A Distributional Perspective on Forward Guidance and the US Term Structure

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Abstract

This paper revisits the impact of forward guidance on the term structure of U.S. interest rates. Using a dynamic location–scale model, I find that FOMC forward guidance announcements not only depress the yield curve, but also reduce the conditional volatility of yield changes. The volatility channel is persistent across maturities and strongest at shorter ones. This volatility effect is consistent across nominal and real yields, as well as implied expected inflation. These results are robust to a number of specification, including ones that account for central bank information shocks and ones that exclude forward guidance conducted when rates were near the zero lower bound.

Keywords: Forward guidance, Term Structure, Conditional volatility

JEL: E43, E52, C32, G14

1 Introduction

Since the Global Financial Crisis, central banks have relied increasingly on communication as an active policy instrument. In the United States, forward guidance became a central tool once the policy rate approached its effective lower bound. The Fed's forward guidance evolved over time from relatively simple, less informative statements (e.g., "economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time") to state-contingent language that explicitly tied future policy action to the unemployment rate, and later to guidance intended to smooth the gradual rate increases that began in December 2015. The language of forward guidance has always been intended to shape expectations about the future policy path. However, it can shape expectations through two channels. A statement containing forward guidance can depress the expected path of future interest rates, which is the primary mechanism through which it provided monetary easing at the zero lower bound (ZLB). Another channel is that it can provide greater certainty to markets by clarifying the future course of policy. In statistical terms, the first channel moves the conditional mean of interest rates, which has been thoroughly investigated in the literature. The second channel affects higher order moments, specifically conditional volatility (or standard deviation), which thus far has been a far less investigated concept in the literature.

A large empirical literature documents that U.S. monetary policy announcements move asset prices in tight windows around FOMC communications. A key insight from this work is that financial markets respond not only to unexpected changes in the current policy rate, but also to surprises about the expected path of policy embodied in statements and other communications. Gurkaynak et al. (2005) show that two factors (current and path) are needed to account for Treasury yield responses around announcements. Swanson (2021) extends this approach to separately identify surprises in the current rate, forward guidance, and large-scale asset purchases, and finds that forward guidance has statistically significant and persistent effects across a wide range of financial assets. Yet, despite the centrality of forward guidance in policy practice and in high-frequency identification schemes, its overall effectiveness—and, crucially, how it transmits—remains less settled than for conventional monetary policy shocks.

A first reason is conceptual: forward guidance is not merely a promise about the future policy path, but it can also be read as information about the central bank's outlook. Campbell et al. (2012) formalize this distinction by contrasting "Odyssean" guidance (a commitment to future policy) with "Delphic" guidance (a disclosure of forecasts and intentions conditional on incoming information). Related work emphasizes that the market impact of guidance can depend on what else is bundled into a statement, which helps rationalize why responses to these might be heterogeneous. Del Negro et al. (2023) document the "forward guidance puzzle" concept, which posits that standard models usually imply that announcements can have an implausibly large effect on the economy at long horizons. On the theory side, McKay et al. (2016) show that the potency of forward guidance is highly sensitive to assumptions about market completeness and precautionary behavior. Introducing these frictions sharply dampens the implausibly large effects that standard models attribute to promises about future rates, which provides an explanation to the above puzzle. In the data, belief heterogeneity can further blur the meaning of guidance: Andrade et al. (2019) argue that "rates will stay low" can simultaneously signal a weaker outlook (bad news) and a more accommodative stance (good news), implying that observed average asset-price responses may mask offsetting channels.

A second reason the evidence is incomplete is methodological. Most empirical studies of forward guidance in financial markets use event study and high frequency identification approaches and focus primarily on conditional mean responses of yields and asset prices. This focus is natural given the identification problem and the central role of expected short rates in term structure models. However, it is potentially too narrow for evaluating an instrument that is explicitly designed to manage expectations and stabilize markets. Policy communication is frequently described, in practice, as a way to reduce uncertainty and avoid "surprising" markets. In other words, forward guidance may be intended to calm markets, not only to lower the level of yields. Filardo and Hofmann (2014), for example, explicitly note that forward guidance can reduce uncertainty and interest rate volatility, which potentially lowers risk premia. If so, then focusing only on mean effects risks missing a key part of the transmission mechanism.

This paper studies forward guidance from a distributional perspective, asking whether forward guidance affects not only the location of the distribution of U.S. Treasury yields, but also its scale (i.e.: the conditional volatility that investors face when pricing and hedging interest-rate risk). The motivation is straightforward: fixed-income markets price risk as well as expectations. Even if average yield effects of forward guidance appear modest at some maturities, systematic reductions in conditional volatility can materially affect term premia, portfolio allocation, and the broader financial conditions channel. Conversely, if guidance compresses uncertainty at the front end but increases uncertainty elsewhere (e.g., by shifting uncertainty into longer horizons), the overall term-structure implications may involve meaningful mean–variance tradeoffs that are invisible in standard mean regressions.

Several pieces of recent literature point to an uncertainty channel to monetary policy. Bundick et al. (2017) provide direct evidence that forward guidance operates partly by changing uncertainty about the future policy path. Using Eurodollar options to infer the term structure of implied interest rate volatility, they identify shocks to monetary policy uncertainty around policy announcements and show that reductions in uncertainty lower term premia and spill over to the broader economy. More recently Bundick et al. (2024) develop new measures of the term structure of policy rate uncertainty and show these measures help explain yield and forward real rate movements beyond standard monetary policy shocks. At the macro level, uncertainty is itself a meaningful driver of the business cycle (see e.g.: Baker et al. (2016)). Husted et al. (2020) construct an uncertainty index specifically about monetary policy and document that shocks to this index also affect output and spreads. This also provides motivation why central bank communication is such an important tool. Finally, a broader event-study literature has long emphasized that monetary policy days are special for volatility. Bomfim (2000) documents lower than normal conditional volatility around Fed announcements with volatility spiking on announcement days.

A distributional view of forward guidance also connects naturally to the "outlook-at-risk" literature in macro-finance, which emphasizes that the effects of policy and financial conditions often operate through changes in the shape of predictive distributions, not only through changes in conditional means. The now seminal work of Adrian et al. (2019) introduces the term "Growth-at-Risk" by modelling the full conitional distribution of future GDP growth. A key message of their research is that tighter financial conditions are not only associated with weaker expected growth, but disproportionately worsen the left tail of the distribution. Building on this perspective, similar findings are established for inflation (see Lopez-Salido and Loria (2024)) and public debt (see Furceri et al. (2025)). Understanding the entirety of the predictive distribution is necessary because macroeconomic losses are highly nonlinear and asymmetric. A small increase in the probability of severe downturns can matter far more for economic stability than a comparable change in the conditional mean. For this reason, distributional forecasting tools have increasingly been incorporated into policy institutions; for example, the New York Fed's Outlook-at-Risk framework tracks the conditional distribution of key aggregates and how it shifts with financial and macroeconomic conditions. For this reason, distributional forecasting tools have increasingly been incorporated into policy institutions (see e.g.: NY Fed Outlook-at-Risk). In dynamic settings, Adrian et al. (2022) shows how downside risks evolve from the near term to the medium term using quantile regressions and local projections. More recently, Frangiamore et al. (2025) shows that fiscal consolidation can, beyond reducing expected future public debt, also reduce uncertainty around future public debt as well.

