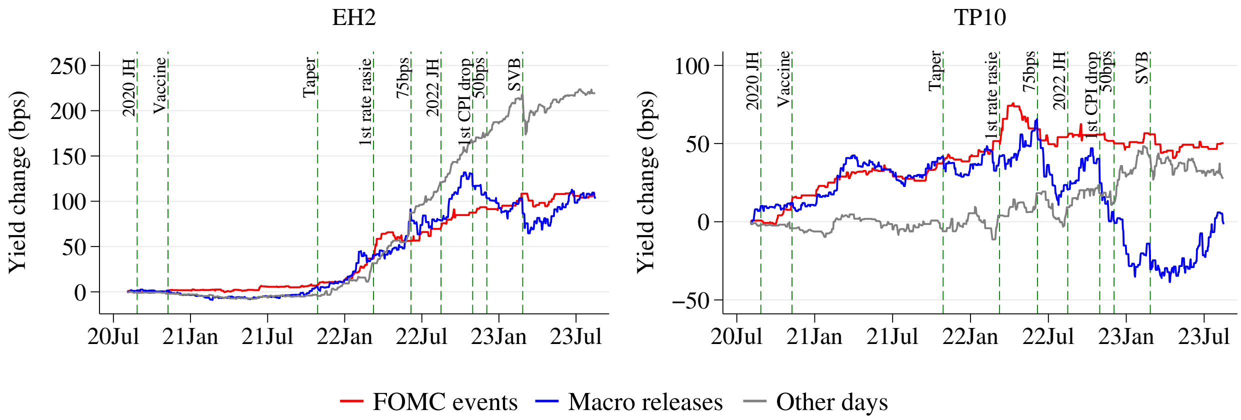

Figure A-9. Short-rate expectations and term premia on Fed days. The figure presents the cumulative changes (starting from August 1, 2020) on Fed days in the short-rate expectations component of the two-year yield (*EH2* panel) and the term premium component of the ten-year yield (*TP10* panel) from Kim and Wright (2005). The green cross indicates the peak in term premia on Fed days, which occurs on April 19, 2022.

Dependent variable: 20-day change $(t-20,t)$ in the WSJ-based index of perceived policy mistakes

	KW decomposition			CP decomposition			
	(1) $(t-20,t)$	(2) $(t-20,t)$	(3) $(t-20,t)$	(4) $(t-20,t)$	(5) $(t-20,t)$	(6) $(t-20,t)$	(7) $(t-20,t)$
$\Delta EH2$	-0.053		-0.162				
	(-0.33)		(-0.85)				
$\Delta TP10$		0.206**	0.271***				
		(2.12)	(2.85)				
$\Delta y^{10}(MP)$				0.018			
				(0.11)			
$\Delta y^{10}(G)$					-0.131		
					(-1.28)		
$\Delta y^{10}(CRP)$						0.371***	
						(4.28)	
$\Delta y^{10}(HRP)$							-0.231
							(-1.64)
R^2	0.00	0.04	0.06	0.00	0.02	0.14	0.05
N	890	890	890	890	890	890	890

Table A-7. Term premia and perceptions of policy mistakes. The table reports regressions of changes in the WSJ-based policy mistakes index on changes in yield components. The dependent variable is the change from $t-20$ to t in the n-day average mistakes index ($n = 20$ is plotted in Figure 9). The explanatory variables are components of yield changes between $t-5$ and $t-25$. Columns (1)–(3) are for changes in two-year short-rate expectations and ten-year term premia from Kim and Wright (2005) ("KW decomposition"). Columns (4)–(7) are for the univariate regression of the ten-year yield changes from Cieslak and Pang (2021) ("CP decomposition"), same as in Table II. The sample period is 2020:08–2023:12. The regressions are estimated at a daily frequency. HAC t-statistics with 36 lags are reported in parentheses.

Dependent variable: Change in yield components from $t-1$ to $t+3$ days

	KW decomposition				CP decomposition, $\Delta y^{10}(\text{news}_i)$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta EH2$	$\Delta TP10$	$\Delta TP10^{\perp}$	$\Delta TP10$	*MP*	*G*	*CRP*	*HRP*
Speeches-HD_t Pre 2020:08	0.003	0.017	0.018	0.015	-0.009	0.036	-0.010	0.020
	(0.10)	(0.37)	(0.44)	(0.44)	(-0.33)	(0.90)	(-0.22)	(0.55)
Speeches-HD_t Post 2020:08	0.145**	-0.060	-0.170***	-0.149***	0.196**	-0.011	-0.149***	0.088*
	(1.99)	(-1.32)	(-4.42)	(-4.58)	(2.31)	(-0.19)	(-3.63)	(1.85)
$\Delta EH2$				0.610***				
				(7.46)				
Sentiment$_t$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PC-HD_{t-}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.07	0.01	0.06	0.35	0.06	0.01	0.02	0.01
N	554	554	554	554	554	554	554	554

Table A-8. Term premia sensitivity to the Fed's communication. The table reports regressions of yield changes on the Fed's hawkish/dovish policy stance in Fed official's speeches. The dependent variables are changes from $t-1$ to $t+3$ in yield components from Kim and Wright (2005) and Cieslak and Pang (2021). $\Delta TP10^{\perp}$ in column (3) is the residual of regressing $\Delta TP10$ on $\Delta EH2$. The independent variable is the text-based measure of policy stance (Speeches-HD_t). An increase in Speeches-HD_t indicates an expression of a tighter policy stance. Sentiment$_t$ and PC-HD_{t-} control for policymakers' directional views on inflation and the real economy and the announced policy stance from the previous Chair's press conference, respectively. The sample period is 2016:01-–2023:12, excluding three days around the FOMC announcement. HAC t-statistics with 20 lags are reported in parentheses.

