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Speaking of Inflation: The Influence of Fed Speeches on Expectations[*]

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Abstract

We examine how speeches by Federal Open Market Committee (FOMC) members, including regional Fed presidents, shape private sector expectations. Speeches that signal rising inflationary pressures prompt both households and professional forecasters to *raise* their inflation expectations, consistent with Delphic effects. Only professional forecasters respond to Odyssean communications—statements about the Fed's intended policy response—leaving Delphic effects as the dominant channel for households. These household responses are driven by speeches from regional presidents, likely due to greater visibility in regional media coverage. A general equilibrium model, featuring agents who differ in their ability to interpret Odyssean signals, explains this heterogeneity.

Keywords: Central bank communication, Delphic, Odyssean, inflation expectations, textual analysis, expectation formation.

JEL codes: E31, E58, D83

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1 Introduction

Communication has become an essential policy tool for central banks. However, engaging with the public does not always produce the results intended by policymakers. Research has shown that discussing a potential outcome can sometimes reinforce private sector expectations of that outcome, a phenomenon known as Delphic communication (Campbell et al., 2012; Melosi, 2017; Campbell et al., 2017; Nakamura and Steinsson, 2018). This contrasts with central banks' typical goal of conveying their policy intentions or reaction function, signaling a commitment to a course of action aimed at addressing the outcome, often described as Odyssean communication.

Identifying Delphic and Odyssean effects in the data is often challenging. It is conceivable that when a member of the Federal Open Market Committee (FOMC) communicates their view on future inflation dynamics, they will also indicate how they intend to address it. Thus, communication carries both Delphic and Odyssean elements. Another challenge lies in the fact that the relative importance of these effects likely depends on the language used by policymakers in their communications (Lunsford, 2020). In this paper, we conduct a textual analysis of speeches delivered by FOMC members, including those of the regional Federal Reserve (Fed) presidents, to disentangle and quantify these effects.

A key contribution of our paper is its focus on speeches by FOMC members—rather than other forms of communication, such as minutes or statements—which have received considerably more attention in the literature. Focusing on speeches is interesting for several reasons. First, unlike minutes, speeches are explicitly addressed to an external audience. Second, they provide real-time information that is publicly accessible. Third, they reflect a diversity of views and roles within the FOMC, including those of the Chair, Vice-Chair, Governors, and regional Federal Reserve Bank Presidents. Finally, the time series for speeches is longer and available at a higher frequency than for policy statements or the *Summary of Economic Projections* (SEP).[1]

As the first contribution of the paper, we extract a measure of the intensity with which the Fed communicates about inflationary pressures in the economy. To construct this *inflationary pressure index* we proceed as follows. First, we collect speeches made by FOMC members. Our dataset consists of about 5,134 speeches by FOMC members and regional Fed presidents from January 1995 until December 2024. Second, we split all speeches into sentences and identify a sentence about inflation if it contains one of the two identifiers: "inflat", or "price". This gives us a total of 79,055 sentences. We then create a dictionary—that is, a collection of modifier words, based on the most common words

[1] Policy statements are available following every meeting from January 2000 onward. The Fed started to release statements in 1994 but only for meetings that were associated with a policy rate change. The SEP first appeared in November 2007.

used in FOMC speeches to characterize the identifiers.[2] Next, we use a large language model to exclude sentences referring to the past. Then, we score sentences on inflation based on modifier words. Finally, we construct the monthly index as the sum of the sentences scored in a month. A high (low) inflationary pressure index reflects high (low) current or expected inflation. We view our index as a proxy for Delphic communication—that is, the part of FOMC communications referring to the inflation nowcast or forecast. This interpretation is validated by the finding that the index is positively and strongly correlated with the FOMC economic projections for one-year-ahead inflation.

We want to test whether the inflationary pressure index affects the inflation expectations of households and professional forecasters, using the Michigan Survey of Consumers (MSC) and the Survey of Professional Forecasters (SPF). A key challenge in estimating the causal effect of inflationary pressure on expectations is the presence of several macroeconomic variables that might simultaneously drive our inflationary pressure index and inflation expectations. One way to solve the problem is to include these confounding factors as control variables in the regression analysis. However, there may be a potentially large number of such confounding factors at play. To be parsimonious and agnostic with respect to the variables that cover the information set available to FOMC members and economic agents, we follow the approach of Belloni and Chernozhukov (2013) and proceed in two steps. First, we regress expectations on a large number of possible predictors, including several measures of inflation, using machine learning techniques. This procedure selects among the macro-financial variables from FRED-MD and FRED-QD data sets, assembled in McCracken and Ng (2016), those that have explanatory power for inflation expectations. In a second step, we regress inflation expectations on the lagged inflationary pressure index and on the controls surviving the selection procedure.[3]

We find that the inflationary pressure index affects the one-year-ahead inflation expectations of both consumers and professional forecasters. A higher index results in an increase in expectations. In particular, a one-standard deviation increase in the index—that is, fifty more times mentioning a surge in inflation, results in an increase of 0.09 percentage points for households and 0.08 for professional forecasters. The effect is quantitatively larger and more significant in the second half of the sample that starts with the Great Financial Crisis. This finding suggests larger Delphic effects in FOMC communication, since the Committee has adopted a more transparent approach when communicating policy decisions.

[2] Examples of modifier words are: below (-1), ease (-1), declin (-1), muted (-1), elevat (+1), spik (+1), climb (+1), rising (+1).

[3] An alternative approach to estimate the causal effect consists in regressing the inflationary pressure index on the confounding factors in the first step, and using the residuals from this regressions as explanatory variables for expectations in the second step. We run this exercise as a robustness check, but we note that Lloyd and Manuel (2023) show that although in population the two approaches provide the same estimated causal effect, the so-called "shock-first" approach suffers from the drawback of larger standard errors, which results in an unnecessarily more conservative inference.

In November 2007, the SEP was published for the first time at the end of an interest-setting meeting, introducing a major innovation in the FOMC communication strategy. The SEP provides policymakers' forecasts for key macroeconomic variables—growth, inflation, unemployment, and interest rates—based on their individual assessments of appropriate monetary policy. While our inflationary pressure index provides qualitative information and might reflect both current and future assessments of economic conditions, these projections are quantitative and related to specific future horizons. For this reason, we add the FOMC inflation projections from the SEP to the second step regression as a potential explanatory variable of agents' expectations. Therefore, an important contribution of our paper is that we jointly study how these two distinct forms of communication, qualitative and quantitative, affect forecasters and households' expectations. We document that the SEP regarding inflation is able to steer inflation expectations of all economic agents. As in the case of the inflationary pressure index, higher SEP projections result in higher expected inflation by households and professional forecasters. Importantly, our inflationary pressure index measure remains highly significant even when the SEP are included in the regressions.

The inflationary pressure index is designed to capture the current or expected inflation outlook of the FOMC member who delivers a speech, not necessarily a commitment to a specific policy response. In that sense, this index measures the Delphic component of a speech. As such, the positive revision of the inflation expectations of households and professional forecasters is not surprising and is perfectly in line with what theory predicts (Melosi, 2017). When the central bank and the public hold different information about inflation, policymakers' signals of rising (falling) inflation lead the private sector to revise its inflation forecasts upward (downward). However, speeches signaling high inflationary pressures may also convey how the FOMC member intends to respond. For example, they may include strong remarks underscoring a commitment to fight inflation and foreshadow an upcoming rate hike. According to the theory of Odyssean communications, such commitments can lead households or professional forecasters to revise their inflation expectations downward.

To account for Odyssean effects, we construct a *hawkishness index* for each FOMC member by analyzing the tone of all their public speeches. This index measures the frequency of terms "inflation" and "price" relative to "unemployment." A high hawkishness index captures a stronger anti-inflation preference of *all* FOMC members actively speaking in a given period.[4] When FOMC communications are dominated by dovish members—reflected in a low hawkishness index—a high inflationary pressure index sig-

[4]We construct our index under the assumption that the policy preferences of FOMC members are time-invariant. This is consistent with the findings in Istrefi (2018), which, using newspapers and financial media coverage of 130 FOMC members serving during 1960-2015, shows that the large majority of FOMC members are perceived to have had persistent policy preferences—either "inflation-fighting hawks" or "growth-promoting doves"—over time.

nals concern about inflation but may lack a clear commitment to react, typical of Delphic communication. As a result, the private sector can revise inflation expectations upward. In contrast, when hawkish members dominate—reflected in a high hawkishness index—a high inflationary pressure index may signal Odyssean communication, conveying not just concern about inflation but also, arguably, a credible commitment to counter it. As a result, inflation expectations may remain stable or even decline.

Although the hawkishness index is purged of current economic conditions, it may still capture instances where FOMC members describe their own reaction function or express personal views on inflation without committing the Committee to a specific course of action. Yet, compared to a dovish speaker, a hawk is more likely to emphasize inflation risks and discuss forceful responses—signals that, even if non-binding, may still be interpreted by the public as indicative of a tighter policy stance creating the impression—if not the reality—of a commitment to a more aggressive path. This is especially true when most FOMC members expect inflationary pressures to increase. To validate this interpretation of the hawkishness index, we show that it correlates positively with the policy stance score developed by Cieslak et al. (2023), which is based on internal FOMC transcripts and more directly reflects actual policy intent.

When we estimate the marginal effect of the hawkishness indicator on expectations, we find that as concerns about rising inflation are communicated by historically inflation-focused FOMC members ("hawks"), inflation expectations among professional forecasters decline. In contrast, household expectations remain unaffected by the type of FOMC members who convey the inflationary outlook. This suggests that professional forecasters respond to Odyssean communication—interpreting it as a signal of future policy action—whereas households do not, leaving Delphic effects as the dominant channel for the general public.

Unlike sophisticated agents, such as professional forecasters, who closely follow all forms of Fed messaging, it is less clear to what extent Fed communications register with households. Recognizing this distinction, we show that households' Delphic responses are driven by speeches delivered by regional Fed presidents. This supports the view that households are more likely to react to local news—whether through regional newspapers, television, radio, or social media—which tend to give greater prominence to speeches by the president of the local Fed district.

To make this point, we construct two inflationary pressure sub-indices: a Trinity index which includes only speeches by the Chair, the Vice-Chair and the NY Fed president, and a non-Trinity index, which instead includes only speeches by the regional presidents. This analysis is made possible by our focus on speeches—as opposed to minutes or official statements—which allows us to attribute each communication to a specific FOMC member. We find that only the inflationary pressures communicated by regional presidents affect households' expectations.

Our empirical findings regarding the estimation of the effects of Delphic and Odyssean communication echo those of Bauer and Swanson (2023a), who suggest that Odyssean communications dominate Delphic communications for sophisticated agents responding to high-frequency, financial-market-based monetary policy surprises. We show that these findings hold for professional forecasters even when monetary policy communications are measured through textual analysis of FOMC speeches. Although Bauer and Swanson (2023a) do not analyze the response of households' expectations to monetary policy surprises, we document significant Delphic reactions among less sophisticated economic agents, such as households. It is plausible that the "Fed response to news" channel is weaker for households, as they arguably tend to pay less attention or respond more slowly to national economic news.

Finally, we introduce a structural model to define the role of Delphic vs. Odyssean communication and to offer a possible explanation for why sophisticated agents seem to better understand the central bank's commitment to stabilizing inflation. This model is a stylized New Keynesian model, augmented with the assumption that information about the state of the economy is asymmetrically distributed between the central bank and the private sector. This assumption is critical to allow for potential information transfers, thereby giving rise to Delphic effects in the model. The central bank communicates the expected inflation rate to the private sector through what is known as Delphic forward guidance. Additionally, the central bank engages in Odyssean forward guidance by announcing a more hawkish reaction following an inflationary shock.

We consider two scenarios. In the first, the private sector fails to understand the Odyssean announcement and mistakenly believes that the central bank's reaction function remains unchanged. This reflects the situation of households that are not sophisticated enough to fully comprehend the strategies articulated by the central bank to combat inflationary pressures. These agents interpret an announced interest rate hike as a signal of rising inflation. In the second scenario, agents pay attention to the Odyssean announcement, arguably reflecting professional forecasters' ability to incorporate Odyssean communications—captured by the hawkishness index—into their inflation forecasts. The structural model predicts that, following an inflationary shock, unsophisticated households raise their inflation expectations, whereas sophisticated forecasters lower theirs in response to the more hawkish policy stance. This structural model with the central bank's forward guidance is novel and provides a modeling framework that can be applied to study Delphic and Odyssean effects in general equilibrium settings.

Literature review. Our paper contributes to the literature on central bank communication. Most studies have focused on transcripts and statements (see Hansen et al., 2017; Handlan, 2020; Cieslak et al., 2023; Gati and Handlan, 2023), press conferences after the FOMC meetings, such as Gorodnichenko et al. (2023), or documents that Fed staff prepare in advance of policy decisions, as in Aruoba and Drechsel (2024).

Scholars increasingly recognize that major shifts in monetary policy are often conveyed to markets through speeches that offer valuable insights into the central bank's intended stance. The literature that analyzes speeches by Fed presidents or FOMC members is limited, but fast-growing. Neuhierl and Weber (2019) document that speeches of the Fed chair or vice chair predict the slope of the yield curve. Ehrmann et al. (2021) find that voting rights affect Fed presidents' number and tone of speeches, with voting members giving more speeches. They also show that speeches move financial markets less in years in which presidents vote. Swanson (2023) and Swanson and Jayawickrema (2024) document that Fed Chair speeches are more powerful than FOMC announcements to generate fluctuations in financial markets. Gordon and Lunsford (2024) investigate how different types of Congressional testimony by the Chair of the Federal Reserve affect financial markets. Malmendier et al. (2021) use speeches to test whether FOMC members' attitude towards monetary policy can be detected in the language, or tone, they use in their speeches. Istrefi et al. (2023) check whether Fed policy actions can be explained by FOMC members' financial stability concerns, captured by a financial concern index constructed on FOMC speeches. Bertsch et al. (2025) find that Federal Reserve officials perceive financial stability as an additional policy objective. Ahrens and McMahon (2021) construct a new series of monetary policy shocks based on FOMC speeches. Altavilla et al. (2025) construct an extensive dataset for the Euro Area that, by also including policymakers' speeches, expands the number of policy events to study their effects on the transmission of monetary policy to financial markets and the real economy. In contrast to these studies, we focus on the effect of speeches on inflation expectations and consider both sophisticated and non-sophisticated agents.