Methodologically, I extend the framework of Hubert and Labondance (2018) in two key dimensions. First, instead of modeling conditional heteroskedasticity as an ARCH-type process, I estimate a location–scale specification in which forward guidance, monetary policy shocks, and macro-financial controls can shift both the conditional mean and the conditional volatility of yield changes. This allows the data to speak directly to whether forward guidance stabilizes markets by compressing the distribution of outcomes, rather than treating volatility as a residual feature. Second, I embed the location–scale model in a local projections framework and estimate horizon-specific responses for both location and scale, using cumulative yield changes so that the dynamic coefficients can be interpreted as level effects over the horizon. Implemented along the full U.S. nominal term structure (and, where available, along real yields and breakeven inflation), this approach nests the standard high-frequency mean event-study design while adding an explicit and interpretable uncertainty channel.

Overall, the paper contributes to three strands of literature. First, it contributes to the empirical forward-guidance and high-frequency monetary policy literature by documenting the dynamic effects of forward guidance along the U.S. term structure in a framework that nests the standard conditional mean event study while adding an explicit conditional volatility channel. Second, it contributes to the growing work on monetary policy uncertainty and higher-order effects by providing yield curve evidence that forward guidance can materially shift the conditional volatility investors face. Third, it bridges the term structure and monetary policy literature to the outlook-at-risk literature by bringing an explicit distributional regression perspective (tracking both location and scale effects) into the study of policy communication and the yield curve.

The remainder of the paper is outlined as follows. Section 2 describes the data including forward guidance dates. Section 3 presents the empirical framework of the dynamic location–scale local-projection design. Section 4 reports the estimated responses of both conditional means and conditional volatilities across maturities and explores robustness exercises. Finally Section 5 concludes and discusses extensions.

2 Data

2.1 Dependent variables

The main dependent variables I use in this paper are different maturities of the US nominal yield curve from one month to twenty years. I use par yields to track the expected returns for maturity m at time t. A par yield is the fixed coupon rate on a hypothetical treasury note that would price at par. This is a convenient benchmark to represent a risk-free rate an investor would earn on a note bought today and held to maturity. As par yields provide a constant-maturity representation of the yield curve, they allow movements at each horizon to be tracked without contamination from changes in coupon structure, remaining maturity, or security-specific liquidity. Although they are not pure zero coupon rates, these rates are pinned down by the same term structure of discounting as zero coupon yields. As a result, I do not need to construct zero-coupon yields at shorter maturities in order to track market-implied changes in discount rates.

In addition to nominal yields, I use Treasury Inflation-Protected Securities (TIPS) yields and breakeven inflation rates as well. TIPS yields provide a measure of real interest rates by indexing principal and coupon payments to realized CPI inflation, while breakeven inflation rates (computed as the difference between nominal and TIPS yields) captures market-implied inflation rates at different horizons. These two additional yield curves allow me to investigate whether the effects that forward guidance has on the nominal term structure also carry over to inflation expectations. Additionally, running the same exercises along these yields offers a clean robustness check as real yields and expected inflation are allowed to have more variation during periods when nominal rates were near the ZLB. The TIPS and Breakeven curves start at a maturity of two years.

2.2 Controls and monetary policy shocks

Deviating from Hubert and Labondance (2018), I use different monetary policy shock series to control for monetary policy surprises. The Kuttner (2001) surprise series and Krippner (2013) shadow short rate, are widely used, I find these less adequate for my analysis. The former focuses on relating changes of futures contracts to interest rates alone, virtually disregarding unconventional action. The latter does account for unconventional monetary policy, however, changes in the shadow short rate may also carry also carry expected changes due to endogenous macroeconomic information. However, recent advancements in the high-frequency identification literature allow for capturing monetary policy shocks that account for unconventional policy action as well. Moreover, one can also separate innovations into pure monetary policy shocks as well as information shocks.

As a baseline control, I use the unified monetary policy shock series of Bu et al. (2021) (labelled as

BRW). This series is designed track specifically monetary policy action (or inaction) shocks on FOMC announcement days. It tracks surprises both from conventional and unconventional action and is purged of central bank information. In another specification, I also use the decomposed series of Jarociński and Karadi (2020), which include a pure monetary policy surprise ($JKMP$) and a central bank information shock ($JKCBI$). This is particularly useful, as it allows me to control for the central bank's disclosed assessment and expectations of the economy that may confound the effect of forward guidance announcements. All of these series are available at the daily frequency, and only take non-zero values on FOMC announcement days.

In order to keep the model otherwise comparable to Hubert and Labondance (2018), I use a similar set of covariates as controls as their paper. I thus include daily S&P500 returns to track market variations, changes in WTI oil prices, the daily Composite Indicator of Systemic Stress of Chavleishvili and Kremer (2023), and changes in the ICE U.S. Dollar Index as a proxy of broad macro fundamentals and risk sentiment. All data is publicly available at the daily frequency. The data spans from August 2001 to December 2019.

2.3 Forward Guidance

To capture the effects of forward guidance, I use a dummy variable FG_t that takes a value of 1 on FOMC announcement days that introduce some form of innovation in the forward guidance language of the statement associated with the meeting. This is tracked between December 2008 and January 2019 using the Fed's website "Timelines of Policy Actions and Communications: Forward Guidance about the Federal Funds Rate". Focusing on language innovations is important, as forward guidance is often highly repetitive and predictable, with many statements reaffirming the previously communicated stance verbatim. Such reaffirmations are likely largely anticipated by markets and therefore cause little to no revision in expectations. Encoding these predictable reaffirmations as events would dilute the estimated coefficients on FG_t. In contrast, changes in the information content of forward guidance are more plausibly unexpected; as such, constructing the dummy in this way yields a cleaner and more credible estimate of the effects of forward guidance.

The forward guidance timeline also provides information on the specific nature of each language change. On March 18, 2009, for instance, the FOMC replaced the phrase "for some time" with "for an extended period" when describing how long rates were expected to remain low. While this change conveyed relatively little additional information to the public, many subsequent innovations provided substantially more clarity regarding the Fed's expected policy timing. On August 9, 2011, the FOMC introduced an explicit earliest exit date, committing to keep rates low "at least through mid-2013." On December 12, 2012, the Committee adopted state-contingent guidance for the first time, stating that rates would remain low "at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored."[1]

[1] Naturally, one could argue that statements providing a more substantial amount of information (such as state-contingent

Examining innovations toward the end of the sample, the Fed also used forward guidance to provide a sense of clarity to the markets while gradually increasing rates. Although the Fed began raising rates on December 16, 2015, the accompanying communication throughout the tightening cycle consistently indicated a relatively dovish stance, using language such as "the stance of monetary policy remains accommodative," that the Committee "can be patient" in normalizing policy stance, or that "only gradual increases" are to be expected. While this does not offer the variability to compare explicitly dovish to explicitly hawkish commitments, it does allow for splitting the FG_t dummy into two indicators (FG^{ZLB} and FG^{NZLB} respectively) to compare the effectiveness of forward guidance announcements during the ZLB and in the subsequent normalization period[2]

Lastly, by examining each statement in the timeline individually, it is possible to determine whether a given meeting contained only forward guidance or also involved other policy actions (e.g., changes to the federal funds rate or the introduction or extension of LSAP programs). This distinction is important because Hubert and Labondance (2018) define their forward guidance dummy to take a value of 1 only on meeting dates when the ECB's monetary policy action consisted solely of communication. While I argue that the monetary policy shock controls included in the baseline specification are sufficient to account for potential confounding effects from concurrent policy actions, this classification nevertheless motivates a natural robustness exercise. Specifically, I re-estimate the model using a narrower forward guidance dummy that excludes meetings in the Fed's timeline associated with any policy action beyond communication.

