# Puppies or Policy: Measuring Household (In)Attention to Central Bank Communication

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**Abstract**

This paper proposes a novel approach to examine the causal effects of monetary policy announcements on households' inflation and interest rate expectations by employing a repeated cross-sectional per-announcement analysis. Departing from conventional panel estimation techniques, this method facilitates a more nuanced and contextual assessment of how and when central bank communication drives household expectations, without relying on arbitrary assumptions about monetary policy indicators. Leveraging responses from the Bundesbank Online Panel of Households (BOP-HH) collected on days before and after ECB Governing Council meetings, this approach reveals a much more pronounced household reaction to policy announcements than is typically suggested by related event studies.

JEL Classification: D84, E12, E31, E40, E58

# Introduction

*"[M]ost people are not obsessed about the central bank [...], they would rather watch puppies on YouTube."*

- Alan S. Blinder, 2015[1]

*"[W]e must explain much better to the general public what we are doing and why, and we must talk to people that we do not normally reach."*

- Christine Lagarde, 2020

Ever since the early 1990s, and particularly since the aftermath of the Great Recession, central banks have made great efforts to improve the transparency of monetary policy and to provide a more comprehensive account of their actions (Binder, 2017b). This marks a notable departure from the communication practices of prominent figures such as Arthur Burns, Paul Volcker, and especially Alan Greenspan, whose penchant for ambiguity in conveying information to the public earned the colloquial label of "Fed speak" or, as Blinder

[1] See Blinder's comment in Kumar et al. (2015)

succinctly phrased it: "a turgid dialect of English [...] which seems to connote the use of numerous and complicated words to convey little if any meaning" (2001, p.66). What was once considered unorthodox in the realm of central banking – the clear communication of policy decisions and monetary targets – has now become common practice and an essential policy tool in its own right.

While the increasing reliance on central bank communication as a dedicated policy tool has been driven primarily out of necessity, due to constraints imposed by the effective lower bound (ELB), both academics and, intriguingly, central bankers alike generally agree that communication with the public will remain an integral part of the future policy mix.[2] This universal emphasis on clear and consistent communication aligns with the notion that effectively disseminated and well understood monetary policy enhances its predictability, which in turn supports the anchoring of inflation expectations and thereby provides policymakers with an additional degree of freedom in the conduct of monetary policy (Clarida et al., 1999).

A critical prerequisite for the success of central bank communication, however, is the ability of policymakers to credibly manage and engage with the macroeconomic expectations of *all* agents, including those of the broader public, rather than exclusively those of a select group of already highly attentive financial market participants. While sophisticated stakeholders have traditionally been able to decipher a central bank's monetary policy stance by closely monitoring the character and size of open market operations conducted by the central bank's trading desks, it remains questionable whether households pay any attention at all to central bank announcements (Binder, 2017b).

From a macroeconomic modeling perspective, the management of expectations matters for monetary transmission mainly through two channels: The forward-looking IS relation obtained from the optimal consumption-saving decision of households, and the New Keynesian Phillips curve, derived from the optimization problem of price-setting agents (Walsh, 2017). Thus, if households play any role in setting prices or wages (as suggested by Coibion et al. (2018), among others), then their expectations matter not only through the former channel, but also through the latter. To be clear, the link between household expectations and monetary transmission is not merely a supplementary assumption to motivate this paper, but rather a fundamental premise of New Keynesian macro-modelling. The question of whether a central bank's communication strategy reaches the broader public is thus crucial for assessing the effectiveness of monetary policy transmission through the expectation channel, and it is *imperative* to understand whether households are paying attention or not. There is *little reason* in providing positive policy advice in a New Keynesian framework if we ignore the empirical validity of this key assumption to begin with. Extending on this line of thought, we must consider scenarios in which households pay little or no attention to central bank announcements. In such cases, reverting to

[2] For comprehensive surveys on this sentiment, see Fry et al. (2000) or Blinder et al. (2017).

discretionary monetary policy may be preferable, as the central bank's commitment to communication, coupled with a failure to effectively reach its audience, could lead to unintended negative outcomes. For instance, increased transparency may impose adverse conformity pressures on central bankers' deliberations (Hansen et al., 2018). Without effective communication, these pressures are then not offset by the intended merits of aligning households' expectations with the central bank's objectives. Consequently, when central bank communication is poor or public interest is low, the costs of transparency may outweigh its benefits, potentially making discretionary policy the more prudent approach. In this regard, both Coibion, Gorodnichenko, and Ropele (2020) and D'Acunto et al. (2021) show that the mismatch between the information sent by central banks and the information received by households is an important economic friction that should be overcome.

Taking these arguments into account this paper aims to test the assumption that central banks effectively shape household expectations through communication and examines the causal effects of the ECB's monetary policy announcements on German households' inflation and interest rate expectations. In the existing literature, this question is typically addressed empirically using a panel regression design to estimate average announcement effects over a given period. Contributions such as Lamla and Vinogradov (2019) or De Fiore et al. (2021), which implement this panel estimation procedure, generally provide little or no empirical support for the assumption that the general public pays attention to the central bank, thus casting doubt on the recent enthusiasm for increased central bank communication with a broader audience.

The main contribution of this paper is to present a novel perspective on how to assess the causal effects of central bank communication on household expectations. In contrast to estimating an average announcement effect using a panel regression, I propose a repeated cross-sectional approach to estimate announcement effects on a per-announcement basis. This methodology facilitates the interpretation of estimated announcement effects in the context of specific monetary policy events and uncovers heterogeneity in household responses across different announcements. This heterogeneity, in turn, suggests that households appear to pay selective attention to policy announcements, contrary to the impression given by panel regressions, which typically yield null results due to the persistence of treatment intensities of monetary policy announcements across meetings.

I estimate the respective announcement effects using an event study approach, which, in contrast to experimental approaches such as Andre et al. (2022) or Coibion et al. (2022), allows not only to analyze whether the received information is correctly processed, but also to assess whether the central bank's signal is received in a non-laboratory context, where news about monetary policy is not forced upon subjects and thus may not enter their information sets to begin with.

The analysis leverages responses from the Bundesbank Online Panel of Households (BOP-HH), a representative monthly survey of approximately 3,000 German households

(Braggion et al., 2024). The resulting panel data covers survey responses from April 2020 to December 2023, providing ample variation in policy announcements across ECB Governing Council meetings. To demonstrate the discrepancy between panel estimates and repeated cross-sectional per-announcement estimates, this paper proceeds in two steps. First, using the BOP-HH data, I replicate the analysis of De Fiore et al. (2021), who estimate the average response of U.S. household expectations to FOMC announcements using a panel approach, but find only negligible effects. I apply their methodology to the German context, focusing on ECB announcements, and also find a limited traction on household expectations. Second, using the same data, I show that this panel estimation masks a considerable amount of heterogeneity in the response of German household expectations to ECB Governing Council announcements by estimating announcement effects on a per-announcement basis. The results suggest that household reactions between April 2020 and December 2023 can be broadly classified into three distinct groups, which differ inherently due to considerable differences in the intensity of treatment across the respective Governing Council meetings:

1. *Expansionary Pandemic-related Meetings*: These meetings feature unconventional monetary policy measures to stimulate the economy which was grappling with the fallout of the COVID-19 pandemic. With the policy rate at its effective lower bound, the announcements during this period mainly concerned asset purchases under the APP and the PEPP, with a focus on aggravating the subdued price dynamics. The estimated announcement effects closely mirror the Governing Council's policy decisions, showing an increase in inflation expectations and null results for expected interest rate changes.

2. *Contractionary post Ukraine War Meetings*: These meetings are characterized by a series of consecutive interest rate hikes aimed at mitigating the escalating price pressures caused by rising food and energy price inflation. Consistent with the existing literature, household expectations exhibit a pronounced and persistent response to these meetings, supporting the notion that changes to the policy rate are far more salient than unconventional measures like large-scale asset purchases or forward guidance. I estimate highly significant and positive announcement effects for interest rate expectations and negative effects for inflation. The estimated announcement effects only begin to moderate once the ECB announced that interest rates would not rise any further.

3. *Affirmative Meetings*: These meetings, scattered throughout the survey period, are outliers as they simply confirm existing policy measures without announcing any new changes to the ECB's conduct of monetary policy. The announcement effects estimated for this category of Governing Council meetings are characterized by slack and inertia, suggesting that the ECB's reaffirmation of its policy stance does not generate as much traction with household expectations as clear-cut policy changes.

The estimated announcement effects are highly robust, holding up well across a wide range of regression specifications. The results suggest that there is a strong relationship between ECB communication and German households' expectations about interest rates and inflation that cannot be captured by the average announcement effects estimated by panel approaches.

The remainder of this paper is organized as follows. Section 1 provides a comprehensive review of the related literature. Section 2 describes the primary data sources used in the main analysis, with particular emphasis on the BOP-HH. Section 3 outlines the central identification strategy and estimation procedure and serves as the methodological foundation for the main analysis. Section 4 presents the main results. Section 5 briefly discusses the robustness of the main results and Section 6 concludes.

# 1 Related Literature

This paper contributes to the literature advocating for more committed central banking through clear and targeted communication. As outlined in the introduction, the shift away from full discretionary action is not a temporary trend, but rather a permanent change in the practices of central banking. This transition is supported both by the tangible actions and efforts of central bankers and by a substantial body of academic research. For supportive statements from within academia, see Blinder (1999, 2009) or Woodford (2001, 2005), who were among the first to advocate for more central bank communication with a broader audience beyond just economic experts and financial markets. For endorsing comments from practitioners, see Bernanke (2003), Yellen (2013), or Lagarde (2020).

Independent of macroeconomic considerations, the International Monetary Fund (IMF) has established a set of principles to promote central bank transparency (1999). These principles emphasize the creation of public information services to which central banks would commit themselves in order to ensure their accountability and integrity. In line with this argument, scholars such as Dincer and Eichengreen (2014) or Binder (2017a) contend that accountability, achieved through clear communication and transparency, is a fundamental prerequisite for the usually legislated independence of central banks.[3] Similarly, Ettema (2007) presents a parallel argument from a political science perspective.

Returning to the theoretical discussion of monetary policy transmission, it is evident that central bank communication serves a dual purpose. Beyond institutional legitimation, it can function as a tool for policymakers to fulfill their mandate of maintaining price stability. In their seminal work, Clarida et al. (1999) discuss the benefits of "committed" central banking within the context of rule-based policymaking and inflation targeting. They employ a straightforward three-equation New Keynesian model to demonstrate that

[3] The ECB's independence is codified in Article 130 of the Treaty on the Functioning of the European Union (TFEU).

a credible commitment to a policy rule (e.g., a Taylor rule) can improve the short-run output-inflation trade-off relative to scenarios of full or partial discretion, provided that price setting depends on expectations about future economic conditions.[4] Similarly, they show that the classic inflation bias problem under discretion, as identified by Kydland and Prescott (1977) or Barro and Gordon (1983), can be moderated under commitment. While not explicitly advocating for central bank *communication* or *transparency*, their results imply that the "commitment" – let it be a clearly articulated policy rule or inflation target – must be well-understood by all economic agents to unambiguously anchor expectations to the stated commitment. Against this background, an improved and well-reasoned communication strategy emerges as a natural, if not apparent, starting point.

Coibion, Gorodnichenko, Kumar, and Pedemonte (2020) highlight the importance of central bank communication as a policy tool, particularly in periods of low interest rates and when the ELB constrains conventional policy options. They also examine the various channels through which information released by a central bank can propagate and shape expectations, and offer guidance on how to refine communication strategies to reach intended audiences more effectively. A more formal argument for central bank communication and commitment at the ELB is presented in Svensson (1997) or Eggertsson and Woodford (2003).

While the above references make a compelling case for central bank communication, they often neglect the need to differentiate within the central bank's audience, assuming that central banks only need to address a homogeneous group of agents, and thus do not consider whether different types of agents may require tailored communication strategies, or whether certain agents need to be addressed at all. A naive approach to segment a central bank's audience into relatively homogeneous subgroups would be to adopt the framework proposed by Kumar et al. (2015). This framework suggests focusing on three key demographics: financial markets, firms, and households.

As outlined above, the primary research question of this paper is inherently different from the well-studied branch of the literature that examines the impact of central bank communication on financial markets. Historically, this demographic has proven to be the most sensitive to monetary policy decisions, even in cases where the central bank does not actively engage, as is common practice today (Woodford, 2005). Although the reaction of financial markets in response to monetary policy announcements is not subject of this paper, there are some methodological parallels. Notable contributions in this direction certainly include Bernanke and Kuttner (2005), D'Amico and Farka (2011), Gagnon et al. (2018) or Andrade and Ferroni (2021).

In contrast to research on financial markets, research on the effects of monetary policy announcements on firm expectations is comparatively scarce, primarily due to the limited

[4] Prominent examples of widely used DSGE models with this feature include Bernanke et al. (1999) or Smets and Wouters (2003).

availability of survey data. In their 2020 review paper, Coibion, Gorodnichenko, Kumar, and Pedemonte note that "[t]here are few surveys that ask for quantitative [...] expectations of firms, and those that do tend not to be nationally representative" (p.10). Moreover, they show that there is a substantial variance across surveys in how questions about macroeconomic expectations are phrased; using methods such as asking for quantitative point estimates, bins, qualitative categories, etc.

Despite the constraints imposed by limited data availability, studying how firms respond to monetary policy announcements remains an interesting area of research, as firms can be situated anywhere on the informational spectrum between professional forecasters, who are undoubtedly extremely well informed, and households, who tend to be poorly informed (Kumar et al., 2015).

To assess the impact of central bank communication on firm decisions, Coibion et al. (2018) conduct an information provision experiment involving firm managers sampled from a nationally representative survey in New Zealand. In the experiment, the treatment group received explicit information about the Reserve Bank of New Zealand's (RBNZ) inflation target, while the control group did not. The authors find that managers in the treatment group tend to revise down their inflation expectations immediately after the intervention. However, this effect disappears completely within six months. Although there are no significant changes in the pricing or wage strategies of treated firms, there is a significant reduction in hiring relative to firms in the control group.

Firms' expectations matter in the context of this paper since there is a strand of literature that robustly suggests that firms' inflation expectations closely mirror those of households. Blinder (1999) presents evidence that a majority of both wholesalers and retailers do not consult professional inflation forecasts when setting their prices. Nalewaik (2016) shows that inflation expectations in the Federal Reserve Bank of Atlanta's Survey of Business Inflation Expectations broadly resemble those in the Michigan Survey of Consumers (MSC). A very similar result is presented by Coibion and Gorodnichenko (2015) but for inflation expectations of firm managers in New Zealand. Hence, investigating whether central banks effectively reach ordinary households with their communication is crucial for understanding if they can steer the expectations of a not inconsiderable share of price-setting agents.

Turning explicitly to households, this paper is directly related to the literature that questions the exposure of ordinary households to monetary policy announcements. Carroll (2003) provides empirical evidence that the average consumer only seldomly pays attention to macroeconomic news. Binder (2017c) finds that most U.S. households do not know the fundamental operating objectives of monetary policy. Similarly, D'Acunto et al. (2023) argue that U.S. households have little to no knowledge about basic economic concepts and, as a consequence, perceive persistent deflation as desirable. Both Coibion, Gorodnichenko, Kumar, and Pedemonte (2020) and D'Acunto et al. (2021) argue, in this context, that

if ordinary households are indifferent to monetary policy announcements, then policies designed to influence consumer expectations may prove ineffective, as households are virtually unresponsive to central bank communication to begin with.

In order to assess the degree of the general public's exposure to central bank announcements, it is important to distinguish methodologically between experimental and event study approaches. Coibion et al. (2022) experimentally study the formation of inflation expectations in a subsample of the Nielsen Consumer Panel. They test the effect of eight different forms of information provision and find that reading about the actual Federal Open Market Committee (FOMC) meeting has about the same average effect on inflation expectations as simply being told about it. Further, they show that the information content of newspapers is adversely discounted. Andre et al. (2022) experimentally measure the impact of monetary shocks on unemployment and inflation expectations. They find that households adjust their inflation and unemployment expectations in response to a hypothetical change in the Federal Funds Rate. An important caveat with this type of experimental literature is that central bank communication is artificially imposed on the subjects. Consequently, these estimates may suffer from an upward bias if the central bank's real-world signal is too weak to penetrate to the household level. In other words, experimental studies may prove that central bank communication can actively manage expectations, but only under the condition that the signal is actually received. However, this does not imply that all information released by the central bank is automatically absorbed by households in a non-laboratory context. In support of this last argument, Lamla and Vinogradov (2019) find in an event study, using a custom sample of U.S. households, surveyed two days before and after 12 FOMC meetings between 2015 and 2018, that policy announcements have no significant effect on inflation nor on interest rate expectations. But they do show that an increase in communication increases the probability that households get hold of central bank announcements. In contrast, other event studies like De Fiore et al. (2021), suggest that the real-world communication channel from central banks to households is present but far less pronounced than what is indicated in experimental studies. Using data from the Survey of Consumer Expectations (SCE) and all FOMC meetings from 2013 to 2019, they find that only expectations about the interest rate on savings accounts are robustly affected by policy announcements. Expectations regarding personal variables such as income and consumption are unaffected. This last finding also holds true for variations in financial literacy. Lewis et al. (2020) use daily survey data from Gallup to study how central bank announcements influence household beliefs about economic conditions. They find that only shocks to the Federal Funds Rate significantly affect consumer confidence.