The literature on the effects of central bank communication on household expectations is reviewed by Binder (2017). Part of the literature on this topic relies on randomized control trials (RCT) in surveys to identify the causal effects of central bank communication on agents' beliefs (see Candia et al., 2020; Coibion et al., 2023; Weber et al., 2025). This amounts to providing the survey respondents with some information, e.g., statements, projections, or central bank target, and studying the inflation revisions due to this information. However, these studies assume that all "treated" subjects receive the message, which might not be the case in a real-world setting, as in Blinder et al. (2024). As a contribution to this literature, we show that economic agents are indeed listening, adding to the results in Ehrmann and Wabitsch (2022). Moreover, we document that they adjust their expectations in the direction suggested by the Fed inflationary pressure index and projections. Our findings complement those in Coibion et al. (2022), which conduct a large RCT on US households to gauge the effects of information on the current or FOMC's expected rate of inflation, the Fed monetary policy objective, and the latest FOMC policy decision. We differ from this study in several dimensions. First, we study the effect of communication over a long sample, which allows us to detect changes in the effectiveness of the communication strategy over time. Second, we focus on FOMC speeches, rather than statements. Third, we consider different types of agents. Fourth, we are able to isolate the effects of the speakers' policy preferences on agents' expectations.

RCT experiments assume that the information reaches agents. How can central banks deliver their message to the intended receiver? Sophisticated agents are well known to pay attention to central bank communications, as shown in Blinder (2018), whereas the general public is unlikely to be informed about monetary policy directly from the source. In fact, Gardt et al. (2021) suggest that households receive information about central banks through intermediate channels such as television, printed press, online press, and radio (see Munday and Brookes, 2021; ter Ellen et al., 2022). Adding to these studies, we provide anecdotal evidence that media coverage of FOMC members increases when they give speeches, as the number of articles mentioning a specific FOMC member spikes in the week in which the FOMC member gives a speech.

The remainder of this paper is organized as follows. Section 2 presents the speeches, the inflationary pressure index, the survey data, and the macro data. Section 3 describes the empirical modeling framework and shows the main results. The effect of the hawkishness of the FOMC speakers on expectations is discussed in Section 4. Section 5 presents some robustness checks for our baseline results. The theoretical model is introduced and discussed in Section 6. In Section 7 we present our conclusions.

2 Data and measurement

In this section, we describe the corpus of Fed speeches and how we construct the inflationary pressure index from these documents. We also describe the expectations data and our set of macroeconomic controls.

2.1 Speeches and Inflationary Pressure Index

A first contribution of this paper is the creation of a database of FOMC speeches.[5] We collect speeches by FOMC members and regional Fed presidents, which we downloaded from the websites of the Fed Board and the regional Federal Reserve Banks.[6] The FOMC consists of twelve voting members. The first seven members belong to the Board of Governors of the Fed System, including the Chair. The eighth permanent member is the president of the Federal Reserve Bank of New York. The remaining four voting members

[5]The full corpus of speeches is available at: `www.vegardlarsen.com/FOMC_speeches_for_GLMM.csv`

[6]Several speeches were available only as video recordings or PDF documents. We converted all speeches into raw text using appropriate extraction and transcription tools, enabling their inclusion in textual analysis.

Identifiers	Additive Modifiers (+1)	Subtractive Modifiers (−1)
inflat, price	boost, climb, intensify, jump, elevat, escalate, expand, foster, height, high, increas, persist, pressure, _rise, _rising, rose, soar, solid, spik, surg, sustain, strong, strength, upward, _up_, upside_risk	below, collaps, damp, drop, _ease_, easing, declin, deteriorate, diminish, down, _low, modest, moderated, muted, reduction, restrain, set_back, slow, _soft, subdued, weak, fall, plummet, retreat

Table 1. Identifier and modifier terms for constructing the inflationary pressure index. An underscore represents a required space.

are chosen from the rotating pool of the other eleven Reserve Bank presidents, who serve one-year terms. Non-voting Reserve Bank presidents attend FOMC meetings.

Our sample includes all seven Governors and twelve regional presidents, regardless of their voting status. In a year with all seats filled, we would have 19 potential speakers. We collect speeches from January 1995 to December 2024, resulting in a total of 76 speaker-entries and 5,134 speeches.[7] To construct our measure of inflationary pressures conveyed in the FOMC speeches, we first split each speech into sentences and remove all numerical data. We then select the subset of sentences that contain either the root "inflat" or "price." Because we rely on string matching, this search captures words like "inflationary" or "prices". This procedure yields a total of 79,055 sentences on inflation.

The inflationary pressure index is calculated using a scored dictionary based on our reading of multiple FOMC speeches. The dictionary consists of additive (+1) and subtractive (-1) modifier terms that are applied to each inflation-related sentence. Each sentence is assigned a score equal to the sum of these modifiers. Table 1 lists the identifier and modifier terms used to construct the index.

We aim to exclude backward-looking statements from our measure, as our primary focus is on communication related to the present assessment and future outlook of economic developments, which we consider essential for influencing expectations. To systematically identify backward-looking content, we classify each sentence into one of three temporal categories: past, present, or future. This classification is performed using a large language model (LLM) in a few-shot learning setting (see, for example, Brown et al., 2020), specifically employing Gemma 3 (Team Gemma, 2025). Additional details on the temporal classification procedure are provided in Appendix A.[8]

We construct a daily index by summing the scores of sentences identified as containing present- or future-oriented information within each day. If multiple speeches occur on the same day, their scores are aggregated. Subsequently, the daily index is converted into monthly and quarterly indices by summation. Finally, we standardize the resulting series

[7] The total number of distinct individuals is 74, but Janet Yellen and John Williams are counted twice because they served in different FOMC roles, resulting in 76 speaker-entries.

[8] All sentences about inflation, their corresponding classifications, and the reasoning provided by the LLM via Chain-of-Thought are available at www.vegardlarsen.com/sentences_classified_GLMM.csv.

by subtracting its mean and dividing by its standard deviation, calculated over the entire sample period. Appendix B provides examples of sentences from several speeches and highlights the identified terms and modifiers within these sentences.

How do we interpret our inflationary pressure measure? It captures the strength of the inflationary pressures communicated by the speaker. It conveys whether inflation is high or low in absolute terms such that a higher level of the index reflects higher current or expected inflationary pressures.[9] The index does not express an assessment of whether the inflation outlook is good or bad—that is, inflation is close to target or under/overshooting the target. For example, in an environment of inflation well below the target, communication about higher inflationary pressures could be perceived as a good outlook, while higher inflationary pressures in an environment of high inflation would represent a bad outlook for inflation. For this reason, we do not include in our modifiers words such as *improv*, which was instead included in the dictionary of Gardner et al. (2022) to characterize the general economic outlook of FOMC statements.

The monthly series is shown in Figure 1, together with the monthly year-over-year inflation for the consumer price index (CPI), all items. Our measure positively co-moves with actual inflation, although the former seems less persistent. The index peaks in the fall of 2005, just as energy prices increase due to energy supply shocks such as Hurricane Katrina. The index spikes again in July 2008, when we also observe an increase in the CPI driven by a surge in food prices. CPI inflation and our inflationary pressure index diverge in 2009, when inflation falls into negative territory, while our measure climbs. A combination of high growth in food and gasoline prices coincides with a high inflationary pressure index in April and May 2011. The indicator then slowly decreases and declines sharply in December 2015, as inflation remains persistently low. Lastly, the index has increased substantially since May 2021, peaking in September 2022, consistent with the rise in CPI inflation.

Table 2 corroborates that our indicator captures both current economic conditions and expected short-term dynamics of inflation. Our index is positively correlated with contemporaneous measures of inflation, in particular with CPI all items and personal consumption expenditure (PCE) and to a lesser extent with oil prices. Importantly, the inflationary pressure index is positively correlated with the FOMC economic projections for the one-year ahead PCE inflation. Figure 2 confirms that, except for the first couple of years in our sample, the inflationary pressure index and the FOMC projections move closely together. We take this as crucial validation that the inflationary pressure index can be regarded as a proxy for Delphic communication—that is, the part of FOMC communications referring to the inflation forecast.

[9] A positive value represents how many standard deviations the index is above average.

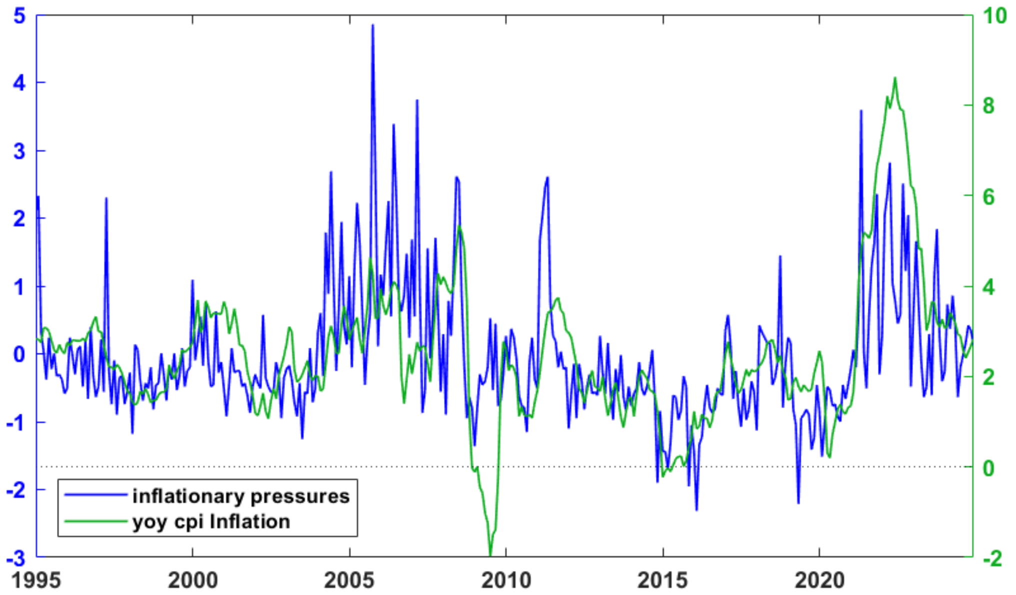

Figure 1. The monthly inflationary pressure index (left vertical axis) and year over year CPI all items inflation (right vertical axis) over the sample 1995M1 - 2024M12. The monthly index is the monthly sum of the daily inflationary pressure index, standardized to have mean zero and standard deviation of one.

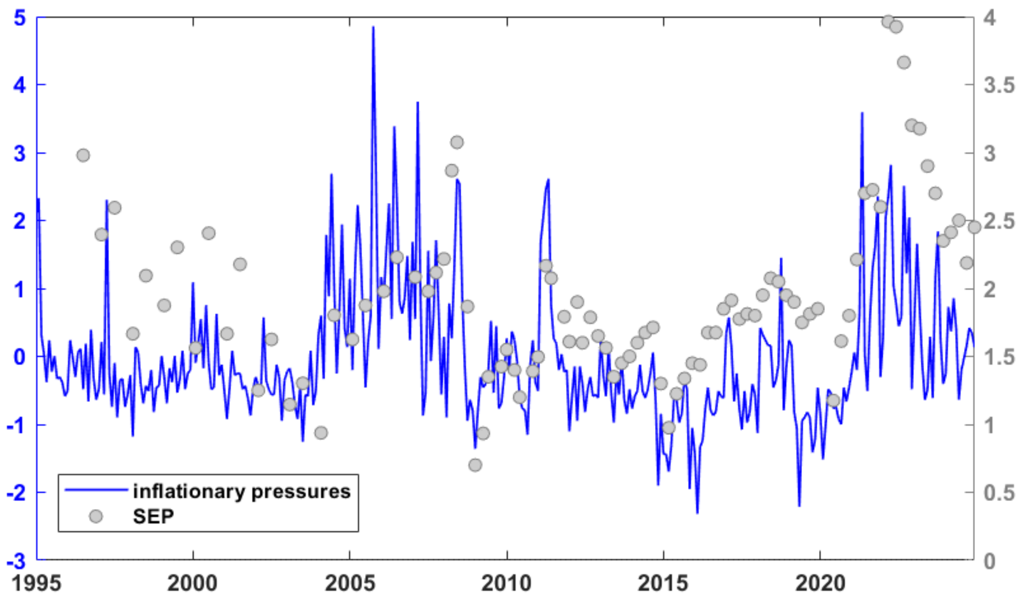

Figure 2. The monthly inflationary pressure index (left vertical axis) and FOMC projections (right vertical axis) over the sample 1995M1 - 2024M12. The monthly index is the monthly sum of the daily inflationary pressure index, standardized to have mean zero and standard deviation of one.

2.2 Macroeconomic Forecasts

Households' expectations of future inflation crucially affect their economic decisions regarding consumption and saving (Coibion et al., 2022), housing tenure and mortgage uptake (Malmendier and Nagel, 2016; Botsch and Malmendier, 2020), stock market par-

	Correlations: Monthly Variables			
	CPI: All Items	PCE	Oil Prices	SEP
IPI	0.52	0.54	0.42	0.56
CPI-All Items	1	0.98	0.62	0.85
PCE		1	0.62	0.83
Oil Prices			1	0.41

Table 2. Contemporaneous correlation across monthly indices and variables over the sample 1995M1-2024M12. The oil price series is the West Texas Intermediate (WTI) - Cushing, Oklahoma. SEP refers to the one year ahead PCE inflation forecasts from the Summary of Economic Projections of the Federal Reserve Board members and Federal Reserve Bank presidents.

ticipation (Das et al., 2020), labor supply and wage bargaining. We study inflation expectations of households from the Michigan Survey of Consumers (MSC), which is designed to be representative of the U.S. population and samples a minimum of 500 members from the general public each month. We take the inflation forecast as the median response to the question about price increases. The exact question is "*By about what percent do you expect prices to go (up/down) on the average, during the next 12 months?*". The Michigan Consumer Survey is one of the most commonly used U.S. surveys in the literature (see, for example, Weber et al., 2022) and is the longest time series of consumers' expectations available for the United States. The length of the Michigan Survey allows us to study the impact of the Fed inflation pressure on household expectations over a longer sample and over sub-samples. The interviews are conducted throughout the month, with starting and ending dates scheduled on irregular dates. The fieldwork starts up to eight days before the beginning of the reference month and ends between five days and two weeks before the month's end. Therefore, we assume households are affected by speeches given the month before the reference month.

Expectations from professional forecasters are important for monetary policy, as they are often used, for example, to estimate the slope of the Phillips Curve (Ball and Sandeep, 2019), to increase the accuracy of empirical forecasting models (Gergely and Odendahl, 2021), or to improve the fit of structural models (Del Negro et al., 2015). As a measure of professional inflation forecasts, we use the one year ahead annual median headline CPI inflation rate from the Survey of Professional Forecasters (SPF), which covers professional forecasters in a variety of institutions. The survey is available at the quarterly frequency and is calculated as the geometric average of the quarter-over-quarter median forecasts for CPI inflation. The deadline for the response is set on the second to third week of the middle month of each quarter. Therefore, we assume that forecasters have access to the speeches from the first month of the quarter when the forecasts are made.