3 Empirical Methodology

Following Hubert and Labondance (2018), my goal is to estimate the static effects of forward guidance as well as to trace out its dynamic effects. However, an important departure from their approach is that, instead of modeling yield changes using an ARCH framework, I explicitly allow the covariates to shift the conditional volatility of returns. This is most naturally accommodated within a location–scale model. In addition, rather than accumulating coefficients obtained from a dynamic local projections estimation, I directly model cumulative yield changes in place of first differences in order to recover level changes, following the seminal contribution of Jordà and Taylor (2025). This ensures that contemporaneous responses are interpreted in the same way as in Hubert and Labondance (2018), while dynamic responses correspond to level changes and confidence bands are obtained directly for these level effects.

guidance) should perform better. However, how informative a statement is at a given time can be subjective. To examine this, I split the FG_t dummy into "high" and "low" information dummies following this logic. State-contingent guidance and indicated exit dates were assigned to the former, and the remaining meetings in the timeline to the latter. This exercise, however, yields no confirmation of this hypothesis, neither for location nor for scale effects.

[2] If we examine the last three entries in the forward guidance timeline (June 13, 2018; September 26, 2018; and January 30, 2019),we could argue that these no longer indicate a dovish stance. However, none of these explicitly communicate a hawkish commitment from the Fed. Accordingly, I conduct an additional robustness exercise in which these three entries are removed from the FG_t dummy, labelled as FG^D.

3.1 The location-scale model

The empirical framework builds on the location–scale model of Rigby and Stasinopoulos (2005), in which the conditional distribution of a dependent variable is characterized by separate equations for its location and scale parameters. In its general form,

$$
\begin{aligned}
y \mid X &\sim \mathcal{D}(\mu, \sigma), \\
\mu &= \beta_0 + X\beta, \\
\log \sigma &= \gamma_0 + X\gamma.
\end{aligned}
$$

where μ governs the conditional mean and σ the conditional dispersion of the dependent. The logarithmic link function ensures that the scale parameter remains strictly positive for all values of the covariates. Applied to yield changes, this framework allows forward guidance and monetary policy shocks to influence not only the expected response of interest rates, but also the degree of uncertainty surrounding that response.

Within this framework, the coefficient vector β captures the effects of a regressor on the level ("location") of the dependent variable and is directly comparable to coefficients estimated via OLS in standard event-study regressions. The coefficient vector γ captures how a regressor shifts the conditional volatility ("scale") of the dependent variable. A negative value implies a compression of the conditional distribution, i.e. a reduction in uncertainty, while a positive value indicates an expansion of the conditional distribution and higher uncertainty. Because the scale enters multiplicatively, these effects are naturally interpreted in percentage terms.

This distinction is central to the contribution of the paper. Forward guidance may have modest or even negligible effects on expected yields, while still exerting economically meaningful effects through the uncertainty channel. By jointly estimating location and scale responses, the model allows for such outcomes and makes it possible to evaluate whether forward guidance primarily operates by shifting expectations, by stabilizing markets, or by trading off mean and variance effects across maturities and horizons.

3.2 A dynamic location-scale model

To trace the dynamic responses of both location and scale parameters, I follow Frangiamore et al. (2025) and estimate the location–scale model within a local projections framework. Rather than imposing a parametric dynamic structure, local projections estimate horizon-specific coefficients directly for each forecast horizon h. This approach offers two advantages. First, it is robust to misspecification of the underlying data-generating process. Second, it allows the dynamic responses of conditional means and conditional volatilities to differ flexibly across horizons.

Frangiamore et al. (2025) apply this methodology to study how fiscal consolidations reshape the predictive distribution of public debt, showing that policy actions can have distinct and persistent effects on both the location and dispersion of future outcomes. Their framework provides a natural template for the present analysis, which applies the same dynamic location–scale logic to the U.S. term structure in response to forward guidance innovations.

I estimate this dynamic model along the US term structure as

$$r^m_{t+h} - r^m_{t-1} = \beta^h_0 + \beta^h_1 FG_t + \beta^h_2 MP_t + \beta^h_3 X_t + \exp(\gamma^h_0 + \gamma^h_1 FG_t + \gamma^h_2 MP_t + \gamma^h_3 X_t)\, \varepsilon_t,$$

for horizons $h = 0 : 30$ with robust standard errors. FG_t denotes the forward guidance dummy, MP_t is the monetary policy shock, and X_t is the matrix of covariates described in the data section. Horzion $h = 0$ yields the contemporaneous responses, horizons $h = 1 : 30$ trace dynamic level changes and the associated evolution of uncertainty. I estimate this model along the nominal, TIPS, and breakeven yield curves as dependent variables. In alternative specifications, the baseline FG_t dummy is replaced by alternative definitions of forward guidance innovations.[3] In addition, some specifications augment the baseline with a central bank information shock (CBI_t) alongside the monetary policy shock.

4 Results

I assess the impact of Fed forward guidance on the U.S. nominal, real, and breakeven inflation term structures. The nominal term structure includes maturities from one month to twenty years, while the real and breakeven inflation term structures include maturities from two years to twenty years. The coefficients are estimated on a sample spanning August 2001 to December 2019, yielding over 4,000 daily observations for each maturity. This section is organized as follows. First, I discuss the contemporaneous responses along the nominal term structure. I then examine the dynamic responses of forward guidance obtained from the local projections estimation of the location–scale models. Next, I analyze the transmission of forward guidance to real yields and breakeven inflation rates in a dynamic setting. This is followed by a discussion of the dynamic effects of monetary policy shocks and central bank information shocks on the nominal term structure. Finally, I provide a brief overview of robustness exercises.

4.1 Contemporaneous responses

Table 1 reports the contemporaneous location–scale estimates of the effects across the U.S. nominal term structure. The location estimates indicate that the immediate effects of forward guidance are modest overall, peaking at around a 1 basis point reduction in yields. While the magnitude of the point estimates tends to increase with maturity, many of the forward guidance coefficients are not statistically significant. By contrast, monetary policy shocks significantly raise yields across most of the term structure, with the

[3] As discussed in the data section. When estimating complementary dummies (such as ZLB and non-ZLB forward guidance) they are included jointly in the same specification rather than estimated in separate regressions.

exception of the one-month and twenty-year maturities. The impact of monetary policy shocks is strongest at medium maturities and more muted at both the short and long ends of the curve. Overall, the location effects associated with monetary policy shocks are substantially larger than those of forward guidance.

The scale estimates tell a different story. For forward guidance, the scale coefficients are negative from the one-month to the two-year maturities and positive at longer maturities. A larger share of these coefficients are statistically significant than in the location equation of the model. Monetary policy shocks, on the other hand, raise uncertainty at the one-month maturity and tend to reduce it at longer maturities, although the statistical significance of these effects is weaker.

