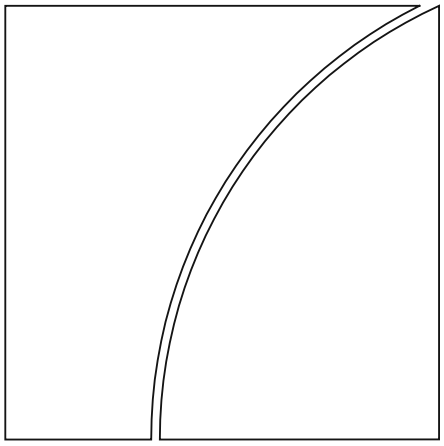


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U.S. Monetary Policy, Macroeconomic News, and the Global Secular Decline of Interest Rates*

Boris Hofmann† Zehao Li‡ Steve Pak Yeung Wu§

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Abstract

The global secular decline in long-term interest rates since the 1990s has been largely driven by cumulative yield changes during U.S. monetary policy announcement windows (FOMC windows). We document this FOMC-window effect for a group of ten major advanced economies. Based on a term structure model, we show that the effect operates through the expected path of future short-term interest rates rather than term premia. We further find that the global secular decline in interest rates has been concentrated in FOMC windows preceded by macroeconomic news. We interpret this pattern as a "Fed response to news" channel and provide empirical evidence to support this interpretation.

Keywords: Monetary policy, bond yields, interest rate trends, global financial cycle.

JEL Codes: E43, E52, F42

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1 Introduction

The secular decline in long-term interest rates since the 1990s has been concentrated in the three days surrounding U.S. Federal Open Market Committee (FOMC) monetary policy decisions. The cumulative change in bond yields in the FOMC window has closely tracked the total decline in long-term government bond yields not only in the United States, as previously documented by Hillenbrand (2025), but also across other major advanced economies (Figure 1). This finding poses a challenge to established explanations of the secular fall in interest rates, which emphasize structural factors such as falling productivity growth, excess savings, demographic decline, and reduced capital investment opportunities (Bernanke (2005), Carvalho et al. (2016), Summers (2014)).

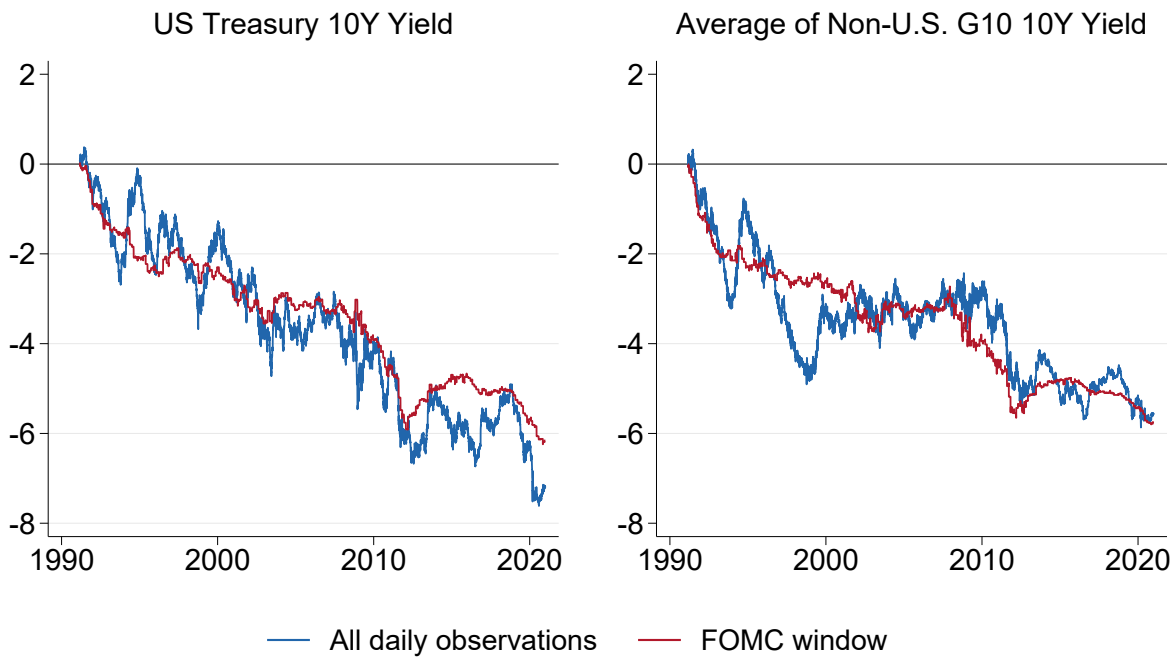


Figure 1: Cumulative yield changes in the U.S. and other major advanced economies (%).

Notes. "All daily observations" is the sum of all daily yield changes over the sample period. "FOMC window" is the sum of daily yield changes within the 3-day FOMC windows. "Domestic central bank window" is the sum of daily yield changes within the 3-day announcement window of each country's domestic central bank. "non-U.S. G10" refers to the G10 countries excluding the U.S., and see Section 2 for a detailed description.

In this paper, we aim to shed new light on the underlying forces behind the dominant role of the FOMC window in global secular bond yield dynamics. We use daily data on long-term government bond yields for the period 1990-2024 for the G10 economies to establish two new findings.[1] First, the secular decline in the long-term government bond yield since 1990 was closely tracked by the cumulative changes in the yield in the FOMC window, driven by revisions to the expected path of future short-term interest rates. Second, we provide evidence of a "Fed Response to News" mechanism being at work, showing that the secular decline in global yields was concentrated in those FOMC windows that were preceded by macro news releases, in particular CPI releases.

These two findings are established in two analytical steps. In the first step of the analysis, we assess the cumulative effects of U.S. monetary policy announcements on global yields. We document that yield changes in the time window around U.S. monetary policy decisions account for the bulk of the secular decline of long-term interest rates, not only in the U.S. but also in each of the other nine major advanced economies covered by our analysis.[2]

We use the term structure model of Bauer and Rudebusch (2020) to decompose the cumulative yield decline during the FOMC window in each economy into changes in the expected path of future short-term interest rates and changes in term premia. The term structure decomposition suggests that global yield movements during FOMC windows were largely driven by revisions in the path of expected short-term rates. We also show that the policy rate in the U.S. Granger-causes policy rates in other countries. These findings suggest that U.S. monetary policy announcements are associated with persistent adjustments in market expectations about future policy rates globally.

In the second part of the analysis, we explore the economic mechanisms behind the key role of the FOMC window in the global secular decline in long-term interest rates. It turns out

[1] These economies are United States, Japan, United Kingdom, Canada, Switzerland, Sweden, Norway, Australia, New Zealand, and Germany representing the euro area.

[2] This finding expands on Hofmann et al. (2025), who focus on comparing the role of the FOMC window and other central bank announcement windows in global bond yield dynamics over shorter sample periods mostly starting in 2000.

that the downward shifts in yields occur predominantly during a subset of FOMC meetings that are preceded by major U.S. macroeconomic announcements—namely, CPI and GDP releases. The results show that nearly all of the cumulative yield decline—over 99 percent in the case of U.S. 10-year Treasuries—originates from these macro-news FOMC windows. We also highlight the special role of price-related macro news, as FOMC windows preceded by CPI alone account for 81% of the yield variation in the U.S. and 61% worldwide.

The decline that occurs during the "macro news FOMC windows" is closely associated with Bauer and Swanson (2023a)'s "Fed response to news" component of high-frequency monetary policy surprises—that is, the portion of monetary policy surprises that is ex post explainable by macro variables known before the shock. A regression analysis shows that the "Fed response to news" component of short-rate policy surprises can explain 92% of the long-term yield variation in FOMC windows. In contrast, we find that several alternative measures of information effects—including macro announcement days themselves, FOMC announcements associated with the "dot plot," and Fed Chair speeches—cannot account for the secular decline in long-term interest rates.

Overall, these findings suggest that the FOMC window effect is linked to revisions of the Fed's perceived reaction function. If macroeconomic conditions and outlook alone determined long-term interest rates, regardless of central bank decisions, then the macro news itself should be the main driver of interest rate trends. Conversely, if the decline in interest rates were purely driven by releases of the central bank's private information about underlying macroeconomic conditions and trends, the meetings with releases of economic projections and the Fed Chair's speeches should be more informative about the long-run trend than the monetary policy decision announcements. The empirical pattern we document suggests that it is the specific nexus between updates of macroeconomic information and the subsequent FOMC actions that contributed to the decline. However, there are also other possible explanations for our findings. They could simply reflect a learning process about the fundamental drivers of long-term interest rates that is concentrated in days of both macroeconomic and

monetary policy news. Or they may reflect a causal effect of monetary policy on long-run interest rate levels working through the channels suggested by Rungcharoenkitkul and Winkler (2025), Beaudry et al. (2024), and McKay and Wieland (2021).

Literature Review Our paper contributes to various strands of literature, in particular those on monetary transmission, monetary policy spillovers, and the secular decline in interest rates.

Since the pioneering studies of Kuttner (2001) and Gürkaynak et al. (2005), a large empirical literature has employed high-frequency financial data to identify monetary policy shocks. Hanson and Stein (2015) documents a strong effect of monetary shocks at the long end of the yield curve and raises questions about long-run money neutrality. Important refinements in the identification and interpretation of policy shocks have been advanced by Bauer and Swanson (2023b), Bauer and Swanson (2023a), Nakamura and Steinsson (2018), Jarociński and Karadi (2020), Altavilla et al. (2019), Bu et al. (2021), Miranda-Agrippino and Ricco (2021), Acosta (2023), and Boehm and Kroner (2024). Swanson (2021) apply the technique to study a broader set of high-frequency monetary policy surprises, including forward guidance and quantitative easing surprises.

Our paper is closely related to recent studies assessing the cumulative effects of monetary policy news. Hillenbrand (2025) demonstrates that the three-day window surrounding FOMC monetary policy announcement dates accounts for much of the secular decline in long-term U.S. interest rates. Alam (2023) focuses on the pre-FOMC stock market drift and the FOMC announcement equity premium after macro news and documents a similar secular decline in U.S. bond yields linked to these FOMC windows. We make three key contributions to this literature. First, we examine the effects of FOMC announcements on international interest rates and show that declines in international yield are heavily concentrated in the FOMC windows. Second, we offer several decompositions of the link between monetary policy announcements and the secular decline in rates, showing that the decline is linked to

shifts in expected short-term rates and concentrated in FOMC windows preceded by macro news, in particular CPI news. Third, we demonstrate that the underlying mechanism is consistent with a "Fed responses to news" interpretation and directly link the yield declines around the FOMC window to the corresponding monetary policy surprises.[3]

Monetary policy spillovers from the U.S. to other economies have been studied and documented by a large body of literature. In particular, the literature on the global financial cycle, pioneered by Rey (2013), identifies U.S. monetary policy shocks as a key global factor driving risky asset prices worldwide. This work has been expanded by studies including Albagli et al. (2019), Dedola et al. (2017), Gilchrist et al. (2019), Hofmann and Takats (2015), Miranda-Agrippino and Rey (2020), Obstfeld (2015) and Brusa et al. (2020). Boehm and Kroner (2026) highlights the role of macro news announcements in driving the global financial cycle. Rather than examining how identified shocks drive short-term fluctuations in asset prices, our paper introduces a novel perspective by investigating the association between monetary policy and long-term trends in safe asset prices.

The literature examining the secular decline in the natural rate of interest has evolved from initial estimation efforts to broader explorations of its structural determinants. Foundational empirical frameworks developed by Laubach and Williams (2003), Holston et al. (2017), Hamilton et al. (2016), and Del Negro et al. (2017) established that natural rates have trended downward across advanced economies since the 1990s. Subsequent work investigated the underlying mechanisms shaping this decline. A large literature has highlighted the role of structural factors, including slower productivity growth (Cesa-Bianchi et al. (2022); Mankiw (2022)), financial globalization and the scarcity of safe assets (Bernanke (2005); Caballero et al. (2008); Del Negro et al. (2019); Bárány et al. (2023)) and demographic trends (Carvalho et al. (2016); Gagnon et al. (2021)). More recently, Borio et al. (2017), McKay and Wieland (2021), Rungcharoenkitkul and Winkler (2025), and Beaudry et al. (2024) suggest

[3]Relatedly, a growing literature explains yield movements through fiscal events. Studies include Treasury issuances (Lou et al. (2022)), budget announcements (Gomez Cram et al. (2025)), and Treasury auctions (Somogyi et al. (2025)). We complement this literature by focusing on the interaction between macro news and monetary policy announcements, as well as their implications for cross-country yields.

that persistent monetary accommodation, financial frictions, and policy non-linearities may also influence equilibrium real rates. The present study contributes new empirical evidence highlighting the role of U.S. monetary policy news in shaping the long-run trajectory of global interest rates.

The remainder of the paper is organized as follows. Section 2 describes the data. Section 3 documents the dominant role of yield changes during FOMC windows in the global secular decline in interest rates and decomposes the effect into its risk-neutral yield and term premium components. Section 4 investigates the economic channels through which FOMC announcements have operated, providing evidence of a cumulative "Fed response to news" effect being at work. Section 5 concludes.

