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Survey Measures of the Natural Rate of Interest and Long-Run Policy Rate Expectations

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This paper constructs survey-based measures of long-run neutral policy rate expectations using market participant surveys conducted by several central banks in the United States, euro area, United Kingdom, and Canada. The paper compares such alternative estimates of r-star to more traditional structural estimates of r-star such as those of Holston, Laubach, and Williams (2017) and Lubik and Matthes (2015). While all measures of r-star have declined over time prior to the COVID-19 pandemic along with traditional structural measures, there has been substantial divergence in r-star estimates during the early 2020s. Namely, survey-based measures of long-run neutral policy rate expectations have risen while structural estimates of the natural rate have exhibited mixed dynamics during this period of resurgent inflation. At the peak of the 2022–2023 tightening cycle, survey-based measures imply that U.S. monetary policy was approximately 1 to 1.5 percentage points less restrictive than suggested by standard model-based r-star estimates. These survey measures closely track the Federal Reserve's Summary of Economic Projections (SEP) median longer-run federal funds rate forecast. These measures should be interpreted as expectations-based neutral rate estimates reflecting market participants' beliefs about the long-run policy rate, rather than structural natural rates derived from economic primitives.

Keywords: Interest Rates, Monetary Policy, Natural Rate of Interest, Expectations
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1 Introduction

Measuring the natural rate of interest (also referred to as r-star or r*) is an essential tool for policymakers in determining the current stance of monetary policy. It is often considered a long-run equilibrium interest rate and the short-term interest rate achieved by an economy when inflation is stable.

This paper proposes survey-based measures of long-run neutral policy rate expectations derived directly from central bank market participant surveys. Unlike existing structural estimates of r-star, these measures are model-free, forward-looking, and immediately observable. They provide a direct read on how financial market participants perceive the long-run neutral stance of monetary policy.

This paper studies survey measures of long-run neutral policy rate expectations and related natural-rate concepts. In some jurisdictions (United Kingdom and Canada), surveys explicitly elicit estimates of the neutral or natural rate. In others (United States and euro area), surveys elicit long-run policy rate expectations that are informative about market participants' views regarding the long-run stance of monetary policy.

Importantly, these survey-based measures should be interpreted as expectations-based neutral rate estimates rather than structural natural rates determined by economic fundamentals such as preferences, technology, and demographics. Structural natural rates are latent equilibrium objects inferred from macroeconomic dynamics, while survey-based measures capture market participants' expectations regarding the policy rate consistent with long-run macroeconomic stability. These expectations incorporate beliefs about inflation, fiscal policy, productivity growth, financial conditions, and central bank behavior.

The concept of the natural rate of interest dates back to Wicksell (1898).[1] This paper provides an alternative model-free measure of the natural rate of interest based on survey expectations, which may help policymakers avoid misjudging the stance of monetary policy.

This paper makes three contributions. First, it introduces new survey-based measures of the natural rate of interest for the United States, euro area, United Kingdom, and Canada using recently introduced central bank market participant surveys. Second, it documents a systematic divergence between survey-based and structural r-star estimates following the COVID-19 pandemic, with survey measures rising while widely used model-based estimates display mixed or declining dynamics. Third, it shows that survey-based measures closely track policymakers' own long-run interest rate projections—particularly the Federal Reserve's Summary of Economic Projections (SEP), leading to materially different assessments of the stance of monetary policy.

Historically, neutral rates have been measured using various structural models (Laubach and Williams 2003; Lubik and Matthes 2015, Holston et al. 2017). Natural rates are often computed using dynamic stochastic general equilibrium (DSGE) models (Edge et al. 2008; Barsky et al. 2014; Curdia et al. 2015; Del Negro et al. 2017; Roberts 2018). However, such structural approaches, including those of Laubach and Williams (2003), Lubik and Matthes (2015), and Holston, Laubach, and Williams (2017), are highly susceptible to model misspecification. Standard errors for model-estimated r-stars can often be substantial, in the magnitude of several percentage points. Typically, such structural estimates show that the neutral rate has been falling for many decades (Rachel and Smith 2017; Rachel and Summers 2019).

Recent papers have explored r-star from different perspectives, including its fiscal consequences, with some economists arguing for a separate "fiscal r-star" measure (Campos et al. 2024; Bolhuis et al. 2024) and others examining the financial stability consequences for r-star (Akinci et al. 2023). Other papers have introduced new real-estate-based measures of the natural rate of interest, using foothold versus leasehold values (see Giglio, Maggiori, and Stroebel (2015) and Bäcker-Peral, Hazell, and Mian (2023) for analyses of values in the United Kingdon [UK] and Singapore) and historical long-term bond yields (Rogoff et al. 2024).

[1] In his 1898 magnum opus *Interest and Prices*, Swedish economist Knut Wickell coins the concept of the "natural rate of interest" saying, "It is not a high or low rate of interest in the absolute sense which must be regarded as influencing the demand for raw materials, labour, and land or other productive resources, and so indirectly as determining the movement of prices. The causative factor is the current rate of interest on loans as compared to what I shall be calling the natural rate of interest on capital."

One challenge with using long-term bond yields or other long-run interest rates as indicators is that they contain a risk premium and an uncertain term premium, both of which can be difficult to measure. A similar issue exists with using inflation-linked securities (such as Treasury Inflation Protected Securities in the US) as unbiased forecasts of inflation. Economists such as Dhawan, Seidner, and Clarida (2024) have attempted to use central bank surveys to measure term premiums as well.

This paper compares alternative survey estimates of r-star to the more traditional structural estimates, specifically those of Holston, Laubach, and Williams (2017). While both alternative survey estimates and traditional structural estimates of r-star declined over time prior to the COVID-19 pandemic, there has been substantial divergence in estimates during the early 2020s. Specifically, survey-based estimates of r-star have risen while structural estimates of r-star have fallen during this period of resurgent inflation.

Recent statements by monetary policymakers suggest that survey-based measures are increasingly considered alongside model-based estimates. In this sense, survey-based and structural measures should be viewed as complementary: structural models discipline beliefs using economic theory and historical relationships, while surveys reveal how those models and assumptions are interpreted in real time.[2][3]

The paper is structured as follows: Section 2 describes and presents the survey data. Section 3 discusses the conceptual interpretation of survey-based r-star. Section 4 discusses the implications for Taylor rules. Section 5 provides concluding remarks.

2 Survey Expectations About Short-Term Policy Rates In The Long-Run

Long-run nominal policy rate expectations provide a measure of market participants' beliefs regarding the neutral policy rate. Under standard monetary models, the neutral nominal policy rate equals the sum of the real natural rate and long-run inflation expectations. However, long-run policy rate expectations may differ from structural natural rates due to variation in inflation expectations, risk premia, and expectations regarding central bank policy regimes. Accordingly, the survey-based measures studied here should be interpreted as belief-based neutral rate expectations rather than structural natural rates.

To obtain a real natural rate, one can take a long-run forecast of the policy rate and subtract the long-run inflation forecast (or, more simply, the central bank inflation target of 2 percent).

The survey questions considered in this paper are not identical across jurisdictions. The Bank of England and Bank of Canada surveys explicitly ask respondents about the neutral, natural, or equilibrium policy rate. By contrast, the Federal Reserve Bank of New York and European Central Bank surveys ask respondents for their expectations regarding the long-run level of the policy rate. While these concepts are distinct, both provide information regarding market participants' beliefs about long-run monetary policy settings and are therefore analyzed jointly while noting the differences in interpretation.

