Tough Talk: The Fed and the Risk Premium

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We study how the Fed’s communication of its forward-looking policy stance affects risk premia in financial markets. We analyze private deliberations of the Federal Open Market Committee (FOMC) to elicit policy stance beyond the current announcement. We show that more hawkish (dovish) policymakers’ views expressed in the FOMC meeting predict economically significant reductions (increases) in risk premia during the subsequent intermeeting period. The risk premium reaction unfolds gradually in the days after the FOMC announcement. The effect is not subsumed by the content of the FOMC statements and is distinct from the “on impact” risk-premium reduction caused by surprise rate cuts at the FOMC announcements, documented in the literature. To understand the predictive power of the Fed’s private deliberations, we trace out how the stance emerging from the meeting is revealed to the public via speeches and minutes, and tie the movements in risk premia to the granular communication events over the intermeeting period. The results highlight the role of communication in managing public risk perceptions.

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I. Introduction

The Federal Reserve faces a challenge of supporting the economy by cutting rates aggressively in downturns and potentially creating uncertainty about future output gap, inflation, and interest rates. We study how communication of the policy stance by the Fed affects financial markets. The importance of central bank communication as a policymaking tool is hard to overstate. Fed officials carefully craft their remarks, and financial markets attend to them for hints about the policymakers’ views and intentions. However, the specific channels through which communication affects financial markets continue to be debated. Understanding those channels requires both the identification of the content that is communicated as well as how and when this content is processed by financial markets. This poses at least two challenges. First, although simple policy rules are a standard description of the Fed’s reaction function, the Fed’s policy stance is often more complex than what such rules capture. Second, and related, policy transmission onto financial conditions operates through channels beyond the traditional short-rate news, affecting investors’ risk perceptions and risk premia they require and, potentially, beliefs about the state of the economy. Understanding the financial market response to the Fed is thus inseparable from the question about the nature of the policy stance that markets are reacting to.

We start with the premise that the policy stance can be identified and measured from the internal Fed’s deliberations. Exploiting the language of the Federal Open Market Committee (FOMC) members recorded in the transcripts of the FOMC meetings, we elicit a forward-looking measure of policy stance meeting by meeting. We then establish the relationship between the internal policy stance, its communication to the public, and investor belief updates as revealed in asset prices.

Our main empirical finding is that a more hawkish (dovish) stance emerging from within the FOMC meeting predicts reductions (increases) in the risk premia over the subsequent intermeeting period, after controlling for the Fed’s macroeconomic forecasts and the policy rate. The effect unfolds gradually over time in the days after the FOMC announcement and accounts for an economically significant amount of intermeeting volatility of long-term interest rates and aggregate stock market returns. Specifically, a one standard deviation increase in FOMC policymakers’ hawkishness in a given meeting forecasts a risk premium
reduction corresponding to about 17% of intermeeting ten-year yield volatility and about
15% of intermeeting stock return volatility.

As the movements in the risk premium that we document occur outside of the narrow
FOMC announcement windows, they are distinct from the previously studied “on impact”
asset price reactions to the Fed’s announcements.\textsuperscript{2} To understand how and when the Fed’s
internal views reach the outside world, we trace out the Fed’s communication during the
intermeeting period. Using publicly available Fed documents, we construct language-based
policy stance from the FOMC statements, speeches, and minutes. Consistent with the lack
of an on-impact effect, we show that the content of the internal deliberations driving risk
premia between meetings is not revealed to the public via the FOMC statements. While
the FOMC minutes do provide a fairly detailed reflection of the Fed’s deliberative process,
their release is typically not associated with a large reaction of financial markets, suggesting
that the content is already largely anticipated ahead of the minutes’ release. Instead, as the
information flow from the Fed intensifies soon following the FOMC announcement, we find
that speeches are an important conduit through which forward-looking policymakers’ views
reach the financial markets over the intermeeting period. According to our estimates, the
policy stance communicated via speeches could, in principle, account for the magnitude of
the overall intermeeting effect on the risk premium that we find.

To appreciate the meaning of the above results, several characteristics of the policy stance
as elicited from the Fed’s internal deliberations are worth highlighting. Most importantly,
the content of deliberations relevant for risk premia is orthogonal to both the Fed’s macroe-
conomic forecasts and the current policy rate action. It, therefore, summarizes the Fed’s
forward-looking intentions and contingencies as they are perceived by policymakers in real-
time. Indeed, while the internal stance predicts the Fed’s actions implemented several
meetings ahead, we argue that its immediate effect on financial markets operates via risk
premia as opposed to expectations of future short-term interest rates. Further dissecting
this result, we show that the predictive power of stance for the intermeeting risk premia is
particularly strong outside periods when the Fed has explicitly implemented an interest rate
change, and accrues mainly during prolonged easing episodes that follow aggressive interest
rate cuts. This fact highlights the conditional nature of our results. The Fed faces a trade-

\textsuperscript{2}See, e.g., Cochrane and Piazzesi (2002), Gürkaynak, Sack, and Swanson (2005a), Gürkaynak, Sack, and
Swanson (2005b), Bernanke and Kuttner (2005), Hanson and Stein (2015).
off between cutting rates aggressively to save the economy in downturns and potentially opening up large output gaps, which can be inflationary and ultimately destabilizing for the economy if rates stay low for too long. The risk premia can rise if the market perceives the Fed’s stance to be a mistake. By credibly promising a more hawkish stance, should the need arise, the Fed can convey to the public a contingency plan allowing to stabilize financial risk premia in the near term.

We contribute to the existing literature by providing evidence on the mapping between Fed’s private deliberations, their communication to the public, and asset price reactions day by day outside the narrow FOMC windows. Understanding policy effects during the intermeeting period is challenging as it requires attribution of asset price movements at high frequency (daily or higher) to an economically interpretable news sources. A growing literature documents that monetary policy can act through several channels, beyond short-rate news whereby the Fed changes the current short-term rate or the public expectations of the future short-term rate. Beyond this standard “expectations hypothesis” logic, the channels that have been examined can be broadly separated into information effects (e.g., Campbell, Evans, Fisher, and Justiniano, 2012, Nakamura and Steinsson, 2018) and risk premium effects (e.g., Bernanke and Kuttner, 2005, Hanson and Stein, 2015).3 In the former, the Fed provides the public with information about macroeconomic fundamentals (other than its effect on the short rate); in the latter, it impacts public perceptions of risk and/or the willingness to take risk.

Most plausibly, multiple monetary transmission channels operate simultaneously, both at the time of the Fed announcement and, perhaps even more importantly, during the intermeeting period when the Fed predominantly relies on communication. Investigating the overall movements in stock prices or interest rates will not deliver clear answers on which channel is at work as their effects could be either mutually reinforcing or offsetting and, therefore, hard to detect in aggregate asset prices. Suppose, for example, that the Fed signals that future increases in interest rates are likely. As one possible scenario, such a signal could induce the public to simultaneously raise short-rate expectations, downgrade growth expectations,  

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3The literature trying to understand and quantitatively assess the importance of these channels is rapidly growing, e.g., Miranda-Agrippino (2016), Jarocinski and Karadi (2020), Bauer and Swanson (2023). A few recent papers attempt to separately assess the role of news about future short rates versus risk premia, e.g., Hansen, McMahon, and Tong (2018), Cieslak and Schrimpf (2019), Pfueger and Rinaldi (2022), Bianchi, Lettau, and Ludvigson (2022a), Bianchi, Ludvigson, and Ma (2022).
and also perceive less uncertainty about future discount rates. Alternatively, higher rates could indicate the Fed’s positive outlook for the real economy and lower uncertainty about economic growth. The fact that various constellations of belief updates are possible poses an identification challenge. Additionally, the timing of the public belief updates is unclear as certain news may be harder to interpret and can accumulate slowly over the intermeeting period.

To address these issues, we dissect the types of news driving financial markets at a daily frequency using a sign-restricted structural VAR approach proposed by Cieslak and Pang (2021). Using the joint variation in stock returns and interest rate changes across different maturities, we disentangle short-rate news from risk-premium news on any given day. We then show that the Fed’s communication of policy stance during the intermeeting period simultaneously affects risk premia on both stocks and long-term bonds in the same direction, which we refer to as the “common risk premium” effect.

Our analysis is related to the literature on the interaction between time-variation in the Fed’s policy rule and the risk premia in financial markets. The time-variation in the policy rule has been studied extensively in monetary economics (Bianchi, 2013, Boivin and Giannoni, 2006, Coibion and Gorodnichenko, 2011, Primiceri, 2005). The results from this work suggest that the Fed has switched toward a more activist policy in recent decades. Building on these insights, Bianchi, Ludvigson, and Ma (2022) develop a mixed-frequency setting in a New Keynesian tradition with a rich set of state variables that allows studying multiple transmission channels. They emphasize the role of shifting investors’ beliefs about the Fed’s reaction function parameters for the equity risk premia. Bauer, Pflueger, and Sunderam (2022) estimate the public perceptions of the Fed’s time-varying policy rule using individual-level survey expectations of inflation and output. They argue that forecasters’ changing perceptions about the policy rule affect bond risk premia. In an earlier work, Ang, Boivin, Dong, and Loo-Kung (2010) develop and estimate a dynamic quadratic term structure model embedding a time-varying coefficient Taylor rule and discuss how that time-variation affects bond risk premia. These studies rely on observable dynamics of interest rates, macro variables, or public survey expectations to identify the time variation in the perceived policy rule. We take a complementary approach by directly measuring the policy stance using the text of the FOMC’s internal deliberations and then tying it to the risk premium variation.
in the intermeeting period via the Fed’s communication. Our results are consistent with the notion that investors’ learning about the Fed’s perceptions of the macroeconomy and the strength of response to it has a significant impact on the risk premia.

Related research explores the Fed’s effect on the risk premia by relying on carefully identified Fed surprises in narrow event windows of the FOMC announcements and the resulting responses of longer-duration assets. The seminal studies of Bernanke and Kuttner (2005) and Hanson and Stein (2015) indicate that unexpected policy easing reduces risk premia in stocks and bonds on FOMC announcements. Bauer, Bernanke, and Milstein (2023) review evidence documenting how the Fed’s announcements impact risk appetite and risk-taking. Recent efforts explain these empirical results with theoretical models. Pflueger and Rinaldi (2022) study a New Keynesian setting with habit formation in which monetary easing, by affecting the surplus consumption, can induce large reductions in risk aversion, thus lowering risk premia. Kekre and Lenel (2022) develop a heterogeneous agent model where agents differ in their marginal propensity to take risks. They show that an unexpected easing redistributes wealth to households with a high risk-taking propensity, again lowering risk premia. Ai and Bansal (2018) postulate an information channel where announcements carry information about future economic growth. They characterize intertemporal preferences for the representative consumer, under which announcements drive positive realizations of market equity premium via the resolution of uncertainty. In a related way, Hu, Pan, Wang, and Zhu (2022) also argue that announcements (either Fed- or macro-related) resolve uncertainty. They entertain the possibility that agents learn about the news magnitude (whether the surprise will be large or small) before the announcement, which imparts additional risk premium effects.

The common theme of many of these models is that surprisingly dovish FOMC announcements cause risk premium reductions. However, it is not ex-ante clear whether the Fed’s dovishness is always desirable and should unambiguously lower the premium. Kashyap and Stein (2023) argue that the Fed’s policy could create an intertemporal trade-off whereby a low risk premium today comes at the cost of future financial instability. Caballero and Simsek (2022a) develop a model, in which the Fed and the markets disagree and show that if policy announcements provide information about the scope of disagreements, the market will price a higher policy-“mistakes” risk premium. We contribute empirical evidence
suggesting that the Fed’s forward-looking communication of dovish views can indeed raise
the risk premium, while communication of forward-looking hawkishness can reduce it. We
characterize how these patterns evolve over time since the 1980s and how they complement
the existing evidence.

While the implications of the Fed announcements for asset prices on impact are increasingly
well understood, there is also growing evidence that news from the Fed comes out outside
the narrow event windows. The results provided by Cieslak, Morse, and Vissing-Jorgensen
(2019), Cieslak and Pang (2021), Neuhierl and Weber (2019), Swanson (2023), and the
mixed-frequency approach Bianchi, Ludvigson, and Ma (2022) suggest that policymaking
happens on a continuous basis in the intermeeting period. We contribute to this body
of work by identifying an essential component of policy stance that is developed during the
FOMC meeting, but that does not get revealed via the FOMC announcement. We then show
that this information reaches the public domain via the Fed’s communication, affecting risk
premium throughout the intermeeting period.