B. Additional quotes

Quote 1: "However, some policymakers may place little, if any, weight on current and projected unemployment deviations on the grounds that the welfare costs of unemployment running somewhat or even substantially below the staff's estimate of the natural rate are by themselves small. These policymakers may even view the unemployment rate falling below its natural rate as a useful means to speed up the return of inflation to 2 percent. [...] In the scenario in which policymakers incur no losses from the unemployment rate falling below the natural rate, the optimal control path of the federal funds rate is considerably below the corresponding path under the standard loss function, and also below the Tealbook baseline path. This relatively low path for the policy rate stems from policymakers' desire to raise inflation back to 2 percent; a greater undershooting of the natural rate of unemployment helps achieve that outcome. In this simulation, inflation returns to 2 percent more quickly than in the Tealbook baseline as a result of the tighter labor market, and then edges above the Committee's longer-run objective for a few years. " — Tealbook B(April 2016, Optimal Control with Asymmetric Weight on Unemployment Gap and Steeper Phillips Curve)

Quote 2: "However, a price-level target can be problematic in the face of supply shocks, and the switch to a price-level target from the current inflation targeting approach would be a significant communications challenge." —Bernanke (2017)

Quote 3: "We believe that our existing framework for conducting monetary policy has generally served the public well, and the review may or may not produce major changes. Consistent with the experience of other central banks with these reviews, the process is more likely to produce evolution rather than revolution." — Powell (03/08/2019, SIEPR Economic Summit)

Quote 4: "While we believe that our existing framework for conducting monetary policy has served the public well, the purpose of this review is to evaluate and assess ways in which our existing framework might be improved so that we can best achieve our dual mandate objectives on a sustained basis. That said, based on the experience of other central banks that have undertaken similar reviews, our review is more likely to produce evolution, not a revolution, in the way that we conduct monetary policy." — Clarida (04/09/2019, Fed Listens: Distributional Consequences of the Cycle and Monetary Policy)

Quote 5: "What I think will be surprising a little bit to markets is that the economy will continue to improve, possibly more rapidly than financial markets currently think, and yet the Fed will just keep with its current policy. – Bullard (10/06/2019, WSJ)

Quote 6: "We need them to be anchored in a level—at a level that's consistent with our symmetric 2 percent inflation goal. And we think that we need to conduct policy in a way that supports that outcome. That's what we're doing now.

[...] That's at the very heart of what we're doing in the review. It's too early to be announcing decisions. We haven't made them yet. But we're in the middle of thinking about ways that we can make that symmetric 2 percent inflation objective more credible by achieving symmetric 2 percent inflation. And it comes down to using your policy tools to achieve 2 percent inflation, and that is the—that is the thing that must happen for credibility in this area. So we're committed to doing that." — Powell (10/30/2019, Press Conference)

Quote 7: “I view the policy of the FOMC really is to make sure we achieve our 2% symmetrical. And that means, inflation, we want to be around 2%—of course, that means sometimes a little bit above." — Williams (12/18/2019, CNBC)

Quote 8: “We need to clarify what we mean by symmetric inflation objective, we’ve been underrunning our 2% objective for pretty much as long as we’ve announced our 2% objective back in 2012. I think we need to overshoot, I think we need to be not concerned with inflation even if it is up to 2.5% on a sustained basis. I think we need a framework that acknowledges what is acceptable in a much more explicit fashion. I think there’s too much artfulness in the way it’s described now." — Evans (01/03/2020, Bloomberg)

Quote 9: “And with inflation exhibiting low sensitivity to labor market tightness, policy should not preemptively withdraw support based on a historically steeper Phillips curve that is not currently in evidence. Instead, policy should seek to achieve employment outcomes with the kind of breadth and depth that were only achieved late in the previous recovery." — Brainard (07/14/2020, Speech)

Quote 10: “We have not changed our view that a longer-run inflation rate of 2 percent is most consistent with our mandate to promote both maximum employment and price stability." — Powell (08/27/2020, Jackson Hole)

Quote 11: “Though hard to imagine now, high inflation might one day be a problem again, and another revamp of its principles could be in order." — Ip (08/27/2020, WSJ)

Quote 12: “The revamp also set the table for the Fed to provide more specifics about how long it expects to keep interest rates low as soon as its Sept. 15-16 meeting. It could do that by putting forward an inflation threshold and a qualitative description of labor market conditions that would warrant higher rates." — Timiraos (08/27/2020, WSJ)

Quote 13: “We’ve missed our target to the low side for quite a while here, almost a decade depending on how you measure it, and we think that that’s because the effective lower bound is kind of pulling the average inflation down over time, so this is a way to make up for that and make sure that you get credibility for your two percent inflation target." — Bullard (08/27/2020, Bloomberg)

Quote 14: “For me, a little bit means a little bit, I’ve said publicly, 2.25%, maybe a little bit more than that. I still think price stability is the overriding goal and this framework does not change that." — Kaplan (08/28/2020, Bloomberg)

Quote 15: “Inflation has run below target certainly by half a percent for quite a while so it seems like you could run above for a half a percent for quite a while. The idea here is to cement inflation expectations at the two percent target because you really want that credibility all the time." — Bullard (08/28/2020, CNBC)

Quote 16: “Somewhere north of 2% but to me it’s not so much the number, whether it’s 2.5% or 3%. It’s whether it’s reaching 2%, creeping up to 2.5%, or shooting past 2.5%, so it’s really about the velocity of inflation, not just the overall level." — Harker (08/28/2020, CNBC)

Quote 17: “HOWARD SCHNEIDER. (...) I wonder if you could explain them a little bit more. How do we pin down assessments of maximum employment? When you say that “inflation has risen to 2 percent,” does that mean 2 percent for a day, a month, six months? And when you say “on track to moderately exceed,” how should we define “moderately”? And how should we define “for some time”?

CHAIR POWELL (...) So, what does “moderate” mean? It means not large. It means not very high above 2 percent. It means moderate. I think that’s a fairly well-understood word. In terms of “for a time,” what it means is not permanently and not for a sustained period. We’re resisting the urge to try to create a rule or a formula here." — Powell-Schneider (09/16/2020, Press Conference)

Quote 18: “I think policy is in a good place right now. I think that our interest-rate actions we’ve taken, the forward guidance we’ve taken and the asset purchases we’re doing have really got markets where we want them to be." — Daly (10/15/2020, WSJ)

Quote 19: “Our framework aims ex ante for inflation to average 2% over time, but it does not make a time-inconsistent commitment to achieve ex post inflation outcomes that average 2% under any and all circumstances and constellations of shocks." – Clarida (11/16/2020, Brookings)

Quote 20: “In addition, the Federal Reserve will continue to increase its holdings of Treasury securities by at least $80 billion per month and of agency mortgage-backed securities by at least $40 billion per month until substantial further progress has been made toward the Committee’s maximum employment and price stability goals." — FOMC (12/16/2020, FOMC Statement)

Quote 21: “I believe that a useful way to summarize the framework defined by these five features is temporary price-level targeting (TPLT, at the ELB) that reverts to flexible inflation targeting (once the conditions for liftoff have been reached)." — Clarida (2020, 2022)

Quote 22: “[We won’t remove accommodation] soon at all. [...] We’re going to be accommodative for a very long time because the economy needs it to get back on its feet." — Mester (02/08/2021, Interview with Toledo Rotary)

Quote 23: “Despite the surprising speed of recovery early on, we are still very far from a strong labor market whose benefits are broadly shared. [...] In the past few months, improvement in labor market conditions stalled as the rate of infections sharply increased." —Powell (02/10/2021, Economic Club)

Quote 24: “[The stimulus package] is not going to overheat our economy." —Daly (02/11/2021, WSJ)