We obtain long-run forecasts from several central bank surveys: The Federal Reserve Bank of New York (New York Fed) Primary Dealers Survey. In the United States, the New York Fed initially collected long-run policy rate expectations through its Survey of Primary Dealers, which began asking explicit "longer-run" federal funds rate questions in 2012. A separate New York Fed survey titled the Survey of Market Participants (asking non-primary dealer

[2]Federal Reserve Board Governor Adriana Kugler in a February 7, 2025 public interview with the author of this paper said, "I have to say I do like looking at the surveys as well. And there's survey based models, right? Which use the survey data to inform where r-star is too.", see *Capitalism and Freedom in the 21st Century* episode: "U.S. Monetary Policy, Inflation, and Labor Markets with Adriana Kugler (Federal Reserve Governor)"https://www.hoover.org/research/us-monetary-policy-inflation-and-labor-markets-adriana-kugler-federal-reserve-governor

[3]Federal Reserve Board Governor Chris Waller in an August 28, 2025 public interview with the author of this paper, talked about dispersion in survey-based r-star estimates saying, "When I was saying 3% was a median estimate, that's what I mean. ...If you even look at the FOMC survey of economic projections, they run from about two and a half to close to 4%.So even on our committee that's how big of the range is and how much uncertainty there is. So that's basically the way I kind of look at it is it's going to be a point estimate that moves around over time."

investors) similarly was run. These were merged, culminating in the launch of the Survey of Market Expectations in 2025, which harmonizes and extends the earlier survey instruments. Throughout this transition, question wording and the interpretation of the "longer-run" policy rate have remained closely aligned, allowing the series to be treated as a consistent measure of market participants' long-run policy rate expectations. In 2025, these two New York Fed surveys merged to form the Survey of Market Expectations), the European Central Bank (ECB) Survey of Monetary Analysts (SMA) (which began asking about long-run expected policy rates in 2021), the Bank of England Market Participants Survey (which began in 2022), and the Bank of Canada's Market Participants Survey (which began in 2023).

Related work extracts policy stance from market prices using shadow-rate term structure models, such as Wu and Xia (2016), which are particularly useful for summarizing the effective stance of monetary policy near the zero lower bound; the survey-based measures studied here instead capture long-run policy rate expectations directly and are designed to complement, rather than replace, such market-based approaches.

The details of these surveys are summarized in Table 1. These surveys ask market participants questions about traditional macroeconomic aggregate forecasts as well as more detailed forecasts regarding market expectations of different aspects of monetary policy, including balance sheet size and expectations about the neutral rate or the policy rate in the "long-run." The latter are of chief interest to this study.

Previously, forecasting surveys only asked for estimates several years into the future. One example is the long-running, US-based Survey of Professional Forecasters, which began in 1968 and was initially conducted by the American Statistical Association (ASA) and the National Bureau of Economic Research (NBER). It was taken over by the Federal Reserve Bank of Philadelphia in 1990 and asked questions about interest-rate forecasts, such as the three-month Treasury bill (as well as the consumer price index [CPI]), but only up to four years into the future. Questions about the "long run" have been noticeably absent until the past decade.[4] One notable exception is the Survey of Professional Forecasters (SPF), which has long elicited estimates of the natural rate of unemployment (u-star). As shown in Appendix Figure 9, these forecasts provide an example of a survey-based measure of a latent equilibrium concept and illustrate that such questions have a longer history in macroeconomic forecasting than is often recognized.

2.1 U.S. Survey of Long-run R-star Expectations

The NY Fed Primary Dealers Survey asks the question: "In addition, provide your estimate of the longer run target federal funds rate and your expectation for the average federal funds rate over the next 10 years. Please provide your responses out to at least one decimal place (e.g. for one percent enter 1.0, not 0.01)." [5]

Figure 1 plots the NY Fed Primary Dealer survey median "longer run" federal funds rate expectation versus the effective federal funds rate. In general, the NY Fed Primary Dealer Survey r-star estimates fell during the 2010s, consistent with the broader view that r-star has declined over many decades.

[4]The Survey of Professional Forecasters has asked economic forecasters about their forecast for the natural rate of unemployment or u* since the 1990s (See Appendix for data). The Survey of Economic Projections (SEP) which began in the late 2000s, also asks FOMC members about their long-run unemployment forecast. See Appendix for the time series of such natural rate of unemployment forecasts versus the U.S. civilian unemployment rate.

[5]The NY Fed Primary Dealer Survey in earlier waves around 2013 also asked for estimates of the 2 year ahead neutral rate eg. in the October 2013 survey, in Question 3b. it asks respondents "As noted in the minutes to the September FOMC meeting, a number of participants expected that, "if economic headwinds died away only slowly. . . the achievement of the Committee's employment and price stability objectives would likely require keeping the federal funds rate below its longer-run equilibrium value for some time even as economic conditions improved." We are interested in the degree to which economic headwinds are impacting your estimate of the neutral nominal federal funds rate over the next several years—that is, the rate that would be consistent with no unemployment gap and inflation at the FOMC's objective. Please provide your estimate of the neutral nominal federal funds rate at end-2016, given the financial and economic conditions you expect to prevail at that time". When asked to "Please comment on any difference between this [2 year ahead neutral rate] estimate and your longer run estimate provided", it asks "Some dealers noted that their estimate for the neutral nominal federal funds rate at end-2016 was different from their estimate of the longer run target, while several others stated that they saw little to no difference between the rates. Of the dealers that saw a difference between the two estimates, some cited a variety of economic and regulatory headwinds resulting from the financial crisis that would imply a lower neutral nominal rate over a shorter time horizon. Several dealers noted their view that various economic headwinds had put downward pressure on the economy's potential growth rate". Note the median end of 2016 neutral rate forecast of 3.25% to 3.50% around this time is somewhat lower than the roughly 4.00% forecast of the long run federal fund rates.

According to estimates from the NY Fed Primary Dealer Survey, the effective federal funds policy rate was above r-star by approximately 3 percent at the peak of the 2021–2023 tightening cycle. This contrasts sharply with the Lubik-Matthes nominal r-star estimate (real r-star plus 2%), which suggests the policy rate was above r-star by more than 4 percent during this period. In addition the nominal Holston-Laubach-Williams r-star estimate (real r-star plus 2%) was below 3%.

There has been substantial debate whether r-star has risen or fallen in the wake of COVID-19. Interestingly, there is significant divergence in the direction of r-star movements between the New York Fed market participant survey estimates along with Lubik-Matthes r-star estimates, which both generally suggest that r-star has risen since COVID-19, and the Holston-Laubach-Williams r-star estimates, which indicate a decline.

2.2 Euro Area Survey of Long-run R-star Expectations

Similarly, the ECB Survey of Monetary Analysts asks: "Please indicate the level (in percentage per annum) of the following interest rates that you consider most likely (i.e. the mode) to prevail over the reserve maintenance period after the Governing Council meetings listed below. Also, please indicate the level thatyou consider most likely (i.e. the mode) to prevail at the end of each of the quarters and years listed below, and in the long run".

Figure 2 plots the ECB Survey of Monetary Analysts median "longer run" deposit facility rate expectation versus the Holston-Laubach-Williams r-star and the ECB deposit facility rate. Note that from 2021 to 2024, the survey median estimate rose from 1.0 percent to 2.0 percent.

Similar to the US comparison, there is also a divergence between market participant survey forecasts, which generally suggest that r-star has risen since COVID-19, and the Holston-Laubach-Williams r-star estimates, which have fallen significantly.

According to the ECB survey r-star median estimates, the ECB policy rate, which peaked at 4.0 percent, was above r-star by less than 2.0 percent at the height of the early 2020s tightening cycle. This contrasts with the Holston-Laubach-Williams r-star estimate, which suggests the policy rate was above r-star by more than 2.0 percent during this period.

2.3 U.K. Survey of Long-run R-star Expectations

The Bank of England's Market Participants Survey began asking in their March 2022 survey "And where do you see the level of Bank Rate at which monetary policy is neither expansionary nor contractionary (often referred to as the neutral, natural or equilibrium rate)?".

Figure 3 plots the Bank of England Market Participants Survey long-term nominal neutral rate median estimate versus the Holston-Laubach-Williams r-star (which was discontinued in 2020) and the Bank of England policy rate. Notably, from early 2022 (when the survey first began asking r-star questions) to early 2024, the survey median estimate rose from 1.25 percent to 3.25 percent. There has been substantial debate whether r-star has risen or fallen in the wake of COVID-19, and this provides further support for the view that it has increased. Additionally, the survey estimates recently have in past years stabilized around levels close to the most recent estimate of UK Holston-Laubach-Williams provided by the New York Fed, at 1.55 percent for the second quarter of 2020.