	N1M	N3M	N6M	N1Y	N2Y	N3Y	N5Y	N10Y	N20Y
Location (μ)									
(Intercept)	0.001	0.001***	0.001***	0.001*	0.000	-0.000	-0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
BRW	-0.027	0.168***	0.258***	0.667***	0.990***	1.046***	0.828***	0.286***	-0.073
	(0.045)	(0.048)	(0.037)	(0.059)	(0.074)	(0.086)	(0.096)	(0.095)	(0.087)
CISS	-0.021**	-0.025***	-0.023***	-0.014**	-0.010	-0.007	-0.005	-0.003	-0.001
	(0.010)	(0.007)	(0.005)	(0.005)	(0.006)	(0.007)	(0.007)	(0.007)	(0.006)
FG	-0.007	-0.004	-0.010***	-0.012**	-0.012	-0.009	-0.012	-0.016	-0.014
	(0.005)	(0.003)	(0.003)	(0.006)	(0.007)	(0.010)	(0.015)	(0.016)	(0.013)
SP500	0.285***	0.275***	0.435***	1.005***	1.520***	1.732***	1.870***	1.833***	1.629***
	(0.084)	(0.054)	(0.044)	(0.053)	(0.067)	(0.073)	(0.077)	(0.076)	(0.072)
USD	0.005***	0.006***	0.010***	0.020***	0.029***	0.032***	0.032***	0.026***	0.020***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
WTI	0.000	0.000	0.000	0.001**	0.002***	0.003***	0.003***	0.004***	0.004***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Scale (σ)									
(Intercept)	-3.232***	-3.739***	-3.873***	-3.645***	-3.356***	-3.247***	-3.175***	-3.175***	-3.231***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
BRW	8.539***	-0.559	-5.202***	-2.224*	-2.933**	-2.575**	-2.008	-2.263*	-2.561**
	(1.258)	(1.258)	(1.258)	(1.258)	(1.258)	(1.258)	(1.258)	(1.258)	(1.258)
CISS	2.568***	3.074***	2.401***	1.923***	1.533***	1.417***	1.309***	1.236***	1.221***
	(0.066)	(0.066)	(0.066)	(0.066)	(0.066)	(0.066)	(0.066)	(0.066)	(0.066)
FG	-0.783***	-0.702***	-0.730***	-0.187	-0.169	0.079	0.377**	0.455***	0.259
	(0.163)	(0.163)	(0.163)	(0.163)	(0.163)	(0.163)	(0.163)	(0.163)	(0.163)
SP500	0.103	-2.946***	-3.608***	-2.750***	-2.662***	-2.700***	-2.412**	-2.247**	-2.824***
	(0.955)	(0.955)	(0.955)	(0.955)	(0.955)	(0.955)	(0.955)	(0.955)	(0.955)
USD	-0.224***	-0.201***	-0.066***	-0.031	-0.040	-0.040	-0.040	-0.039	-0.027
	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
WTI	-0.024***	0.010	0.038***	-0.013*	-0.018**	-0.014*	-0.006	0.004	0.008
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Cox–Snell R^2	0.290	0.422	0.402	0.330	0.313	0.307	0.294	0.271	0.247
Observations	4417	4417	4417	4417	4417	4417	4417	4417	4417

Table 1: Location-scale regressions across the US nominal term structure

Interpreting these results in a narrow announcement-day window, monetary policy shocks appear to increase uncertainty at very short maturities, while reducing uncertainty further out the curve. Forward guidance, by contrast, has a pronounced contemporaneous effect in reducing uncertainty at short maturities, but this is accompanied by higher conditional volatility at longer horizons. Forward guidance redistributing uncertainty across the term structure could be a short run disturbance that reflects portfolio adjustments, rather than the full propagation of policy communication. As shown in the next subsection, the dynamic effects point to a persistent stabilizing effect rather than broadly applies to all of the term structure.

4.2 Dynamic responses

Hubert and Labondance (2018) tests whether the effects of forward guidance are offset after announcement days and finds that this is not the case: forward guidance has persistent effects, particularly at longer maturities. For this reason, I also estimate the location–scale models in a dynamic setting using the local projections method of Jordà and Taylor (2025). The left panel of Figure 1 reports the dynamic responses of the location coefficients, while the right panel reports the corresponding scale coefficients for forward guidance over a 30-day horizon. Regarding location effects, the findings are broadly consistent with the earlier paper. Fed forward guidance persistently lowers long-term yields. While the effect on short- and medium-maturity rates are offset following the announcement, yields at the five-, ten-, and even twenty-year maturities remain depressed by approximately 5–10 basis points over the 30-day window.

More importantly, the scale coefficients indicate that forward guidance compresses uncertainty around bond yields across the entire term structure. As suggested by the contemporaneous results, this uncertainty-reduction channel is strongest at short maturities and gradually weakens as maturity increases. These results show why looking at the dynamic responses is crucial. The announcement-day results suggest that depressing the yield curve may involve a short-run mean–variance tradeoff, with uncertainty temporarily shifting toward longer maturities. However, the modest increase in conditional volatility at the long end dissipates within a few days after the announcement, and although the effect is smaller than at short maturities, uncertainty at long maturities is ultimately reduced as well.

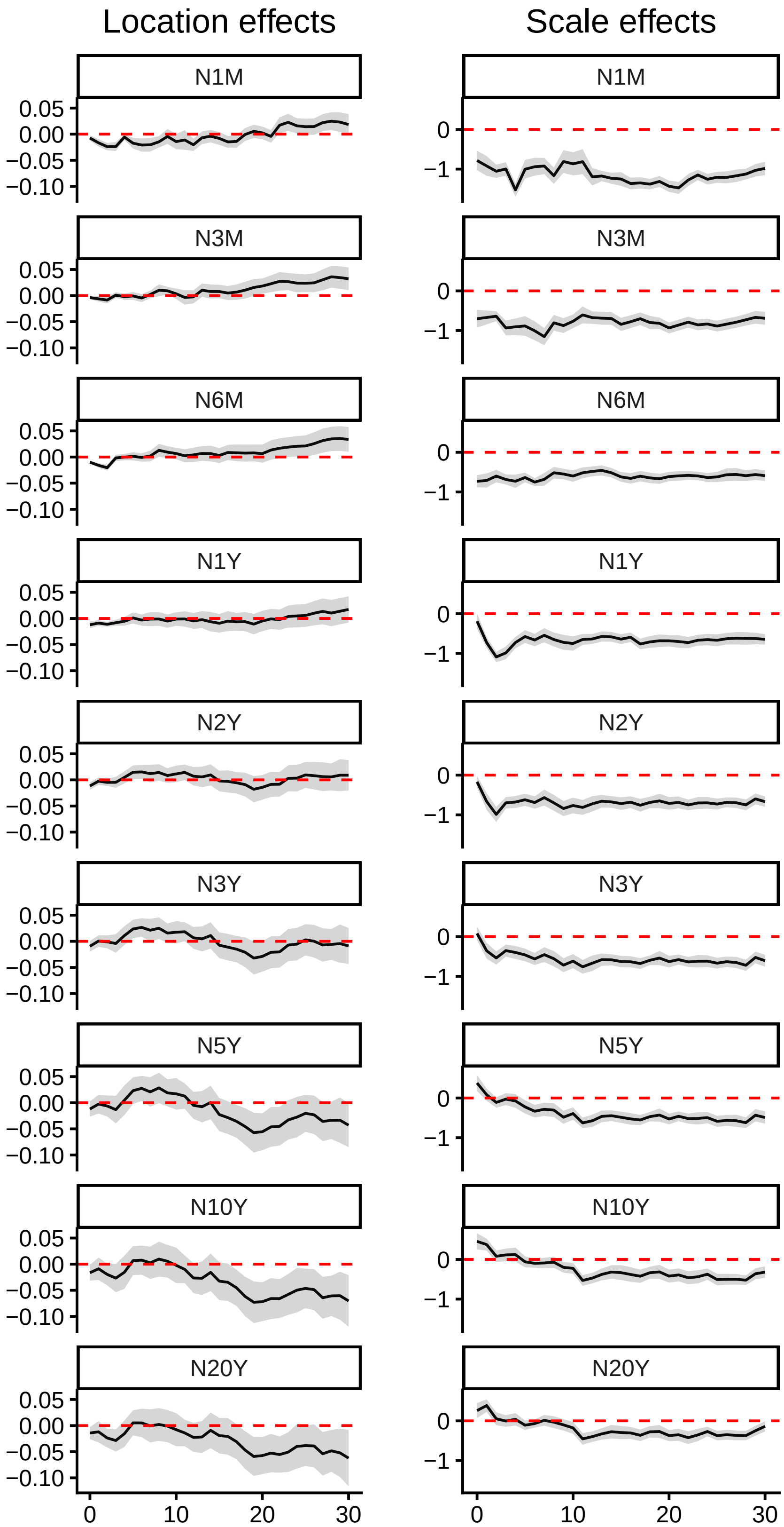

Figure 1: Dynamic responses of the nominal term structure to forward guidance

Notes: The solid lines indicate the coefficients β and γ at horizon h for the location and scale effects respectively. The shaded areas correspond to a one standard deviation confidence interval.