Exploiting the content of the Fed documents using natural language processing tools has
become an increasingly common approach to measuring policy stance. The primary focus
of much of this work lies in analyzing the FOMC statements (Apel and Blix Grimaldi,
2012, Gardner, Scotti, and Vega, 2022, Handlan, 2020, Lucca and Trebbi, 2009) and public
communications such as policymakers’ speeches (e.g., Malmendier, Nagel, and Yan, 2021,
Neuhierl and Weber, 2019). Several authors use text to control for the Fed’s information
effects in monetary policy surprises constructed from high-frequency interest rate changes
around FOMC announcements. Ochs (2021) controls for the sentiment in the FOMC
minutes; Aruoba and Drechsel (2023) pursue a related approach based on internal Fed staff
documents, so-called Greenbooks (now, Tealbooks); Acosta (2022) constructs shocks from
the texts of newspaper articles written about Fed announcements.

A smaller set of papers focuses on understanding the Fed’s reaction function by analyzing
private deliberations during the FOMC meetings. Meade (2005) pioneers the use of the
FOMC meeting transcripts to codify the expressed policy preferences about the short-term
interest rate.4 Shapiro and Wilson (2022) rely on the transcripts to estimate the Fed’s loss

4Istrefi (2019) and Bordo and Istrefi (2023) use a classification scheme of FOMC members based on
narrative records in the public media that discuss policy preferences of individual FOMC members.
function, identifying losses from the negative sentiment in the meeting’s language. Cieslak, Hansen, McMahon, and Xiao (2022) use transcripts to understand the properties of the FOMC’s loss function, highlighting the Fed’s concern with policy-induced uncertainty as a determinant of the policy stance over and above the Fed’s macroeconomic forecasts. Exploiting the internal structure of deliberations during the FOMC meetings, they construct a range of measures of policymakers’ perceived moments of economic distributions as well as their policy stance. Building on this work, we expand its scope by connecting the internal deliberations in the transcripts to information revealed via public communication, including FOMC statements, speeches, and minutes. This allows us to trace the link between the internal policy stance developed within the FOMC meeting, its public communication, and finally, the financial market reaction following the meeting.

II. How could the Fed’s policy stance affect the risk premia?

To set the stage for our empirical analysis, we start with a simple illustration in New Keynesian spirit of how policy stance could affect public risk perceptions and risk premia.

II.A. The policymaking challenge

In the baseline New Keynesian model (Clarida, Gali, and Gertler, 1999), the Fed uses the policy rate to minimize deviations in inflation and output from targets. Assuming the Fed can observe the shocks driving the economy, the optimal policy requires it to fully offset the demand shocks. Thus, if demand shocks are the only source of fluctuations, optimal policy eliminates risk entirely, simultaneously stabilizing output and inflation, a result frequently referred to as “divine coincidence.”

In practice, monetary policymaking is much more difficult, even absent the cost-push shocks that induce the well-known policy trade-off. The theoretical demand shocks are empirically hard to pin down, especially in real time, as is the assessment of the size of the output gap, i.e., the deviation of current output from its natural level. While both a positive demand shock and a positive productivity shock raise output, they require a different policy response. A positive productivity shock can be output-gap neutral (meaning no interest rate response is needed) or can even reduce the output gap (requiring a rate cut). Thus, one challenge in
implementing optimal policy stems from imperfect information in real time as to whether fluctuations are demand- or supply-side driven.

Faced with a difficult filtering task, the market\(^5\) and the Fed may form different views on the underlying economic shocks and the Fed’s optimal reaction to those shocks.\(^6\) These differences give rise to monetary policy shocks as perceived by the market (Caballero and Simsek, 2022a,b). Our illustration centers on how such policy shocks can become a source of risk premia.

**II.B. A simple macro-finance illustration**

Suppose the market believes that the macroeconomy is described by the system:

\[
x_t = \rho x_{t-1} - \theta (i_t - \delta \pi_t) + \eta_t \\
\pi_t = \rho \pi_{t-1} + \kappa x_t,
\]

where \(x_t\) is the output gap, \(\pi_t\) is inflation, and \(i_t\) is the nominal short rate. The model is entirely backward-looking and all variables are in deviations from the steady state. Equation (1) represents the IS curve, where \(\eta_t\) is an aggregate demand shock, with \(\theta > 0\), and \(0 < \delta < 1\), and \(E_t(\pi_{t+1}) = \delta \pi_t\). Equation (2) is the Phillips curve, with \(\kappa > 0\).\(^7\)

The market assumes that the Fed follows a simple rule setting the nominal short rate:

\[
i_t = \phi_x x_t + \phi_{\pi} \pi_t + \varepsilon_t.
\]

For simplicity, the market believes the optimal coefficients \(\phi_x > 0, \phi_{\pi} > 0\) are time-invariant. The market-perceived shocks \(\eta_t\) and \(\varepsilon_t\) are uncorrelated with each other, and have conditional variances, \(\sigma^2_\eta\) and \(\sigma^2_\varepsilon\). The policy rule residual \(\varepsilon_t\) captures the idea that, in the market’s

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\(^5\)We refer to the market participants (the market) and the public interchangeably.

\(^6\)Although the Fed may have genuinely private information (such as bank balance sheet data) which affects its assessment (Peek, Rosengren, and Tootell, 2003), to a first approximation, it seems likely that the market has access to the same kind of macroeconomic data as the central bank. Overall, the informational advantage of the Fed over markets appears small (e.g., Bauer and Swanson, 2023), but markets may not form the same prudent assessments of the shocks, for instance, in the face of potential non-linearities.

\(^7\)The system (1)-(3) can be thought of a stylized description of the post mid-1980s environment, where the demand shocks dominate economic fluctuations (see e.g., Bianchi, Ludvigson, and Ma, 2022, Pfueger, 2023), and which is the period we focus on in our empirical analysis that follows. Appendix C presents the version of this model with cost-push supply-side shocks.
assessment, the Fed does not perfectly offset the demand shocks, thus divine coincidence does not hold. This is in line with Galí (2015)’s interpretation of the monetary policy shock “as a random, transitory deviation from the ‘usual’ conduct of monetary policy as anticipated by the public, due to a change in policymaker’s preferences, a response to unusual unanticipated event, or simply and error in the implementation of monetary policy.” For now, we treat \( \varepsilon_t \) as reflecting a broad notion of perceived policy mistakes, but leave their sources unspecified. We turn to an interpretation in Section VI.

The backward-looking terms (time- \((t-1)\)) do not matter for the risk premia, and thus, we ignore them in the discussion below. We denote innovations with a tilde, e.g., \( \tilde{x}_{t+1} \) is the innovation to output gap. We assume that aggregate consumption equals aggregate output and that shocks to output gap \( \tilde{x}_{t+1} \) are priced by the market, with the real log SDF given by

\[
m_{t+1} = -r_t - 0.5\gamma^2\sigma_x^2 - \gamma\tilde{x}_{t+1},
\]

(4)

where \( \gamma > 0 \), \( \sigma_x^2 = \text{Var}_t(\tilde{x}_{t+1}) \), and the real rate is \( r_t = i_t - E_t(\pi_{t+1}) \).

To illustrate the properties of risk premia, we focus on the claim to the next period’s consumption (“stock”, paying real cash flow equal to \( x_{t+1} \)) and two-period nominal bond (paying \(-i_{t+1} - \pi_{t+1}\) in real terms). Assuming joint log-normality, the conditional risk premium on the stock \( (r_{p_t^x}) \) and bond \( (r_{p_t^b}) \) is given by the minus covariance of the log SDF innovations and payoff innovations:

\[
r_{p_t^x} \equiv E_t(r_{x_{t+1}}^x) + 0.5\text{Var}_t(r_{x_{t+1}}^x) = -\text{Cov}_t(\tilde{m}_{t+1}, \tilde{x}_{t+1})
\]

(5)

\[
r_{p_t^b} \equiv E_t(r_{x_{t+1}}^b) + 0.5\text{Var}_t(r_{x_{t+1}}^b) = -\text{Cov}_t(\tilde{m}_{t+1}, \tilde{i}_{t+1} - \tilde{\pi}_{t+1}).
\]

(6)

where \( r_{x_{t+1}} \) denotes log excess returns. Solving the market’s model (1)–(3) for the endogenous innovations and calculating covariance terms in (5) and (6) yields:

\[
r_{p_t^x} = \gamma \left( \frac{\phi_x + \kappa(1+\delta)}{\Omega^2} \sigma_\eta^2 \right) + \gamma \left( \frac{\theta^2}{\Omega^2} \sigma_\varepsilon^2 \right)
\]

(7)

\[
r_{p_t^b} = \gamma \left( \frac{\phi_x + \kappa(1+\delta)}{\Omega^2} \sigma_\eta^2 \right) + \gamma \left( \frac{\theta[1-\kappa\theta(1+\delta)]}{\Omega^2} \sigma_\varepsilon^2 \right)
\]
where \( \Omega = 1 + \phi_x \theta + (\phi_{\pi} - \delta)\kappa \theta \).

The above risk-premium expressions capture the intuition whereby demand uncertainty \((\sigma^2_{\eta})\) induces a positive risk premium on stocks but a negative risk premium on bonds (as interest rates tend to fall and bond prices tend to rise in a demand-driven recession). Uncertainty associated with monetary policy shocks \((\sigma^2_{\varepsilon})\) induces a positive risk premium on both stocks and bonds.

While we ignore sources of time-varying volatilities and abstract from complex dynamics (e.g., via learning), comparative statics on equation (7) illustrate how the Fed’s policy stance can impact the risk premia in stocks and bonds via \(\sigma^2_{\varepsilon} = Var_t(\varepsilon_{t+1})\). This channel pertains to the magnitude and persistence of the Fed’s mistakes as seen by the market. At different times, the market may be more or less convinced of the Fed’s assessment of the economic shocks and/or the Fed’s reaction to those shocks. To the extent that \(\sigma^2_{\varepsilon}\) changes with these perceptions, those changes act simultaneously and in the same direction on the stock and bond risk premia, which we refer to as the “common” risk premium effect.

Overall, the stylized setting suggests an ambiguous effect of the Fed’s easy policy stance on the risk premium. While by aggressively offsetting particularly negative shocks the Fed is able to provide reassurance and reduce risk premia, it also potentially increases uncertainty and premia if its assessment of the economy diverges from that of the market. In practice, the relative strength of these effects is likely to vary over the business cycle, an issue we explore empirically below. Of course, the Fed considers the market views in their deliberations, which in turn affect their policy choice and communication. We attempt to capture such effects with market-based controls available to the Fed at the time of the meeting.

III. Measuring policy stance within the FOMC meeting

A novel feature of our analysis lies in establishing a link between the policy stance developed by policymakers within an FOMC meeting and the financial market behavior in the period following the meeting. While the literature has studied textual measures of policy stance, it has primarily focussed on analyzing the statements and public communications such as speeches of the Fed officials, as opposed to private policymakers’ deliberations. And yet, the FOMC meetings are a proximate venue where policy views are expressed. In this section,
we discuss the measurement and the properties of the internal policy stance revealed by the FOMC meeting transcripts, and establish its forward-looking content beyond the current policy rate or the Fed’s macroeconomic expectations.

III.A. *The structure of internal deliberations*

Since 1994, the Federal Reserve Board publishes nearly verbatim transcripts of the FOMC meetings, with a delay of five years after the calendar year in which the meeting took place.\(^8\) The transcripts contain a fully attributed, statement-by-statement account of meetings. The sample period we consider spans 228 meetings from August 1987 (the first meeting of Alan Greenspan’s chairmanship) through December 2015 (the last meeting for which a transcript was available at the time of data processing).\(^9\) Scheduled FOMC meetings occur eight times per year, with occasional special meetings convened via conference call during times of macroeconomic turbulence. Since the format of these calls is somewhat irregular, we only consider regular meetings in our analysis. During our sample, a total of 75 unique FOMC members appear in the transcripts in at least one meeting. The typical composition of the FOMC consists of 19 members, of which twelve are regional Fed Presidents and seven are Governors. A number of Fed staff economists also participate in the meetings.

Our construction of policy stance exploits the regular structure of FOMC meetings which has been largely unchanged throughout the sample period. The two core parts of the meeting are the economy round and the policy round.\(^10\) The economy round makes up 43% of all sentences in the transcripts. The Fed staff economists first present their forecasts of economic activity (contained in Greenbooks) along with supporting contextual information. Each FOMC member in turn presents his or her views on economic developments. These developments can be discussed in the context of alternative interest rate paths, but FOMC members do not advocate for particular policy choices at this stage.

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\(^8\)See [https://www.federalreserve.gov/monetarypolicy/fomc_historical.htm](https://www.federalreserve.gov/monetarypolicy/fomc_historical.htm)

\(^9\)Only a small part of the May 1988 meeting was transcribed, so we treat it as a missing observation.