2 Data

Daily Sovereign Yields. The main source of our daily sovereign yields is Bloomberg, following Du et al. (2018).[4] Our analysis primarily focuses on the 10-year yield. In one subsection, we rely on the entire yield curve data to estimate changes in the expected interest rates and term premia during monetary policy announcement windows. The Federal Reserve Board and the Bank of England provide daily sovereign yields on their websites, with start dates earlier than those of the Bloomberg data. In this case, we use the yield curve data provided by the central bank. Online Appendix Table A1 summarizes the sources of daily sovereign yields and the respective starting dates. For each country, the Bloomberg yield curve dataset contains maturities of 3 months, 6 months, and annual maturities of 1, 2, 3, 4, 5, 7, and 10 years. Gürkaynak et al. (2007) (GSW) covers maturities from 1 year to 30 years with yearly increments. We augment the GSW yield curve data with 3-month and 6-month interest rate data from the FRED. For the U.S., we select the same maturities as Bloomberg

[4]We focus on the G10 currencies, including the Australian Dollar, Canadian Dollar, Swiss Franc, Euro, British Pound, Japanese Yen, Norwegian Krone, Swedish Krona, and U.S. Dollar. We use German bond yields to represent the Euro area. Our analysis centers on the 10-year bond yield, the longest maturity widely available across currencies. Bloomberg reports par yields, which we convert to zero-coupon yields using bootstrapping.

to be consistent with other countries. For Norway, while the Bloomberg dataset begins in 1998 and lacks observations between November 2012 and April 2014, `Investing.com` provides daily Norwegian 10-year yield data dating back to February 18, 1994. We complement the Bloomberg data with this source to create a longer and more complete time series. The sample ends on Aug 21, 2023.

FOMC Announcement Dates. The Federal Open Market Committee (FOMC) makes U.S. monetary policy decisions. Since 1981, the FOMC has typically held eight scheduled meetings per year. Most monetary policy decisions since 1994 have been made during these *scheduled* meetings, while a few were made during *unscheduled* meetings. In contrast, unscheduled meetings accounted for a large fraction of changes in the federal funds rate before 1994. For those unscheduled meetings, FOMC decisions were communicated to markets through the size and type of open market operations (or in a few cases, through a discount rate change press release).[5] Some of the unscheduled meetings were not followed by immediate policy actions or a statement. The public learned about these meetings with a significant time lag. These meetings are excluded from the list of FOMC announcement dates.

Consistent with Hillenbrand (2025), we include both scheduled and unscheduled meetings in our sample. There are in total 27 unscheduled meetings. Before 1994, changes in monetary policy were typically disclosed to the market one day after the meeting through open market operations. Therefore, for dates before 1994, we rely on the dates that the market associated with a monetary policy change, as identified by Kuttner (2001, 2003). Our first FOMC announcement window was in June 1989. After 1994, monetary policy decisions were predominantly made during scheduled FOMC meetings, with the Fed consistently releasing a statement if the federal funds rate changed. Consequently, we utilize the dates when these statements were released. In Appendix B, we list the FOMC announcement dates.

Fed Chair Speeches. We obtain the dates of the Federal Reserve Board Chair speeches from the Federal Reserve Board's official website. The website documents the dates of

[5]We are grateful to Eric T. Swanson for a discussion about the institutional details. Appendix A1 of Gürkaynak et al. (2005) provides a detailed list of FOMC monetary policy announcement dates and times.

speeches by the Federal Reserve Board Chair, Vice Chair, and other officials from 1996 onwards.

3 FOMC Announcements and Global Bond Yield Dynamics

In this section, we examine the secular dynamics of 10-year government bond yields across G10 economies. We document the contributions of yield changes around FOMC windows to the secular decline in long-term yields across the G10 countries. We then leverage a term structure model to decompose the effect for each country into changes in risk-neutral yields (i.e., the expected path of short-term interest rates) and changes in term premia.

3.1 FOMC Announcement Windows

We divide the sample period into two parts: U.S. central bank monetary policy announcement windows (FOMC windows) and other days (non-FOMC windows). We follow Hillenbrand (2025) to define FOMC windows as the days $\tau-1, \tau, \tau+1$ surrounding each monetary policy announcement date τ, with non-monetary policy announcement windows encompassing the remaining days. For each event window, we construct the cumulative change in the 10-year government bond yield by summing daily yield movements.

Formally, we define the cumulative change series as

$$\nabla y_t^W = \sum_{s=t_0+1}^{t} (y_s - y_{s-1})\, \mathbf{1}_{s\in W}, \tag{1}$$

where t and s index daily observations, t_0 denotes the starting date of the sample, y_s is the log, i.e., continuously compounded, n-year Treasury zero-coupon yield at date s, and $\mathbf{1}_{s\in W}$ is an indicator function for the event set W. The set $W \in \{\text{FOMC, nonFOMC}\}$ corresponds to either the FOMC monetary policy announcement window, or the complementary set of non-

announcement days. The total yield change from the start of the sample can be decomposed into the contributions of the two windows:

$$y_t - y_0 = \nabla y_t^{AllDates} = \nabla y_t^{FOMC} + \nabla y_t^{nonFOMC}. \tag{2}$$

For simplicity, we normalize yields by subtracting their initial value so that $\nabla y_t^{AllDates}$ and y_t can be treated equivalently.

We evaluate model fit using a pseudo R^2 measure. The measure is computed as one minus the ratio of the squared fitting error of the FOMC window series to the sum of the squared fitting errors of both the FOMC and non-FOMC window series:

$$pseudo\ R^2 \equiv 1 - \frac{\overbrace{\sum_{t=1}^{T}\left(y_t - \nabla y_t^{FOMC}\right)^2}^{\text{fitting error (FOMC windows)}}}{\underbrace{\sum_{t=1}^{T}\left(y_t - \nabla y_t^{nonFOMC}\right)^2}_{\text{fitting error (non FOMC windows)}} + \underbrace{\sum_{t=1}^{T}\left(y_t - \nabla y_t^{FOMC}\right)^2}_{\text{fitting error (FOMC windows)}}}. \tag{3}$$

Intuitively, the pseudo R^2 can be interpreted as analogous to R^2 and is bounded between zero and one. A larger pseudo R^2 indicates that greater error occurs during non-FOMC windows, suggesting that the FOMC windows provide a better fit to the observed yields. Since the FOMC and non-FOMC windows cover the entire sample period, a higher pseudo R^2 also implies that the FOMC series fits the observed yield data more effectively.

In Figure 2, we plot the cumulative sum of daily changes in the 10-year government yields during FOMC windows for the G10 countries. For each country, the blue line represents the total cumulative yield change up to time t, the red line indicates the cumulative yield change within FOMC windows, and the black line reflects the cumulative yield change during non-FOMC windows. At any time t, the cumulative changes within FOMC and non-FOMC windows together equal the observed cumulative yield change (red line + black line = blue line). The pseudo R^2 statistic is reported in the title of each subfigure.

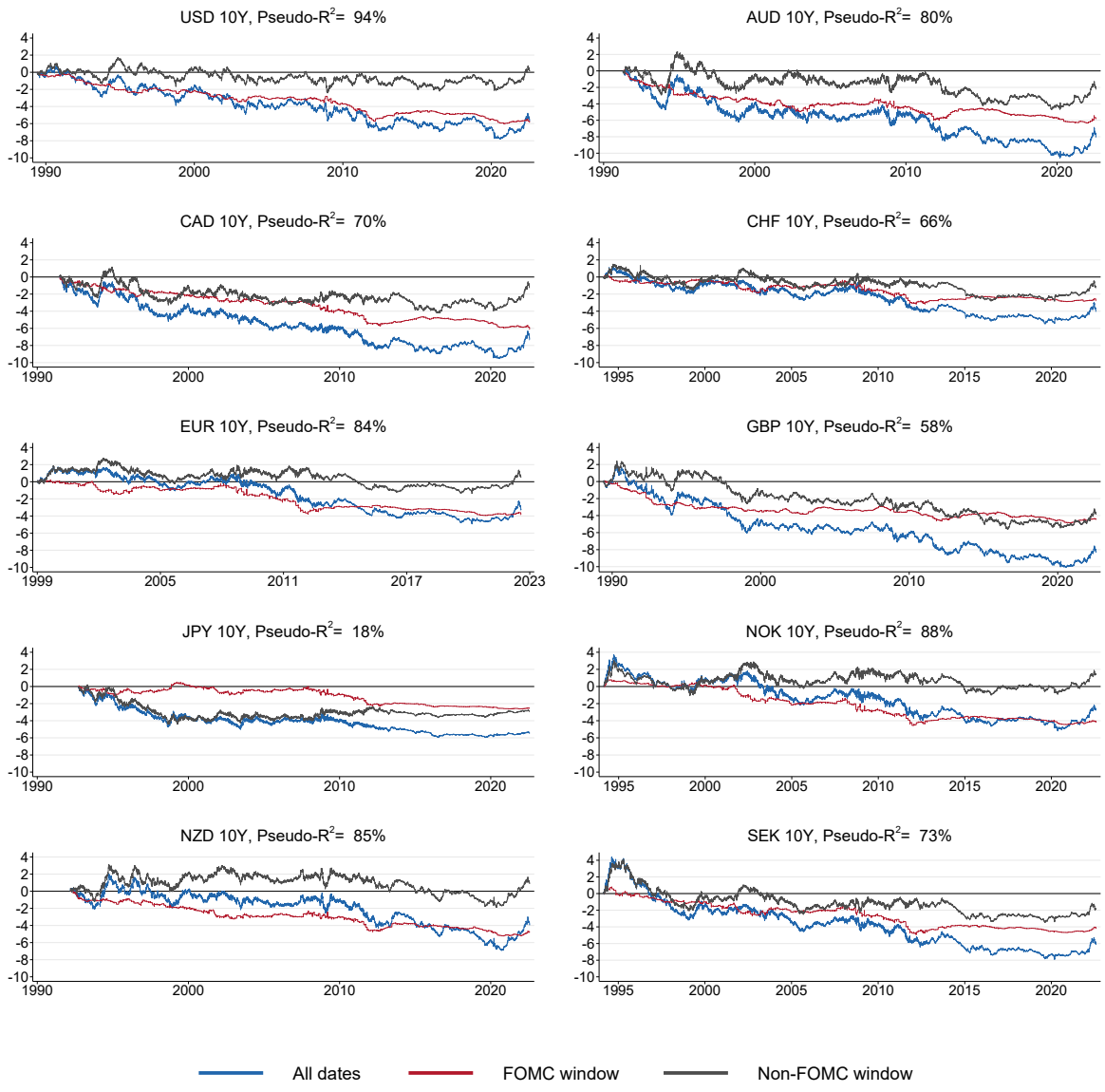


Figure 2: Cumulative changes in nominal 10-year yields during FOMC announcement windows.

Notes. Unit of the y-axis is percentage p.a.. The cumulative change in the 10-year yield y_t during event window W is $\nabla y_t^W = \sum_{s=t_0+1}^{t}(y_s - y_{s-1})\mathbf{1}_{s\in W}$. The FOMC window consists of $\{\tau-1, \tau, \tau+1\}$ if date τ is an FOMC announcement date. The non-FOMC window complements the FOMC window. The pseudo R^2 is defined as $1 - \frac{\sum_{t=1}^{T}\left(y_t - \nabla y_t^{FOMC}\right)^2}{\sum_{t=1}^{T}\left(y_t - \nabla y_t^{nonFOMC}\right)^2 + \sum_{t=1}^{T}\left(y_t - \nabla y_t^{FOMC}\right)^2}$.

The figure highlights the extent of the global declines in 10-year government bond yields over the last three decades (blue lines). The average decline across countries was approximately 4.7 percentage points, with the U.K. yield experiencing the largest decrease at 8.2 percentage points. These trends align with a substantial body of literature documenting the secular decline of long-term interest rates and the natural interest rate, r^* (See Benigno et al. (2024)).

The other striking fact underscored by the figure is that the yield decline during FOMC windows (red lines) closely tracks the total decline over time and across countries. In the United States, and consistent with Hillenbrand (2025), the cumulative decline in the 10-year yield during FOMC windows closely mirrors the observed data, reaching a trough of about -6%.

Even more strikingly, the FOMC window also captures the overall decline in other countries' interest rates quite well. For instance, the Australian 10-year yield shows a persistent decline starting in 1991, reaching about –6.5% by the end of the sample. The decline during FOMC windows is similarly persistent, amounting to roughly –6% by the end of the sample. Very similar findings are obtained for Canada, Switzerland, Germany (EUR), Norway, New Zealand, and Sweden. Importantly, the figure shows not only an endpoint-to-endpoint alignment of the cumulative changes but also that the path of the FOMC-window decline tracks the overall cumulative decline throughout the sample. In the Online Appendix, we employ a placebo test to demonstrate that the FOMC effect is significantly different from yield changes observed during eight randomly selected three-day windows per year.

The fact that the cumulative change in the FOMC window closely tracks the overall decline is reflected in the high measures of statistical fit. In terms of pseudo R^2, the FOMC series fit the actual yields quite well. The most striking one is the U.S. 10-year yield. The pseudo R^2 indicates that the FOMC windows explain 94% of the total variation in the U.S. 10-year yield. Additionally, the FOMC windows demonstrate high explanatory power for yields in Australia, Canada, Switzerland, Germany, Norway, New Zealand, Sweden, and

account for two-thirds of the observed total variations in non-U.S. G10 10-year yield. The exception is Japan, where the pseudo R^2 is rather low at 18%, potentially reflecting a more limited role of foreign investors in the Japanese bond market, mitigating spillover effects.

Overall, our findings document that the FOMC windows provide a striking fit in accounting for the global interest rate decline, both in terms of the first moment (total yield change) and the second moment (pseudo R^2) statistics.[6] It is important to note that these cumulative yield change analyses and pseudo R^2 measures are strictly decomposition-based and do not imply causality. However, the fact that the international secular yield decline is concentrated within a narrow set of time windows—accounting for only about 7% of trading days (eight 3-day meeting windows out of 260 trading days)—merits further investigation into the underlying economics.

3.2 Expected Short-Term Rates vs. Term Premia

Theoretically, long-term yields can be decomposed into the expected path of short-term interest rates (risk-neutral yield) and the term premium. In this subsection, we perform this decomposition and show that the FOMC window effect documented in the previous subsection operates primarily through changes in expected short-term rates.

