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 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 eventual actions helped stabilize premia, mitigating adverse macroeconomic news.

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I. Introduction

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, introducing two key elements: flexible average inflation targeting (FAIT) and asymmetric focus on employment shortfalls. In this paper, we analyze the Fed's policy stance and the financial market response following the announcement through 2023. 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 zero lower bound through most of 2021, in line with the Fed's intentions, 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



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.

then moderating premia as policymakers shifted their language.[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 key motives behind the Fed's 2020 framework and the assumptions embedded within it. Against this backdrop, we document that the Fed's communication introduced uncertainty about its reaction function. We support this claim with a range of evidence, including market and Fed forecasts, survey-based dispersion, and textual analysis of both Fed communication and media coverage.

The 2020 framework marked a significant shift in the Fed's approach to policymaking. It was constructed with a specific scenario in mind: the effective lower bound and the prevalence of demand shocks. With FAIT as the key tenet, the FOMC clearly signaled willingness to overshoot the 2% inflation target to make up for past undershoots. How-

[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).

ever, we argue that those past inflation misses have concerned the Fed more than they did the market. 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 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 the forward guidance 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 then examine how the yield curve evolved during the post-framework period, focusing on high-frequency windows around macroeconomic announcements and Fed communications. Between August 2020 and August 2023, the ten-year yield rose by more than 350 basis points (bps). Of that, nearly 150 bps (41% of the total increase) occurred within 30-minute windows following eight categories of macro releases. Fed communication windows initially produced only modest increases in long-term yields—no more than 14 bps by March 1, 2021, while short-term yields remained flat. As inflation picked up and the labor market tightened in 2021, long-term yields began to rise more sharply—mostly outside Fed communications. Starting in the second half of 2021, however, a striking divergence emerged: while macro announcements continued to push long yields higher, Fed communication began to exert a moderating influence. This shift coincided with increasingly hawkish policy stance. The Fed's pivot happened

gradually, starting with less accommodative and more uniformly hawkish messaging by Fed officials that built toward tightening actions in 2022Q1 and culminating in an unprecedented 75bps move in June 2022. By August 2023, cumulative effects of Fed communication windows had lowered the ten-year yield by roughly 40 basis points, offsetting about 11% of the total increase.

These high-frequency results suggest that markets respond rapidly to Fed communication and macroeconomic surprises. Responses to macro news are large and serve as real-time tests of the Fed's policy assumptions. Incoming data can either validate or contradict the Fed's stance, prompting markets to reprice long-term yields accordingly. A coordinated shift in Fed communication—especially when aligned with data—can help stabilize long-term rates via the term premia.

We illustrate those 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 and stocks.

To isolate the channels empirically, we study the dynamics of short-rate expectations and term premia day by day. We show that the Fed event days and macro days are associated with a significant buildup of term premia that continues until the Fed's hawkish pivot. We estimate that the term premium component linked to the Fed-induced uncertainty rises cumulatively by around 80 bps at the ten-year maturity from August 2020 to mid-April 2022. From that point, it stabilizes and begins to moderate as the Fed officials consistently communicate more hawkish stances. 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 sensitivity of term premia, which again abates once policy starts to normalize. As such, to the extent that markets and the Fed disagree on the appropriate policy stance, markets can unwind the effect policymakers intended to achieve (in this case, easy financial conditions) by charging a higher premium.

To connect the premium dynamics and changing market perceptions of policy mistakes, we exploit the content of Wall Street Journal articles covering the Fed. We document that term premia, but not short-rate expectations, co-move positively with our textual

measure of perceived mistakes. Finally, we also show that determinate hawkish language in Fed officials' speeches post-pivot contributed to lowering term premia on long-term bonds.

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 presents the high-frequency event study. Section IV develops model predictions that we examine 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. The 2020 framework and market perceptions of the Fed's policy stance

II.A. The 2020 framework emphasized a weak demand scenario

Chair Powell announced the Fed's new policy framework on August 27, 2020, at Jackson Hole. The framework had taken shape over the previous decade, following the global financial crisis (GFC), as the Fed faced persistently low inflation and the challenge of supporting the economy at the effective lower bound (ELB) (Clarida, 2020, 2022). With estimates of the natural rate of interest (r^*) remaining low, policymakers saw anchoring inflation expectations at 2% as a way to create more room for monetary policy during recessions (Quote 6).[2] The Fed's view that allowing inflation to overshoot the 2% target could be beneficial was reinforced by the tightening between 2015 and 2018, which many believed hindered the economy (Eggertsson and Kohn, 2023; Meade, 2023).

To re-anchor inflation expectations at 2%, the framework implemented two new elements: (1) emphasis on employment shortfalls instead of two-sided deviations from maximum employment, and (2) FAIT.[3] The framework statement primarily focused on the complementarity between the Fed's inflation and employment goals, consistent with the experience of the demand-driven downturns of the recent past. Both elements then implied an asymmetric policy reaction function and allowed for a delayed liftoff from the ELB. Although the framework contained "escape clauses" for situations where Fed's inflation and employment objectives are not complementary (as with supply shocks), the one-sided emphasis on a weak-demand scenario was noted at the time of the announcement (Ip, 2020, Quote 11).

The framework represented a major policy shift in the Fed's views on inflation. Historically, going back to Chair Greenspan, the Fed embraced preemptive tightening to guard against inflation tail risk as part of its risk-management approach (Greenspan, 2004; Cieslak et al., 2023). With the 2020 framework, the Fed would abandon this strategy and instead would allow inflation to run above target aiming for an average rate of 2% over time. Thus, the Fed would seek to "make up" for periods of low inflation with periods of somewhat higher inflation. The theoretical advantages of such a strategy are well-founded (Krugman et al., 1998; Eggertsson and Woodford, 2003; Bernanke et al., 2019;

[2]The FOMC meeting memos from 2014–2018 regularly discussed concerns about low inflation, declining r^*, and weak long-term inflation expectations.

[3]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.

Bernanke, 2020).[4] If credible, FAIT can create around 25 to 50 bps of additional stimulus at the ELB because inflation expectations should shift up endogenously as inflation falls below the target (e.g., Krane et al., 2023).

The effectiveness of the asymmetric framework relied on market participants fully understanding the mechanism and adjusting expectations accordingly. In practice, several forms of disconnect emerged between the Fed and markets. Before the framework's announcement, the Fed's and markets' inflation expectations were closely aligned. However, while the Fed increasingly emphasized risks of inflation undershooting its 2% target, market participants did not appear equally concerned. The NY Fed's Survey of Primary Dealers (SPD) reveals that the probability of CPI inflation falling below 2% remained very low and stable, while downside risks were more pronounced in the Fed's projections (see Appendix Figure A-1). This divergence points to differing beliefs about inflation and r^* dynamics, with the Fed putting more weight on low-r^* scenarios as the new framework was formulated (see also Levy and Plosser, 2024).

II.B. The Fed navigated multiple overlapping shocks and uncertainty

The Fed's decision to announce the framework in August 2020 came amid the Covid-19 pandemic. Figure 2 situates the monetary policy events within the complex macroeconomic, fiscal policy, and geopolitical environment from the pandemic outbreak through late 2023.

Unemployment peaked at 14.8% in April 2020 and annual core CPI inflation dropped to 1.2% by May 2020 as a result of pandemic lockdowns. With the policy rate newly at the ELB, the Fed's ability to respond to the economic downturn appeared limited. The framework thus offered a way to create policy space at a time of considerable uncertainty and when additional fiscal support remained unclear. It was soon followed by two major pieces of forward guidance. In September 2020, the Fed signaled it would not tighten preemptively against inflation. In December, it added guidance on tapering asset purchases, tying it to "substantial further progress" on *both* employment and inflation objectives. Tapering was understood as necessary but not sufficient for rate hikes. The guidance set a high bar for tightening, effectively assuming no trade-off between the Fed's dual-mandate goals. Appendix Table A-1 provides a detailed timeline of policy actions and phrasing.

[4] An extensive academic literature and policymakers' speeches discuss price-level targeting and inflation targeting, especially in a low interest rate environment, including but not limited to Svensson (1999), Orphanides (2004), Gaspar et al. (2010), Woodford (2010), Erceg et al. (2011), Evans (2012), Hebden and López-Salido (2018), and Mertens and Williams (2019).

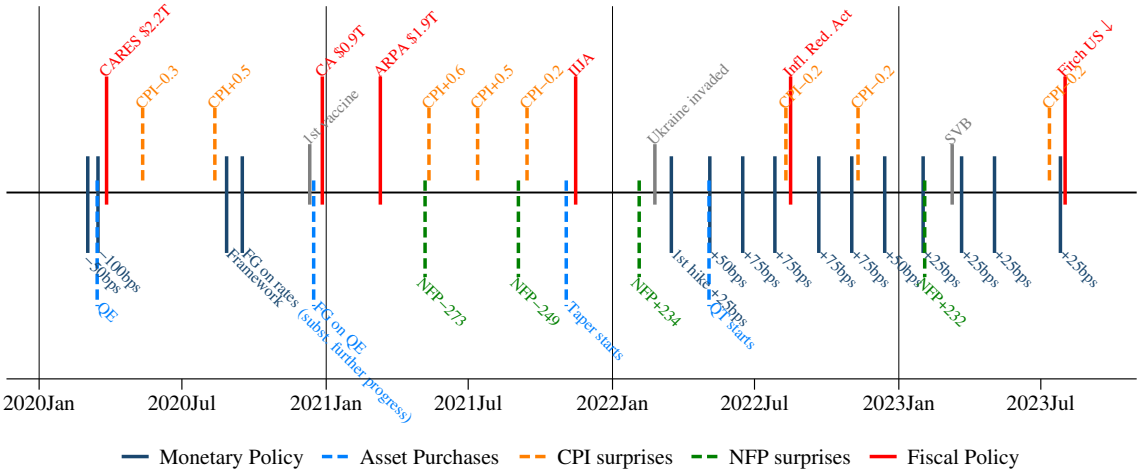


Figure 2. Timeline of main events. The figure shows the key economic, policy and geopolitical events. The abbreviations are: CARES—the Coronavirus Aid, Relief, and Economic Security Act; CA—the Consolidated Appropriations Act; ARPA—the American Rescue Plan Act; IIJA—Infrastructure Investment and Jobs 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.

In early 2021, the output gap was closing (Lewis et al., 2022), supported by extensive fiscal measures totaling more than $5tr by 2021Q1.[5] Inflation picked up in 2021 as economies reopened, supply disruptions continued, and fiscal policy led to excess demand (Cochrane, 2022; Bianchi et al., 2023; Di Giovanni et al., 2023). Throughout 2021, macroeconomic signals were mixed. Higher-than-expected inflation coincided with labor market data showing weaker-than-expected nonfarm payrolls alongside rising JOLTS vacancies (Appendix Figure A-3 shows the macroeconomic surprises). Inflation continued to rise, further propelled by oil and gas price increases after Russia's invasion of Ukraine in February 2022. It peaked in June 2022 at 7.1% PCE deflator and 9.0% CPI inflation, and gradually fell back to around 3% by spring 2024, following an easing of supply constraints, energy cost declines, and the Fed's response.

Specifically, the Fed deemed "substantial further progress" to have been achieved in November 2021, and started gradually reducing monthly asset purchases. It completed the process in March 2022, which coincided with the first 25 bps FFR increase. The March 2022 meeting also preannounced that the sale of the Fed's balance sheet assets was forthcoming. The quantitative tightening (QT) began in May 2022 combined with a 50 bps FFR increase. While another 50 bps hike was expected before the June 2022 meeting,

[5]The Coronavirus Aid, Relief, and Economic Security (CARES) Act was signed into law on March 27, 2020, providing $2.2tr of fiscal support. In December 2020, the Consolidated Appropriations Act added a stimulus of around $900bn. With the new Biden administration, the American Rescue Plan was signed into law on March 11, 2021, extending the support by $1.9tr.

a June 13 WSJ article suggested the FOMC would pursue a 75 bps move (Timiraos, 2022). The FOMC followed through with the 75 bps rise on June 15, 2022, taking the FFR target range to 1.50%–1.75%. The FOMC made three additional such moves in a row, followed by further 50 bps and 25 bps. The FFR target settled at 5.25%–5.50% in July 2023.

II.C. The Fed suspended its preemptive response to inflation

A critical part of our subsequent analysis focuses on the period after the framework and the forward guidance announcements in 2020 through the Fed's tightening pivot in mid-2022. To summarize the Fed's policy stance in this period, Figure 3 superimposes the FOMC's one-year-ahead FFR projections against its assessment of inflation risks—the risk diffusion index. Both series are from the Summary of Economic Projections (SEP). The risk diffusion index reflects the policymakers' assessment of whether inflation risks are weighted to the upside or downside of their individual inflation forecasts.[6]

The plot reveals a striking discrepancy. The FOMC sees a rapid increase in upside inflation risks between December 2020 and June 2021. By March 2022, all members perceive risks to the upside, marking the first time when the entire FOMC agrees on the inflation risk assessment.[7] Notably, however, the FOMC's FFR projections one year ahead remain very close to the ELB until September 2021. Figure 3 displays the median and high-range FFR forecasts (excluding the three highest numbers). In September 2021, with the inflation risk index already at 0.72, the high FFR forecast one year ahead only reads 0.325%.

Thus, even as upside inflation risks become apparent in 2021, the Fed's projected policy path remains largely unchanged. Compared to earlier periods (e.g., 2016–2019) and the Fed's historical conduct (Cieslak et al., 2023), the Fed's responsiveness to inflation risk is markedly slower, indicating a substantial shift in policy behavior post-2020 framework.[8] Throughout 2021, policymakers express little concern about the upside risk of deanchoring expectations (see also Reis (2021, 2022)). Potentially to raise inflation

[6]For each SEP, participants respond to the question "Please indicate your judgment of the risk weighting around your projections." The risk diffusion index represents the number of participants who responded "Weighted to the Upside" minus the number who responded "Weighted to the Downside," divided by the total number of participants.

[7]During 2021, the unemployment risk diffusion index is around zero (see Appendix Figure A-7).

[8]In line with this evidence, Romer and Romer (2024) also argue that removal of preemptive policy action, along with increased emphasis on the employment component of the dual mandate, was an important factor in delaying the Fed's action. Both aspects were consistent with, and a consequence of, the framework assumptions and the announced forward guidance.