The Fed conveys the forecasts of economic conditions of the FOMC members through the Summary of Economic Projections (SEP), which are the economic projections of the Board members and regional presidents. They reflect the individual members' assumptions of future developments and are conditional on "appropriate" monetary policy. While the inflationary pressure index we construct might capture both current and future assessments of economic conditions and statements in speeches are mostly qualitative, the projections are quantitative and related to specific short and long term future horizons. Therefore, we include them in the regression as potential explanatory variables of agents' expectations. This allows us to determine the relative effectiveness of different communication channels in managing expectations. The FOMC forecasts have been published in March, June, September, and December since June 2012 but irregularly in the earlier part of our sample, until 2007. Inflation projections of the Fed Governors and Reserve Bank Presidents from July 1996 until September 2007 are obtained from the Monetary Policy Reports to the Congress, available in the months of July and February.[10] We consider the simple average of the lower and upper central tendency for PCE inflation. The projections are made for a fixed date (e.g. current year and next year) rather than a fixed horizon (e.g. four quarters ahead). Following Dovern et al. (2012), we transition from fixed date to fixed horizon by taking the weighted average of the current and next calendar years, where the weights are given by the share of the forecast horizon at the forecast origin.

2.3 Macro data

Expectations of economic agents as well as the content and tone of the FOMC speeches could be simultaneously driven by recent economic developments. If so, regressing expectations on the inflationary pressure index alone might wrongly lead us to conclude that the index affects expectations. To address this potential issue, we control for past information using a large set of lagged macro-financial variables extracted from the collection of monthly series assembled in McCracken and Ng (2016). They provide downloadable monthly and quarterly macroeconomic datasets for the United States (FRED-MD and FRED-QD), consisting of 127 and 245 time series, respectively, which cover all the main macroeconomic aggregates and a number of financial indicators. The dataset is extensively used in the forecasting literature (see, for example, Granziera and Sekphosyan, 2019) and includes series that capture output, income, labor market, housing, consumption, orders, money, credit, interest and exchange rates, consumer and producer prices, energy prices, and asset prices. The series are made stationary by taking first-order differences. In particular, we use year-over-year log-difference, i.e. $\log(x_t) - \log(x_{t-h})$ where $h = 12$ for the regressions involving the MSC and $h = 4$ in the regressions for the SPF expectations. Therefore, we control for year-over-year inflation of the CPI all items as well as several sub-components of inflation. This is important as it has been documented, for example, in Weber et al. (2022) and D'Acunto et al. (2021), that agents' beliefs about recent inflation are accurate predictors of expectations about future inflation.

[10]For the years 1996-1999 we use projections for CPI inflation, as projections for PCE inflation are not available.

As an additional control, we consider the news sentiment index proposed by Shapiro et al. (2022). This is a daily measure of economic sentiment based on textual analysis of economics-related news articles from U.S.-based newspapers. Because this index has been shown to help predict survey-based measures of sentiment such as the Michigan Consumer Sentiment Index (MCSI) and/or the Conference Board's Consumer Confidence Index (CBCI), it might also be correlated with survey-based measures of inflation expectations.

3 Inflationary Pressure Index and Delphic Effects

In this section, we discuss our methodological approach and show how the inflationary pressure index affects the inflation expectations of households and professional forecasters.

3.1 Methodology

To characterize how the inflationary pressure index (IPI) affects expectations, for each set of agents, we project the one-year ahead inflation expectation onto the inflationary pressure index:

$$E_t\pi_{t+h} = \alpha + \beta\,\mathrm{IPI}_{t-1} + \gamma' X_{t-1} + u_t, \qquad \text{(Model 1)}$$

where $E_t\pi_{t+h}$ is the expected inflation rate between the current period and h periods ahead, where h equals 12 for the Michigan Survey of Consumers (MSC) monthly forecasts and equals 4 for the Survey of Professional Forecasters (SPF) quarterly forecasts, as introduced in Section 2.2. IPI_{t-1} is the inflationary pressure index introduced in Section 2.1, X_{t-1} is a set of controls discussed below, and u_t is a normally distributed i.i.d. error term. We will refer to this specification as Model 1.

In a second specification (henceforth, Model 2) we also control for the FOMC's quantitative inflation forecasts, which include the Economic Projections from the Monetary Policy Reports to the Congress and the SEP, as described in Section 2.2:

$$E_t\pi_{t+h} = \alpha + \beta\,\mathrm{IPI}_{t-1} + \delta\,\mathrm{SEP}_{t-1} + \gamma' X_{t-1} + u_t. \qquad \text{(Model 2)}$$

This specification allows us to jointly analyze how the two distinct forms of communication, quantitative and qualitative, affect inflation expectations.

In both Models 1 and 2, the timing of the inflationary pressure index is consistent with the information set available to the agents when the forecasts are made and differs between the monthly and quarterly regressions. In the regressions at the monthly frequency for the MSC, the inflationary pressure index enters the regression with a one period lag, as agents who make forecasts and complete the survey in month t have information available up to (at most) time $t-1$. In the regressions at the quarterly frequency for the SPF, we use the inflationary pressure index from the first month of the quarter, as agents who complete the survey in the middle of a quarter t have information available up to (at most) the end of the first month in quarter t. For the control variables, we use the lagged values to take into account the publication lags of most series, so that in month/quarter t agents observe the value of the series up to month/quarter $t-1$. In Model 2 we include the lag of the SEP so that agents observe the latest release of the projections. For example, in the month of July, households observe the SEP released in June, and professional forecasters, whose forecasts are collected in July, observe the SEP released in Quarter 2 (end of June).[11]

Our objective is to estimate the causal effect of the inflationary pressure on expectations. Clearly, several macroeconomic variables might simultaneously drive our inflationary pressure index and inflation expectations. Not taking into account this issue could hinder the identification of the causal effect. The literature has taken two approaches to solve this problem. The first is to include confounding factors as control variables in the regression analysis. The second one, called "shock-first" approach, consists in orthogonalizing the causal variable of interest and then using the shock as a regressor. In our setting, this would mean regressing the inflationary pressure index on the set of confounding variables and then projecting inflation expectations onto the residuals from the first regression. Although the second approach has become quite popular, Lloyd and Manuel (2023) show that the standard errors in this method will typically be misestimated, in particular they will be larger than in the first approach, resulting in more conservative inference. For this reason, we resort to the first approach and include the relevant confounding factors as predictors. For completeness, we report the results for the shock-first procedure as a robustness check in Appendix D.2.

The number of potential confounding factors X_{t-1} is quite large. To retain parsimony while remaining agnostic on which controls might be relevant, we perform the analysis in two steps. First, we regress the expectations on all the macro-financial variables included in McCracken and Ng (2016) using the Least Absolute Shrinkage and Selection Operator (LASSO). We target the tuning parameter in the LASSO estimator such that the LASSO procedure selects a number of variables equal to about 10% of the number of observations, to ensure enough degrees of freedom. Second, the surviving regressors are collected in X_{t-1} and are used as controls in Models 1 and 2. LASSO is a regression analysis method that performs variable selection and thereby favors parsimonious models. Therefore, it allows us to exclude unimportant variables from the regression. The two-step procedure has been suggested by Belloni and Chernozhukov (2013), who show that the estimated coefficients from the OLS regression post-LASSO exhibit a smaller bias than the coefficients estimated from a one-step LASSO regression. Importantly, this holds even if the OLS post-LASSO model is misspecified—that is, it does not include some of the explanatory variables of the "true" regression model.

[11]Note that in this regression model we drop observations for which SEP projections were not released in the previous period.

Michigan Survey of Consumers	PPI by Commodity: Final Demand: Finished Goods CPI: Commodities PCE PCE: Durable goods
Survey of Professional Forecasters	Capacity Utilization: Manufacturing CPI : All Items Less Food and Energy Real Revolving Credit Owned and Securitized

Table 3. Variables selected from the LASSO estimation of expectations on the variables included in the FRED-MD and FRED-QD dataset and the news sentiment index by Shapiro et al. (2022) over the sample 1995M1-2024M12.

3.2 Baseline Results

The variables selected in the first step of our analysis through the LASSO estimation are listed in Table 3. Households' expectations are affected by commodity prices and the prices of durable goods, consistent with the findings of previous studies, such as Coibion and Gorodnichenko (2015), Binder (2018), and Coibion et al. (2022). Professional forecasters are more sophisticated. Their expectations correlate significantly not only with past inflation but also with capacity utilization, consistent with them relying on a Phillips curve type relationship between inflation and labor market conditions to make their forecasts. Interestingly, they look at a measure of underlying inflation, CPI all items less food, rather than more volatile measures of changes in prices.

In the first step, we select the series that are most important in explaining inflation expectations. Next, we regress expectations on these controls and on the "soft" and "hard" information provided by the Fed—that is, the inflationary pressure index and the FOMC projections, respectively. Table 4 reports the results of our baseline regressions for both types of agents. In Model 1, the coefficient for the inflationary pressure index is statistically significant for both households and professional forecasters. The coefficient is positive, suggesting that a higher inflationary pressure index, which signals higher inflation, translates into higher one year ahead inflation expectations. A one standard deviation increase in the index, which corresponds to an inflationary index score higher by fifty points, increases inflation expectations of households by 0.09 percentage points and of professional forecasters by 0.08 percentage points. To understand the magnitude of the impulse, note that an increase by fifty points in the index score means that the pair "increasing prices" or "raising inflation", for example, is included fifty more times over all the speeches given by FOMC members in a month.

When we add the FOMC projections to the set of explanatory variables in Model 2, the inflationary pressure index retains its significance and magnitude.[12] This result underscores the unique informational role of speeches: soft information conveyed through speeches has additional influence beyond that of quantitative information. The coefficient

[12]Note that including the SEP projections as regressors substantially reduces the sample size, especially for the household regression.

	Michigan Survey of Consumers		Survey of Professional Forecasters	
	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.09**	0.20***	0.08***	0.08***
	(0.04)	(0.07)	(0.03)	(0.02)
SEP_{t-1}		0.15		0.20***
		(0.13)		(0.07)
R-Squared	0.66	0.74	0.79	0.86
Observations	359	91	120	86

Table 4. Baseline regressions. The dependent variables are the one year ahead expectation (median) of percentage price changes from the MSC, and the one year ahead expectation (median) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, and controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The series includes inflation projections of the Fed Governors and Reserve Bank Presidents from the Monetary Policy Reports to the Congress up to July 2007 and the Summary of Economic Projections afterwards. The tuning parameters for the LASSO regressions are 0.005 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

associated with the FOMC projections is positive, once again suggesting that signaling future high inflation increases inflation expectations, and is highly significant for sophisticated agents. The magnitude of the coefficient is such that a one percentage point higher projected inflation by FOMC members increases one year ahead inflation expectations of professional forecasters by 0.20 percentage points.

We interpret this first set of results as consistent with a Delphic effect of central bank communication.[13] The inflationary pressure index is designed to reflect the current or expected inflation of the FOMC member who made the speech. In that sense, this index measures the Delphic component of a speech. Since we do not control for the monetary policy response conveyed in FOMC speeches, in our regression we tried to isolate the Delphic effects of communicating the FOMC forecasts to households and professional forecasters. Indeed, we find that Delphic effects are significant and households and professional forecasters adjust their inflation expectations in the direction signaled by the FOMC's speeches. Are Delphic effects strong enough to remain significant even when we take into account the Odyssean effects of the speeches—namely, the FOMC communications regarding the policy response? We will turn to this important question later in the paper.

The Fed's communication strategy has changed substantially over time in an effort to become more transparent. For example, starting in November 2007, the economic projections of FOMC meeting participants have been consistently released to the public close to the monetary policy decision meetings, whereas they were published only twice a

[13] Identification of Delphic effects in VAR models is an active area of research (see, for example, Miranda-Agrippino and Ricco, 2021; Jarociński and Karadi, 2020).

	Michigan Survey of Consumers				Survey of Professional Forecasters			
	1995:M1-2007:M12		2008:M1-2024:M12		1995:Q1-2007:Q4		2008:Q1-2024:Q4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.03	0.20***	0.25***	0.26***	0.06*	0.05**	0.11***	0.07***
	(0.04)	(0.06)	(0.05)	(0.07)	(0.03)	(0.02)	(0.03)	(0.03)
SEP_{t-1}		-0.13		0.36*		0.06		0.20***
		(0.10)		(0.21)		(0.10)		(0.08)
R-Squared	0.50	0.60	0.78	0.81	0.76	0.67	0.87	0.90
Observations	155	24	204	67	52	23	68	63

Table 5. Sub-sample analysis. The dependent variables are the one year ahead expectation (median) of percentage price changes from the MSC, and the one year ahead expectation (median) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, and controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The series includes inflation projections of the Fed Governors and Reserve Bank Presidents from the Monetary Policy Reports to the Congress up to July 2007 and the Summary of Economic Projections afterwards. The tuning parameters for the LASSO regressions are 0.005 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

year in the Monetary Policy Reports to the Congress before then. Therefore, the ability of the Fed to affect expectations could differ over the sample. For this reason, we repeat our analysis over two sub-samples: one that runs from 1995 to 2007 and a second one from 2008 to 2024. The sub-sample results in Table 5 show a striking difference in the magnitude and significance of the coefficients associated with both the inflationary pressure index and the FOMC projections. After the Great Financial Crisis, the FOMC's ability to affect households and professional forecasters' expectations has increased substantially, almost doubling. Has this higher influence led to better forecasts? Although inflation has become more volatile in the second sample, the relative forecast accuracy of both households and professional forecasters has increased, compared to a simple average forecast, as seen in Table 13, Appendix D. The relative improvement is greater for households.

We assess the robustness of our baseline results along several dimensions: shock first approach to estimate the causal effect of the inflationary pressure index on expectations, principal components as the shrinkage method, treatment of outliers, other variations in model specification and alternative data sources for household expectations. We find that our baseline results survive these checks documented in Section 5.

3.3 Discussion

We acknowledge that identifying causal effects of central bank communication on expectations is particularly difficult outside the context of RCT experiments such as those conducted in Coibion et al. (2022) and Weber et al. (2025). In this subsection, we discuss the main challenges related to omitted variables and endogeneity and our solutions to mitigate concerns related to these issues.

First, one could argue that our baseline regressions do not include as controls all the confounding factors that affect both inflation expectations and the inflationary pressure index. In our baseline, we include a wide range of LASSO-selected controls. An alternative approach is the “shock-first” approach discussed in Section 3.1. In this exercise, we first regress the inflationary pressure index on all possible confounders, that is, the controls described in Section 2.3, and obtain the residual u_t^S. This residual represents exogenous variation in the inflationary pressure index unexplained by contemporaneous macro and financial variables. Then, we project the one-year inflation expectations on the orthogonalized shock u_{t-1}^S.