To be clear, this paper does not debate whether or not a central bank should communicate with the general public. The opening quote from President Lagarde underlines that the ECB is already committed to do so. Rather, this paper focuses on a more nuanced

question: Assuming that a central bank has already decided to communicate with the public, does this communication reach households and effectively shape their expectations?

My research contributes to the existing literature in three crucial aspects. First, this paper employs an event study approach to investigate how ECB announcements impact German household expectations. While most of the previous research has concentrated on FOMC announcements and U.S. households, this work shifts focus to the European context. The methodologically closest related study, Enders et al. (2019), examines German firms rather than households. Second, my sample period encompasses 30 ECB Governing Council meetings, offering substantial variation in policy announcements. This stands in contrast to Lamla and Vinogradov (2019), who based their conclusions on a limited sample of 12 FOMC meetings. Their assertion of null results in both per-announcement and pooled estimations should be interpreted cautiously due to the restricted variation in treatment intensities or as the authors acknowledge themselves: "While overall, on average, [...] the effect is statistically nil, this does not yet necessarily mean announcements are irrelevant" (Lamla and Vinogradov, 2019, p.26). Finally, and most importantly, I emphasize the need to assess the effects of monetary policy announcements on a per-announcement basis. This approach avoids the potential pitfall of estimating average zero effects caused by the persistence of monetary policy announcements across meetings. I claim that assessing the effectiveness of central bank communication in a panel regression is uninformative because it dilutes the significant announcement effect of certain key meetings. I show that panel estimates typically lead to null results, while per-announcement estimates reveal that households do indeed pay selective attention to central bank announcements. To argue that households don't pay any attention at all to central bank announcements because they don't do so on average would imply that they also did not react to Mario Draghi's "whatever it takes" or the Fed's *Taper Tantrum*.

The hazards of relying solely on panel estimates to assess household attention to central bank announcements cannot be understated. The case of the Fed's *Taper Tantrum* provides a compelling illustration of this point in the context of the evidence presented by De Fiore et al. (2021). This single event was potent enough to render the estimated average announcement effect on interest rate expectations significant for the entire period from 2013 to 2019. It is no coincidence that De Fiore et al. (2021, p.16), when discussing the few significant results in their sample, state that "[e]xcluding the Taper Tantrum episode [the estimated] effect becomes insignificant" or that "for interest rate expectations, [the] effect is entirely driven by the Taper Tantrum episode." It is probable that other FOMC announcements during this period would also show significant effects when examined individually, even if not as pronounced as the *Taper Tantrum* itself. However, without the inclusion of the *Taper Tantrum*, these effects were likely diluted in the estimation of the average announcement effect, due to the general persistence of monetary policy across FOMC meetings that took place between 2013 and 2019. In other words, excluding

the *Taper Tantrum*, these announcements alone may not have been sufficient to render the overall average effect statistically significant, despite potentially having a meaningful impact on household expectations at the time of the respective announcements. By focusing solely on average effects, we forfeit the ability to pinpoint which specific announcements succeeded in engaging household expectations and, more importantly, to understand the underlying reasons for these responses. However, this granular insight is essential for a comprehensive understanding of how central bank communication affects the public's perception and economic behavior.

# 2 Data

## 2.1 Bundesbank Online Panel of Households (BOP-HH)

The BOP-HH is a monthly online panel conducted by the Bundesbank that aims to elicit German household expectations with respect to inflation, interest rates, rents, and housing prices.[5] Initially, the Bundesbank launched a preliminary pilot survey which was conducted over three consecutive months, from April to June 2019. During these first three waves, 4,077 responses were collected through 6,652 interviews. After a review period and a brief interruption due to the pandemic, the BOP-HH resumed in April 2020 with some methodological changes to its survey design. This fourth wave also marked the transition out of the pilot phase. At the time of writing in November 2024, the BOP-HH has been administered every month since its resumption in April 2020.

I was granted access to the first 48 waves of the survey, which include both the initial three pilot waves and the subsequent standardized production waves numbered 4 through 48. Due to methodological differences between the three pilot and the successive production waves, the analysis will focus exclusively on waves 4 to 48. This strategically delineated dataset spans the period from April 2020 to December 2023. The average sample size during this period is 4,239 with a standard deviation of 1,546.

As the name suggests, the BOP-HH is administered online using Computer Assisted Web Interviewing (CAWI). The distinct benefits of this online format are quick turnaround times and readily available data with minimal need for additional processing. As a result, the BOP-HH is much more timely than comparable face-to-face surveys, can be conducted on a monthly basis, and is less prone to measurement errors due to human intervention. These features make it particularly appealing for analyzing the impact of monetary policy announcements, which in the case of the ECB's Governing Council meetings occur on a roughly six-week cycle. The BOP-HH's timeliness also sets it apart from other surveys such

[5] I rely exclusively on the Bundesbank's Technical Paper by Beckmann and Schmidt (2020) for the discussion of the BOP-HH survey design. While the Technical Paper mainly refers to the initial pilot survey, it is still applicable to the scope of this paper.

as the Bundesbank's Panel on Household Finances or the ECB's Consumer Expectations Survey. While these latter surveys are more comprehensive, they lack the BOP-HH's frequency and immediacy.

The main disadvantage of conducting the survey online is that individuals who do not regularly use the Internet are less likely to be included in the sample. In other words, non-response to the BOP-HH may not be random. The BOP-HH addresses this issue by reverting to initially recruiting respondents offline. To be specific, respondents are recruited by telephone as part of the *forsa.omnitel* survey, which represents the German-speaking population aged 14 years or older. Within this telephone survey, participants are asked if they would be interested in participating in online surveys and are then randomly assigned to the BOP-HH. This offline recruitment strategy offers the advantage of including individuals with limited Internet usage in the online survey, effectively reducing the online selection bias due to the non-randomness of non-response, but does not fully resolve it. Beckmann and Schmidt (2020) show that compared to the general population, especially older female respondents and respondents with lower educational attainment are underrepresented in the BOP-HH. With those considerations in mind, the BOP-HH sample is weighted to represent individuals aged 16 years or older with Internet access residing in Germany. As already stated it excludes individuals without Internet access and may not account for unobservable characteristics that influence the decision to join an online panel. This selection bias is the main limitation introduced by the BOP-HH's online format. Nonetheless, this can be partially offset by the BOP-HH's outstanding regional coverage, which exceeds the typical scope of face-to-face surveys by providing household data from 398 out of the 401 German districts. In addition, it should be noted that the German Federal Statistical Office, *Destatis*, reported that 95% of all German households had Internet access in 2023.

The BOP-HH is designed to use soft prompts, a mechanism by which the "Don't know" and "Refuse to answer" options are initially hidden from the respondent. These options only become available when the individual attempts to move on to the next question without providing a valid answer to the current one, thus ensuring that each question receives a response. Unlike some longer running surveys, such as the Michigan Survey of Consumers, which allows respondents to revise extreme answers, the BOP-HH maintains a strict approach that doesn't allow respondents to revisit or change previously answered questions. This approach ensures decisive responses, forcing respondents to be more deliberate and certain when answering, and promotes a consistent and straightforward data collection process (Beckmann & Schmidt, 2020). In addition, the questionnaire is designed so that respondents cannot interrupt the survey and resume at a later point in time. This design ensures that *all* responses from a single household match the timestamp that is passively collected once a household starts answering the survey. Such a setup effectively eliminates any potential uncertainty about whether a response was collected

before or after any given event, such as an ECB monetary policy announcement. A corollary benefit of this structured approach is the remarkably short average interview duration, which stands at only 19 minutes for waves 4 to 48 and prevents respondents from rushing questions due to survey fatigue.

## 2.2 Expectation Variables

The BOP-HH core questionnaire focuses on eliciting macroeconomic expectations and collecting relevant control variables to analyze how household expectations are formed. Given the infancy of the survey, there is still considerable variation in the specific variables collected across waves, especially in the earlier iterations of the survey, most of which is due to the addition of new questions or randomized control trial questions dropping in and out of the survey. Nevertheless, there is a set of 44 core variables that are collected across all waves. These core variables include all the relevant expectation and control variables that will be used for the main analysis in Section 4.

For the dependent variables, I focus on questions related to expectations about inflation and the interest rate on savings accounts. The BOP-HH elicits these expectations in a qualitative form. The exact wording of the expectation variables used Section 4 is detailed in Table 1. For ease of interpretation (and due to computational considerations), I combine the categories "decrease significantly" and "decrease slightly" into *decrease* and the categories "increase significantly" and "increase slightly" into *increase*. Unreported robustness checks show that this does not change the qualitative interpretation of the estimated coefficients.

| **Variable Name** | **Question** | **Answer Options** |
|---|---|---|
| Interest Rate 12M | Will interest rates on savings accounts... | 1 decrease significantly<br>2 decrease slightly<br>3 stay roughly the same<br>4 increase slightly<br>5 increase significantly |
| Inflation 12M | Will the inflation rate over the next twelve months... | 1 decrease significantly<br>2 decrease slightly<br>3 stay roughly the same<br>4 increase slightly<br>5 increase significantly |

**Table 1:** *BOP-HH questions and related response options for the expectation variables used in the main analysis. Note that the survey is administered in German. The provided translation is the author's interpretation and is not an official translation endorsed by the Bundesbank.*

In terms of controls, I rely on a set of variables commonly used in the literature. Specifically, I include: *age, gender, education*, and *income*. This set of control variables is collected in all relevant waves of the BOP-HH, allowing for consistency across per-

announcement estimations, and was chosen to ensure comparability with related research. While the particular choice of control variables can sometimes appear erratic in the literature, it should be noted that the baseline results estimated in Section 4 are extremely robust to variations in the control variables used due to the random treatment in the event study. This includes any permutation of the controls listed above or the addition of other controls available in the BOP-HH. More information on the robustness of the estimates is provided in Section 5.

## 2.3 Monetary policy announcements

The ECB divides its policy communication into five categories: interviews, speeches, press releases, monetary policy decisions, and press conferences.[6] The *interviews* category covers all face-to-face media interactions between journalists and members of the Executive Board. Similarly, the *speeches* category curates all formal speeches delivered by members of the Governing Council. These speeches typically do not contain information on new monetary policy decisions. Still, they are intended to clarify existing decisions and to address other issues related to central banking, the financial system, and the broader economic environment.[7] *Press releases* is a collective term for all other releases that do not fall into one of the above categories and are unrelated to the announcement of new monetary policy decisions. This includes, for example, the announcement of survey results, the release of economic indicators, staff reports, financial statements, etc.

While each of these categories has interesting aspects for analysis on its own, I will focus my analysis on the remaining two and arguably the most salient categories, *policy decisions* and *press conferences*, which are really just two successive stages of a single monetary policy announcement event – the Governing Council meeting.

As of January 2015, the ECB Governing Council meets on a six-week cycle to announce its new monetary policy decisions. On the day of a meeting, different from what is practice in the U.S., the ECB's policy decisions are announced in two separate steps. First, at 13:45 Central European Time (CET), a brief press release is issued, announcing the policy decisions along with a concise rationale. Then, at 14:30 CET, the President of the ECB reads a prepared text, the introductory statement, on the reasons for the decisions, which market participants often perceive as also providing information on the future path of monetary policy. The President takes about 15 minutes to read the statement, followed by a 45-minute question-and-answer session with journalists (Altavilla et al., 2019). The press release published at 13:45 CET is categorized under the *policy decisions* label, while

[6] This information is retrieved from the ECB's press achieve (https://www.ecb.europa.eu/press/html/index.en.html).

[7] Mario Draghi's "*whatever it takes*" is listed in the *speeches* category (https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html). While not a monetary policy decision per se, it is clear that the *speeches* category can also provide relevant information regarding the trajectory of monetary policy.

the introductory statement and the subsequent Q&A session are jointly published in the *press conferences* category.

Since the BOP-HH only contains information about the day on which a household completed the survey, but no information on the time at which it was submitted, there is no way of knowing whether a particular interview collected on a Governing Council meeting day was completed before the policy decisions' press release, during the interim period between the release and the press conference, or after the press conference. Therefore, there is no way to classify surveyed households on the day of a Governing Council meeting into exposed and non-exposed households. In close reference to De Fiore et al. (2021) I therefore discard all survey replies collected on any given Governing Council meeting day. This in turn implies that it is not possible to estimate the announcement effects of the monetary policy decision and the press conference separately. I will therefore revert to Altavilla et al.'s (2019) terminology of discussing the monetary policy decision and the press conference jointly as one singular monetary policy announcement event. Consistent with this terminology, the BOP-HH reference period covers a total of 30 monetary policy announcement events.

# 3 Identification and Estimation

To estimate the impact of a monetary policy announcement on household expectations, I compare the BOP-HH responses of households surveyed just before a Governing Council meeting with those surveyed thereafter. To do so, I merge all 45 waves of the BOP-HH into one dataset and drop all observations that do not fall within a symmetric $N$-day bracket around a monetary policy announcement. As discussed earlier, I also exclude responses that were submitted on the day of a Governing Council meeting because the BOP-HH does not allow to distinguish whether a survey was completed before or after any given Governing Council meeting. As a result, I obtain a panel with synthetic waves, where each wave no longer corresponds to the actual BOP-HH wave in which the household response was collected, but to the closest monetary policy announcement. The original wave variable can then be understood as a cohort-specific effect that controls for differences between actual BOP-HH survey waves.

Each synthetic wave is then split into control and treatment according to whether the respective surveys were completed before or after a given Governing Council meeting. A dummy variable $T$ denotes the assignment to control or treatment, taking a value of 0 before the announcement and 1 thereafter. In this context, it should be emphasized that the term treatment dummy can be somewhat misleading for the interpretation of $T$, as it suggests that households with $T = 1$ were actually treated with the information communicated by the ECB. However, since I follow an event study approach and the BOP-HH does not actually nudge respondents to inform themselves about monetary

policy decisions, it is not clear whether a household with $T = 1$ is actually aware of the announcement or not, even if the response comes in after the Governing Council meeting took place. Thus, $T = 1$ refers to those who had the opportunity to receive information about the ECB's monetary policy announcement, but it doesn't imply that they were actually treated with the news.

Figure 1 visualizes the exact timing of the identification approach outlined above for an exemplary monetary policy announcement $M$ and a symmetric $N$-day window bracketing the event.

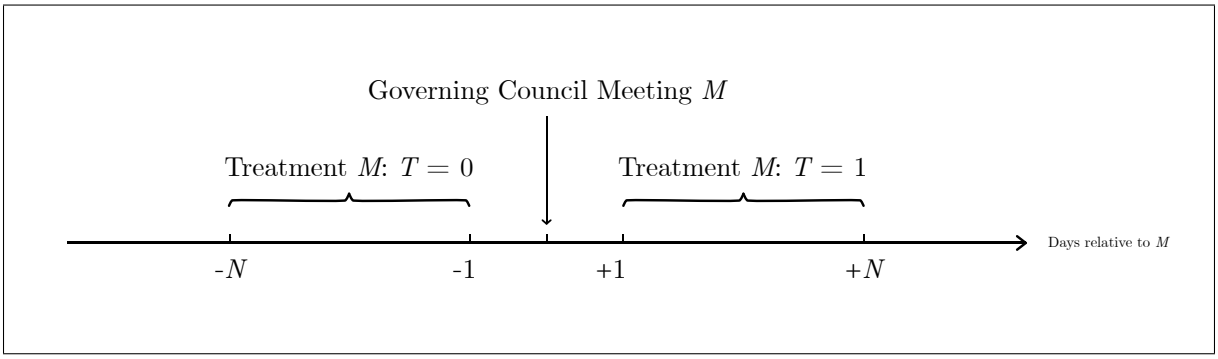


**Figure 1:** *Identification Timeline*

This method of identifying the effects of monetary policy announcements is closely related to the methodology proposed by De Fiore et al. (2021) and, more generally, to the broader literature on event studies in the context of monetary policy announcements introduced in Section 1. In reference to De Fiore et al. (2021) I set $N$ to 21 days. This serves two purposes. First, it ensures comparability with the results reported by De Fiore et al. (2021). Second, it maximizes the number of observations. As will be shown in Section 5, the baseline results estimated in Section 4 are robust to shortening the time frame $N$ in which responses are included. Note, however, that the minimum value for $N$ is 14 due to the survey design of the BOP-HH described in Section 2.1.