\(^10\)The sectioning of meetings has been performed by manually by us. One outlier in meeting structure is the September 2009 meeting, for which the policy and economic rounds were merged into one round. In this case, we manually classify sentences as either belonging to the economy round or the policy round. For further details on the structure of FOMC meetings and the composition of the committee, see Hansen, McMahon, and Prat (2018).
The main source from which we measure the policy stance is the policy round, which follows the economy round discussions. The policy round accounts for 24% of all sentences. It begins with the staff laying out different policy alternatives, after which FOMC members debate on which alternative to adopt before proceeding to a final vote. This section also includes a discussion of the public statement released along with the policy announcement.

III.B. Internal policy stance, HD

To assess the FOMC’s policy stance in each meeting, we follow the procedure developed by Cieslak, Hansen, McMahon, and Xiao (2022). Using texts of the policy round, the basic idea is to gauge the intensity with which policymakers express directional policy views. We focus on the views of the FOMC members (chair, vice chair, governors, and regional Fed presidents), the ultimate decision makers, and exclude the statements made by the staff. We first apply a set of rules to classify whether or not a sentence spoken by an FOMC member in the policy round refers to monetary policy. We then separate hawkish and dovish leanings by matching policy terms with directional language at a sentence level, accounting for negations. Our classification of hawkish and dovish language takes into consideration both conventional policy as well as, starting from 2009, the unconventional tools. This allows us to obtain a consistent stance proxy throughout the entire sample, including the zero-lower-bound period. Additionally, to ensure that we do not simply capture language describing fluctuations in asset prices and interest rates, we exclude sentences in which such market movements are mentioned. Appendix A describes the details of the construction.

With the above algorithm, we calculate the frequency of occurrence of language indicating hawkishness and dovishness, scaled by the overall length of the policy round (the total number of phrases in that round attributed to the FOMC members). We denote the resulting scores in meeting $t$ as $Hawk_t$ and $Dove_t$, respectively, and summarize the overall policy stance by taking the balance:

$$HD_t = Hawk_t - Dove_t.$$  \hspace{1cm} (8)
Thus, the $HD_t$ variable reflects a directional tilt in the policy views that emerges during meeting $t$. For subsequent analysis, we normalize $HD$ to have a sample zero mean and a unit standard deviation.

### III.C. Properties of HD

We refer to $HD$ as the *internal* policy stance to highlight the private nature of the policy discussions at its source. Cieslak, Hansen, McMahon, and Xiao (2022) study its properties focussing on how the stance emerges within the meeting. The key feature for the purposes of our subsequent analysis is that the $HD$ variable captures a significantly broader notion of policy stance beyond the rule-based Fed’s reaction function and the current policy action.

To illustrate the stance evolution during our sample period, Figure 1 plots the $HD$’s time series along with the federal funds rate (FFR) and the shadow rate from Wu and Xia (2016) to account for the zero-lower-bound period. The $HD$ measure has intuitive business cycle dynamics, becoming elevated in expansions and declining rapidly in recessions and during periods of financial turmoil.

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**Figure 1. Hawk-dove policy score $HD$ and the policy rate.** The figure superimposes the hawk-dove score $HD$ constructed for FOMC members in the policy round of the FOMC meeting against the FFR target and the shadow policy rate from Wu and Xia (2016).
Table I summarizes the statistical properties of the *HD* measure. To capture the rule-based component of the Fed’s reaction function, we use Greenbook economic forecasts and forecast updates, and a proxy for the Fed’s inflation target (trend inflation). Greenbook forecasts are prepared by the staff at the Fed Board ahead of each scheduled FOMC meeting, and constitute an important part of discussion during the economy round of the meeting. We measure current policy stance either with the fed funds rate (FFR) or with the shadow rate. Some covariates are suppressed from the table for brevity.\(^\text{11}\)

First, *HD* is a strong predictor of the current policy decision over and above the standard Taylor rule variables. Columns (1)–(2) of Table I, Panel A, focus on explaining changes in the actual policy instrument—the federal funds rate (FFR) target. The sample runs through 2008:12, omitting the zero-lower bound thereafter. On a stand-alone basis, *HD* captures 41\% of the FFR target change variation (column (1)). A one-standard-deviation increase in *HD* is associated with approximately an 18 basis-point increase in the FFR target (0.64 standard deviations) with a t-statistic of 9. Column (2) shows that *HD* remains economically and statistically significant once we control for the Greenbook forecasts and policy rate inertia (lagged FFR). We verify that this result does not dependent on the choice of specific horizons for the economic forecasts.

Analogous results follow when we use *HD* to predict a widely-adopted measure of monetary policy surprises proposed by Romer and Romer (2004) in column (3).\(^\text{12}\) *HD* alone explains a quarter of variation in Romer-Romer shocks. We do not include additional controls here, since Romer-Romer shocks are constructed from changes in the policy rate at each meeting already purged of the Fed’s Greenbook forecasts. Finally, to extend the sample through the zero-lower-bound period, in column (4), we use the changes in the shadow rate from Wu and Xia (2016), and find that *HD* remains a highly significant predictor of the shadow rate as

\(^\text{11}\)Following Coibion and Gorodnichenko (2012), as Greenbook controls, we use longer-term CPI inflation forecasts (four quarters ahead, \(F_t(\pi_4)\)), and current quarter real GDP growth forecast (nowcast, \(F_t(g_0)\)). We also add forecast revisions between meetings \((FR_t(\pi_3), FR_t(g_1))\), following Romer and Romer (2004) to account for changes in forecasts in addition to levels. To capture the slow-moving inflation target over the sample, we construct a trend inflation variable as the discounted moving average of past core inflation following Cieslak and Povala (2015), see also, e.g. Bianchi, Lettau, and Ludvigson (2022b) or Pflueger (2023) who use similar measures to estimate realistic policy rules. Including trend inflation allows the regression to capture the effect of deviations of expected inflation from the inflation target on the policy rate. We use this set of controls in all subsequent analysis unless indicated otherwise.

\(^\text{12}\)We obtain the Romer-Romer shock series from the data set accompanying Valerie Ramey’s handbook chapter on propagation of macro shocks (Ramey, 2016). The shocks are available during the pre-zero-lower-bound sample 1987:08–2007:12.
Table I. Properties of HD as a measure of policy stance. In left columns of Panel A, the dependent variables are changes in the FFR target between the current and last meeting \( \Delta \text{FFR}_t = \text{FFR}_t - \text{FFR}_{t-1} \) (column (1) and (2)), the Romer-Romer surprises from Ramey (2016) (column (3)), and the change in the shadow rate \( \Delta \text{SFFR}_t = \text{SFFR}_t - \text{SFFR}_{t-1} \) from Wu and Xia (2016) (column (4)). In the right columns of Panel A, the dependent variable is \( \text{HD}_t \). The controls include Greenbook forecasts prepared for meeting \( t \), \( F_t(\pi_4) \) (displayed in the table), as well as forecast updates \( F_t(\cdot) \), and a proxy for time-varying inflation target \( \tau_t \) (not displayed variables are indicated as “Controls”). The sample period is: 1987:08–2008:12 in columns (1) and (2), i.e., excluding the zero-lower bound; 1987:08–2007:12 in column (3); and 1987:08–2015:12 in all other columns. In Panel B, the dependent variables are the future changes in the policy rate, from today’s meeting \( t \) to one meeting ahead \( (h = 1) \) and up to four meetings ahead \( (h = 4) \). The \( \text{FFR}_t \) forecasts are up to 2008:12, while the \( \text{SFFR}_t \) forecasts use the entire sample for which \( \text{HD}_t \) is available, 1987:08–2015:12. We include the maximal set of controls as specified in Panel A. In all regressions in Panels A and B, the Greenbook forecasts and \( \text{HD}_t \) are standardized, and rates are in percentages per annum. All regressions are estimated at the frequency of the FOMC meetings. HAC t-statistics with eight lags are reported in parentheses.

well. As HD predicts the current policy action beyond the Greenbook forecasts, this suggests
that the language in the meeting is informative about the FOMC’s deviations from a simple policy rule.

The second main fact about $HD$ is that it forecasts future policy outcomes, beyond the current policy decision. Panel B of Table I shows that $HD_t$ predicts the future path of the FFR or the shadow rate between the current meeting $t$ and future meeting up to $t+4$. The size of the coefficient stabilizes beyond this horizon but it remains significant up to eight meetings ahead (not shown in the table). The predictive content of $HD$ for future actions is visible in Figure 1 showing that $HD$ tends to move in anticipation of the policy subsequently implemented. Importantly, regressions in Panel B of Table I corroborate that the predictive content of $HD$ for future policy rate is over and above the Fed’s economic forecasts.

III.D. Residual policy stance: The $HD$ gap

Naturally, the variation in $HD$ reflects, in part, the Fed’s expectations about economic conditions. A projection of $HD$ on the Greenbook economic forecasts and policy rates (Panel A, columns (5)–(7)) shows that $HD$ has intuitively signed loadings on expected inflation and real GDP growth. However, the economic forecasts explain less than one-third of its variation.

In light of the above properties, we construct a measure of the internal policy stance as an orthogonal component of $HD$ not spanned by either the Fed’s economic forecasts or by the recent policy actions. Specifically, we define a variable, $HD_{gap}$, as a residual from projecting $HD$ on the Greenbook controls and the current and lagged policy rates:

$$HD_{gap_t} = HD_t - \hat{HD}_t,$$

where $\hat{HD}_t = \hat{\gamma}_0 + \hat{\gamma}_1 F_{t,GB}^t + \hat{\gamma}_2 (\text{FFR}_t, \text{FFR}_{t-1})'$. (9)

where $F_{t,GB}$ are the Greenbook forecasts available at meeting $t$. Specification (9) corresponds to column (6) of Table I, Panel A. The fitted value $\hat{HD}_t$ can be interpreted as representing the standard constant-parameter rule-based part of the policy stance giving rise to the current action. For completeness, column (7) of Table I, Panel A, reports the estimates on the pre-zero-lower-bound sample.

Figure 2, Panel A, superimposes the variation in the overall $HD$ against its fitted value $\hat{HD}$. To display the contribution of the Greenbook forecasts, we separately plot the fitted
value excluding the current and lagged policy rate (corresponding to column (5) in Table I, Panel A). Figure 2, Panel B, shows that the residual $HD_{gap}$ continues to display large fluctuations over time, in line with the fact that about 56% of the $HD$ variance remains unexplained by Greenbook forecasts and the policy rate.

It is natural to ask about the drivers of the residual variation in $HD$. To the extent that $HD_{gap}$ measures the deviations of policymakers’ views from the currently implemented policy and first-moment beliefs about the economy, it should capture forward-looking policy intentions and contingencies. The deviations can have several sources, for example, representing the Fed’s concerns about tail risks, uncertainty about policy transmission, or credibility concerns. Cieslak, Hansen, McMahon, and Xiao (2022) study how policymakers’ perceptions of uncertainty and higher-moments of economic distributions more broadly (identified from the language in the economy round of the FOMC meeting) predict stance in the policy-round deliberations. They show that the inflation uncertainty perceived by policymakers (particularly in expansions) and their negative sentiment about the real economy (mainly in downturns) are important drivers of the forward-looking policy stance, after controlling for the policy rate and the Greenbook forecasts. Specifically, a positive relationship between the expressed negative sentiment about the real economy and $HD$ is consistent with the Fed’s concern to provide enough support to the economy in downturns. The positive relationship between the perceived inflation uncertainty and $HD$ is, instead, consistent with policymakers’ watching for signs of inflationary pressures as evidence of policy overstimulation in expansions. These results highlight the value added by using texts of internal deliberations to reveal a broader notion of policy stance beyond policymakers’ first-moment beliefs about the path of the macroeconomy and policy.

III.E. $HD$ gap vs. on-impact financial market reaction to the FOMC announcements

Existing studies demonstrate the importance of the FOMC statements’ language for policy transmission that extends beyond policy actions (e.g., Gürkaynak, Sack, and Swanson, 2005a, Lucca and Trebbi, 2009). The statements are immediately released after the FOMC meeting.