Quote 25: "With regard to upside risks, some participants pointed to the possibility that fiscal policy could have a more expansionary effect than anticipated, that households could display a greater-than-expected willingness to spend out of accumulated savings, or that widespread vaccinations and easing of social distancing could result in a more rapid boost to spending and employment than anticipated." — FOMC (03/17/2021, FOMC Minutes)

Quote 26: “I’ve also said publicly with the new framework we don’t want to be pre-emptive [...] I’d say there’s a balance between not being pre-emptive, but you also don’t want to be–in our efforts to not be pre-emptive, you also don’t want to become reactive and behind the curve. — Kaplan (04/07/2021, WSJ)

Quote 27: "On the upside, I think, the fiscal actions have definitely put a lot of money in people’s bank accounts, and that’s been commented on a lot. And we—you know, we don’t have a lot of experience with that much—you know, such large transfers to the household sector and to small businesses and how quickly will that money be spent as the economy reopens. So there's definitely upside possibilities for the economic outlook." — Williams (05/05/2021, WSJ)

Quote 28: "I'm watching expectations very closely — both survey-based expectations and market expectations — but I'd say there's nothing in either one of those metrics that looks like you're seeing a breakout in inflation, and you have to remember that inflation is a recurring phenomenon." —Barkin (05/03/2021, CNBC Interview)

Quote 29: "We have heard from many contacts across the district that it is difficult to find labor. I want things to go a little bit further in terms of some of the [labor market] statistics. [...] I think we are going to get more clarity as we get through the summer and get to September [...] I think schools being open in September will help alleviate some of the supply constraints in the labor market." — Mester (06/21/2021, Call with reporter)

Quote 30: "Given the upside surprises and recent data points, I've pulled forward my projection for our first [rate hike] to late 2022." — Bostic (06/23/2021)

Quote 31: "It would be a mistake to [raise interest rates] at a time when virtually all forecasters believe that these [inflation pressures] will come down on their own accord. [...] It would be a mistake to act prematurely." — Powell (07/14/2021, House testimony)

Quote 32: "I think we are in a situation where we can taper. [...] I think it is time to end these emergency measures." — Bullard (07/15/2021, Bloomberg)

Quote 33: "I'm not convinced we were actually at maximum employment before the Covid shock hit us. So, that's exactly why I want us to be really humble about declaring, 'This is as good as it can get'." — Kashkari (08/15/2021 Bloomberg)

Quote 34: "[The unemployment rate] is still much too high [and it] understates the amount of labor market slack." — Powell (08/27/2021, Jackson Hole Symposium)

Quote 35: ""You know, we want to foster a strong labor market, and we want to foster inflation averaging 2 percent over time, and I think we're very much on track to achieve those things. In terms of the framework, I see this as very consistent with the framework. We want inflation expectations to be anchored at around 2 percent. We want, we're—that's really the ultimate test of whether we're getting this done under the framework. And, you know, we do want inflation to run moderately above 2 percent." — Powell (09/09/2021, Press conference)

Quote 36: "While Bullard said he agrees inflation will ease somewhat on its own, he said it will take more central bank effort to ensure that happens smoothly over time, and never requires the sort of restrictive policies that could imperil the current expansion. Inflation "is going to stay above target over the forecast horizon. That is a good thing. We are delivering on our...framework," Bullard said of Fed projections last week that inflation will remain above 2% through 2024, even as interest rates remain below the level that would be considered restrictive." — Schneider (2021)

Quote 37: "In light of the substantial further progress the economy has made toward the Committee's goals since last December, the Committee decided to begin reducing the monthly pace of its net asset purchases by $10 billion for Treasury securities and $5 billion for agency mortgage-backed securities." — FOMC (11/03/2021, FOMC Statement)

Quote 38: "Chairman Jerome Powell seems eager to urge patience on raising interest rates for the sake of increasing labor participation. This approach reflects lessons learned about economic growth during the Trump administration, but changed conditions render it inappropriate for the current moment." — WSJ (11/17/2021, The Fed Needs to Remove Its Blinkers)

Quote 39: "[Higher inflation has not] dented my optimism that the strong recovery will continue ... [but it has] raised the risks that supply constraints may limit job gains and output growth." — Waller (11/19/2021, Center for Financial Stability)

Quote 40: "So you can look at those long-run measures now of [inflation] expectations and take... comfort in ... that ... they're a little bit above 2%, but they're basically in line with 2% inflation. But you've got to remember that built into those expectations are the Fed taking appropriate action." — Mester (01/12/2022, WSJ Interview)

Quote 41: "The next step in reducing monetary accommodation to the economy will be to gradually bring the target range for the federal funds rate from its current very-low level back to more normal levels. ... [The Fed is] approaching a decision [on raising rates]." — Williams (01/14/2022, Council on Foreign Relations)

Quote 42: "My forecast is that we would have a 25 basis-point increase in March, barring any changes in the data." — Harker (01/14/2022, Virtual Event)

Quote 43: "In light of the remarkable progress we've seen in the labor market and inflation that is well-above our 2% long-run goal, the economy no longer needs sustained high levels of monetary policy support. ... That is why we are phasing out our asset purchases...and we expect it will soon be appropriate to raise the target range for the federal funds rate." — Powell (01/26/2022, Press Conference)

Quote 44: "There is an obvious need to move expeditiously to return the stance of monetary policy to a more neutral level, and then to move to more restrictive levels if that is what is required to restore price stability." — Powell (03/21/2022, NABE)

Quote 45: "If monetary policy did not respond to these broader inflation pressures, we would see the expectation of continued high inflation become embedded in economic decisions, and we would have even harder work to do to rein it in. So monetary policy must shift to removing accommodation in a timely fashion, which is what you've seen in the latest actions by and communications from the FOMC." — Evans (04/01/2022, Chicago Fed)

Quote 46: "I do think we have to move forthrightly in order to get the policy rate up to the right level to deal with inflation that we've got in front of us. We want to do that in a way that doesn't cause too much disruption, but on the other hand, we do have a serious inflation issue and we have to move forthrightly to get inflation under control." — Bullard (04/07/2022, Speech)

Quote 47: "Throughout the week, investors remained preoccupied with commentary from Federal Reserve officials as well as the minutes from the central bank's March policy meeting, Those minutes showed that policy makers had considered raising interest rates and unwinding its balance sheet faster, driving stocks lower." [...] "The Fed has been the number-one story and that continues," said James Athey, an investment manager at Abrdn. "The effect of the sort of tightening that has been discussed, that has a history of being very destabilizing." — WSJ (04/08/2022, Markets Coverage)

Quote 48: "Federal Reserve board member Christopher Waller said Wednesday that he expects interest rates to rise considerably over the next several months." — Cox (04/13/2022, CNBC)

Quote 49: "U.S. inflation expectations could become unmoored without credible Fed action, possibly leading to a new regime of high inflation and volatile real economic performance. The Fed has reacted by taking important first steps to return inflation to the 2% target." — Bullard (06/01/2022, Economic Club of Memphis).