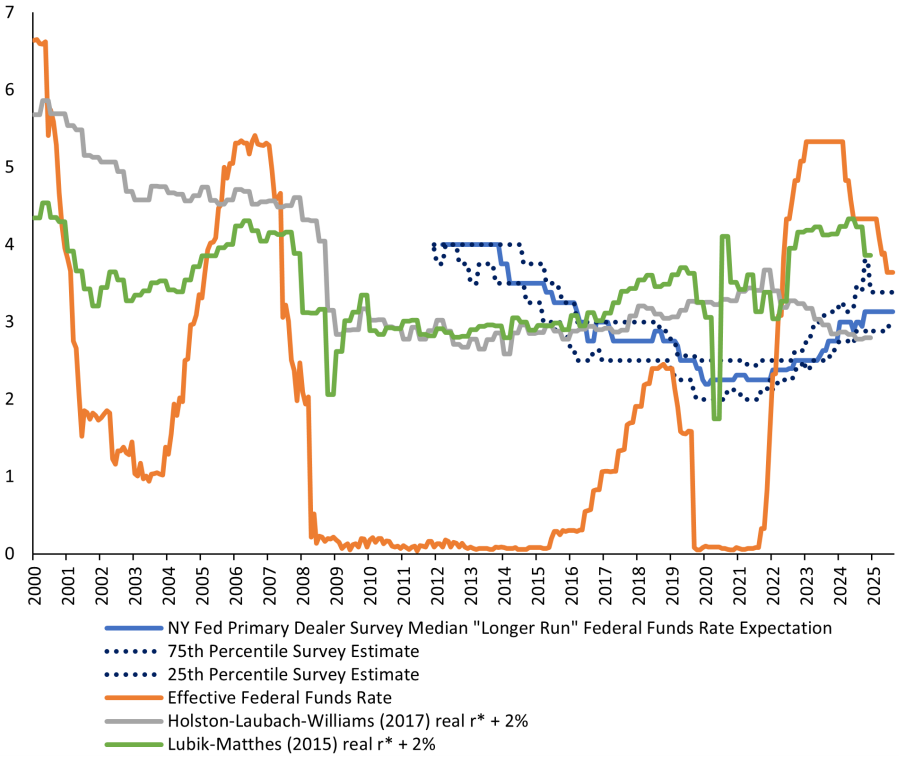
It is also worth noting that, based on r-star estimates from the Bank of England Market Participant Survey, the Bank of England policy rate was restrictive by more than 2 percent at the height of the early 2020s tightening cycle.

2.4 Canada Survey of Long-run R-star Expectations

The Bank of Canada's Market Participants Survey asks "What is your estimate of the long-term nominal neutral rate in Canada?".

Figure 4 plots the Bank of Canada Market Participants Survey long-term nominal neutral rate median estimate versus the Holston-Laubach-Williams r-star and the Bank of Canada overnight rate. While the sample size is limited

Figure 1: NY Fed Primary Dealer Survey Median "Longer Run" Federal Funds Rate Expectation Versus Holston-Laubach-Williams (2017) r-star and the Effective Federal Funds Rate



Notes: Source: The NY Fed Primary Dealer Survey, FRED

(as the Bank of Canada survey only began in 2023), the available data with a median between 2.5 percent and 3 percent suggest that the Bank of Canada policy rate was restrictive by more than 2 percent at the beginning of 2023 before the central bank started cutting interest rates in 2024.

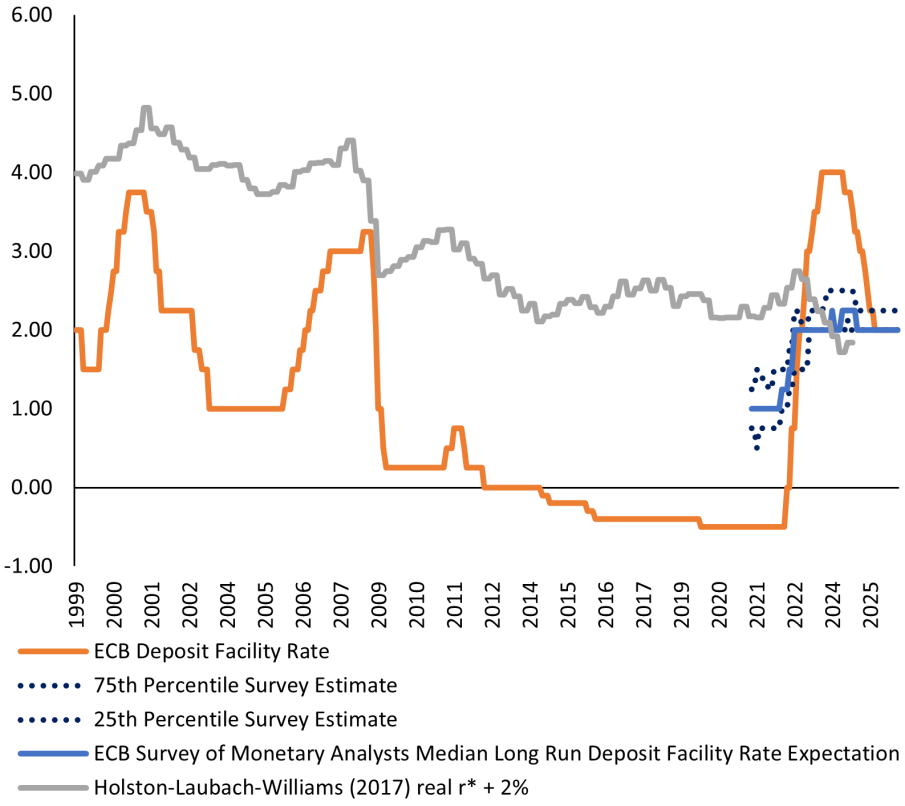
This is compared with the Canadian Holston-Laubach-Williams r-star estimate, which, at 3.62 percent as of the third quarter of 2024, is approximately 1 percent higher than the survey-based median estimate of r-star at 2.75 percent. This suggests that monetary policy is about one percentage point more restrictive in terms of its stance if one is going by the survey measure of r-star estimate instead of the Holston-Laubach-Williams estimate.

2.5 Relationship with Forward Guidance and Central Bank Economic Projections

The Federal Reserve in 2007 began publishing its Summary of Economic Projections (SEP) and in January 2012, FOMC participants assumptions about the appropriate level of the federal funds rate at year-ends and in the "longer run" were added to the SEP.[6] Figure 5 presents the median Federal Reserve (FOMC) Summary of Economic Projections (SEP) median longer-run Fed Funds rate forecast in comparison with the NY Fed Primary Dealer Survey Median 'Longer Run' federal funds rate expectation. Fascinatingly, these survey measures of market participant r-star expectations are closely related to the Federal Reserve FOMC Summary of Economic Projections (SEP) median longer run fed funds rate forecast. Since 2012, the beginning of when both data series have been in existence, the two series have never been more apart than 0.42% and most often no more than 0.13% apart, a striking result. Whether FOMC members follow market participants r-star forecasts to inform their forecast of r-star or vice-versa is an interesting question. Some FOMC members have publicly said they follow such market participant forecasts.

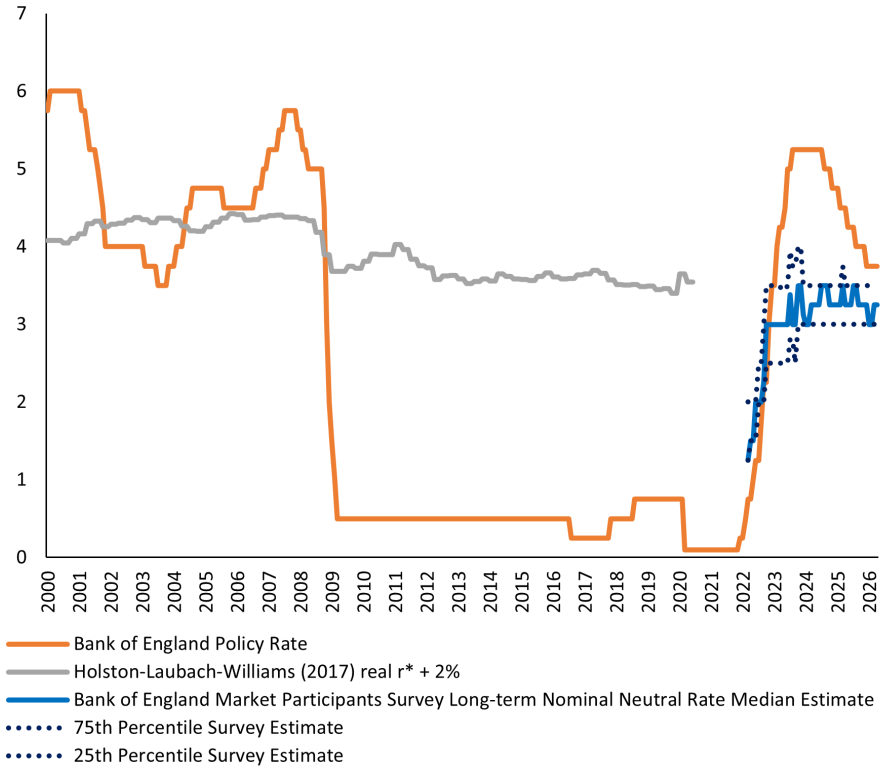
[6]https://www.federalreserve.gov/monetarypolicy/timeline-summary-of-economic-projections.htm