Since the BOP-HH elicits expectations in a qualitative form (see Table 1), I estimate the effects of monetary policy announcements using a multinomial logit model (MLOGIT), which is essentially a series of binary logit regressions against a predefined base category. Here, I set the *stay the same* category as the base category and estimate coefficients for the remaining *increase* and *decrease* categories. The exponentiated MLOGIT coefficients can then be interpreted as the relative risk of choosing either *increase* or *decrease* over the base category *stay the same*. In other words, MLOGIT provides a separate coefficient for *increase* relative to *stay the same* and a separate coefficient for *decrease* relative to *stay the same*, without being constrained by the proportional odds assumption enforced by ordered logit models. This allows for an asymmetric analysis of household responses to monetary policy announcements, providing detailed insights into the direction of change in survey responses.

To further motivate why it is preferable to estimate the announcement effects in this

particular case using a multinomial logit rather than an ordered logit or OLS estimation, consider the following: If the central bank confirms its previously announced policy stance with no further changes to interest rates, and households correctly receive and process this signal, it would be reasonable for households to adjust their expectations from both the *decrease* and *increase* response categories to the *stay the same* response category. In this scenario, the MLOGIT would estimate two coefficients with negative signs, indicating a decreasing probability of choosing either *increase* or *decrease* over *stay the same* after receiving information that, for example, interest rates will remain unchanged. This level of detail and flexibility is not possible with OLS or ordered logit regressions because they estimate a single coefficient. This single regression estimate may then indicate that respondents tend to adjust their expectations in ways that do not accurately capture the nuances of their responses, e.g., switching from both *decrease* to *stay the same* and from *stay the same* to *increase* if the coefficient is positive, or vice versa if the coefficient is negative. Such asymmetries are particularly prevalent when the ELB is binding, as subjects have little reason to expect further interest rate decreases but may anticipate future rate increases.

The discussion of using MLOGIT versus OLS mirrors the discussion of choosing between OLS and logit models for binary outcome variables. A key consideration in this debate is the fact that the categorical outcomes of the expectation variables have an ordinal ranking (*decrease* < *stay the same* < *increase* ) but not a cardinal relationship. Thus, the choice of numerical proxies for the categories is not arbitrary and relevant for OLS estimation. This concern does not apply to MLOGIT, making it the appropriate choice for this analysis.

# 4 Main Results

## 4.1 Estimating Announcement Effects using a Panel Estimation

As outlined in the introduction, I will commence the main analysis by estimating the average announcement effect of the ECB Governing Council's monetary policy decisions on German household expectations using an off the shelf panel regression. More precisely, I replicate the baseline specification estimated by De Fiore et al. (2021):

$$Y_{i,M} = \theta_t + \boldsymbol{\beta} \times T_{i,M} \times \boldsymbol{s}_{i,M} + \alpha_i + \epsilon_{i,M} \tag{1}$$

where $Y_{i,M}$ represents one of the two expectation variables reported in Table 1, elicited from respondent $i$ before or after Governing Council meeting $M$, $\boldsymbol{\beta}$ denotes the relevant $1 \times k$ coefficient row vector of interest, $T_{i,M}$ is the treatment dummy discussed in Section 3, $\boldsymbol{s}_{i,M}$ is a $k \times 1$ column vector of monetary policy indicators and $\epsilon_{i,M}$ is the idiosyncratic error term. Individual fixed effects $\alpha_i$ control for time-invariant factors that might impact the baseline level of an individual's macroeconomic expectations. $\theta_t$ controls for differences

across BOP-HH waves. Standard errors are clustered at the respondent-level.

Before discussing the results obtained from estimating Equation (1), two important points warrant consideration. First, the relevant vector of coefficients $\boldsymbol{\beta}$, which provides the qualitative information on whether households exposed to the ECB's monetary policy announcements exhibit a robust reaction to the Governing Council's policy decisions, does not carry an index. This is because the panel specification in Equation (1) estimates an average effect across all policy announcements within the sample. This is different from what will be done in Section 4.2. Second, since we are estimating a panel regression, we need to interact the treatment dummy $T_{i,M}$ with a quantitative measure of monetary policy for each Governing Council meeting in the reference period. This is necessary because a monetary policy announcement can be affirmative, expansionary, or contractionary. If we were to regress $Y_{i,M}$ on $T_{i,M}$ alone, $\boldsymbol{\beta}$ could not be identified, as $T_{i,M}$ would merely constitute noise, since $T_{i,M} = 1$ would be mapped to both monetary contraction and expansion. Consequently, a choice must be made regarding how to quantify each monetary policy announcement $M$ to give $T_{i,M}$ a meaningful direction. The corresponding measure, captured by the interaction variable $\boldsymbol{s}_{i,M}$, could then be anything from a crude measure, such as a dummy indicating monetary contraction (in which case both $\boldsymbol{s}_{i,M}$ and $\boldsymbol{\beta}$ would be scalars), to a more refined measure, such as a factor model with up to $k$ factors capturing the impact of monetary policy announcements along the yield curve. In the latter case, $\boldsymbol{s}_{i,M}$ would be a $k \times 1$ column vector of these factors, and $\boldsymbol{\beta}$ would be a $1 \times k$ row vector of corresponding coefficients. However, when it comes to actually choosing which policy indicators to include in $\boldsymbol{s}_{i,M}$, there exists a plethora of options. As previously noted, $\boldsymbol{s}_{i,M}$ could be as simple as a binary indicator signaling a rate hike, or a more complex continuous measure representing the actual underlying change in the policy rate itself. During periods when interest rates are constrained by the ELB, such as from 2020 to 2022, an estimated shadow rate could be used to capture the hypothetical changes in the policy rate resulting from unconventional monetary policy measures. In terms of estimating a shadow rate, several well-established approaches exist. See the models proposed by Krippner (2013), Wu and Xia (2016), Geiger and Schupp (2018), Lombardi and Zhu (2018), or De Rezende and Ristiniemi (2023), to name a few of the more commonly used ones.

Although changes in the shadow rate theoretically encompass various aspects of monetary policy, this policy measure has two important limitations. First, it does not explicitly distinguish between different dimensions of monetary policy, such as changes in the policy rate, forward guidance, or large-scale asset purchases. Second, it does not indicate the extent to which policy changes were anticipated.

One way to account for these aspects of monetary policy would be to use high-frequency identified financial market surprises, which are typically estimated using factor analysis. Several viable approaches for estimating these surprises (commonly referred to as shocks) have been proposed. Notable works in this area include those by Gürkaynak et al. (2005),

Altavilla et al. (2019), Jarociński and Karadi (2020), or Swanson (2021).

Another option would be to default to methods of textual analysis. Lucca and Trebbi (2009) present an automated and objective scoring technique to measure the content of central bank communication about future interest rate decisions. Tobback et al. (2017) construct a *Hawkish-Dovish* indicator of the media's perception of the ECB's tone at press conferences. Hansen et al. (2019) extract high-dimensional narrative signals from the Bank of England's inflation reports, and so on.

The preceding discussion should emphasize that the estimates derived from Equation (1) are likely to depend on the specific policy indicators included in $\boldsymbol{s}_{i,M}$. This dependency presents a challenge, as there is no a priori guidance on which policy measure to use or objective rationale for its selection. To further add to this concern, Krippner (2020) shows that estimated shadow rates can be highly sensitive to small choices in their estimation. He therefore warns that "it should not be presumed that any [shadow rate] series will necessarily be quantitatively useful" (p. 951) – a result that can be more generally extended to factor models.

To partially resolve the uncertainty about which measure to use, De Fiore et al. (2021) estimate the model specified in Equation (1) four times, each time using a different set of monetary policy indicators $\boldsymbol{s}_{i,M}$. Specifically, they use:

1. A dummy variable indicating monetary tightening derived from the shadow rate estimated by Lombardi and Zhu (2018)

2. Quantitative changes in the shadow rate estimated by Lombardi and Zhu (2018)

3. High-frequency identified financial market surprises for the Federal Funds Rate, Forward Guidance and LSAPs as proposed by Swanson (2021)

4. High-frequency identified monetary policy and information shocks as proposed by Jarociński and Karadi (2020)

To maintain focus on the main contribution of this paper presented in Section 4.2, and given the aforementioned sensitivity of the regression results to the choice of the underlying policy indicator, I limit the replication of De Fiore et al. (2021) to using only the third set of policy indicators listed above. However, since I am estimating announcement effects for ECB Governing Council meetings (rather than FOMC announcements), I use the methodologically similar Target, Timing, Forward Guidance, and QE factors proposed by Altavilla et al. (2019) instead of the factors proposed by Swanson (2021) used in De Fiore et al. (2021). The Altavilla et al. (2019) factors are specifically tailored for ECB policy analysis and aim to capture the impact of monetary policy decisions along the yield curve. The Target and Timing factors capture the short end, the Forward Guidance (FG) factor the medium term, and the Quantitative Easing (QE) factor the long end of the yield curve. The corresponding regression results are reported in Table 2.

| | Interest 12M | | Inflation 12M | | Interest 12M | | Inflation 12M | |
|---|---|---|---|---|---|---|---|---|
| | MLOGIT | | MLOGIT | | MLOGIT | | MLOGIT | |
| | (1) Decrease | (2) Increase | (3) Decrease | (4) Increase | (5) Decrease | (6) Increase | (7) Decrease | (8) Increase |
| Post-Announcement | -0.078 | 0.081 | -0.037 | -0.087 | -0.032 | 0.071 | -0.050 | -0.112 |
| | (0.075) | (0.083) | (0.097) | (0.068) | (0.079) | (0.086) | (0.102) | (0.072) |
| Post-Announcement × Target Factor | -0.015 | 0.003 | 0.011 | -0.016 | -0.011 | 0.009 | -0.001 | -0.022 |
| | (0.029) | (0.019) | (0.027) | (0.019) | (0.030) | (0.018) | (0.029) | (0.020) |
| Post-Announcement × Timing Factor | 0.029 | -0.163 | 0.012 | 0.129 | 0.057 | -0.169 | 0.019 | 0.086 |
| | (0.111) | (0.107) | (0.138) | (0.102) | (0.116) | (0.110) | (0.147) | (0.108) |
| Post-Announcement × FG Factor | -0.032 | -0.008 | 0.020 | -0.015 | -0.034 | -0.025 | 0.020 | -0.018 |
| | (0.034) | (0.033) | (0.052) | (0.036) | (0.035) | (0.033) | (0.054) | (0.037) |
| Post-Announcement × QE Factor | -0.006 | -0.086** | -0.005 | -0.025 | -0.013 | -0.075* | 0.038 | -0.021 |
| | (0.040) | (0.039) | (0.067) | (0.042) | (0.041) | (0.040) | (0.071) | (0.044) |
| Individual FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Wave-specific FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls | No | No | No | No | Yes | Yes | Yes | Yes |
| Observations | 90,587 | 90,587 | 76,721 | 76,721 | 83,126 | 83,126 | 70,437 | 70,437 |
| Respondents | 16,697 | 16,697 | 14,104 | 14,104 | 15,463 | 15,463 | 13,067 | 13,067 |

**Table 2:** *Baseline panel regression results. The base category for the MLOGIT estimates is* stay the same*, hence estimates are reported for both* decrease vs. stay the same *and* increase vs. stay the same*. Clustered standard errors at the individual level in parentheses.* $^{*}p < 0.10$*,* $^{**}p < 0.05$*,* $^{***}p < 0.01$

Looking at columns (3) and (4), which present the estimates for inflation expectations, we find that none of the estimates are significant at conventional levels. This confirms the findings of De Fiore et al. (2021) that households do not adjust their inflation expectations in response to monetary policy announcements. This result is robust to the inclusion of further control variables, as can be seen in columns (7) and (8) respectively.

Concerning interest rate expectations, columns (1) and (2) paint an even more striking picture than that observed by De Fiore et al. (2021). In contrast to their results, I find that households do not adjust their interest rate expectations even in response to increases in the target factor, as the coefficients on both *decrease* and *increase* are insignificant. However, as noted in Section 1, the significant effect of the target factor in their estimates is "entirely driven by the Taper Tantrum episode" (De Fiore et al. 2021, p.16). Thus, my results can be reconciled with their findings.

Overall, the evidence obtained from estimating the panel model specified in Equation (1) indicates that households do not adjust their expectations about interest rates and inflation in response to the Governing Council's monetary policy announcements. These results are consistent with the broader literature conducting similar event studies [e.g., Lamla and Vinogradov (2019) or De Fiore et al. (2021), respectively]. Nevertheless, these findings should be interpreted cautiously, as they ultimately depend on the choice of monetary policy measures included in $\boldsymbol{s}_{i,M}$. In a series of unreported regressions using the quantitative changes in the shadow rate estimated by Krippner (2020), I find that while robust adjustments in inflation expectations consistent with Table 2 remain absent,

households do revise their interest rate expectations upward in response to increases in the shadow rate. This aligns more closely with the findings of De Fiore et al. (2021). However such inconsistencies in qualitative results between regressions using different sets of policy indicators are also an issue in De Fiore et al. (2021) and should not come as a surprise given the discussion above.

## 4.2 Per-Announcement Estimations

Next, I propose an alternative method for assessing the causal impact of central bank announcements on household expectations. Instead of estimating an average announcement effect for the entire panel, I estimate announcement effects individually for each monetary policy announcement within the BOP-HH reference period from April 2020 to December 2023. Specifically, I employ the following baseline regression specification:

$$Y_{i,M} = \alpha_M + \beta_M \times T_{i,M} + \epsilon_{i,M} \tag{2}$$

where $Y_{i,M}$ is the expectation response elicited from respondent $i$ before or after the monetary policy announcement $M$, $\alpha_M$ is a constant, $\beta_M$ is the estimated announcement effect of interest, and $\epsilon_{i,M}$ is the error term.

There are two critical differences in Equation (2) when compared to Equation (1). First, the coefficient of interest $\beta_M$, which represents the estimated announcement effect, now carries an index $M$. This indicates that Equation (2) is estimated separately for each monetary policy announcement $M$ within the sample period. Since there were 30 Governing Council meetings during the BOP-HH reference horizon, Equation (2) is estimated 30 times. This repeated estimation results in a set of 30 regression coefficients, labeled $\beta_1$ to $\beta_{30}$, each measuring the impact of the respective monetary policy announcement on household expectations within a symmetric $N$-day window around the respective policy announcement $M$. For context, the corresponding coefficient in Equation (1) lacked an index since the panel regression estimated an average announcement effect over the entire panel period rather than doing so for each announcement individually. Second, the treatment dummy $T_{i,M}$ is no longer interacted with a monetary policy indicator. Unlike the panel estimation, the per-period approach does not require information about whether a monetary policy announcement was expansionary or contractionary to obtain meaningful estimates. Instead, the sign and significance of the estimated $\beta_M$ will indicate how households perceived the stance of monetary policy at the time of a given Governing Council announcement.

Consider the following example. A central bank credibly announces at meeting $M$ that it does not intend to raise its interest rate for the next 10 meetings. Let's assume that at meeting $M + 1$ the central bank breaks this promise and announces that it intends to raise the interest rate by 100 basis points at meeting $M + 5$. What would we expect the

MLOGIT estimates of $\beta_{M+1}$ to look like? If the central bank's announcement actually reaches households, we would expect them to discern that interest rates will rise in four periods from now and to update their expectations accordingly. Thus, we would expect a MLOGIT regression to estimate a positive $\beta_M$ for the *increase* category. This is because treated households would be more likely to expect interest rates to increase than to stay the same. Conversely, we would expect a negative estimate for the *decrease* category, as households would be less likely to expect interest rates to fall.[8]

We can derive all this information qualitatively simply by looking at the signs of the MLOGIT estimates, without making assumptions about which monetary policy indicator to use. In contrast, panel regressions depend on the specific and inherently arbitrary choice of monetary policy indicators included in $\boldsymbol{s}_{i,M}$. Therefore, estimating announcement effects using the per-period approach is more parsimonious and less arbitrary with respect to assumptions, making it qualitatively preferable to the panel approach commonly used in the literature. Moreover, the per-period approach allows us to analyze the impact of each monetary policy announcement individually, thereby identifying which specific announcements had a robust impact on household expectations. Thus, by using BOP-HH waves 4 to 48, we can now assess the impact of all Governing Council meetings that took place between 2020-04-30 and 2023-12-14.[9] For ease of interpretation, I report the regression estimates for Equation (2) in graphical form only. The corresponding detailed regression results can be found in Appendix Table B1. Figure 2 shows the results for interest rate expectations and Figure 3 shows the results for inflation expectations.