13Controlling for the policy rate with the shadow rate from Wu and Xia (2016) instead of the FFR does not change our results. While the shadow rate helps address the zero-lower bound, it is available at the end of months and not at the time of the FOMC meetings. Thus, for a precise timing of the Fed’s actions, in subsequent analysis, we use the $HD_{gap}$ residualized with respect to the FFR.
Figure 2. Policy stance **HD** and its residual component **HDgap**. Panel A superimposes the hawk-dove score **HD** constructed using statements by the FOMC members in the policy round of the meeting against the fitted value of the **HD_t**, **ĤD_t** in equation (9) explained with the Greenbook forecasts and current and lagged policy rate, **FFR_t**, **FFR_t−1**, corresponding to specifications (6) in Table I. We additionally display the fitted value obtained using only Greenbook forecasts, corresponding to specifications in columns (5) of Table I. Panel B plots the **HDgap_t** as the difference between **HD_t** and **ĤD_t**.

and are closely scrutinized for their content by financial market participants. One may thus wonder to which extent they already reveal the internal policy stance captured by **HDgap**.
To answer this question, in Table II, we explore the relationship between $HDgap$ and monetary policy surprises identified from high-frequency changes in interest rates in a narrow window around the FOMC announcements. These surprises plausibly reflect investors’ belief updating due to the information released by the Fed. Thus, to the extent that $HDgap$ carries meaningful forward-looking information about policy (Table I, Panel B), and if this information gets revealed via the statement, it should be immediately reflected in the market interest rates upon the FOMC announcement. We consider several proxies of high-frequency market-based surprises from representative studies (Swanson (2021), Gertler and Karadi (2015, GK), Nakamura and Steinsson (2018, NS), and Bauer and Swanson (2022)) to account for different construction details, maturities of interest rates involved and sample periods. Across all specifications in Table II, the $HDgap$ does not predict market interest rate reactions on impact in the narrow announcement window, despite the predictive power for future policy (shown in Table I, Panel B). This suggests that a major part of internal policy views does not reach the public domain at the time of the FOMC announcement.

In sum, the results of this section underscore the forward-looking nature of the internal FOMC’s deliberations, providing a quantitative validation of the narrative accounts by the Fed insiders:

So was the FOMC meeting merely a ritual dance? No. I came to see policy decisions as often evolving over at least a couple of meetings. The seeds were sown at one meeting and harvested at the next. [The discussion] could change my mind, even if it could not change my vote at that meeting. (...) I was often positioning myself, and my peers, for the next meeting. – Meyer (2009)

The forward-looking content of $HDgap$ combined with the fact the markets seem not to learn this content directly at the FOMC announcement, points to an important role of the Fed’s communication in the intermeeting period.

IV. Decomposing financial market dynamics over the intermeeting period

Does the information about the internal stance get ultimately revealed, and if so what are its effects on asset prices? To answer this question it is necessary to disentangle the news channels driving asset prices day by day. We follow the approach in Cieslak and Pang (2021)
Table II. Policy stance $HDgap_t$ and high-frequency monetary policy surprises in narrow FOMC announcement windows. The table reports projections of high-frequency measures of monetary policy surprises at the time of the FOMC announcements on the $HDgap_t$ variable. Columns (1) and (2) contain high-frequency target and path surprises from Swanson (2021) extending the approach of Gürkaynak, Sack, and Swanson (2005a) (1991:07–2015:10 sample). Columns (3) and (4) use shocks from Gertler and Karadi (2015) obtained from the current month fed fund futures (MP0, sample 1988:11–2012:06) and 12-month ahead Eurodollar futures (ED12m, sample 1987:08–2012:06). Column (5) is the policy news shock from Nakamura and Steinsson (2018) (sample 1995:02–2014:03). Columns (6) and (7) use surprises from Bauer and Swanson (2022): the monetary policy surprise (MPS, first principal component of four Eurodollar futures rates, ED1 to ED4) and that surprise orthogonal to predictors of policy surprises (MPS⊥) (sample: 1988:02–2015:12). Robust t-statistics are reported in parentheses. All regressions are estimated at the frequency of FOMC meetings. The coefficients are standardized.

to identify different types of news—monetary, growth, and two distinct risk premiums—from stock returns and nominal Treasury yield changes. The gist of the approach is to impose intuitive sign restrictions on asset price movements in a structural VAR framework to decompose their variation into interpretable news at the daily frequency.

At a basic level, the identification amounts to rotating information in stock returns and yields changes into four orthogonal factors with a particular interpretation. Let $z_\tau$ be a vector of daily zero-coupon yield changes and log aggregate stock returns on day $\tau$:

$$z_\tau = (\Delta y^{(2)}_\tau, \Delta y^{(5)}_\tau, \Delta y^{(10)}_\tau, \Delta s_\tau)^T,$$

where we include changes in two-, five-, and ten-year yield from Gürkaynak, Sack, and Wright (2006), and $\Delta s_\tau$ is the log S&P 500 index return (all demeaned). We estimate a VAR(1) on $z_\tau$ to obtain reduced form residuals, $u_\tau$. Superscript 14 indicates that we impose sign restrictions on the $\hat{A}$ matrix:

$$\omega_\tau = \hat{A}^{-1}u_\tau$$

14Daily stock returns and yield changes have very low serial correlation, therefore the specification of the conditional mean in the VAR is of little practical importance for the results.
We summarize the restrictions and label the factors in Table III. The restrictions on $\tilde{A}$ come in two flavors: (i) monotonicity restrictions on the effect that news has on the yield curve across maturities, and (ii) sign restrictions on the comovement between stock and bond returns. The monotonicity restrictions serve to separate news driving short-rate expectations from news driving the risk-premium variation. Building on the implications of term structure models, the strategy exploits the fact that short-rate expectations news has a more pronounced impact on yields with shorter maturities (the expectations hypothesis term, $EH$), while risk premium news has a more pronounced impact on longer maturities (the risk premium term, $RP$). The stock-bond comovement restrictions further distill two types of $EH$ news and two types of $RP$ news, which we lay out below.

The resulting daily shocks $\omega_t$ are by construction in-sample uncorrelated with each other and normalized to have unit variance and zero mean.\(^\text{15}\) The decomposition gives rise to four news factors:

$$
\omega_t = (\omega^G, \omega^{MP}, \omega^{HRP}, \omega^{CRP})'.
$$

To understand the assumed asset price responses in Table III, suppose there is a positive one unit shock to each element in $\omega$:

- “Growth news” $\omega^G$ raises stock prices and lowers bond prices, affecting yields at short maturities more than at long maturities (cash-flow effect);
- “Monetary news” $\omega^{MP}$ simultaneously lowers stock and bond prices, affecting yields at short maturities more than at long maturities (discount-rate effect);
- “Hedging premium news” $\omega^{HRP}$ lowers stock prices and raises bond prices, affecting yields at long maturities more than at short maturities (compensation for cash-flow news exposure);
- “Common premium news” $\omega^{CRP}$ simultaneously lowers stock and bond prices, affecting yields at long maturities more than at short maturities (compensation for discount-rate news exposure).

\(^{15}\)The matrix $\tilde{A}$ is set identified as opposed to point identified. We use the so-called median target solution in our subsequent analysis (Fry and Pagan, 2005), i.e., the solution from the set for which responses of asset prices to $\omega$ shocks are the closest to the median response across all solutions. Cieslak and Pang (2021) discuss the properties of the entire set.
The $\omega^{MP}$ and $\omega^{G}$ components reflect the typical effects of news moving short-rate expectations found in the literature (e.g., Gürkaynak, Kisacikoglu, and Wright, 2018, Gürkaynak, Sack, and Swanson, 2005b). The separation between risk premium news aims to capture two distinct effects: (i) a time-varying common premium ($\omega^{CRP}$) that drives compensation required by stock and bond investors in the same direction due to both being exposed to discount rate news versus (ii) a time-varying hedging premium ($\omega^{HRP}$) that drives stock and bond premia in opposite directions due to bonds providing a hedge against bad economic times (as real rates generally decline in bad times). The hedging premium is thus akin to a flight-to-safety effect.

These four factors can be mapped onto to the simple setting in Section II.B, with $\omega^{G}$ and $\omega^{MP}$ reflecting asset pricing effects of demand shocks $\eta$ and monetary policy shocks $\varepsilon$, respectively, and $\omega^{CRP}$ and $\omega^{HRP}$ capturing the risk premium effects in equation (7). In particular, the common premium $\omega^{CRP}$ subsumes any potential movements in the discount-rate premium induced by the Fed either via changes in the policy coefficients ($\phi_x, \phi_\pi$) or uncertainty associated with monetary policy shocks ($\sigma^2_\varepsilon$). The hedging premium $\omega^{HRP}$ captures fluctuations stemming from demand shock uncertainty ($\sigma^2_\eta$), outside the control of the Fed.

On a given day, an observed yield change or the aggregate stock market return can be disaggregated into contributions of each factor via a historical decomposition from the VAR (see Cieslak and Pang (2021) for details). For example,

$$\Delta y^{(10)}_\tau = \sum_j \Delta y^{(10)}_\tau (\omega^j), \quad j = \{G, MP, HRP, CRP\}$$

(11)

is a four-way decomposition of the ten-year yield change on day $\tau$. An analogous decomposition can be performed for daily stock returns or yields with other maturities.\(^{16}\)

IV.A. Notation and timing conventions

For interpreting economic magnitudes, we present our results in terms of how different news factors in $\omega$ affect the ten-year yield on a given day or over some interval. For example,

\(^{16}\)Bond prices fall as yields increase. We characterize the effects in terms of yield changes as opposed to bond returns given that economic magnitudes are more transparent in yield units.
\( \Delta y^{(10)}_t(\omega^{CRP}) = 10 \text{ bps} \) means that \( \omega^{CRP} \) news induced a ten-basis-point change in the ten-year yield from day \( \tau - 1 \) to \( \tau \).\(^{17}\)

We index scheduled FOMC meetings with \( t, t+1, \ldots \). We denote a one-day yield change from a day before to the day of the \( t \)-th FOMC announcement induced by \( \omega^j \) news as \( \Delta y^{(10)}_{\tau_t}(\omega^j) \), where \( \tau_t \) marks the day of announcement for meeting \( t \). To explore the drivers of asset price movements between two consecutive scheduled FOMC meetings, we sum up the daily changes in yields induced by \( \omega^j \) news

\[
\Delta y^{(10)}_{t,t+1}(\omega^j) = \sum_{i=1+\tau_t}^{\tau_{t+1}} \Delta y^{(10)}_i(\omega^j), \tag{12}
\]

where we exclude the announcement day for meeting \( t, \tau_t \).\(^{18}\) We also consider yield changes over different windows following the \( t \)-th announcement, e.g.,

\[
\Delta_h y^{(10)}_{\tau_t+1,\tau_t+h}(\omega^j) = \sum_{i=1+\tau_t}^{\tau_{t+1}} \Delta y^{(10)}_i(\omega^j) \tag{13}
\]

is the \( h \)-day yield change following announcement \( t \), again excluding the change on the announcement day itself.

When discussing the economic magnitudes of coefficients in regressions below, we scale the yield changes driven by a \( \omega^j \) factor by a constant equal to the overall unconditional standard deviation of the intermeeting yield changes, \( \sigma(\Delta y^{(10)}_{t,t+1}) \). For example, \( \frac{\Delta y^{(10)}_{t,t+1}(\omega^{CRP})}{\sigma(\Delta y^{(10)}_{t,t+1})} \) is the impact of \( \omega^{CRP} \) news on intermeeting change in the ten-year yield, expressed in units of unconditional volatility of the intermeeting ten-year yield changes. For example, a number \(-0.2\) means that \( \omega^{CRP} \) news induced a decline in the ten-year yield equal to 20\% of intermeeting yield change volatility.

\(^{17}\)The choice of units in terms of the ten-year yield changes is a convention we adopt. Given that (11) is a decomposition and the same \( \omega \) factors span stock returns and yield changes, we could alternatively express the magnitudes in terms of stock return impacts.

\(^{18}\)We verify that including the day of the announcement at the next meeting in this calculation does not materially affect the results. Below, we also present results excluding the next meeting.
Table III. Identification of news in asset prices. The table summarizes the identification restrictions following Cieslak and Pang (2021) used for separating out different types of news moving asset prices.