Our main assumption here is that the controls we consider include all the relevant information that is common to Fed officials when making their speeches and agents when making their forecasts. Because of the large number of series considered and the breadth of information they convey, we believe that this assumption is reasonable. Consistent with the theoretical predictions in Lloyd and Manuel (2023), in Table 14 we find that the estimated coefficients are similar to the baseline results in Table 4, but the standard errors are much larger, resulting in fewer coefficients that are statistically significantly different from zero.

A related concern might be that our controls enter the regression with a lag, while agents' expectations and Fed officials' assessment of the economic outlook are influenced by the latest economic news. Such news may be incorporated in the speeches and in the expectations, but not properly accounted for in our regressions. Bauer and Swanson (2023b) document the existence of a Fed “response to news” channel in the context of monetary policy surprises and show that both the Fed and professional forecasters react to economic news released in the days leading up to an FOMC announcement.

Our regressions are consistent with the information set available to the agents when making their forecasts and the Fed officials when writing their speeches, since the majority of macroeconomic variables are available with a publication lag. However, to ease remaining concerns, we estimate our baseline regression Models 1 and 2 using the contemporaneous values of the controls, rather than the lagged ones to account for the effect of news releases on expectations, while keeping the lagged timing for the inflationary pressure index. Therefore, we assume that when forming their inflation expectations at time t, agents know the realized values of the controls for time t, but only consider speeches up to $t-1$.

Table 6 shows that our results are unchanged. In fact, while Bauer and Swanson (2023b) document that the information effect of FOMC *announcements* disappears when controlling for macroeconomic news, they acknowledge that this might not be the case for other forms of communication, particularly speeches.

Speeches by Fed officials are not delivered in a vacuum. The decision to give a speech,

Michigan Survey of Consumers						
	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.11**	0.24***	0.06	0.19***	0.23***	0.27***
	(0.04)	(0.07)	(0.04)	(0.04)	(0.06)	(0.09)
SEP_{t-1}		0.17		-0.11		0.37
		(0.14)		(0.08)		(0.25)
R-Squared	0.66	0.74	0.51	0.70	0.73	0.76
Observations	359	91	155	24	204	67
Survey of Professional Forecasters						
	1995:Q1-2024:Q4		1995:Q1-2007:Q4		2008:Q1-2024:Q4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.05**	0.06***	0.01	0.07*	0.09***	0.06***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
SEP_{t-1}		0.20***		0.12		0.20***
		(0.06)		(0.09)		(0.07)
R-Squared	0.82	0.87	0.78	0.67	0.89	0.90
Observations	120	86	52	23	68	63

Table 6. Contemporaneous controls. The dependent variables are the one year ahead expectation (median) of percentage price changes from the MSC and the one year ahead expectation (median) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, and controls X_t selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_t, with Z_t the contemporaneous predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The series includes inflation projections of the Fed Governors and Reserve Bank Presidents from the Monetary Policy Reports to the Congress up to July 2007 and the Summary of Economic Projections afterwards. The tuning parameters for the LASSO regressions are: 0.005 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

its timing and its specific content might be influenced by factors that also directly affect future economic conditions and private sector expectations. However, note that speeches are scheduled several months in advance or are periodical, such as the testimonies of the Federal Reserve Chair to the U.S. House of Representatives. Moreover, there is no indication that higher inflation would lead FOMC members to give more or less speeches: the contemporaneous correlation between the number of speeches and inflation is -0.03 at the quarterly frequency over the sample 1995Q1-2024Q4.

Our results suggest that inflation expectations respond to central bank communication, although the magnitude of the response varies between agents. In addition, we find significant evidence of a Delphic effect. In the next section, we introduce a novel semantic-based measure to capture the anti-inflationary tone of the FOMC member delivering the speech. This allows us to evaluate whether the tone communicated in the speech was interpreted as Odyssean communication, or whether the Delphic interpretation continues to dominate.

4 Hawkishness and Odyssean Effects

FOMC members might discuss rising inflation to signal and justify the Fed's monetary policy stance, particularly an impending interest rate hike. Economic agents might anticipate the future monetary tightening and therefore not change or even lower their expectation about future inflation, even when an FOMC member reveals rising inflationary pressures in their speech. Therefore, the perceived attitude of the FOMC speaker towards inflation might affect how agents interpret the tone of the speech and revise their inflation expectations. In this section, we test whether the Odyssean tone in FOMC speeches can overturn the prevailing Delphic effects documented in the previous section.

To account for variations in the stance towards inflation among different speakers, we compute a measure of the speaker's willingness to fight inflation—that is, of *hawkishness*. The terms hawk and dove have long been used to describe the monetary policy leanings of policymakers. The label *hawk* refers to a policymaker more concerned about the threat of inflation and *dove* to a policymaker more focused on risks to the labor market.

To construct our index, we assume that each speaker maintains their stance (hawk and dove) constant throughout their tenure. This is in line with the finding in Istrefi (2018), which documents that the vast majority of FOMC members are perceived to have persistent policy preferences over time. Similar to the inflationary pressure index, our hawkishness measure is extracted from the speeches of the FOMC members and regional presidents via textual analysis. In particular, the degree of hawkishness for speaker i, denoted as $\textit{hd-measure}_i$, is computed as follows:

$$\textit{hd-measure}_i = \frac{\text{Total occurrences of the terms ``inflation'' and ``price''}}{\text{Total occurrences of the term ``unemployment''}}$$

Here, the counts are aggregated over all speeches given by speaker i. A higher value of $\textit{hd-measure}_i$ indicates a more hawkish speaker. The rationale for our measure is that, throughout their tenure, growth-promoting speakers ("doves") should put emphasis on unemployment and labor market conditions, whereas inflation-fighting speakers ("hawks") should stress inflation and price dynamics.

To quantify the overall hawkishness of FOMC members actively speaking at a given time t, we construct a hawkishness index, denoted by HI_t. For each day, we first compute the average hawkishness from all speeches delivered on that day:

$$HI_d = N_d^{-1} \sum_{i \in \mathcal{S}_d} \textit{hd-measure}_i$$

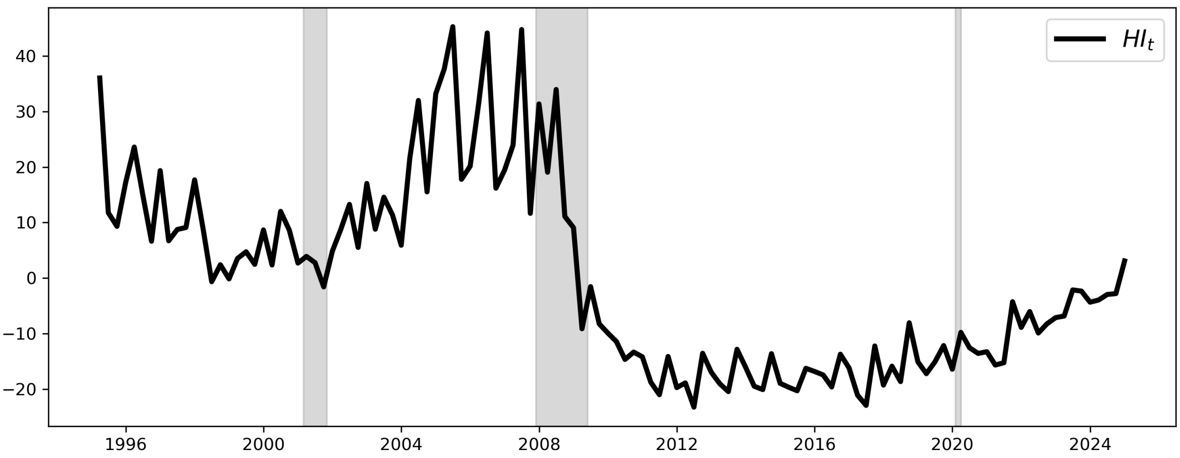

Figure 3. The hawkishness index, HI_t, of FOMC members who are active speakers over the sample 1995Q1-2024Q4. Grey areas represent NBER based Recession Indicators.

where $\mathcal{S}_d$ and N_d denote the set and the number, respectively, of all individual speeches delivered by FOMC members on day d. When converting from daily to monthly or quarterly frequency, we sum the daily averages within each month or quarter t. Formally, the monthly or quarterly index is defined as:

$$HI_t = \sum_{d \in t} HI_d$$

Note that multiple speeches from the same member within a given period contribute to HI_t. A high hawkishness index underscores that most FOMC speakers active during period t are "hawks", and thus the Fed's overall communication is perceived as predominantly conveying firmer actions on inflation. Figure 3 shows the hawkishness index HI_t, which is based on the speakers active in a particular quarter.

Although, for the purposes of our analysis, it would be enough to show that a greater number of FOMC hawks speaking about mounting inflation pressure creates even just the *perception* of a firmer monetary policy stance, there is evidence suggesting that the hawkishness index may also capture a genuine commitment to a tighter policy path.

To show this, we compare our policy preference measure against two textual measures: the hawk-dove balance computed by Hack et al. (2023) and the policy stance score in Cieslak et al. (2023). The former classifies FOMC members as hawks or doves based on human reading of media articles about all FOMC members, regardless of whether they are active speakers or not. The latter instead proxies the Fed policy stance, as it extracts the collective FOMC view regarding the direction of upcoming policy changes from transcripts of the scheduled FOMC meetings, which are released with a publication lag of five years.

These two alternative indicators exhibit considerable comovement, suggesting that (i) our hawkishness index captures changes in the general policy inclination of the entire

FOMC—not just of the preferences of the members who speak in a given month; and (*ii*) an increase in the index is associated with a broader and firmer resolve within the Committee to combat inflation.

Moreover, our index broadly co-moves with the one in Cieslak et al. (2023), as well as showing the cyclical behavior of the hawk-dove balance in Hack et al. (2023). It is high in the early part of the sample, decreases in the late 90s and early 2000s, rises again around the mid-2000s, tanked after the Great Financial Crisis, and slowly increased during the pandemic. We consider this as an important external validation of our index.

We now assess whether accounting for the Odyssean dimension of FOMC communication alters the response of inflation expectations among professional forecasters and households. To do so, we first define the dummy variable HID_t, which takes the value of one if the index HI_t is larger than its historical mean up to time t:

$$HID_t = \mathbb{1}(HI_t > \overline{HI_t})$$

where $\overline{HI_t}$ is the real-time mean. In this way, we capture instances in which the Fed is communicating a preferred policy response stronger than its average response. Because we use only past values of the hawkishness index to construct the mean of the hawkishness indicator, we make sure to use only information available in real time to households and professional forecasters.

Then we interact this hawkishness dummy with our inflationary pressure index and include it as an additional regressor in Models 1 and 2. The interaction term tells us by how much expectations change in response to changes in the inflationary pressure index when the hawkishness attitude of the speakers is high. Including the hawkishness leaning of the speakers as a dummy variable allows us to compare the magnitude of the coefficients associated with the inflationary pressure index and the interaction term. The objects of interest are the individual coefficients, which can be seen as the effects of Delphic and Odyssean communication, and their sum, which provides the overall effect of the Fed communication about inflation on expectations.

The results of these regressions are presented in Table 7. Introducing the interaction term does not alter the sign of the coefficient associated with the inflationary pressure index; instead, its magnitude increases for both households and professional forecasters. For households, the sign of the coefficient on the interaction term varies between positive and negative depending on the model specification, and the coefficient remains statistically insignificant.

One possible explanation for the variation across specifications is that including the SEP projections results in several observations being dropped from the sample. For professional forecasters, the coefficient on the interaction term is negative, statistically significant, and similar in magnitude between specifications. In addition, it offsets the

	Michigan Survey of Consumers		Survey of Professional Forecasters	
	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.13**	0.19**	0.15***	0.12***
	(0.06)	(0.08)	(0.03)	(0.03)
$\text{HID}_{\text{t-1}}{*}\text{IPI}_{t-1}$	-0.08	0.04	−0.14***	−0.09***
	(0.08)	(0.14)	(0.05)	(0.04)
SEP_{t-1}		0.16		0.17***
		(0.13)		(0.06)
R-Squared	0.66	0.74	0.81	0.87
Observations	359	91	120	86

Table 7. Hawkishness. The dependent variables are the one year ahead expectations (median) of percentage price changes from the MSC and the one year ahead expectation (median) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, the interaction term between the IPI index and the hawkishness dummy $HID_{\text{t-1}}$, and controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The series includes inflation projections of the Fed Governors and Reserve Bank Presidents from the Monetary Policy Reports to the Congress up to July 2007 and the Summary of Economic Projections afterwards. The tuning parameters for the LASSO regressions are 0.005 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

coefficient associated with the inflationary pressure index.

These findings suggest that high inflationary pressures, when communicated by hawkish speakers, do not substantially raise expectations of professional forecasters, but raise those of households. In other words, professional forecasters adjust their expectations in response to Odyssean communications, whereas households do not, leaving Delphic effects dominant. This differential response may stem from the fact that professional forecasters—being Fed watchers—are well aware of the individual preferences of the FOMC members delivering the speech. As a result, they are more inclined to interpret warnings of looming inflationary pressures from a hawkish member as a signal that the speaker will advocate raising interest rates, in contrast to a similarly toned speech by a dovish member. This expected monetary tightening will likely lower or stabilize inflation expectations.

5 Robustness and Extensions

We extend and test the robustness of our results in several dimensions, including model specification, shrinkage methodologies for control variables, the treatment of outliers, variations in the set of keywords for the inflationary pressure index, and alternative data sources for household expectations.

So far, we have assumed that speeches have an almost contemporaneous effect on expectations. For robustness, we allow for a prolonged effect by including one additional lag of the inflationary pressure index as a regressor. We also include an additional lag of the explanatory variables in the LASSO regressions that select the control variables. Table 15 in Appendix D shows that the inclusion of the lags does not change the estimated coefficients for the inflationary pressure index or the SEP. Moreover, the coefficient associated with the lagged IPI is close to zero and not statistically significant for respondents of both surveys.

In our baseline regressions, we select individual control variables using the LASSO approach. This allows us to (i) identify the specific series that are more important in affecting inflation expectations, and (ii) give an economic interpretation of our controls and compare with previous findings in the literature on the determinants of inflation expectations. As an alternative to LASSO, in the following robustness assessment, we reduce the dimensionality of the control variables by shrinking the information set with principal components. Therefore, we run the following regression model:

$$E_t\pi_{t+h} = \alpha + \beta\,\text{IPI}_{t-1} + \delta' P_{t-1} + u_t,$$

where P_{t-1} is a vector that collects the first K principal components extracted from the control variables X_{t-1}. Principal component analysis is an alternative way to deal with parameter proliferation and reduce the number of regressors. The results for this exercise are shown in Table 16 in Appendix D for a specification that includes the first three principal components. Again, we find that the inflationary pressure index positively affects inflation expectations and the magnitude of the coefficients is virtually unchanged.