To fully leverage the power of the per-period estimation, it would be ideal to discuss each Governing Council meeting separately. However, since this goes beyond the scope of this paper, I will focus on general trends observed in the estimated coefficients and highlight a few key announcements in the recent history of the ECB's monetary policy stance. A comprehensive reference guide with brief summaries of all Governing Council meetings can be found in Appendix A.

Generally speaking, the ECB's conduct of monetary policy in the relevant period from April 2020 to December 2023 was mainly shaped by two major developments. First, the COVID-19 pandemic, which struck Europe in early 2020 and led to a sharp economic downturn as a result of stringent containment measures. With policy rates at their effective lower bound, the Governing Council's announcements during this period focused mainly on asset purchases under the APP and the PEPP in order to address the subdued price dynamics and to steer the economy through the pandemic. Subsequently, the Russian

[8] It might also be plausible to observe an insignificant coefficient for the *decrease* category, since the announcement described should particularly affect the choice of *increase* over *stay the same*. However, what we definitely do not want to observe is a positive sign on $\beta_M$ for the *decrease* category, as this would imply that households are more likely to believe that interest rates are going down, which is the opposite of what the central bank has announced.

[9] Dates are always quoted in YYYY-MM-DD format.

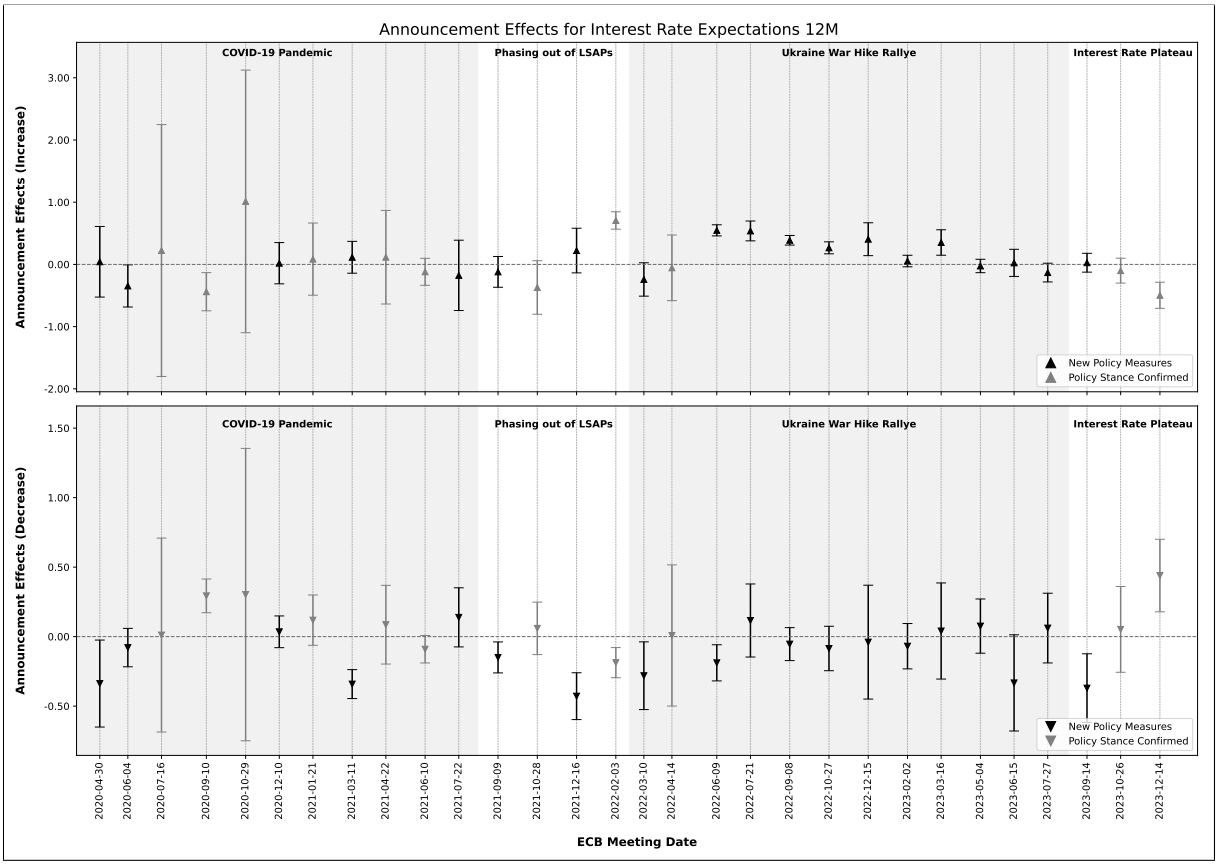


**Figure 2:** *MLOGIT regression estimates with 95% confidence intervals for $\beta_M$ with Interest Rates 12M as the dependent variable. The top panel shows the estimates for the* increase *category, the bottom panel shows the estimates for the* decrease *category. Gray markers indicate monetary policy meetings in which no new policy measures were announced, while black markers indicate meetings in which new policy measures were announced.*

invasion of Ukraine in the February of 2022 marked a decisive shift in the ECB's policy stance. This event catalyzed the already planned gradual normalization of monetary policy through a series of subsequent interest rate hikes, aimed at mitigating escalating price pressures, stemming primarily from food and energy price inflation, exacerbated by war-induced supply chain disruptions. Figures 2 and 3 highlight these two episodes with differently shaded areas. It is also important to clarify that while the Governing Council's press releases are consistently titled as *monetary policy decisions*, this does not necessarily imply that new monetary policy measures are announced at every meeting. Instead, the Governing Council may simply confirm its previously announced monetary policy stance. Meetings that fall into this category of *affirmative* meetings are indicated by gray markers in Figures 2 and 3. Conversely, meetings that introduced previously unannounced policy measures are indicated by black markers.

A first interesting observation with Figures 2 and 3 is that the estimated announcement effect $\beta_M$ is statistically insignificant for 7 out of 10 *affirmative* meetings. While there are three exceptions, it seems as if households are particularly unresponsive to meetings where no new policy measures are announced.

Focusing specifically on interest rate expectations, the top panel of Figure 2 shows that during the pandemic – excluding the 2020-09-10 meeting – households in the treatment

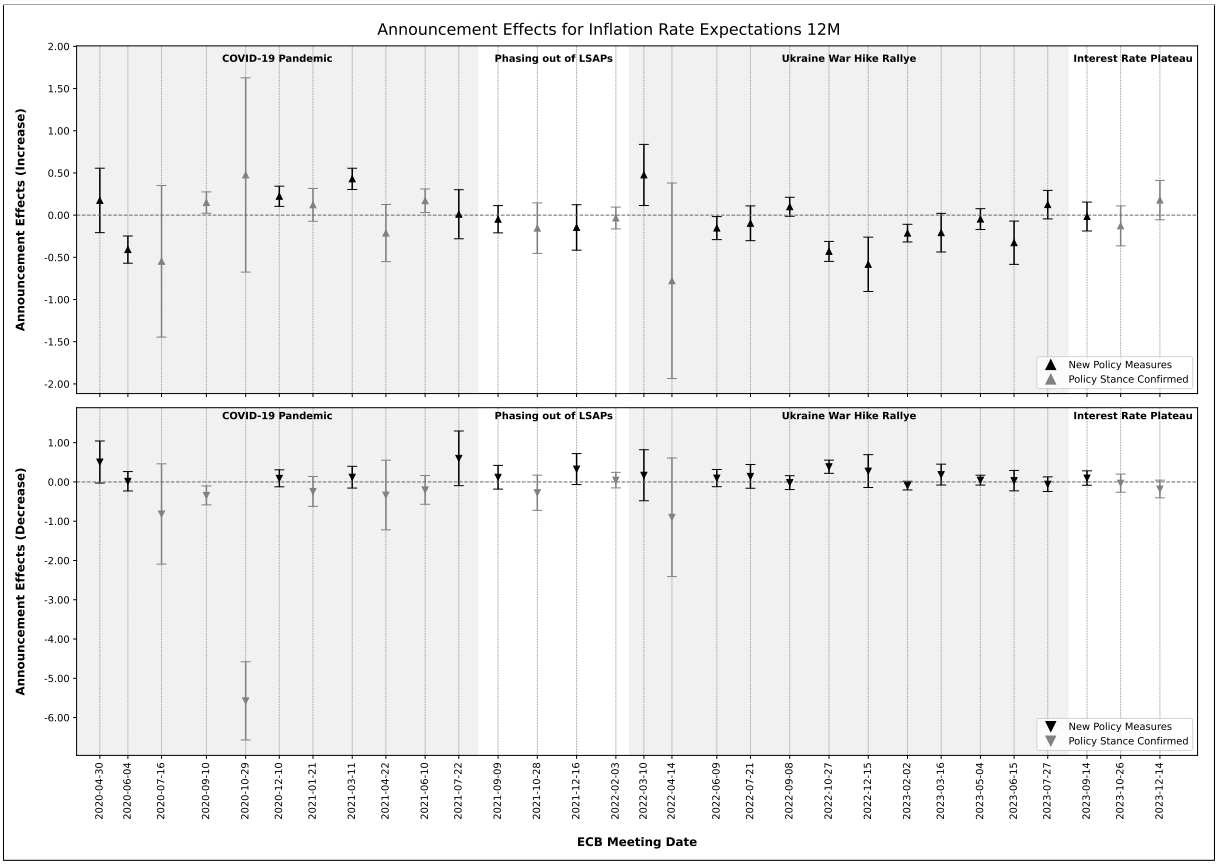


**Figure 3:** *MLOGIT regression estimates with 95% confidence intervals for $\beta_M$ with Inflation 12M as the dependent variable. The top panel shows the estimates for the* increase *category, the bottom panel shows the estimates for the* decrease *category. Gray markers indicate monetary policy meetings in which no new policy measures were announced, while black markers indicate meetings in which new policy measures were announced.*

group were no more or less likely to anticipate interest rate increases than those in the control group. This is evident from the absence of statistically significant estimates. Looking at the bottom panel, it turns out that households in the treatment group did also not differ significantly from those in the control group in their likelihood to anticipate interest rate cuts. Taking into account that policy rates at the time where stuck at their ELB and given the ECB's forward guidance that they would remain at their current low levels until the outlook for inflation has converged to a level "sufficiently close to, but below, 2%" (with a contemporary rate of 0.4%), this result suggests that households internalized the fact that interest rate would not move in the foreseeable future.[10] Hence observing null results should be interpreted as desirable in this situation. It would be odd for treated households to believe that interest rates would fall further, since they were already constrained by the ELB. Conversely, it wouldn't make sense for them to expect interest rates to rise given the ECB's forward guidance. To further strengthen this rationale, it's important to note that when significant estimates are observed at meetings during the COVID-19 pandemic, they are predominantly negative. This can be interpreted as follows: Treated households are more likely to expect interest rates to stay the same 12

[10] This quote is taken from the Governing Council meeting that took place on 2020-04-30. For details see Appendix A.

months ahead than those in the control group, which could be interpreted as an anchoring of interest rate expectations at the ELB, mirroring the ECB's forward guidance – not conflicting with my previous argument about null results.[11] The 2020-09-10 meeting stands again as a notable exception to this pattern.

Given the above discussion, it appears as if all Governing Council meetings during the COVID-19 period were *affirmative* meetings in the sense that the ECB never raised interest rates and never deviated in the wording of its forward guidance regarding the potential timing of future interest rate hikes. So why do we observe non-gray markers in Figure 2 for this time period? As noted above, the policy announcements during the pandemic concerned mainly large scale asset purchases under the APP and PEPP to address the subdued price dynamics and to steer the economy through the pandemic. The primary objective of these asset purchases was not to further reduce the short-term policy rate but to push up prices in order bring inflation back to the desired level of "sufficiently close to, but below, 2%". Thus, the black markers associated with the COVID-19 pandemic represent, for the most part, announcements of increases in the volume or pace of asset purchases. Two notable examples in this context are the Governing Council meetings that were held on 2020-12-10 and 2021-03-11.

At the 2020-12-10 meeting, the Governing Council announced two major expansionary measures. First, it increased the PEPP's envelope by €500 billion, bringing the total up to €1,850 billion. Second, it launched four additional Pandemic Emergency Longer-Term Refinancing Operations (PELTROs). These actions constituted one of the most aggressive expansionary policy announcements in recent history. The 2021-03-11 meeting was not as drastic by comparison, but it was announced that asset purchases under the PEPP would be conducted at a significantly higher pace in the coming quarter than in the early months of 2021. Looking at the estimates in Figure 3, these announcements did indeed revive households' inflation expectations, as we observe in both cases positive estimates in the top panel (indicating that treated households were more likely to expect inflation to rise in the coming 12 months than households in the control group) and null results in the bottom panel (indicating that treated households were no more or less likely to expect inflation to fall). In all other pandemic-related cases, the estimates concerning inflation expectations either remain insignificant or indicate an increase in expectations, closely mirroring the ECB's efforts to stimulate the economy during this period.

Having thoroughly discussed the qualitative strength of the per-period estimates in the context of the COVID-19 pandemic, which has thus far been reassuring, transparency demands that we address the outliers that don't align as well with the main narrative. First, there is the Governing Council meeting that was held on 2020-06-04. At this meeting the ECB announced, that the PEPP's envelope would be increased by €600 billion to a

[11] Admittedly, it would have been preferable if we had observed negative coefficients for all COVID-19-related meetings.

total of €1,350 billion and to extend its horizon for net purchases to at least the end of June 2021, instead of the previously announced fourth quarter of 2020. Hence we would expect to observe qualitatively similar effects as with the 2020-12-10 meeting discussed in the previous paragraph. However, instead of a positive estimate in the top panel of Figure 3, we observe a negative one, implying that treated households were more likely to stabilize their inflation expectations than households in the control group. This is certainly not what the Governing Council had in mind. It is difficult to make sense out of this result, if anything would help to rationalize this result it could be President Lagarde's statement during the press conference that the euro area experienced an "unprecedented contraction" with a significant downward revision to the projected GDP growth to -8.7% and a decline in HICP headline inflation to 0.1%.

The second outlier is the aforementioned affirmative 2020-09-10 meeting. Instead of observing either a negative or insignificant estimate for the decrease category of interest rate expectations, the bottom panel of Figure 2 shows a positive coefficient, implying that treated households were more likely to expect interest rates to decrease than households in the control group. This result is an outlier in the sense that it is inconsistent with the ELB constraint and the ECB's forward guidance.

At this point, I would like to emphasize that these two estimates are the two only outliers among all 44 coefficients estimated in the context of pandemic-related meetings. While it is unfortunate that these two outliers exist, they cannot in any way detract from the fact that all of the other estimates are qualitatively consistent with the Governing Council's policy announcements and that there is a clear difference between the estimates of affirmative meetings and non-affirmative meetings. In order to strengthen this point, we will now examine the post-Ukraine War policy announcements. This analysis should demonstrate that the estimates discussed above are not coincidentally aligned with the Governing Council's monetary policy announcements, but rather represent robust reactions in household expectations.

First of all, looking at the bottom panel of Figure 2, we can note that treated households were in no instance more likely to expect interest rates to go down than households in the control group. Conversely, starting with the 2022-06-09 meeting, treated households were much more likely to expect interest rates to go up than households in the control group. What happened and motivated this pattern?