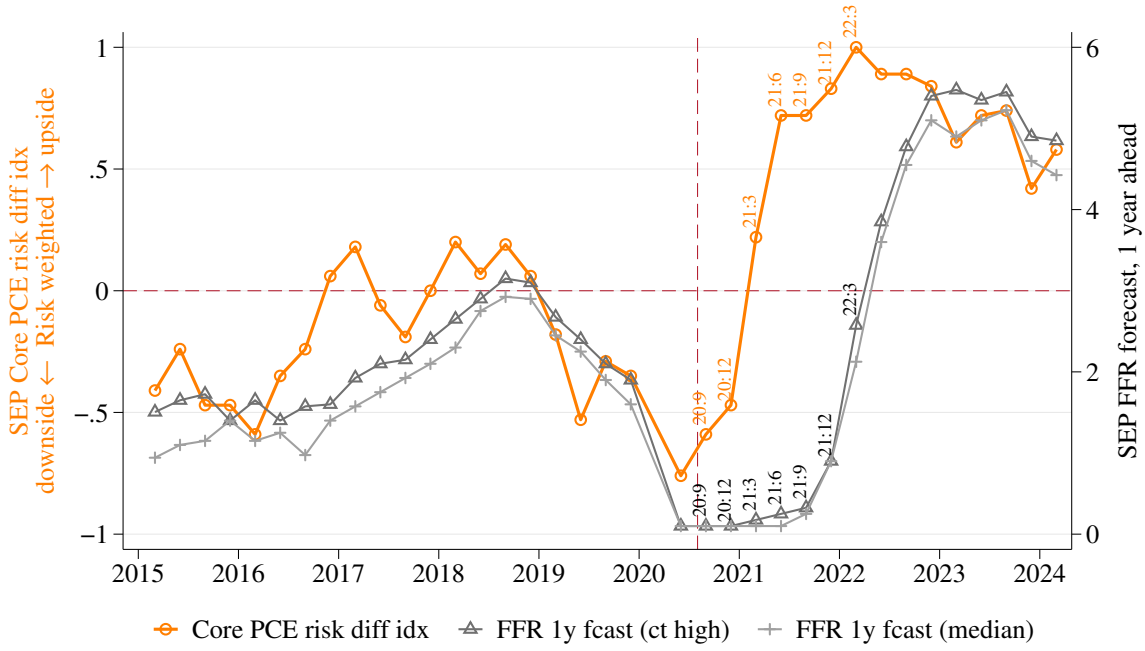


Figure 3. FOMC inflation risk assessment in SEP. The figure plots the risk diffusion index of the FOMC participants for the core PCE inflation against the FOMC's projections of the FFR path one year ahead. The risk diffusion index equal to 1 means that all participants perceive risks weighted to the upside of their forecasts.

expectations, when expectations actually begin drifting up,[9] many FOMC members initially cite expectations' stability as a reason why policy action is not needed (Quote 28). Simultaneously, they frequently emphasize uncertainty about the recovery and strive for achieving the employment objectives (Quotes 23, 29, and 36).

From early 2022, however, the FOMC's messaging starts to reflect the importance of the Fed's action to keep expectations contained (Quote 37), acknowledging the risk of deanchoring if the Fed failed to respond (Quote 43). The FOMC's resolve to move policy from accommodative to restrictive in order to reduce inflation becomes increasingly clear in announcements, press conferences, and speeches (Quote 38 and 44).

II.D. Fed's communication in late 2020 through 2021 fostered market's confusion about the reaction function

The challenges with executing and communicating "temporary price-level targeting (TPLT, at the ELB) that reverts to flexible inflation targeting (once the conditions for liftoff have been reached)" (Clarida, 2020) were earlier recognized by Bernanke (2017, Quote 2) in

[9] Appendix Figure A-5 details the dynamics of inflation beliefs in the Survey of Primary Dealers, including first and higher moments.

the face of supply shocks, and Sack (2019), when the central bank seeks to preserve flexibility. Early assessments expressed concern that the framework "adds confusion and lacks clarity" (Levy and Plosser, 2020).[10]

II.D.1. Inconsistent communication from the Fed was noted by the market

The framework 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).

To document inconsistent communication about the Fed's interpretation of the framework, we obtain data from the Goldman Sachs Economics Research publication called Chatterbox. Chatterbox collects "notable comments on key topics from Fed officials" over the FOMC intermeeting period, thus filtering communication noteworthy from investors' perspective.[11] Within that set, inflation overshooting was highlighted 47 times. The numbers range from 2.25% to 3%, with various officials quoting different numbers around the same time, projecting a lack of consensus on central aspects of the framework. The last noted mention of overshooting is in November 2021 when the inflation surge was already underway (see Appendix Figure A-4).

More broadly, we then classify the communicated policy stances from dovish (preference for looser policy) to hawkish (preference for tighter policy) by assigning scores on a scale $\{-1, -0.5, 0, 0.5, 1\}$ to the Chatterbox quotes (1,278 quotes in total). The score assignment is based on our reading and judgment to capture the relative changes in policy stances.[12]

Figure 4 reports averages and standard deviations of those scores calculated across all individual quotes in a given FOMC intermeeting period. A negative (positive) score indicates a tendency of Fed officials to express easier (tighter) policy views. The graph

[10] 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.

[11] Our sample covers 762 unique intermeeting individual speaking events (including speeches, testimonies, media interviews, webinars, etc.) over the 2019:12–2023:12 period. Appendix Figure A-4 presents the number of communication events by the Fed officials during the post-2020 period that were highlighted in Chatterbox.

[12] For robustness, we also asked ChatGPT to analyze the Chatterbox quotes and classify their implied policy stances. The resulting classifications are broadly consistent with our human readings.

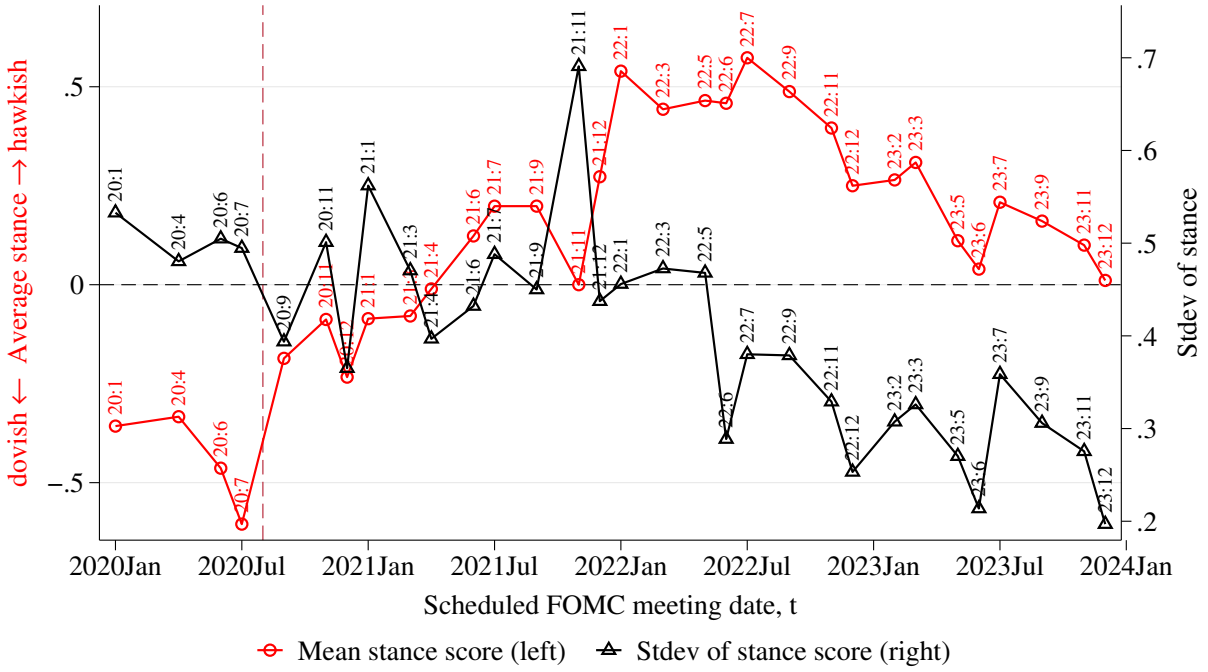


Figure 4. Fed officials' policy stance communication. The figure summarizes the mean and standard deviation of the Fed officials' policy stances coded from loose to tight on a scale $\{-1, -0.5, 0, 0.5, 1\}$ that are communicated over the intermeeting period based on the key quotes highlighted in Goldman 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.

shows that the initially dovish policy stances start reversing in early 2021. From around June 2021, following several positive inflation surprises and increasing evidence of a tightening labor market, officials become on average hawkish, and decisively so in January 2022. However, this tendency toward a tighter stance is still accompanied by a relatively high dispersion of views across individuals. Communication becomes significantly more uniform following the Fed's hawkish pivot in June 2022, and signals the return to managing upside inflation risks (Quotes 48 and 49).

II.D.2. Public uncertainty about the Fed's reaction function increased

Against this background, we provide two pieces of evidence indicating increased public uncertainty about the Fed's reaction function on inflation. We first analyze the disagreement in survey forecasts about the policy path and then construct a textual proxy of markets' perceived uncertainty based on Wall Street Journal (WSJ) articles.

Figure 5 shows the interquartile range of investors' FFR forecasts one, four, and eight quarters ahead, based on the Survey of Primary Dealers. From around July 2020 through

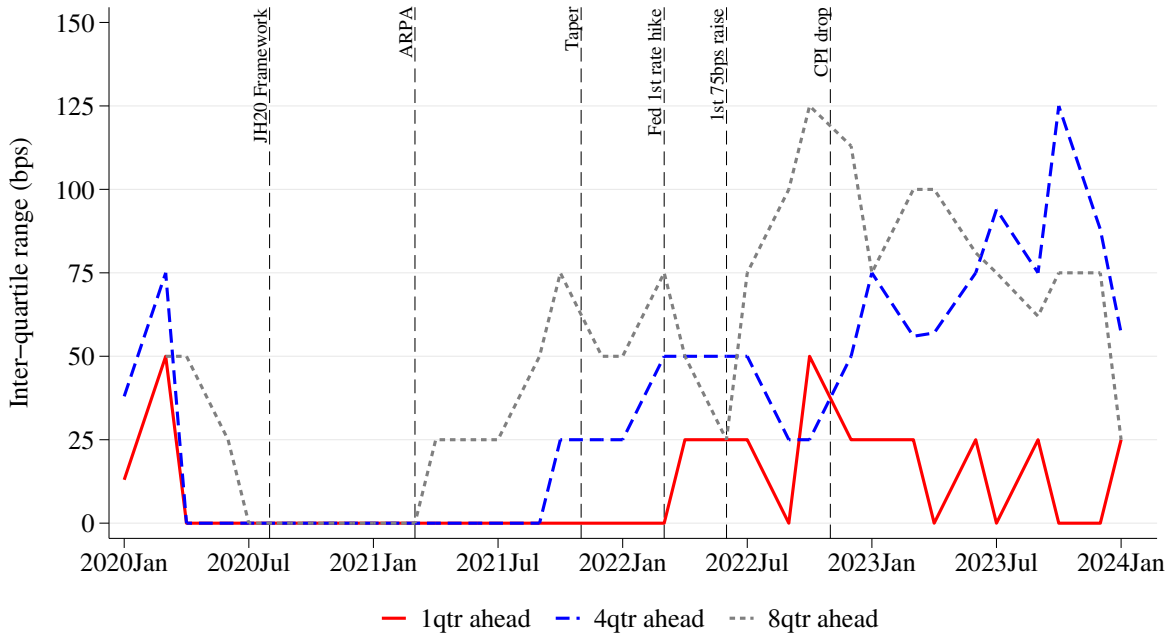


Figure 5. FFR forecast dispersion in the SPD. The figure plots the FFR forecast dispersion from the NY Fed Survey of Primary Dealers (SPD) for one-, four-, and eight-quarter-ahead forecasts. Dispersions are measured as the interquartile (75th-25th) range across participants. There are, on average, 24 participants in the survey.

early 2021, the forecasters agree on both the short- and medium-term path of policy, 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 while still agreeing about the near term, as the forward guidance from late 2020 is still in place. Post 2020, we find that macroeconomic disagreements explain little of FFR forecast dispersion beyond next quarter, suggesting the FFR dispersion at longer horizons reflects in large part policy-related uncertainty (Appendix Tables A-2 and A-3).

Media coverage of the Fed indeed suggests that the public became increasingly uncertain about the Fed's response to inflation. 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).[13] Of all articles, 38% are classified as indicating some form of uncertainty about the Fed. Uncertainty about the Fed's inflation

[13]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

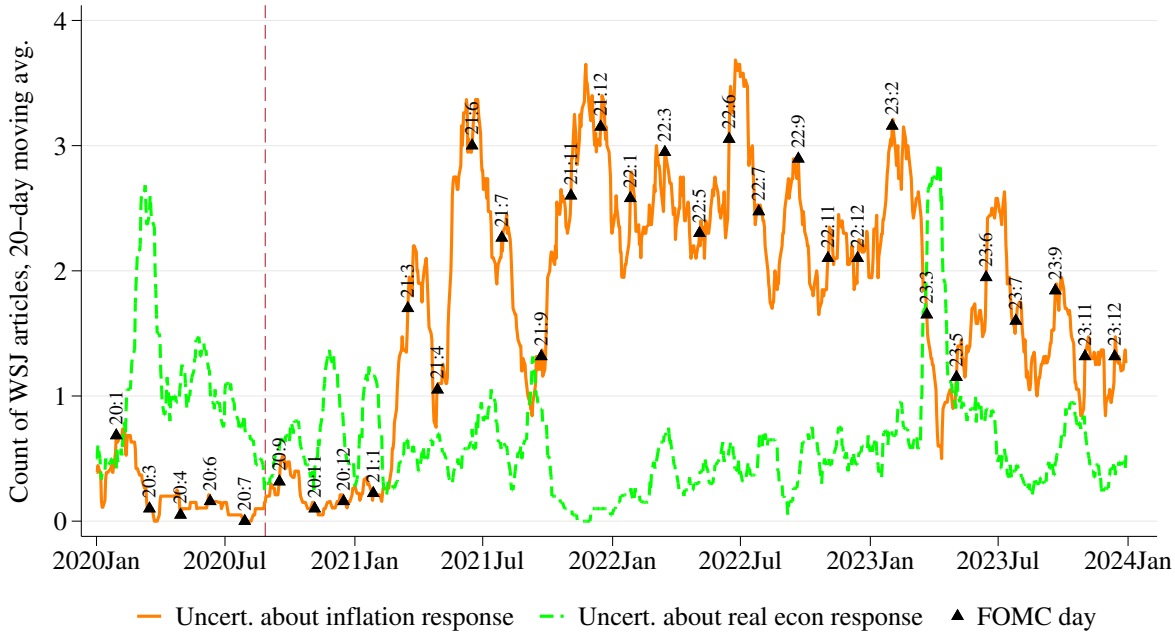


Figure 6. Public perceptions of reaction function uncertainty. The figure presents proxies for public perceptions of uncertainty about the Fed's reaction function. The indices are daily counts of WSJ articles that are classified as suggesting uncertainty about the Fed's response to inflation and the 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.