Quote 50: "I certainly am comfortable to do what it takes to get inflation trending down to the level we need it to be. I really think these inflation numbers have been going on too long, and consumers, businesses and everyday Americans are depending on us to get inflation back down and bridling it." — Daly (06/01/2022, CNBC)

Quote 51: "Other analysts said Monday afternoon that a larger 0.75-point rate jump would cause more problems for the central bank than it would solve by confusing investors about how the Fed reacts to new data. "It just opens up additional communication challenges thereafter," said Neil Dutta, an economist at research firm Renaissance Macro. "It suggests the Fed is losing confidence in its forecast. We all know they were trying to catch up, but now it looks like they are panicking." —Timiraos (06/13/2022, WSJ)

Quote 52: "Clearly, today's 75 basis point increase is an unusually large one, and I do not expect moves of this size to be common." — Powell (06/15/2022, PC)

Quote 53: "But having given it [forward guidance], you feel constrained to follow through on it, and so it diverts policy from what would otherwise be the optimal path." — Summers (06/17/2022, Barrons Magazine)

Quote 54: "[...] that it's more costly for policy makers to be wrong about inflation expectations being well anchored when they are not, as opposed to erroneously assuming they are rising when they're actually well anchored." — Mester (06/29/2022, ECB forum)

Quote 55: "We are taking forceful and rapid steps to moderate demand so that it comes into better alignment with supply, and to keep inflation expectations anchored. We will keep at it until we are confident the job is done." — Powell (08/26/2022, Jackson Hole)

Quote 56: "This year, GDP was roughly flat through the first three quarters, and indicators point to modest growth this quarter. [...] Despite the tighter policy and slower growth over the past year, we have not seen clear progress on slowing inflation. [...] It is likely that restoring price stability will require holding policy at a restrictive level for some time. History cautions strongly against prematurely loosening policy. We will stay the course until the job is done." — Powell (11/30/2022, Inflation and the Labor Market)

Quote 57: Host: "I would like to start the first question and go straight to the news that came today, about which you must be pleased that the headline inflation came out as 7.7% down from 8.2% and core inflation down to 6.3% from 6.7." Daly: "So let's talk about the numbers that came out today. [...] So look at us, we can just be easy. We have to be resolute to bring inflation down to 2% on average."

Quote 58: "Just a few minutes ago data on retail sales for March was released, which will give us some idea of how consumer demand is holding up. [...] Perhaps even more closely than usual, I will be watching the data to evaluate the appropriate path of monetary policy." — Waller (04/14/2023, Financial Stabilization and Macroeconomic Stabilization)

C. Model Description

This appendix provides details on the model presented in Section III of the paper.

C.1. Model Environment and Timing

There are two agents: the Fed (denoted with superscript f) and the market (m). The Fed determines the policy rate. The market conducts economic activities and trades financial assets. The model is static, representing any period t, but we divide period t into two instances:

Assumption 1. *We assume the following timing:*

- *Pre-shocks period t': Before shocks are realized and economic activity takes place, the market trades financial assets and the Fed determines the nominal short interest rate $i_{t'}$.*
- *Main period t: Economic activity is realized based on the policy rate $i_{t'}$ and realized shocks. Financial assets pay off.*

Monetary policy can only react to past shocks and its expectations of economic variables in period t. This also applies to market's pricing of financial assets which we will elaborate further in Section C.6.

Expectations of agent j made at t' about the period t realization of a variable z, $E^j_{t'}[z]$, are written as $E^j[z]$. Forecast errors are denoted with $\epsilon^j_z \equiv z - E^j[z]$. When an expectation is common across both agents, we drop the superscript, i.e., $E^j[z]$ is written as $E[z]$ and ϵ^j_z as ϵ_z.

C.2. Economic Structure

Economic activity is determined by a Phillips Curve and a IS equation subject to two shocks, a cost-push shock u and a demand shock d:

$$\pi_t = E^m[\pi^*] + \kappa(l_t - l^*) + u_t \quad \text{(Phillips curve)} \tag{A.9}$$

$$l_t - l^* = -\chi(i_{t'} - E^m[\pi^*] - r^*) + d_t \quad \text{(IS equation)} \tag{A.10}$$

The behavior of inflation is anchored by the markets' perceptions of the Fed's inflation target ($E^m[\pi^*]$) which we allow to differ from the actual Fed's target π^*. r^* is the natural rate of interest. In terms of monetary transmission, nominal interest rates affect the level of employment via the IS equation (A.10), which then affects inflation through the Phillips curve (A.9).

With the FOMC having perfect information and standard timing assumptions, they could set $i_{t'} = \frac{1}{\chi} d_t + E^m[\pi^*] + r^*$ which, by closing the employment gap, would ensure that inflation $\pi_t = E^m[\pi^*] + u_t$. This is a form of divine coincidence in this model if $u_t = 0$ and $E^m[\pi^*] = \pi^*$. However, we assume imperfect information and a lag in policy reaction to new shocks.

Reflecting the 2020 Fed's framework, we assume that the FOMC has an asymmetric loss with respect to employment:

$$L_t = \begin{cases} (\pi_t - \pi^*)^2 + \lambda_B (l_t - l^*)^2 & if \;\; l_t \leqslant l^* \\ (\pi_t - \pi^*)^2 + \lambda_G (l_t - l^*)^2 & if \;\; l_t > l^*, \end{cases} \tag{A.11}$$

where $\lambda_B > \lambda_G$. Reflecting the timing assumptions, $i_{t'}$ is chosen to minimize the expected value of this loss: $E^f[L_t]$.

C.3. Model Information

We introduce the following assumptions about what the Fed and the market know, do not know, and where they agree or disagree.