At the 2022-06-09 meeting, the Governing Council announced that all three key ECB interest rates would be raised by 25 basis points at the next Governing Council meeting in July 2022, marking the first rate hike since July 2011. In contrast to the meetings associated with the COVID-19 pandemic, the 2022-06-09 estimate for the interest rate increase category shows a pronounced positive effect, indicating that households surveyed after the announcement were more likely to expect a rate hike than those surveyed before. This result suggests that the insignificant coefficients for interest rate expectations observed

since the 2020-06-04 meeting are most likely not due to inattention, but to the lack of changes in the policy rate on the part of the ECB. This argument is supported by the fact that the coefficient estimate at the 2022-06-09 meeting is not just an outlier, but rather the start of a series of consecutive estimates with a positive sign for the increase category and null results for the decrease category, indicating that the interest rate expectations of the surveyed households increased after each respective meeting. These estimates are qualitatively substantiated by statements of the Governing Council, such as that the surprise 50 basis point rate hike at the 2022-07-21 meeting was only "a first step [towards] policy rate normalization" or the statement at the 2022-12-15 meeting that "Governing Council judges that interest rates will still have to rise significantly at a steady pace to reach levels that are sufficiently restrictive."

Another revealing observation in the top panel of Figure 2 is that while most of the interest rate estimates are positive between the 2022-06-09 and the 2023-03-16 meetings, their magnitude is declining, suggesting that the impact of Governing Council announcements on the probability of treated households to revise their interest rate expectations upward relative to to households in the control group is declining as well. This can be rationalized once again when reading the actual press releases. Policy rates were raised by 75 basis points at both the 2022-09-08 and 2022-10-27 meetings, with a clear intention to raise rates further at upcoming Governing Council meetings. From the 2022-12-15 meeting onwards, the Governing Council increased interest rates by only 50 basis points, while continuing to provide explicit forward guidance on future increases. At the 2023-02-02 meeting, the Governing Council raised the key ECB interest rates by yet another 50 basis points. However, the Governing Council removed the phrase that "[it] judges that interest rates will still have to rise significantly at a steady pace to reach levels that are sufficiently restrictive", from the press release, eventually rendering the coefficient in the top panel of Figure 2 insignificant, only to rebound with the decision to raise rates by a further 25 basis points at the 2023-06-15 meeting, which appears to have been unexpected.

Finally, it is interesting to comment on the coefficients starting with the 2023-09-14 meeting, where the Governing Council announced that "the key ECB interest rates have reached levels that [will be] maintained for a sufficiently long duration." With the benefit of hindsight at the time of writing in November 2024, we know of course that the 2023-09-14 meeting was in fact the last meeting to raise policy rates before they plateaued and eventually declined by 25 basis points in June 2024. And indeed, the estimated announcement effects would have predicted this trajectory. The estimates in the top panel of Figure 2 become insignificant starting with the 2023-05-04 meeting and remain so until finally reversing sign at the 2023-12-14 meeting, the second consecutive meeting without a rate hike. More strikingly, the coefficient in the bottom panel (which had been insignificant since the first announcement of a rate hike in June 2022) turns positive at the same time. This suggests that households surveyed after the 2023-12-14 meeting were both less likely

to expect the interest rate to rise in 12 months and more likely to expect the rate to fall in 12 months than households surveyed before the 2023-12-14 meeting, which turned out to be the case with the June 2024 rate cut.

Turning briefly to inflation expectations, in Figure 3, we can see that the announced interest rate hikes achieved their objective in the sense that treated households did not show a robust response to further increases their inflation expectations, as we observe mostly insignificant or negative estimates in the top panel of Figure 3 and mostly insignificant or positive estimates in the bottom panel. The fact that the inflation estimates show a less pronounced response pattern than those reported for interest rate expectations is consistent with the notion that it is more difficult for households to internalize the effects of interest rate changes on changes in inflation than it is to translate changes in the policy rate into changes to the interest rate on savings accounts.

Overall, the discussion of the per-period estimates proves that the repeated cross-sectional approach provides much deeper qualitative insight than the average announcement effects estimated in Section 4.1. In particular, the sharp contrast between the insignificant interest rate expectation estimates during the COVID-19 pandemic and the pronounced pattern of significant coefficients after the Russian invasion of Ukraine proved that null results may not be undesirable in some cases. This could be either because it would not make sense to observe significant results (e.g., due to the ELB constraint), or because the Governing Council does not provide any new information about the future path of monetary policy.

Given that more than half of the Governing Council meetings that took place during the BOP-HH reference period fall into one of the two categories above, it is not surprising that the average announcement effects estimated in Section 4.1 turns out to be insignificant. However, the discussion in this Section should hopefully have made it clear that it may be a fallacy to conclude from the null results in Section 4.1 that German households are agnostic to ECB announcements, since the repeated cross-sectional estimates suggest that there is indeed a rather strong relationship between the Governing Council's monetary policy decisions and German households' interest rate and inflation expectations.

# 5 Robustness Analysis

The baseline results discussed in Section 4 were rigorously examined for robustness and sensitivity through two chief variations in the estimation procedure. First, I assess the impact of narrowing the time frame around monetary policy announcements to examine whether unknown confounding events could bias the estimates by introducing noise to household expectations when they are sampled too far away from the actual monetary policy announcement itself. Second, I extend the per-announcement baseline specification

(2) to include controls:

$$Y_{i,M} = \alpha_M + \beta_M \times T_{i,M} + \boldsymbol{\gamma}_{i,M} \times \boldsymbol{C}_i' + \epsilon_{i,M} \tag{3}$$

where $\boldsymbol{C}_i$ is a $k \times 1$ column vector of control variables as specified in Section 2. The full regression results of this augmented specification are presented alongside the original baseline results in Appendix Table B1.

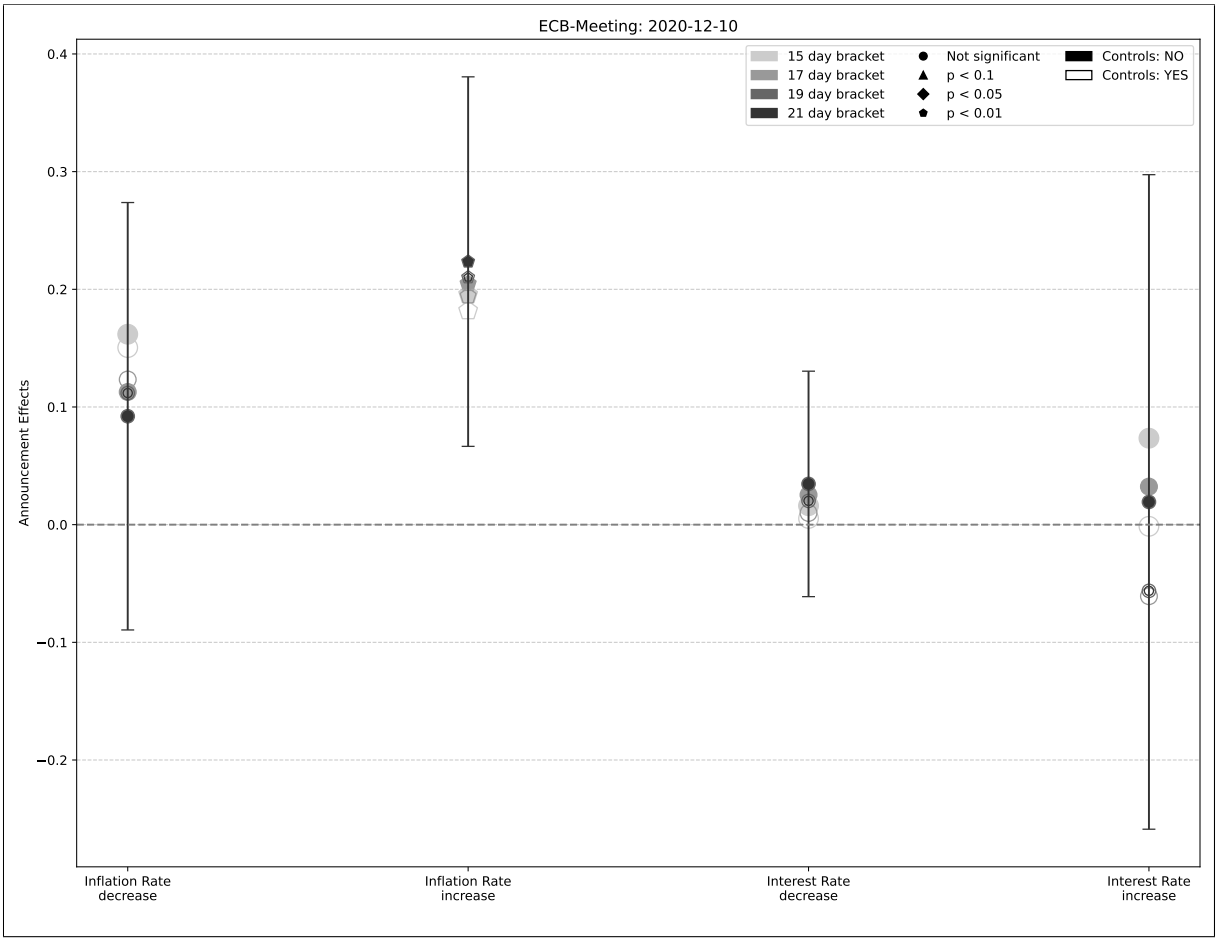


**Figure 4:** *Robustness analysis conducted for the Governing Council meeting on 2020-12-10. The x-axis contains ticks for the different MLOGIT regression estimates, corresponding to the columns in Table B1. Markers on the graph are differentiated based on several parameters. Solid markers represent regression coefficients estimated per baseline specification (2) without controls, while hollow markers represent regression coefficients estimated in a specification with controls. Different shades of gray are used to indicate different values of N,defining the maximum number of days bracketing the Governing Council meeting, used for the estimation. The confidence intervals are derived for the baseline estimate with $N = 21$, treatment only. In addition, the marker shapes illustrate the significance levels of the estimates - the more corners a marker has, the higher its level of significance.*

The estimates show minimal variation across different robustness specifications compared to the baseline scenario with $N = 21$ and treatment only. While some estimates show slight changes in absolute values for different $N$, these deviations are small ($< 0.1$), falling well within one standard deviation of the original estimates. Crucially, these variations *do not* alter the qualitative interpretations presented in Section 4. In particular, the signs of the significant estimates remain consistent across changes in $N$, and it's worth noting that a substantial portion of the observed variation is due to the reduction in sample size when adjusting $N$ from 21 to down 14 days.

For the sake of brevity, the following paragraphs discuss the robustness analysis outlined above for only three particularly interesting Governing Council meetings in the BOP-HH reference period.

Figure 4 shows the results of the robustness analysis for the Governing Council meeting held on 2020-12-10. As a brief reminder, at this meeting the ECB announced to increase the PEPP's envelope by €500 billion and to launch four additional PELTROs to offer significantly more favorable financing conditions. These announcements resulted in a positive and significant MLOGIT estimate for the increase category of interest rate expectations. As the results in Figure 4 suggest, the baseline estimates are largely unaffected by the inclusion of controls or variations in $N$. Neither the sign nor the significance of any of the estimates changes relative to baseline. Moreover, all estimates fall within the confidence interval of the baseline coefficient. If there is anything of interest to report about Figure 4, it is the instance that the magnitude of the coefficients declines as $N$ declines, suggesting that there may be slack in the transmission of information from the central bank to households. However, these differences are not statistically significant.

Figure 5 shows the robustness analysis for the Governing Council meeting held on 2022-04-14. At this meeting, the ECB confirmed its highly accommodative monetary policy stance and thus belongs to the category of *affirmative* meetings. As shown in Figure 5 the

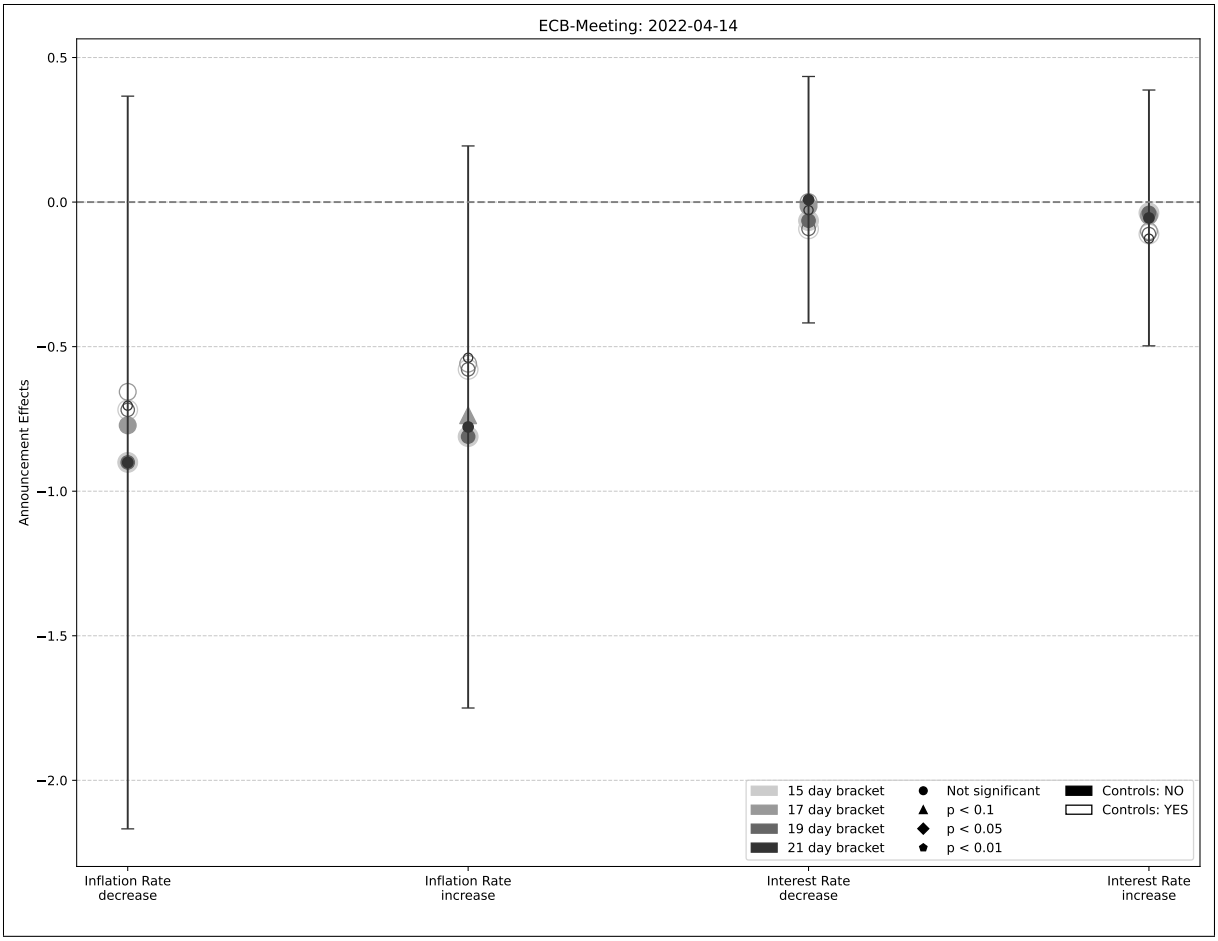


**Figure 5:** *Robustness analysis conducted for the Governing Council meeting on 2021-06-10.*

results tend to confirm the results discussed in Section 4 – namely, that households hardly revise their expectations in cases where no new monetary policy decisions are announced.