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 6 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.[14] Over the same period, the correlation between macro news and the uncertainty about the real-economy response is much weaker.

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targets / communication / Fed's macroeconomic projections / Fed policy framework / dot plots} {explanation less than 25 words}

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-8 compares the indices from the two runs, showing nearly identical time-series variation.

[14] 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.

Elevated uncertainty about the Fed's inflation response coincides with a rising FFR forecast dispersion at longer horizons. We find that the FFR forecast dispersion is high when the WSJ-based inflation-response uncertainty is high, and the positive link is the strongest for the eight-quarter-ahead dispersion (Appendix Table A-4).

The balance of evidence indicates that the Fed's communication about the framework, combined with unconditional forward guidance, created conditions for fragility. Market 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 Fed's inconsistent communication.

III. Yield reactions to the Fed and macro news: High-frequency evidence

The uncertainty surrounding the Fed's policy stance before liftoff suggests that investors continuously revised their views about its appropriateness in response to incoming macroeconomic news.[15] We begin by documenting how the yield curve responded to Fed communications and macro news from the introduction of the framework through 2023. Using high-frequency event studies, we disentangle the effects of Fed announcements from other shocks. These results motivate our theoretical model, which formalizes how perceived policy stance drives risk premia.

III.A. Data

We use high-frequency data on Treasury futures with underlying bond maturities of two, ten, and 30 years from TickData.com. We convert log futures price changes into yield changes using the duration of the underlying notional bond available from Bloomberg.[16]

We consider a comprehensive set of Fed communication events including monetary policy decision announcements (MPD), Chair's press conferences (PC), minutes releases.

[15] See Boyd et al. (2005), Cieslak and Pang (2021), Elenev et al. (2024), and Feunou et al. (2024) on how investor beliefs about monetary policy interact with macroeconomic announcements.

[16] The futures duration is shorter than the maturity because the underlying is a coupon bond, and the deliverable basket admits a range of maturities. We use the "ultra" versions of the ten- and 30-year Treasury futures, which specify a narrower range of deliverable maturities compared with the standard contracts. The average durations of the two-, ten-, and 30-year futures are 1.9, 8.0, and 17.6 years, respectively, from 2020:08 to 2023:12.

We also include communications by individual Fed officials via speeches, media interviews, testimonies, etc., as noteworthy Fed news often happens outside the scheduled FOMC announcements.[17] Time stamps for individual communications are from the FOMC Speak database, which is available through August 30, 2023.[18] To reduce noise, we only use events that have exact time stamps and that were mentioned in the WSJ up to two days following the event. This leaves us with 479 individual "key speaker" events. We consider the most relevant time-stamped macroeconomic announcements from the Bloomberg Economic Calendar. Appendix Table A-5 summarizes the Fed and macro events and Table A-6 lists the types of communication by individual Fed officials.

For announcements, we measure yield changes from 10 minutes before to 20 minutes after the release. For press conferences and other speaking events, we use a window from the event's onset and extending 120 minutes forward. Results are robust to using shorter windows of 60 or 90 minutes.

III.B. Impact of Fed and macro events on yields

We have argued that although the framework aimed to raise inflation expectations, its announcement and subsequent Fed communications introduced uncertainty rather than clarity. Figure 7 shows yield responses around Chair Powell's August 27, 2020 announcement. On that day, long-term yields rose by up to 15 bps—a three-standard-deviation move—while two-year yields remained unchanged, a pattern consistent with an increased term premium despite stable near and mid-term short-rate expectations. Inflation swap rates were largely unchanged, making it unlikely the market interpreted the announcement as a shift in the Fed's inflation target.[19] Instead, investor uncertainty centered on the Fed's asymmetric response to employment shortfalls (Quote 12). Long-term yields declined in the following days as Fed officials offered further interpretation, notably Brainard on September 1. Still, by the September 16 meeting, which introduced new forward guidance, markets remained unclear on the conditions that would prompt a rate liftoff. Powell declined to clarify the framework's operational details, and the dissents from Presidents Kaplan and Kashkari signaled internal disagreement. On balance, those initial events created interest rate volatility and foreshadowed the communication challenges the Fed would face ahead.

[17] See Bianchi et al. (2025), Cieslak et al. (2019), Cieslak and McMahon (2024), Swanson and Jayawickrema (2023).

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

[19] The ten-year swap rate rose just 1.3 bps to 1.971% on August 27 and to 2.013% on September 1.

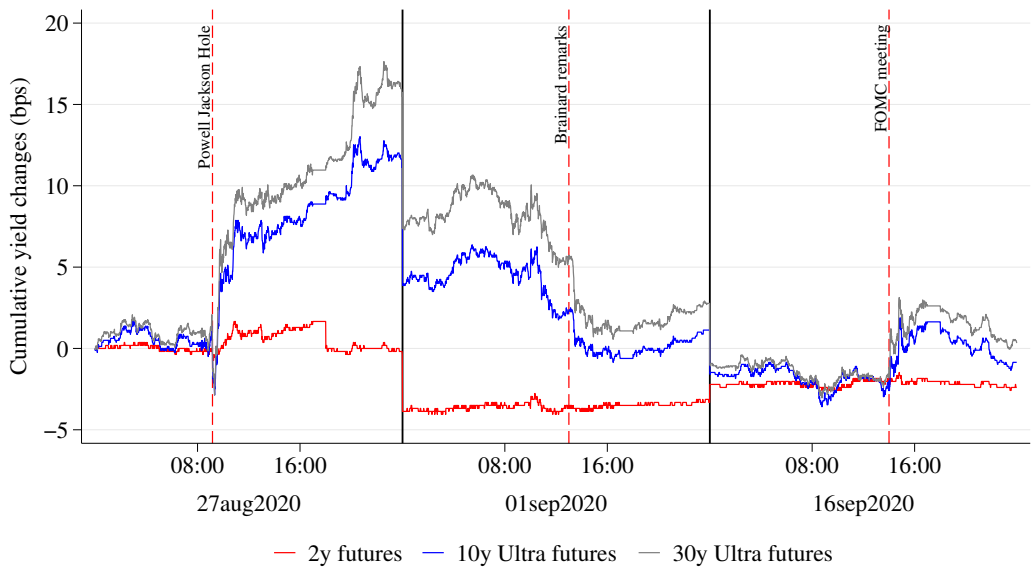


Figure 7. Fed events around the August 27, 2020 framework announcement. The figure plots minute-frequency intraday bond yield movements for two-, ten-, and 30-year Treasury futures. Yield changes are cumulative starting from 12 AM on August 27, 2020, the day the new framework was announced and displayed for three selected days: Chair Powell's Jackson Hole Symposium speech on August 27; Governor Brainard's remarks at the Brookings Institution on September 1, and the FOMC meeting statement release and press conference on September 16. The vertical lines indicate the starting time of each event.

In Table I, we summarize overall yield changes that occurred from 2020:08 to 2023:08. Monetary policy decision announcements raised interest rates, consistent with the overall tightening of the policy stance over this period. However, the Chair's post-decision press conferences had the opposite effect and generally lowered rates (see also Narain and Sangani (2025)). The intermeeting communication by the Fed officials likewise lowered long-term interest rates. The bulk of yield increases happened around macro announcements and on other days. The "other days" category contains several pivotal events from Figure 2, including fiscal and geopolitical events that we do not separately classify.

Tracing the yield curve behavior over this period allows us to delineate several distinct phases. Figure 8 shows the cumulative yield changes starting from August 2020. Until mid-2021, the two-year yield remains largely unresponsive to the Fed communication and macro events, while long-term yields moderately increase. As the two-year yield is highly sensitive to news about the monetary policy path, its stability over this period aligns with evidence in Section II that the lower-for-longer policy was clearly communicated to the market. Notably, however, long-term yields increase rapidly in the first quarter of 2021, on news about the forthcoming fiscal stimulus, which Cieslak (2024)

Year	Asset	Total yld chng (bps)	Fed events					Macro	Resid.
			MPD	PC	Minutes	Key speak.	Overall		
2020:8-2023:8	2y	422.9	31.0	-60.5	1.5	49.2	23.9	114.5	284.6
	10y	358.8	27.6	-49.1	-2.8	-16.4	-39.9	147.0	251.7
	30y	325.4	24.4	-28.0	-1.4	-41.5	-45.9	141.7	229.6
Total		959 (days)	24		25	480		357	

Table I. Cumulative yield changes around FOMC and macro events. The table reports the total changes in Treasury yields of different maturities accruing around different Fed and macro events, from 2020:08 to 2023:08. Yield changes are in basis points and are obtained from duration-adjusted futures price changes. The events are summarized in Appendix Table A-5. High-frequency windows of "MPD," "PC," "Minutes," and "Macro" do not overlap with each other but could overlap with key-speaker communications. The key-speaker windows remove overlap with other events. The "Overall" column sums changes across Fed event types. "Resid." denotes all trading hours outside the Fed and macro events. Counts of events are reported in the last row. Red (green) cells indicate large (small) contributions of an event type to a total yield change reported in that row.

estimates to have added about 50 bps to the 10-year yield through March 2021. This increase is seen in the bottom panel of Figure 8.

From the second half of 2021, as inflationary pressures become evident, short-term rates generally rise. Long-term yields, however, display a striking divergence, increasing steeply around macro events but declining around the Fed events. This pattern starts to emerge in 2021 when the Fed's intermeeting communication changes course toward increasingly hawkish, as documented in Figure 4. The divergence becomes especially visible from mid-2022, around the Fed's pivot toward aggressive hikes. By the end of the sample, the Fed event windows cumulatively offset about 50 bps of long-term yield increases on macro announcements and other days.

IV. Conceptual Framework

We now present a model to examine how the assumptions embedded in the 2020 framework 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 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. The complete model is detailed in Appendix D. This section highlights its key components and implications most relevant to our empirical analysis.

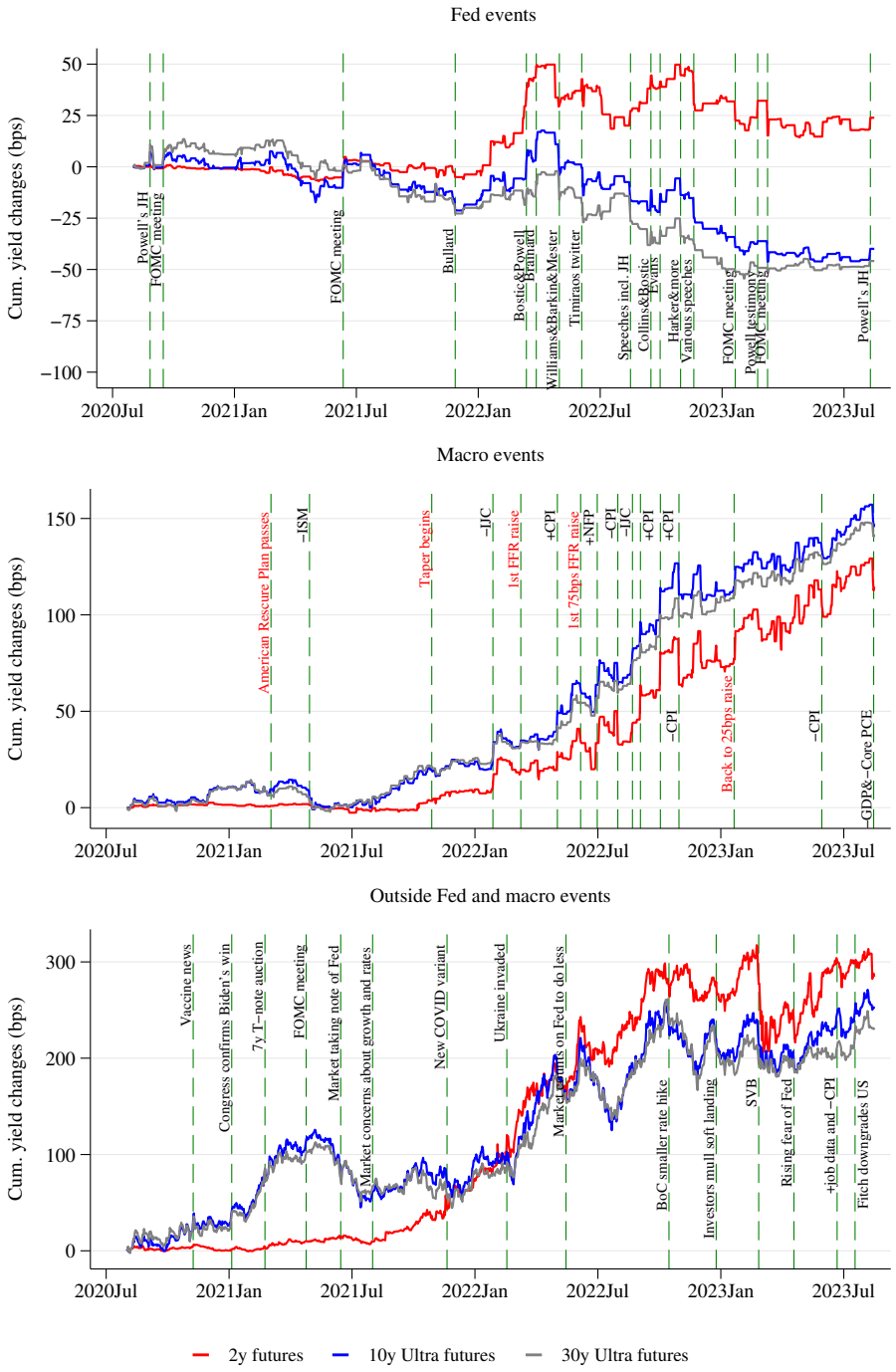


Figure 8. Cumulative yield changes around the Fed and macro events. The figure presents the cumulative yield changes (starting from August 1, 2020) of different maturities in high-frequency windows defined in Table A-5, during Fed events, macro events, and across all other days.