The inflationary pressure index shows some large spikes throughout the sample. Therefore, one might be concerned that these outliers bias the estimates of the coefficient β associated with the inflationary pressure index in regression Models 1 and 2. To ease this concern, we repeat the analysis but drop the top 5 percent of observations with the largest deviation from the mean. These turn out to be all observations with positive values. Our baseline results are robust to this additional exercise, as shown in Table 17 in Appendix D.

In our baseline analysis, we use the median one year ahead inflation expectation as it is more robust to outliers. For completeness, we repeat our analysis using the mean one year ahead inflation expectations, instead of the median. We report the results in Table 18 in Appendix D. We also consider other percentiles of the distribution, specifically the 25th and 75th, and report the results in Table 19 and 20 in Appendix D. Again, the results are very similar to the baseline, though the magnitude of the coefficient associated with the inflationary pressure index is even greater for households in the second sample than in the baseline regression for the mean and 75th percentile regressions.

Next, we consider two modifications of our index. First, we extract an alternative inflationary pressure index where the word “deflation” is added to the list of identifiers in Table 1 in Appendix D. This word is used much less frequently than “inflation” and “prices”, with an average monthly word count of 3 versus 176. When computing the revised inflationary pressure index, the additional identifier receives a score of minus one.

Our baseline index focuses on sentences on current or future prices. To the extent that past inflation is important in determining future inflation or that agents—households in particular—are not very well informed about macroeconomic conditions, descriptive reporting of past inflation could be important in determining expectations about future inflation. Therefore, as a second modification, we consider an alternative version of the inflationary pressure index not purged from backward-looking statements. Tables 21 and 22 in Appendix D show that our baseline results are not affected by either of the two modifications of the index.

As a final robustness check, we rerun our analysis using household expectations collected from an alternative monthly survey, the NY Fed Survey of Consumer Expectations (SCE). The SCE is an online survey of approximately 1,300 households, more than twice the number of households interviewed in the MSC. This survey asks about expected inflation, rather than changes in prices, at the one and three years ahead horizons. We do not use this survey as our baseline due to its limited sample size, as the survey was first run in January 2013. Table 23 in Appendix D shows that the coefficient that estimates the effect of the inflationary pressure index on the one year ahead inflation expectations is comparable in sign and magnitude to the coefficient estimated in our baseline regression for the sub-sample starting in 2008.

5.1 Reaching the General Public

How can economic agents be affected by FOMC speeches? Sophisticated agents (professional forecasters) might pay particular attention to all forms of Fed communications, whereas non-sophisticated agents (households) likely do not. Then, at first glance, our result that household inflation expectations are influenced by the Delphic communication of the Fed might sound implausible. We argue that our findings can be explained by the role of the media channel and the focus of households on regional developments.

One possible explanation for our result is that households are exposed to local news, which is more likely to report speeches by regional presidents. Ehrmann et al. (2021) show that speeches by regional presidents are related to regional conditions that households might care more about than the aggregate economy. To test our hypothesis, we construct two inflationary pressure sub-indices, based on the methodology described in Section 2.3. The first sub-index is a Trinity-specific inflationary pressure index that includes speeches by the Chair, the Vice-Chair, and the NY Fed President only. The second sub-index is a non-Trinity inflationary pressure index, which includes speeches by all regional

Michigan Survey of Consumers						
	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1
$\text{IPI}^{\text{Trinity}}_{t-1}$	0.06	0.01	0.08*	0.03	0.14	0.10*
	(0.06)	(0.04)	(0.04)	(0.03)	(0.10)	(0.06)
$\text{IPI}^{\text{Non-Trinity}}_{t-1}$	0.35***	0.09**	0.18***	0.02	0.44***	0.16***
	(0.06)	(0.04)	(0.05)	(0.04)	(0.07)	(0.05)
R-Squared	0.28	0.66	0.19	0.49	0.40	0.77
Observations	359	359	155	155	204	204

Table 8. Trinity vs non-Trinity. The dependent variables are the one year ahead expectations (median) of percentage price changes from the MSC. The inflationary pressure index (IPI) is the standardized inflationary pressure index constructed as described in Section 2, based only on speeches by the Trinity (Fed Chair, Vice-Chair and NY Fed President), or non-Trinity (regional Fed presidents, excluding NY Fed President). Model 0 includes a constant and the two inflationary pressure indices. Model 1 also includes controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

presidents, excluding the NY Fed President.[14] Table 8 shows that only the inflationary pressures communicated by regional presidents affect households' expectations. These findings support the view that local newspapers can serve as a transmission channel for FOMC communications to households and less sophisticated agents.

Recent studies document that the public is informed about monetary policy via the media rather than through direct channels such as the central bank's website or social media accounts (Blinder et al., 2024). In addition, the media plays an important role in the inflation expectation formation process of households, as shown in Larsen et al. (2021). Our conjecture is that households rely on the media to obtain information about inflation, unemployment, and general economic conditions. In turn, the media acquires this information from communications from central banks and statistical agencies.

To provide additional evidence in support of our claim, we report in Figure 4 the US media coverage of FOMC speeches in the weeks around speeches by FOMC members.[15] Consistent with our argument, the figure reveals a significant increase in the number of articles during the week in which the speech is given. This anecdotal evidence points to the importance of the media channel as a means by which central banks reach the general public.

[14] The seven members of the Board of Governors of the Federal Reserve System are therefore excluded from this index.

[15] A detailed description of the analysis is provided in Appendix C.

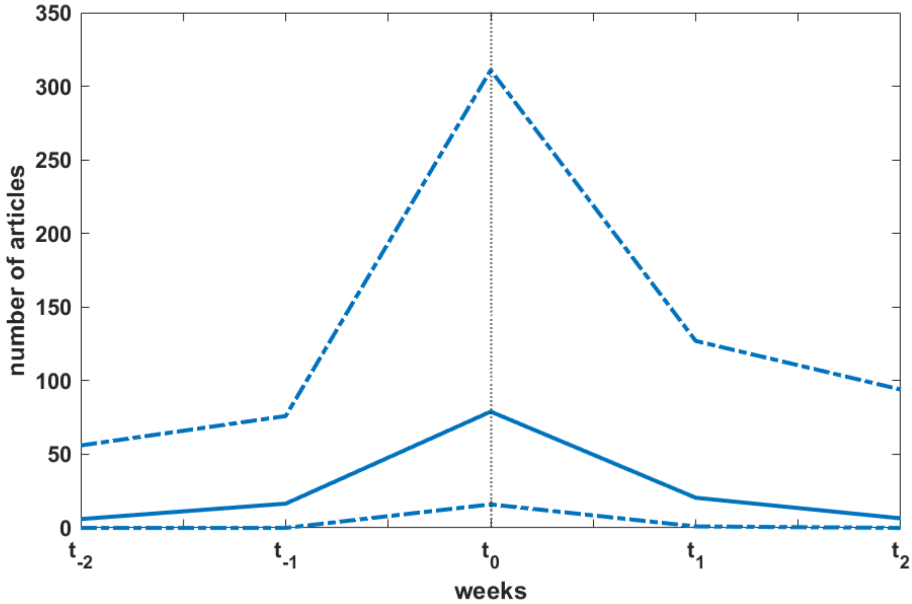

Figure 4. Media coverage. Median (solid line) and minimum and maximum (dashed lines) number of articles from US newspapers (online and paper), blogs and news websites covering FOMC speeches by all members, excluding Chair and NY Fed President, January 1st to April 17th 2023. t_0 is the week in which the speeches are given. Source: Factiva.

6 A Model with Delphic and Odyssean Signals

We introduce a theoretical general equilibrium model to study the Delphic and Odyssean effects of central bank communication. We also use the model to illustrate a possible explanation for the differential responses to central bank communications between households and forecasters. This explanation is based on the idea that these two economic agents likely have different levels of sophistication, reflecting their varying ability to understand announced changes to the monetary policy strategy.

The model is a prototypical three-equation New Keynesian DSGE model with a total factor productivity (TFP) shock. The model is log-linearized around its unique steady-state equilibrium, which results in the following equations.

$$\begin{aligned}
\widehat{Y}_t &= E_t^P \widehat{Y}_{t+1} - \sigma^{-1}\left(\widehat{R}_t - E_t^P \widehat{\Pi}_{t+1}\right), \\
\widehat{\Pi}_t &= \kappa(\widehat{Y}_t - \widehat{Y}_t^*) + \beta E_t^P \widehat{\Pi}_{t+1}, \\
\widehat{R}_t &= \phi_\pi \widehat{\Pi}_t + \phi_x \widehat{X}_t, \\
\widehat{Y}_t^* &= \omega \epsilon_t^a,
\end{aligned}$$

where we define $\omega = (1+\eta)/(\eta+\sigma)$, with η the Frisch labor elasticity σ^{-1} denotes the intertemporal elasticity of substitution. The slope of the New Keynesian Phillips curve is $\kappa = (1-\phi)(1-\phi\beta)(\sigma+\eta)/\phi$ where ϕ denotes the degree of nominal rigidities, β is the household's discount factor. Output is defined as $\widehat{Y}_t = (Y_t - Y)/Y$, the inflation rate as $\widehat{\Pi}_t$, the nominal interest rate as $\widehat{R}_t = R_t - R$, output in the flex price economy as $\widehat{Y}_t^* = (Y_t^* - Y^*)/Y^*$, and the output gap as $\widehat{X}_t = \widehat{Y}_t - \widehat{Y}_t^*$. The shock ϵ_t^a is independent and identically distributed (i.i.d.) mean-zero Gaussian random variable: $\epsilon_t^a \sim \mathcal{N}(0, \sigma_a^2)$. As standard, the central bank steers the nominal interest rate. The parameters ϕ_π and ϕ_x denote the central bank's response to changes in inflation and in the output gap.

After some manipulations, the model equations can be written as:

$$\widehat{X}_t = E_t^P \widehat{X}_{t+1} - \sigma^{-1} \left(\widehat{R}_t - E_t^P \widehat{\Pi}_{t+1} - \widehat{R}_t^* \right), \tag{3a}$$

$$\widehat{\Pi}_t = \kappa \widehat{X}_t + \beta E_t^P \widehat{\Pi}_{t+1}, \tag{3b}$$

$$\widehat{R}_t = \phi_\pi \widehat{\Pi}_t + \phi_x \widehat{X}_t, \tag{3c}$$

$$\widehat{R}_t^* = -\sigma \omega \epsilon_t^a, \tag{3d}$$

where $\widehat{R}_t^*$ denotes the natural rate of interest.

The private sector, comprising households and firms, observes a signal regarding the future realization of the technology:

$$s_t^P = \epsilon_{t+1}^a + \eta_t^P, \tag{4}$$

with noise $\eta_t^P \sim \mathcal{N}\left(0, \sigma_{\eta,P}^2\right)$.[16] The history of signals s_t^P denotes agents' private information.

6.1 Delphic announcements: the inflationary pressure index

The private sector also receives a signal from the central bank in the form of the central bank's expectations about future inflation, $E_t^C \Pi_{t+1}$. This signal is introduced to investigate the implications of a change in the inflationary index of the type we measure in the data on inflation expectations. This case is called *Delphic* as all the central bank does is to announce a revision to its projection of inflation. Later, we will investigate the case where the central bank provides guidance regarding how it will respond to the inflationary pressure.

The central bank's inflation expectations are based on a signal it observes in every period:

$$s_t^C = \epsilon_{t+1}^a + \eta_t^C, \tag{5}$$

with noise $\eta_t^C \sim \mathcal{N}\left(0, \sigma_{\eta,C}^2\right)$.

The equilibrium law of motion of the output gap and inflation can be shown to be

[16] This signal can also be interpreted as a signal about the natural rate ($\widehat{R}_{t+1}^* = -\sigma \omega \epsilon_{t+1}^a$).

governed by the following equations:

$$\begin{bmatrix} \widehat{X}_t \\ \widehat{\Pi}_t \end{bmatrix} = \begin{pmatrix} \alpha_x \\ \alpha_\pi \end{pmatrix} \epsilon_t^a + \begin{pmatrix} \gamma_x \\ \gamma_\pi \end{pmatrix} E_t^P \epsilon_{t+1}^a. \tag{6}$$

where the scalar α_π and γ_π are obtained by solving the model in its news-representation form (Chahrour and Jurado, 2018).[17] Note that $E_t^P \epsilon_{t+1}^a$ is not zero as agents receive the private signal, s_t^P, regarding the realization of the shock in the next period—e.g. Equation (4).

The news representation of the equilibrium dynamics of inflation and the output gap in our model can be expressed as follows:

$$\begin{bmatrix} \widehat{X}_t \\ \widehat{\Pi}_t \end{bmatrix} = \begin{pmatrix} \alpha_x & \alpha_x \\ \alpha_\pi & \alpha_\pi \end{pmatrix} \begin{bmatrix} \epsilon_{a,t}^0 \\ \epsilon_{a,t-1}^1 \end{bmatrix} + \begin{pmatrix} \gamma_x \\ \gamma_\pi \end{pmatrix} \epsilon_{a,t}^1, \tag{7}$$

where $\epsilon_{a,t}^0$ is the surprise component of the technology shock or the private sector's forecast error and $\epsilon_{a,t}^1$ is the component of the technology shock that is observed in period t and is expected to hit the economy in period $t+1$. Formally, $\epsilon_t^a \equiv \epsilon_{a,t}^0 + \epsilon_{a,t-1}^1$.

Starting from the equilibrium law of motion of inflation in period t—roll Equation (6) one period forward, the central bank's expectations about next period's inflation will be:

$$\begin{aligned} E_t^C \widehat{\Pi}_{t+1} &= \alpha_\pi E_t^C \epsilon_{t+1}^a + \gamma_\pi E_t^P \epsilon_{t+2}^a, \\ &= \alpha_\pi \frac{\sigma_a^2}{\sigma_a^2 + \sigma_{\eta,C}^2} \underbrace{\left(\epsilon_{t+1}^a + \eta_t^C\right)}_{s_t^C}, \\ &= \alpha_\pi k_C \left(\epsilon_{t+1}^a + \eta_t^C\right), \end{aligned} \tag{8}$$

where the Kalman gain is as follows: $k_C = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_{\eta,C}^2}$.[18]

The central bank announces its forecast of inflation $E_t^C \widehat{\Pi}_{t+1}$ to the private sector, and the private sector tries to learn the central bank's view about the future realization of the shock. Formally, the private sector observes the following *Delphic signal* from the central

[17]The news representation of this New Keynesian model with private and Delphic signals can be obtained by replacing the signal and the signal extraction problem with the assumptions that agents receive news, $\epsilon_{a,t}^1$ in every period about the one-period-ahead realization of the shock, ϵ_{t+1}^a. In the news representation is further assumed that the realization of the shock in the next period is made of two components: a surprise component and an anticipated components (news). Formally, $\epsilon_{t+1}^a = \epsilon_{a,t+1}^0 + \epsilon_{a,t}^1$, where $\epsilon_{a,t}^0$ denote the surprise or forecast error at time $t+1$. As shown by (Chahrour and Jurado, 2018), there exists a mapping from the solution to the signal extraction problem solved by agents in the actual economy to the realizations of news and surprise shocks so that the model and its news representation are observationally equivalent.