To decompose long-term interest rates into their term premium and expected future short-term interest rate components, we adopt the "observed shifting endpoint" (OSE) affine term structure model developed by Bauer and Rudebusch (2020). The model is particularly appropriate for our analysis because it allows for a time-varying interest rate trend rather than maintaining the standard assumption of a constant r^*.[7]

We closely follow the model developed by Bauer and Rudebusch (2020) and estimate the

[6] Accounting for the monetary policy announcement windows of foreign central banks does not materially change the results, as these announcements fall within the non-FOMC window. See a related analysis in Hofmann et al. (2025).

[7] Bauer and Rudebusch (2020) show that once an otherwise standard affine term structure model incorporates the cointegration trend as a state variable, the long-term behaviors of expected interest rates and term premia are opposite to those implied by canonical models. The reason is that canonical term structure models assume stationary state processes, so expected interest rates at long horizons must converge to the unconditional mean.

term structure model on a country-by-country basis. Details of the model and estimation procedures are deferred to Online Appendix D. The model is estimated using the first three principal components of each country's yield curve as the state variable. We approximate the "observed shifting endpoint", denoted τ_t, as the first principal component of the cumulative daily changes in domestic and U.S. yield curves during the three-day FOMC windows.

We use the OSE model to decompose daily 10-year yields into risk-neutral rates and term premia, then compute the sum of their daily changes during the FOMC windows. Figure 3 presents the contributions of the risk-neutral and term premium components to the cumulative yield change during the FOMC windows, ∇y_t^{FOMC}. The series "FOMC window, yield" replicates the FOMC-window cumulative yield change series in Figure 2. The series "FOMC window, RNY" and "FOMC window, TP" denote the cumulative change in the risk-neutral yield (RNY) and term premium (TP) during FOMC windows. Clearly, the risk-neutral component explains most of the cumulative changes in the FOMC windows for all countries' interest rates, except Japan. The risk-neutral component for Japan has remained nearly constant, as the Japanese short-term rate has been stuck at zero for most of our sample period. In contrast, the term premium component for all countries, except Japan, shows limited variation during the FOMC windows, thereby explaining only a small portion of the variation in the cumulative responses of long-term interest rates to FOMC announcements.

To quantitatively evaluate how much of the observed cumulative yield changes during FOMC windows can be explained by risk-neutral yields, we redefine the pseudo R^2 as

$$pseudoR^2 \equiv 1 - \frac{\sum_{t=1}^{T}\left(\nabla y_t^{FOMC} - \nabla y_t^{RNY,FOMC}\right)^2}{\sum_{t=1}^{T}\left(\nabla y_t^{FOMC} - \nabla y_t^{TP,FOMC}\right)^2 + \sum_{t=1}^{T}\left(\nabla y_t^{FOMC} - \nabla y_t^{RNY,FOMC}\right)^2}. \tag{4}$$

Since $\nabla y_t^{FOMC} = \left(\nabla y_t^{FOMC} - \nabla y_t^{TP,FOMC}\right) + \left(\nabla y_t^{FOMC} - \nabla y_t^{RNY,FOMC}\right)$, the pseudo R^2 is analogous to R^2 measuring how well the risk-neutral yield fits the actual yield during the

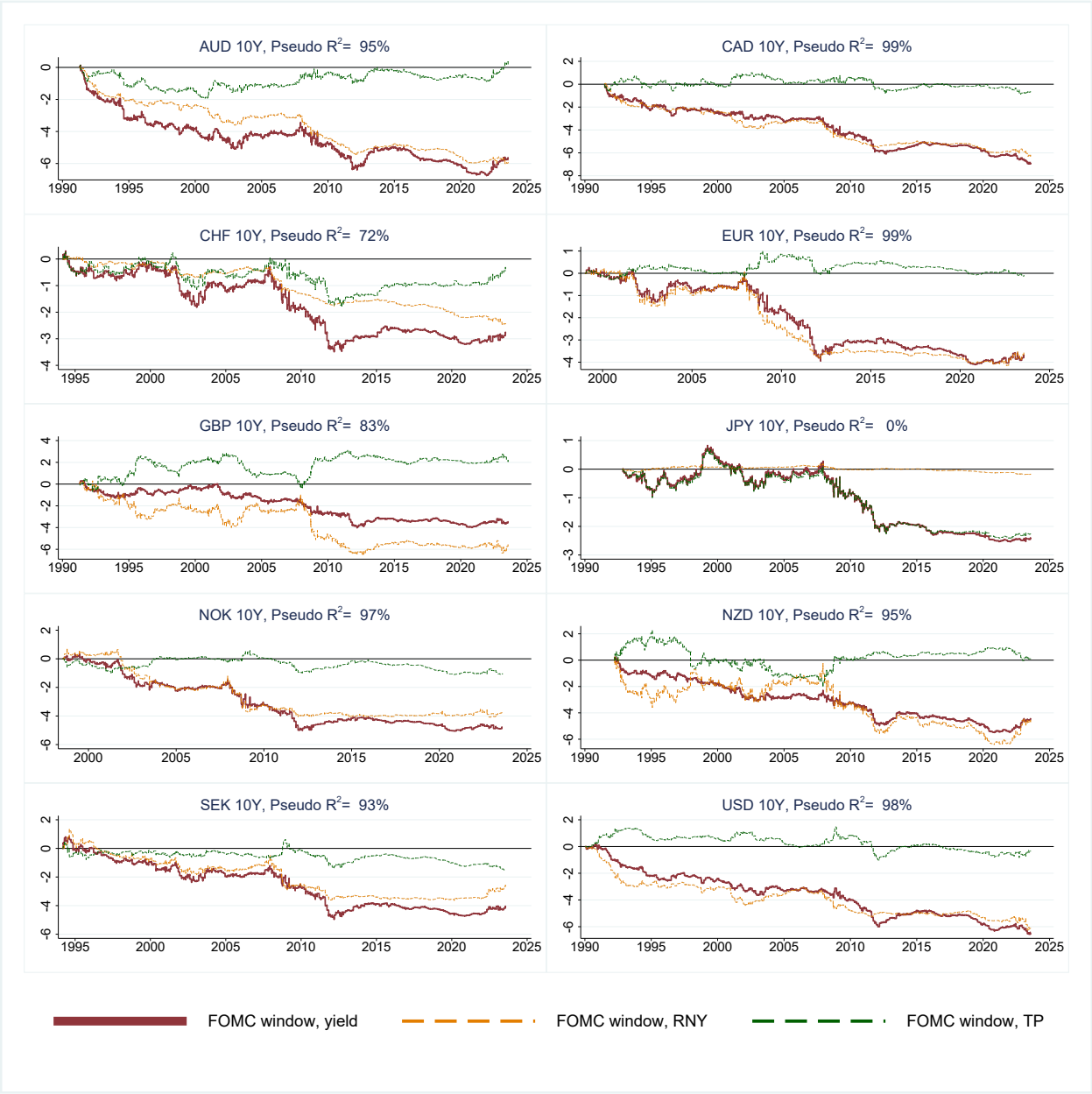


Figure 3: FOMC window: risk-neutral yield (RNY) vs. term premia (TP).

Notes. Unit of the y-axis is percentage p.a.. The figure decomposes the FOMC-window cumulative change in the 10-year yield into cumulative changes in the risk-neutral yield (RNY) and the term premium (TP) components. The pseudo R^2 measures the fraction of FOMC-window cumulative yield changes explained by the risk-neutral component. The figure shows the decomposition of the U.S. yield, and the table reports the results for other countries. $pseudoR^2 \equiv 1 - \frac{\sum_{t=1}^{T}\left(\nabla y_t^{FOMC} - \nabla y_t^{RNY,FOMC}\right)^2}{\sum_{t=1}^{T}\left(\nabla y_t^{FOMC} - \nabla y_t^{TP,FOMC}\right)^2 + \sum_{t=1}^{T}\left(\nabla y_t^{FOMC} - \nabla y_t^{RNY,FOMC}\right)^2}$.

FOMC windows. The pseudo R^2 measures are reported in the titles of the subfigures of Figure 3. Except for Japan, the risk-neutral yields account for over 70% of the cumulative changes in the 10-year yields, and the number exceeds 90% for six out of the ten currencies.

The exercise in this sub-section sheds light on the specific spillover mechanisms at play. During the FOMC windows, the secular decline in U.S. long-term interest rates is largely driven by the expected short-rate component. This decline in U.S. rates then spills over to other countries' expected short rates, highlighting the interconnectedness of global financial markets. These results are consistent with those of Albagli et al. (2019), who examine the contemporaneous pass-through of U.S. monetary policy to foreign countries. We demonstrate that the short rate passthrough is a key factor in explaining the secular decline in interest rates, underscoring the dominant role of U.S. monetary policy in shaping global interest rate trends.

3.3 Policy Rate Spillovers

We have just shown that global yield changes in the FOMC window mostly reflect changes in expected short-term rates. This points to expected short-term interest rate spillovers as a driving factor. In this subsection, we provide formal evidence supporting this hypothesis, documenting that U.S. policy rates exert significant spillover effects on the policy rates of other countries, whereas the reverse does not hold.

To formally test for policy rate spillovers, we estimate a series of monthly bivariate vector autoregressions (VARs),[8] each involving the U.S. policy rate (the effective federal funds rate) and the policy rate of a foreign country. For each country, we estimate the following system:

$$\begin{bmatrix} i_t^{(p)} \\ i_t^{(p^*)} \end{bmatrix} = \left(\sum_{l=1}^{12} \Phi_l L^l \right) \begin{bmatrix} i_t^{(p)} \\ i_t^{(p^*)} \end{bmatrix} + \begin{bmatrix} \varepsilon_t^{(p)} \\ \varepsilon_t^{(p^*)} \end{bmatrix}. \tag{5}$$

[8]Since policy rates are set by each central bank in its meetings, which commonly take place in monthly or even lower frequency, there is no meaningful daily variation in policy rates.

where L denotes the lag operator, and the system includes twelve monthly lags of both the U.S. and foreign policy rates. Note that these monthly regressions capture variation from all interest rate changes, not just changes happening during FOMC windows. We then perform Granger causality tests to determine whether the U.S. policy rate provides statistically significant predictive content for foreign policy rates, and vice versa. Japan is excluded from this analysis due to a prolonged period of policy rate at the zero lower bound, which undermines the power of the test.

The results suggest that there are significant policy rate spillovers from the U.S. to other countries, but not vice versa.[9] Table 1 presents the p-values from Wald tests for Granger causality between the U.S. and foreign policy rates. In each case, the null hypothesis is that one country's policy rate does not Granger-cause the other. The results display a striking asymmetry: the U.S. policy rate Granger-causes foreign policy rates at the 1% significance level for all foreign policy rates, whereas there is no statistically significant evidence in the reverse direction. The smallest p-value for the hypothesis that a foreign policy rate Granger-causes the U.S. rate is 0.18, far from conventional significance thresholds.

Table 1: p-values from Wald tests for Granger causality between the U.S. and foreign policy rates.

	AUD	CAD	CHF	EUR	GBP	NOK	NZD	SEK
US rate → foreign rate	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
Foreign rate → US rate	0.41	0.19	0.90	0.41	0.75	0.18	0.33	0.81

Notes. The table presents p-values from Wald tests for Granger causality. The null hypothesis is that one country's policy rate does not Granger-cause the other. The column head currency is the currency of the foreign policy rate.

Taken together, this section provides three key insights. First, changes in the U.S. policy rate create meaningful spillovers to foreign countries. Second, these short-rate changes translate into changes in expected short rates and lead to declines in long-term rates dur-

[9]Note that Granger causality establishes temporal precedence rather than a definitive causal link from the U.S. policy rate to foreign policy rates. It remains entirely possible that global macroeconomic information is revealed during U.S. meeting windows, driving changes in the U.S. policy rate and sequentially impacting foreign rates. We provide more related analysis on this in the next section.

ing FOMC windows. Finally, the yield declines during FOMC windows are not offset by non-FOMC windows, resulting in the secular decline observed in the data.

4 Channels Behind the Secular Decline in Global Yields

Why is the decline in global interest rates concentrated in FOMC windows? In this section, we first show that the secular decline is concentrated in a particular subset of FOMC windows—those preceded by macroeconomic news announcements. We then present evidence supporting the "Fed response to news" channel, which captures the Federal Reserve's reaction to macroeconomic information arriving shortly before monetary policy decisions. This channel, recently emphasized by Bauer and Swanson (2023a,b), constitutes a key component of the monetary policy news observed on FOMC announcement days. Our results indicate that this mechanism also accounts for a substantial portion of the cumulative decline in yields over the past three decades.

4.1 FOMC Announcements Preceded by Macro News

We partition the FOMC windows into two disjoint subsets: those preceded by macroeconomic news announcements and those that are not. Given the Federal Reserve's dual mandate, we focus on Consumer Price Index (CPI) and Gross Domestic Product (GDP) announcements as the prime indicators of price and real activity developments,[10] the two key variables in standard characterizations of monetary policy reaction functions such as the Taylor rule. An FOMC window is classified as being preceded by macroeconomic news if a CPI or GDP data release occurs within the four business days leading up to the FOMC meeting. The four-day cutoff is selected so the sample split between meetings preceded by macroeconomic news and those that are not is roughly equal (52% and 48%).

It is important to note that GDP releases also contain a wide range of additional eco-

[10]For GDP announcements, we include advance, revised, and final estimates.

nomic information, such as Personal Consumption Expenditures (PCE), the quarterly PCE price index, GDP components, and Corporate Profits. Because the monthly PCE and PCE price index are typically released one day after the GDP announcement, including GDP announcements does not isolate GDP information alone. However, our main message is simply that interest rate declines are disproportionately concentrated during FOMC windows preceded by macroeconomic news. We detail the relative contributions of a broader range of macro news in Section 4.3, including the employment report and industrial production, and assess their relative explanatory power.