IV.A. Model Outline

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:

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

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

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):

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

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, $E^f[L_t]$.

Information assumptions. The information assumptions aim to capture the sources of possible differing views between the Fed and the market discussed in Section II.D. The market and the Fed have perfect knowledge of the timing, the Fed's optimization problem, and the parameters κ and χ. 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. $N(E^j[d_t], \sigma_d^2)$, $j \in \{m, f\}$. 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 $E^f[l^*]$. The market knows r^* and l^*, 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.[20]

IV.B. The Fed's policy stance

The focus on employment shortfalls, $\lambda_B > \lambda_G$ in loss function (3), is an integral part of FAIT. Already in 2016, the Tealbooks regularly discuss how the asymmetric weight on employment shortfalls helps bring inflation back to the 2% target (Quote 1). Specifically, in a demand-driven economy, as consistent with the FOMC's views when designing the framework, the $\lambda_B > \lambda_G$ asymmetry implies that the FOMC will tolerate inflation overshoot following a period of inflation below target. Moreover, by assuming the market's expected inflation target $E^m[\pi^*]$ can differ from the FOMC's policy-relevant π^*, the model captures market's beliefs about the extent and duration of inflation overshoot under FAIT.

Importantly, 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.[21]

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 $i_{t'}$:

[20] 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.

[21] 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.

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

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^*.

As highlighted by Eggertsson and Kohn (2023), the asymmetric loss function implies that policy is dovishly biased:[22]

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

The policy bias increases with the Fed's uncertainty, $\frac{\partial g}{\partial \Sigma_t} > 0$.[23] 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 9 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 ($\Sigma_t = 0$), 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^*,

[22] 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.

[23] 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.

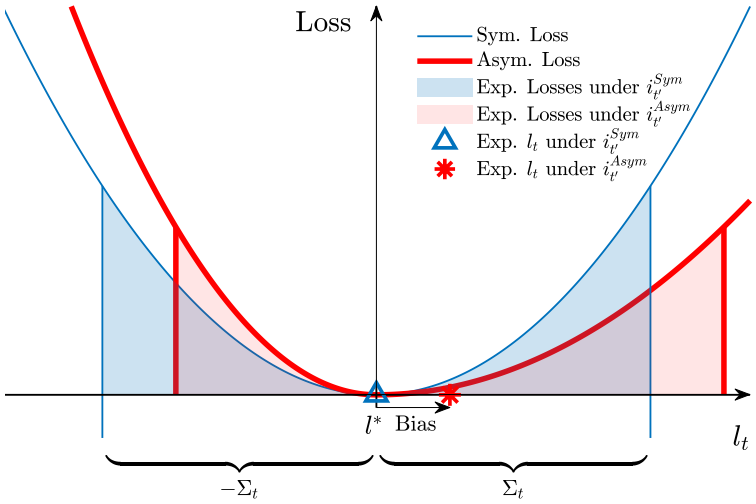


Figure 9. Illustration of the policy bias under an asymmetric loss function. The figure plots the Fed's losses as a function of the employment gap $l_t - l^*$. The curves depict the quadratic loss under symmetric loss function (*Sym*, with weights $\lambda_G = \lambda_B = \lambda$, blue thin line) and 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.

$E^f[l_t] > l^*$. 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 D.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.

IV.C. Market-perceived policy surprises and asset pricing

Based on the evidence in Section II, 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, $\epsilon^m_{i_{t'}} = i_{t'} - E^m[i_{t'}]$, through the following channels: (i) beliefs about the size of the demand shock ($\epsilon^{f,m}_d = (E^f - E^m)[d_t]$),[24] (ii) 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 $\epsilon^m_{i_{t'}}$:[25]

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

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.

[24] 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 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.

[25] See Appendix D.5 for the expression for the surprise and the variance term in equations (A.19) and (A.20).

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:

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

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

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.[26] 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.[27]

IV.D. Model predictions for risk premia

As its basic prediction, 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

[26] 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.

[27] 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.

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).

We now highlight specific predictions, as comparative statics, that guide our interpretation of the empirical results focusing on how Fed-induced uncertainty influences financial assets.

Prediction 1. 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, $Var^m[\epsilon_i^m]$, rises with uncertainty stemming from both disagreement about the r^*, $Var^m[\epsilon_{r^*}^f]$, and the divergent views on the relative strength of demand shocks, $Var^m[\epsilon_d^{f,m}]$. 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 $Var^m[\epsilon_i^m]$ and, in turn, the risk premium—despite the Fed still maintaining an easy policy stance.

Prediction 2. 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 $Var^m[\epsilon_{\pi^*}^m]$ 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 $Var^m[\epsilon_i^m]$.

Prediction 3. 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:

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

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 9. This effect gets amplified

as the market becomes concerned about the Fed excessively overweighting employment shortfalls and tolerating too high inflation overshoots.

Predictions (1)–(3) imply that markets can undermine the Fed's desired stance by pricing in the Fed-induced 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.

V. Fed-induced uncertainty and the yield curve

To isolate the effects of the Fed-driven uncertainty, we next turn to the analysis of the yield curve dynamics over the post-framework period.

V.A. Yield curve decompositions

We rely on two decompositions to empirically separate term premium variation in the yield curve. The first approach is based on the Kim and Wright (2005, KW) no-arbitrage term structure model used already in Figure 1.[28] We use the term premium on the ten-year yield (denoted as "*TP10*" below) and compute short-rate expectations at the two-year horizon (denoted as "*EH2*" below) as the two-year yield (fitted by their model) minus the two-year term premium.

Our second approach follows 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 growth news (*G*), and risk premium news into common premium (*CRP*) news and hedging premium (*HRP*) news. These last two components proxy for $Var^m[\epsilon^m_{i'}]$ and σ^2_d terms in equation (8). *CRP* is of particular interest as a proxy for 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 long-term bond returns in the same direction. The *HRP* component is instead identified from news moving stocks and long-term bonds in opposite directions, as in flight-to-safety episodes, aiming to reflect economic uncertainty exogenous to the Fed.

[28] The data is available at a daily frequency at https://www.federalreserve.gov/data/yield-curve-tables/feds200533.csv.

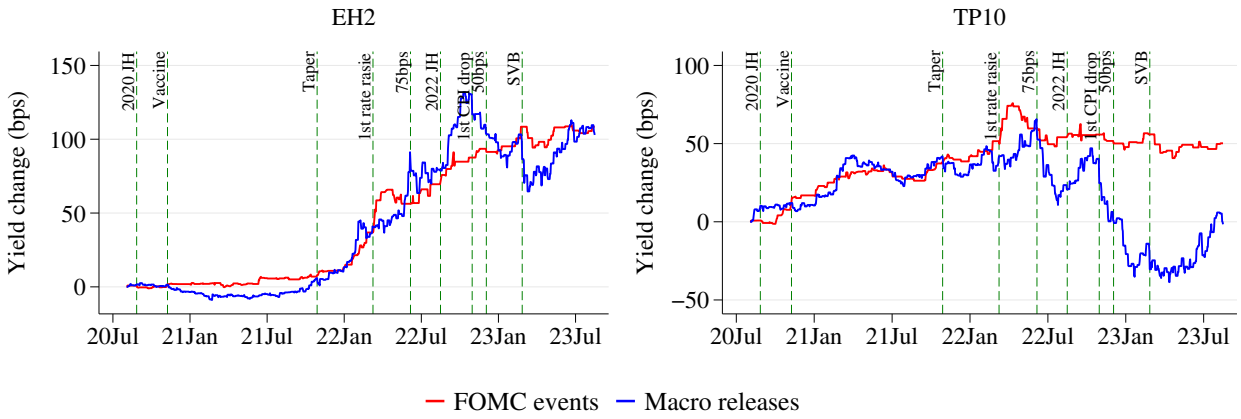


Figure 10. Short-rate expectations and term premia. The figure presents the cumulative changes (starting from August 1, 2020) in the short-rate expectations component of the two-year yield (*EH2* panel) and the term premium component of the ten-year yield (*TP10* panel). The yield decomposition is based on the Kim and Wright (2005) model. Each component is further split into changes on days with Fed events, days with macro releases, and other days. When a macro release happens on the same day as a Fed event, we classify it as a macro day.

We use both decompositions at the daily frequency.[29] Figure 10 plots the cumulative short-rate expectations and term premia changes as seen in Figure 1, but now separately for the Fed and macro events, starting from August 2020. Short-rate expectations two years out (*EH2*) remain anchored at the lower bound through 2020 and most of 2021, until the taper announcement. Thus, the markets did not doubt the Fed's commitment to keeping rates low. Simultaneously, term premia keep rising (*TP10*). The cumulative ten-year term premium increase reaches 144 bps by June 14, 2022 (the Fed's surprise 75 bps hike), with 60 bps realized on the Fed event days, another 66 bps realized on macro days, and the rest on other days.[30] The peak in term premia on the Fed days occurs on April 6, 2022 and on macro days on June 14, 2022. After the rate tightening starts, term premia first decline and then remain stable on Fed event days and drift down on macro days.

The dynamics of the overall term premium conceal an important complexity in the post-framework period. As equation (8) illustrates, the term premium can be shaped by

[29] 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.

[30] One question is whether the term premium increase is due to QT as opposed to other news. Most of the increase did not overlap with QT announcements. On November 3, 2021, the Fed announced the start of tapering, and *TP10* rose by 1.36 bps. On March 16, 2022, the Fed signaled the end of tapering and indicated that balance sheet tightening would begin at the next meeting; *TP10* increased by 3.21 bps. On May 4, 2022, the Fed formally announced that QT would begin on June 1; *TP10* declined by 2.42 bps.

opposing forces: one driven by Fed-related uncertainty, and the other by the resolution of uncertainty surrounding the pandemic and the economic recovery. In addition to the Fed-induced uncertainty channel, increases in term premia may thus reflect a reversal of economic uncertainty and a shift away from the flight-to-safety seen early in the pandemic.

To further disentangle the different types of news, in Figure 11 we graph the cumulative ten-year yield changes due to the four news factors from the CP decomposition. The monetary news component (MP panel) confirms that policy rate expectations remain anchored until late 2021. Afterwards, macro news days, in particular, are associated with investors revising their beliefs toward a tighter monetary stance. On balance, revisions of monetary policy views on macro days are at least as large as on the Fed event days. The growth news component (G panel) remains relatively stable throughout.

Importantly, our proxy for the Fed-driven uncertainty, the common risk premium (CRP panel), starts rising on the Fed event days soon after the August 2020 framework announcement, and accelerates through the first half of 2021 on macro news. *CRP* then peaks on April 19, 2022 at 84 bps 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 4 (see also Quotes 39, 40, 41, and 42). The overall peak of *CRP* across all days occurs on June 16, 2022, the day after the first 75 bps hike.

The *HRP* component 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 (bottom right panel of Figure 11). Conversely, it is expected to depress yields as economic uncertainty increases and in flight-to-safety episodes, as seen in late 2022 and around the SVB collapse.

Overall, in line with predictions in Section IV.D, through mid-2021, the Fed-induced uncertainty channel drives rising term premium against the Fed's accommodating stance, large fiscal shocks, and mixed macroeconomic signals. The subsequent stabilization of the term premium coincides with the changing Fed's communication from mid 2021 toward more hawkish, foreshadowing later tightening actions.

V.B. Yield sensitivity to inflation surprises

The analysis so far suggests that macroeconomic news can trigger updating of market perceptions of policy stance. When economic shocks and market expectations conflict with policymakers' assumptions, financial conditions can tighten as markets demand

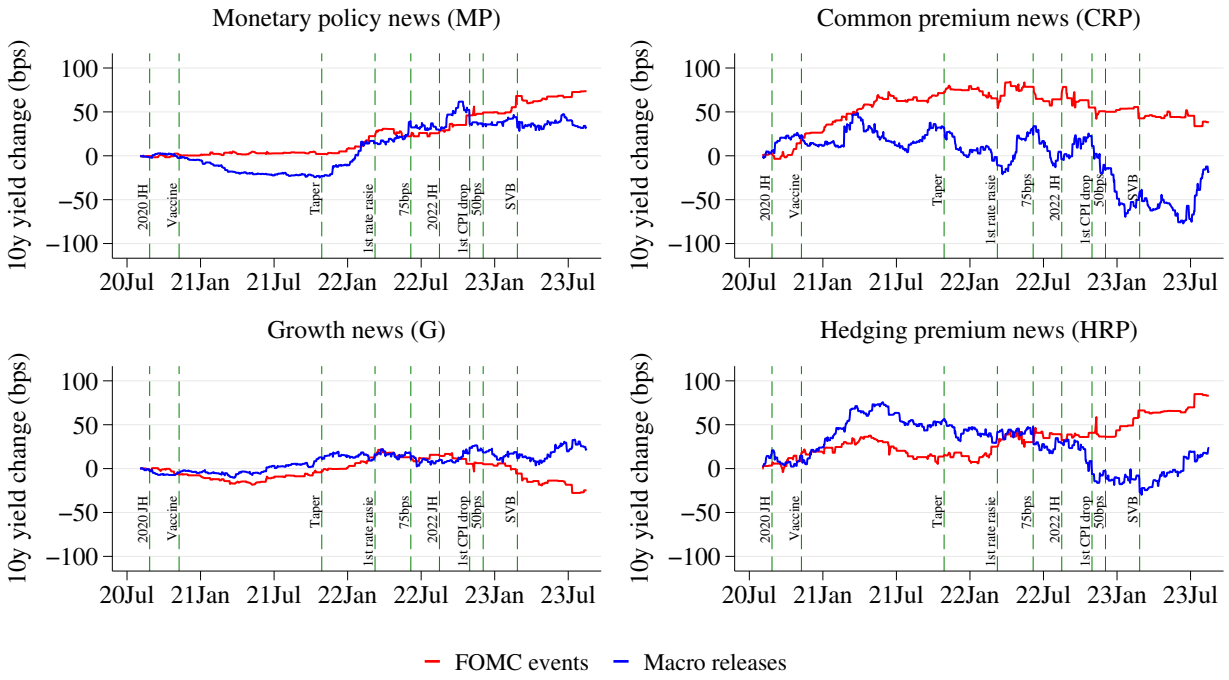


Figure 11. News decomposition. The figure presents the cumulative changes (starting from August 1, 2020) in the ten-year yield due to four orthogonal factors: monetary news (*MP*), growth news (*G*), common premium (*CRP*) news, and hedging premium (*HRP*) news. The yield decomposition is based on Cieslak and Pang (2021). Each news component is further split into changes on days with Fed events, days with macro releases. When a macro release happens on the same day as a Fed event, we classify it as a macro day.

higher risk premia—even when the policy stance is expected to remain easy. Model prediction 3 implies that such premium tightening should occur when the Fed's uncertainty is elevated, as it amplifies policy bias, and when markets grow increasingly concerned about the Fed's excessive asymmetry. The 2021 environment—with incoming inflation shocks—was thus conducive to increases in the term premium.