Figure 2: ECB Survey of Monetary Analysts (SMA) Median "Longer Run" Deposit Facility Rate Expectation Versus Holston-Laubach-Williams (2017) r-star and the ECB Deposit Facility Rate



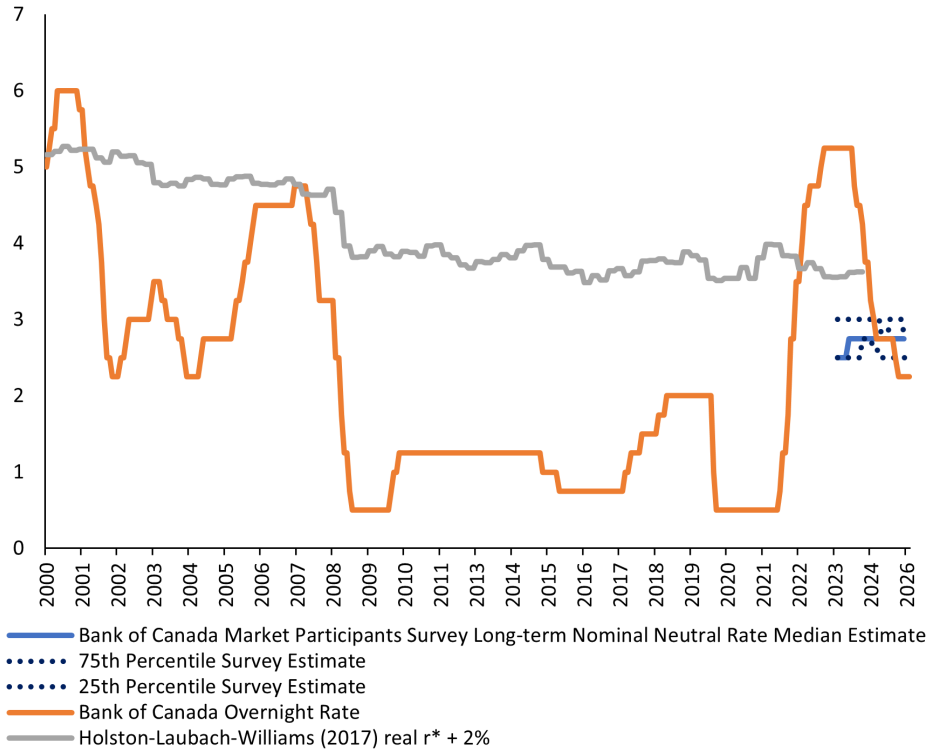
Notes: Source: ECB Survey of Monetary Analysts (SMA), FRED

Figure 3: Bank of England Market Participants Survey Long-term Nominal Neutral Rate Median Estimate Versus Holston-Laubach-Williams (2017) r-star and the Bank of England Policy Rate



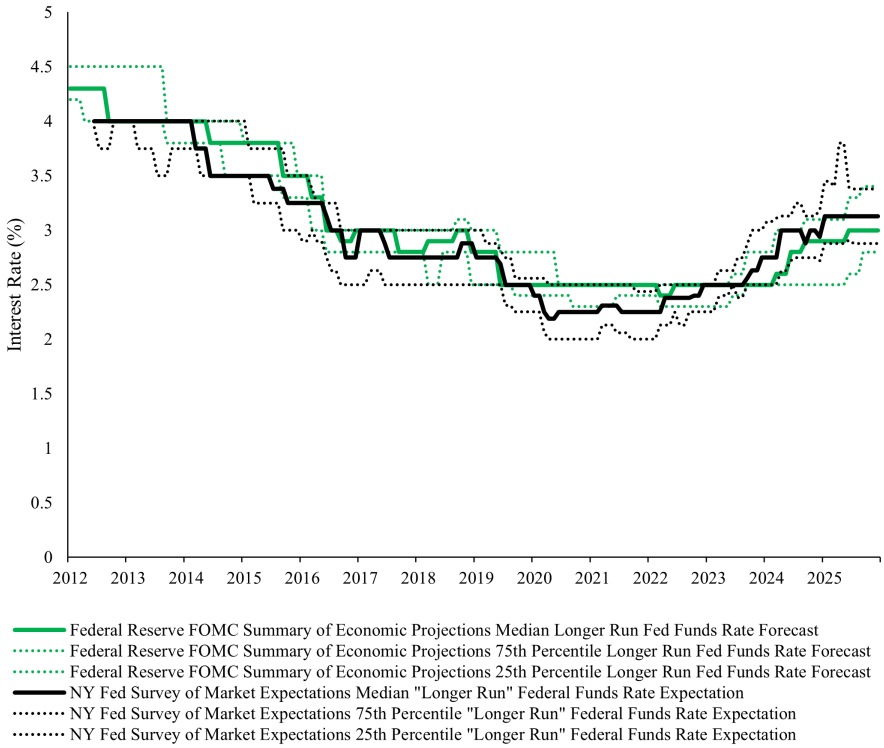
Notes: Source: Bank of England Market Participants Survey, Bank of Canada

Figure 4: Bank of Canada Market Participants Survey Long-term Nominal Neutral Rate Median Estimate Versus Holston-Laubach-Williams (2017) r-star and the Bank of Canada Overnight Rate



Notes: Source: Bank of Canada Market Participants Survey, Bank of Canada

Figure 5: NY Fed Primary Dealer Survey Median “Longer Run" Federal Funds Rate Expectation Versus Federal Reserve FOMC Summary of Economic Projections Median Longer Run Fed Funds Rate Forecast



Notes: Source: Federal Reserve FOMC Summary of Economic Projections, The NY Fed Primary Dealer Survey, FRED