4.3 Transmission to real yields and expected inclation

Findings from the nominal term structure raise two related questions: Are these results merely an artifact of the fact that the majority of forward guidance events occurred between 2009 and 2015, when policy rates were near the ZLB? Is there any meaningful transmission of forward guidance to real yields and, subsequently, to expected inflation? By addressing the second question, the analysis also provides some indirect evidence on the first.[4] The TIPS yields (and consequently the breakeven inflation curve) are available starting at the two-year maturity. Since breakeven inflation is mechanically defined as the difference between nominal and TIPS yields, a stronger response of real yields to forward guidance directly implies an effect on inflation expectations. Moreover, negative scale coefficients for real yields would suggest that markets assign credibility to the central bank's commitment to its stated policy path and inflation objective.

Figure 2 compares the location and scale coefficients across nominal yields, TIPS yields, and breakeven inflation rates. On the location side, the impact of forward guidance at shorter (two and three-year) maturities is larger for TIPS yields than for nominal yields. As a result, forward guidance effectively raises short-run expected inflation. The shape of these responses is broadly consistent with recent findings by Jarociński (2024), as the effects are delayed but pronounced. At longer maturities, the responses of TIPS yields converge toward those of the nominal curve, indicating that long-run inflation expectations remain well anchored. In line with the findings of Galati and Moessner (2021) for policy rate shocks, forward guidance does not unanchor long-run inflation expectations either.

Turning to scale effects, the results closely mirror those observed for the nominal term structure. Forward guidance persistently reduces uncertainty across all three yield curves. This uncertainty-reduction channel is strongest at shorter maturities and gradually weakens as maturity increases. At the ten- and twenty-year maturities, the magnitude of the scale effects is virtually identical across nominal yields, TIPS yields, and breakeven inflation rates. At the two, five and three-year maturities, the uncertainty channel appears to be slightly smaller for TIPS yields and breakeven rates than for nominal yields, and it also tends to fade out over the 30-day horizon.

I interpret these patterns as empirical evidence supporting central bank credibility. Forward guidance reduces the conditional volatility of real interest rates and expected inflation. The uncertainty stabilization is front-loaded and happens mostly around announcement for the shortest maturity. Uncertainty reduction around expected inflation fades as (the location of) expected inflation rises. The location-scale response pattern is quite similar for the three year maturity. On the five-year and longer maturities, there is some evidence of a short-run mean–variance tradeoff around the announcement; however, this effect dissipates over time, and the scale responses turn negative within the 30-day window. The similarity of the scale

[4] In the robustness exercises, I explicitly test whether the effects of forward guidance conducted during the ZLB differ from those observed during the subsequent normalization period.

responses across the TIPS and breakeven term structures further suggests that these findings are not merely an artifact of the ZLB.

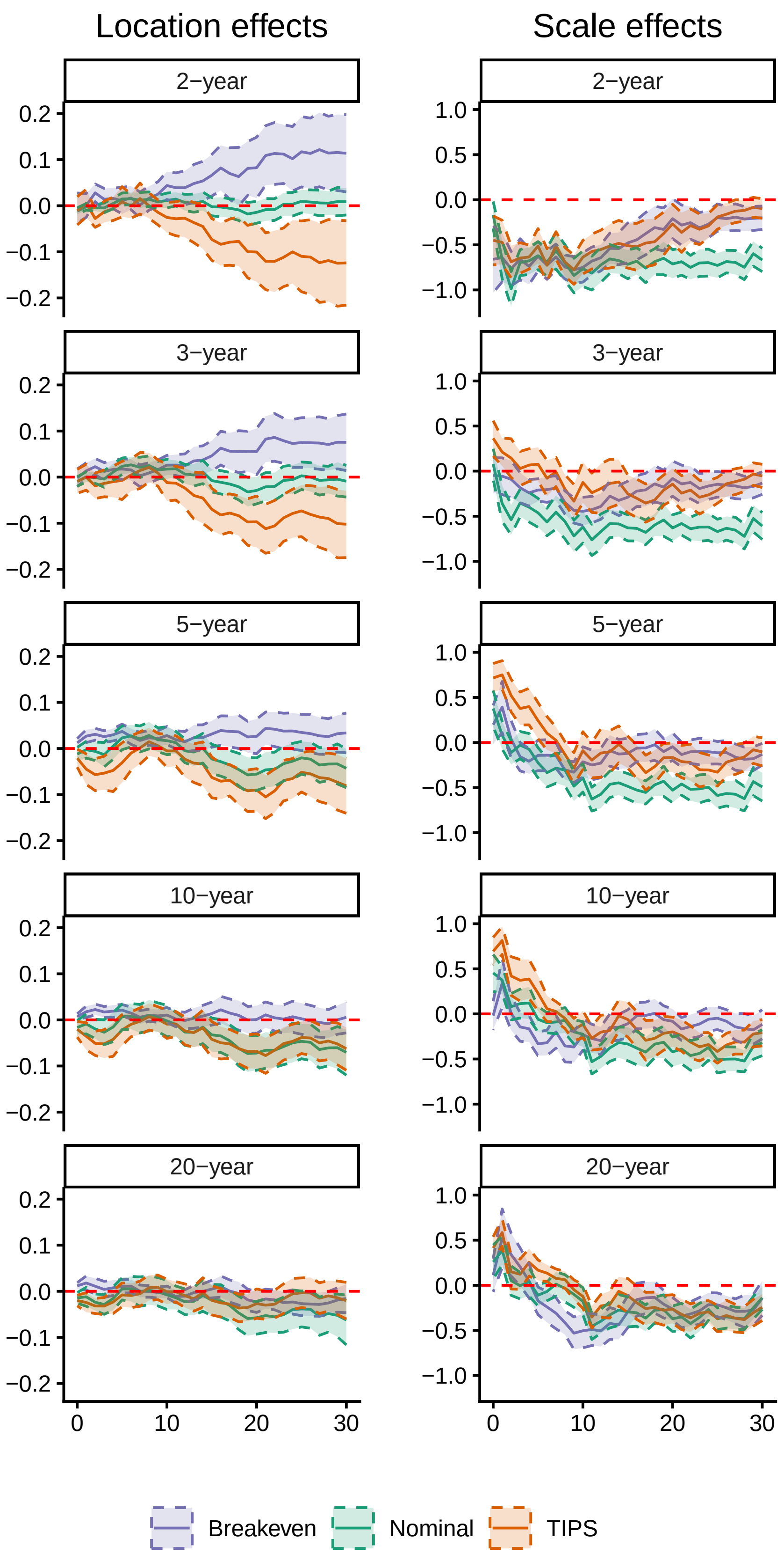

Figure 2: Dynamic responses of real yields and breakeven inflation rates to forward guidance

Notes: The solid lines indicate the coefficients β and γ at horizon h for the location and scale effects respectively. The shaded areas correspond to a one standard deviation confidence interval.

4.4 Monetary policy shocks and central bank information

So far, the analysis has focused on forward guidance without explicitly addressing monetary policy shocks. However, each forward guidance announcement (and, more generally, each FOMC meeting) also entails a monetary policy shock. While these shocks are not the primary focus of this paper, it is nevertheless informative to examine how their effects compare to those of forward guidance. Moreover, the forward guidance dummy is designed to capture a very specific component of the monetary policy toolkit: Odyssean-type guidance about the future course of the policy rate. Beyond this, policy statements may also convey other forms of information revealed by the central bank, commonly referred to as central bank information effects or central bank information shocks. To study how the term structure (in particular its conditional volatility) responds to monetary policy shocks, I re-estimate the location–scale local projection regressions by replacing the Bu et al. (2021) shock series with the separate monetary policy surprise and central bank information shock series of Jarociński and Karadi (2020).