Similar to Equation (3), we define a pseudo R^2 to evaluate how much of the yield changes during FOMC windows can be explained by those that are preceded by macro news. The pseudo R^2 of macro news FOMC windows is:[11]

$$pseudo\ R^2 \equiv 1 - \frac{\sum_{t=1}^{T} \left(\nabla y_t^{FOMC} - \nabla y_t^{macronewsFOMC}\right)^2}{\sum_{t=1}^{T} \left(\nabla y_t^{FOMC} - \nabla y_t^{macronewsFOMC}\right)^2 + \sum_{t=1}^{T} \left(\nabla y_t^{FOMC} - \nabla y_t^{non-macronewsFOMC}\right)^2}. \tag{6}$$

The yield changes in the macro news FOMC windows closely track the overall yield changes in the FOMC window. This is shown for the U.S. in Figure 4. The red line depicting the yield changes in FOMC windows preceded by macro news tracks very closely at all times the overall yield changes in all FOMC windows (blue line). Yield changes during FOMC windows that were not preceded by macro releases explain close to nothing of the total change. The pseudo R^2 of macro news FOMC windows is 99%, indicating it perfectly explains the total yield variation during FOMC windows.

The macro news FOMC window also drives the FOMC-window effects observed across other advanced economies. For non-U.S. G10 countries, the macro-news FOMC windows explain, on average, about 82% of the cumulative change variation based on the pseudo R^2 measure. The yield changes around macro-news FOMC windows also track the overall

[11] Since $\nabla y_t^{FOMC} = \nabla y_t^{macronewsFOMC} + \nabla y_t^{non-macronewsFOMC}$, this definition is equivalent to Equation (3) when we partition days into two disjoint subsets.

change in yields well. The average decline in long-term rates over the sample period was -4.2% across countries, with -3.1% occurring during the macro-news FOMC windows.

Note that macro-news and non-macro-news FOMC windows roughly equally split the sample. As a benchmark, the pseudo R^2 and cumulative decline during the macro-news FOMC windows would be 50% if the yield decline were evenly distributed. The fact that the pseudo R^2 values exceed this neutral benchmark suggests that the Fed's responses to macroeconomic news play a crucial role in shaping yield movements around FOMC meetings.[12]

4.2 Comparison with Other Channels

We next compare the fit of the macro news FOMC windows with three alternative windows. This approach helps identify the economic mechanism driving the observed patterns around the macro news FOMC windows.

First, we consider the macro data announcement window itself, defined as the three-day windows surrounding U.S. GDP or CPI releases. According to standard economic theories, long-term interest rate trends are determined by the economy's underlying fundamentals, and the market uses the latest macroeconomic data to update its assessment of these trends. If this mechanism were driving our findings for the FOMC macro-news window, we would expect to see a similarly strong fit for the macro data release windows.

Second, we zoom in on the FOMC windows associated with the release of FOMC members' federal funds rate forecasts in the Summary of Economic Projections ("dot plot FOMC window"). Since 2012, the Summary of Economic Projections (SEP) includes the "dot plot," which shows each FOMC member's projection for the appropriate federal funds rate over the current year, the next two years, and the longer run.[13] Hillenbrand (2025) finds that inter-

[12] Alam (2023) shows that repricing around FOMC meetings preceded by macro releases plays a key role pre-FOMC stock market drift, the announcement premium, and the secular decline in U.S. long-term interest rates. Our analysis expands on this finding in three main ways. First, we isolate the key macro news driver—CPI announcements. Second, we focus on the international dimension of the secular decline in interest rates. Third, we connect the macro FOMC windows to the "Fed response to news" mechanism.

[13] The SEP, which has been published quarterly since late 2007, outlines how Federal Reserve officials

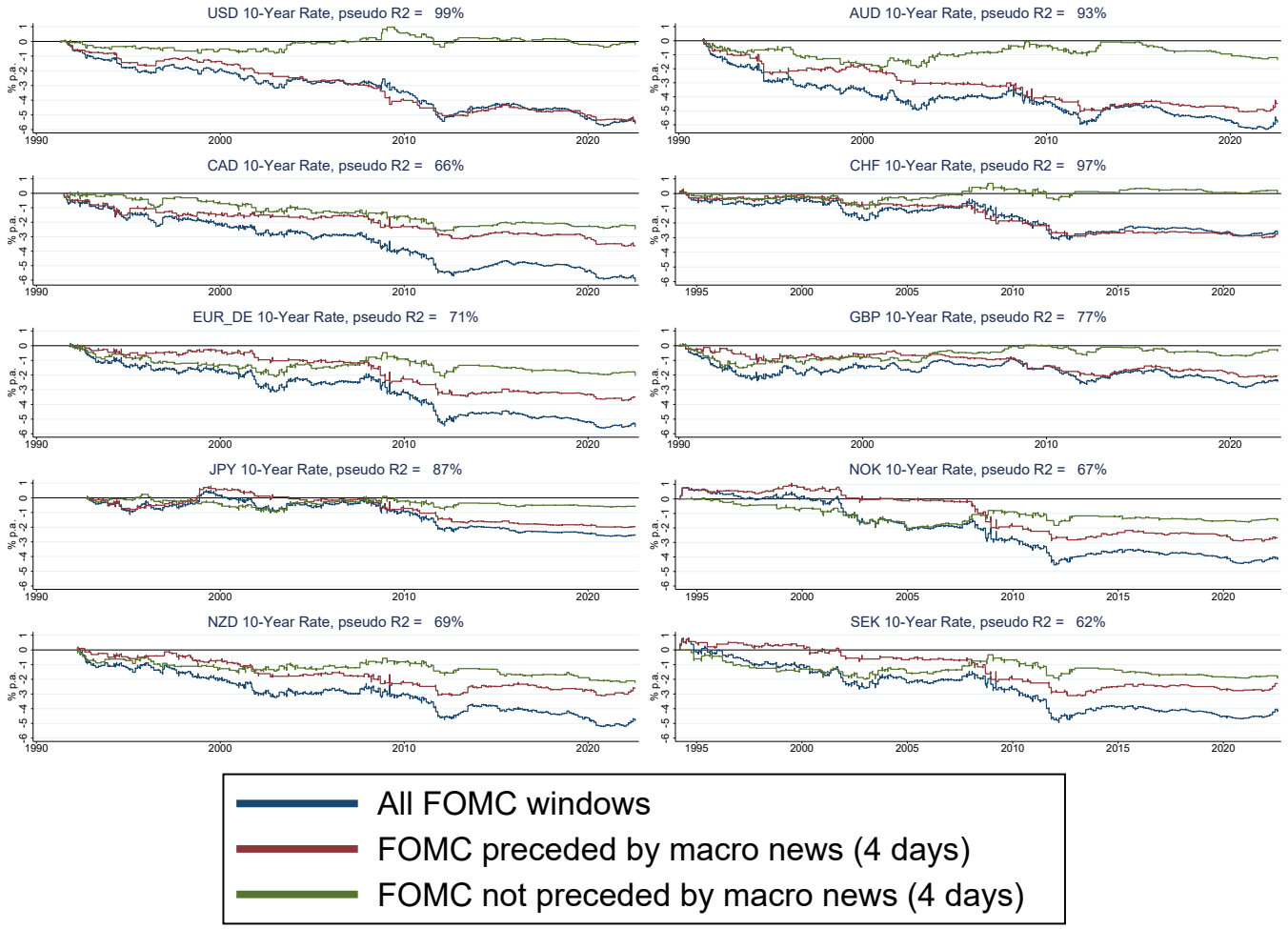


Figure 4: Cumulative 10Y yield changes during different FOMC windows.

Notes. All announcement windows are days -1 to 1 relative to the announcement day. Macro news refers to the release of US CPI and US GDP data. The four-day window is inclusive. For example, if an FOMC meeting takes place on a Wednesday, we examine whether CPI or GDP data were released during the preceding four trading days, from the previous Friday through Wednesday.

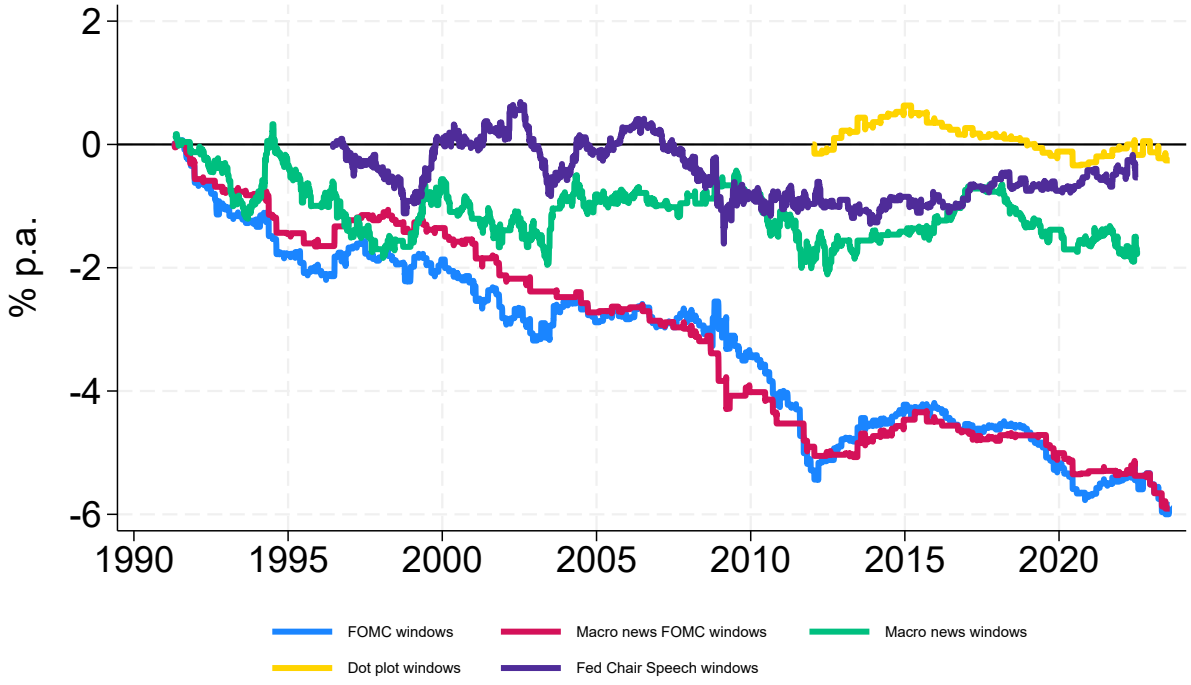


Figure 5: Cumulative U.S. 10Y yield changes during alternative event windows.

Notes. All announcement windows are days -1 to 1 relative to the announcement day. "FOMC" refers to the FOMC monetary policy announcements. "Macro FOMC" consists of the FOMC announcements preceded by U.S. CPI or GDP announcements by at most four business days. "Macro" consists of U.S. CPI or GDP announcement windows. "Dot plot" consists of the FOMC announcements that release dot plots. "Fed Chair speech" consists of the days that the Fed Chair delivers speeches.

est rate changes during FOMC windows are linked to changes in the dot plot forecast over time—for instance, a drop in the longer-run median projected policy rate tends to coincide with a decline in the 10-year Treasury yield during these windows. He interprets this pattern as evidence of a "Fed information effect", whereby the market reacts not only to realized policy actions but also to new information conveyed by the SEP regarding the longer-run equilibrium interest rate or other measures of r^*. In particular, revisions in the dot plot provide signals that the market's perception of r^* may have changed.

Third, we consider a three-day window around Fed Chair speeches. As documented by Swanson and Jayawickrema (2023), asset price volatility—particularly for long-maturity yields—is often higher on Fed Chair speech dates than during FOMC meetings, as markets tend to react strongly to the Chair's statements. They argue that Fed Chair speeches may be more important than FOMC announcements for monetary policy transmission. For our purposes, Fed Chair speeches may convey more information about longer-term policy. We also view this as an alternative measure of the information effect. Notably, while the dot plot is only available from 2012, records of Fed Chair speeches span a much longer period. We source Fed Chair speech dates from the Federal Reserve Board of Governors' website, with records beginning on June 13, 1996.[14] There are 663 Fed Chair speech dates in our sample, whereas the number of FOMC announcements during the same period is 226.

Figure 5 plots the cumulative changes in the 10-year U.S. Treasury yield during the four alternative windows considered: 1) macro news FOMC windows, 2) macro news windows, 3) dot plot FOMC windows, and 4) Fed chair speech window. The figure clearly shows that macro-news FOMC window dominates the others in explaining the FOMC window of the U.S. 10-year yield decline (and thus the overall decline). The statistics of pseudo R^2s and

view the outlook for the U.S. economy. The report presents each participant's forecasts for key variables, such as GDP growth, unemployment, and inflation. Following Hillenbrand (2025), we begin our sample for the dot plot FOMC windows in 2012, when the dot plot was added to the SEP. Starting the sample in 2007 does not change our results.

[14]Depending on the country sample, some of the 10-year bond yield series start from 1991 to 1994 (see Online Appendix Table A1), for this exercise, we cumulate the Fed Chair window only from 1996 due to data availability. The website is https://www.federalreserve.gov/newsevents/speeches.htm.

overall yield changes for all countries are summarized in Online Appendix Table A4.

Interestingly, U.S. macroeconomic data announcement windows, considered in isolation, account for only a small share of the observed yield dynamics. These windows—including those associated with data revisions—comprise roughly 15% of all trading days, twice the frequency of FOMC announcement windows. Nevertheless, they explain much less of the variation in yields than their FOMC counterparts. The cumulative yield decline during these windows is approximately 2%, with the overall decline over time generally remaining in the 0–2% range. As shown in Online Appendix Table A4, the average pseudo-R^2 measuring the share of total yield changes explained by macro news windows is 14%, closely mirroring the share of trading days on which such announcements occur.[15]

Similarly, dot plot FOMC windows do not account for the overall secular decline in yields. This is primarily due to two reasons. First, the dot plot is available only from 2012, thus not covering a substantial portion of the sample period. Second, yield changes since 2012 have been relatively small. From 2012 to the end of the sample, the decline in the 10-year Treasury yield during FOMC windows is less than -0.5%. Therefore, while dot plot FOMC windows capture post-2012 movements well, they do not drive the long-term decline. In Online Appendix Table A4, the pseudo R^2 for dot plot FOMC windows is close to 0%, as these windows do not capture the overall downward trend and omit a large portion of the sample.