[18]The central bank knows that the private sector has information about future shocks only up to one period ahead and hence it knows that $E_t^P \epsilon_{t+2}^a = 0$.

bank:

$$\widetilde{s}_t^P = \alpha_\pi \kappa_C \left(\epsilon_{t+1}^a + \eta_t^C\right) = \alpha_\pi \kappa_C s_t^C. \tag{9}$$

Since economic agents are rational, they understand both the equilibrium law of motion for inflation (α_π and γ_π) and the precision of the central bank's signal (κ_C). Consequently, the private sector can infer the signal observed by the central bank, s_t^C, from the Delphic announcement. It follows that the private sector is aware of the central bank's signal extraction problem and accounts for it when processing the Delphic signal. However, its expectations about the future realization of the technology shock will differ from those of the central bank, as the private sector has access to its own private signal—one that the central bank does not observe. This private signal can be interpreted as a prior, available to the private sector before receiving the Delphic signal.

Taking all this into account, the private sector's expectations of the next period's technology shock, after incorporating the central bank's Delphic signal, are given by:

$$E_t^P \epsilon_{t+1}^a = \underbrace{\kappa_P \left(\epsilon_{t+1}^a + \eta_t^P\right)}_{\text{Prior expectations}} + \kappa_C \left[\underbrace{\left(\epsilon_{t+1}^a + \eta_t^C\right)}_{s_t^C} - \kappa_P \underbrace{\left(\epsilon_{t+1}^a + \eta_t^P\right)}_{s_t^P}\right], \tag{10}$$

where prior expectations refer to the private sector's expectations conditioned only on the private signal s_t^P, received before the Delphic communication takes place. The Kalman gain associated with the signal extraction from the private sector's first observed signal, s_t^P, is given by $\kappa_P = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_{\eta,P}^2}$. Note that if the private sector's signal were completely uninformative ($\kappa_P = 0$), then the central bank and the private sector would fully agree on the next realization of the technology shock.

The dynamics of the expected realization of the next period's technology shock in Equation (10) can be combined with the law of motions shown in Equation (6) to obtain the equilibrium dynamics of the output gap and inflation under Delphic communications. The private sector's inflation expectations are as follows:

$$E_t^P \widehat{\Pi}_{t+1} = \alpha_\pi E_t^P \epsilon_{t+1}^a, \tag{11}$$

where the expectation term on the right-hand side is defined in Equation (10).

To illustrate the Delphic effects, assume that no shock occurs in periods t and $t+1$; however, the noise in the central bank's signal is negative at time t, such that $\eta_t^C < 0$. The private sector's prior on the technology shock is zero, i.e., $\mathbb{E}[\kappa_p(\epsilon_{t+1}^a + \eta_t^P)] = 0$. When the central bank observes a negative signal ($s_t^C < 0$), it anticipates a negative technology shock in the next period, leading it to expect positive inflationary pressure, $E_t^C \widehat{\Pi}_{t+1} > 0$. When this inflationary pressure is communicated to the private sector, they revise their inflation expectations upward to fully align with the central bank's expectations, such that $E_t^P \widehat{\Pi}_{t+1} = E_t^C \widehat{\Pi}_{t+1}$. In this example, where the noise in the central bank's signal drives the announcement, the communication is fully Delphic. This model's prediction provides a rationale for our first empirical finding: speeches signaling higher inflationary pressure lead the public to revise their inflation expectations upward.

6.2 Announcements Signaling a Hawkish Commitment

Now, we consider the case in which, following the announcement of anticipated inflationary pressure, the central bank communicates its view regarding the policy response. Specifically, the central bank communicates the expected interest rate in the next period, $E_t^C R_{t+1}$.

For the sake of argument, the central bank announces its commitment to fight the announced inflationary pressure with a response that exceeds the one implied by the baseline policy rule in Equation (3c). Formally, the stronger anti-inflation commitment embedded in the announced interest rate is $\overline{\phi}_\pi > \phi_\pi$. This type of communication focused on the reaction function constitutes a form of Odyssean communication.

We consider two cases. The first case involves an unsophisticated agent who cannot understand monetary policy well enough to disentangle the change to the reaction function from the central bank's announcements. As a result, the unsophisticated agent treats the announcement regarding the future interest rate as another forecast provided by the central bank based on the baseline policy rule, ϕ_π. Consequently, the unsophisticated agent overlooks the Odyssean component of the communication—namely, the stronger anti-inflation commitment embedded in the announced interest rate. This case provides a possible explanation for the weak response of households' inflation expectations to conditional shifts in the hawkishness index we find in the data.

In the second case, we consider a sophisticated agent who can recognize the stronger commitment to fight inflationary pressure reflected in the interest rate projected by the central bank. These agents can thus disentangle the Odyssean component of the announcement—namely, the stronger-than-average anti-inflation commitment in the announced interest rate. This case serves as a possible explanation for professional forecasters' significant response to changes in the hawkishness index observed in the data.

Recall that the monetary policy rule implies that the interest rate expected by the central bank depends on its forecast about inflation and the output gap. So the central bank announces the following rate for the next period:

$$E_t^C(\widehat{R}_{t+1}|\overline{\phi}_\pi) = \overline{\phi}_\pi E_t^C(\widehat{\Pi}_{t+1}|\overline{\phi}_\pi) + \phi_x E_t^C(\widehat{X}_{t+1}|\overline{\phi}_\pi),$$

where the parameter $\overline{\phi}_\pi$ reflects the central bank's newly announced, stronger anti-inflation response.

The signal can equivalently be expressed in terms of expectations about the future technology shock by rolling forward the equilibrium laws of motion for inflation and the output gap in Equation (6) by one period, then applying the expectation operator conditional on the information held by the central bank. By plugging these expectations into the equation above, we obtain

$$E_t^C(\widehat{R}_{t+1}|\overline{\phi}_\pi) = \underbrace{\left[\alpha_\pi(\overline{\phi}_\pi)\overline{\phi}_\pi + \alpha_x(\overline{\phi}_\pi)\phi_x\right]}_{\alpha_R(\overline{\phi}_\pi)} E_t^C(\epsilon_{t+1}^a)$$

where $\alpha_\pi(\overline{\phi}_\pi)$ and $\alpha_x(\overline{\phi}_\pi)$ capture the equilibrium response of inflation and the output gap to the current technology shock conditional on all the model parameters—including the stronger commitment to fight inflation announced by the central bank, $\overline{\phi}_\pi$. The operator $\alpha_R(\phi_\pi)$ maps realized technology shocks to the equilibrium interest rate. As an equilibrium mapping, it depends on all model parameters, including the central bank's response to inflation. Note that the central bank's expectations about the next period's technology shock, $E_t^C\epsilon_{t+1}^a$, are defined as $\kappa_c\left(\epsilon_{t+1}^a + \eta_t^c\right)$.

How agents adjust their expectations following the announcement, $E_t^C(\widehat{R}_{t+1}|\overline{\phi}_\pi)$, depends on their ability to assess the degree of anti-inflation commitment embedded in the Odyssean announcement. Let us first consider the less sophisticated agent who is unable to observe the new anti-inflation attitude of the central bank making the announcement.

The unsophisticated agent's expectations regarding the next period interest rate will be updated as follows:

$$\widetilde{E}_t^P(\widehat{R}_{t+1}|\phi_\pi) = E_t^P(\widehat{R}_{t+1}|\phi_\pi) + \kappa_C\left[E_t^C(\widehat{R}_{t+1}|\overline{\phi}_\pi) - E_t^P(\widehat{R}_{t+1}|\phi_\pi)\right], \qquad (12)$$

where $E_t^P(\widehat{R}_{t+1}|\phi_\pi)$ represents the expectations of unsophisticated agents before observing the central bank's announcement regarding the interest rate. These prior expectations are based on the inflation response implied by the baseline policy ($\phi_\pi < \overline{\phi}_\pi$). The expectation operator $\widetilde{E}_t^P(\widehat{R}_{t+1}|\phi_\pi)$ denotes the interest rate expected by unsophisticated agents after receiving the hawkish announcement. However, these posterior expectations remain conditional on the weaker monetary policy response to inflation (ϕ_π), as unsophisticated agents fail to recognize the policy shift. Finally, the conditioning of the signal $E_t^C(\widehat{R}_{t+1}|\overline{\phi}_\pi)$ indicates that the announced interest rate reflects the central bank's stronger response to inflation, even though agents are unable to perceive this change in the central bank's reaction function.

We can use the response of the interest rate to technology shocks, $\alpha_R(\cdot)$, to express the above equation in terms of expectations of technology shocks. In doing so, it is critical to account for how each expectation operator is conditioned on the policy response to inflation:

$$\widetilde{E}_t^P \epsilon_{t+1}^a - E_t^P \epsilon_{t+1}^a = \kappa_C \left(\frac{\alpha_R(\overline{\phi}_\pi)}{\alpha_R(\phi_\pi)} E_t^C \epsilon_{t+1}^a - E_t^P \epsilon_{t+1}^a \right), \tag{13}$$

where $E_t^P \epsilon_{t+1}^a$ denotes the technology shock expected by the private sector before observing the central bank's interest rate announcement. This expectation is formally defined in Equation (10). The unsophisticated agent's expectation of the technology shock after observing the announced interest rate is denoted by $\widetilde{E}_t^P \epsilon_{t+1}^a$. Finally, $E_t^C \epsilon_{t+1}^a$ represents the central bank's expectation of the technology shock for the next period. The ratio $\frac{\alpha_R(\overline{\phi}_\pi)}{\alpha_R(\phi_\pi)}$ is strictly greater than one under plausible calibrations of the model parameters.

The role of this ratio is particularly insightful in understanding how Delphic effects operate. Consider a scenario where the only shock occurring in periods t and $t+1$ is the noise in the central bank's signal in period t, denoted by η_t^C. In this case, it is straightforward to show that $E_t^C \epsilon_{t+1}^a = E_t^P \epsilon_{t+1}^a$.[19] If agents fully understood the hawkish shift in policy ($\phi_\pi \to \overline{\phi}_\pi$), the ratio would be equal to one. In this case, the central bank's hawkish announcement would not lead to any revision in the agents' expectations about the next shock. As we will discuss further in the case of sophisticated agents, the central bank's second signal pertains to the reaction function and does not convey any additional information about the state of the economy (ϵ_{t+1}^a) beyond what the private sector could have already inferred from the first inflation signal. In fact, the second announcement is not based on any additional information beyond the signal s_t^C that the central bank has already observed and communicated by revealing its view on the inflationary pressure. However, unsophisticated agents fail to correctly assess the degree of hawkishness, which is reflected in the ratio being strictly greater than one. As a result, these agents *overreact* to the interest rate communicated by the central bank, leading to a Delphic pass-through from central bank expectations to private sector expectations.

To convert the expectations of technology shocks into the expectations of inflation, we use the mapping $\alpha_\pi(\phi_\pi)$, based on the unsophisticated agent's (mistaken) perception of the central bank's inflation response. The revision to inflation expectations after the unsophisticated agent observes the Odyssean signal is as follows:

$$\widetilde{E}_t^P (\widehat{\Pi}_{t+1} | \phi_\pi) - E_t^P (\widehat{\Pi}_{t+1} | \phi_\pi) = \alpha_\pi(\phi_\pi) \left[\widetilde{E}_t^P (\epsilon_{t+1}^a) - E_t^P (\epsilon_{t+1}^a) \right], \tag{14}$$

where we use Equation (11) to define agent's prior beliefs about inflation, $E_t^P (\widehat{\Pi}_{t+1} | \phi_\pi)$.

When the announced interest rate exceeds their prior beliefs—i.e., $E_t^C (\widehat{R}_{t+1} | \overline{\phi}_\pi) > E_t^P (\widehat{R}_{t+1} | \phi_\pi)$—unsophisticated agents revise their expectations about the technology shock and inflation upward. Failing to recognize that the higher interest rate merely reflects a

[19] Recall that $E_t^P \epsilon_{t+1}^a$ represents the private sector's expectations after receiving the first announcement and observing its own signal, s_t^P.

stronger commitment to fighting inflation, these agents mistakenly infer that the central bank has observed a new signal indicating even higher inflation than initially suggested by the first announcement. Thus, the assumption of a lack of sophistication implies that both signals—the announcement of inflationary pressure and the announcement of the interest rate for the next period—are perceived as Delphic by these agents.

Let us now turn to the case of sophisticated agents who fully recognize the Odyssean nature of the second signal. Since sophisticated agents understand the model, including the central bank's new reaction function, and know the signal , s_t^C observed by the central bank, they can perfectly anticipate the announced interest rate for the next period. As a result, there is no Bayesian updating regarding the central bank's view on inflation. Instead, sophisticated agents revise their expectations of next period's inflation solely in response to the central bank's more hawkish policy reaction, which directly influences future inflation outcomes. Specifically, they adjust their expectations as follows:

$$\widetilde{E}_t^P(\widehat{\Pi}_{t+1}|\overline{\phi}_\pi) - E_t^P(\widehat{\Pi}_{t+1}|\phi_\pi) = \left[\alpha_\pi(\overline{\phi}_\pi) - \alpha_\pi(\phi_\pi)\right] E_t^P \epsilon_{t+1}^a, \tag{15}$$

where the left-hand side equation captures the change in the sophisticated agent's inflation expectations after observing the central bank's hawkish signal. The right-hand side of the equation reflects the Odyssean adjustment. The sign of this revision is determined by the responses of inflation to the technology shock under each policy reaction—i.e., the baseline reaction , $\alpha_\pi(\phi_\pi)$ and the hawkish reaction announced, $\alpha_\pi(\overline{\phi}_\pi)$.

Importantly, there is no Delphic revision, as sophisticated agents fully anticipate the interest rate announced by the central bank. Consequently, their expectations remain unchanged with respect to the central bank's inflation outlook, and no Bayesian updating occurs.

To illustrate how the different types of agents react to the announcement regarding the future interest rate, we set the model parameters of this stylized model as follows: $\beta = 0.975$, $\sigma = 1.0$, $\kappa = 0.03$, $\phi_\pi = 1.5$, $\overline{\phi}_\pi = 2.0$, $\phi_x = 0.25$, $\eta = 2$, $\sigma_a = \sigma_{\eta,P} = \sigma_{\eta,C} = 1.0$.

The revision to inflation expectations following the hawkish announcement is measured relative to the Delphic expectation, $E_t^P\widehat{\Pi}_{t+1}$, and is plotted in Figure 5 for both types of agents. The inflationary pressure on the x-axis varies as the noise, η_t^C, in the central bank's public signal changes.