Figure 3 presents the estimated location and scale coefficients for both series. Consistent with the findings in Jarociński and Karadi (2020), both shocks raise interest rates along the nominal term structure. Their effects are less persistent at short maturities, weaker at the long end, and show the strongest persistence at medium-term maturities. The scale coefficients reveal a particularly interesting contrast. Standard monetary policy surprises increase uncertainty at short (three-month to one-year) maturities while having little to no effect on uncertainty at longer horizons. Central bank information shocks, by contrast, act as uncertainty mitigators. The estimated scale coefficients are negative, and resemble the scale coefficients estimated for forward guidance. The impact of central bank information shocks is also particularly meaningful on the distribution of shorter maturities and it fades out as maturity increases. Since central bank information is typically conveyed through communication about the expected future state of the economy, these results reinforce the importance of policy communication. In particular, information shocks appear to offset (or in some cases reverse) the uncertainty generated by standard policy rate surprises.[5]

[5] Running the regression using the single-factor ("total") shock from Jarociński and Karadi (2020) yields results similar to the combined effects of the two shocks shown here.

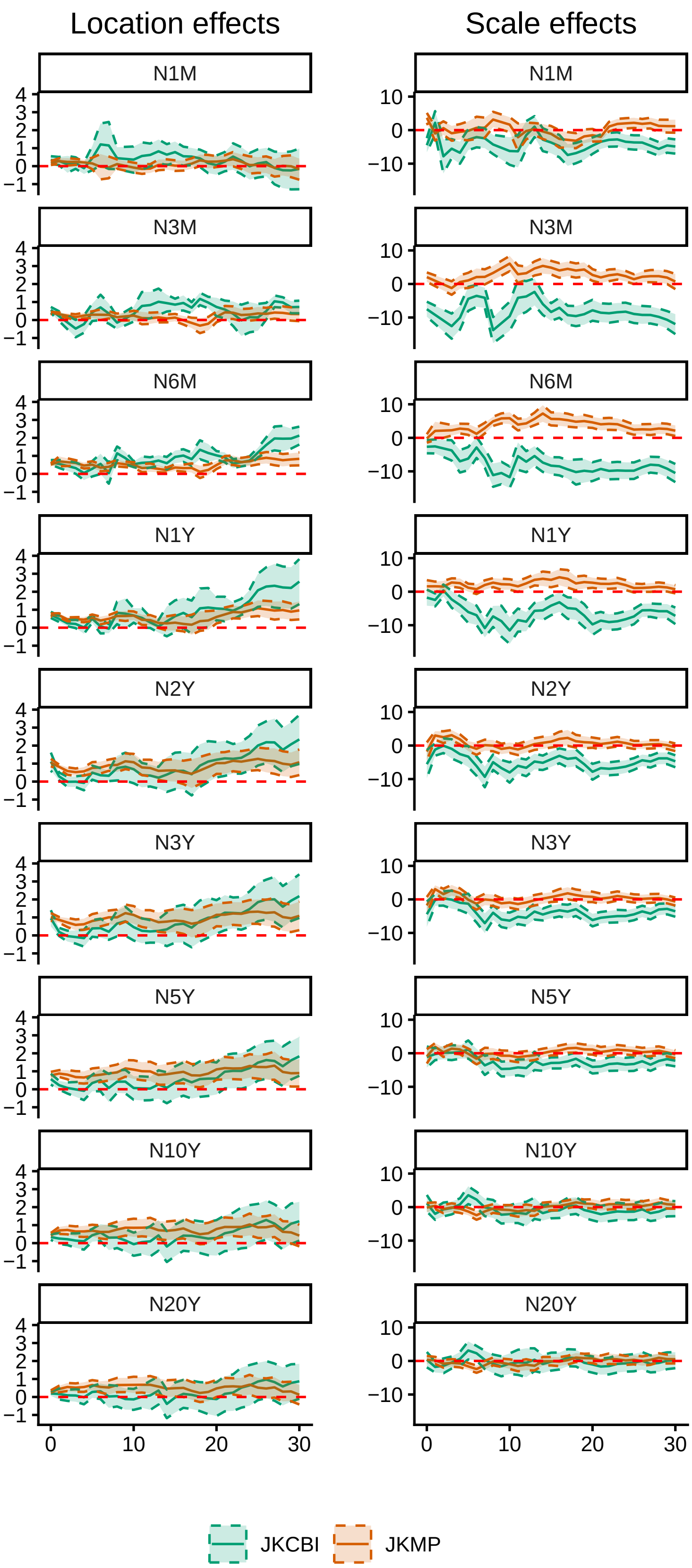

Figure 3: Dynamic responses of the nominal term structure to monetary policy surprises and central bank information shocks

Notes: The solid lines indicate the coefficients β and γ at horizon h for the location and scale effects respectively. The shaded areas correspond to a one standard deviation confidence interval.

4.5 Robustness

In this subsection, I give a brief overview of the robustness exercises carried out to validate the results. For the sake of brevity, the corresponding figures are not reported in the main body of the paper; all of them are instead presented in the Appendix. I first address potential concerns related to ZLB. Since the analysis focuses primarily on a conditional volatility channel of a policy tool that was used predominantly when interest rates were constrained near zero, it is important to verify that the estimated scale coefficients are not simply capturing reduced variation in interest rates during that period. To this end, I split the FG dummy into two separate indicators. All of the forward guidance announcements covered by the FG dummy that occurred between December 16, 2008 and December 16, 2015 are assigned to a dummy labelled FG^{ZLB}, while the remaining announcements are assigned to a dummy labeled FG^{NZLB}. The models are then re-estimated with both dummies included jointly. Figure 4 in the Appendix shows that the scale effects are similar across the two subsamples, reinforcing the interpretation that the earlier findings reflect a causal relationship rather than a ZLB-specific artifact.

Second, one might argue that the baseline FG dummy is misspecified and contains potentially confounding events. The universe of forward guidance announcements in the sample can largely be characterized as communicating a dovish monetary policy stance. As discussed in the data section, however, the final three entries in the forward guidance timeline represent a departure from this pattern. It is therefore possible that the estimated coefficients (particularly in the location equation) are attenuated by including these observations. Another possible concern is that some announcement days captured by the FG dummy also coincide with other policy actions beyond forward guidance. Along this motivation, Hubert and Labondance (2018) include only two events from the ECB's forward guidance timeline where the only action taken was purely forward guidance. To address these issues, I construct two additional dummy variables. FG^{D} includes all events from the baseline FG dummy except the final three entries (June 13, 2018; September 26, 2018; and January 30, 2019), in order to address the potential confounder related to changes in policy tone. FG^{PURE} takes a value of 1 only on dates included in the baseline FG dummy that did not coincide with any other policy action. Specifically, I exclude December 16, 2018; September 13, 2012; December 12, 2012; December 16, 2015; March 15, 2017; June 13, 2018; and September 26, 2018, as these meetings involved additional policy decisions such as changes to the target range or actions related to the LSAP program. The results obtained using these alternative definitions are reported in Figures 5 and 6 in the Appendix. The results obtained with these two modifications closely mirror the earlier estimates both for the location and the scale coefficients.