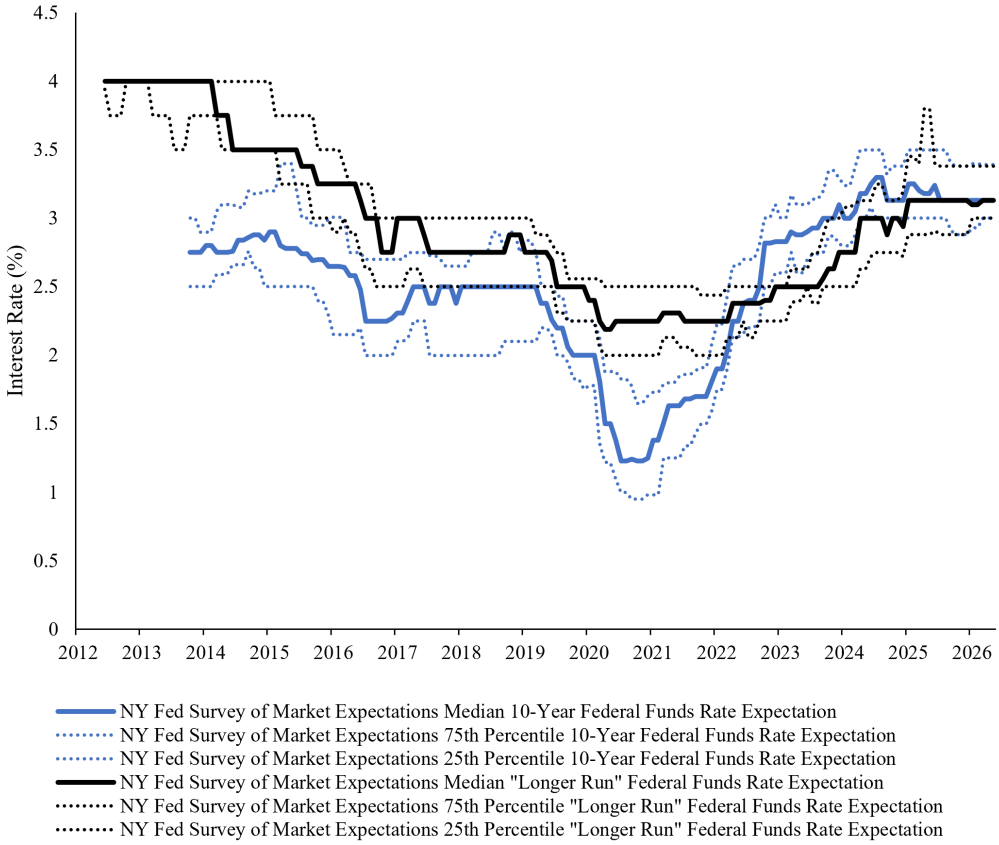
Several central banks publish forward guidance and economic projections, though their formats differ from the Fed's Summary of Economic Projections (SEP) and none regularly publish long-run interest rate forecasts from monetary policymakers. The European Central Bank (ECB) provides macroeconomic projections quarterly, including GDP growth, inflation, and other indicators, but doesn't use a dot plot format for interest rate projections. They tend to use more qualitative forward guidance in their communications. The Bank of England (BOE) publishes its Monetary Policy Report quarterly with fan charts showing probability distributions for future inflation, GDP growth and the bank policy rate, however, the horizon is only 3 years ahead and too short to be considered a good proxy for the long-run equilibrium interest rate (neutral rate). The Bank of Japan (BOJ) releases economic outlook reports with board members' forecasts for GDP and inflation, but historically has been less explicit about future interest rate paths given their long period of near-zero rates. The Reserve Bank of Australia (RBA) provides economic forecasts but has traditionally been more reserved about explicit interest rate projections compared to the Fed.

This difference in communication approaches reflects varying views on the benefits and risks of providing explicit rate forecasts. Some central banks worry that markets might interpret projections as commitments rather than conditional forecasts based on current data.

However, given the lack of a comparable policymaker or central bank staff neutral rate forecast from their economic projections (forward guidance), only the Fed's long-run policy rate projections are used in this paper to compare with the projections for the forecast for the long-run policy interest rate from market participants (in this case the New York Fed Survey of Primary Dealers and Survey of Market Participants).

2.6 Comparing 10-Year and Longer-Run Policy Rate Expectations

Figure 6: NY Fed Survey Federal Funds Rate 10-Year Versus "Longer-Run" Expectations



Notes: The figure compares the median, 25th percentile, and 75th percentile responses for the expected average federal funds rate over the next ten years with the corresponding responses for the expected longer-run federal funds rate from the New York Fed Survey of Primary Dealers and Survey of Market Participants. The ten-year expectation measures the expected average policy rate over the coming decade, whereas the longer-run expectation reflects respondents' assessment of the federal funds rate in the longer run.

The New York Fed Survey of Primary Dealers and Survey of Market Participants has long asked respondents both for their expectation of the average federal funds rate over the next ten years and for their estimate of the federal funds rate in the "longer run." Figure 6 compares these two long-horizon policy rate forecasts. While the survey does not explicitly define the relationship between these concepts, the comparison is informative because it sheds light on how respondents distinguish between long-horizon policy expectations and the eventual level of the policy rate beyond standard forecasting horizons.

Second, the longer-run estimate tends to exceed the ten-year average during periods when respondents expect policy rates to remain relatively low over an extended horizon. This pattern was particularly evident during the years following the Global Financial Crisis, when the average expected federal funds rate over the subsequent decade remained well below the reported longer-run federal funds rate.

Third, the gap between the two measures narrowed considerably during the late 2010s but widened again following the COVID-19 pandemic and the subsequent inflation surge. By 2024–2025, both measures had risen substantially, although the longer-run federal funds rate expectation remained modestly above the ten-year average expectation. This pattern is consistent with market participants revising upward their views regarding the long-run neutral policy rate while simultaneously expecting a gradual normalization path.

The close relationship between the two measures suggests that both capture common information regarding respondents' views of the long-run stance of monetary policy. At the same time, differences between the two series indicate that respondents do not treat the concepts as identical. The gap between the measures therefore provides additional information regarding how market participants distinguish between long-horizon policy expectations and their assessment of policy rates in the longer run.

2.7 Additional Survey-Based Measures of Long-Run Interest Rate Expectations

In addition to central bank market participant surveys, several private-sector and expert surveys provide valuable information on long-run interest rate expectations. The Blue Chip Financial Forecasts long-range survey collects semiannual projections from professional forecasters for key macroeconomic variables, including Treasury yields and short-term policy rates, over horizons extending five to ten years ahead. Because these forecasts reflect consensus views from institutional economists across financial institutions, consulting firms, and academia, they provide an independent benchmark for long-run interest rate expectations that is not directly influenced by central bank survey design or market pricing distortions such as term premia.

A complementary perspective is provided by the Duke Survey of Former Federal Reserve Insiders, which elicits expectations from individuals with direct experience in Federal Reserve policymaking, including former governors, reserve bank presidents, and senior staff economists. These respondents possess detailed institutional knowledge of monetary policy frameworks, reaction functions, and communication strategies. As a result, their expectations may more closely reflect informed assessments of the Federal Reserve's long-run policy framework rather than purely market-based forecasts.

Together, these surveys provide additional evidence on long-run interest rate expectations from both market participants and former policymakers. Their inclusion helps distinguish movements in expected future policy rates from changes in risk premia and provides further validation of survey-based measures of the natural rate of interest presented in this paper.

3 Conceptual Interpretation of Survey-Based r^*

This section proceeds as follows. Section 3.1 defines survey-based r* as a belief-based object derived from long-run policy rate expectations. Section 3.2 embeds this measure in an expectations equilibrium. Sections 3.3 and 3.4 compare survey-based and structural estimates and decompose their divergence. Section 3.5 discusses policy interpretation and limitations while Section 3.6 discusses the dispersion of the survey r-star estimates.

This section clarifies the economic interpretation of survey-based measures of the natural rate of interest and their relationship to traditional model-based estimates. While structural approaches such as Laubach and Williams (2003) or Holston, Laubach, and Williams (2017) define r^* as a latent equilibrium object inferred from macroeconomic dynamics, survey-based measures capture market participants' beliefs about the long-run policy rate consistent with macroeconomic stability.

3.1 Survey-Based Neutral Rate Expectations as a Belief-Based Measure

Central bank market participant surveys typically ask respondents to report the level of the policy rate that they expect to prevail in the long run, or the rate at which monetary policy is neither expansionary nor contractionary. These responses provide a direct measure of agents' expectations regarding the long-run neutral nominal policy rate.

We define the survey-based neutral real rate expectation as:

$$r_t^{\text{neutral,belief}} = \lim_{h \to \infty} \mathbb{E}_t \left[i_{t+h} - \pi_{t+h} \right], \tag{1}$$

where i_{t+h} denotes the nominal policy rate and π_{t+h} denotes inflation. In empirical implementation, we proxy this object using survey-based long-run nominal policy rate expectations combined with survey-based long-run inflation expectations.

Unlike structural natural rate estimates, which are derived from macroeconomic models imposing restrictions on preferences, technology, and equilibrium conditions, survey-based measures capture market participants' expectations regarding the long-run policy rate consistent with macroeconomic stability. These belief-based measures incorporate expectations about inflation, productivity growth, fiscal policy, financial conditions, and central bank behavior.

As such, survey-based neutral rate expectations should be interpreted as expectations-consistent equilibrium objects rather than structural natural rates inferred from macroeconomic models.

3.2 Survey-Based r^* in an Expectations Equilibrium

In modern monetary models, equilibrium outcomes depend not only on structural parameters but also on agents' expectations about long-run policy behavior. Consider a standard New Keynesian framework in which the central bank follows an interest rate rule of the form:

$$i_t = r_t^* + \pi_t + \phi_\pi(\pi_t - \pi^*) + \phi_y(y_t - y_t^*).$$

Taking expectations far into the future under the assumption that inflation converges to target and output gaps close yields:

$$\lim_{h\to\infty} \mathbb{E}_t[i_{t+h}] = \mathbb{E}_t[r_{t+h}^*] + \pi^*.$$

To make this expectations-based interpretation precise, it is useful to formalize the fixed-point logic underlying survey-based measures of the neutral rate.