V. The internal policy stance and risk premia in the intermeeting period

We now show that the policy stance elicited within the FOMC meeting contains information that significantly impacts risk premia during the intermeeting period in the days after the public policy announcement. At the outset, it is important to emphasize that the public does not have access to the transcripts for another five years after the meeting. Results in Table II indicate that the FOMC announcement per se provides a limited insight into the forward-looking policy stance, measured with $HD_{gap}$, emerging from the meeting. Therefore, the public needs to gradually learn about the stance in the days that follow. The decomposition of asset prices at the daily frequency into interpretable news factors allows us to trace out not only when investors revise their beliefs between meetings but also what types of beliefs are revised. In this section, we tie these revisions to the content of internal policy deliberations, controlling for a variety of potential confounders. In the following section, we then map the policy stance in the transcripts onto the Fed’s communication in the intermeeting period to directly assess the extent to which the internal policymakers’ views reach the public domain.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
Impact on LT vs. ST yields & Short-rate expectations, $EH$ & Risk premium, $RP$ & \\
\hline
$|ST| > |LT|$ & Growth $\omega^G \uparrow$ & Monetary $\omega^{MP} \uparrow$ & Hedging $\omega^{HRP} \uparrow$ & Common $\omega^{CRP} \uparrow$ \\
\hline
Bond returns & (-) & (-) & (+) & (-) \\
Stock returns & (+) & (-) & (-) & (-) \\
Stock-bond comovement & (-) & (+) & (-) & (+) \\
\hline
\end{tabular}
\caption{Identification of news in asset prices.}
\end{table}

V.A. Baseline predictive results over the intermeeting period

In Table IV, we report the results from predicting news driving asset prices over the intermeeting period from meeting $t$ to $t+1$ with the policy stance in meeting $t$. Specifically, the dependent variable is the change in the ten-year yield attributed to a given type of news and accruing from a day after the meeting-$t$ announcement up to and including the day of the next meeting-$(t+1)$ announcement, as defined in equation (12). Our baseline regression in
Table IV, Panel A, is specified as

\[
\Delta y_{t,t+1}^{(10)}(\omega^i) = \gamma_0 + \gamma_1 HDgap_t + \epsilon_{t,t+1},
\]

where the $HDgap$ variable is defined in equation (9). For comparison, in Panel B, we estimate an analogous regression using the raw $HD$ score from the FOMC transcripts without any controls. The three left columns of Table IV contain results for the risk premium components, while the three right columns contain analogous results for the short-rate expectations components. To interpret the economic significance of the predictive relationship, we express the slope coefficient to represent the effect of a one-standard-deviation change in $HDgap_t$ (or $HD_t$) on $\Delta y_{t,t+1}^{(10)}(\omega^i)$ per unit of the unconditional standard deviation of the intermeeting ten-year yield change, $\sigma(\Delta y_{t,t+1}^{(10)})$. We follow this convention for all results below, unless otherwise noted.

The main result in Table IV reveals that the internal policy stance within the FOMC meeting is a strongly significant forecaster of the subsequent risk premium changes, and this effect stems entirely from the variation in the common risk premium component, $\omega^{CRP}$. Recall that positive $\omega^{CRP}$ news simultaneously sends stocks and long-term bonds lower (and long-term yields higher), an effect that is orthogonal to shorter-term yield movements. The negative coefficient of $-0.17$ in the second column of Panel A implies that a one-standard-deviation increase in $HDgap$ forecasts a reduction in the common premium corresponding to 17% of the intermeeting volatility of the ten-year yield changes. The coefficient is similar ($-0.19$) when we use the raw $HD$ variable as predictor in Panel B. A comparison of Panel A and B suggests that the policy stance relevant for predicting premia in the intermeeting period is not driven by either the Fed’s economic forecasts or the current policy rate decision. These conclusions are unchanged when, we use $HD$ and control for the Fed’s forecasts and the FFR directly in the regressions, which addresses the problem of $HDgap$ being a generated regressor. In fact, the results become somewhat stronger with the coefficient on $HD$ increasing to $-0.24$ (see Appendix Table A-1). While not separately reported, analogous estimates to those in Panel A and B performed for stock returns show respectively that a one-standard-deviation increase in $HDgap$ ($HD$) predicts a stock return increase of 15% (16%) of the intermeeting stock return volatility.
Panel A. Predictability of $\Delta y^{(10)}_{t+1}(\omega_i)$ with policy stance residual, $\text{HDgap}_t$

<table>
<thead>
<tr>
<th>RP components</th>
<th>EH components</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{RP overall}$</td>
<td>$\text{EH overall}$</td>
</tr>
<tr>
<td>$\text{CRP}$</td>
<td>$G$</td>
</tr>
<tr>
<td>$\text{HRP}$</td>
<td>$MP$</td>
</tr>
<tr>
<td>$\text{HDgap}_t$</td>
<td>-0.19***</td>
</tr>
<tr>
<td></td>
<td>(-3.29)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.046</td>
</tr>
<tr>
<td>N</td>
<td>227</td>
</tr>
</tbody>
</table>

Panel B. Predictability of $\Delta y^{(10)}_{t+1}(\omega_i)$ with raw policy stance in transcripts, $\text{HD}_t$

<table>
<thead>
<tr>
<th>RP components</th>
<th>EH components</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{RP overall}$</td>
<td>$\text{EH overall}$</td>
</tr>
<tr>
<td>$\text{CRP}$</td>
<td>$G$</td>
</tr>
<tr>
<td>$\text{HRP}$</td>
<td>$MP$</td>
</tr>
<tr>
<td>$\text{HD}_t$</td>
<td>-0.16**</td>
</tr>
<tr>
<td></td>
<td>(-2.54)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.033</td>
</tr>
<tr>
<td>N</td>
<td>227</td>
</tr>
</tbody>
</table>

Table IV. Predictability of news in asset prices by the internal policy stance. The table reports predictive regressions of news moving asset prices over the intermeeting period (between meeting $t$ and $t+1$) by the policy stance in meeting $t$. The dependent variable is the change in the ten-year yield over the intermeeting period attributed to particular news type, $\omega_j$, with news components indicated by column titles. Columns “RP” and “EH” report the combined contributions of the risk premium news and expectations hypothesis news, respectively. Panel A uses as the dependent variable the $\text{HDgap}_t$ defined in equation (9), i.e., $\text{HD}_t$ residualized with respect to the Greenbook controls and the current and lagged policy rate. Panel B uses the raw $\text{HD}_t$ without controls. $\text{HD}_t$ and $\text{HDgap}_t$ are standardized to have a unit standard deviation. The slope coefficients are expressed in units of volatility of the intermeeting ten-year yield changes, and thus, report the signed fraction of intermeeting yield volatility induced by news $\omega_j$ that is predictable by policy stance. The dependent variables display trivial autocorrelation; therefore, we use robust standard errors, which are more conservative than the Newey-West standard errors in this application. The regressions are estimated at the frequency of the FOMC meetings from 1987:08 through 2015:12.

It is noteworthy that the $\text{HD}$ variable also predicts the evolution of monetary news $\omega^{MP}$ during the intermeeting period, as seen in the last column of Panel B. The positive coefficient is intuitive and indicates that a more hawkish policy stance in the FOMC meeting predicts higher market expectations of policy rate afterward. This result is consistent with the predictive power of the $\text{HD}$ variable for the future path of the short rate documented in Table II as well as with the finding in the literature that short-rate expectations evolve between the meetings and not just at the FOMC announcement (e.g., Brooks, Katz, and Lustig, 2018, Neuhierl and Weber, 2019). However, in contrast to the risk premium results, the predictability of monetary news disappears in Panel A once we focus on the $\text{HDgap}$ variation, purged of the Fed’s economic forecast and policy rate. The fact that the common risk premium news component remains predictable by $\text{HDgap}$, but the monetary news component
is not, implies that the content of policy deliberations that affects the risk premium is distinct from the usual monetary news channel operating via market’s short-rate expectations.

The negative sign of the predictive relationship between $HDgap$ and the common risk premium distinguishes our results from the literature finding that a surprise monetary easing lowers the risk premium on impact, i.e., at the time of the FOMC announcement (Bernanke and Kuttner, 2005, Hanson and Stein, 2015). The estimates in Table IV, column $CRP$, imply that a more dovish stance in the meeting (in excess of the current action) is associated with a rise of the common risk premium component in days that follow the announcement. Importantly, these results complement rather than contradict the existing work in two ways. First, they accrue over the intermeeting period, not at the announcement. Second, by relying on the decomposition (12), the results pertain to movements in long-term yields and stock returns after controlling for the variation in short-rate expectations.

The negative relationship is as a robust feature of the 1987–2015 sample that we study. Figure 3 contains a graphical representation of the regression in a scatter plot with $HDgap$ on the x-axis and the subsequent intermeeting change in the ten-year yield due to the common risk premium news $ω^{CRP}$ on the y-axis. We include the fitted regression lines for the full sample, corresponding to the results in Table IV Panel B, as well as two subsamples 1987–2007:12 and 2008:01–2015:12.

To further document the robustness of this link, Figure 4 provides a low-frequency view by juxtaposing the cumulative sum of $HDgap$ (accumulated over all scheduled FOMC meetings) against the cumulative sum of the daily changes in the ten-year yield due to $ω^{CRP}$ risk premium news (accumulated over all days in the sample). The negative low-frequency relationship between the residual policy stance and risk premium suggests a systematic link and not an artifact of data outliers.

V.B. Timing of the predictability during the intermeeting period

To unpack the above intermeeting results, we trace out when the risk premium effect unfolds in the days following the announcement. We estimate the following regressions for different horizons $h$
Figure 3. Policy stance $HDgap$ and the intermeeting ten-year yield changes due to the common risk premium component. The figure displays the relationship between the internal policy stance in the FOMC transcripts, measured as the $HDgap$, at meeting $t$, and the $\Delta y_{t+1}^{(10)}(\omega^{CRP})$ risk premium in the subsequent intermeeting period from $t$ to $t+1$. The full-sample line corresponds to results presented in Table IV, Panel B.

Figure 4. Low-frequency variation in the policy stance $HDgap$ and the ten-year yield due to the common risk premium. The figure superimposes the cumulative sum of $HDgap$ (defined in equation (9)), accumulated over all scheduled FOMC meetings against the cumulative sum of the daily changes in the ten-year yield due to the $\omega^{CRP}$ risk premium news (accumulated over all days in the sample).
where $\tau_t$ is the day of meeting $t$ (the day of the announcement), and $\Delta_h y_{\tau_t+1, \tau_t+h}^{(10)}(\omega^{CRP})$ is the $h$-day yield change following meeting $t$ announcement, defined in equation (13).

Figure 5 presents the slope coefficients $\beta_h$ as a function of horizon $h$ along with 95% confidence intervals. The result for $h = 0$ refers to the yield change from day before to the announcement day; subsequent results for $h > 0$ exclude the change on the announcement day. Given that the length of the interval between the FOMC meetings varies over time, we report results for $h \leq 33$ days, making sure that day $\tau_t+h$ does not include the day of the next announcement.\textsuperscript{19} The intermeeting result is marked in Figure 5 with the horizontal line at $-0.17$ (taken from Table IV, Panel A, column $CRP$).

The pattern of coefficients across $h$ shows that the predictability accumulates gradually over time, most steeply from around day five up to around day 18 after the announcement. The coefficient for $h = 0$ is insignificant in line with earlier findings in Table II and the idea that the internal policy stance is not disclosed with the FOMC statement at announcement. The accumulating pattern of $\beta_h$ suggests that information about policy stance reaches the market in the days after the announcement. Plausible channels through which such information can be revealed are the Fed officials’ speeches and the FOMC minutes releases, which we analyze in more detail in Section VII.

V.C. Controlling for the known FOMC announcement effects

How does the above intermeeting predictability relate to the existing evidence in the literature that studies the impact of monetary policy surprises on asset prices? To highlight the novel dimension of our findings, in Table V we augment the horizon-specific regressions (15) with additional covariates available at the time of the Fed’s announcement. The goal is to span various channels that have been studied in the literature.

First, we control for asset price reaction in a narrow window around the FOMC announcement to document that our predictive results are separate from the known on-impact effects. Our regressions thus include the target and path monetary policy surprises from Swanson\textsuperscript{19}The last reported regression for $h = 33$ is based on 73 observations; after this point the number of observations drops abruptly, and hence the results are not reported.
Figure 5. Timing of the HDgap-predictable variation in the common risk premium between meetings. The figure presents the slope coefficients from the predictive regression (15) across different horizons $h$, measured in days after the FOMC meeting. The coefficients are expressed as the fraction of the unconditional intermeeting ten-year yield volatility. The spikes indicate 95% confidence intervals obtained with robust standard errors.

(2021), which reflect the immediate response of yields to the FOMC announcement. As part of our sample includes the period of unconventional monetary policy, we also add the LSAP factor identified by Swanson (2021).

Second, we distinguish the predictable variation in the risk premium from the ex-post predictability of monetary policy surprises due to investors’ expectational frictions (deviations from the full-information rational expectations). Specifically, we control for macroeconomic and financial variables documented by previous studies to predict monetary policy surprises ex-post (Bauer and Swanson, 2023, Cieslak, 2018, Miranda-Agrippino and Ricco, 2021). Bauer and Swanson (2022) summarize this literature proposing six predictors of monetary policy surprises, which we incorporate in our specification. The variables are: (1) the latest non-farm payroll surprise before the FOMC announcement, (2) year-on-year log change on nonfarm employment growth, (3) log S&P500 return, (4) change in the yield curve slope, (5) log change in the Bloomberg Commodity Spot Price index, and (6) implied yield skewness from options on ten-year Treasury note futures as in Bauer and Chernov (2023). Variables

\[\text{We download the data from Michael Bauer’s website.}\]
(3), (4), and (5) are calculated in log changes from three months before to the day before the FOMC announcement.