To test the changing sensitivity of short-rate expectations and term premia to macroeconomic surprises, we consider four subsamples: 2016:01–2020:02 (pre-Covid), 2020:05–2020:12 (early Covid recovery, framework review period), 2021:01–2022:04 (large inflationary surprises), and 2022:05–2023:12 (active rate hikes and uniformly hawkish communication). We focus on yield sensitivity to core CPI surprises. Even though the Fed started hiking in March 2022, the decisive shift in communication happened leading up to the June 2022 meeting (Figure 4). Thus, we use May 2022 as a cutoff point for the active hikes period.[31] During the 2016–2023 period, surprises have a standard deviation

[31]The CPI is the inflation indicator most followed by investors according to Bloomberg's relevance index and the core component is relevant for policy. Core CPI surprises are plotted in Figure A-3. In unreported results, we study the sensitivity of yields to a broader set of inflation news (core PCE price index, PPI,

	Yields, $\Delta y^{(n)}$		KW decomp.		CP decomp., $\Delta y^{10}(\text{news}_i)$			
	2y	10y	EH2	TP10	MP	G	CRP	HRP
				A. Unconditional sensitivity in full sample				
CPICsurp	0.18***	0.17***	0.088***	0.079***	0.050**	0.026*	0.089***	0.0045
	(3.07)	(3.89)	(3.15)	(3.82)	(2.07)	(1.68)	(3.14)	(0.17)
$\overline{R}^2$	0.12	0.14	0.13	0.13	0.059	0.028	0.093	-0.010
N	96	96	96	96	96	96	96	96
				B. Sensitivity in subsamples sample				
$D_{16:01,20:02}\times$CPICsurp	0.097**	0.087	0.043**	0.053*	0.010	0.034*	0.049	-0.0051
	(2.22)	(1.58)	(2.24)	(1.84)	(0.94)	(1.78)	(1.08)	(-0.12)
$D_{20:05,20:12}\times$CPICsurp	0.025**	0.13***	0.015*	0.055***	-0.039***	0.016	0.015	0.14***
	(2.19)	(3.98)	(1.86)	(3.71)	(-4.52)	(1.61)	(0.45)	(4.51)
$D_{21:01,22:04}\times$CPICsurp	0.090*	0.13***	0.045*	0.059***	0.017	0.011	0.12***	-0.015
	(1.79)	(3.69)	(1.93)	(3.47)	(1.41)	(0.55)	(3.60)	(-1.06)
$D_{22:05,23:12}\times$CPICsurp	0.84***	0.50**	0.41***	0.22*	0.35***	0.076	0.16	-0.087
	(4.14)	(2.08)	(4.39)	(1.94)	(3.65)	(1.07)	(1.47)	(-0.66)
$\overline{R}^2$	0.39	0.20	0.42	0.18	0.44	0.023	0.095	0.038
N	96	96	96	96	96	96	96	96

Table II. Yield sensitivity to inflation surprises. The table reports the regressions of yield changes on core CPI inflation surprises. The dependent variables are two- and ten-year yield changes (first two columns), changes in two-year short-rate expectations and ten-year term premia using Kim and Wright (2005) estimates ("KW decomposition") and four-factor decomposition of the ten-year yield changes from Cieslak and Pang (2021) ("CP decomposition"). The upper panel shows the sensitivity of yields to core CPI inflation surprises over the full 2016:01–2023:12 sample. The bottom panel presents per-period sensitivity interacting CPI surprises with subperiod dummies. Robust t-statistics are reported in parentheses.

of 0.15 annualized percentage points (pp), a maximum of 0.7 pp, and a minimum of -0.3 pp.

Table II presents regressions of daily yield changes on inflation surprises. The top panel estimates the unconditional sensitivity over the 2016–2023 sample for a total of 96 CPI announcements. The bottom panel estimates sensitivities for subperiods, interacting surprises with subperiod dummy variables. The first two columns show that two- and ten-year yields respond positively to higher-than-expected CPI numbers. In terms of magnitudes, a 0.5 pp inflation surprise raises the ten-year yield by 8.5 bps on announcement days in the full sample, but the effects differ significantly across subperiods. In the last subperiod of active Fed hikes (2022:05–2023:12), the ten-year yield sensitivity

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.

rises to roughly 25 bps per 0.5 pp surprise.[32] The next two columns analyze the news sensitivity of short-rate expectations and term premium, *EH2* and *TP10*. The estimates show that the Fed's commitment to low-for-long policy in the early sample made short-rate expectations relatively insensitive to inflation news, but did not constrain the ten-year term premium, which responded to news similarly until the 2022 tightening.

Looking at overall components masks the changing source of the yield responses, which reflect market views on the economy as well as the Fed's stance. The last four columns further dissect responses using CP decomposition of the ten-year yield. The component-specific loadings indicate that investors' interpretation of inflation surprises changed over time. In 2020, positive inflation news was associated with an increase in the term premium via the hedging component *HRP*. The positive loading (HPR column, second row) is consistent with investors then viewing higher-than-expected inflation as a signal about economic recovery. To the extent that such news resolves economic uncertainty, it should also lower demand for the recession-hedging benefits of Treasuries as investors become more willing to hold stocks. At the same time, the negative coefficient on *MP* news in 2020 (MP column, second subperiod) suggests that positive inflation surprises led investors to see monetary policy as more accommodative than expected.

The interpretation changes markedly as inflationary pressures become evident in 2021. The sensitivity of yields to inflation surprises is now driven entirely by the *CRP* component (CRP column, third subperiod), whereby positive inflation surprises make both stocks and bonds more risky. This effect could arise from the Fed-induced uncertainty but also from investors pricing the risk of supply shocks.[33] Consistent with a significant role of Fed-induced uncertainty, we note the *CRP* response becomes statistically insignificant in the final period as the Fed starts to tighten (CRP column, fourth subperiod), even though the supply-side factors continue to contribute significantly to the inflation dynamics (e.g., Shapiro (2024)). Importantly, in the tightening period, short-rate expectations become highly responsive to inflation news and the ten-year yield sensitivity primarily reflects investors' revising expectations about monetary policy (MP column, fourth subperiod) rather than term premia.[34]

[32] Relatedly, Bocola et al. (2024) argue that between 2020 and 2022 markets perceived the Fed as less responsive to inflation. Kroner (2025) documents an increase in the market reaction to CPI releases during the 2021–2023 inflation surge. Bauer et al. (2024) also find increased yield sensitivity post liftoff.

[33] See Campbell et al. (2017), Campbell et al. (2020), Bekaert et al. (2021), among others, for the analysis of demand and supply drivers of risk premia.

[34] The sensitivity of the term premia documented above is specific to inflation surprises. In Appendix Table A-9, we show that term premia, and the *CRP* piece in particular, do not respond to nonfarm payroll news over the post-2020 sample.

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. Specifically, the lack of updating in the *MP* and *G* news components of short-rate expectations aligns with the post-pandemic forward guidance being strong and unconditional, similar to the 2011 date-based forward guidance studied by Swanson and Williams (2014). However, the inflation sensitivity regressions also highlight the challenge the Fed faces in influencing long-term interest rates. Although the Fed managed to anchor short-rate expectations through 2021 with the goal of maintaining easy financial conditions, investors offset part of the intended easing by charging higher term premia when their perceptions of inflationary pressures became inconsistent with the Fed's policy.

V.C. Linking yield curve movements to the public perceptions of policy mistakes

Our model framework links term premia to the market-perceived probability of the Fed becoming excessively biased to the downside via equation (8). Monetary surprises can then be interpreted as perceived policy mistakes, as seen by the market. Those mistakes stem from disagreements about the state of the economy or what the appropriate policy response to the economy should be. To measure those perceptions, we again turn to textual analysis of the WSJ news articles covering the Fed. Using the same corpus of articles as in Section II.D.2, we ask whether an article indicates the public's concern about a potential Fed policy mistake, error, or incorrect decision using a large language model.[35]

The goal is to approximate the time variation in the policy mistake probability as perceived by the public and link it to the movements in interest rates. 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 12 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 five days. We experiment with other smoothing windows and lags, and find that they do not qualitatively change the conclusions (see Appendix Table A-10).[36]

[35] 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}.

[36] 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

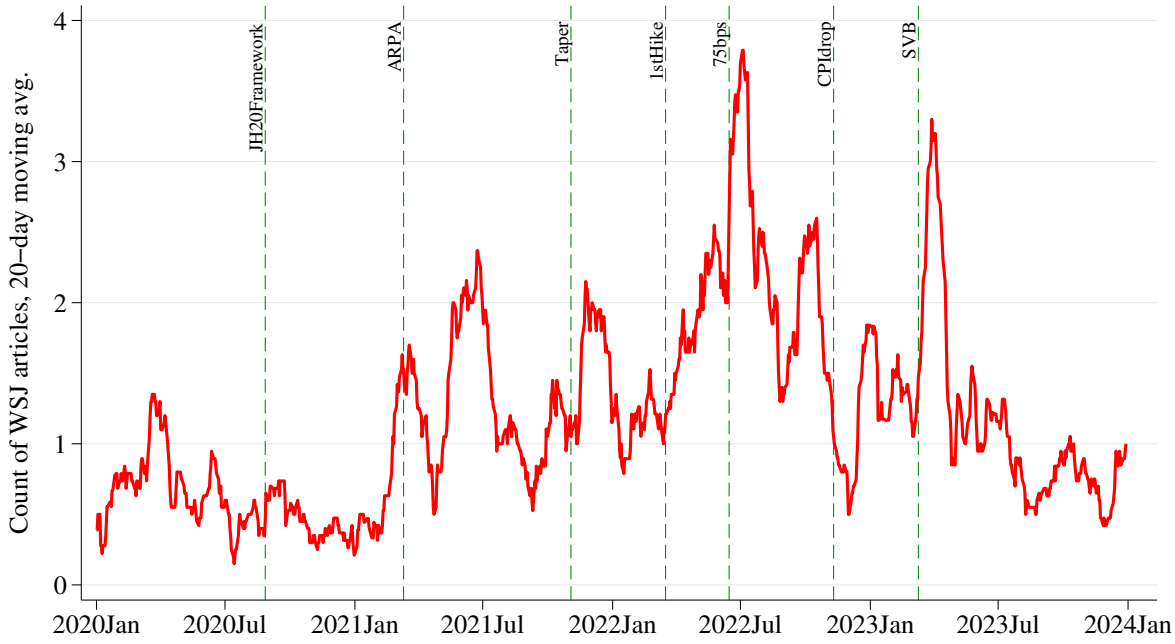


Figure 12. Mistakes index from WSJ articles. The figure plots the 20-day moving average of the mistakes index from 2020:01 to 2023:12. The mistakes index on a day t is the count of WSJ articles of that day classified as suggesting that the public is concerned about possible Fed policy mistake, error, or incorrect decision (count of "Yes" answered by GPT-4 to the prompt in footnote 35). 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.

Table III starts by projecting changes in the mistakes index on the changes in KW's short-rate expectations and term premia (columns (1)–(3)). The coefficients indicate a significantly positive association of perceived policy mistakes with term premium changes but no association with short-rate expectations changes. A one-standard-deviation increase in the ten-year yield term premium predicts a 0.21 standard deviation increase in the mistakes index (column (2)). Because KW decomposition generates term premia and short-rate expectations that are positively correlated, to isolate pure term premium changes, in column (3), we include both components jointly. Controlling for short-rate expectations further strengthens the positive term premium loading, in line with the idea that a heightened probability of policy mistakes can increase premia over and above any movements in expected short rates.

Columns (4) to (8) project the mistakes index changes onto ten-year yield changes disaggregated into CP news components. The results further document that the positive link

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 $t-25$.

between mistake perceptions and term premia stems from the common premium (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. Again, there is no relationship between the mistakes index and the news driving short-rate expectations (monetary and growth news factors).[37]

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

	KW decomposition			CP decomposition				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta EH2$	-0.053		-0.162					
	(-0.33)		(-0.85)					
$\Delta TP10$		0.206**	0.271***					
		(2.12)	(2.82)					
$\Delta y^{(10)}(MP)$				0.018				0.070
				(0.11)				(0.58)
$\Delta y^{(10)}(G)$					-0.131			-0.107
					(-1.28)			(-0.99)
$\Delta y^{(10)}(CRP)$						0.371***		0.382***
						(4.28)		(4.56)
$\Delta y^{(10)}(HRP)$							-0.231	-0.296**
							(-1.64)	(-2.46)
R^2	0.00	0.04	0.06	0.00	0.02	0.14	0.05	0.23
N	890	890	890	890	890	890	890	890

Table III. 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 20-day average mistakes index (plotted in Figure 12). 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 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 a daily frequency. HAC t-statistics with 36 lags are reported in parentheses.

V.D. Term premia sensitivity to the Fed's communication

The evidence so far suggests that the Fed was able to stabilize term premia after switching toward more hawkish and consistent communication. In the context of model predictions 2 and 3, term premia should decline once the uncertainty about the Fed's reaction function, in particular its asymmetry, gets resolved.

[37] The coefficient on the hedging premium (HPR) is negative, which suggests that the Fed's policies over the period might have negatively affected economic uncertainty (e.g., by raising concerns about financial stability), which would in turn increase the demand for safe bonds (and lower their premium) away from stocks. While the loading on HPR is only marginally significant, such an offsetting effect can explain the weaker link between the overall Kim-Wright term premium and the mistake perceptions relative to the one documented for the CRP alone.