A simple way to formalize the expectations equilibrium is to define a mapping from beliefs about the long-run neutral rate to realized long-run policy outcomes. Let private agents hold a belief $\tilde{r}_t^*$ about the long-run real neutral rate, and suppose the central bank follows an interest rate rule of the form:

$$i_t = \tilde{r}_t^* + \pi_t + \phi_\pi(\pi_t - \pi^*) + \phi_y(y_t - y_t^*).$$

Assume that along the long-run path inflation converges to target and output gaps close, so that

$$\lim_{h\to\infty} E_t[\pi_{t+h}] = \pi^*, \qquad \lim_{h\to\infty} E_t[y_{t+h} - y_{t+h}^*] = 0.$$

Taking expectations far into the future implies the long-run nominal policy rate

$$\lim_{h\to\infty} E_t[i_{t+h}] = \pi^* + \lim_{h\to\infty} E_t[\tilde{r}_{t+h}^*].$$

Let s_t denote the survey-based long-run nominal policy rate expectation (e.g., the median survey response). A belief-based real neutral rate is therefore given by

$$\hat{r}_t^{*,\text{survey}} \equiv s_t - \pi^*.$$

Define a belief-updating operator $\mathcal{B}$ such that

$$\tilde{r}_t^* = \mathcal{B}(Z_t, \mathcal{R}_t),$$

where Z_t summarizes beliefs about long-run fundamentals (trend growth, fiscal policy, demographics, risk premia) and $\mathcal{R}_t$ summarizes perceived monetary policy regimes (reaction functions, credibility, and communication strategies). Combining these expressions implies

$$s_t = \pi^* + \mathcal{B}(Z_t, \mathcal{R}_t).$$

In this interpretation, survey-based r^* measures the fixed point of a system in which beliefs about long-run policy and beliefs about long-run macroeconomic stability are mutually consistent.

In this environment, agents' beliefs about the long-run policy rate implicitly embed their beliefs about the long-run equilibrium real rate. Survey-based measures therefore capture the fixed point of an expectations equilibrium in which beliefs about long-run policy and macroeconomic stability are mutually consistent.

Importantly, this equilibrium object need not coincide with the steady-state real interest rate implied by a particular structural model. Instead, it reflects agents' synthesis of information about productivity growth, fiscal policy, financial conditions, demographic trends, and central bank reaction functions. Survey-based r^* can therefore be interpreted as an expectations-consistent equilibrium rate rather than a purely technological or preference-driven parameter.

In this sense, survey-based r^* can be interpreted as the fixed point of beliefs in which private agents' expectations about long-run policy are consistent with their expectations about long-run macroeconomic stability.

3.3 Relationship to Structural Estimates

Survey-based and structural estimates of r^* should not be viewed as competing measures of a single latent object, but rather as complementary perspectives. Structural estimates translate macroeconomic data into an implied equilibrium interest rate conditional on a specific model, while survey-based measures reflect how economic agents interpret those models, assumptions, and data in forming expectations about the long-run policy environment.

Importantly, structural estimates may inform survey respondents, who choose—implicitly or explicitly—which models and assumptions they find most credible. In this sense, survey-based measures embed a form of model averaging across the beliefs of market participants.

3.4 Interpreting Divergence Between Survey and Structural Estimates

The divergence between survey-based neutral rate expectations and structural natural rate estimates can be decomposed as:

$$r_t^{\text{neutral,belief}} - r_t^{*,\text{structural}} = \underbrace{\Delta_t^{\text{expectations}}}_{\text{belief component}} + \underbrace{\Delta_t^{\text{model}}}_{\text{model specification component}} + \underbrace{\Delta_t^{\text{policy}}}_{\text{policy regime component}} . \tag{2}$$

The first component reflects differences in beliefs regarding long-run macroeconomic fundamentals, including trend productivity growth, fiscal sustainability, demographic developments, and financial stability risks.

The second component reflects differences arising from model specification, including filtering methods, assumptions regarding trend growth, and treatment of financial frictions.

The third component reflects expectations regarding central bank policy regimes, including perceived reaction functions, forward guidance, and credibility.

This decomposition highlights that survey-based neutral rate expectations and structural natural rates need not coincide. Rather, survey-based measures capture agents' expectations regarding the neutral policy rate given their beliefs about the economic environment and monetary policy framework.

3.5 Policy Interpretation and Limitations

Survey-based measures of r-star may be influenced by central bank communication and policymakers' own projections, as evidenced by their close alignment with the Federal Reserve's Summary of Economic Projections. Rather than viewing this reflexivity as a limitation, it reflects the expectations-driven nature of modern monetary policy. If private agents base decisions on perceived rather than structural neutral rates, belief-based measures may provide the relevant object for assessing policy stance.

Survey-based r-star estimates are subject to limitations, including small sample sizes for newer surveys, heterogeneity in question wording, and potential anchoring. They should therefore be interpreted as complements to, rather than

substitutes for, structural estimates. Their informational content is likely greatest during periods of structural change or elevated uncertainty, when backward-looking statistical filters may adjust only slowly.

3.6 Survey Estimate Dispersion

The central bank surveys on top of reporting median survey response for long-run/neutral rate from respondents, the central banks also report the 75th and 25th percentiles. Figure 7 plots the time series of 75th and 25th percentiles for the long-run/neutral rate estimates reported by the central bank surveys. In the case of the U.S., the difference between the 75th percentile estimate and the 25th percentile estimate on average is 0.42% and has a maximum of 0.75%. In the case of Europe, with a shorter time series, the difference between the 75th percentile estimate and the 25th percentile estimate on average is 0.29% and is never greater than 0.50%. For the U.K., the difference between the 75th percentile estimate and the 25th estimate on average is 0.73% and has a maximum of 1.25%, all of which suggests that there is greater uncertainty in survey estimates of r-star in the U.K.. For Canada, the difference between the 75th percentile estimate and 25th percentile estimate on average is 0.40% and has a maximum of 0.50%.

It is informative to compare this dispersion to that implied by policymakers' own longer-run projections. Since 2012, the Federal Reserve's Summary of Economic Projections (SEP) has reported the distribution of FOMC participants' longer-run federal funds rate forecasts. Notably, dispersion across SEP participants has increased in recent years, particularly following the COVID-19 pandemic, and now exceeds the dispersion observed in market participant surveys. While SEP participants' 75th–25th percentile range has widened materially since 2021, the corresponding dispersion in the New York Fed Survey of Market Expectations has remained comparatively stable.

This pattern suggests that disagreement about the long-run neutral rate has risen more sharply among policymakers than among market participants during the post-pandemic period. One interpretation is that market participants may converge more quickly to a shared assessment of long-run policy regimes, while policymakers face greater internal uncertainty when structural relationships are perceived to be shifting.

Taken together, these considerations imply that differences in r^* measurement are not merely academic, but can materially affect the implied stance of monetary policy (a point explored quantitatively in the Taylor rule exercises that follow).

This framework generates several testable implications. First, survey-based measures of r^* should comove more closely with financial conditions and policy communication than with slow-moving structural estimates. Second, divergence between survey and structural measures should be largest following large macroeconomic shocks. Third, policy rules calibrated using survey-based r^* should better align with observed policy behavior during periods of elevated uncertainty.

4 Implications For Taylor Rules

The purpose of the Taylor rule exercises is not to advocate a particular policy rule or coefficient choice, but to illustrate how alternative measures of r-star translate into materially different assessments of monetary policy stance. In all cases, policy rule coefficients are held fixed and only the measure of r-star is varied.

One way to assess the impact of different r-star estimates is to examine their implications in a standard Taylor Rule framework, following Taylor (1993) and Taylor (1999) ("balanced-approach") and inertial rules.