Assumption 2. *Common information: Both the market and the Fed have perfect knowledge of the timing, the Fed's optimization problem, and the parameters κ and χ. The market and the Fed have identical beliefs on the distribution of the supply shocks $u_t \sim$ i.i.d. $N(E[u_t], \sigma_u^2)$, and the Fed's forecast error, i.e., $d_t - E^f[d_t]$, $u_t - E[u_t]$, $l^* - E^f[l^*]$, and $r^* - E^f[r^*]$.*

Assumption 3. *The Fed's information:*

1. *The Fed knows the parameters λ_G, λ_B and π^* and the market's expectation of the inflation target $E^m[\pi^*]$.*
2. *The Fed does not know r^* and l^* but forms expectations of them, i.e., $E^f[r^*]$ and $E^f[l^*]$*
3. *The Fed believes the demand shocks have the following distribution: $d_t \sim$ i.i.d. $N(E^f[d_t], \sigma_d^2)$.*

Assumption 4. *The market's information:*

1. *The market believes the demand shocks have the following distribution: $d_t \sim$ i.i.d. $N(E^m[d_t], \sigma_d^2)$.*
2. *The market knows the natural rate of interest r^* and the maximum employment rate l^*.*
3. *The market does not know the Fed's inflation target π^* but forms expectations $E^m[\pi^*]$.*
4. *The market knows the average policy preference $\lambda = \frac{\lambda_B + \lambda_G}{2}$, but is uncertain about the values of λ_G and λ_B believing they come from the following probability distribution where $\Delta > 0$:*

$$\lambda_G, \lambda_B \sim \begin{cases} \lambda_G = \lambda - \Delta \text{ and } \lambda_B = \lambda + \Delta & w.p. \;\; p_{t'} \\ \lambda_G = \lambda - \frac{1}{2}\Delta \text{ and } \lambda_B = \lambda + \frac{1}{2}\Delta & w.p. \;\; (1 - p_{t'}) \end{cases}$$

The final element of Assumption 4 indicates that the market recognizes the Fed's adoption of an asymmetric policy function, placing greater weight on inflation (or employment) shortfalls as $\lambda_B > \lambda_G$ in both cases. This aligns with the Fed's introduction and communication of its new framework in 2020. However, the exact degree of this asymmetry remains unknown to the market, as it is not explicitly specified in the framework statement or related communications. Interpreting Δ as the degree of the asymmetry, the assumption implies that the market believes there is probability $(1 - p_{t'})$ of Fed exhibiting an asymmetry of Δ, whereas with probability $p_{t'}$, it may adopt a stronger asymmetry of 2Δ, placing even greater emphasis on employment (or inflation) shortfalls.

To keep the model tractable, we do not explicitly model expectation formation but instead assume that they are formed through external learning processes as in Schorfheide (2005). That is, expectations are formed exogenously, ignoring the general equilibrium effects of decisions on expectations. This assumption has been extensively used in the literature, e.g., the adaptive learning in Evans and Honkapohja (2009), the expectation formation involving behavioral frictions in Bianchi et al. (2022), and the VAR expectations approach in the FRB/US model.

C.4. Fed's Optimal Monetary Policy

The assumption that monetary policy is set before the shock realizations means that Fed must minimize the expected loss subject to uncertainty. The loss function asymmetry interacts with the Fed's uncertainty. The Fed must assess whether $(l_t - l_t^*)$ will be positive or negative as this has different impacts on the loss. At t' the Fed has an expectation of how $(l_t - l_t^*)$ will evolve but it is also uncertain about net demand conditions and the real interest rate:

$$l_t - l^* = \underbrace{-\chi(i_{t'} - E^m[\pi^*] - E^f[r^*]) + E^f[d_t]}_{\equiv E^f[l_t - l^*]} + \underbrace{\epsilon^f_{d_t} + \chi\epsilon^f_{r*}}_{\equiv \theta_t} \tag{A.12}$$

The stochastic component θ_t arises from potential forecast errors in demand shocks, $\epsilon^f_{d_t} = d_t - E^f[d_t]$, and the natural rate of interest, $\epsilon^f_{r*} = r^* - E^f[r^*]$. For tractability, we assume that θ_t is uniformly distributed on $[-\Sigma_t, \Sigma_t]$, where Σ_t captures the Fed's uncertainty arising from forecast errors. These matter because the forecast errors affect the probability that the employment gap will be positive or negative and this has a distinct impact on losses because of the asymmetry in the loss function (A.11). For the problem to be well defined and also realistic, we impose the restriction $-\Sigma_t < E^f[l_t - l^*] < \Sigma_t$, such that the uncertainty is large enough. This ensures that under the optimal policy, there remains the possibility of both a shortfall and an overshoot.

C.4.1. An Illustrative Case

We begin with an illustrative case in which the Fed cares only about the employment gap. Specifically, $L_t = \lambda_B(l_t - l^*)^2 \mathbb{1}_{l_t \leqslant l^*} + \lambda_G(l_t - l^*)^2 \mathbb{1}_{l_t > l^*}$, with $\lambda_B = \lambda_G$ in the standard symmetric case. This setup corresponds to the illustration in Figure 5 and helps clarify how the asymmetric loss function interacts with uncertainty Σ_t in generating policy bias.

To simplify notation, define $X \equiv l_t - l^*$, $a \equiv E^f[X] - \Sigma_t$, and $b \equiv E^f[X] + \Sigma_t$. By uniform distribution assumption for θ_t in equation (A.12), we have $X \sim U(a, b)$ with probability density function (pdf) $f(X) = \frac{1}{b-a}$, where $b - a = 2\Sigma_t$. Using this notation, the loss function can be rewritten as a function of X, $L_t = \lambda_B X^2 \mathbb{1}_{X\leqslant 0} + \lambda_G X^2 \mathbb{1}_{X>0}$.

The expected loss is:

$$\begin{aligned} E^f[L_t] &= \int_a^0 \lambda_B X^2 f(X) dX + \int_0^b \lambda_G X^2 f(X) dX \\ &= \lambda_B \int_a^0 X^2 \frac{1}{b-a} dX + \lambda_G \int_0^b X^2 \frac{1}{b-a} dX = -\frac{1}{3}\lambda_B \frac{a^3}{b-a} + \frac{1}{3}\lambda_G \frac{b^3}{b-a} \end{aligned} \tag{A.13}$$

Substituting back for a and b yields:

$$E^f[L_t] = -\frac{1}{6}\lambda_B \frac{(E^f[l_t - l^*] - \Sigma_t)^3}{\Sigma_t} + \frac{1}{6}\lambda_G \frac{(E^f[l_t - l^*] + \Sigma_t)^3}{\Sigma_t} \tag{A.14}$$

The optimal policy is obtained by solving the first order condition (FOC) of the expected loss $E^f[L_t]$ with respect to $E^f[l_t - l^*]$ and the FOC is:

$$-\frac{1}{2}\lambda_B \frac{(E^f[l_t - l^*] - \Sigma_t)^2}{\Sigma_t} + \frac{1}{2}\lambda_G \frac{(E^f[l_t - l^*] + \Sigma_t)^2}{\Sigma_t} = 0 \tag{A.15}$$

When $\Sigma_t > 0$, the FOC reduces to $\lambda_B(E^f[l_t - l^*] - \Sigma_t)^2 = \lambda_G(E^f[l_t - l^*] + \Sigma_t)^2$, i.e., the optimal policy equates the marginal loss from the shortfall with the marginal loss from the overshoot. In the symmetric case, $\lambda_B = \lambda_G$, the solution is $E^f[l_t - l^*] = 0$. In the asymmetric case, $\lambda_B \neq \lambda_G$, the optimal policy is given by $E^f[l_t - l^*] = \frac{\Sigma_t(\sqrt{\lambda_B} - \sqrt{\lambda_G})^2}{\lambda_B - \lambda_G}$.[2] When $\lambda_B > \lambda_G$, the case considered in this paper, we have $E^f[l_t - l^*] > 0$ implying that the Fed's optimal policy exhibits an overshooting bias.