Finally, I address robustness with respect to the control variables, focusing in particular on monetary policy is controlled for. As discussed in the previous subsection, central bank information shocks have effects on conditional volatility that are similar in nature to those of forward guidance. This raises the possibility that the forward guidance dummy may partially capture a central bank information effect and accounting for a it in the controls could attenuate the estimated impact of forward guidance. To examine this concern, I plot the estimated γ coefficients from regressions that explicitly include both the monetary policy surprise and the central bank information shock of Jarociński and Karadi (2020). These results are shown in Figure 7 in the Appendix. The scale coefficients are near identical irrespective of whether or not one accounts for the central bank information shocks. For the most part, this holds for the location coefficients as well, exception being the medium term, where accounting for it appears to sharpen the identification slightly.

5 Conclusions

This paper revisits the effects of Federal Reserve forward guidance on the U.S. yield curve from a distributional perspective. Using a dynamic location–scale local projections framework, I show that forward guidance innovations have modest contemporaneous effects on the conditional mean of yields, but significant and persistent effects on conditional volatility. In the nominal term structure, forward guidance lowers long-maturity yields over a 30-day window and, more importantly, compresses uncertainty across maturities. The largest and most persistent volatility reductions are concentrated at the short end. Extending the analysis to TIPS yields and breakeven inflation rates yields a consistent message: forward guidance stabilizes the conditional volatility of real rates and expected inflation as well, while leaving the distribution long-run inflation expectations unchanged. Taken together, these results show that forward guidance has a secondary channel. It can not only change the mean (location) of expectations of interest rates at various maturity, but also has a volatility (scale) channel that reduces uncertainty around these rates.

The uncertainty channel is robust to alternative definitions of forward guidance events, to separating ZLB and post-ZLB episodes, and to tighter "pure communication" classifications that exclude meetings with concurrent policy actions. The forward guidance effects remain stable when controlling not only for monetary policy action, but information disclosed by the central bank as well. In comparison to forward guidance, monetary policy shocks appear to increase uncertainty at short maturities. This however is offset by central bank information, which, much like the forward guidance events, lower the conditional volatility of expected interest rates across the term structure.

Altogether, these findings suggest that central bank communication plays a powerful stabilizing role in bond markets, with potential transmission to the real economy through inflation expectations. Natural extensions of this work include: i) extending the sample to incorporate forward guidance episodes from the 2020s; ii) expanding the analysis to a panel of economies to assess these effects across countries and investigate the possibility of spillovers; and iii) examining whether monetary policy also exhibits scale effects on macroeconomic aggregates.

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7 Appendix

7.1 Data descriptives

Statistic	Mean	St. Dev.	Min	Pctl(25)	Median	Pctl(75)	Max
N1M	1.297	1.486	0.000	0.070	0.900	1.968	5.270
N3M	1.354	1.508	0.000	0.100	0.950	2.010	5.190
N6M	1.466	1.536	0.020	0.160	1.040	2.130	5.330
N1Y	1.599	1.495	0.083	0.310	1.212	2.347	5.374
N2Y	1.827	1.421	0.158	0.635	1.486	2.651	5.324
N3Y	2.080	1.340	0.303	0.972	1.667	2.910	5.262
N5Y	2.550	1.216	0.586	1.589	2.332	3.439	5.201
N10Y	3.343	1.133	1.386	2.332	3.215	4.346	5.728
N20Y	3.870	1.095	1.798	2.852	3.979	4.848	6.086

Table 2: Summary Statistics: US Nominal Term Structure

7.2 Robustness check results

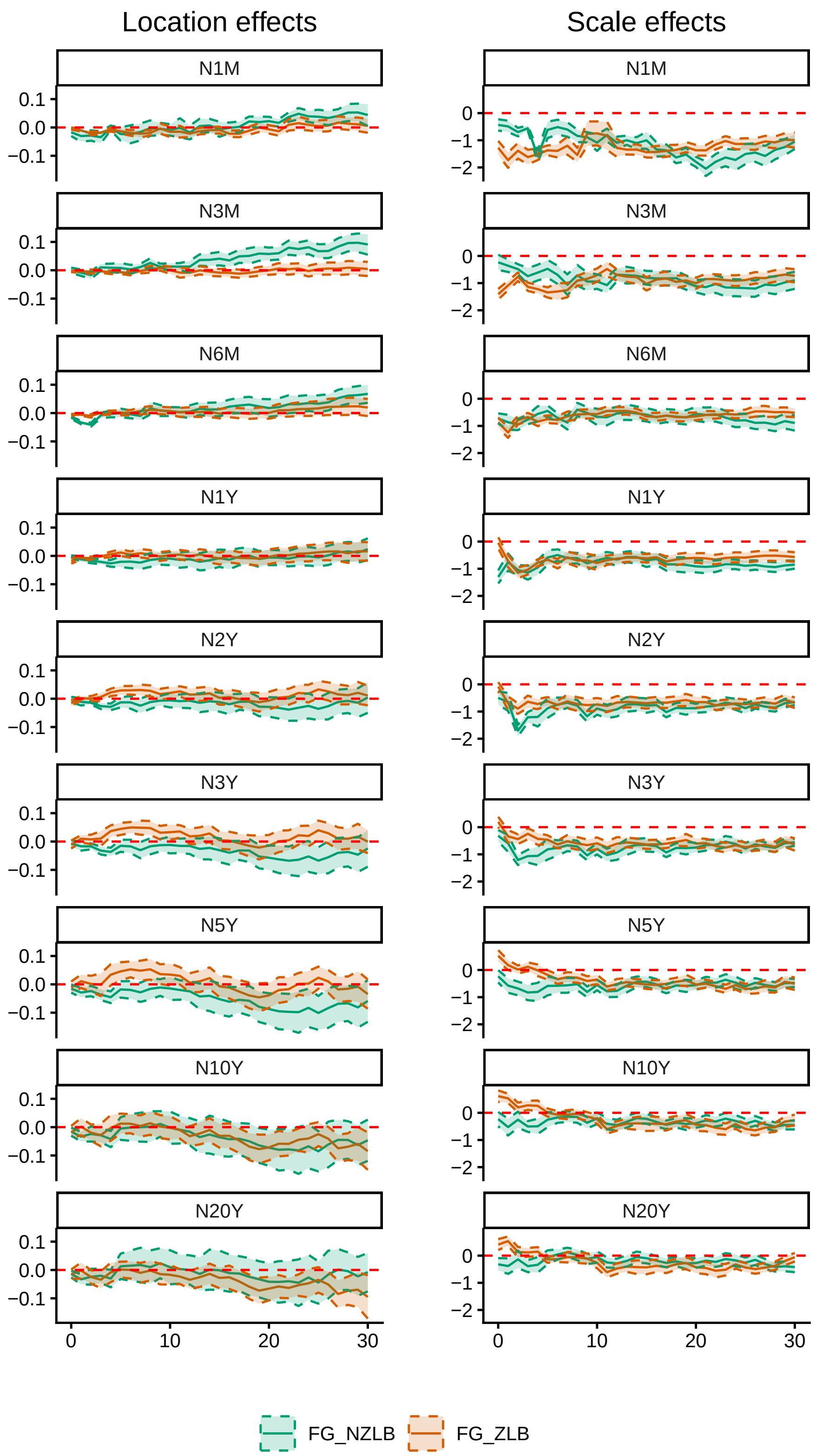

Figure 4: Effect of forward guidance: During the ZLB and during the normalization of interest rates

Notes: The solid lines indicate the coefficients β and γ at horizon h for the location and scale effects respectively. The shaded areas correspond to a one standard deviation confidence interval.