The Delphic effects drive the revisions in the unsophisticated agent's inflation expectations, as defined in Equation (14). The blue solid line remains in positive territory, indicating that the announcement of a tighter monetary policy response leads these agents to revise their inflation expectations upward. This upward revision reinforces the initial increase in inflation expectations triggered by the central bank's announcement of inflationary pressure.

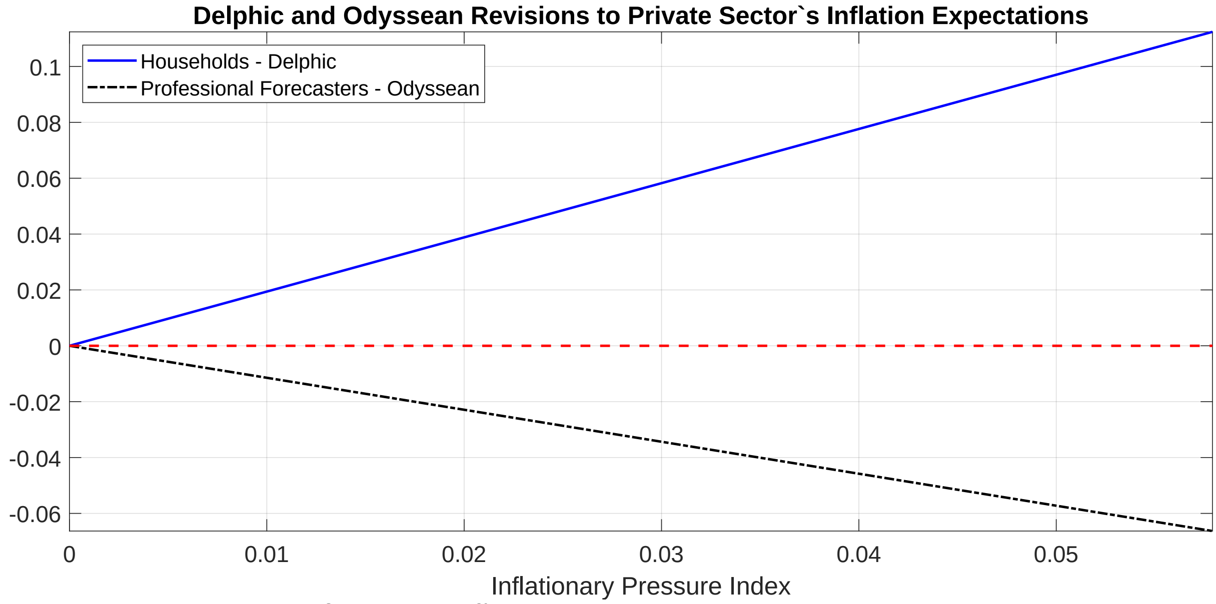

Figure 5. Delphic and Odyssean effects. Revisions in private sector's inflation expectations before and after an hawkish announcement for sophisticated agents (professional forecasters)—$\widetilde{E}_t^P(\Pi_{t+1}|\overline{\phi}_\pi) - E_t^P(\Pi_{t+1}|\phi_\pi)$—and unsophisticated agents (households)—$(\widetilde{E}_t^P(\Pi_{t+1}|\phi_\pi) - E_t^P(\Pi_{t+1}|\phi_\pi)$. On the x-axis, the inflationary pressure index, $E_t^C\pi_{t+1}$, is varied by changing the realization of the noise, η_t^c, in the central bank's signal.

The expectation revisions of sophisticated agents reflect only Odyssean effects, as discussed earlier. After the central bank's hawkish announcement, sophisticated agents do not revise their expectations about the economic outlook; rather, they update their beliefs about the central bank's reaction function. These revisions, plotted as the black dash-dotted line, remain in negative territory, indicating that sophisticated agents lower their inflation expectations as they internalize the central bank's more hawkish response to the inflationary pressure. The downward slope of the line reflects the intensification of Odyssean effects as the inflationary pressure communicated by the central bank in the first stage increases.

6.3 Discussion

The theoretical model of central bank communication is introduced to help explain some of our findings on the role of Delphic versus Odyssean guidance—specifically, to shed light on why less sophisticated agents, such as households, appear less able to grasp policymakers' varying degrees of commitment to fighting inflation. More broadly, the model provides a novel and flexible general-equilibrium framework for analyzing Delphic and Odyssean effects, standing as a contribution on its own beyond the paper's other findings.

Like any theoretical framework, the model relies on a set of assumptions. One that warrants further discussion is the distinction it draws between agents' ability to process different types of central bank communication. While all agents are assumed to be rational in interpreting Delphic announcements, unsophisticated agents are assumed to struggle with communications that involve changes to the central bank's reaction function.

Is this assumption plausible? One rationale is that Delphic communication does not imply changes in the structural parameters of the model policymakers use to formulate their message. As such, the private sector need not solve the general equilibrium or incorporate any new information about signal precision. Sophisticated and unsophisticated agents can arguably rely on historical patterns and observed regularities, since no structural change is occurring or being conveyed.

In contrast, Odyssean communication signals an ex-ante unexpected commitment by the central bank and thereby a shift in the policy rule itself. This may undermine unsophisticated agents' ability to rely on past regularities, making it harder for them to interpret the message accurately.

While not the focus of our analysis, it is nonetheless helpful to clarify the role of informational differences between the central bank and the private sector in the model. Specifically, one might ask whether the model implicitly assumes that one side possesses superior information. Taking a stance on this issue is not necessary to study Delphic effects in the model. Although the private sector observes both its own signal and the Delphic communication, the private signal mainly serves to capture agents' prior beliefs before the public signal arrives. We can vary the precision of this prior—or even assume that the private signal carries no information at all (i.e., $\sigma_{\eta,P} \to \infty$, implying $E_t^P \epsilon_{t+1}^a = 0$ or the unconditional mean of the shock)—without materially affecting the main conclusions of our analysis. What matters for Delphic effects to emerge is the presence of asymmetric information or disagreement; informational superiority by either the central bank or the private sector is not essential.

7 Conclusion

This paper investigates the impact of central bank communication on inflation expectations, uncovering an asymmetry in how different economic agents interpret FOMC speeches. We find that speeches emphasizing inflationary pressures, captured through a novel inflationary pressure index, exert significant Delphic effects, raising expectations among both households and professional forecasters. However, only professional forecasters adjust their expectations downward in response to Odyssean communication, proxied by the Fed's hawkishness.

The distinction in response patterns reflects differences in the way economic agents process central bank information. Professional forecasters appear attentive not only to the economic outlook conveyed in speeches but also to the inferred policy response. In contrast, households tend to focus on the inflation signal alone, treating it as news about the economy rather than as part of a broader policy strategy. This asymmetry persists even after accounting for quantitative guidance through formal projections, indicating that the qualitative tone embedded in speeches carries distinct influence. We also find that households respond primarily to speeches by regional Fed presidents, consistent with a local-media transmission mechanism.

We formalize these findings through a structural model with asymmetric information between the central bank and the private sector. The model incorporates agents that differ in their ability to interpret policy commitments and predicts that only those with sufficient sophistication adjust expectations in line with both the central bank's forecast and its intended policy response. As a result, the same speech may lead to different reactions between agent types, consistent with the empirical results.

Taken together, these results underscore the limits of one-size-fits-all communication strategies in monetary policy, as their effectiveness varies with the audience's capacity to decode the message. Ensuring that policy signals are understood, not just heard, remains a central challenge for effective monetary policymaking.

Overall, our work contributes to the growing literature on central bank communication by demonstrating the distinct roles of qualitative and quantitative messaging, and by highlighting the importance of agent sophistication in the expectation formation process.

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Appendices

Appendix A Temporal Classification of Speeches

To ensure our empirical analysis exclusively focuses on contemporaneous and forward-looking statements, we classify each sentence from the FOMC speeches into three temporal categories:

- **Past**: Sentences primarily describing events, actions, or states that have already occurred.
- **Present**: Sentences describing current conditions, events occurring at the moment of speaking, or statements expressing timeless or general truths.
- **Future**: Sentences that contain forecasts, planned actions, predictions, or contingencies relating to events or conditions yet to materialize.

We remove all sentences classified as *Past*, retaining only those classified as *Present* and *Future*. The resulting corpus constitutes the analytical dataset employed in the empirical analyses.

Few-shot Classification with a Large Language Model

To implement temporal classification systematically, we employ the *Gemma 3* large language model (Team Gemma, 2025), which consists of approximately 27 billion parameters and is fine-tuned for instruction-following tasks. Specifically, we use a locally hosted, quantized (8-bit) variant. Quantization, a method that reduces computational precision from 32-bit to 8-bit arithmetic, significantly enhances computational efficiency and reduces memory requirements without notably sacrificing accuracy.

Classification is facilitated through a standard few-shot prompting approach. Inference is performed at a temperature setting of 0.1 to ensure deterministic, high-confidence predictions. Model execution is carried out locally using two NVIDIA GeForce RTX 4090 GPUs, each equipped with 24 GB of RAM. Under these conditions, the classification speed averages approximately 5 seconds per sentence.[20] The prompt structure comprises three distinct components designed to clearly guide the model:

- A definition for each temporal category to establish clear classification criteria.
- Canonical examples illustrating each temporal class, with two representative sentences provided per class.

[20] We additionally processed 10,000 sentences with a substantially larger model, Deepseek R1 (Guo et al. (2025)), observing an average inference time of approximately 60 seconds per sentence. The overlap in classifications relevant to the IPI reached 88%.

- A final segment prompting classification of a target sentence.

Below is the complete prompt used for the few-shot classification task:

> You are tasked with classifying sentences extracted from speeches by central bankers. Each sentence should be categorized based on whether it primarily refers to:
>
> Past: Describes events, actions, or states that have already occurred.
>
> Present: Describes current conditions, events happening at the moment of speaking, or general facts and truths.
>
> Future: Describes expected, planned, predicted, or potential events or conditions that have not yet occurred.
>
> When classifying, consider the main verb tense, context, and any explicit temporal indicators within the sentence.
>
> Examples:
>
> Past
>
> Sentence: "Inflation peaked in 2020 before gradually slowing later that year."
>
> Classification: Past
>
> Sentence: "We saw prices drop sharply after the financial crisis."
>
> Classification: Past
>
> Present
>
> Sentence: "Inflation is currently running above our 2 percent target."
>
> Classification: Present
>
> Sentence: "Prices remain stable despite recent supply constraints."
>
> Classification: Present
>
> Future
>
> Sentence: "We expect inflation to moderate toward target next year."
>
> Classification: Future
>
> Sentence: "Price pressures will likely ease over the coming quarters."
>
> Classification: Future
>
> Classify the following sentence:
>
> `{sentence}`
>
> Classification:

The model outputs a single token–*Past*, *Present*, or *Future*–which is parsed case-insensitively. In some instances, the model is uncertain and produces classifications such as *Present/Future* or *Past/Present.* In these cases, we classify the sentence as *Present.*

Additionally, the model generates a reasoning chain, commonly referred to as a Chain-of-Thought, which explains the rationale behind the model's classification decision. While we do not further analyze this reasoning chain, we retain it for reference.

Appendix B Speeches

Date	Speaker	Sentiment (total/example)	Example sentences: Identifiers and Modifiers
1999-10-12		-30	
	Laurence Meyer	-30/-3	*If nominal wage cuts are rare, efficiency in the allocation of resources may decline, and as a result, output might be lower at price stability than if there were some low rate of inflation.*
2004-10-29		-7	
	Roger Ferguson	-7/-1	*That should gradually return the economy to full utilization of its resources, while inflation remains subdued.*
2005-10-18		104	
	Roger Ferguson	44/1	*This substitution will mitigate somewhat, but not fully offset, the effects of higher energy prices on consumer spending.*
	Alan Greenspan	30/1	*Additionally, the longer-term crude price has presumably been driven up by renewed fears of supply disruptions in the middle east and elsewhere.*
2014-11-10		-38	
	Eric Rosengren	-38/-1	*During periods when the gap is wide, the inflation rate tends to fall over time.*
2015-11-12		-36	
	Stanley Fischer	-6/-1	*First, while the U.S. economy has performed relatively well–as is visible especially in our steady progress toward full employment–major foreign economies have generally experienced weak growth, along with low inflation.*
	William Dudley	-27/-1	*Avoiding a japan-like experience in which inflation expectations have become unanchored to the downside should be an important consideration in the conduct of monetary policy.*
	Jeffrey Lacker	-3/0	*While a description like this pins inflation at higher frequencies to move around, perhaps in response to a variety of relative price shocks.*

Table 9. This table shows the sentiment scores for various speakers and dates, along with illustrative example sentences highlighting the identifiers and modifiers contributing to the sentiment. Blue represents identifiers, while green and red represent positive and negative modifiers, respectively.

Date	Speaker	Sentiment (total/example)	Example sentences: Identifiers and Modifiers
2015-11-12		-36	
	Stanley Fischer	-6/-1	*Nevertheless, an extensive literature has found that the degree of pass-through of exchange rate changes to U.S. import prices is low, as foreign exporters prefer to keep the dollar price of the goods they sell in the U.S. market relatively constant.*
	William Dudley	-27/-1	*If the economy continues to grow at an above-trend pace, then I think worries about inflation remaining too low, should begin to recede.*
	Charles Evans	10/-1	*One reason is that there exist a number of important downside risks to the inflation outlook.*
	James Bullard	-10/-1	*In addition, the current year-over-year inflation rate, while low, reflects an outsized oil price shock that occurred during.*
	Jeffrey Lacker	-3/-1	*But this specification is hard to distinguish statistically from one in which inflation does move, perhaps slowly, toward a better anchored long-run expectation.*
2021-05-05		85	
	Charles Evans	41/1	*Yet, despite some recent price increases, achieving our inflation goal may prove more difficult.*
	Eric Rosengren	21/2	*As a result, my perspective is that the emphasis on actual outcomes rather than forecasts of rising inflationary pressures when setting monetary policy appears justified.*
	Loretta Mester	22/-1	*In particular, the general level of interest rates is lower than in the past and inflation dynamics have changed so that economic slack plays less of a role and inflation expectations play more of a role in determining inflation outcomes.*
	Michelle Bowman	1/1	*Although i expect these upward price pressures to ease after the temporary supply bottlenecks are resolved, the exact timing of that dynamic is uncertain.*

Table 10. This table shows the sentiment scores for various speakers and dates, along with illustrative example sentences highlighting the identifiers and modifiers contributing to the sentiment. Blue represents identifiers, while green and red represent positive and negative modifiers, respectively.

Appendix C Speeches in the Media

To construct Figure 4, we search for the keywords "[FOMC member name]" and "speech" for the sample size January 1st to April 17th 2023 in the Factiva database, which includes articles from US newspapers (online and paper), blogs and news websites. The speakers, the number of speeches and the number of articles are listed in Table 11. Examples of media covering FOMC speeches in the time period under analysis is provided in Table 12.