Finally, Figure 6 shows the results of the robustness analysis for the Governing Council meeting that took place on 2022-06-09. During this meeting, the Governing Council announced that it would finally begin to normalize monetary policy by raising the three key interest rates by 25 basis points at the upcoming meeting in July of 2022. The robustness

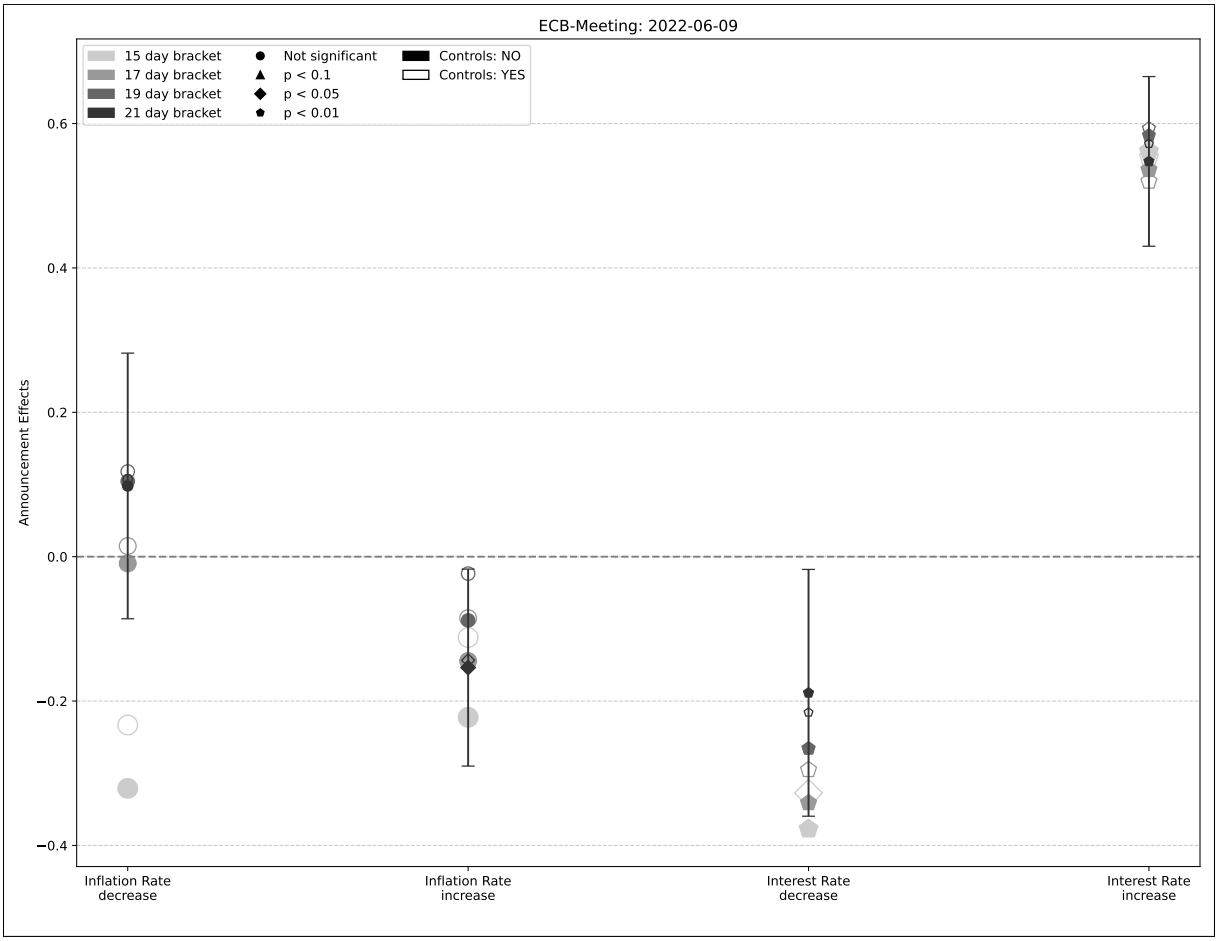


**Figure 6:** *Robustness analysis conducted for the Governing Council meeting on 2022-06-09.*

analysis shows that there are almost no outliers. The estimates for the two interest rate categories are highly robust, with minimal variation in magnitude and significance. However, the baseline estimate for the increase category of inflation expectations becomes insignificant for all other $N$ than $N = 21$.

As a final sanity check, I also estimate the baseline results presented in Section 2 using only first-time survey respondents. The purpose of this exercise is to check whether panelists suffer from panel conditioning. The results are reported in Appendix Table B2 and should be compared with the baseline estimates in Appendix Table B1. Note that the BOP-HH only provides information on which participant is a first-time participant from wave 11 onwards, so I only report estimates for Governing Council meetings that took place after BOP-HH wave 11. The baseline results remain robust in all cases.

# 6 Conclusion

This paper examines the causal effects of the European Central Bank's monetary policy announcements on German households' inflation and interest rate expectations. The analysis leverages responses from the Bundesbank Online Panel of Households (BOP-HH) collected on days before and after ECB Governing Council meetings and reveals a robust impact on households' inflation and interest rate expectations.

The main contribution of this paper is to challenge traditional panel estimation techniques by employing a repeated cross-sectional per-announcement analysis. This approach offers a novel perspective on how to assess the causal effects of central bank communication on household expectations and does not require arbitrary assumptions about monetary policy indicators.

Methodologically, I run a series of cross-sectional regressions for each Governing Council meeting within the BOP-HH reference period from April 2020 to December 2023. The resulting regression estimates are then evaluated in conjunction with the qualitative news content of the respective monetary policy decisions and related press conferences. The main analysis covers 30 Governing Council meetings, which can be broadly divided into three categories:

1. *Expansionary Pandemic-related Meetings*: These meetings feature unconventional monetary policy measures to stimulate the economy which was grappling with the fallout of the COVID-19 pandemic. With the policy rate at its effective lower bound, the announcements during this period mainly concerned asset purchases under the APP and the PEPP, with a focus on aggravating the subdued price dynamics. The estimated announcement effects closely mirror the Governing Council's policy decisions, showing an increase in inflation expectations and null results for expected interest rate changes.

2. *Contractionary post Ukraine War Meetings*: These meetings are characterized by a series of consecutive interest rate hikes aimed at mitigating the escalating price pressures caused by rising food and energy price inflation. Consistent with the existing literature, household expectations exhibit a pronounced and persistent response to these meetings, supporting the notion that changes to the policy rate are far more salient than unconventional measures like large-scale asset purchases or forward guidance. I estimate highly significant and positive announcement effects for interest rate expectations and negative effects for inflation expectations. The estimated announcement effects only begin to moderate once the Governing Council announced that interest rates would not rise any further.

3. *Affirmative Meetings*: These meetings, scattered throughout the survey period, are outliers as they simply confirm existing policy measures without announcing any new changes to the ECB's conduct of monetary policy. The announcement effects estimated

for this category of Governing Council meetings are characterized by slack and inertia, suggesting that the ECB's reaffirmation of its policy stance does not generate as much traction with household expectations as clear-cut policy changes.

The estimated announcement effects suggest that households pay selective attention to ECB announcements and adjust their expectations only to actual policy changes. This is particularly evident for interest rate expectations, which did not move during the pandemic but showed a pronounced response once the ECB started to raise policy rates. In contrast, this qualitative insight is completely obscured by the average announcement effect estimated in a panel regression due to the persistence of policy announcements across Governing Council meetings. The analysis shows that it would be wrong to conclude that households do not pay attention to policy announcements just because they do not do so on average. The estimated announcement effects are highly robust, holding up well across a wide range of regression specifications, models, and time frames around monetary policy announcements.

Overall, the evidence presented in this paper is consistent with the strong support for more central bank communication with the broader public that has been advocated by practitioners and academics alike.

# TL;DR

While panel regressions suggest the general public is preoccupied with puppies (understandably), repeated cross-sectional per-announcement estimates indicate they also pay close attention to the Central Bank's key policy announcements. Priorities, right?

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# Appendix A Summary of Monetary Policy Decisions

## Governing Council Meeting 2020-04-30

This Governing Council meeting was the first regularly scheduled meeting since the outbreak of the COVID-19 pandemic in Europe and the first since the emergency meeting at which the PEPP was launched. The ECB announced that the conditions of the targeted longer-term refinancing operations (TLTRO III) would be further eased by reducing the relevant interest rate to 50 basis points below the average rate on the main refinancing operations from June 2020 until June 2021 and, for those counterparties whose net lending meets a pre-defined lending performance threshold, to 50 basis points below the average deposit facility. In addition, the ECB announced a series of seven non-targeted pandemic emergency longer-term refinancing operations (PELTROs) to support liquidity conditions in the euro area. These PELTROs were to be conducted as fixed rate tender procedures with full allotment and an interest rate of 25 basis points below the average rate on the main refinancing operations. With regard to the PEPP, the Governing Council reaffirmed the ECB's readiness to increase its size and composition by as much as necessary. The three key ECB interest rates were announced to remain at their current levels until the outlook for inflation has converged to a level "sufficiently close to, but below, 2%". Further, the ECB confirmed the previously announced trajectory for the APP in terms of size and pace with full reinvestment of maturing principal payments. During the press conference, the president articulated concerns regarding an unparalleled decline in GDP growth due to the pandemic. The euro area real GDP had already declined by 3.8% and was projected to potentially fall further by between 5% and 12%. Additionally, the decline in economic activity was accompanied by a reduction in HICP inflation, which fell from 0.7% in March to 0.4% in April, with a further decline to be expected due to sharp decreases in energy price inflation and downward pressures on core inflation linked to weak demand.

## Governing Council Meeting 2020-06-04

The focal point of this Governing Council meeting was the economic impact of the COVID-19 pandemic. During the press conference, the President announced that the pandemic had caused an "unprecedented contraction", with a significant downward revision to the projection for GDP growth to -8.7% and a decline in HICP headline inflation to 0.1%,

mainly reflecting falling energy prices. To counteract this persistent downward trend in inflation over the projection period, the Governing Council decided to increase the envelope of its Pandemic Emergency Purchase Program (PEPP) by €600 billion to a total of €1,350 billion and to extend its horizon for net purchases to at least the end of June 2021, instead of the previously announced fourth quarter of 2020. Further, the Governing Council confirmed the previously announced trajectory of the Asset Purchase Program (APP) and that the key interest rates will remain unchanged until the inflation outlook is "sufficiently close to, but below, 2%". The corresponding press release states that these measures should further ease the general monetary policy stance.

## Governing Council Meeting 2020-07-16

At this meeting, the ECB mainly confirmed its policy stance from the previous Governing Council meeting. No new changes were announced regarding PEPP, APP or the three key interest rates. However, the ECB emphasized that it will continue to provide "ample liquidity through its refinancing operations". During the press conference, the President highlighted that economic activity had rebounded in May and June from its April lows, attributing this to the easing of lockdown measures and increasing demand. However, GDP growth remained significantly below pre-pandemic levels. The outlook for the euro area economy continued to be tilted to the downside, with headline inflation projected to decline in the coming months before experiencing an upturn in early 2021.

## Governing Council Meeting 2020-09-10

In this meeting's press release, the Governing Council did not announce any new policy measures. It merely confirmed the trajectory of previously announced policy decisions regarding the PEPP, the APP and the three key interest rates. However, it was reported that the third series of targeted longer-term refinancing operations (TLTRO III) had seen "a very high take-up of funds", supporting commercial bank lending to firms and households. In the introductory statement, the President announced that "the outlook for real GDP growth has been revised up for 2020 and is largely unchanged for 2021 and 2022" and that "price pressures will remain subdued owing to weak demand, lower wage pressures and the appreciation of the euro exchange rate, despite some upward price pressures related to supply constraints." In this context, annual HICP inflation was reported to have decreased from 0.4% in July 2020 to -0.2% in August 2020. Overall, the monetary policy stance should be understood as accommodate to the overall strong recovery in economic activity, which is "broadly in line with previous expectations".

## Governing Council Meeting 2020-10-29

Once more the Governing Council reaffirmed its already announced policy measures with no major changes to the conduct of monetary policy. However the Governing Council assured that it stands ready to recalibrate its instruments if necessary. During the press conference, the President gave a pessimistic outlook for the economy, which at the time was struggling with a strong resurgence of COVID-19 infections and strict containment measures. Inflation fell to -0.3% in September from -0.2% in August, with headline inflation expected to remain negative until early 2021.

## Governing Council Meeting 2020-12-10

At this meeting, the Governing Council announced a wide range of expansionary measures. The PEPP's envelope was increased once more, by €500 billion to a total of €1,850 billion. The horizon for net purchases under the PEPP was also extended to at least the end of March 2022. In addition, the period during which the significantly more favorable funding conditions under TLTRO III apply was extended by 12 months, and the total amount that counterparties could borrow was increased from 50% to 55% of their stock of eligible loans. However, in order for these conditions to apply, counterparties must meet a lending performance target in order to avoid a further tightening of lending to households and businesses. This precautionary measure is consistent with the President's press conference warning that "the growth of lending to the private sector has plateaued". Further four additional Pandemic Emergency Longer-Term Refinancing Operations (PELTROs) were announced. During the press conference, the President also commented on the future path of inflation, noting that "headline inflation is likely to remain negative until early 2021." "Thereafter, it is expected to increase owing to the end of the temporary VAT reduction in Germany and upward base effects in energy price inflation."

## Governing Council Meeting 2021-01-21

This meeting is interesting since the Governing Council announced that it "decided to reconfirm its very accommodative monetary policy stance". It thus proactively pointed out that there were no changes to the conduct of monetary policy. During the press conference, it was projected that "headline inflation is likely to increase in the coming months".

## Governing Council Meeting 2021-03-11

At this meeting, the Governing Council largely reaffirmed the policy decisions presented at the 2020-12-10 meeting. However, the Governing Council doubled down on the PEPP and announced that purchases under the PEPP would be conducted at a significantly higher pace in the coming quarter than in the first few months of 2021. This decision

was justified in the press conference, where the President expressed concern about rising market interest rates, which could pose "a risk to wider financing conditions" and could "translate into a premature tightening of financing conditions for all sectors of the economy." Other than this the monetary policy stance remained unchanged.

## Governing Council Meeting 2021-04-22

At this meeting, the Governing Council again explicitly chose the words "the Governing Council decided to reconfirm its very accommodative monetary policy stance" and left the previously announced policy instruments untouched. During the press conference, the President explained that real GDP in the euro area fell by 0.7% in the fourth quarter of 2000 and is now 4.9% below its pre-crisis level. Although annual HICP inflation rose from 0.9% in February to 1.3% in March 2021, the President's economic analysis suggests that the near-term economic outlook remains tilted to the downside, while medium-term risks remain more subtle.

## Governing Council Meeting 2021-06-10

As with the 2021-04-22 meeting the Governing Council explicitly "confirm[s] its very accommodative monetary policy stance". There are no changes to the conduct of monetary policy. The staff projections released during the press conference indicate an upward revision to GDP growth and HICP inflation.

## Governing Council Meeting 2021-07-22

In general, the stance of monetary policy was left unchanged at this meeting. In particular, it was announced that the APP and PEPP would be conducted as planned at previous meetings. However, in a strategy review, the ECB agreed on a symmetric inflation target of two per cent over the medium term and consequently reformulated the forward guidance for its three key interest rates from "the Governing Council expects the key ECB interest rates to remain at their present or lower levels until it has seen the inflation outlook robustly converge to a level sufficiently close to, but below, 2%" to "the Governing Council expects the key ECB interest rates to remain at their present or lower levels until it sees inflation reaching two per cent well ahead of the end of its projection horizon." Further, the Governing Council added that "[t]his may also imply a transitory period in which inflation is moderately above target." During the press conference the President confirmed the economic rebound during the second quarter of the year and pointed to strong expected growth in the third quarter of 2021. HICP inflation in June 2021 was reported to be 1.9% in June and projected to increase further over the coming months due to a sharp increase in energy prices and the reversal of the temporary VAT reduction in Germany,

but was expected to decline again in 2022, when these effects drop out of the year-on-year calculations.

## Governing Council Meeting 2021-09-09

Apart from the announcement that "favorable financing conditions can be maintained with a moderately lower pace of net asset purchases under the PEPP than in the previous two quarters", no new policy changes were announced at this Governing Council meeting. As forecast at the 2021-07-22 press conference, HICP inflation rose from 1.9% in June to 3.0% in August. Further increases were expected through the fall, followed by a decline in 2022. The new staff projections for annual inflation were 2.2% in 2021, 1.7% in 2022 and 1.5% in 2023. These projections were accompanied by corresponding projections for real GDP growth of 5.0% in 2021, 4.6% in 2022 and 2.1% in 2023.

## Governing Council Meeting 2021-10-28

At this meeting, the Governing Council did not announce any policy changes, but merely confirmed the trajectory of the previously announced policy measures. The updated projections for real GDP growth and inflation released during the press conference were also in line with the projections made at the previous meeting. However, the President noted that "the current phase of higher inflation will last longer than originally expected" but will eventually ease out in 2022 as previously anticipated.

## Governing Council Meeting 2021-12-16

The Governing Council decided that progress in the economic recovery warranted a "step-by-step reduction in the pace of its asset purchases." This was underscored by the announcement that the PEPP would end in March 2022, as originally announced, and hence would not be renewed or expanded. Principal payments from maturing PEPP securities would be continued to be reinvested through at least the end of 2024. In addition, it was announced that purchases under the APP would be phased out and that the special conditions under TLTRO III would expire in June 2022. These decisions were supported by an improved economic outlook, with GDP growth projected at 5.1% in 2021, 4.2% in 2022, 2.9% in 2023 and 1.6% in 2024, and HICP inflation at 2.6% in 2021, 3.2% in 2022, 1.8% in 2023 and 1.8% in 2024. Although the inflation rate for November 2021 was reported to be 4.9%, the ECB continued to argue that prices would decline over the course of 2022.