Figure 5 illustrates the above derivations by calibrating $\lambda_B = \lambda_G = 2$ for the symmetric case and $\lambda_B = 3$, $\lambda_G = 1$ for the asymmetric case, with $\Sigma_t = 1.1$. The quadratic loss functions L_t under different λ's, the implied optimal policies, and the associated uncertainty bounds follow directly from the preceding discussion. The blue shaded area in Figure 5 under the quadratic loss function with bounds $[a, b]$ is related to the expected loss up to a scaling by a constant factor $\frac{1}{b-a} = \frac{1}{2\Sigma_t}$.[3]

[2] There exists another root when $\lambda_B \neq \lambda_G$, namely $E^f[l_t - l^*] = \frac{\Sigma_t(\sqrt{\lambda_B} + \sqrt{\lambda_G})^2}{\lambda_B - \lambda_G} > \Sigma_t$. Since we restrict $-\Sigma_t < E^f[l_t - l^*] < \Sigma_t$, this solution is excluded.

[3] The shaded area corresponds to $\int_a^b L_t \, dl_t$ and the expected loss is given by $E^f[L_t] = \frac{1}{b-a}\int_a^b L_t \, dl_t$. For instance, in the symmetric case the expected loss equals $\frac{\lambda}{3}\Sigma_t^2$, while the blue shaded area in Figure 5 is given by $\lambda \int_{-\Sigma_t}^{\Sigma_t} X^2 f(X) \, dX = \frac{2\lambda}{3}\Sigma_t^3$.

C.4.2. General Case

We now go back to the general case and the Fed's optimal policy rate $i_{t'}$ is:

$$i_{t'} - E^m[\pi^*] - E^f[r^*] = \chi^{-1}\left(E^f[d_t] + \frac{\kappa}{\tilde{\kappa}}(E[u_t] - \epsilon^m_{\pi*})\right) + i^{bias}_{t'}, \tag{A.16}$$

where

$$i^{bias}_{t'} = \chi^{-1}(\lambda_G - \lambda_B)\left(\frac{\Sigma_t}{4\tilde{\kappa}} + \frac{\kappa^2}{4\Sigma_t\tilde{\kappa}^3}(E[u_t] - \epsilon^m_{\pi*})^2\right) \tag{A.17}$$

where $\tilde{\kappa} \equiv \kappa^2 + \lambda$ and $\lambda = \frac{\lambda_G+\lambda_B}{2}$ is the average policy stance. Solution details are provided in Appendix Section C.7 below, while the underlying intuition remains the same as in the illustrative case.

The policy rule (A.16) states that the Fed will choose an expected real rate gap, $(i_{t'} - E^m[\pi^*] - E^f[r^*])$ to optimally, considering the trade-off between employment and inflation, offset expected demand shocks, $E^f[d_t]$, and expected cost-push shocks, $E[u_t]$. Additionally, the Fed accounts for the extra inflation arising from the market's incorrect belief about the inflation target, $\epsilon^m_{\pi*}$. For example, if the market overestimates the inflation target $\epsilon^m_{\pi*} < 0$, the Fed needs to maintain a tighter policy.

The last term $i^{bias}_{t'}$ is negative when $\lambda_G < \lambda_B$, i.e., the Fed places greater emphasis on inflation (or employment) shortfalls. The Fed will preemptively set a rate lower than in the symmetric case to account for the risk of inflation (or employment) falling below the target. The greater the Fed's forecast uncertainty, the higher the Σ_t, a more expansionary bias is required to reduce the likelihood of a shortfall. A similar intuition applies to the second term of the bias. When cost-push shocks and incorrect beliefs about the inflation target already necessitate a trade-off between inflation and employment, the difference between the marginal loss contribution of a shortfall and an overshoot increases due to the quadratic loss function.

Under the optimal policy rate, the inflation gap is given by:

$$\pi_t - \pi^* = \frac{\lambda}{\tilde{\kappa}}E[u_t] - \frac{\lambda}{\tilde{\kappa}}\epsilon^m_{\pi*} + \kappa\chi\epsilon^f_{r*} + \kappa\epsilon^f_{d_t} + \epsilon_{u_t} - \kappa\chi i^{bias}_{t'}. \tag{A.18}$$

Similar to the short rate gap, the inflation gap arises from the incorrect market's belief of inflation target as well as Fed's forecast errors of demand/supply shocks and the natural rate of interest. The additional bias term comes directly from the bias in the short rate. With $\lambda_G < \lambda_B$, $i^{bias}_{t'} < 0$, the inflation rate will be higher than in the symmetric case, as $-\kappa\chi i^{bias}_{t'} > 0$, leading to a positive inflation bias. This result explains why an asymmetry loss function in favor of employment shortfalls is also consistent with the Fed placing more weight on inflation shortfalls.

C.5. Market Beliefs of the Monetary Policy

As assumed in Section C.3, the market has perfect knowledge of the Fed's optimization problem and, thus, the solution form in (A.16), but its information does not perfectly align with that of the Fed. The market's beliefs about the Fed's policymaking in the presence of belief differences therefore affects their pricing of assets. We make an additional assumption about the higher-order beliefs:

Assumption 5. *Market's higher-order expectations:*
The law of iterated expectations holds for the market agents, i.e., $E^m[E^f[\cdot]] = E^m[\cdot]$

Assumption 4 and 5, with equation (A.16), gives the market's expected nominal short rate:

$$E^m[i_{t'}] = E^m[\pi^*] + r^* + \chi^{-1}\left(E^m[d_t] + \frac{\kappa E[u_t]}{\tilde{\kappa}} + E^m[i_{t'}^{bias}]\right)$$

A corollary of the Assumption 2 and 3, and 4 is that the Fed and the market agree on the expected supply shocks, i.e., $E^m[u_t] = E^f[u_t] = E[u_t]$ but they may have different expectations of the demand shocks, i.e., $E^m[d_t] \neq E^f[d_t]$. This implies that the market perceived monetary policy surprise, $\epsilon^m_{i_{t'}} \equiv i_{t'} - E^m[i_{t'}]$, is:

$$\epsilon^m_{i_{t'}} = -\epsilon^f_{r*} + \chi^{-1}\left((E^f - E^m)[d_t] - \frac{\kappa}{\tilde{\kappa}}\epsilon^m_{\pi*} + A_{t'}\epsilon^m_{\lambda_G - \lambda_B}\right), \tag{A.19}$$

where $A_{t'} \equiv \frac{\Sigma_t}{4\tilde{\kappa}} + \frac{\kappa^2}{4\Sigma_t\tilde{\kappa}^3}\left({\epsilon^m_{\pi*}}^2 - Var^m(\epsilon^m_{\pi*}) - 2E[u_t]\epsilon^m_{\pi*}\right)$.