What were the aspects of the Fed's communication that contributed to changes in the markets' risk perceptions and, therefore, to changes in the term premia? To cast light on this question, we explore the content of the speeches by the Chair, Vice Chair, and the governors over the 2020:08–2023:12 period. We follow Cieslak et al. (2023) 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.[38] To focus on intermeeting 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 IV, 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 2020:08–2023:12 sample. We use a longer window for yield changes to account for the full effect. The first four columns document that term premia tend to fall as speeches convey a tighter policy stance. This effect is separate from changes in short-rate expectations. To show this, column (3) uses as the dependent variable premium changes orthogonalized with respect to contemporaneous changes in short-rate expectations.[39] Column (4) directly controls for short-rate expectations in the regression. In both specifications, the loading on Speeches-HD_t is statistically significant, with one standard deviation more hawkish communication reducing the premium component by between 0.17 and 0.20 standard deviations. Columns (5)–(8) confirm this finding using the four-factor news decomposition. A tighter stance in speeches is associated with investors' updating upward beliefs about the policy path (*MP* component in column (5)) and revising downward the common premium (*CRP* in column (7)). The latter effect dominates in terms of statistical significance.

[38] See Cieslak et al. (2023) for details on the text-based policy stance and macroeconomic sentiment measures.

[39] Expected short-rate changes explain 32% of contemporaneous variation in term-premium changes in the KW decomposition, using the four-day window as in Table IV.

The evidence in Table IV suggests that the hawkish communication over the intermeeting period served to counter risk premium increases. Indeed, while we estimate the above regressions on the entire 2020:08–2023:12 sample, we find that the significance of the communicated policy stance for term premia is driven by the post-2021 period. This is also when the communication has become more consistent across individuals and focused on reasserting the Fed's credibility in fighting inflation, as we argued in Section II. Using the intuition from equation (7), term premia can rise on perceptions of policy mistakes going either in an excessively dovish or excessively hawkish direction. The evidence suggests that in the post-Covid period, the concerns driving term premia were tilted toward too-dovish policy.

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

	KW decomposition				CP decomposition, $\Delta y^{10}(\text{news}_i)$			
	(1) $\Delta EH2$	(2) $\Delta TP10$	(3) $\Delta TP10^{\perp}$	(4) $\Delta TP10$	(5) *MP*	(6) *G*	(7) *CRP*	(8) *HRP*
Speeches-HD_t	0.118	-0.097	-0.203***	-0.174***	0.201*	-0.020	-0.199***	0.103
	(1.06)	(-1.25)	(-3.36)	(-3.60)	(1.76)	(-0.22)	(-3.19)	(1.14)
$\Delta EH2$				0.650***				
				(5.89)				
Sentiment$_t$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PC-HD_{t-}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.09	0.01	0.10	0.40	0.06	0.01	0.04	0.04
N	187	187	187	187	187	187	187	187

Table IV. 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 2020:08–-2023:12, excluding three days around the FOMC announcement. HAC t-statistics with 20 lags are reported in parentheses.

VI. Conclusion

We have analyzed 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 have emphasized the channel through which markets' uncertainty about the policymakers' reaction function and concerns about 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 challenges that the Fed faced in the post 2020 period 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 has abandoned the key elements of the 2020 framework, returning to flexible inflation targeting, eliminating the"makeup" strategy, and removed "shortfalls" from the statement.

The lessons from the post-2020 episode still remain pertinent today. 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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A. Fed and the market: Additional evidence

In the years before the framework announcement, the Fed and the market largely agreed in inflation forecasts. From 2015–2019, the Fed's expectations of core PCE inflation were just a few basis points below the market forecasts. Figure A-1 compares median 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).[2]

The Fed's communication ahead of the framework announcement was explicit about the desirability of overshooting the 2% inflation target. The benefits of overshooting were communicated to the public by multiple Fed officials as early as 2019 (Quote 7 and Quote 8). Notwithstanding this clear sign-posting, inflation expectations underrunning the 2% target – critical for the Fed – did not appear to be a major concern for the market.

To assess the relative weight placed on the low inflation scenario leading up to the framework review, Figure A-1 Panel B describes the inflation tail risk as seen by the market and the Fed using available survey proxies. The SPD elicits investors' subjective probabilities for the distribution of CPI inflation over the next five years and from five to ten years ahead. The risk diffusion index, published as part of the SEP following the 2020 Framework Review helps assess the evolution of the FOMC's perceptions of tail risks.

The left plot in Figure A-1 Panel B depicts the investors' perceived probability from the SPD that the CPI inflation over the next five years falls below 1%, 2%, or exceeds 3%. Pre-pandemic, the market assessed the probability of CPI inflation below 2% to be 45% on average.[3] That probability was relatively stable from 2018 through 2019, never crossing 50%, which suggests that the market viewed CPI inflation above 2% as the more likely scenario. The probability of CPI inflation below 1% was at most 4%, in line with investors putting little weight on the very low inflation outcome in the next five years. Likewise, the probability of CPI inflation above 3% was consistently around 5%. The market's projection of inflation from five to ten years ahead shared similar patterns (not shown). The overall stable inflation tails are thus consistent with anchored inflation expectations of market participants before the pandemic.

[2] In the 2015–2019 sample, the Fed's one- and two-year ahead expectations are six and three basis points lower than the market's. In the 2020-2023 sample, they are respectively 18 and eight basis points higher than the market's. Appendix Figure A-2 compares the Fed's SEP high- and low-end forecasts (excluding top and bottom three forecasts) with the 25th and 75th percentiles of the market's distribution.

[3] This number is not directly interpreted as the probability of inflation below the Fed's 2% inflation target as the target is expressed in terms of PCE inflation rather than CPI inflation. The mean of CPI inflation is on average 26 bps higher than the PCE inflation over the period from 2010 to 2019. Thus, the probability of CPI inflation below 2% proxies for the probability that inflation ends up 26 bps or more below target. Rarely before 2021, the SPD also elicits distributions of PCE inflation. We verify that the probability of PCE inflation falling below 2% did not materially change from 2016 to 2019; using available data for 2016:07, 2017:07, 2018:06, and 2019:04 surveys, we estimate those probabilities at 55%, 59%, 56.5%, and 57.5%.

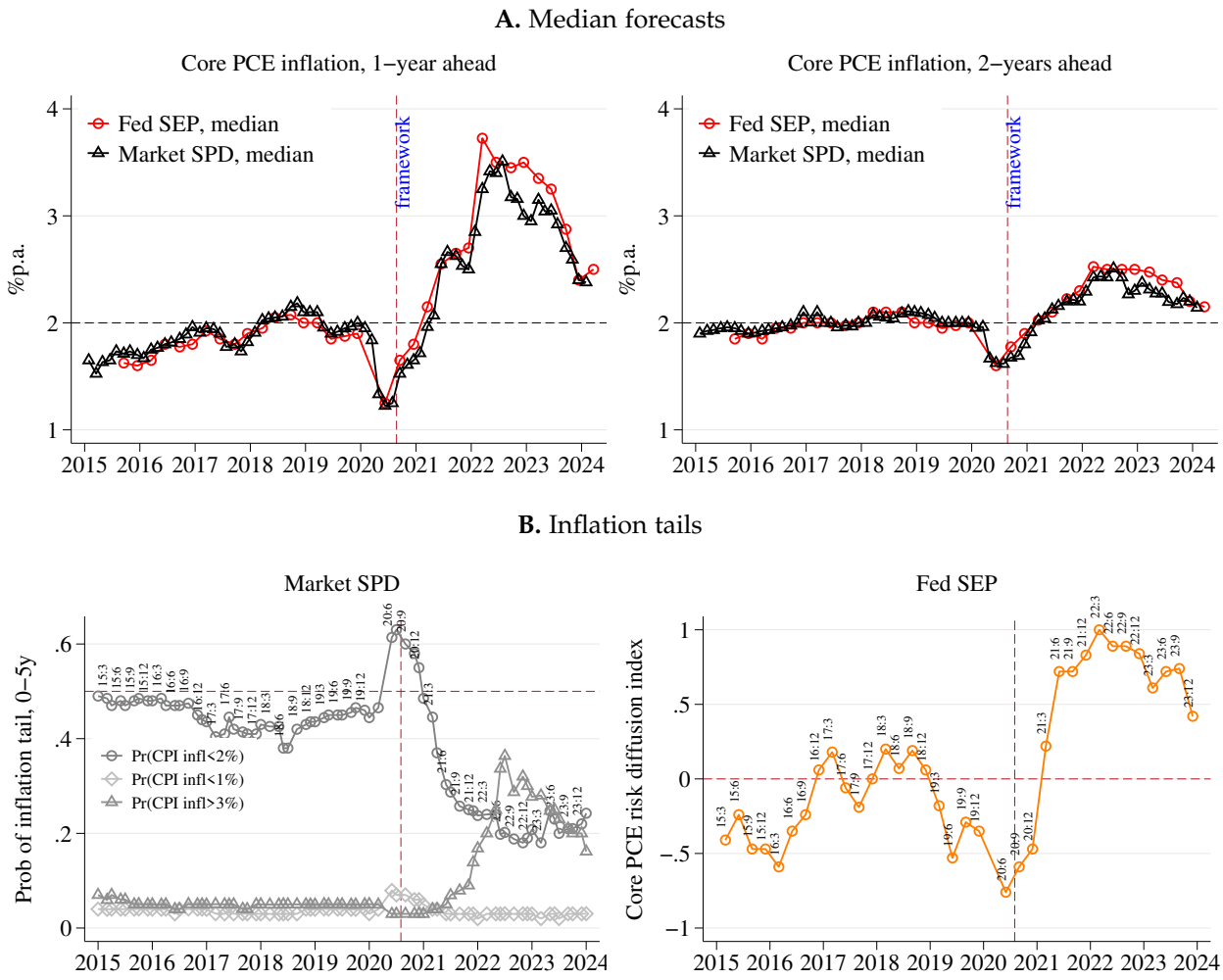


Figure A-1. Inflation expectations and tail risks perceived by the Fed and the market. The figure presents measures of inflation expectations and inflation tail risks from the FOMC's Summary of Economic Projections (SEP) and the NY Fed Survey of Primary Dealers (SPD). Panel A compares the median core PCE inflation forecasts in the SEP and the SPD one and two years ahead. Panel B plots inflation risk measures. 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.

The right plot in Figure A-1 Panel B displays the FOMC's risk diffusion index for the core PCE inflation. Different from the market, the decline in the risk diffusion index from December 2018 to June 2019 indicates that a significant number of FOMC members switched from a balanced assessment of inflation risks to a view that the risks are weighted to the downside. Over the same time, the market perceived probability of downside inflation risk remained nearly unchanged. The disconnect in the perceived inflation tail risk suggests the Fed and the market also differed

in their perceptions of the low r^*. Additional evidence (available upon request) shows that the Fed's statistical models estimated an r^* post GFC was systematically below that implied from long-term interest-rate and inflation survey forecasts.

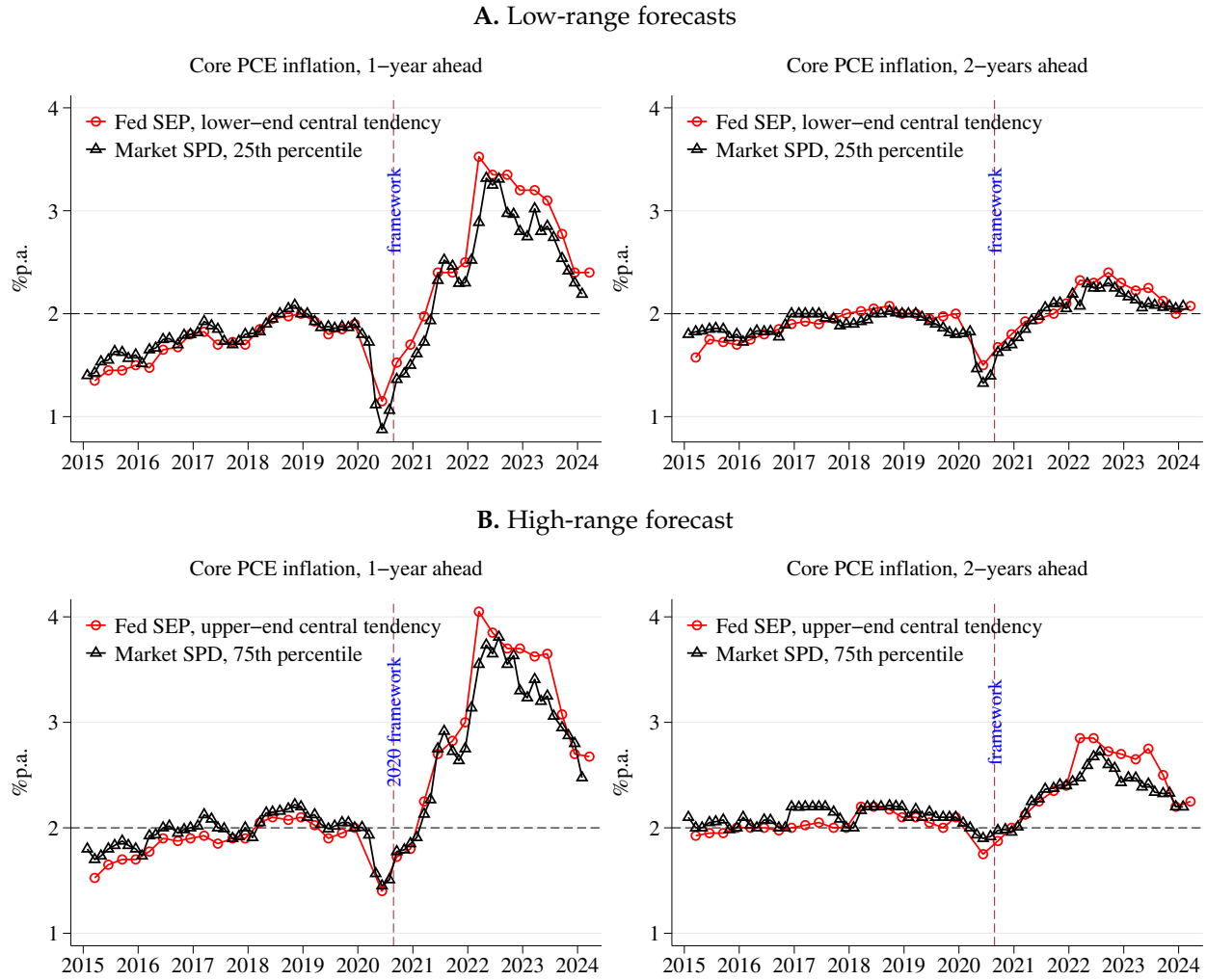


Figure A-2. Inflation expectations of the Fed and market participants. The figure compares core PCE inflation expectations of the FOMC participants from the Summary of Economic Projection (SEP) with the projections from the NY Fed Survey of Primary Dealers (SPD). Both for SEP and SPD, we convert a fourth-quarter to fourth-quarter forecast to a fixed horizon forecast one year ahead (i.e., annual inflation rate starting from today) and two years ahead (i.e., annual inflation rate starting one year from today). The upper panels report lower-range forecasts. The bottom panels report 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.