Also, the Fed Chair speech windows have not played a role in the secular decline in interest rates. The cumulative sum of yield changes in this window is near zero at the end of the sample, with roughly half of the days slightly above zero and half slightly below. The average pseudo R^2 of how much of the overall yield change can be explained by Fed Chair speech windows across countries is only about 5% (Online Appendix Table A4). Notably,

[15]This result does not contradict our previous finding of a strong yield decline during macro news FOMC windows. This is because the FOMC windows are 3-day windows around FOMC dates, whereas the macro news windows are 3-day windows around macro news dates. Since not all macro news is followed by FOMC meetings, the two sets of windows are quite different. Moreover, we find that there is no strong yield decline for FOMC windows followed by macro news, or for macro news windows following an FOMC meeting.

the fact that Fed Chair speech windows do not explain the secular trend in Treasury yields does not contradict Swanson and Jayawickrema (2023). In the Appendix, we show that the standard deviation of daily 10-year yields across countries during FOMC and Fed Chair speech windows is similar and higher than on regular business days, generalizing Swanson and Jayawickrema (2023) from the U.S. to G10 countries. However, market reactions to Fed Chair speeches do not exhibit a downward drift and thus cannot account for the secular decline in government bond yields.

In summary, our findings suggest that the yield changes in the three days around FOMC meetings preceded by macroeconomic data releases have primarily driven the global downward trend in interest rates. Macro data releases alone, dot plot releases, or Fed Chair Speeches have not been associated with cumulative downward interest rate movements.

4.3 Relative Contribution of Various Macro News

In this subsection, we broaden the scope to consider a wider set of macro news and assess their relative importance. The key finding is that FOMC windows that are preceded by CPI-related news play a dominant role.

We consider four types of macroeconomic announcements: CPI, GDP, employment reports (including the unemployment rate and nonfarm payrolls, abbreviated as UN), and industrial production (IP). In the first panel of Table 2, we report the pseudo R^2 for FOMC windows preceded by each type of macro news over the prior four days, individually. Depending on the category, approximately 15% to 30% of FOMC windows are preceded by a given type of announcement. The results highlight a key role for inflation-related news. FOMC windows preceded by CPI releases account for 28% of all windows, yet explain 81% of the variation in U.S. yields and 60% for the remaining non-U.S. G10 economies. By contrast, the explanatory power of other announcements—such as IP, UN, or GDP—remains modest and broadly proportional to their frequency in the sample.

Given the prominent role of CPI announcements, the second panel considers pairs of

macro news, with CPI included in each combination. The results show that CPI combined with GDP delivers a very high pseudo R^2, reaching 99% for U.S. yields and 81% for non-U.S. G10 yields. Similarly, CPI combined with employment reports yields a pseudo R^2 of 93% for U.S. yields and 65% for non-U.S. G10 yields, albeit with a slightly smaller share of total window observations. Overall, while CPI accounts for the majority of the explanatory power, adding either GDP or employment reports provides some incremental gains, indicating that these variables play a complementary role to CPI. In contrast, IP plays a limited role: when combined with CPI, the pseudo R^2 for non-U.S. G10 yields declines from 81% (CPI alone) to 60%, indicating that including IP reduces explanatory power rather than enhancing it.

Table 2: Pseudo R^2 of various macro news FOMC windows (%).

	CPI	GDP	UN	IP	CPI+GDP	CPI+UN	CPI+IP
10 year US Treasury	81	18	1	13	99	93	60
average of non-US G10 10 year Treasury	60	7	2	34	81	65	63
Share of $\frac{\text{this macro news FOMC windows}}{\text{total FOMC window}}$	28	25	15	26	53	42	37

Pseudo R^2 represents how much the total decline in yield during FOMC windows is explained by the particular macro-news FOMC windows. The pseudo R^2 is defined in Equation (6).

4.4 Measuring Fed Response to News Using High Frequency Surprises

We next assess the connection between macro news FOMC windows and high-frequency measures of monetary policy shocks. In particular, the macro news FOMC window is highly related to the "Fed response to news" component of Bauer and Swanson (2023a,b).

High-frequency identified monetary policy shocks (MPS) have become a standard tool in the empirical macro literature since Kuttner (2001) and Gürkaynak et al. (2005). We use the MPS measure from Bauer and Swanson (2023a,b), which is defined as the first principal component of 30-minute changes in the first four Eurodollar futures around FOMC announcements. As Bauer and Swanson (2023a,b) pointed out, part of the MPS is predictable by a set of macro variables and macro announcements before the FOMC meeting. Therefore,

the MPS measure can be "purified" or orthogonalized with the following regression:

$$MPS_t = \gamma_0 + \gamma_1 X_{t-} + u_t, \tag{7}$$

where X_{t-} is a set of macro variables known before the announcement date t. Bauer and Swanson (2023a,b) estimate this equation and categorize the error term u_t as the orthogonalized monetary policy shock, MPS_t^{ORTH}. For our purpose, we measure the "Fed responses to news" component as the predictable component of MPS.[16] In other words, we define

$$MPS_t^{Response} \equiv MPS_t - MPS_t^{ORTH}. \tag{8}$$

Figure 6 shows the cumulative MPS, along with the cumulative $MPS^{Response}$. The figure indicates that realized monetary policy shocks over the past three decades have been predominantly negative, driven primarily by the cumulative response component.

In Table 3, we first assess the relevance of MPS^{ORTH} and $MPS^{Response}$ for the macro news FOMC window using a contemporaneous regression. We regress the 3-day change of the 10-year government bond yield on both $MPS_t^{Response}$ and MPS_t^{ORTH}. We estimate this regression separately for the macro-news FOMC windows (if there is a CPI or GDP announcement within 4 days before the FOMC) and the non-macro-news FOMC windows. The table summarizes the results for both the U.S. and the non-U.S. G10 countries, estimated with a panel fixed effect regression:

$$\Delta_3 y_{i,t} = \alpha + \beta_1 MPS_t^{ORTH} + \beta_2 MPS_t^{Response} + u_{i,t}. \tag{9}$$

It turns out that $MPS_t^{Response}$ is a significant predictor of the 3-day yield change during the macro news FOMC windows but not the non-macro news FOMC windows. On the

[16] We take these components of MPS directly from Bauer and Swanson (2023a,b)'s database. With more VAR identification restrictions, Jarociński and Karadi (2020) document that more than 80% of the $MPS_t^{Response}$ variations are explained by the Fed response to macro news.

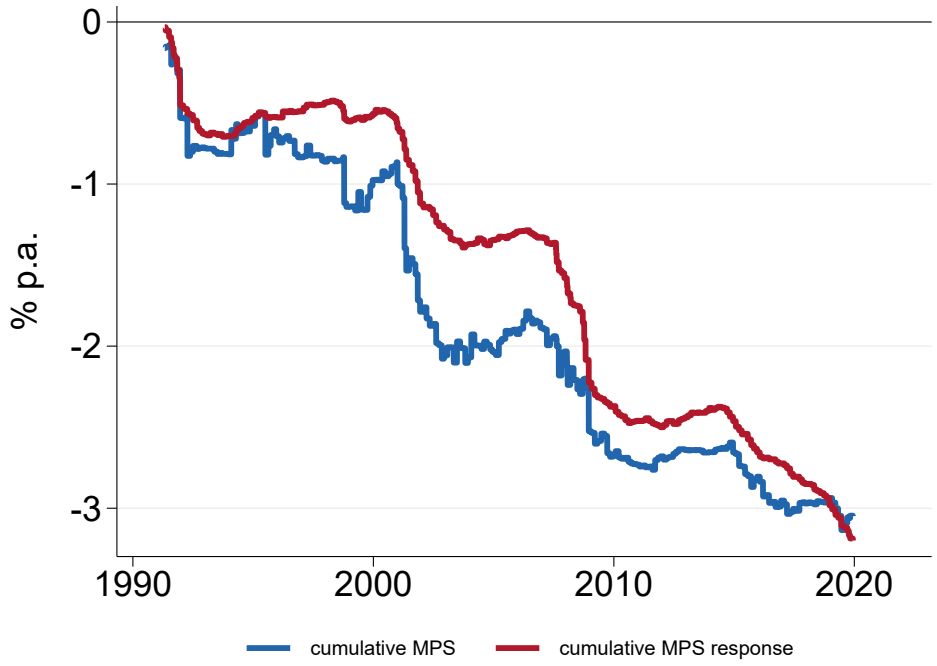


Figure 6: Cumulative U.S. monetary policy shocks.

Notes. MPS refers to monetary policy shock measured by Bauer and Swanson (2023a). MPS response is the component of MPS defined in equation (8).

Table 3: Contemporaneous effects of monetary policy shocks on 10-year yield during FOMC windows

	U.S.		non-US G10	
	Macro	Non Macro	Macro	Non Macro
MPS^{orth}	0.2	0.8***	-0.2	0.3***
	(0.2)	(0.2)	(0.2)	(0.1)
$MPS^{Response}$	1.5***	-0.1	1.1**	-0.2
	(0.4)	(0.5)	(0.5)	(0.5)
Const.	-0.0*	-0.0	-0.0	-0.0
	(0.0)	(0.0)	(0.0)	(0.0)
N	134	115	1134	1034

Notes. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.The table reports results for $\Delta_3 y_{i,t} = \alpha + \beta_1 MPS_t^{ORTH} + \beta_2 MPS_t^{Response} + u_{i,t}$. $\Delta_3 y_{i,t}$ denotes three-day changes in country i's 10-year yield over the FOMC window. For the "non-U.S. G10" columns, the equation is estimated for the panel of non-U.S. G10 countries with country fixed effects. For the "U.S." columns, the equation uses the U.S. yield only. "Macro" and "Non Macro" denote whether the regression is estimated using FOMC windows preceded by U.S. GDP or CPI announcements.

other hand, the MPS_t^{ORTH} is significant during the non-macro news FOMC windows but not during the macro news FOMC windows. The regression results suggest that the global yield decline during the macro-FOMC windows is significantly linked to the Fed's response to macroeconomic news.

We estimate the following equation to assess the relationship between the FOMC yield decline and the cumulative MPS:

$$\nabla y_t^{macronewsFOMC} = \gamma_0 + \gamma_1 CMPS_t^{ORTH} + \gamma_2 CMPS_t^{Response} + u_t, \tag{10}$$

where $\nabla y_t^{macronewsFOMC}$ is the sum of daily changes in a country's 10-year yield over macro news FOMC windows, and $CMPS_t^j = \sum_{s=0}^{t} MPS_s^j$ is the cumulative sum of the response component and orthogonalized component of historical MPS up to t during the macro news FOMC windows.[17]

[17]We focus on explaining the cumulative $\nabla y_t^{macronewsFOMC}$ for two reasons. First, while the macro news FOMC windows account for 50% of the FOMC windows, they account for about 80% of the yield decline across countries, and especially 99% of the yield decline in the U.S. Therefore, they capture significant

Table 4: Relative contributions of $\text{CMPS}^{\text{ORTH}}$ and $\text{CMPS}^{\text{Response}}$ in equation (10).

	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	USD	Avg.
R^2 (%)	77	90	85	89	72	85	95	91	89	92	87
Semipartial correlation^2 (Response)	76	86	69	84	61	53	85	90	80	90	77
Semipartial correlation^2 (Orthogonal)	7	0	0	0	10	7	1	4	1	2	3

We fit the equation country by country. In Table 4, we report the overall R^2 of the regression and the semipartial squared correlation of each of the regressors.[18] The results indicate that, in all cases, the cumulative yield change within macro news FOMC windows is well explained by the monetary policy shocks. The average R^2 across countries is 87%. For the semipartial correlation, the table shows that adding $CMPS_t^{Response}$ to the regressions provides a much better fit to the cumulative 10-year yield decline. On the other hand, $CMPS_t^{ORTH}$ adds very little to the fit.

The analysis in this subsection indicates that the cumulative yield declines in the FOMC window are closely connected to the "Fed response to news" component of MPS. This result corroborates the earlier evidence that the FOMC window effect is essentially driven by macro FOMCs.

4.5 Interpretations of the "Fed Response to News" Effect on Long-Term Yields

How can we interpret the large role of the cumulative "Fed response to news" in the secular decline in global yields? The FOMC windows preceded by macro news can be seen as offering a glimpse of the central bank's reaction function. From this perspective, the secular decline in long-term rates concentrated in this window would reflect revisions to the market's

variations. Second, by the OLS construction, MPS_t^{ORTH} sums up to zero, so there cannot be a downward trend over the full sample. Looking at the macro-news FOMC windows avoids the mechanical sum-to-zero problem. In any case, our key focus is $CMPS_t^{Response}$.

[18] Squared semipartial correlation measures the additional contribution of the regressor X_1 to explaining the Y variable, above and beyond another variable X_2.

perception of the monetary policy reaction function.