Finally, the inclusion of the Greenbook forecasts in the regressions accounts for potential information that the Fed reveals to the public about the economy (e.g., Nakamura and Steinsson, 2018). While $HDgap$ is orthogonalized with respect to these forecasts to absorb the rule-driven policy stance, reintroducing Greenbooks here allows for a direct effect the revelation of the Fed’s economic forecasts could have on target or path surprises included in the regression.

The first row of Table V reports the loading of the announcement-day ($h = 0$) yield change $\Delta y_{t}^{(10)}(\omega^{CRP})$ on $HDgap_t$, and the loading of subsequent yield changes $\Delta_{h}y_{t+1, t+h}(\omega^{CRP})$ on $HDgap_t$ for $h > 0$. The loading for the entire intermeeting yield change is in the last column. The number of observations is slightly lower than in Table IV because the target and path surprises are not available before 1991. The presence of the controls does not affect the main finding: the internal policy stance continues to negatively predict risk premia in the intermeeting period with the economic magnitude unchanged from the univariate estimates in equation (15). The table also shows a significantly positive relationship between the risk premium and the path surprise, which is consistent with risk premia amplifying the policy decision on impact, as documented by previous studies (e.g., Hanson and Stein, 2015). However, the path surprise coefficient is insignificant beyond a short announcement window and a few days after, contrasting with predictability by $HDgap$ which strengthens over the intermeeting period.\footnote{The fact that the target surprise is insignificant is expected. Indeed, the risk premium news component is constructed to be orthogonal to the conventional monetary news driving the short end of the yield curve.}

Two other coefficients worth highlighting are non-farm payroll surprise before the meeting ($NFPSurp_{t-}$) and the log S&P500 return before the meeting ($\Delta \ln SP500_{t-}$), which Bauer and Swanson (2023) find to be significant predictors of monetary surprises. Both variables remain significant a few days after the meeting ($NFPSurp_{t-}$ marginally so) but this effect mean-reverts over the intermeeting period, and thus is distinct from the predictive content of $HDgap$. One interpretation of the significant $\Delta \ln SP500_{t-}$ coefficient is that the public updates beliefs about how the Fed responds to financial market conditions. If the Fed fails to communicate its vigilance for policy becoming too stimulative following prior stock market
Dependent variable: $\Delta y_{t+\tau} (\omega^{CRP})$ for $h = 0$ and $\Delta y_{t+1, t+\tau + h} (\omega^{CRP})$ for $h > 0$

<table>
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<tr>
<th>$h$</th>
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<th>$h = 15$</th>
<th>$h = 20$</th>
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<td>-0.098***</td>
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<td>-0.11***</td>
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<td>0.022</td>
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<td>(0.30)</td>
<td>(0.58)</td>
<td>(1.12)</td>
<td>(1.45)</td>
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<td>0.047**</td>
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<td>0.047</td>
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<td>-0.037</td>
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<td>$\Delta \ln SP500_{t-}$</td>
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<td>-0.067***</td>
<td>-0.12***</td>
<td>-0.086**</td>
<td>-0.086</td>
<td>-0.051</td>
</tr>
<tr>
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<td>(1.47)</td>
<td>(-3.37)</td>
<td>(-4.06)</td>
<td>(-2.05)</td>
<td>(-1.47)</td>
<td>(-0.76)</td>
</tr>
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<td>0.054**</td>
<td>0.060*</td>
<td>0.044</td>
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<td>0.084</td>
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</tbody>
</table>

Table V. Predictability of common risk premia with additional controls. The table augments predictive regressions in (15) with additional controls. The first column ($h = 0$) uses the announcement day yield change $\Delta y_{t+\tau} (\omega^{CRP})$ as the dependent variable. The last column ($h = IM$) uses the intermeeting yield change, $\Delta y_{t+1, t+\tau + h} (\omega^{CRP})$. In between, the horizon $h$ is measured in days after the FOMC announcement. The controls include the high-frequency target, path, and LSAP surprises from Swanson (2021) measured on announcement day, as well as variables documented to predict monetary policy surprises, all available before the meeting ($t-\tau$) and complied by Bauer and Swanson (2022) (BaSw), and the same Greenbook forecast controls (GB) as in Table I. The output for some of BaSw controls and GB controls is suppressed for brevity. The dependent variable is expressed in units of intermeeting volatility of the ten year yield change, and the explanatory variables are standardized to have unit standard deviation. The sample period is from 1991:07 (when high-frequency surprises are available) through 2015:12. Robust standard errors are reported in parentheses.

decreases (and thus for financial conditions becoming too easy), this could lead to a risk premium increase. In this case, the negative loading on $\Delta \ln SP500_{t-}$ for several days after the meeting is consistent with the effect of excess dovishness on the risk premia.

V.D. Conditioning on the policy regime

To further understand in which policy environment the relationship between the policy stance and the risk premium is particularly strong, we condition the predictive regressions on the policy regimes. There are multiple ways to slice the sample. For simplicity, we define a dummy variable $D_t^{cut} = 1$ ($D_t^{hike} = 1$) to indicate the cutting (hiking) episode as one, in which the Fed has cut (hiked) rates in any of the meetings $t-\tau$ to $t$ (current). Additionally, we define an action episode $D_t^{act} = 1$ as one in which either a cut or a hike has occurred in
Dependent variable: Intermeeting yield change, Δh_{t,t+1}(ω^{CRP})

<table>
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<th>(2)</th>
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<th>(4)</th>
<th>(5)</th>
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<th>(7)</th>
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<tbody>
<tr>
<td>All</td>
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<td>-0.14***</td>
<td>-0.28**</td>
<td>-0.099*</td>
<td>-0.23**</td>
<td>-0.15**</td>
<td>-0.17***</td>
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<td></td>
<td>(-3.52)</td>
<td>(-2.79)</td>
<td>(-2.00)</td>
<td>(-1.67)</td>
<td>(-2.56)</td>
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<td>0.063</td>
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<td>102</td>
<td>70</td>
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<td>55</td>
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</table>

Table VI. Policy regimes. The table reports the relationship between HDgap_t at meeting t, and the Δh_{t,t+1}(ω^{CRP}) risk premium in the subsequent intermeeting period from t to t + 1, conditioning on different policy environments. We define an episode as “Cut”, “Hike” or “Act” as one in which either a cut, a hike, or either cut or hike, has occurred in any of meetings t, t – 1, t – 2. Column “All” presents the baseline result from Table IV for the full sample. All variable definitions remain as in Table IV. The sample period is 1987:8–2015:12. Robust t-statistics are in parentheses.

any of meetings t to t – p. The complements of these sets, no-cut, no-hike, and no-action, respectively, are when the dummy variables take the value of zero. We use p equal to two, e.g., D^{cut}_t = 1 if a cut occurred in any of the three last meetings including the current one, t.

Table VI presents the predictive regressions estimated on the meeting subsets. The explanatory variable is the HDgap_t. Results using the raw HD with controls, to flexibly account for any potential changes in the rule component of stance across episodes, are qualitatively unchanged and are included in the Appendix Table A-2.

Column (1) of Table VI contains the results for all meetings, corresponding to the baseline specification in Table IV, Panel B. The subsequent columns reveal that the policy stance predicts premia negatively in each subset of meetings. This is consistent with the relationship not being driven by a few isolated episodes. However, comparing columns (2) and (3), the economic significance of the predictability is twice as strong in those periods when the Fed has not explicitly acted by changing rates. In the “no-act” region, a one-standard-deviation more hawkish stance predicts a reduction in risk premium equivalent to 28% of the unconditional intermeeting ten-year yield volatility, compared to 14% in the “act” region. Subsequent columns show that the economic and statistical significance of the coefficient is especially large outside of the direct cutting episodes (“no-cut” region, column (5)).

22 The scaling of coefficients by the unconditional intermeeting volatility of yield changes is the same across the various sample splits.
These results align with Figure 1 which indicates that HD adjusts relatively swiftly even while the actual policy rate may remain unchanged. The policy stance starts to display a visibly more hawkish tilt after periods of rapid easing when the actual policy rate stays low. Prolonged periods of low interest rates can be conducive to investors’ concern with the Fed overstimulating the economy and therefore raise uncertainty about the future path of monetary policy, and the risk premia. The results in Table VI suggests that the Fed can affect the uncertainty in these periods by expressing readiness to stabilize inflation and output gap, should need arise, which we capture as heightened hawkishness in the language of the FOMC meetings. This language can reassure the markets that any mistakes are unlikely to be persistent: the Fed is watching closely for signs of a mistake and is ready to quickly reverse course. In contrast, episodes when the Fed adopts a strongly dovish stance (as seen in the early 1990s, 2000s and in 2007 before the financial crisis) can lead to risk premium increases, suggesting that the markets may disagree with the Fed’s negative assessment of the economy and worry about impending policy mistakes.

VI. Interpreting the results

To interpret the link between the forward-looking policy stance via HDgap and the inter-meeting risk premia, we return to the illustration from Section II, focusing on the perceived Fed mistakes as the source of monetary policy shocks. Equation (7) shows that the uncertainty induced by the marked-perceived Fed mistakes drives the risk-premium variation. However, it does not rationalize the directional effect whereby the Fed’s increased forward-looking dovishness (hawkishness) would induce a risk-premium increase (decline). Below, we propose an argument based on the perceived Fed’s inflation fighting-credibility to explain that asymmetry.

We continue to assume $\phi_x, \phi_\pi, x_t, \text{and } \pi_t$ represent the market assessment of those concepts, as in equation (3), but abstract from many real-life aspects of dynamic environments such as learning. We label with $cb$ superscript the market’s perception of the central bank measure; except for the interest rate $i_t$ with which we denote the Fed chosen short rate. The Fed is seen as setting its policy according to $i_t = \phi^{cb}_{x,t} x_t^{cb} + \phi^{cb}_{\pi,t} \pi_t^{cb}$. We denote the market’s perceived optimal interest rate with $\tilde{i}_t^{mkt}$. Thus, $i_t = \tilde{i}_t^{mkt} + \varepsilon_t$, where $\tilde{i}_t^{mkt} = \phi_x x_t + \phi_\pi \pi_t$.
We consider two sources of differences between the Fed and the market. First, we assume disagreement over a specific realization of the demand shock, $\eta_t$:

$$
\eta_t^{cb} = \eta_t + \tilde{\eta}_t,
$$

(16)

where $\tilde{\eta}_t$ represents demand shock misjudgements by the Fed, in the eyes of market participants, with $E(\tilde{\eta}_t) = 0$. Given the aggregate IS equation (1), the demand shock disagreement implies different assessments of the output gap, $x_t^{cb} = x_t + \tilde{\eta}_t$.

Second, we assume potential disagreements in the reaction function coefficients. For simplicity, at date $t$, the market and the Fed deem the same output coefficient as appropriate ($\phi_x = \phi_x^{cb}$), but the market believes that the Fed’s inflation-fighting credentials, reflected in $\phi_{\pi,t}^{cb}$, may vary over time. We model the difference in the optimal inflation reaction as:

$$
\phi_{\pi,t}^{cb} = \phi_{\pi} + \tilde{\phi}_{\pi,t},
$$

(17)

where $\tilde{\phi}_{\pi,t}$ is the central bank deviation from the market.

With the setup above, even though the Fed sets $i_t$ without introducing policy randomness, market participants perceive monetary policy errors as arising from

$$
\varepsilon_t = \frac{\phi_x \tilde{\eta}_t}{\phi_x^{cb}} + \frac{\tilde{\phi}_{\pi,t} \pi_t}{\phi_{\pi,t}^{cb}},
$$

(18)

and, as seen in Section II, become a driver of economic fluctuations, in the eyes of the market. Market participants face an identification challenge: they observe $i_t$ chosen by the Fed, but they don’t perfectly observe $\phi_{\pi,t}^{cb}$ and $x_t^{cb}$. The same $i_t$ could be generated by different combinations of reaction function and beliefs about the macroeconomy.

Equation (18) gives content to the notion of monetary shocks and, via equation (7), allows to tie the uncertainty induced by those shocks, $\sigma^2_{\varepsilon,t} = Var_t(\varepsilon_{t+1})$, to the common risk premium component affecting stocks and bonds. The market perception of (potentially time-varying) uncertainty stemming from future policy errors drives the risk premium.