Speaker	**Branch**	**# of Speeches**	**# Articles**	**# Articles about Speeches**
Thomas Barkin	Richmond	3	220	40
Michael Barr	Board	3	852	163
Raphael Bostic	Atlanta	4	931	98
Michelle Bowman	Board	3	86	28
James Bullard	St. Louis	4	391	37
Susan Collins	Boston	4	496	98
Lisa Cook	Board	1	94	26
Mary Daly	San Francisco	2	175	78
Esther George	Kansas City	1	49	16
Austan Goolsbee	Chicago	2	295	67
Patrick Harker	Philadelphia	2	293	80
Philip Jefferson	Board	3	492	75
Neel Kashkari	Minneapolis	4	934	159
Lorie Logan	Dallas	3	299	93
Loretta Mester	Cleveland	3	1233	262
Christopher Waller	Board	6	1135	311

Table 11. This table shows, for all FOMC members active speakers between January 1st and April 17 2023, the branch of affiliation, the number of speeches given, the number of articles that mention the FOMC member, and the number of articles mentioning a speech by the FOMC member.

Keywords	Source
speech + [FOMC member name]	Axios, Barron's, Benzinga (US), The Bond Buyer, Business Insider, Chicago Daily Herald, CNN, Daily Business Review, Easter Park Trail Gazette, Investor's Business Daily (US), GlobeNewsWire, Los Angeles Business Journal, Market Watch, Miami Daily Business Review, National Mortgage News, New York Post, Platts, Reuters, RTT News (US), The Wall Street Journal, USA Today

Table 12. Keywords and main news sources covering speeches by FOMC members over the sample January 1st-April 17th 2023.

Appendix D Robustness Checks

D.1 Accuracy

	Michigan Survey of Consumers		Survey of Professional Forecasters	
	1995:M1-2007:M12	2008:M1-2024:M12	1995:Q1-2007:Q4	2008:Q1-2024:Q4
RMSFE	1.02	2.16	1.01	1.91
RMSFE/(σ_π)	1.32	1.03	1.17	0.97
σ_π	0.77	2.09	0.86	1.97
Observations	155	196	52	64

Table 13. Accuracy. Root Mean Squared Forecast Errors (RMSFE), relative RMSFE and standard deviation of actual inflation computed over subsamples.

D.2 Shock-First Approach

Michigan Survey of Consumers						
	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
u^S_{t-1}	0.13^{***}	0.05	0.07^{***}	0.11^{**}	0.21^{***}	0.02
	(0.03)	(0.04)	(0.02)	(0.05)	(0.05)	(0.05)
SEP_{t-1}		0.38^{***}		0.05		0.50^{***}
		(0.06)		(0.07)		(0.06)
R-Squared	0.86	0.92	0.92	0.78	0.85	0.94
Observations	359	91	155	24	204	67
Survey of Professional Forecasters						
	1995:Q1-2024:Q4		1995:Q1-2007:Q4		2008:Q1-2024:Q4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
u^S_{t-1}	0.06	0.07^{***}	-0.02	0.04	0.06	0.03
	(0.07)	(0.03)	(0.08)	(0.03)	(0.11)	(0.03)
SEP_{t-1}		0.53^{***}		0.38^{***}		0.55^{***}
		(0.04)		(0.07)		(0.04)
R-Squared	0.01	0.76	0.00	0.52	0.00	0.84
Observations	120	86	52	23	68	63

Table 14. Two Step Shock-First Approach. The dependent variables are the one year ahead expectation (median) of percentage price changes from the MSC and the one year ahead expectation (median) of CPI all items inflation from the SPF. Model 1 includes a constant, the residual from the LASSO regression of IPI_{t-1} on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 additionally includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The tuning parameters for the LASSO regressions are 0.004 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

D.3 Number of Lags

Michigan Survey of Consumers						
	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.09**	0.15**	0.03	-0.12**	0.22***	0.25***
	(0.05)	(0.07)	(0.04)	(0.05)	(0.06)	(0.08)
IPI_{t-2}	0.00	-0.00	0.01	-0.13*	0.06	0.05
	(0.05)	(0.08)	(0.04)	(0.07)	(0.06)	(0.06)
SEP_{t-1}		0.11		-0.24*		0.36
		(0.14)		(0.10)		(0.22)
R-Squared	0.67	0.69	0.52	0.75	0.78	0.80
Observations	358	91	154	24	204	67

Survey of Professional Forecasters						
	1995:Q1-2024:Q4		1995:Q1-2007:Q4		2008:Q1-2024:Q4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.07***	0.08***	0.03	0.06***	0.11***	0.07***
	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
IPI_{t-2}	0.02	0.00	0.04	−0.06	−0.00	−0.00
	(0.02)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)
SEP_{t-1}		0.20***		0.05		0.21***
		(0.06)		(0.09)		(0.08)
R-Squared	0.79	0.86	0.76	0.68	0.87	0.89
Observations	119	86	51	23	67	62

Table 15. Inclusion of Lags. The dependent variables are the one year ahead expectation (median) of percentage price changes from the MSC and the one year ahead expectation (median) of CPI all items inflation from the SPF. Model 1 includes a constant, the first and second lags of the standardized inflationary pressure index, IPI_{t-1} and IPI_{t-2}, constructed in Section 2.1, and first and second lags of controls, X_{t-1} and X_{t-2}, selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The tuning parameters for the LASSO regressions are 0.005 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

D.4 Principal Components

Michigan Survey of Consumers	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.28***	0.23***	0.15***	0.28***	0.46***	0.22***
	(0.05)	(0.07)	(0.04)	(0.05)	(0.07)	(0.08)
SEP_{t-1}		0.62***		-0.11		0.75***
		(0.11)		(0.12)		(0.11)
R-Squared	0.40	0.68	0.34	0.54	0.57	0.78
Observations	359	91	155	24	204	67

Survey of Professional Forecasters	1995:Q1-2024:Q4		1995:Q1-2007:Q4		2008:Q1-2024:Q4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.09**	0.08***	−0.09	0.02	0.17***	0.06*
	(0.05)	(0.02)	(0.06)	(0.04)	(0.05)	(0.03)
SEP_{t-1}		0.40***		0.32***		0.45***
		(0.06)		(0.09)		(0.07)
R-Squared	0.51	0.81	0.38	0.48	0.72	0.86
Observations	120	86	52	23	68	63

Table 16. Principal Components Analysis. The dependent variables are the one year ahead expectation (median) of percentage price changes from the MSC and the one year ahead expectation (median) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, and the first three principal components of Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

D.5 Outliers

Michigan Survey of Consumers	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.12**	0.15**	0.06	0.15**	0.26***	0.24***
	(0.05)	(0.07)	(0.06)	(0.06)	(0.06)	(0.09)
SEP_{t-1}		0.10		-0.15		0.28
		(0.12)		(0.10)		(0.21)
R-Squared	0.62	0.68	0.48	0.48	0.74	0.78
Observations	341	86	147	23	194	64
Survey of Professional Forecasters	**1995:Q1-2024:Q4**		**1995:Q1-2007:Q4**		**2008:Q1-2024:Q4**	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.08***	0.09***	0.06*	0.05*	0.09***	0.07**
	(0.03)	(0.02)	(0.04)	(0.03)	(0.04)	(0.03)
SEP_{t-1}		0.20***		0.09		0.22***
		(0.07)		(0.10)		(0.08)
R-Squared	0.77	0.85	0.75	0.61	0.85	0.88
Observations	114	81	49	21	65	60

Table 17. Exclusion of outliers of the IPI index: the percentage of observations excluded from each sample is 5%. The dependent variables are the one year ahead expectation (median) of percentage price changes from the MSC and the one year ahead expectations (median) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, and controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The tuning parameters in the LASSO regressions are 0.005 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

D.6 Mean

Michigan Survey of Consumers						
	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.12*	0.27**	-0.01	0.20*	0.38***	0.39***
	(0.07)	(0.12)	(0.05)	(0.10)	(0.08)	(0.12)
SEP_{t-1}		0.46*		-0.08		0.66*
		(0.24)		(0.17)		(0.36)
R-Squared	0.70	0.74	0.61	0.59	0.81	0.81
Observations	359	91	155	24	204	67
Survey of Professional Forecasters						
	1995:Q1-2024:Q4		1995:Q1-2007:Q4		2008:Q1-2024:Q4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.09***	0.09***	0.07***	0.08***	0.12***	0.07**
	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
SEP_{t-1}		0.21***		0.07		0.22***
		(0.07)		(0.10)		(0.09)
R-Squared	0.79	0.86	0.76	0.71	0.86	0.89
Observations	120	86	52	23	68	63

Table 18. Mean Forecasts. The dependent variables are the one year ahead expectation (mean) of percentage price changes from the MSC, and the one year ahead expectation (mean) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, and controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The tuning parameters for the LASSO regressions are 0.007 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

D.7 Percentiles: 25th

Michigan Survey of Consumers	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.10**	0.18**	0.08*	0.23**	0.14**	0.12
	(0.04)	(0.07)	(0.04)	(0.10)	(0.07)	(0.09)
SEP_{t-1}		0.19		-0.13		0.77**
		(0.15)		(0.17)		(0.26)
R-Squared	0.63	0.64	0.71	0.64	0.62	0.68
Observations	359	91	155	24	204	67

Survey of Professional Forecasters	1995:Q1-2024:Q4		1995:Q1-2007:Q4		2008:Q1-2024:Q4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.05*	0.05***	0.05	0.05**	0.07**	0.05*
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
SEP_{t-1}		0.12*		0.10		0.05
		(0.06)		(0.11)		(0.08)
R-Squared	0.80	0.85	0.80	0.72	0.84	0.87
Observations	120	86	52	23	68	63

Table 19. 25th Percentile. The dependent variables are the one year ahead expectation (25th percentile) of percentage price changes from the MSC, and the one year ahead expectation (25th percentile) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, and controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The tuning parameters for the LASSO regressions are 0.007 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

D.8 Percentiles: 75th

Michigan Survey of Consumers						
	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.10	0.26	-0.00	0.12^{**}	0.43^{***}	0.44^{**}
	(0.09)	(0.16)	(0.04)	(0.05)	(0.11)	(0.19)
SEP_{t-1}		0.27		-0.25^{***}		0.43
		(0.33)		(0.08)		(0.54)
R-Squared	0.68	0.68	0.38	0.66	0.77	0.74
Observations	359	91	155	24	204	67

Survey of Professional Forecasters						
	1995:Q1-2024:Q4		1995:Q1-2007:Q4		2008:Q1-2024:Q4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.10^{***}	0.10^{***}	0.05^{*}	0.06^{**}	0.18^{***}	0.13^{***}
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
SEP_{t-1}		0.28^{***}		0.14		0.23^{***}
		(0.09)		(0.10)		(0.09)
R-Squared	0.80	0.83	0.68	0.60	0.87	0.89
Observations	120	86	52	23	68	63

Table 20. 75th Percentile. The dependent variables are the one year ahead expectation (75th percentile) of percentage price changes from the MSC, and the one year ahead expectation (75th percentile) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, and controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The tuning parameters for the LASSO regressions are 0.007 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

D.9 Deflation

Michigan Survey of Consumers						
	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.09**	0.19***	0.04	0.16**	0.24***	0.27***
	(0.04)	(0.07)	(0.04)	(0.06)	(0.05)	(0.08)
SEP_{t-1}		0.14		-0.13		0.34
		(0.14)		(0.11)		(0.22)
R-Squared	0.66	0.74	0.50	0.57	0.77	0.81
Observations	359	91	155	24	204	67
Survey of Professional Forecasters						
	1995:Q1-2024:Q4		1995:Q1-2007:Q4		2008:Q1-2024:Q4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.08***	0.08***	0.05**	0.05**	0.11***	0.07***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
SEP_{t-1}		0.19***		0.06		0.19***
		(0.07)		(0.10)		(0.08)
R-Squared	0.79	0.87	0.76	0.67	0.88	0.90
Observations	120	86	52	23	68	63

Table 21. Additional identifier: deflation. The dependent variables are the one year ahead expectation (median) of percentage price changes from the MSC and the one year ahead expectation (median) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, with the additional keyword "deflation", and controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The tuning parameters for the LASSO regressions are 0.005 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

D.10 Overall IPI

Michigan Survey of Consumers						
	1995:M1-2024:M12		1995:M1-2007:M12		2008:M1-2024:M12	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.08*	0.19***	0.02	0.23***	0.25***	0.22***
	(0.05)	(0.07)	(0.04)	(0.07)	(0.05)	(0.07)
SEP_{t-1}		0.18		-0.09		0.43**
		(0.14)		(0.10)		(0.21)
R-Squared	0.66	0.74	0.50	0.61	0.77	0.81
Observations	359	91	155	24	204	67
Survey of Professional Forecasters						
	1995:Q1-2024:Q4		1995:Q1-2007:Q4		2008:Q1-2024:Q4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.08***	0.07***	0.05*	0.04*	0.11***	0.06**
	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
SEP_{t-1}		0.20***		0.06		0.22***
		(0.07)		(0.10)		(0.08)
R-Squared	0.78	0.85	0.75	0.65	0.87	0.89
Observations	120	86	52	23	68	63

Table 22. Inflationary Pressure Index computed over all sentences, including sentences about past inflation. The dependent variables are the one year ahead expectation (mean) of percentage price changes from the MSC, and the one year ahead expectation (mean) of CPI all items inflation from the SPF. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, with the addition of sentences about the past, and controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The tuning parameters for the LASSO regressions are 0.007 for MSC and 0.01 for SPF. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.

D.11 NY-Fed Survey of Consumer Expectations

	One Year Ahead		**Three Years Ahead**	
	Model 1	Model 2	Model 1	Model 2
IPI_{t-1}	0.11^{*}	0.23^{***}	0.11^{*}	0.24^{***}
	(0.06)	(0.07)	(0.05)	(0.07)
SEP_{t-1}		-0.92^{***}		-0.72^{***}
		(0.21)		(0.22)
R-Squared	0.93	0.95	0.50	0.62
Observations	139	45	139	45

Table 23. NY Fed SCE. The dependent variable is the one year ahead and three year ahead inflation expectations (median) from the New York Fed Survey of Consumer Expectations over the sample 2013M1-2024M12. Model 1 includes a constant, the standardized inflationary pressure index IPI_{t-1} constructed in Section 2.1, and controls X_{t-1} selected from the LASSO regression of $E_t\pi_{t+h}$ on Z_{t-1}, with $E_t\pi_{t+h}$ the MSC one year ahead median expectations, Z_{t-1} the predictors described in Section 2.3. Model 2 also includes the FOMC's quantitative inflation forecasts, SEP_{t-1}. The tuning parameter for the LASSO regressions is 0.01. '*', '**' and '***' indicate significance levels at the 10, 5 and 1 percent respectively.