To shed more light on the underlying mechanisms, it is instructive to revisit the link between the monetary policy reaction function and long-term interest rates. A standard way to represent the monetary policy reaction function is through a standard Taylor rule:

$$i_t = r_t^* + \pi_t + \gamma_t^{\pi}(\pi_t - \pi_t^*) + \gamma_t^{Y}(outputgap_t) + u_t, \tag{11}$$

where i_t is the nominal policy rate, r_t^* is the natural rate of interest,π and π^* are the inflation rate and the inflation target, $outputgap_t$ is the deviation of output from its potential level and u_t is a monetary policy shock with zero mean. Decomposing the long-term interest rate into the expected path of future short-term interest rates and the term premium, and substituting the Taylor rule for the former, we obtain:

$$y_t^{(n)} = \underbrace{\frac{1}{n}\mathbf{E}_t\left[\sum_{k=0}^{n-1} r_{t+k}^* + \sum_{k=0}^{n-1}\pi_{t+k} + \sum_{k=0}^{n-1}\gamma_{t+k}^{\pi}(\pi_{t+k} - \pi_{t+k}^*) + \sum_{k=0}^{n-1}\gamma_{t+k}^{Y}(outputgap_{t+k})\right]}_{\text{Risk Neutral Yield}_t \equiv \frac{1}{n}\mathbf{E}_t[i_t + i_{t+1} + \cdots + i_{t+n-1}]} + TP_t. \tag{12}$$

In Section 3 we found that the FOMC window effects have been driven primarily by changes in the expected future path of short-term rates—that is, the risk-neutral yield. As highlighted in Equation (12), the risk-neutral yield reflects the expected future path of the natural rate (r^*), the expected future path of inflation (π_t), as well as the cumulative expected policy responses to future deviations of inflation from target and future output gaps.

Equation (12) suggests that adjustments to different elements of the reaction function path might have driven the secular decline in long-term yields since the 1990s.

First, the observed Fed's response to news may have led to sequential downward revisions of perceptions of the natural rate of interest and the future path of inflation, the first two terms on the right-hand side of Equation (12). Markets may perceive the Fed as having better information about both variables and update their views when observing the monetary

policy response to incoming macro news. This interpretation is consistent with Hillenbrand (2025) "long-run Fed guidance" interpretation whereby Fed decisions and communications provide guidance to markets about long-run levels of real interest rates and inflation. This is consistent with structural explanations of the secular decline in interest rates, just with the qualification that markets learn about them through monetary policy decisions.

Second, the macro FOMC windows may have induced markets to revise the path of expected monetary policy response to inflation deviations from target and to the output gap, the third and fourth terms on the right-hand side of Equation (12). Expected persistent negative deviations of inflation from target and persistently negative expected output gaps could, from this perspective, lead to a fall in long-term interest rates through the implied lower future policy rates. Also, as highlighted by Bauer and Swanson (2023a) and Bocola et al. (2024), the perceived policy response coefficients themselves may vary over time, further amplifying the influence of macroeconomic expectations on yields. For instance, if the monetary policy decision in the wake of a macro release induces expectations of persistent negative deviations of inflation from target, this effect would be amplified if the decision also gave rise to the view that monetary policy would respond more aggressively to it, implying a larger expected γ^{π}_{t+k}.

However, other interpretations of the secular Fed response to news effect on long-term interest rates are also conceivable. For instance, the Fed's response to news may simply reflect the updating of agents' perceptions of the structural forces that shape long-term interest rates. Specifically, fundamental economic forces such as excess savings, demographics, and productivity drive inflation and output surprises, to which the Fed then responds in a way that may again surprise markets (the Fed-response-to-news effect). Agents observe these double surprises and update their information sets discretely around these macro news FOMC windows. From this perspective, although fundamental economic forces ultimately cause the decline in long-term interest rates, these interest rate changes predominantly manifest around FOMC announcements, because this is when agents mostly update their assessment

of the state of the economy.

Yet another possible interpretation is that monetary policy itself may have a causal effect on r_t^* through information effects. Rungcharoenkitkul and Winkler (2025) highlight the potential role of information feedback loops between central banks and financial markets, what they refer to as the "hall of mirrors". Specifically, when the central bank cuts the policy rate in response to a large negative demand shock, market participants may attribute part of the reduction to a lower r_t^* in the reaction function. The central bank, in turn, may misinterpret lower market yields as indicating a lower r_t^*, and hence cut the rate further. Such loops can induce shifts in perceived r_t^* despite no independent shifts in saving and investment. Shifts in perceived r_t^*, in turn, could affect r_t^* to the extent that they influence spending decisions. As highlighted above, the Fed-response-to-news mechanism highlighted by our analysis may also work through adjustments in perceptions of the natural rate of interest, the first stage in the "hall-of-mirrors" effect highlighted by Rungcharoenkitkul and Winkler (2025).[19]

5 Conclusion

This study contributes to the literature by first documenting a pivotal role of U.S. monetary policy news in the global secular decline in long-term interest rates and then analyzing the underlying economic mechanisms. Our empirical analysis establishes two main new results. First, we demonstrate that the global secular decline in long-term interest rates since the 1990s has been largely driven by cumulative yield changes during U.S. monetary policy announcement windows (FOMC windows). State-of-the-art term structure models suggest

[19] Another mechanism highlighted in the literature is that monetary easing can generate intertemporal substitution in consumption of durable goods: households bring forward durable purchases, which reduces future demand and lowers the path of equilibrium rates. This channel is developed in McKay and Wieland (2021). A lifecycle monetary model developed by Beaudry et al. (2024) suggests that monetary policy could have a weak net effect on current economic activity, resulting in persistent policy-induced interest rate feedback into trends in long-run real rates. However, unlike previous interpretations that naturally tie into macroeconomic news, this mechanism implies that long-term interest rates would shift after every FOMC meeting that involves a policy surprise.

that this FOMC-window effect has operated through the expected path of future short-term interest rates rather than term premia. Second, we find that the global secular decline in interest rates has been concentrated in FOMC windows preceded by macroeconomic news. We interpret this pattern as a cumulative "Fed response to news" effect and provide empirical evidence to support this interpretation.

Our findings challenge conventional views that attribute the secular yield declines solely to structural economic shifts, emphasizing instead the pivotal role of learning about monetary policy reaction functions in a globally interconnected financial environment. However, the findings are open to a wide range of interpretations, including more conventional information effects as well as more unconventional causal effects of monetary policy on long-run interest rate levels. Further research is required to develop formal methodologies for distinguishing between these different interpretations.

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Online Appendix (not for publication)

A Daily Sovereign Yields Data Sources

Table A1: Sources of daily sovereign yields.

Country	Abbreviation	Source	Start
Australia	AUD	Bloomberg C12710Y	Apr 16, 1991
Canada	CAD	Bloomberg C10110Y	Jun 25, 1991
Switzerland	CHF	Bloomberg C25610Y	Feb 25, 1994
Germany	EUR	Bloomberg C91010Y	Oct 03, 1991
U.K.	GBP	Bank of England	Jan 02, 1979
Japan	JPY	Bloomberg C10510Y	Sep 30, 1992
Norway	NOK	Bloomberg C26610Y (after 1998) & `Investing.com`	Feb 18, 1994
New Zealand	NZD	Bloomberg C25010Y	Mar 9, 1992
Sweden	SEK	Bloomberg C25910Y	Feb 25, 1994
U.S.A.	USD	Federal Reserve Board (GSW)	Aug 16, 1971

Notes: The plots start from the first FOMC date (June 5, 1989) or the first date the yields become available, whichever is later. GSW refers to Gürkaynak et al. (2007). The starting dates are those for the 10-year yield series.

B FOMC Announcement Dates

Table A2 presents the scheduled FOMC dates in our sample. Table A3 presents the unscheduled FOMC announcement dates in our sample.

Table A2: Scheduled FOMC meeting dates.

		Scheduled FOMC Meetings							
Year	N	1.	2.	3.	4.	5.	6.	7.	8.
1989	5				7-Jul	23-Aug	4-Oct	15-Nov	20-Dec
1990	8	8-Feb	28-Mar	16-May	5-Jul	22-Aug	3-Oct	14-Nov	18-Dec
1991	8	7-Feb	27-Mar	15-May	5-Jul	21-Aug	2-Oct	6-Nov	18-Dec
1992	8	6-Feb	1-Apr	20-May	2-Jul	19-Aug	7-Oct	18-Nov	23-Dec
1993	8	4-Feb	24-Mar	19-May	8-Jul	18-Aug	22-Sep	17-Nov	22-Dec
1994	8	4-Feb	22-Mar	17-May	6-Jul	16-Aug	27-Sep	15-Nov	20-Dec
1995	8	1-Feb	28-Mar	23-May	6-Jul	22-Aug	26-Sep	15-Nov	19-Dec
1996	8	31-Jan	26-Mar	21-May	3-Jul	20-Aug	24-Sep	13-Nov	17-Dec
1997	8	5-Feb	25-Mar	20-May	2-Jul	19-Aug	30-Sep	12-Nov	16-Dec
1998	8	4-Feb	31-Mar	19-May	1-Jul	18-Aug	29-Sep	17-Nov	22-Dec
1999	8	3-Feb	30-Mar	18-May	30-Jun	24-Aug	5-Oct	16-Nov	21-Dec
2000	8	2-Feb	21-Mar	16-May	28-Jun	22-Aug	3-Oct	15-Nov	19-Dec
2001	8	31-Jan	20-Mar	15-May	27-Jun	21-Aug	2-Oct	6-Nov	11-Dec
2002	8	30-Jan	19-Mar	7-May	26-Jun	13-Aug	24-Sep	6-Nov	10-Dec
2003	8	29-Jan	18-Mar	6-May	25-Jun	12-Aug	16-Sep	28-Oct	9-Dec
2004	8	28-Jan	16-Mar	4-May	30-Jun	10-Aug	21-Sep	10-Nov	14-Dec
2005	8	2-Feb	22-Mar	3-May	30-Jun	9-Aug	20-Sep	1-Nov	13-Dec
2006	8	31-Jan	28-Mar	10-May	29-Jun	8-Aug	20-Sep	25-Oct	12-Dec
2007	8	31-Jan	21-Mar	9-May	28-Jun	7-Aug	18-Sep	31-Oct	11-Dec
2008	8	30-Jan	18-Mar	30-Apr	25-Jun	5-Aug	16-Sep	29-Oct	16-Dec
2009	8	28-Jan	18-Mar	29-Apr	24-Jun	12-Aug	23-Sep	4-Nov	16-Dec
2010	8	27-Jan	16-Mar	28-Apr	23-Jun	10-Aug	21-Sep	3-Nov	14-Dec
2011	8	26-Jan	15-Mar	27-Apr	22-Jun	9-Aug	21-Sep	2-Nov	13-Dec
2012	8	25-Jan	13-Mar	25-Apr	20-Jun	1-Aug	13-Sep	24-Oct	12-Dec
2013	8	30-Jan	20-Mar	1-May	19-Jun	31-Jul	18-Sep	30-Oct	18-Dec
2014	8	29-Jan	19-Mar	30-Apr	18-Jun	30-Jul	17-Sep	29-Oct	17-Dec
2015	8	28-Jan	18-Mar	29-Apr	17-Jun	29-Jul	17-Sep	28-Oct	16-Dec
2016	8	27-Jan	16-Mar	27-Apr	15-Jun	27-Jul	21-Sep	2-Nov	14-Dec
2017	8	1-Feb	15-Mar	3-May	14-Jun	26-Jul	20-Sep	1-Nov	13-Dec
2018	8	31-Jan	21-Mar	2-May	13-Jun	1-Aug	26-Sep	8-Nov	19-Dec
2019	8	30-Jan	20-Mar	1-May	19-Jun	31-Jul	18-Sep	30-Oct	11-Dec
2020	7	29-Jan	29-Apr	10-Jun	29-Jul	16-Sep	5-Nov	16-Dec	
2021	8	27-Jan	17-Mar	28-Apr	16-Jun	28-Jul	22-Sep	3-Nov	15-Dec
2022	8	26-Jan	16-Mar	4-May	15-Jun	27-Jul	21-Sep	2-Nov	14-Dec
2023	8	1-Feb	22-Mar	3-May	14-Jun	26-Jul			

Table A3: Unscheduled FOMC Meeting Dates

		Unscheduled FOMC Meetings								
Year	N	1.	2.	3.	4.	5.	6.	7.	8.	9
1989	4				5-Jun	26-Jul	16-Oct	6-Nov		
1990	3	13-Jul	29-Oct	7-Dec						
1991	9	8-Jan	1-Feb	8-Mar	30-Apr	6-Aug	13-Sep	30-Oct	6-Dec	20-Dec
1992	2	9-Apr	4-Sep							
1993	0									
1994	1	18-Apr								
1995	0									
1996	0									
1997	0									
1998	1	15-Oct								
1999	0									
2000	0									
2001	3	3-Jan	18-Apr	17-Sep						
2002	0									
2003	0									
2004	0									
2005	0									
2006	0									
2007	0									
2008	2	22-Jan	8-Oct							
2009	0									
2010	0									
2011	0									
2012	0									
2013	0									
2014	0									
2015	0									
2016	0									
2017	0									
2018	0									
2019	0									
2020	2	3-Mar	15-Mar							
2021	0									

Table A4: Explanatory power of various alternative event windows.

	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	USD	Average
Pseudo R^2, %											
FOMC	80	72	67	84	58	19	86	85	74	94	73
Macro news FOMC	93	66	97	97	77	87	67	69	62	99	82
Macro news	17	16	7	9	17	7	8	17	4	35	14
Dot plot FOMC	1	0	1	1	1	1	2	1	2	0	1
Fed Chair Speech	0.8	4	3	5	4	15	6	7	1	2	5
Yield Change, %											
All Days	-8.1	-7.3	-4.0	-3.3	-8.4	-5.5	-2.8	-3.9	-6.1	-5.7	-5.5
FOMC	-5.8	-6.1	-2.8	-3.8	-2.4	-2.5	-4.2	-4.8	-4.2	-5.6	-4.3
Macro news FOMC	-4.5	-3.6	-2.8	-3.1	-2.1	-2.0	-2.7	-2.6	-2.3	-5.4	-3.1
Macro news	-1.5	-1.3	0.9	0.7	-2.7	2.4	0.1	1.9	1.0	-2.9	-0.2
Dot plot FOMC	0.02	-0.1	0.3	0.4	0.1	-0.4	0.6	0.3	1.2	-0.2	-0.2
Fed Chair Speech	-0.6	-1.7	-1.0	-0.8	-0.8	-1.4	-0.9	-1.7	-1.1	-0.8	-1.1

Notes. The first panel presents the percent variations of the actual yield explained by each event window. The second panel presents the total change in the yield within each event window.