Equation (A.19) shows that there are four main drivers of the market-perceived monetary policy shock:

1. Market-Fed belief difference of the natural rate of interest: ϵ^f_{r*}.
2. Market-Fed belief difference of the demand shocks: $(E^f - E^m)[d_t]$.
3. The market's incorrect belief of the inflation target: $\epsilon^m_{\pi*}$.
4. Misperception of the degree of the asymmetric policy stance: $\epsilon^m_{\lambda_G-\lambda_B} \equiv \lambda_G - \lambda_B - E^m[\lambda_G - \lambda_B]$.

The perceived monetary policy shock uncertainty stems from the uncertainty embedded in these four components:

$$\begin{aligned} Var^m(\epsilon^m_{i_{t'}}) =& Var^m\left(\epsilon^f_{r*}\right) \\ &+ \chi^{-2}\left(Var^m((E^f - E^m)[d_t]) + \frac{\kappa^2 Var^m(\epsilon^m_{\pi*})}{\tilde{\kappa}^2} + p_{t'}(1-p_{t'})\Delta^2({\frac{\Sigma_t}{4\tilde{\kappa}}}^2 + Var^m[A_{t'}])\right), \end{aligned} \tag{A.20}$$

where $Var^m[A_{t'}]$ is a higher-order moment that can be reasonably assumed to be constant or exogenously varying over time. During periods of heightened economic uncertainty faced by the

Fed, we expect $Var^m\left(\epsilon^f_{r*}\right)$, $Var^m((E^f - E^m)[d_t])$, and $\frac{\Sigma_t}{4\bar{\kappa}}$ to be larger. Similarly, when the market is more uncertain about the Fed's behavior, there is greater uncertainty about the inflation target, reflected in a larger $Var^m(\epsilon^m_{\pi*})$, as well as increased uncertainty about the degree of asymmetry, captured by a larger $p_{t'}$.[4]

C.6. Market's Pricing of Risky Assets

We further examine how the asymmetric loss function and belief differences between the market and the Fed affect risky asset prices and how short-rate policy transmits to the long rate. We can rewrite:

$$i_{t'} = E^m[i_{t'}] + \epsilon^m_{i_{t'}} \tag{A.21}$$

$$l_t - l^* = -\chi E^m[i_{t'}] + (l^* + \chi E^m[\pi^*] + \chi r^*) + E^m[d_t] + \tilde{l}_t, \tag{A.22}$$

where $\tilde{l}_t \equiv d_t - E^m[d_t] - \chi\epsilon^m_{i_{t'}}$ is the shock to l_t from the period t' perspective of the market participants. Using the Philips curve (A.9), we can also define $\tilde{\pi}_t \equiv \kappa\tilde{l}_t + u_t - E[u_t]$ to be the shock to π_t.

Assumption 6. *Aggregate consumption is equal to aggregate output and is proportional to l_t by a constant.*

The real SDF is:

$$\log(sdf_t) = -r_{t-1} - \frac{1}{2}\gamma^2\sigma_l^2 - \gamma\tilde{l}_t \tag{A.23}$$

We consider asset prices at the beginning of the period t (i.e., t', before the market observes $i_{t'}$, d_t, and u_t). To illustrate the properties of risk premia, we focus on the claim to the end of period's consumption ("stock", paying real cash flow proportional to $\exp(l_t)$) and a pseudo two-period nominal bond (paying $\exp(-i_{t'} - \tilde{\pi}_t)$ in real terms). The reason we call it a pseudo two-period bond is that it is traded at the beginning of period t (i.e., t') and matures at the start of the period $t+1$ (i.e., $t+1'$). Assuming joint log-normality[5], the conditional risk premium on the stock ($rp^s_{t'}$) and bond ($rp^b_{t'}$) is given by the minus covariance of the log SDF innovations and payoff innovations (from the market's perspective as of the beginning of period t):

$$rp^s_{t'} \equiv E^m[rx^s_{t'}] + 0.5Var^m(rx^s_{t'}) = -Cov^m(\widetilde{\log}(sdf_t), \tilde{l}_t) \tag{A.24}$$

$$\begin{aligned} rp^b_{t'} &\equiv E^m[rx^b_{t'}] + 0.5Var^m(rx^b_{t'}) = -Cov^m(\widetilde{\log}(sdf_t), -\epsilon^m_{i_{t'}} - \tilde{\pi}_t) \\ &= -Cov^m(\widetilde{\log}(sdf_t), -\epsilon^m_{i_{t'}} - \kappa\tilde{l}_t - (u_t - E[u_t])), \end{aligned} \tag{A.25}$$

[4]Note that this applies when $p_{t'}$ is less than 0.5, in which case an increase in $p_{t'}$ increases the product $p_{t'}(1 - p_{t'})$.

[5]This is an approximation. Since the distribution of the determinants in $\epsilon^m_{i_{t'}}$ (see (A.19)) is not specified a priori, the log-normal assumption serves as a convenient approximation.

where rx_t denotes log excess returns. The market's belief of the distributions of the supply shocks in Assumption 2 and of the demand shocks in Assumption 4 gives the following corollary:

Corollary 4. *The market believes their forecast errors of the supply shocks and the demand shocks have the following distribution:* $u_t - E[u_t] \sim i.i.d.\ N(0, \sigma_u^2)$ *and* $d_t - E^m[d_t] \sim i.i.d.\ N(0, \sigma_d^2)$.

We can further get:

$$rp^s_{t'} = \gamma(\sigma_d^2 + \chi^2 Var^m[\epsilon^m_{i_{t'}}]) \tag{A.26}$$

$$rp^b_{t'} = \gamma(-\kappa\sigma_d^2 + (1-\kappa\chi)\chi Var^m[\epsilon^m_{i_{t'}}]) \tag{A.27}$$

The $-Cov^m(\widetilde{\log}(sdf_t), -\tilde{\pi}_t) = -\gamma\kappa(\sigma_d^2 + \chi^2 Var^m[\varepsilon^m_{i,t}])$ in (A.25) captures the inflation risk premium in the conditional excess return of nominal bonds, up to a Jensen's inequality adjustment. Since only the $\tilde{l}_t$-driven component of inflation shock, $\tilde{\pi}_t$, is priced by the SDF, inflation shock is "good" (procyclical, i.e., high inflation occurs in high-output states). As a result, nominal bonds have negative inflation risk premium.