B. Additional tables and figures

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.

	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-2. 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	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-3. 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, 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.

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 A-5. 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-6 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).

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-6. 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.

	KW decomp.		CP decomp., Δy^{10}			
	$\Delta EH2$	$\Delta TP10$	G	MP	HRP	CRP
$\Delta y_{hf}^{(2)}$	0.346***	0.114	-0.281	0.799***	0.692***	-0.579**
	(3.13)	(1.38)	(-1.43)	(3.80)	(4.38)	(-2.20)
$\Delta y_{hf}^{(5)}$			1.234***	-0.590**	-1.359***	0.407
			(4.68)	(-2.53)	(-6.60)	(1.20)
$\Delta y_{hf}^{(10)}$	0.300***	0.479***	-0.523***	0.176	0.814***	0.351
	(2.82)	(5.14)	(-3.42)	(1.34)	(6.01)	(1.63)
Δeq_{hf}			0.313***	-0.283***	0.198***	-0.263***
			(4.43)	(-3.58)	(2.86)	(-2.63)
R^2	0.35	0.31	0.30	0.34	0.19	0.20
N	157	157	155	155	155	155

Table A-7. Projection of FOMC event-day yield changes on high-frequency event-window changes. This table reports regressions of daily yield changes on FOMC event days against high-frequency yield and stock price changes measured over the corresponding FOMC event windows. An FOMC event day is defined as one containing any of the FOMC events listed in Table A-5, but without any macroeconomic announcements. Dependent variables are changes in two-year short-rate expectations and ten-year term premia using Kim and Wright (2005) estimates ("KW decomp.") and the four-factor decomposition of the ten-year yield changes from Cieslak and Pang (2021) ("CP decomp."). Independent variables are event-window changes in two-year, five-year, and ten-year yields (Δy_{hf}) and in stock prices (Δeq_{hf}), both derived from futures prices. Robust t-statistics are reported in parentheses.

	KW decomp.		CP decomp., Δy^{10}			
	$\Delta EH2$	$\Delta TP10$	G	MP	HRP	CRP
$\Delta y_{hf}^{(2)}$	0.648***	0.304**	0.032	1.334***	0.338	-1.089***
	(4.34)	(2.11)	(0.11)	(3.51)	(0.89)	(-4.28)
$\Delta y_{hf}^{(5)}$			0.978**	-1.049*	-0.635	1.731***
			(2.52)	(-1.88)	(-1.26)	(3.71)
$\Delta y_{hf}^{(10)}$	-0.050	0.180	-0.564***	0.039	0.535**	-0.387
	(-0.39)	(1.42)	(-2.95)	(0.15)	(2.52)	(-1.54)
Δeq_{hf}			0.212**	-0.290***	0.207**	0.105
			(2.17)	(-3.42)	(1.99)	(1.03)
R^2	0.36	0.22	0.14	0.38	0.05	0.10
N	348	348	346	346	346	346

Table A-8. Projection of macro announcement-day yield changes on high-frequency event-window changes. This table reports regressions of daily yield changes on macro announcement days against high-frequency yield and stock price changes measured over the corresponding announcement event windows. A macro-announcement day is defined as one containing any of the macro events listed in Table A-5. Dependent variables are changes in two-year short-rate expectations and ten-year term premia using Kim and Wright (2005) estimates ("KW decomp.") and the four-factor decomposition of the ten-year yield changes from Cieslak and Pang (2021) ("CP decomp."). Independent variables are event-window changes in two-year, five-year, and ten-year yields (Δy_{hf}) and in stock prices (Δeq_{hf}), both derived from futures prices. Robust t-statistics are reported in parentheses.

	Yields, $\Delta y^{(n)}$		KW decomp.		CP decomp., $\Delta y^{10}(\text{news}_i)$			
	2y	10y	EH2	TP10	MP	G	CRP	HRP
				A. Unconditional sensitivity in full sample				
NFPsurp	0.10**	0.054	0.041**	0.032*	0.014	0.046***	0.0060	-0.015
	(2.30)	(1.35)	(2.01)	(1.85)	(0.97)	(4.77)	(0.31)	(-0.64)
$\overline{R}^2$	0.045	0.0074	0.033	0.019	0.0037	0.11	-0.010	-0.0069
N	93	93	93	93	93	93	93	93
				B. Sensitivity in subsamples sample				
$D_{16:01,20:02}\times$NFPsurp	0.075	0.089	0.023	0.051	-0.029**	0.065**	0.019	0.033
	(1.00)	(1.24)	(0.76)	(1.58)	(-2.48)	(2.37)	(0.68)	(0.85)
$D_{20:05,20:12}\times$NFPsurp	0.024***	-0.014	0.011	-0.0042	0.0072	0.014	-0.018	-0.017
	(4.48)	(-0.17)	(1.35)	(-0.18)	(0.48)	(0.79)	(-0.34)	(-0.23)
$D_{21:01,22:04}\times$NFPsurp	0.036	-0.011	0.013	0.0034	0.0062	0.025***	-0.010	-0.039
	(1.07)	(-0.22)	(0.73)	(0.16)	(0.54)	(3.20)	(-0.32)	(-1.38)
$D_{22:05,23:12}\times$NFPsurp	0.55***	0.36***	0.24***	0.16***	0.14***	0.13***	0.077*	0.0060
	(4.07)	(3.41)	(3.70)	(3.37)	(3.47)	(4.70)	(1.84)	(0.08)
$\overline{R}^2$	0.14	0.052	0.12	0.055	0.15	0.15	-0.030	-0.024
N	93	93	93	93	93	93	93	93

Table A-9. Yield sensitivity to non-farm payroll news. The table reports the regressions of yield changes on surprises in non-farm payroll (NFP) changes (expressed in thousands). The dependent variables are two- and ten-year yield changes (first two columns), changes in two-year short-rate expectations and ten-year term premia using Kim and Wright (2005) estimates ("KW decomp.") and four-factor decomposition of the ten-year yield changes from Cieslak and Pang (2021) ("CP decomp."). The upper panel shows the sensitivity of yields to NFP surprises over the full 2016:01–2023:12 sample. The bottom panel presents per-period sensitivity interacting NFP surprises with subperiod dummies. We exclude three extreme surprises in May, June, and July 2020 which were between 10 and 100 standard deviation events. Excluding these three dates, NFP surprises have a standard deviation of 163 thousand. Robust t-statistics are reported in parentheses.

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

	KW decomposition			CP decomposition				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta EH2$	-0.053		-0.160					
	(-0.34)		(-0.84)					
$\Delta TP10$		0.195*	0.261**					
		(1.71)	(2.04)					
$\Delta y^{(10)}(MP)$				0.001				0.044
				(0.01)				(0.34)
$\Delta y^{(10)}(G)$					-0.152			-0.122
					(-1.28)			(-0.96)
$\Delta y^{(10)}(CRP)$						0.346***		0.347***
						(3.68)		(3.38)
$\Delta y^{(10)}(HRP)$							-0.155	-0.219**
							(-1.42)	(-2.47)
R^2	0.00	0.04	0.06	0.00	0.02	0.12	0.02	0.17
N	890	890	890	890	890	890	890	890

Table A-10. 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 and $t-20$ in the 20-day average mistakes index (plotted in Figure 12). The explanatory variables are components of yield changes between t and $t-20$. 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.

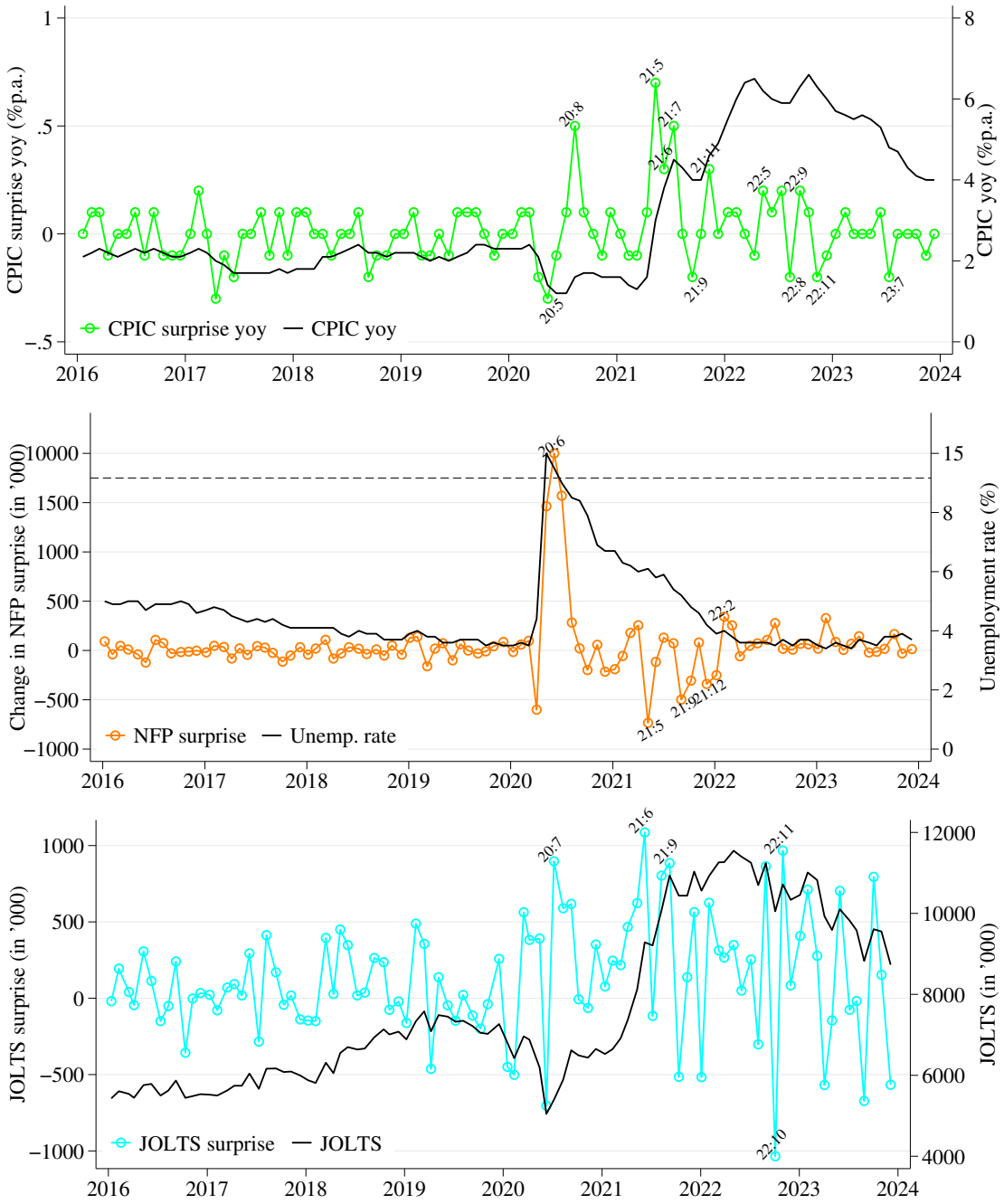


Figure A-3. Inflation, non-farm payroll, and JOLTS surprises. The figure presents the core CPI inflation surprises (upper panel), the non-farm payroll (NFP) change surprises (middle panel), and the job openings and labor turnover survey (JOLTS) surprises (lower panel). Surprises are measured as the actual 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.

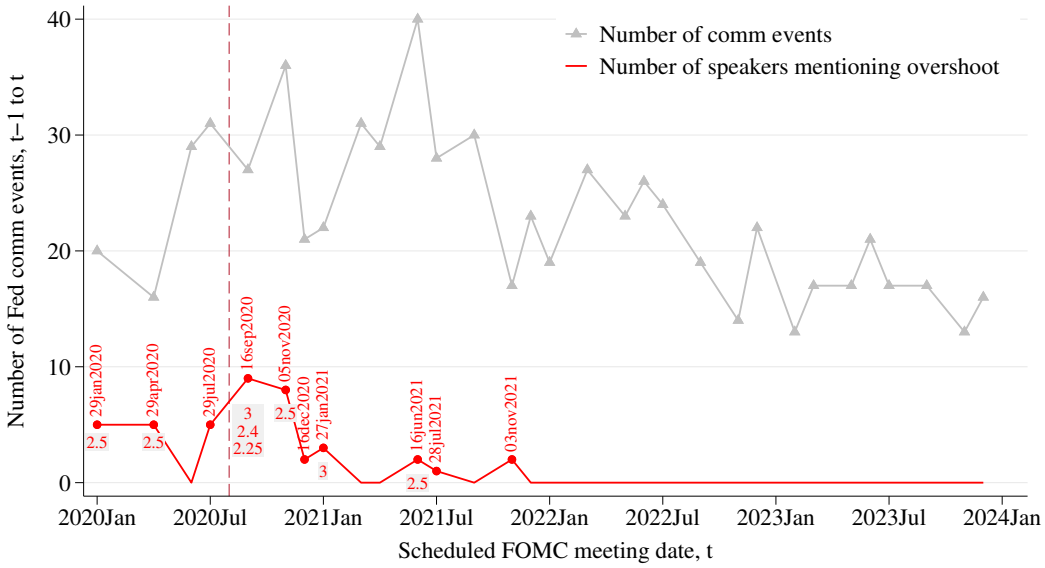


Figure A-4. The Fed's communication of inflation overshooting. The figure displays the number of Fed intermeeting communication events and the number of speakers mentioning inflation overshooting, highlighted in Goldman Sachs' Chatterbox. The reported degree of overshooting is marked on the graph whenever an explicit number is provided.