C Robustness: Placebo Tests

To investigate the statistical significance of the FOMC-based strategy, we compare the actual returns with those implied by randomly selected hypothetical FOMC windows.

Specifically, we conduct the test as follows. For each year y, randomly draw N_y Wednesdays from that year to serve as the hypothetical FOMC announcement days. This is because most FOMC announcements occur on Wednesday afternoon, U.S. Eastern time. We construct three-day windows around these Wednesdays and compute cumulative daily yield changes within these windows. Then, we repeat the process.

Figure A1 presents the placebo test result based on 10,000 random samples. The 90% confidence bands denote the 5^{th} and 95^{th} percentiles of the cumulative yield changes during the placebo three-day windows. Except for Japan, the cumulative changes in the 10-year yields during the actual FOMC windows are at or lower than the lower bound of the confidence bands. In other words, the cumulative yield changes during FOMC windows are lower than 95% of the placebo sample paths, indicating that FOMC windows lead to significantly more negative yield changes than randomly selected event windows of the same length.

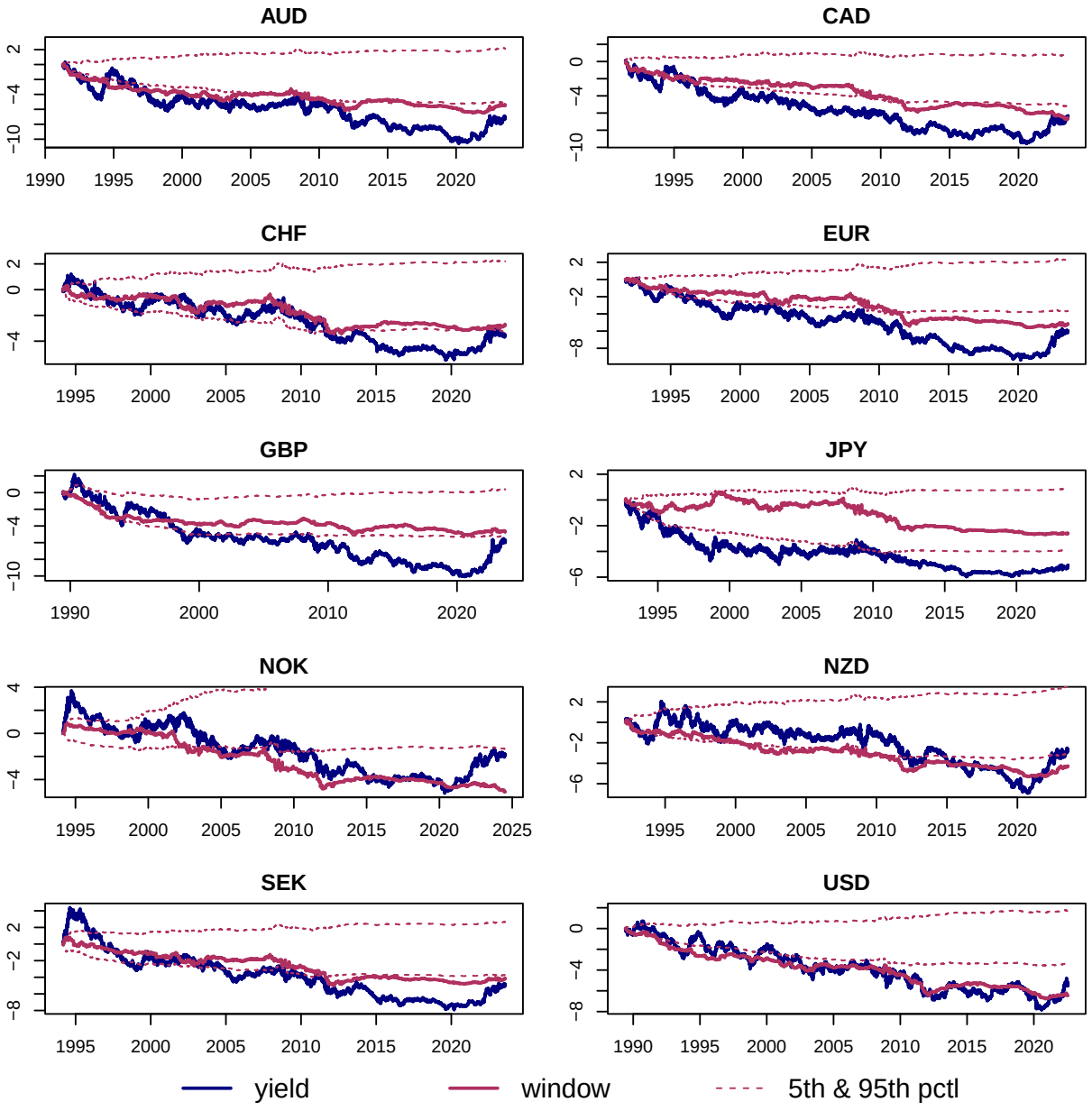


Figure A1: Cumulative yield changes over placebo windows.

Notes. Unit of the y-axis is percentage p.a.. Placebo tests for cumulative yield changes during the $t-1$-to-$t+1$ windows. We randomly pick N_y Wednesdays from each year y serving as the placebo announcement days. Then, construct the placebo announcement windows accordingly. The dashed lines denote the 5^{th} and 95^{th} percentiles from 10,000 placebo samples.

D The Shifting Endpoint Model

D.1 Model Setup

To decompose the long-term interest rates into term premia and expected future short-term interest rates, we adopt the affine term structure model developed by Bauer and Rudebusch (2020). The model is particularly appropriate for our analysis because it allows for the possibility of cointegration trends as state variables.[20]

We use upper case or bold letters to denote vectors. The state variable vector X_t is a $K_X \times 1$ vector X_t consisting of a trend vector $\boldsymbol{\tau}_t$ and a stationary vector $\tilde{X}_t$:

$$\begin{aligned} X_t =& \boldsymbol{\mu} + \Gamma \boldsymbol{\tau}_t + \tilde{X}_t, \\ \boldsymbol{\tau}_t =& \boldsymbol{\tau}_{t-1} + \boldsymbol{\eta}_t, \quad \boldsymbol{\eta}_t \sim \mathcal{N}(0, \Omega_\eta) \\ \tilde{X}_t =& \Phi \tilde{X}_{t-1} + \tilde{U}_t, \quad \tilde{U}_t \sim \mathcal{N}(0, \tilde{\Omega}), \end{aligned} \tag{A1}$$

where $\boldsymbol{\tau}_t$ is a $K_\tau \times 1$ random walk and $\tilde{X}_t$ is a $K_X \times 1$ stationary VAR(1). The shocks are i.i.d over time and $\boldsymbol{\eta}_t \perp \tilde{U}_t$. Define

$$Z_t \equiv \begin{bmatrix} \boldsymbol{\tau}_t^\top & X_t^\top \end{bmatrix}^\top, U_t \equiv \Gamma \boldsymbol{\eta}_t + \tilde{U}_t, \Omega \equiv \mathbf{E}[U_t U_t^\top] = \Gamma \Omega_\eta \Gamma^\top + \tilde{\Omega}.$$

The log stochastic discount factor (SDF) m_{t+1} evolves as

$$m_{t+1} = -\delta_0 - \boldsymbol{\delta}_1^\top X_t - \frac{1}{2} \Lambda_t^\top \Lambda_t - \Lambda_t^\top \Omega^{-\frac{1}{2}} U_{t+1}. \tag{A2}$$

[20] Bauer and Rudebusch (2020) show that once an otherwise standard affine term structure model incorporates the cointegration trend as a state variable, the long-term behaviors of expected interest rates and term premia are opposite to those implied by canonical models. The reason is that canonical term structure models assume stationary state processes, so expected interest rates at long horizons must converge to the unconditional mean.

The price of risk is an affine function of Z_t:[21]

$$\Lambda_t = \Omega^{-\frac{1}{2}}(\Lambda_0 + \Lambda_1 Z_t). \tag{A3}$$

Note that the SDF is driven by a $K_X \times 1$ dimensional shock with the same dimension as X_t, but is a combination of shocks to $\boldsymbol{\tau}_t$ and $\tilde{X}_t$. Although the trend $\boldsymbol{\tau_t}$ does not directly affect the observed yields, it affects risk premia by affecting the price of risk.

The model implies a standard expression in the affine term structure model literature that the log zero-coupon bond prices are affine in the state vector X_t:

$$y_t^{(n)} = A_n + B_n^\top X_t, \tag{A4}$$

where A_n and B_n are coefficients satisfying standard no-arbitrage recursions. The log risk-neutral bond prices solve

$$p_t^{(n),rn} = \ln \mathbf{E}_t \left[\exp \left\{ -y_t^{(1)} + p_{t+1}^{(n-1),rn} \right\} \right], \tag{A5}$$

which is an affine function of X_t and $\boldsymbol{\tau}_t$:

$$p_t^{(n),rn} = \mathcal{A}_n^{rn} + \mathcal{B}_n^{rn\top} X_t + \mathcal{C}_n^{rn\top} \boldsymbol{\tau}_t, \tag{A6}$$

and the coefficients solve the recursions described in Appendix D. The bond price and yield are related by $p_t^{(n)} = -n y_t^{(n)}$, and analogously for the risk-neutral and term premium components. Clearly, risk-neutral rates explicitly depend on $\boldsymbol{\tau}_t$.

[21] We assume that Λ_1 satisfies $\Lambda_1 = \left[(I - \Phi)\Gamma, \Lambda_{12}\right]$, i.e., the first K_τ column of Λ_1 (the loading on $\boldsymbol{\tau}_t$) equals $(I - \Phi)\Gamma$ and the remaining K_X columns is an unrestricted $K_X \times K_X$ matrix Λ_{12}.

D.2 Details of the No-Arbitrage Recursions

First, we show that the state vector Z_t evolves as

$$Z_t = \boldsymbol{\mu}_Z + \Phi_Z Z_{t-1} + V_t, \quad V_t \equiv \begin{bmatrix} \boldsymbol{\eta}_t \\ U_t \end{bmatrix}, \tag{A7}$$

with

$$\boldsymbol{\mu}_Z = \begin{bmatrix} 0 \\ (I-\Phi)\boldsymbol{\mu} \end{bmatrix}, \quad \Phi_Z = \begin{bmatrix} I_{K_\tau} & 0_{K_\tau \times K_X} \\ (I-\Phi)\Gamma & \Phi \end{bmatrix}, \quad \Omega_V \equiv \mathbf{E}[V_t V_t^\top] = \begin{bmatrix} \Omega_\eta & \Omega_\eta \Gamma^\top \\ \Gamma\Omega_\eta & \Omega \end{bmatrix}.$$

We rewrite Z_t as

$$Z_t = \begin{bmatrix} 0 \\ \boldsymbol{\mu} \end{bmatrix} + \begin{bmatrix} I_{K_\tau} & 0_{K_\tau \times K_X} \\ \Gamma & \Phi \end{bmatrix} \begin{bmatrix} \boldsymbol{\tau}_{t-1} \\ \tilde{X}_{t-1} \end{bmatrix} + \begin{bmatrix} \boldsymbol{\eta}_t \\ \Gamma \boldsymbol{\eta}_t + \tilde{U}_t. \end{bmatrix}$$

Note that

$$\begin{bmatrix} \boldsymbol{\tau}_{t-1} \\ \tilde{X}_{t-1} \end{bmatrix} = \begin{bmatrix} 1 & 0_{K_\tau \times K_X} \\ -\Gamma & I \end{bmatrix} \begin{bmatrix} \boldsymbol{\tau}_{t-1} \\ X_{t-1} \end{bmatrix} - \begin{bmatrix} 0 \\ \boldsymbol{\mu} \end{bmatrix}.$$

Substituting for $\boldsymbol{\tau}_{t-1}$ and $\tilde{X}_{t-1}$, we get $\boldsymbol{\mu}_Z, \phi_Z$ and V_t. Since $V_t \perp \tilde{U}_t$, the expression for Ω_V follows naturally.