Similarly, inflation swap contracts have payoffs that are equal to the expected inflation rate plus an inflation risk premium, where the inflation risk premium is given by, $Cov^m(\widetilde{\log}(sdf_t), \tilde{\pi}_t) = -\gamma\kappa(\sigma_d^2 + \chi^2 Var^m[\varepsilon^m_{i,t}])$. Since inflation shocks which are priced are "good" in the model, inflation swap contracts have negative inflation risk premium, suggesting lower inflation swap rates than expected inflation.

C.7. *Proof of the Fed's optimal policy*

Denote $X_t = l_t - l^* = E^f[l_t - l^*] + \theta_t$, where $\theta_t \equiv d_t - E^f[d_t] + \chi(r^* - E^f[r^*]) \equiv \epsilon^f_{d_t} + \chi\epsilon^f_{r*}$ is the stochastic component and $E^f[l_t - l^*] \equiv -\chi(i_{t'} - E^m[\pi^*] - E^f[r^*]) + E^f[d_t]$ is the pre-determined component. Since $\theta_t \sim U_{[-\Sigma_t, \Sigma_t]}$ where $\Sigma_t > 0$:

$$Pr[X_t \leqslant 0] = \frac{-E^f[l_t - l^*] + \Sigma_t}{2\Sigma_t}$$

$$E^f[X_t^2 | X_t \leqslant 0] = \frac{1}{3}(E^f[l_t - l^*] - \Sigma_t)^2 \quad \text{and} \quad E^f[X_t^2 | X_t > 0] = \frac{1}{3}(E^f[l_t - l^*] + \Sigma_t)^2$$

By the Phillips curve:

$$\pi_t - \pi^* = \kappa(l_t - l^*) - \epsilon^m_{\pi*} + u_t,$$

Substituting this into the loss function and take expectations $E^f[\cdot]$,

$$
\begin{aligned}
L_p &= E^f[(\kappa(E^f[l_t - l^*] + \theta_t) - \epsilon^m_{\pi*} + u_t)^2] + \lambda_B Pr[X_t \leqslant 0]E^f[X_t^2|X_t \leqslant 0] + \lambda_G Pr[X_t > 0]E^f[X_t^2|X_t > 0] \\
&= Var^f[\kappa(E^f[l_t - l^*] + \theta_t) - \epsilon^m_{\pi*} + u_t] + (E^f[\kappa(E^f[l_t - l^*] + \theta_t) - \epsilon^m_{\pi*} + u_t])^2 \\
&\quad - \lambda_B \frac{(E^f[l_t - l^*] - \Sigma_t)^3}{6\Sigma_t} + \lambda_G \frac{(E^f[l_t - l^*] + \Sigma_t)^3}{6\Sigma_t} \\
&= \kappa^2 Var^f[\theta_t] + Var^f[\epsilon^m_{\pi*}] + Var^f[u_t] + 2Cov_t[\theta_t, u_t] - 2Cov^f[\theta_t, \epsilon^m_{\pi*}] - 2Cov^f[\epsilon^m_{\pi*}, u_t] \\
&\quad + (\kappa E^f[l_t - l^*] - \epsilon^m_{\pi*} + E[u_t])^2 - \lambda_B \frac{(E^f[l_t - l^*] - \Sigma_t)^3}{6\Sigma_t} + \lambda_G \frac{(E^f[l_t - l^*] + \Sigma_t)^3}{6\Sigma_t}
\end{aligned}
$$

As all variance and covariance terms in the first parenthesis are constants that do not matter for the optimization, taking FOC w.r.t $E^f[l_t - l^*]$, we have:

$$
\kappa(\kappa E^f[l_t - l^*] - \epsilon^m_{\pi*} + E[u_t]) - \lambda_B \frac{(E^f[l_t - l^*] - \Sigma_t)^2}{4\Sigma_t} + \lambda_G \frac{(E^f[l_t - l^*] + \Sigma_t)^2}{4\Sigma_t} = 0
$$

Rearranging terms:

$$
(\kappa^2 + \frac{1}{2}(\lambda_B + \lambda_G))E^f[l_t - l^*] = -\kappa E[u_t] + \kappa\epsilon^m_{\pi*} + (\lambda_B - \lambda_G)\frac{E^f[l_t - l^*]^2}{4\Sigma_t} + (\lambda_B - \lambda_G)\frac{\Sigma_t}{4} \tag{A.28}
$$

If there is no asymmetry, $\lambda_B = \lambda_G = \lambda$, $E^f[l_t - l^*] = \frac{-\kappa(E[u_t] - \epsilon^m_{\pi*})}{\kappa^2 + \lambda} \equiv E^f\overline{[l_t - l^*]}$. We can next solve for the general asymmetric case by considering first-order deviation from this symmetric case. Before that, we make two more assumptions regarding the deviations.

Assumption 7. *The deviations of the asymmetry from the average policy stance are identical:* $d\lambda_G = -d\lambda_B$.

Assumption 8. $\epsilon^m_{\pi*}$ *is a small difference and we treat* $\epsilon^m_{\pi*} d\lambda_G = 0$

Take first-order small deviations $d\lambda_G$=-$d\lambda_B$, and $dE^f[l_t - l^*]$ to rewrite (A.28):

$$
(\kappa^2 + \lambda)(E^f\overline{[l_t - l^*]} + dE^f[l_t - l^*]) = -\kappa E[u_t] + \kappa\epsilon^m_{\pi*} - \frac{d\lambda_G}{2\Sigma_t}(E^f\overline{[l_t - l^*]}^2 + \Sigma_t^2)
$$

Reintroduce $E^f[l_t - l^*] = E^f\overline{[l_t - l^*]} + dE^f[l_t - l^*]$:

$$
E^f[l_t - l^*] = -\frac{\kappa(E[u_t] - \epsilon^m_{\pi*})}{\kappa^2 + \lambda} - (\lambda_G - \lambda_B)(\frac{\Sigma_t}{4(\kappa^2 + \lambda)} + \frac{\kappa^2(E[u_t] - \epsilon^m_{\pi*})^2}{4\Sigma_t(\kappa^2 + \lambda)^3})
$$

Using the IS curve, we get the optimal interest rate:

$$
i_{t'} = E^m[\pi^*] + E^f[r^*] + \chi^{-1}\left(E^f[d_t] + \frac{\kappa(E[u_t] - \epsilon^m_{\pi*})}{\kappa^2 + \lambda} + (\lambda_G - \lambda_B)(\frac{\Sigma_t}{4(\kappa^2 + \lambda)} + \frac{\kappa^2(E[u_t] - \epsilon^m_{\pi*})^2}{4\Sigma_t(\kappa^2 + \lambda)^3})\right).
$$