Let $V(z) = \sigma_z^2$ be the conditional variance of variable $z$. To keep expressions tractable, we assume that market beliefs of disagreements ($\phi_{\pi,t}, \tilde{\eta}_t$) are uncorrelated with each other and

Electronic copy available at: https://ssrn.com/abstract=4560220
economic conditions, obtaining:

\[ V_t(\varepsilon_{t+1}) \equiv \sigma^2_{\varepsilon,t} = (\phi_x)^2 V_t(\eta_{t+1}) + V_t(\phi_{\pi,t+1}) V_t(\pi_{t+1}) + \left[ E_t(\phi_{\pi,t+1}) \right]^2 V_t(\pi_{t+1}). \tag{19} \]

Equation (19) decomposes the sources of the market-perceived monetary uncertainty \( \sigma^2_{\varepsilon} \). Focussing on the role of the Fed’s inflation fighting credentials via \( \phi_{\pi} \), assume that most of the time the market puts high probability on the Fed being suitably hawkish toward inflation (the market perceives that \( \phi_{cb}^{ib} = \phi_{cb}^{ib} \)), but the market also worries, to varying degree across time, that the Fed could become too dovish (\( \phi_{cb}^{ib} = \phi_{cb}^{ib} - \Delta, \Delta > 0 \)). This implies that \( \phi_{\pi} \) follows as a two-state mixture model:

\[
\phi_{\pi,t+1} \sim \begin{cases} 
0 \text{ w.p. } 1 - p_t \\
-\Delta \text{ w.p. } p_t,
\end{cases}
\tag{20}
\]

and \( p_t \) is the probability attached to the Fed becoming too dovish. We interpret \( p_t \) as a measure of the Fed’s inflation-fighting credibility and assume \( p_t < 0.5 \), capturing the fact that the market assesses an excessively dovish switch as relatively unlikely, in line with the post-Volcker experience.

Given the first two moments of \( \phi_{\pi,t} \)

\[
E_t(\phi_{\pi,t+1}) = -p_t \Delta \\
V_t(\phi_{\pi,t+1}) = p_t(1 - p_t) \Delta^2,
\tag{21} \tag{22}
\]

the terms \( V(\phi_{\pi}) \) and \( \left[ E(\phi_{\pi}) \right]^2 \) in (19) both increase in the probability of a dovish switch (on the domain \( p_t < 0.5 \)), raising \( \sigma^2_{\varepsilon} \). Thus, a higher probability \( p_t \) ties a perception of an excessively dovish Fed to a higher monetary uncertainty in (19), and the ensuing rise in the common risk premium via equation (7). The more the market worries about a shift toward dovish stance the greater the variance \( \sigma^2_{\varepsilon} \). To the extent that the Fed’s communication clarifies the Fed’s anti-inflation stance and lowers \( p_t \) via a commitment to tough action if inflation takes off, this mechanism can explain the negative association between the forward-looking stance and risk premia we establish empirically. Consistent with this intuition, in

\[ 23V_t(\varepsilon_{t+1}) = V_t(\phi_x \eta_{t+1}) + V_t(\phi_{\pi,t+1} \pi_{t+1}) + 2 \text{Cov}_t(\phi_x \eta_{t+1}, \phi_{\pi,t+1} \pi_{t+1}); \] our assumptions give us \text{Cov}(\phi_x \eta_{t+1}, \phi_{\pi,t+1} \pi_{t+1}) = 0 and \text{E}(\eta_{t+1}) = 0. \]
the next section, we show that the Fed’s intermeeting communication of its stance explains the predictive content of HDgap for risk premia documented so far.

Of course, in practice policy uncertainty is likely to stem from multiple sources. Equation (19) shows that even when the market is confident about the Fed’s inflation fighting credentials \((V(\hat{\phi}_\pi) = 0 \text{ and } E(\tilde{\phi}_\pi) = 0 \text{ in the limit of } p_t = 0)\), the shock assessment error term, \(V(\tilde{\eta})\), remains as a possible driver of policy uncertainty and premia. At different times, the market may be more or less convinced of the Fed’s assessment of the economy. For example, suppose output declines and the Fed-perceived weakness in demand leads to communication of an easier policy stance than the market expected; at the same time, the market thinks the output decline is partly (or entirely) due to a negative productivity shock. If the market’s view is vindicated, the Fed would have moved in the wrong direction opening a negative real-rate gap, leading to a positive output gap and inflation. While finding out which view prevails takes time, the market’s concerns about assessment errors raise the risk premia in the near term via an increased \(\sigma_\varepsilon^2\).

VII. Disseminating the FOMC stance in the intermeeting period

We now turn to investigating the Fed’s communication through which the internal policy stance could be revealed to the public after the meeting. We piece together the information conveyed via the main official channels: the FOMC statements, the Fed officials’ speeches, and the FOMC minutes releases. We then trace out the effect of the intermeeting communication on the risk premium behavior.

VII.A. Public communication sources

The Fed began providing after-meeting decision statements in 1994, initially only when the policy rate was changed, and from 2000, after every scheduled FOMC meeting. Statements contain the policy decision and a succinct description of the rationale behind it. Before 2005, the FOMC minutes were published on average 47 days after the meeting (i.e., on average three days after the next meeting); from 2005, the publication date shifted to three weeks after the meeting (15 business days, on average). Minutes are significantly longer than statements, typically 7–10 pages, and, according to the Federal Reserve’s website, are
designed to “record all decisions taken by the Committee with respect to [the] policy issues and explain the reasoning behind these decisions.” While the minutes in this format are available from 1993, due to availability of statements, we start our analysis of these texts in 1994.

An important component of the Fed communication are the speeches of the Fed officials. The FOMC members commonly use speeches to provide updates on policy views between the meetings. Such communication becomes more constrained in the days before the announcement during the so-called blackout period. As the Federal Reserve Board guideline, during this period the FOMC members are not supposed to comment on monetary policy or the economic outlook. Nevertheless, some speeches still occur in proximity of the meeting.24

We collect the texts of the statements, speeches, and minutes. We then estimate document-specific $HD$ by applying the same approach to measure policy stance as for the transcripts, resulting in statement-$HD$, minutes-$HD$, and speeches-$HD$ variables. Since minutes are structured to reflect the process of deliberations during the FOMC meeting, we use only those sections in the minutes that summarize the views of the FOMC members and their policy decision. In all cases, we express the $HD$ score as a fraction of the total number of tokens in the document.

VII.B. Do FOMC statements and minutes reveal the internal policy stance in the FOMC meeting?

We start by investigating to which extent FOMC statements and minutes reveal the policy views expressed in the meeting. Minutes and statements are available at the meeting frequency and, by design, should synthesize the policy views of the committee during the meeting. Table VII summarizes the common content across these sources and the meeting transcripts. Given their chronology, we predict the content of the statements with the transcripts, and the content of minutes with the transcripts and statements, all of which are associated with the same meeting $t$. In our previous results, we have established that it is the residual $HDgap$ that predicts risk premium variation in the intermeeting period.

24The blackout period used to stretch from the week before an FOMC meeting to the Friday of the week of the meeting (Meyer, 2009). The current policy, “FOMC Policy on External Communications of Committee Participants,” adopted in 2011, stipulates that the blackout typically begins ten days before the meeting and lasts until the day after the meeting.
The relevant question is whether and to which extent statements and minutes convey this residual policy stance dimension. To understand the source of common variation in HD measures from different sources, we therefore report estimates with and without controls for the Greenbook forecasts and the policy rate in the regressions. In regressions with controls we include the same variables as those in Table I.

The results in Table VII indicate that statements reveal only part of the policy stance emerging from the meeting. While the statements-HD is positively correlated with the transcripts-HD, the correlation weakens once we include the Greenbooks and the policy rate (columns (1) and (2)). This is perhaps not surprising given that statements are short, focus mainly on explaining the current policy decision and economic outlook, and hence are unlikely to disclose the entire prospective deliberations of a meeting. More importantly, it is also consistent with the fact that the risk premium predictability by the transcripts-HD does not accrue immediately at the announcement, and as such, absent significant information processing frictions by market participants, should not be driven by the information in the statement. In contrast to statements, the minutes display a relatively tighter link with the transcripts, and this link stems in large part from the gap component of the stance (columns (3) and (4)), i.e. the portion unexplained by the Greenbooks and the policy rate. A one-standard-deviation increase in the transcripts-HD is associated with 0.5-standard-deviations increase in the minutes-HD, in the regression with controls (column (4)). Finally, column (5) confirms that the common content of the minutes and the transcripts does not simply reflect the information coming out via statement at the FOMC announcement.

From the temporal pattern of predictability in Table V and Figure 5, one can expect that a significant share of information about the internal policy stance gets gradually revealed in the first three weeks after the announcement. In Figure 6, we superimpose the previous predictive coefficient $\beta_h$ on $HD_{gap}$ from Figure 5 (dropping confidence intervals for readability) with the timing of the minutes and speeches during the intermeeting period. While the minutes partially reflect the internal policy stance, the fact that $\beta_h$ drifts before their publication but does not change dramatically at the time of publication indicates that the markets learn about the stance before the minutes come out.\textsuperscript{25} The frequency of speeches increases

\textsuperscript{25}This is naturally true in the earlier part of the sample when minutes were released after the next meeting. The squares in the graph in the first few days after the FOMC meeting stem from the pre-2005 period marking the minutes releases associated with the previous FOMC meeting.
Table VII. Information about policy stance in transcripts, statements, and minutes. The table reports regressions of statements-\( HD_t \) and minutes-\( HD_t \) on transcripts-\( HD_t \). The sample is 1994:02–2015:12, starting when the statements were first released. As not all meetings have a statement in the earlier years, we treat these observations as missing. The regression coefficients are standardized. Robust standard errors are in parentheses. The controls include the Greenbook forecasts and current and lagged FFR, as discussed in Table I.

Figure 6. Timing of the Fed’s communication during the intermeeting period. The figure summarizes the timing of the Fed communications via public speeches of the chair, vice chair and the governors, and minutes releases. The counts of public communication events (right axis) falling on a given day are superimposed against the estimates of predictive \( \beta_h \) coefficients (left axis) from Figure 5.

right after the FOMC meeting, suggesting speeches are a potential channel through which information gets revealed.
Dependent variable: $\Delta y_{t,t+1}^{(10)}(\omega_{CRP})$ over the intermeeting period, scaled by $\sigma(\Delta y_{t,t+1}^{(10)})$

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<td>(1.21)</td>
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<td>176</td>
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Table VIII. Predictability of the common risk premium with the content of FOMC statements and minutes. The table presents the predictive regressions of $\Delta y_{t,t+1}^{(10)}(\omega_{CRP})$ over the intermeeting period with $HD_t$ measures constructed from texts of FOMC statements, minutes, and transcripts. The sample period in columns (1)–(3) is 1994:02–2015:12, where both minutes-$HD$ and transcripts-$HD$ are available. In column (4) we only use meetings for which the FOMC released a statement over the 1994–2015 sample. Robust standard errors are in parentheses.

In Table VIII, we augment the predictive regressions of $\Delta y_{t,t+1}^{(10)}(\omega_{CRP})$ with the policy stance in the minutes and statements. For reference, column (1) reproduces the baseline predictability using the transcripts-$HD$ in the 1994–2015 sample, with controls. Column (2) shows that on a stand-alone basis the coefficient on the minutes-$HD$ is negative, in line with a more hawkish stance being associated with lower premia, although the economic and statistical significance is about half of that for the transcripts-$HD$. If the predictability indeed originates from the internal policy stance, and if the stance is only partially or noisily revealed via the minutes, we expect the minutes-$HD$ to be fully subsumed by the transcripts-$HD$. Column (3) confirms this intuition. Finally, column (4) additionally shows that statements do not contribute to the predictability, supporting the interpretation that the results are not driven by the policy announcement itself.

VII.C. The role of speeches in conveying the policy stance

We now turn to the questions whether the policy stance could be transmitted to the public domain via the speeches of the Fed officials. We construct the $HD$ score for each speech, again following the same approach as for the transcripts. Thus, the speech-level $HD$ is expressed as the balance of the hawkish and dovish phrases relative to the overall length of the document. Our analysis covers speeches of the Fed chair, vice-chair and governors,
obtained from the Federal Reserve website, for a total of 1594 unique documents. The sample runs from 1996:06 to 2022:09. There are 1361 days, on which a speech has been recorded; we assign speeches occurring on the weekend to the next business day. In cases when two Fed officials gave a speech on the same day, we average the individual HD scores on that day to obtain a daily measure. Overall, the speeches-HD is available on 1326 days.\footnote{We also collect data of speeches of the regional Fed presidents from websites of the regional reserve banks. The coverage of these data is significantly less complete, and therefore we do not include regional president speeches in the analysis.}

The information extracted from speeches is bound to be noisy. Speeches present a heterogeneous set of documents covering a variety of subjects beyond the current economic and policy outlook. While their distribution over the intermeeting period allows us to conduct the analysis at a higher frequency than the frequency of the scheduled FOMC meetings, the timing of when the markets fully absorb the speeches’ content is unclear. The speaking events may be scheduled outside of the market trading hours and the implications of a speech may take some time to be processed by the market participants.