Next, we show that the restriction

$$\Lambda_1 = \begin{bmatrix} (I-\Phi)\Gamma & \Lambda_{12} \end{bmatrix} \tag{A8}$$

implies the bond pricing equation $p_t^{(n)} = \mathcal{A}_n + \mathcal{B}_n^\top X_t$. We prove by guess-and-verify. The no-arbitrage recursion is

$$p_t^{(n)} = \mathbf{E}_t[m_{t+1}] + \mathbf{E}_t[p_{t+1}^{(n-1)}] + \frac{1}{2}\mathbf{Var}_t(m_{t+1}) + \frac{1}{2}\mathbf{Var}_t(p_{t+1}^{(n-1)}) + \mathbf{Cov}_t(m_{t+1}, p_{t+1}^{(n-1)}). \tag{A9}$$

Note that $\mathbf{E}_t[\cdot]$ refers $\mathbf{E}[\cdot|Z_t]$, and

$$\begin{aligned}\mathbf{E}_t[X_{t+1}] =& \boldsymbol{\mu} + \Gamma\boldsymbol{\tau}_t + \Phi\tilde{X}_t = \boldsymbol{\mu} + \Gamma\boldsymbol{\tau}_t + \Phi(X_t - \boldsymbol{\mu} - \Gamma\boldsymbol{\tau}_t)\\ =& (I-\Phi)(\boldsymbol{\mu} + \Gamma\boldsymbol{\tau}_t) + \Phi X_t.\end{aligned}$$

When $p_t^{(n)} = \mathcal{A}_n + \mathcal{B}_n^\top X_t$,

$$\mathbf{E}_t[m_{t+1}] + \frac{1}{2}\mathbf{Var}_t(m_{t+1}) = -\delta_0 - \boldsymbol{\delta}_1^\top X_t,$$

$$\mathbf{E}_t[p_{t+1}^{(n-1)}] = \mathcal{A}_{n-1} + \mathcal{B}_{n-1}^\top[(I-\Phi)(\boldsymbol{\mu} + \Gamma\boldsymbol{\tau}_t) + \Phi X_t],$$

$$\mathbf{Var}_t(p_{t+1}^{(n-1)}) = \mathcal{B}_{n-1}^\top \Omega \mathcal{B}_{n-1},$$

$$\mathbf{Cov}_t(m_{t+1}, p_{t+1}^{(n-1)}) = -\mathcal{B}_{n-1}^\top(\Lambda_0 + \Lambda_1 Z_t).$$

Note that $\Lambda_1 Z_t = \Lambda_{11}\boldsymbol{\tau}_t + \Lambda_{12}X_t$, and we hope to eliminate $\boldsymbol{\tau}_t$ from the right-hand side of the recursion. Collecting the terms involving $\boldsymbol{\tau}_t$, we should have

$$\mathcal{B}_{n-1}^\top[(I-\Phi)\Gamma - \Lambda_{11}] = 0, \quad \forall n.$$

So $\Lambda_{11} = (I-\Phi)\Gamma$ eliminates $\boldsymbol{\tau}_t$ from the right-hand side of Equation (A9).

Finally, we derive the bond pricing recursions. Equation (A9) together with Equation (A8) implies

$$\begin{aligned}p_t^{(n)} =& -\delta_0 - \boldsymbol{\delta}_1^\top X_t + \mathcal{A}_{n-1} + \mathcal{B}_{n-1}^\top[(I-\Phi)\boldsymbol{\mu} + \Phi X_t] && \text{(A10)}\\ &+ \frac{1}{2}\mathcal{B}_{n-1}^\top\Omega\mathcal{B}_{n-1} - \mathcal{B}_{n-1}^\top(\Lambda_0 + \Lambda_{12}X_t). && \text{(A11)}\end{aligned}$$

So,

$$\begin{aligned}\mathcal{A}_n =& \mathcal{A}_{n-1} - \delta_0 + \mathcal{B}_{n-1}^\top (I - \Phi)\boldsymbol{\mu} + \frac{1}{2}\mathcal{B}_{n-1}^\top \Omega \mathcal{B}_{n-1} - \mathcal{B}_{n-1}^\top \Lambda_0, \qquad \text{(A12)}\\ \mathcal{B}_n^\top =& -\boldsymbol{\delta}_1^\top + \mathcal{B}_{n-1}^\top (\Phi - \Lambda_{12}). \qquad \text{(A13)}\end{aligned}$$

The yields are

$$y_t^{(n)} = A_n + B_n^\top X_t, \qquad \text{(A14)}$$

with $A_n = -\frac{1}{n}\mathcal{A}_n$ and $B_n = -\frac{1}{n}\mathcal{B}_n$.

The log risk-neutral bond prices solve

$$p_t^{(n),rn} = \ln \mathbf{E}_t \left[\exp\left\{ -y_t^{(1)} + p_{t+1}^{(n-1),rn} \right\} \right]. \qquad \text{(A15)}$$

We guess and verify that $p_t^{(n),rn}$ is an affine function of X_t and $\boldsymbol{\tau}_t$:

$$p_t^{(n),rn} = \mathcal{A}_n^{rn} + \mathcal{B}_n^{rn\top} X_t + \mathcal{C}_n^{rn\top} \boldsymbol{\tau}_t, \qquad \text{(A16)}$$

and the coefficients solve the following recursions:

$$\begin{aligned}\mathcal{A}_n^{rn} =& \mathcal{A}_{n-1}^{rn} - \delta_0 + \mathcal{B}_{n-1}^{rn\top}(I - \Phi)\boldsymbol{\mu} + \frac{1}{2}\mathcal{B}_{n-1}^{rn\top}\Omega\mathcal{B}_{n-1}^{rn}\\ &+ \frac{1}{2}\left(\mathcal{B}_{n-1}^{rn\top}\Gamma\Omega_\eta\mathcal{C}_{n-1}^{rn} + \mathcal{C}_{n-1}^{rn\top}\Omega_\eta\Gamma^\top\mathcal{B}_{n-1}\right) + \frac{1}{2}\mathcal{C}_{n-1}^{rn\top}\Omega_\eta\mathcal{C}_{n-1}^{rn},\\ \mathcal{B}_n^{rn\top} =& -\boldsymbol{\delta}_1^\top + \mathcal{B}_{n-1}^{rn\top}\Phi,\\ \mathcal{C}_n^{rn\top} =& \mathcal{B}_{n-1}^{rn\top}(I - \Phi)\Gamma + \mathcal{C}_{n-1}^{rn\top} \qquad \text{(A17)}\end{aligned}$$

with $\mathcal{A}_1^{rn} = -\delta_0, \mathcal{B}_1^{rn} = -\boldsymbol{\delta}_1, \mathcal{C}_1^{rn} = \mathbf{0}$.

D.3 Estimating the Term Structure Model

We estimate the term structure model separately for each country. We take X_t as the first three principal components of the country's yield curve. To investigate the role of monetary policy, as described above, our empirical proxy for $\boldsymbol{\tau}_t$ is $[\nabla PC1^{US}_{loc,t}, \nabla PC1^{US}_{US,t}]^\top$, the first principal components of the cumulative daily changes in the cross-sections of domestic and U.S. zero-coupon yields during the three-day FOMC windows. For the U.S., $\boldsymbol{\tau}_t = \nabla PC1^{US}_{US,t}$. The results are quantitatively similar if we use changes during the FOMC window in individual yields, such as the 10-year yield. The previous sections have demonstrated that $\nabla PC1^{US}_{loc,t}$ and $\nabla PC1^{US}_{US,t}$ well account for the trends of sovereign yields, so we use them to proxy the persistent state variable of the yield curve over the past three decades. As a robustness check, we demonstrate that the OSE model results are similar to those produced by an estimated shift endpoint model, which estimates $\boldsymbol{\tau}_t$ from the observed yield curve using statistical methods.

Given observed X_t and $\boldsymbol{\tau}_t$, we estimate the term structure model parameters using the regression algorithm described in Adrian et al. (2013). We estimate the parameters using end-of-month observations and plug the daily X_t and $\boldsymbol{\tau}_t$ into the model to get daily estimations of the risk-neutral yields and term premia. For the regressions, we select excess bond returns of the one-month holding period for maturities $n \in \{0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 7, 10\}$ years. The linear regression approach requires no numerical optimization algorithms, making it much faster than the estimation approach in Bauer and Rudebusch (2020).

D.4 Model Fit

In the main text, we estimated the daily model using the OSE method, and the empirical proxy for τ_t is the cumulative yield changes during FOMC announcement windows. As a robustness check, we compare the performances of the OSE and ESE models at the monthly frequency. The proxy for τ_t in the monthly model is the end-of-month observations of $[\nabla PC1^{US}_{loc,t}, \nabla PC1^{US}_{US,t}]^\top$. The ESE model uses τ_t estimated from the observed end-of-month

yields. In Table A5, Table A6, and Table A7, we report the root mean squared errors of yield curve fitting. Specifically, we compute the squared difference between the yield data and model-implied yields. We then compute the square root of the average squared difference over the full sample. For each country, we report the RMSE associated with the 1-, 2-, ..., 10-year maturities and the mean RMSE across all maturities.

Table A5: RMSE of the monthly OSE model.

	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	USD
1	1.46	1.51	1.59	1.46	0.51	1.03	0.52	0.72	1.08	0.55
2	1.20	0.70	1.50	1.52	0.37	2.05	0.47	1.47	1.21	0.43
3	0.65	0.87	0.86	1.20	0.49	1.00	0.29	0.75	1.02	0.42
4	1.43	0.81	1.31	1.92	0.55	1.75	0.34	1.32	1.72	0.46
5	1.46	0.64	1.17	1.63	0.37	2.14	0.45	1.09	1.58	0.25
6	1.57	0.72	1.15	1.56	0.46	3.06	0.65	0.97	1.39	0.34
7	2.91	0.86	2.23	3.36	0.58	4.75	1.21	1.65	1.85	0.50
8	4.70	0.81	3.26	5.30	0.48	6.93	3.16	2.08	2.39	0.44
9	6.37	0.93	3.73	6.72	0.48	9.79	6.48	2.03	3.18	0.39
10	8.45	1.86	5.73	8.98	1.30	14.06	9.19	4.57	5.80	0.99
Mean	3.50	1.22	2.45	3.87	0.59	5.40	3.15	1.78	2.41	0.56

Notes: Root mean squared errors of yield curve fitting, in basis points. For each country, we report the RMSE for the 1-, 2-, ..., 10-year maturities and the mean RMSE across all maturities.

Table A6: RMSE of the monthly ESE model.

	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	USD
1	2.93	1.49	3.00	1.78	0.55	3.86	0.67	0.86	1.13	0.58
2	1.22	0.80	3.28	1.92	0.36	2.84	0.44	1.61	1.31	0.42
3	0.78	1.00	2.19	1.62	0.50	2.21	0.21	0.81	1.20	0.50
4	2.13	1.20	2.61	1.81	0.56	2.38	0.14	1.38	1.63	0.60
5	2.68	0.76	2.61	1.50	0.35	1.77	0.24	1.16	1.31	0.42
6	2.68	0.64	2.14	0.97	0.41	0.95	0.25	0.91	0.80	0.39
7	2.83	0.85	2.07	1.84	0.53	1.21	0.32	1.32	1.22	0.47
8	3.41	0.65	2.21	2.77	0.42	1.54	0.56	1.52	1.43	0.37
9	4.77	0.56	3.48	3.32	0.27	1.66	1.16	0.85	0.91	0.29
10	8.65	1.88	6.97	6.43	1.10	4.61	1.96	3.78	3.30	0.99
Mean	3.83	1.06	3.36	2.82	0.55	2.56	0.80	1.65	1.57	0.54

Notes: Root mean squared errors of yield curve fitting, in basis points. For each country, we report the RMSE for the 1-, 2-, ..., 10-year maturities and the mean RMSE across all maturities.

Table A7: RMSE of the daily OSE model.

	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	USD
1	2.97	4.48	2.75	1.90	1.29	3.19	1.05	0.79	1.19	0.85
2	1.26	3.35	2.86	2.31	1.01	2.63	0.68	1.52	1.35	0.66
3	0.73	3.44	1.82	2.33	1.12	2.42	0.83	0.80	1.11	0.99
4	2.06	3.20	2.33	2.38	1.23	2.33	1.10	1.36	1.91	1.04
5	2.51	2.75	1.99	1.82	1.05	1.75	0.87	1.05	1.61	0.97
6	2.47	2.40	1.71	1.06	0.86	1.23	0.39	0.69	0.94	1.05
7	2.78	2.19	1.86	1.69	0.74	1.46	0.61	1.28	1.29	1.20
8	3.63	2.03	2.19	2.50	0.51	1.79	0.41	1.64	1.52	1.27
9	5.33	2.19	3.44	3.10	0.29	1.95	1.64	1.23	0.84	1.31
10	9.41	3.17	6.23	6.10	1.22	4.62	2.87	3.78	3.66	1.59
Mean	3.55	3.45	2.81	2.63	1.03	2.34	1.16	1.59	1.91	1.16

Notes: Root mean squared errors of yield curve fitting, in basis points. For each country, we report the RMSE for the 1-, 2-, ..., 10-year maturities and the mean RMSE across all maturities.

E Yield Volatility on Fed Chair Speech Dates

The weak relationship between Fed Chair speeches and the secular decline of government bond rates does not imply that these speeches have no impact on asset prices. As highlighted by Swanson and Jayawickrema (2023), Fed Chair speeches significantly influence various asset classes in the U.S., including futures, equities, and the entire term structure of government bond yields. In Table A8, we report the standard deviations of daily changes in world 5-year, 10-year, and 5-5 forward rates during different event windows. "FOMC" and "Chair" refer to the three-day event windows centered around the FOMC announcement dates and Federal Reserve Chair speech dates, respectively. "Other" pertains to days belonging to neither of these windows. All countries' government bond rate changes during the FOMC window are more volatile than those on normal days. Additionally, yield changes in eight out of ten countries during the Fed Chair speech window are more volatile than those during other days. Overall, the findings of Swanson and Jayawickrema (2023) for the U.S. financial market can be generalized to G10 countries, but the reactions to Fed Chair speeches are much less monotonic than those to FOMC announcements, thus failing to explain the secular decline of government bond rates.

Table A8: Standard deviation of daily yield changes.

	FOMC	FOMC w/o Dot Plot	Dotplot	Chair	Other
AUD	11.11	11.59	8.19	10.71	10.00
CAD	9.82	10.47	5.46	9.12	8.72
CHF	9.70	10.44	5.32	9.07	8.57
EUR	10.66	11.23	7.06	9.86	9.21
GBP	5.83	5.80	5.95	5.27	6.73
JPY	9.19	9.98	3.86	8.29	7.92
NOK	9.94	10.65	6.29	10.17	9.84
NZD	10.05	10.58	7.02	9.52	9.01
SEK	10.76	11.45	6.72	9.67	9.58
USD	6.54	6.67	5.79	5.98	5.73

Notes. The table reports standard deviations of daily yield changes over three sets of dates: three-day event windows bracketing FOMC announcements, three-day event windows bracketing Fed Chair speeches, and other dates. The units are annualized basis points.