The Taylor Rule is commonly written as:

$$i_t = \pi_t + r_t^* + \beta_1(\pi_t - \pi_t^*) + \beta_2(y_t - y_t^*)$$

where i_t is the nominal federal funds rate, r_t^* is the real equilibrium interest rate (natural rate), π_t is the current inflation rate, π_t^* is the target inflation rate (e.g., 2% for the Federal Reserve), y_t is the actual output, and y_t^* is the potential output from the CBO.

In the original set-up of Taylor (1993), there is an equal weight on inflation and the output gap: $\beta_1 = \beta_2 = 0.5$. In the "balanced approach" rule of Taylor (1999) there is a greater weight on the output gap with, $\beta_1 = 0.5$ and $\beta_2 = 1$.

In the inertial rule set up, there is a considerable weight of 85% put on the prior period Taylor rule estimate nominal interest rate from the previous period and a 15% weight on the current period Taylor Rule estimate[7]:

$$i_t = 0.85 * i_{t-1} + 0.15[\pi_t + r_t^* + \beta_1(\pi_t - \pi_t^*) + \beta_2(y_t - y_t^*)$$

The intercept in the Taylor Rule represents the neutral nominal policy rate. Differences between structural natural rates and survey-based neutral rate expectations can therefore generate materially different policy prescriptions. An incorrect estimate of r-star can lead to substantial deviations in policy recommendations. This becomes particularly evident in Figure 8, where we contrast Taylor Rule–based interest rate recommendations using different r-star estimates, including the survey measures featured in this paper as well as traditional structural estimates like those of Holston, Laubach, and Williams (2017).

Panel (a) shows such monetary policy rule estimates using a Taylor (1993) rule, while panel (b) shows these estimates using a Taylor (1999) rule (with a bigger weight on the output gap). Due to a larger weight on the output gap, the Taylor (1999) rule goes much deeper below zero than the Taylor (1993) rule during the COVID-19 pandemic.

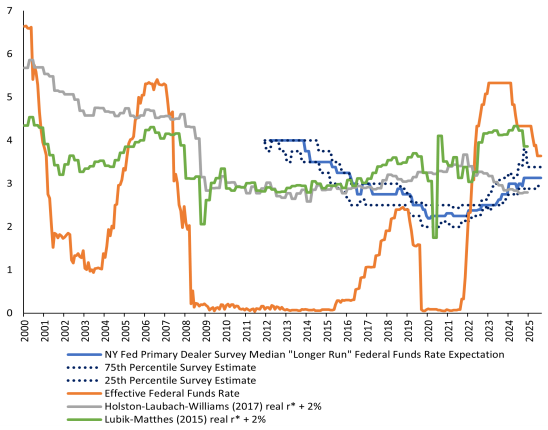
Panels (c) and (d) show the inertial versions of the Taylor (1993) and Taylor (1999) rule with various r-star estimates. The inertial Taylor rule estimates in general do not prescribe as quick of an interest rate tightening cycle in 2022 amidst the peak of the early 2020s inflation, or as fast an interest rate easing cycle in the subsequent years as inflation recedes. This is to be expected as inertial rules prescribe a response of the federal funds rate to economic developments spread out over time. Such inertial responses may better capture the Fed's monetary policy response function which may be slow to act.

The monetary policy rules with the model-based Holston-Laubach-Williams r-star prescribes a lower interest rate than the median survey r-star measure and the most amount of monetary accommodation during the mid-2010s. By the end of the 2010s and early 2020s, as the Holston-Laubach-Williams r-star became higher than the median survey r-star measure, monetary policy rules with the median survey r-star measure prescribes the most amount of monetary accommodation.

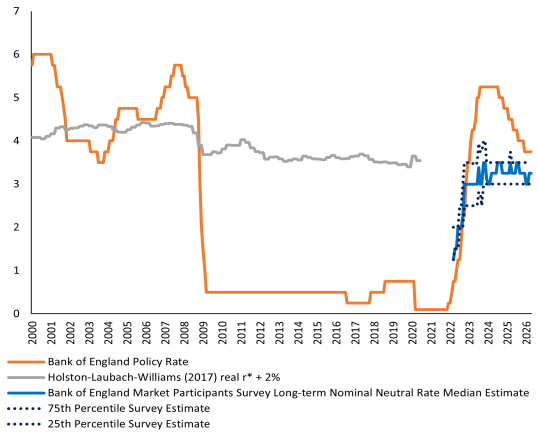
[7]For further discussion of such inertial rules, see Callicott, Papell and Prodan-Boul (2024)

Figure 7: Natural Rate of Interest Survey Estimate Uncertainty (Including 75th and 25th Percentiles)

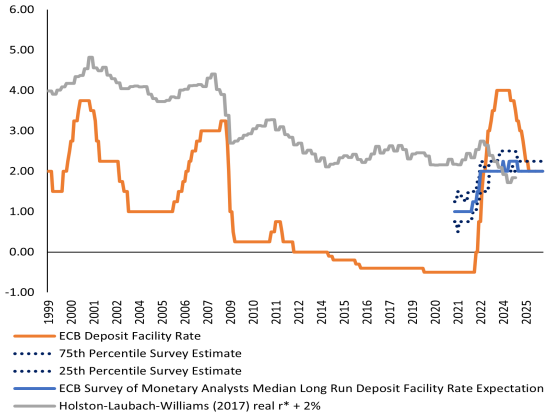
(a) Federal Reserve



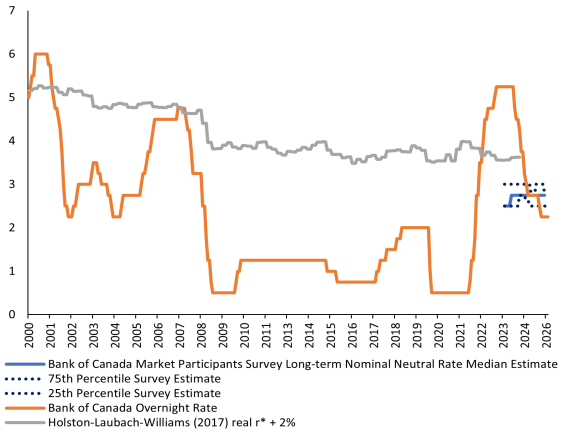
(b) Bank of England



(c) European Central Bank



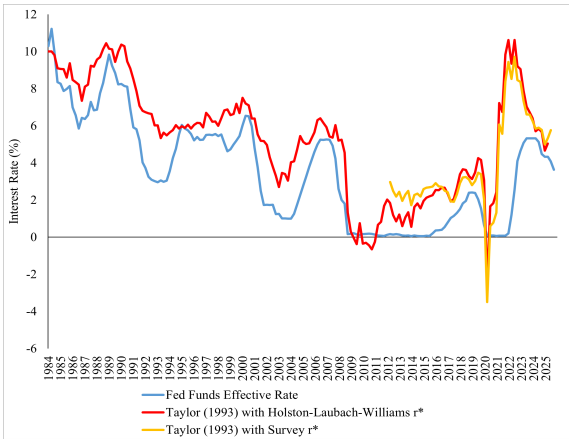
(d) Bank of Canada



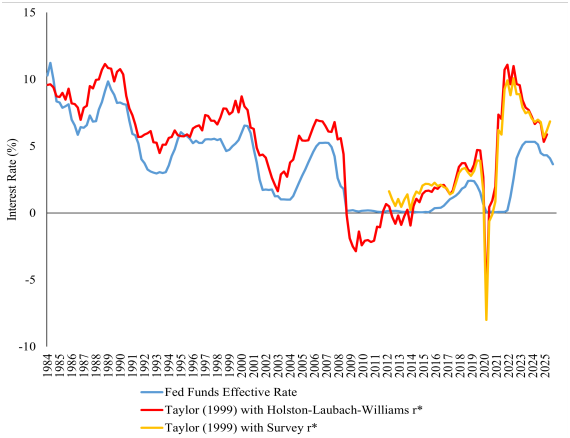
Notes: NY Fed Primary Dealer Survey, ECB Survey of Monetary Analysts, BoE Market Participants Survey, BoC Market Participants Survey, FRED

Figure 8: Various Taylor Rule Estimates For The U.S. Using Different Natural Rate of Interest Estimates Including Survey r-star and Holston-Laubach-Williams