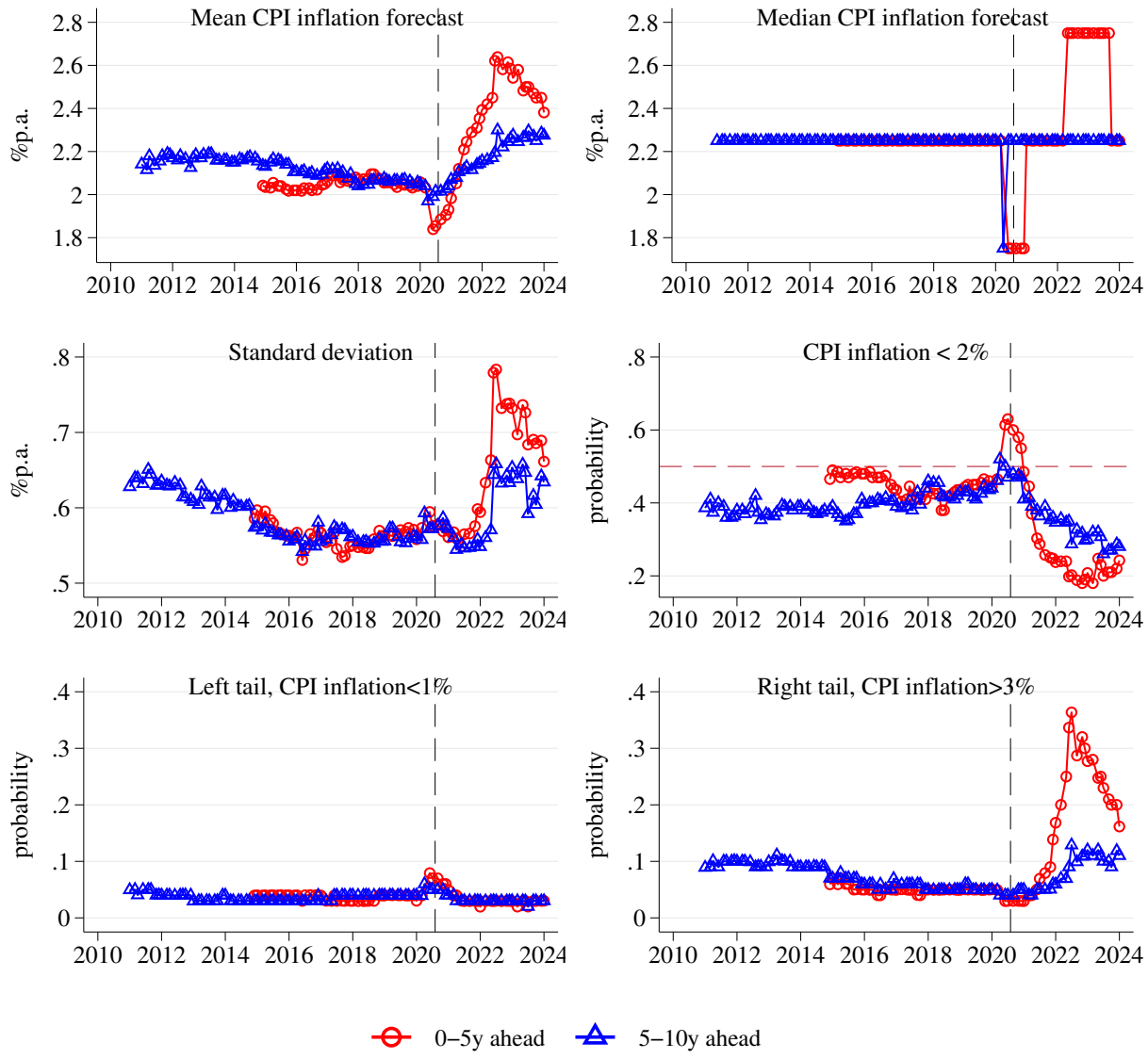


Figure A-5. Inflation distributions perceived by market participants in SPD. The figure plots the CPI inflation distribution forecasts from the NY Fed Survey of Primary Dealers (SPD). In the survey, forecasters are asked to provide a probability distribution of the average CPI inflation rate over the next five years (0-5y ahead, red circles) and over the five-year period that begins five years from now (5-10y ahead, blue triangles). The 0-5y ahead inflation distribution question was only asked since 2015. Probabilities are provided for the CPI inflation rate falling within 0.5%-wide bins. The survey does not have a lower (upper) bound for the lowest (highest) bin. We manually set those extreme bins to 0.5% bin width. We verify that conclusions remain unchanged with an alternative approach having a much wider extreme boundaries using the average$\pm$2.5$\times$standard deviation of the realized inflation rate during the trailling 24-month period. The mean, median, and standard deviation are calculated using the mid-value of each bin. The tail probabilities are obtained by summing probabilities of all bins whose upper (lower) bounds are below (above) a certain threshold. The vertical line in each plot marks August 2020.

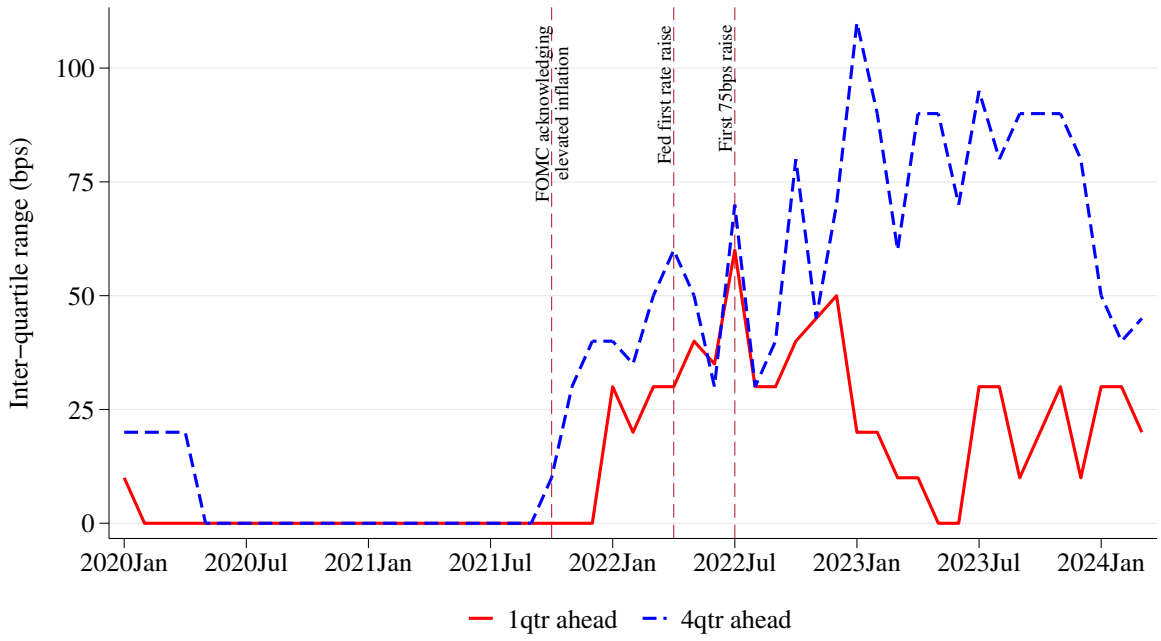


Figure A-6. FFR forecast dispersion in the Blue Chip (BC). The figure plots the Federal funds rate (FFR) forecast dispersion from the Blue Chip survey. Two forecast horizons are plotted. Red and blue lines are for the one-quarter and four-quarter ahead forecasts, respectively. Dispersions are measured as the inter-quartile (75th-25th) range across participants. There are typically around 50 participants in the BC.

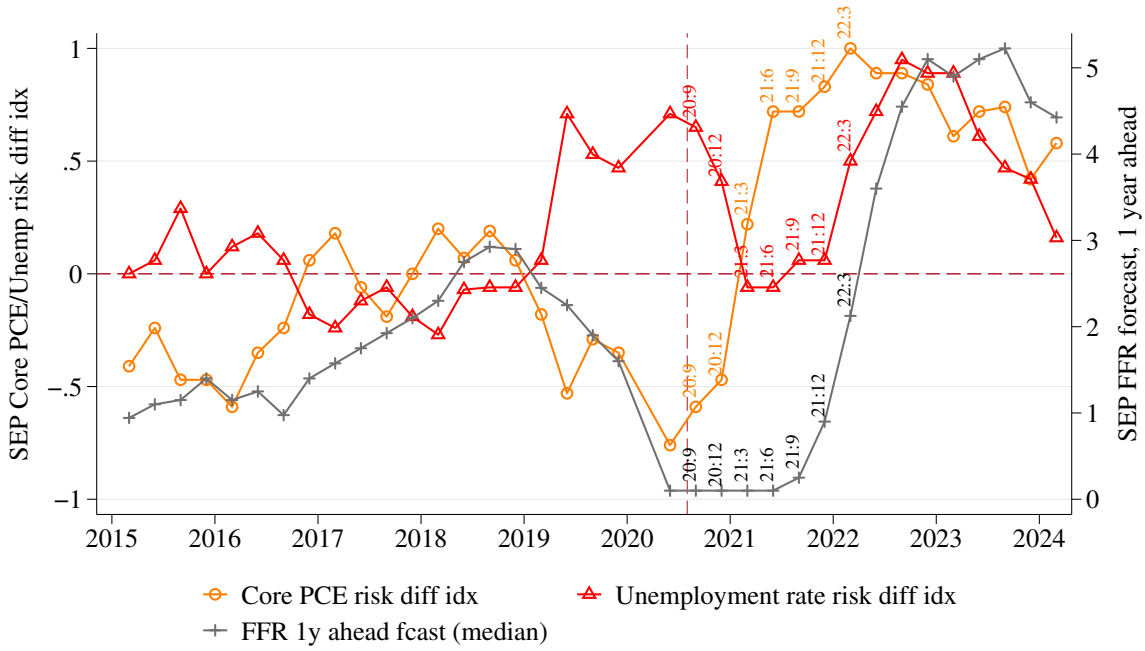


Figure A-7. FOMC inflation and unemployment risk assessment in SEP. The figure plots the risk diffusion index of the FOMC participants for the core PCE inflation and the unemployment rate against the FOMC's projections of the FFR path one year ahead. The risk diffusion index equal to 1 means that all participants perceive risks weighted to the upside of their forecasts.

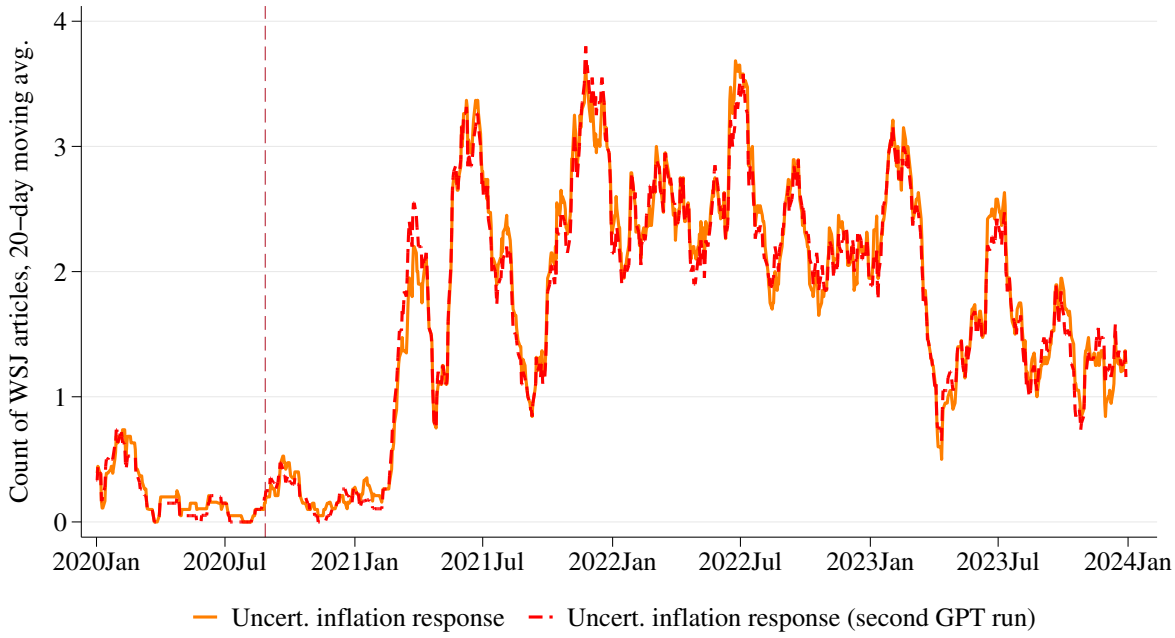


Figure A-8. Robustness: Public perceptions of reaction function uncertainty. The figure presents proxies for public perceptions of uncertainty about the Fed's reaction to inflation obtained from two independent runs of GPT. The solid line reports the inflation reponse uncertainty from Figure 6 in the 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.

C. 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: ""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 34: "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 35: "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 36: "[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 37: "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 38: "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 39: "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 40: "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 41: "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 42: "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 43: "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 44: "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 45: "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 46: "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 47: "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 48: "[...] 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 49: "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)

D. Model Description

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

D.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 D.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.

D.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:

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

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

D.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.

D.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.

D.4.1. An Illustrative Case

We begin with an illustrative case in which the Fed cares only about the employment gap. Specifically, $L_t = \lambda_B(l_t - l^*)^2 \mathbb{1}_{l_t \leq l^*} + \lambda_G(l_t - l^*)^2 \mathbb{1}_{l_t > l^*}$, with $\lambda_B = \lambda_G$ in the standard symmetric case. This setup corresponds to the illustration in Figure 9 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 $E^f[l_t - l^*] = \frac{\Sigma_t(\sqrt{\lambda_B} - \sqrt{\lambda_G})^2}{\lambda_B - \lambda_G}$.[4] 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 9 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 9 under the quadratic loss function with bounds $[a, b]$ is related to the expected loss up to a scaling by a constant factor $\frac{1}{b-a} = \frac{1}{2\Sigma_t}$.[5]

[4] 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.

[5] 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 9 is given by $\lambda \int_{-\Sigma_t}^{\Sigma_t} X^2 f(X) \, dX = \frac{2\lambda}{3}\Sigma_t^3$.

D.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 D.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.

D.5. Market Beliefs of the Monetary Policy

As assumed in Section D.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: $\epsilon^f_{r^*}$.
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:

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

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 $\frac{\Sigma_t}{4\tilde{\kappa}}$ 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 $p_{t'}$.[6]

D.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[7], 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):

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

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

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

[7] This is not at odds with other assumptions in previous parts. The distribution of the determinants in $\epsilon^m_{i_{t'}}$ given by (A.19) are not previously assumed.

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.

D.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):

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

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:

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