To account for these issues, in Table IX we use the speech-HD in the intermeeting period after meeting \( t \) to forecast the risk premia over different windows around the day of the speech, \( \tau_i \in (t, t + 1) \), \( \Delta_y^{[10]}_{\tau_i+p,\tau_i+h}(\omega^{CRP}) \). Column (1) in Panel A shows no effect of speeches HD in the three-day window from one day before to two days after the speech \( (p = -1, h = 2) \). Subsequent columns study the following days, from two days after the speech \( (p = 2) \) up to seven days ahead \( (h = 7) \). The coefficients in columns (2) through (6) are negative and increase in absolute value and statistical significance as the window expands. Their magnitude remains similar beyond day seven (not reported), implying that the effect does not mean revert in the following days, but as expected, the statistical significance gradually weakens. The coefficient of \(-0.032\) in column (6) of Panel A means that a one-standard-deviation increase in the speech hawkishness reduces the risk premium by amount equal to 3.2\% of the intermeeting ten-year yield volatility. The economic magnitudes are naturally smaller than the overall intermeeting results reported earlier, given the shorter predictive window. Scaling up the estimated coefficient to adjust for the window size, with the median length of the FOMC cycle equal to 33 days, implies 21.1\%(= 3.2\% \times 33/5) of the intermeeting yield volatility could be accounted for by the stance in the speeches. This number is comparable to 19\% estimated in Table IV, Panel A,
using transcripts-HD. Thus, stance communicated via speeches could in principle account for the overall intermeeting risk-premium effect documented in earlier sections.

In panel B of Table IX, we explore additional specifications and the robustness. In column (1), we focus only on speeches between day two and day 20 after the meeting, dropping those days that occur close to the FOMC meeting during the blackout period. The coefficient strengthens to $-0.04$, illustrating that predicable variation in risk premia mostly happens over this interval, in line with Figure 6. Column (2) includes the Greenbooks and policy rate controls and shows, again, that it is the residual information about the policy stance that drives our results (all controls are measured as of the time of the last meeting, $t$).

If speeches indeed confer information about the internal policy stance developed during the meeting, speeches-HD should drive out the transcripts-HD as predictor of risk premia in a joint specification. We test this hypothesis in column (3), by including transcripts-HD for meeting $t$ for each day in the intermeeting period for which we have the speeches-HD information, speeches-HD$_{t_i \in (t,t+1)}$. We find that the transcripts-HD indeed becomes marginally statistically significant in the joint regression, although its economic magnitude is comparable to that of the speeches-HD. The significance of the speech-based policy stance is noteworthy as we likely only capture a fraction of actual information flows. Abstracting from noise inherent in the speech-based measures, even a comprehensive collection of speeches is unlikely to entirely span all the information about internal deliberations that policymakers reveal to the public, because such communication takes place via other channels (including informal channels).

VIII. Conclusions

We establish a link between the policy stance revealed through internal FOMC deliberations, the Fed’s public communication of that stance, and asset price reactions in financial markets. The Fed’s private deliberations contain forward-looking information about policymakers’ views and intentions that are not subsumed by the typical estimates of the policy rule using the Fed’s macroeconomic forecasts, the current policy rate, or the language in the FOMC statements. Measuring the stance from the policymakers’ language in the policy round of the FOMC meeting, we show that it has strong predictive power for risk premia on stocks and bonds over the intermeeting period that follows the announcement. An increase in the
Table IX. Within intermeeting period evidence using speeches-HD. The table presents predictability of the common risk premium with speeches-HD during the intermeeting period. Panel A considers different widows over which the $\omega_{CRP}$ news effect on the ten-year yield is measured. In column (1), (-1,2) denotes interval from the day before the speech to two days after the speech; subsequent columns are for intervals after the speech, from two days up to seven days. Panel B considers robustness of the results for the (2,7)-day interval (corresponding to last column in Panel A). Column (1), “Narrow”, uses only days 2 to 20 after the meeting, columns (2)–(4) include the Greenbook controls and the current and lagged FFR. The sample period in Panel A covers days with speeches from 1996:06 through 2022:09. The sample period in Panel B is a subset of these days, with columns (2)–(4) estimated from 1996:06 through 2015:12 as in the main analysis. HAC t-statistics (in parentheses) use eight lags (days) to account for potential overlap in the dependent variable.

FOMC members’ relative hawkishness predicts a risk premium reduction, and an increase in relative dovishness predicts risk premium increase over the intermeeting period. Whereas the stance component impacting premia does not appear to be revealed by the statements accompanying the scheduled FOMC announcements, the FOMC members’ speeches present a vital conduit through which information reaches the public domain between meetings. The effect of stance on risk premia accrues particularly in periods when the Fed has not acted directly on policy rates, emphasizing the importance of communication in these periods.

The results indicate that the Fed’s communication of strongly dovish policy intentions is not unambiguously perceived as beneficial by financial markets, and can induce higher

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<td>(-1,2)</td>
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<td>(2,5)</td>
<td>(2,6)</td>
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risk premia if the markets’ and the Fed’s views are misaligned. By extension, the Fed’s communication of forward-looking hawkishness, by way of reassuring the public about the Fed’s readiness to stabilize inflation and the economy, can prevent risk premium increases. The findings highlight that policymaking happens on a continuous basis outside of the narrow FOMC announcement window, helping quantify the Fed’s overall effect on financial conditions and the channels through which this occurs.
References


Internet Appendix

Tough talk: The Fed and the Risk Premium

Anna Cieslak  Michael McMahon

This version: August 29, 2023

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Electronic copy available at: https://ssrn.com/abstract=4560220
A. Internal policy stance construction

We now describe the algorithm for constructing the measures of hawkishness and dovishness used in the main text to capture the policy stance. For all meetings, we measure generic monetary policy stance using the procedure detailed below. For meetings conducted in 2009 and onwards, we additionally measure preferences over the size of asset purchases as part of the Fed’s quantitative easing program. The sentences we consider consist of those in the policy round since that is the section of the meeting pertaining to the articulation of preferences.

Generic monetary policy preferences. We classify each sentence as pertaining to monetary policy stance:

1. If it contains any phrase in the set \{federal funds rate, funds rate, target rate, policy rate, interest rate, taylor rule, alternative a, alternative b, alternative c, directive, language, statement, symmetry, asymmetry, hawkish, dovish\}.

2. OR if ‘policy’ is in the sentence and NOT any phrase in the set \{fiscal policy, supervisory policy, public policy, budget policy, tax policy, housing policy, regulatory policy, ecb policy, economic policy, government policy, inventory policy, health care policy, macro policy, macroeconomic policy, spending policy, legislation, law, regulation\}.

3. OR if ‘basis points’ is found in the sentence AND any phrase in the set \{cut*, hike*, eas*, tight*, action*, moving, move, firming, recommendation, reduction, increase\}. Conditional on the occurrence of a combination of ‘basis points’ and any of ['cpi', 'inflation', 'yield*', 'treasury'], to ensure we do not include language describing the direction of non-policy-related market prices and interest rates.

We define \(\text{Hawk}_t\) to be the count of terms in \{tight*, hike*, increas*, hawkish, taper, liftoff\} in policy sentences; and \(\text{Dove}_t\) to be the count of terms in \{ease*, easing*, cut*, dovish, reduc*, decrea*\} in policy sentences. Here, we account for negation, and if any of the hawk (dove) terms is immediately preceded by one of \{'less', 'no','not', 'little', 'don’t', 'doesn’t', 'hasn’t', 'haven’t', 'won’t', 'shouldn’t', 'didn’t'\}, it is counted as belonging to dove (hawk) set.

Quantitative easing preferences. We define policy round sentences beginning in 2009 as relating to quantitative easing whenever they contain the term ‘purchase*’ immediately preceded by a phrase in \{mortgage backed securities, mbs, asset, treasur*, agency debt\}. 

Electronic copy available at: https://ssrn.com/abstract=4560220
We then define $Hawk_t''$ to be the count of terms in \{reduce*, taper, stop, purchas*\} within the set of QE sentences; and $Dove_t''$ to be the count of terms in \{more, additional, further\} within the set of QE sentences. We again account for negation.

**Overall preference measure.** Let $NP_t$ be the overall number of terms in the policy round in meeting $t$. Our hawk measure is

$$Hawk_t = \begin{cases} \frac{Hawk_t'}{NP_t} & \text{if meeting } t \text{ occurs prior to 2009} \\ \frac{Hawk_t'+Hawk_t''}{NP_t} & \text{if meeting } t \text{ occurs during or after 2009} \end{cases}$$

and $Dove_t$ is defined analogously.

### B. Additional figures and tables

**Table A-1. Predictability of news in asset prices by the internal policy stance $HD$, with controls.** The table accompanies results presented in Table IV in the main text, by including Greenbook forecasts and current and lagged policy rate in the regression as controls. The controls correspond to those used to construct the $HDgap$ in equation 9.

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<th>(6) Hike</th>
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<td>-0.12*</td>
<td>-0.32***</td>
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**Table A-2. Policy regimes, $HD$ with controls.** The table accompanies results in Table VI, allowing to flexibly control for Greenbook forecasts and current and lagged policy rate in each regression. The controls are as in equation (9).
C. Simple illustration with cosh-push shocks

Consider a simple backward looking model presented in Section II, extended to include the cost-push shocks, \( u_t \).

\[
x_t = \rho_x x_{t-1} - \theta(i_t - \delta \pi_t) + \eta_t \tag{A.23}
\]

\[
\pi_t = \rho_x \pi_{t-1} + \kappa x_t + u_t \tag{A.24}
\]

The Fed sets policy according to the same simple reaction function as in the main text, where the monetary policy shocks, \( \varepsilon_t \), represent the different assessment of the economy between the Fed and the market:

\[
i_t = \phi_x x_t + \phi_\pi \pi_t + \varepsilon_t. \tag{A.25}
\]

Shocks \( \eta_t, u_t \) and \( \varepsilon_t \) are uncorrelated with each other, and have conditional variances, as perceived by the markets, \( \sigma^2_\eta, \sigma^2_u \) and \( \sigma^2_\varepsilon \), respectively. The variance of cost-push shocks is exogenous to monetary policy.

Defining

\[
Y_t = (x_t, i_t, \pi_t)'; \quad \xi_t = (\eta_t, \varepsilon_t, u_t)';
\]

we can write the solution to the above system as

\[
BY_t = \Psi Y_{t-1} + \xi_t \tag{A.27}
\]

\[
Y_t = B^{-1} \Psi Y_{t-1} + B^{-1} \xi_t. \tag{A.28}
\]

By inverting the \( B \) matrix, the innovations to the model state variables are: In the presence of cost-push shocks, the risk premia on the one-period consumption claim (\( r_{px} \)) and two-period nominal bond (\( r_{pb} \)) are:

\[
r_{px} = \gamma \left( \frac{\theta^2 \sigma^2_\pi}{\Omega^2 \sigma^2_\eta} \right) + \theta \left( \frac{\theta(1+\delta)}{\Omega^2 \sigma^2_\varepsilon} \right) + \theta \left( \frac{\theta(1+\delta)}{\Omega^2 \sigma^2_u} \right) \tag{A.29}
\]

\[
r_{pb} = \gamma \left( \frac{(-\phi_x + \kappa (1+\phi_x)) \sigma^2_\eta}{\Omega^2} \right) + \theta \left( \frac{\theta(1-\kappa \theta(1+\delta))}{\Omega^2 \sigma^2_\varepsilon} \right) + \theta \left( \frac{\theta(\phi_x-\delta)[1+\phi_x+\phi_\pi(1+\delta)]}{\Omega^2 \sigma^2_u} \right)
\]
where $\Omega = 1 + \phi_x \theta + (\phi_{\pi} - \delta)\kappa \theta$. A more activist stance (higher $\phi_x, \phi_{\pi}$) generally dampens the impact of demand uncertainty ($\sigma^2_\eta$) and cost-push uncertainty ($\sigma^2_u$) on both risk premia on the consumption claim and the bond. In contrast, the Fed’s activism on inflation ($\phi_{\pi}$) via the cost-push shock uncertainty has an ambiguous impact on the consumption claim premium and, generally, raises the bond risk premium.