## Governing Council Meeting 2022-02-03

At this meeting the "Governing Council confirmed the decisions taken at its monetary policy meeting last December." Economic projections also remained consistent with what was reported at the 2021-12-16 meeting. However this particular Governing Council meeting is special in three regards. First, euro area output had finally returned to pre-pandemic level. Second, the ECB reported that its survey-based indicators point to a stabilization of long-term inflation at 2%. Third, it was the last meeting before the Russian invasion of Ukraine.

## Governing Council Meeting 2022-03-10

As this was the first Governing Council meeting since the Russian invasion of Ukraine, the Governing Council expressed its support for the people of Ukraine and reiterated that "[it] will take whatever action is needed to fulfil the ECB's mandate to pursue price stability and to safeguard financial stability." Further, the Governing Council revised the wording of its forward guidance on the key ECB interest rates by explicitly stating that "adjustments to the [...] interest rates will take place some time after the end of the Governing Council's net purchases under the APP." With regard to the APP, the Governing Council provided forward guidance that it will end the APP in the third quarter of 2022, depending on incoming inflation data. Otherwise, the Governing Council did not make any notable adjustments to its policy mix. During the press conference, the President announced that the staff's projection for inflation had been "revised upwards" and that "[i]nflation has continued to surprise on the upside because of unexpectedly high energy costs" stemming from the ongoing war in Ukraine. Still "[v]arious measures of longer-term inflation expectations derived from financial markets and from surveys stand at around two per cent."

## Governing Council Meeting 2022-04-14

In view of the war-related surge in inflation, the Governing Council decided that the asset purchases under the APP would be terminated in the third quarter of 2022, as proposed during the previous meeting. The Governing Council also announced that it would maintain its plans to raise interest rates only after the purchases under the APP had been concluded. As previously announced, asset purchases under the PEPP were terminated at the end of March 2022, while the reinvestment of principal payments from maturing PEPP securities would continue until at least the end of 2024. The ECB staff projections for economic activity pointed to weak growth due to rising energy prices, subdued business confidence and supply chain constraints caused by the ongoing war in Ukraine. On the other hand, inflation continued to rise to 7.5% in March from 5.9% in

February due to rising energy price pressures. Departing from the previous two meetings, the ECB warned that while various longer-term measures of inflation were broadly around 2%, that there were "initial signs of above target revisions in those measures."

## Governing Council Meeting 2022-06-09

The Governing Council announced that all three key ECB interest rates would be raised by 25 basis points at the next Governing Council meeting in July 2022 to counter rising price pressures, marking the first rate hike since September 2019. In addition, the Governing Council announced that "[it] expects to raise the key ECB interest rates again in September." It also confirmed that investments under the APP would end on July 1, 2022, formally marking the end of the ECB's asset purchase programs and the normalization of the conduct of monetary policy. The projected trajectories for output growth and inflation remained broadly similar to the ECB's projections at the 2022-03-10 meeting, with further upward revisions to the expected paths of both headline and core inflation.

## Governing Council Meeting 2022-07-21

As announced at the Governing Council meeting on 2022-06-09, the ECB did indeed raise its policy rates. However, the ECB did so by 50 basis points as opposed to the previously announced 25 basis points, while describing this decision as only "a larger first step [to] policy rate normalization." The President argued during the press conference that this step was necessary in order to maintain persistent and undesirably high inflation.

## Governing Council Meeting 2022-09-08

As with the previous two meetings, this Governing Council meeting focused on the inflationary price pressures stemming from the ongoing war in Ukraine. According to Eurostat's flash estimate, inflation reached 9.1% in August 2022, a significant increase from the 7.5% reported at the June meeting. The ECB staff projections for HICP headline inflation were thus "significantly revised up", with "price pressures [...] spreading across more and more sectors". As a result, the Governing Council decided to raise all key interest rates by yet another 75 basis points, and signaled its readiness to implement further rate hikes should the inflation outlook continue to deteriorate.

## Governing Council Meeting 2022-10-27

At this meeting, the Governing Council raised the three key ECB interest rates by yet another 75 basis points, with further increases projected down the line. In the press release the Governing Council still stated that "[it] intends to continue reinvesting, in full, the principal payments from maturing securities purchased under the APP for an

extended period of time past the date when it started raising the key ECB interest rates." The ECB's estimates for real GDP growth and HICP inflation remained broadly in line with those reported at the previous two meetings, with a weakening outlook for economic growth due to declining business confidence and rising energy price inflation.

## Governing Council Meeting 2022-12-15

This last meeting of 2022 was characterized by a quite drastic tonal shift when compared to the otherwise relatively consistent wording of successive press releases. First, as previously announced, the Governing Council decided to raise interest rates by a further 50 basis points. However, the press release added further forward guidance by explicitly stating that the "Governing Council judges that interest rates will still have to rise significantly at a steady pace to reach levels that are sufficiently restrictive." Adding to this rather contractionary policy stance, it was also announced that reinvestments under the APP would cease from the beginning of March 2023, with APP asset holdings declining by an average of €15 billion per month until the end of the second quarter of 2023. Taking these policy measures into account, the Eurosystem staff projections for inflation had been revised significantly upwards to 8.4% in 2022, before declining to 6.3% in 2023, 3.4% in 2024 and 2.3% in 2025. In terms of economic growth, the ECB expected a contraction in the fourth quarter of 2022 and the first quarter of 2023. However, any recession would be "relatively short-lived and shallow," resulting in GDP growth projections of 3.4% in 2022, 0.5% in 2023, 1.9% in 2024 and 1.8% in 2025.

## Governing Council Meeting 2023-02-02

The Governing Council announced that it would maintain the policy of "raising interest rates significantly," and raised the three key interest rates by a further 50 basis points. The interest rates on the main refinancing operations, the marginal lending facility and the deposit facility were thus raised to 3.00%, 3.25% and 2.50% respectively. In addition, the Governing Council already decided to raise the interest rates by a further 50 basis points at its next meeting in March 2023. As forecast at the 2022-12-15 meeting, economic activity was reported to have slowed markedly since mid-2022 and was expected to remain weak in the near future. However, as a result of the gradual easing of supply bottlenecks, improved business confidence, increased gas supplies and rising in demand for leisure activities in a post-pandemic environment, the ECB staff projections for economic growth over the medium term remained consistent with those of the 2022-12-15 meeting, with a resilient and recovering economy expected by the end of the year. Interestingly enough the ECB specifically highlighted Eurostat's flash estimate for inflation in Germany which stood at 8.5% in January 2023.

## Governing Council Meeting 2023-03-16

As announced at the 2023-02-02 meeting, the ECB raised the three key ECB interest rates by 50 basis points. However, the Governing Council removed the phrase that "[it] judges that interest rates will still have to rise significantly at a steady pace to reach levels that are sufficiently restrictive." This change is consistent with the new downward revised projections for headline inflation of 5.3% in 2023, 2.9% in 2024 and 2.1% in 2025, and the upward revised projections for economic growth of 1.0% in 2023 and 1.6% in both 2024 and 2025.

## Governing Council Meeting 2023-05-04

At this meeting, the Governing Council raised the three key interest rates by only 25 basis points, but stated that "the policy rates will be brought to levels sufficiently restrictive to achieve a timely return of inflation to the 2% medium-term target and will be kept at those levels for as long as necessary." It was also decided that reinvestments under the APP, which had already been reduced since March 2023, would cease entirely in July 2023, while maturing principal payments from PEPP securities would continue to be reinvested until at least the end of 2024. The projected paths for economic growth and inflation remained broadly consistent with previous estimates, with a slight downward revision to expected core and headline inflation.

## Governing Council Meeting 2023-06-15

Due to unexpected upward surprises to core inflation the ECB once more increased its three policy rates by 25 basis points. The staff projections for headline inflation were also revised up to 5.4% in 2023, 3.0% in 2024 and 2.2% in 2025. On the other hand, the projections for economic growth were revised down slightly to 0.9% in 2023, 1.5% in 2024, and 1.6% in 2025.

## Governing Council Meeting 2023-07-27

As at the previous meeting, the Governing Council raised the three key interest rates by 25 basis points. During the press conference, the President stated that the economy was expected to remain weak in the near term and that inflation had fallen from 6.1% in May to 5.5% in June, largely due to falling energy prices.

## Governing Council Meeting 2023-09-14

At this meeting the Governing Council increased its interest rates yet again by 25 basis points. However the wording of their forward guidance changed to: "Based on its current

assessment, the Governing Council considers that the key ECB interest rates have reached levels that, maintained for a sufficiently long duration, will make a substantial contribution to the timely return of inflation to the target," implying that there might be no further increases in the near future. The projections for the euro area saw average inflation at 5.6% in 2023, 3.2% in 2024 and 2.1% in 2025, and economic growth at 0.7% in 2023, 1.0% in 2024 and 1.5% in 2025.

## Governing Council Meeting 2023-10-26

At this meeting the Governing Council announced that "[it] decided to keep the three key ECB interest rates unchanged," such that the interest rates on the main refinancing operations, the marginal lending facility and the deposit facility remained at their contemporary peak at 4.50%, 4.75% and 4.00% respectively. The Governing Council thus adhered to the forward guidance from their 2023-09-14 meeting. The economic outlook regarding growth remained subdued with downward revisions to expected inflation.

## Governing Council Meeting 2023-12-14

The Governing Council decided to leave its key interest rates unchanged. According to the staff projections, headline inflation would average at 5.4% in 2023, 2.7% in 2024, 2.1% in 2025 and 1.9% in 2026, with downward revisions in 2023 and especially in 2024 when compared to earlier estimates. Economic growth was expected to remain subdued in the short term, but to recover on the back of rising real incomes, declining inflation, and improving foreign demand. Growth was projected to increase from 0.6% in 2023 to 0.8% in 2024 and to 1.5% in both 2025 and 2026.

# Appendix B Regression Results

**Table B1:** *Baseline per-announcement regression results. The base category for the MLOGIT estimates is* stay the same, *hence each of the MLOGIT parent columns displays a distinct column for the estimates of* decrease vs. stay the same *and* increase vs. stay the same. *z-scores in parentheses.* $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

| | Savings Interest Rate 12M | | Inflation 12M | | Savings Interest Rate 12M | | Inflation 12M | |
|---|---|---|---|---|---|---|---|---|
| | MLOGIT | | MLOGIT | | MLOGIT | | MLOGIT | |
| | (1) Decrease | (2) Increase | (3) Decrease | (4) Increase | (5) Decrease | (6) Increase | (7) Decrease | (8) Increase |
| 2020-04-30 | -0.338** | 0.042 | 0.507* | 0.174 | -0.224 | 0.171 | 0.577** | 0.271 |
| | (0.16) | (0.289) | (0.273) | (0.195) | (0.172) | (0.305) | (0.294) | (0.211) |
| N | 2122 | 2122 | 2122 | 2122 | 1894 | 1894 | 1894 | 1894 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2020-06-04 | -0.079 | -0.346** | 0.017 | -0.409*** | -0.044 | -0.418** | 0.074 | -0.391*** |
| | (0.07) | (0.173) | (0.126) | (0.082) | (0.074) | (0.185) | (0.132) | (0.086) |
| N | 3606 | 3606 | 3603 | 3603 | 3341 | 3341 | 3337 | 3337 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2020-07-16 | 0.011 | 0.223 | -0.816 | -0.547 | -0.04 | 0.12 | -0.711 | -0.439 |
| | (0.356) | (1.033) | (0.652) | (0.458) | (0.386) | (1.064) | (0.648) | (0.47) |
| N | 1964 | 1964 | 1965 | 1965 | 1797 | 1797 | 1797 | 1797 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2020-09-10 | 0.293*** | -0.439*** | -0.343*** | 0.149** | 0.289*** | -0.415** | -0.309** | 0.126* |
| | (0.062) | (0.156) | (0.123) | (0.064) | (0.065) | (0.167) | (0.128) | (0.068) |
| N | 5532 | 5532 | 5530 | 5530 | 5055 | 5055 | 5054 | 5054 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2020-10-29 | 0.302 | 1.013 | -5.575*** | 0.476 | -0.144 | 0.966 | -13.213*** | 0.252 |
| | (0.537) | (1.077) | (0.508) | (0.587) | (0.633) | (1.124) | (0.508) | (0.587) |
| N | 1910 | 1910 | 1908 | 1908 | 1767 | 1767 | 1765 | 1765 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2020-12-10 | 0.035 | 0.019 | 0.092 | 0.224*** | 0.02 | -0.056 | 0.112 | 0.21*** |
| | (0.058) | (0.169) | (0.11) | (0.061) | (0.062) | (0.182) | (0.117) | (0.064) |
| N | 5741 | 5741 | 5737 | 5737 | 5194 | 5194 | 5192 | 5192 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-01-21 | 0.119 | 0.085 | -0.242 | 0.122 | 0.186* | 0.109 | -0.314 | 0.099 |
| | (0.092) | (0.296) | (0.194) | (0.099) | (0.099) | (0.317) | (0.211) | (0.105) |
| N | 2251 | 2251 | 2251 | 2251 | 2021 | 2021 | 2021 | 2021 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-03-11 | -0.342*** | 0.115 | 0.121 | 0.43*** | -0.307*** | 0.105 | 0.107 | 0.434*** |
| | (0.053) | (0.131) | (0.141) | (0.064) | (0.056) | (0.136) | (0.149) | (0.068) |
| N | 6830 | 6830 | 6831 | 6831 | 6252 | 6252 | 6250 | 6250 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-04-22 | 0.086 | 0.116 | -0.334 | -0.212 | -0.007 | -0.499 | -0.266 | -0.259 |
| | (0.144) | (0.384) | (0.453) | (0.173) | (0.155) | (0.536) | (0.455) | (0.181) |
| N | 2447 | 2447 | 2445 | 2445 | 2274 | 2274 | 2273 | 2273 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-06-10 | -0.091* | -0.119 | -0.203 | 0.17** | -0.14** | -0.151 | -0.236 | 0.2** |
| | (0.05) | (0.111) | (0.187) | (0.071) | (0.066) | (0.141) | (0.232) | (0.091) |
| N | 9267 | 9267 | 9263 | 9263 | 4341 | 4341 | 4339 | 4339 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-07-22 | 0.139 | -0.176 | 0.601* | 0.011 | 0.097 | -0.155 | 0.754** | 0.029 |
| | (0.108) | (0.288) | (0.355) | (0.148) | (0.117) | (0.306) | (0.375) | (0.16) |
| N | 2482 | 2482 | 2483 | 2483 | 2252 | 2252 | 2253 | 2253 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-09-09 | -0.15*** | -0.12 | 0.119 | -0.049 | -0.156*** | -0.087 | 0.145 | -0.011 |
| | (0.057) | (0.126) | (0.154) | (0.082) | (0.06) | (0.132) | (0.162) | (0.087) |
| N | 5741 | 5741 | 5739 | 5739 | 5273 | 5273 | 5271 | 5271 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-10-28 | 0.06 | -0.371* | -0.275 | -0.154 | 0.028 | -0.459* | -0.237 | -0.196 |
| | (0.096) | (0.22) | (0.229) | (0.153) | (0.104) | (0.239) | (0.234) | (0.158) |
| N | 5512 | 5512 | 5509 | 5509 | 5055 | 5055 | 5053 | 5053 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |

Continued on next page

**Table B1:** *Baseline per-announcement regression results (continued)*

| | Savings Interest Rate 12M | | Inflation 12M | | Savings Interest Rate 12M | | Inflation 12M | |
|---|---|---|---|---|---|---|---|---|
| | MLOGIT | | MLOGIT | | MLOGIT | | MLOGIT | |
| | (1) Decrease | (2) Increase | (3) Decrease | (4) Increase | (5) Decrease | (6) Increase | (7) Decrease | (8) Increase |
| 2021-12-16 | -0.428*** | 0.223 | 0.327 | -0.146 | -0.362*** | 0.169 | 0.248 | -0.136 |
| | (0.086) | (0.183) | (0.201) | (0.137) | (0.092) | (0.191) | (0.209) | (0.143) |
| N | 3962 | 3962 | 3960 | 3960 | 3693 | 3693 | 3691 | 3691 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-02-03 | -0.187*** | 0.706*** | 0.046 | -0.034 | -0.236*** | 0.752*** | 0.069 | -0.029 |
| | (0.055) | (0.071) | (0.101) | (0.066) | (0.059) | (0.075) | (0.105) | (0.068) |
| N | 7879 | 7879 | 7881 | 7881 | 7303 | 7303 | 7304 | 7304 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-03-10 | -0.281** | -0.242* | 0.17 | 0.476*** | -0.242* | -0.347** | 0.149 | 0.564*** |
| | (0.124) | (0.137) | (0.332) | (0.185) | (0.135) | (0.142) | (0.335) | (0.189) |
| N | 5527 | 5527 | 5528 | 5528 | 5141 | 5141 | 5141 | 5141 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-04-14 | 0.008 | -0.055 | -0.901 | -0.778 | -0.028 | -0.126 | -0.704 | -0.538 |
| | (0.259) | (0.269) | (0.77) | (0.591) | (0.277) | (0.279) | (0.778) | (0.593) |
| N | 4666 | 4666 | 4667 | 4667 | 4325 | 4325 | 4325 | 4325 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-06-09 | -0.189*** | 0.548*** | 0.098 | -0.154** | -0.216*** | 0.572*** | 0.107 | -0.143** |
| | (0.066) | (0.046) | (0.112) | (0.07) | (0.071) | (0.048) | (0.116) | (0.073) |
| N | 9204 | 9204 | 9199 | 9199 | 8552 | 8552 | 8549 | 8549 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-07-21 | 0.116 | 0.538*** | 0.142 | -0.097 | 0.135 | 0.619*** | 0.041 | -0.132 |
| | (0.134) | (0.081) | (0.154) | (0.105) | (0.143) | (0.086) | (0.16) | (0.111) |
| N | 3027 | 3027 | 3028 | 3028 | 2820 | 2820 | 2821 | 2821 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-09-08 | -0.054 | 0.388*** | -0.018 | 0.099* | 0.021 | 0.373*** | -0.027 | 0.085 |
| | (0.061) | (0.039) | (0.09) | (0.057) | (0.064) | (0.042) | (0.094) | (0.06) |
| N | 13685 | 13685 | 13690 | 13690 | 12597 | 12597 | 12602 | 12602 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-10-27 | -0.085 | 0.267*** | 0.387*** | -0.43*** | -0.056 | 0.282*** | 0.399*** | -0.438*** |
| | (0.082) | (0.049) | (0.086) | (0.06) | (0.086) | (0.051) | (0.088) | (0.063) |
| N | 8721 | 8721 | 8721 | 8721 | 8199 | 8199 | 8198 | 8198 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-12-15 | -0.04 | 0.405*** | 0.276 | -0.583*** | 0.01 | 0.333** | 0.269 | -0.57*** |
| | (0.209) | (0.135) | (0.213) | (0.164) | (0.219) | (0.141) | (0.216) | (0.172) |
| N | 4656 | 4656 | 4659 | 4659 | 4378 | 4378 | 4381 | 4381 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-02-02 | -0.069 | 0.054 | -0.094* | -0.213*** | -0.022 | 0.092* | -0.076 | -0.205*** |
| | (0.083) | (0.047) | (0.056) | (0.053) | (0.089) | (0.05) | (0.059) | (0.056) |
| N | 8807 | 8807 | 8807 | 8807 | 8117 | 8117 | 8118 | 8118 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-03-16 | 0.04 | 0.352*** | 0.187 | -0.208* | 0.128 | 0.315*** | 0.146 | -0.194 |
| | (0.176) | (0.104) | (0.136) | (0.117) | (0.191) | (0.11) | (0.143) | (0.123) |
| N | 3807 | 3807 | 3807 | 3807 | 3527 | 3527 | 3527 | 3527 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-05-04 | 0.076 | -0.025 | 0.046 | -0.047 | 0.043 | -0.027 | 0.043 | -0.075 |
| | (0.1) | (0.055) | (0.064) | (0.063) | (0.107) | (0.058) | (0.067) | (0.066) |
| N | 6512 | 6512 | 6509 | 6509 | 6006 | 6006 | 6004 | 6004 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-06-15 | -0.333* | 0.025 | 0.033 | -0.327** | -0.359* | -0.042 | 0.019 | -0.322** |
| | (0.177) | (0.111) | (0.133) | (0.131) | (0.187) | (0.118) | (0.138) | (0.136) |
| N | 4280 | 4280 | 4277 | 4277 | 4027 | 4027 | 4024 | 4024 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-07-27 | 0.061 | -0.131* | -0.057 | 0.124 | 0.003 | -0.078 | 0.025 | 0.127 |
| | (0.128) | (0.077) | (0.095) | (0.086) | (0.14) | (0.081) | (0.1) | (0.091) |
| N | 4790 | 4790 | 4787 | 4787 | 4495 | 4495 | 4492 | 4492 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-09-14 | -0.371*** | 0.027 | 0.099 | -0.017 | -0.344*** | 0.066 | 0.142 | -0.026 |
| | (0.126) | (0.077) | (0.094) | (0.087) | (0.134) | (0.082) | (0.099) | (0.092) |
| N | 3141 | 3141 | 3141 | 3141 | 2912 | 2912 | 2912 | 2912 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |

Continued on next page

**Table B1:** *Baseline per-announcement regression results (continued)*

| | Savings Interest Rate 12M | | Inflation 12M | | Savings Interest Rate 12M | | Inflation 12M | |
|---|---|---|---|---|---|---|---|---|
| | MLOGIT | | MLOGIT | | MLOGIT | | MLOGIT | |
| | (1) Decrease | (2) Increase | (3) Decrease | (4) Increase | (5) Decrease | (6) Increase | (7) Decrease | (8) Increase |
| 2023-10-26 | 0.052 | -0.1 | -0.031 | -0.127 | -0.047 | -0.093 | 0.002 | -0.176 |
| | (0.157) | (0.102) | (0.118) | (0.121) | (0.165) | (0.106) | (0.124) | (0.125) |
| N | 3925 | 3925 | 3926 | 3926 | 3668 | 3668 | 3669 | 3669 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-12-14 | 0.44*** | -0.496*** | -0.18 | 0.178 | 0.449*** | -0.472*** | -0.207* | 0.232* |
| | (0.133) | (0.107) | (0.115) | (0.119) | (0.139) | (0.114) | (0.122) | (0.127) |
| N | 4028 | 4028 | 4027 | 4027 | 3746 | 3746 | 3746 | 3746 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |

**Table B2:** *Per-announcement regression results refresher only. The coefficients were estimated exactly as in Table B1. The base category for the MLOGIT estimates is* stay the same*, hence each of the MLOGIT parent columns displays a distinct column for the estimates of* decrease vs. stay the same *and* increase vs. stay the same. *z-scores in parentheses.* $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

| | Savings Interest Rate 12M | | Inflation 12M | | Savings Interest Rate 12M | | Inflation 12M | |
|---|---|---|---|---|---|---|---|---|
| | MLOGIT | | MLOGIT | | MLOGIT | | MLOGIT | |
| | (1) Decrease | (2) Increase | (3) Decrease | (4) Increase | (5) Decrease | (6) Increase | (7) Decrease | (8) Increase |
| 2021-01-21 | 0.177 | 0.046 | -0.339 | 0.019 | 0.272** | 0.038 | -0.291 | 0.033 |
| | (0.109) | (0.352) | (0.234) | (0.118) | (0.118) | (0.379) | (0.253) | (0.125) |
| N | 1477 | 1477 | 1477 | 1477 | 1327 | 1327 | 1327 | 1327 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-03-11 | -0.308*** | 0.336* | 0.441** | 0.502*** | -0.275*** | 0.258 | 0.357* | 0.475*** |
| | (0.078) | (0.173) | (0.195) | (0.098) | (0.083) | (0.183) | (0.207) | (0.102) |
| N | 4415 | 4415 | 4415 | 4415 | 4025 | 4025 | 4024 | 4024 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-04-22 | -0.115 | -0.109 | -0.699 | -0.208 | -0.104 | -0.602 | -0.461 | -0.255 |
| | (0.172) | (0.448) | (0.504) | (0.21) | (0.183) | (0.6) | (0.513) | (0.222) |
| N | 628 | 628 | 628 | 628 | 573 | 573 | 573 | 573 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-06-10 | 0.084 | -0.117 | -0.187 | 0.106 | 0.014 | -0.212 | -0.31 | 0.135 |
| | (0.077) | (0.176) | (0.277) | (0.109) | (0.093) | (0.213) | (0.333) | (0.131) |
| N | 6040 | 6040 | 6036 | 6036 | 2376 | 2376 | 2375 | 2375 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-07-22 | -0.177 | -0.132 | 0.639 | 0.102 | -0.251 | -0.164 | 0.72 | 0.072 |
| | (0.155) | (0.414) | (0.49) | (0.211) | (0.171) | (0.445) | (0.515) | (0.228) |
| N | 816 | 816 | 817 | 817 | 734 | 734 | 735 | 735 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-09-09 | 0.006 | 0.3 | 0.387 | -0.077 | 0.018 | 0.333 | 0.33 | -0.046 |
| | (0.099) | (0.195) | (0.246) | (0.144) | (0.105) | (0.205) | (0.258) | (0.151) |
| N | 2818 | 2818 | 2818 | 2818 | 2579 | 2579 | 2579 | 2579 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-10-28 | 0.239* | -0.407 | -0.502 | -0.388* | 0.261* | -0.484 | -0.375 | -0.353 |
| | (0.142) | (0.327) | (0.33) | (0.222) | (0.151) | (0.359) | (0.34) | (0.235) |
| N | 2130 | 2130 | 2129 | 2129 | 1939 | 1939 | 1939 | 1939 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2021-12-16 | -0.105 | 0.48* | 0.097 | -0.434* | -0.014 | 0.504 | 0.124 | -0.291 |
| | (0.142) | (0.287) | (0.318) | (0.239) | (0.154) | (0.312) | (0.339) | (0.256) |
| N | 893 | 893 | 892 | 892 | 818 | 818 | 817 | 817 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |

Continued on next page

**Table B2:** *Per-announcement regression results refresher only (continued)*

| | Savings Interest Rate 12M | | Inflation 12M | | Savings Interest Rate 12M | | Inflation 12M | |
|---|---|---|---|---|---|---|---|---|
| | MLOGIT | | MLOGIT | | MLOGIT | | MLOGIT | |
| | (1) Decrease | (2) Increase | (3) Decrease | (4) Increase | (5) Decrease | (6) Increase | (7) Decrease | (8) Increase |
| 2022-02-03 | -0.163 | 0.523*** | 0.008 | 0.207 | -0.22* | 0.515*** | 0.054 | 0.286* |
| | (0.112) | (0.15) | (0.217) | (0.147) | (0.12) | (0.156) | (0.233) | (0.154) |
| N | 1724 | 1724 | 1723 | 1723 | 1580 | 1580 | 1579 | 1579 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-03-10 | 0.09 | -0.133 | 0.511 | 0.691** | 0.004 | -0.244 | 0.492 | 0.835*** |
| | (0.199) | (0.215) | (0.537) | (0.286) | (0.217) | (0.227) | (0.571) | (0.297) |
| N | 907 | 907 | 909 | 909 | 830 | 830 | 831 | 831 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-04-14 | 1.103 | 0.178 | -0.392 | 0.861 | 1.4 | -0.078 | -0.226 | 1.321 |
| | (1.101) | (0.846) | (1.445) | (1.099) | (1.246) | (0.879) | (1.349) | (1.013) |
| N | 453 | 453 | 453 | 453 | 416 | 416 | 416 | 416 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-06-09 | -0.236 | 0.374*** | -0.031 | -0.137 | -0.359** | 0.412*** | 0.058 | -0.146 |
| | (0.155) | (0.119) | (0.299) | (0.186) | (0.171) | (0.125) | (0.309) | (0.197) |
| N | 1782 | 1782 | 1780 | 1780 | 1644 | 1644 | 1643 | 1643 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-07-21 | 0.184 | 0.058 | 0.123 | -0.371 | 0.172 | 0.239 | 0.173 | -0.401 |
| | (0.282) | (0.207) | (0.404) | (0.28) | (0.323) | (0.239) | (0.494) | (0.349) |
| N | 460 | 460 | 460 | 460 | 421 | 421 | 421 | 421 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-09-08 | -0.053 | 0.322*** | 0.336 | 0.377** | 0.01 | 0.281** | 0.377 | 0.392** |
| | (0.151) | (0.108) | (0.267) | (0.186) | (0.159) | (0.114) | (0.28) | (0.199) |
| N | 4348 | 4348 | 4355 | 4355 | 4000 | 4000 | 4007 | 4007 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-10-27 | -0.231 | 0.194 | -0.431 | -0.546** | -0.237 | 0.325* | -0.369 | -0.711*** |
| | (0.242) | (0.175) | (0.319) | (0.225) | (0.257) | (0.19) | (0.334) | (0.237) |
| N | 728 | 728 | 729 | 729 | 673 | 673 | 674 | 674 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2022-12-15 | -0.4 | 0.667* | 0.699 | -0.564 | -0.562 | 0.643 | 0.826 | -0.508 |
| | (0.445) | (0.369) | (0.641) | (0.434) | (0.513) | (0.395) | (0.687) | (0.455) |
| N | 517 | 517 | 518 | 518 | 477 | 477 | 478 | 478 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-02-02 | 0.052 | 0.172 | -0.023 | -0.322* | 0.13 | 0.191 | 0.098 | -0.231 |
| | (0.214) | (0.161) | (0.202) | (0.178) | (0.231) | (0.168) | (0.213) | (0.188) |
| N | 819 | 819 | 821 | 821 | 753 | 753 | 755 | 755 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-03-16 | 0.475 | 0.089 | 0.12 | -0.034 | 0.568 | -0.029 | -0.111 | -0.096 |
| | (0.332) | (0.206) | (0.268) | (0.225) | (0.36) | (0.22) | (0.282) | (0.241) |
| N | 540 | 540 | 540 | 540 | 490 | 490 | 490 | 490 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-05-04 | 0.198 | -0.24 | 0.268 | 0.167 | 0.122 | -0.268 | 0.074 | 0.031 |
| | (0.24) | (0.162) | (0.201) | (0.183) | (0.267) | (0.173) | (0.209) | (0.191) |
| N | 763 | 763 | 762 | 762 | 701 | 701 | 700 | 700 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-06-15 | 0.058 | -0.151 | -0.368 | -0.325 | -0.136 | -0.155 | -0.279 | -0.331 |
| | (0.363) | (0.247) | (0.302) | (0.286) | (0.373) | (0.259) | (0.315) | (0.3) |
| N | 567 | 567 | 567 | 567 | 533 | 533 | 533 | 533 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-07-27 | -0.488* | -0.286 | 0.208 | -0.12 | -0.482 | -0.249 | 0.293 | -0.085 |
| | (0.267) | (0.185) | (0.23) | (0.204) | (0.308) | (0.194) | (0.242) | (0.219) |
| N | 629 | 629 | 629 | 629 | 588 | 588 | 588 | 588 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-09-14 | 0.036 | 0.205 | 0.185 | -0.212 | -0.069 | 0.156 | 0.154 | -0.261 |
| | (0.243) | (0.166) | (0.199) | (0.188) | (0.27) | (0.178) | (0.218) | (0.202) |
| N | 815 | 815 | 814 | 814 | 744 | 744 | 743 | 743 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |

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**Table B2:** *Per-announcement regression results refresher only (continued)*

| | Savings Interest Rate 12M | | Inflation 12M | | Savings Interest Rate 12M | | Inflation 12M | |
|---|---|---|---|---|---|---|---|---|
| | MLOGIT | | MLOGIT | | MLOGIT | | MLOGIT | |
| | (1) Decrease | (2) Increase | (3) Decrease | (4) Increase | (5) Decrease | (6) Increase | (7) Decrease | (8) Increase |
| 2023-10-26 | 0.347 | -0.11 | 0.648* | 0.385 | 0.435 | -0.112 | 0.749* | 0.556 |
| | (0.396) | (0.303) | (0.39) | (0.378) | (0.4) | (0.317) | (0.428) | (0.402) |
| N | 459 | 459 | 460 | 460 | 420 | 420 | 421 | 421 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |
| 2023-12-14 | 0.632** | -0.335 | 0.108 | 0.506** | 0.549** | -0.347 | 0.131 | 0.322 |
| | (0.269) | (0.229) | (0.257) | (0.238) | (0.277) | (0.244) | (0.277) | (0.249) |
| N | 616 | 616 | 616 | 616 | 572 | 572 | 572 | 572 |
| Controls | NO | NO | NO | NO | YES | YES | YES | YES |

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