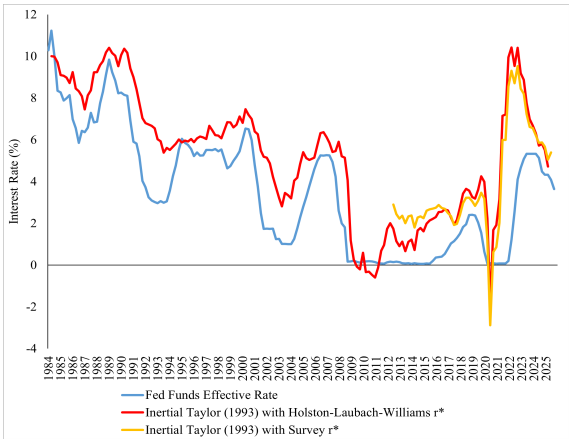
(a) Taylor (1993) Rules



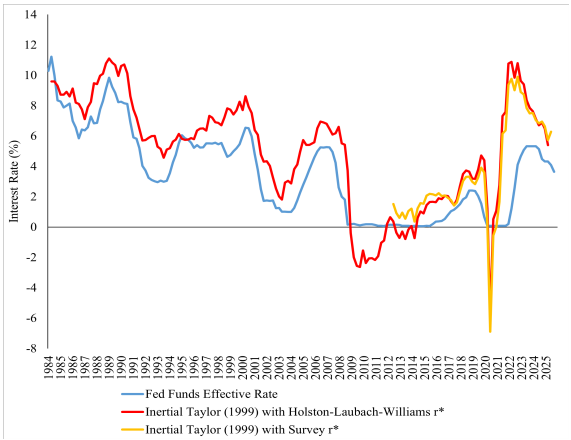
(b) Taylor (1999) Rules



(a) Inertial Taylor (1993) Rules



(b) Inertial Taylor (1999) Rules



Notes: NY Fed Primary Dealer Survey, ECB Survey of Monetary Analysts, BoE Market Participants Survey, BoC Market Participants Survey, FRED

5 Conclusion

To summarize, this paper proposes survey-based measures of long-run neutral policy rate expectations using central bank market participant surveys introduced by several central bank surveys created over the past decade in the U.S., the U.K., Euro Zone, and Canada. The paper compares such alternative estimates of r-star to more traditional structural estimates of r-star such as those of Holston, Laubach, and Williams (2017). While various alternative measures of r-star declined over time prior to the COVID-19 pandemic along with traditional structural measures, there has been substantial divergence in r-star estimates during the early 2020s. Namely, survey-based estimates of r-star have risen while structural estimates of r-star have fallen during this period of resurgent inflation.

Such survey-based estimates may not suffer from misspecification that neutral rates derived from models suffer from (Holston, Laubach, and Williams (2017), Lubik and Matthes (2015)), often facing substantial standard errors. Survey estimates of the natural rate of interest face disagreement among survey respondents, however, such variation is often small when examining the 25th and 75th percentiles in the distribution of survey responses.

Such survey-based estimates also may not suffer from the challenges that long-run market-based measures (eg. long-run interest rates derived from foothold versus leasehold values (Bäcker-Peral, Hazell, and Mian (2023)) or historical long-term bond yields (Rogoff, Rossi and Schmelzing (2024)) which may contain a risk premia and an uncertain term premium which can be hard to measure.

As discussed above, recent statements by monetary policymakers suggest that survey-based measures are increasingly considered alongside model-based estimates.[8] Model-based and survey-based estimates of r^* can and should coexist. Structural models discipline beliefs using economic theory and historical relationships, while survey-based measures reveal how those models and assumptions are interpreted by market participants and policymakers in real time. In an environment where monetary policy operates largely through expectations, belief-based measures of the natural rate of interest provide an essential complement to traditional structural estimates. Ultimately, structural estimates of r-star may shape the information set available to market participants, while survey-based measures reveal how those inputs are synthesized into expectations about the long-run policy environment.

These survey-based neutral rate expectations should be interpreted as belief-based equilibrium objects reflecting market participants' expectations regarding long-run monetary policy and macroeconomic stability. While distinct from structural natural rates derived from macroeconomic models, these expectations are highly relevant for monetary policy transmission and financial market outcomes.

It would be highly valuable to monetary policymakers across countries if additional central banks beyond the Federal Reserve, Bank of Canada, European Central Bank, and Bank of England, were to continue to launch similar central bank surveys asking questions about market participant estimates of r-star. Time will tell how many more central banks follow suit.

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[8] Federal Reserve Governor Adriana Kugler in a February 7, 2025 public interview with the author of this paper said, "I have to say I do like looking at the surveys as well. And there's survey based models, right? Which use the survey data to inform where r-star is too.", see *Capitalism and Freedom in the 21st Century episode*: "U.S. Monetary Policy, Inflation, and Labor Markets with Adriana Kugler (Federal Reserve Governor)" Source: https://www.hoover.org/research/us-monetary-policy-inflation-and-labor-markets-adriana-kugler-federal-reserve-governor

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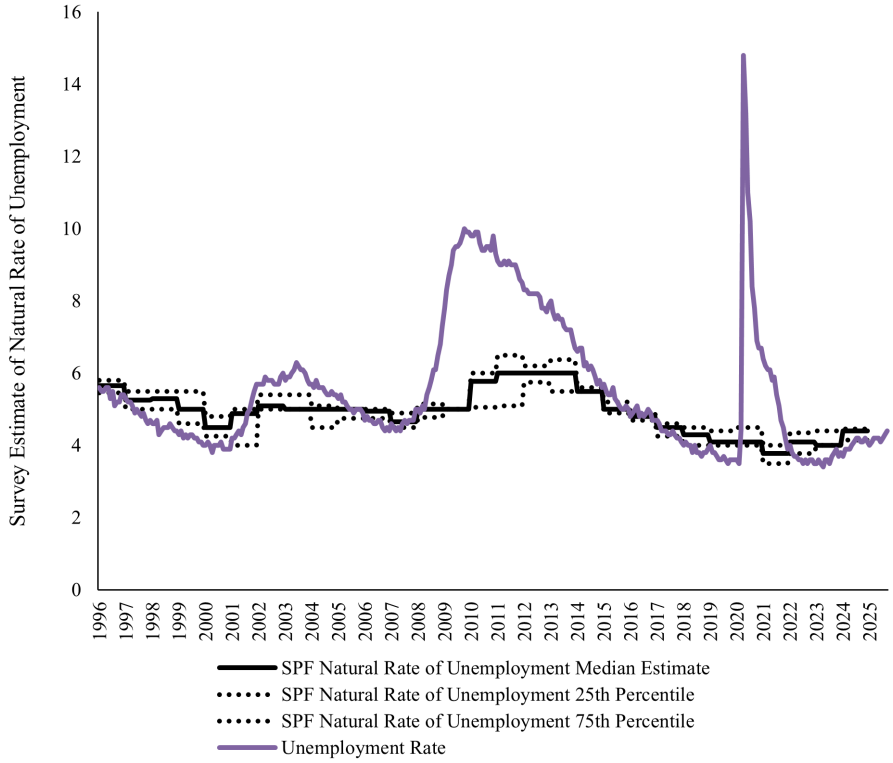
Table 1: Central Bank Market Participant Forecast Surveys

	Bank of Canada	Federal Reserve Bank of New York	European Central Bank	Bank of England
Name of survey	Market Participants Survey	Survey of Primary Dealers / Survey of Market Participants	Survey of Monetary Analysts	Market Participants Survey
Year of first publication	2023	2011/2014	2021	2022
Sample size (number of respondents)	30	25/30	29	50-60
Frequency (times per year)	4	8	8	8
Timing of release of results	Approximately 2 weeks after publication of the *Monetary Policy Report*	3 weeks after the Federal Open Market Committee meeting	The Monday after the monetary policy meeting of the Governing Council	1 day after Monetary Policy Committee meeting
Publication of aggregate results (all or partial)	Partial	All	Partial	All
Follow-up interviews conducted	Yes	No	No	Yes

Notes: Source: Demers, Gomez and Gignac (2023)

Figure 9: Survey of Professional Forecasters (SPF) Natural Rate of Unemployment Survey Estimates



Notes: Natural Rate of Unemployment Data obtained from the Survey of Professional Forecasters (SPF), monthly unemployment rate data obtained from the Federal Reserve Bank of St. Louis.