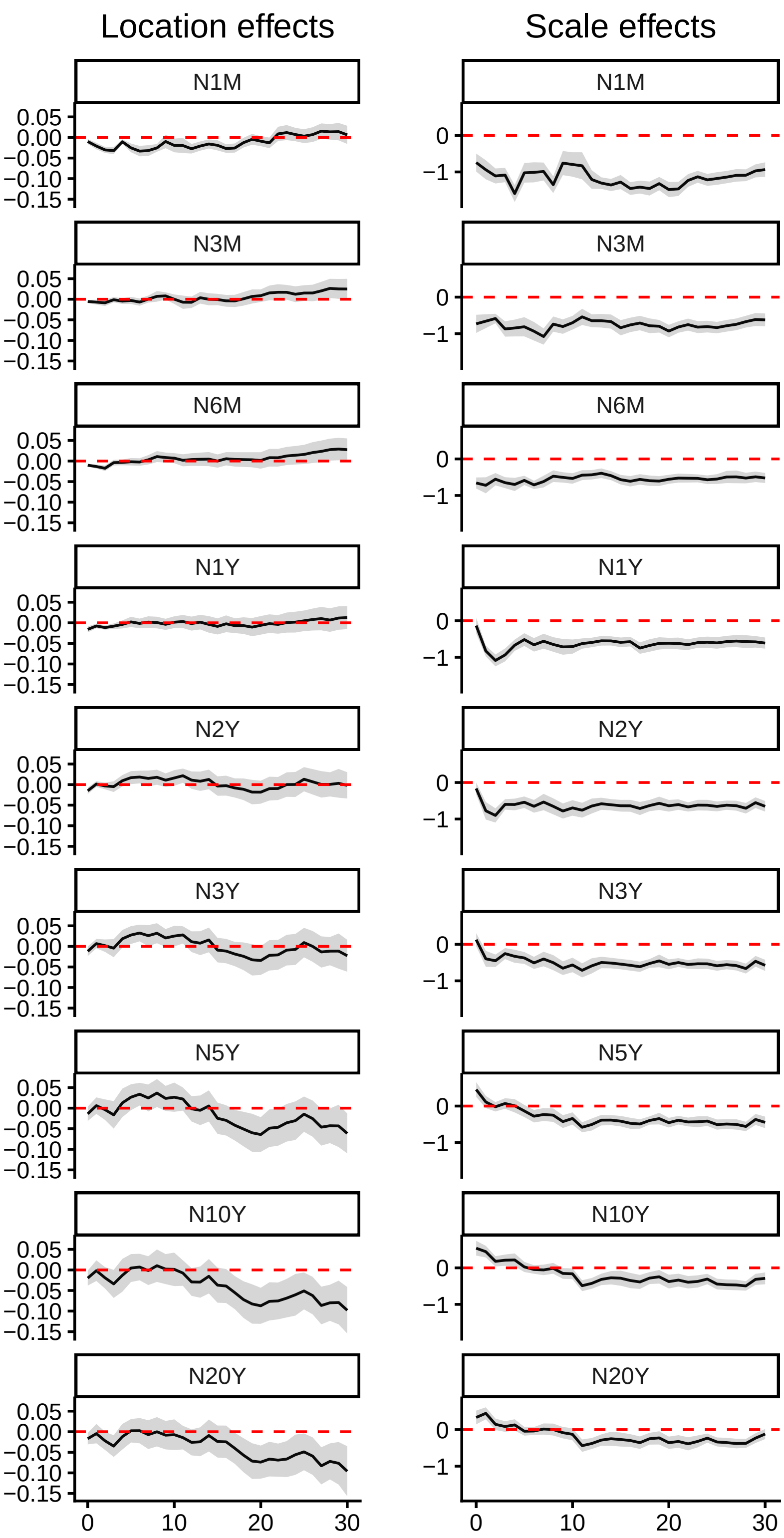

Figure 5: Effect of forward guidance: Only explicitly dovish language events

Notes: The solid lines indicate the coefficients β and γ at horizon h for the location and scale effects respectively. The shaded areas correspond to a one standard deviation confidence interval.

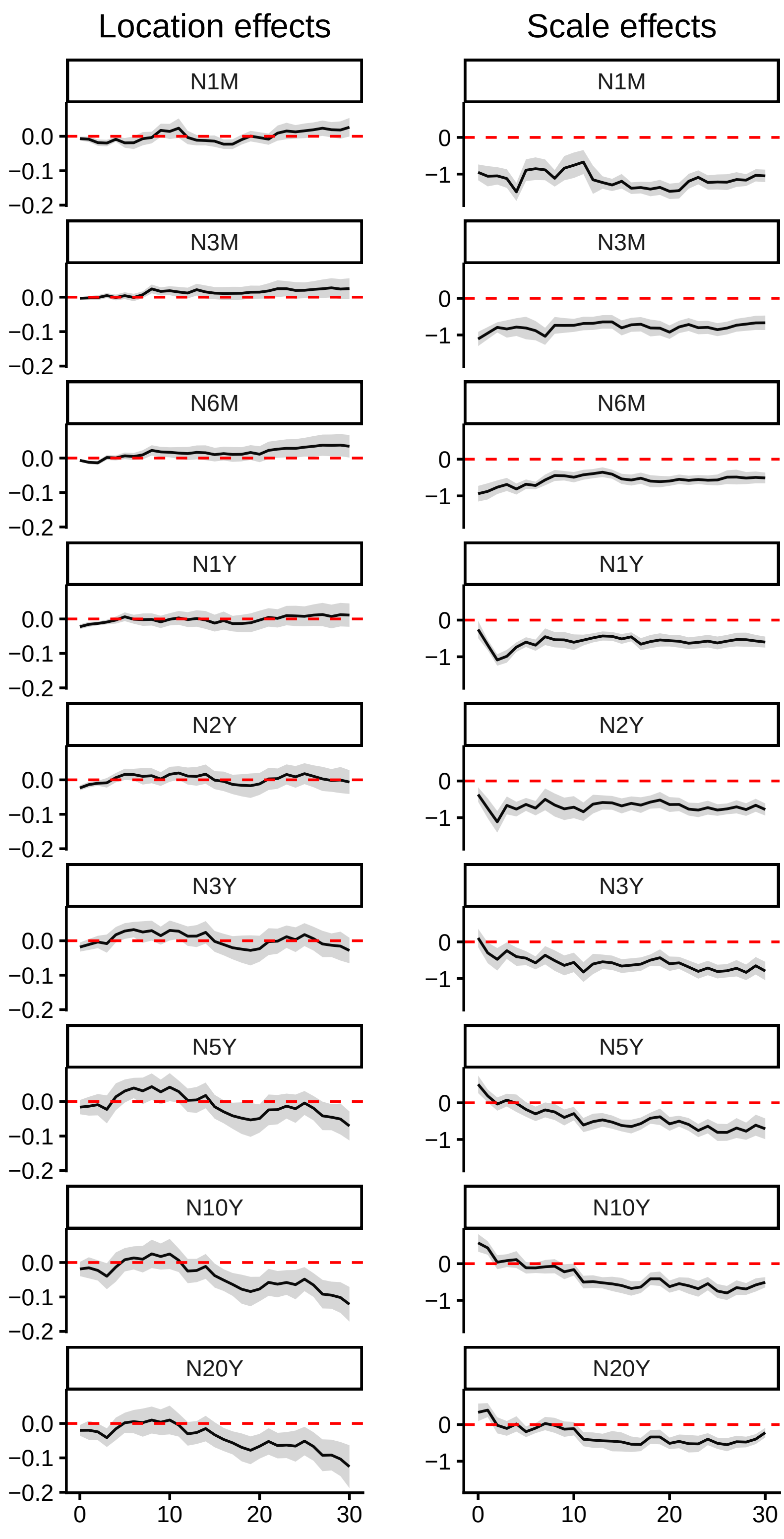

Figure 6: Effect of forward guidance: Excluding events that contain non-forward guidance action

Notes: The solid lines indicate the coefficients β and γ at horizon h for the location and scale effects respectively. The shaded areas correspond to a one standard deviation confidence interval.

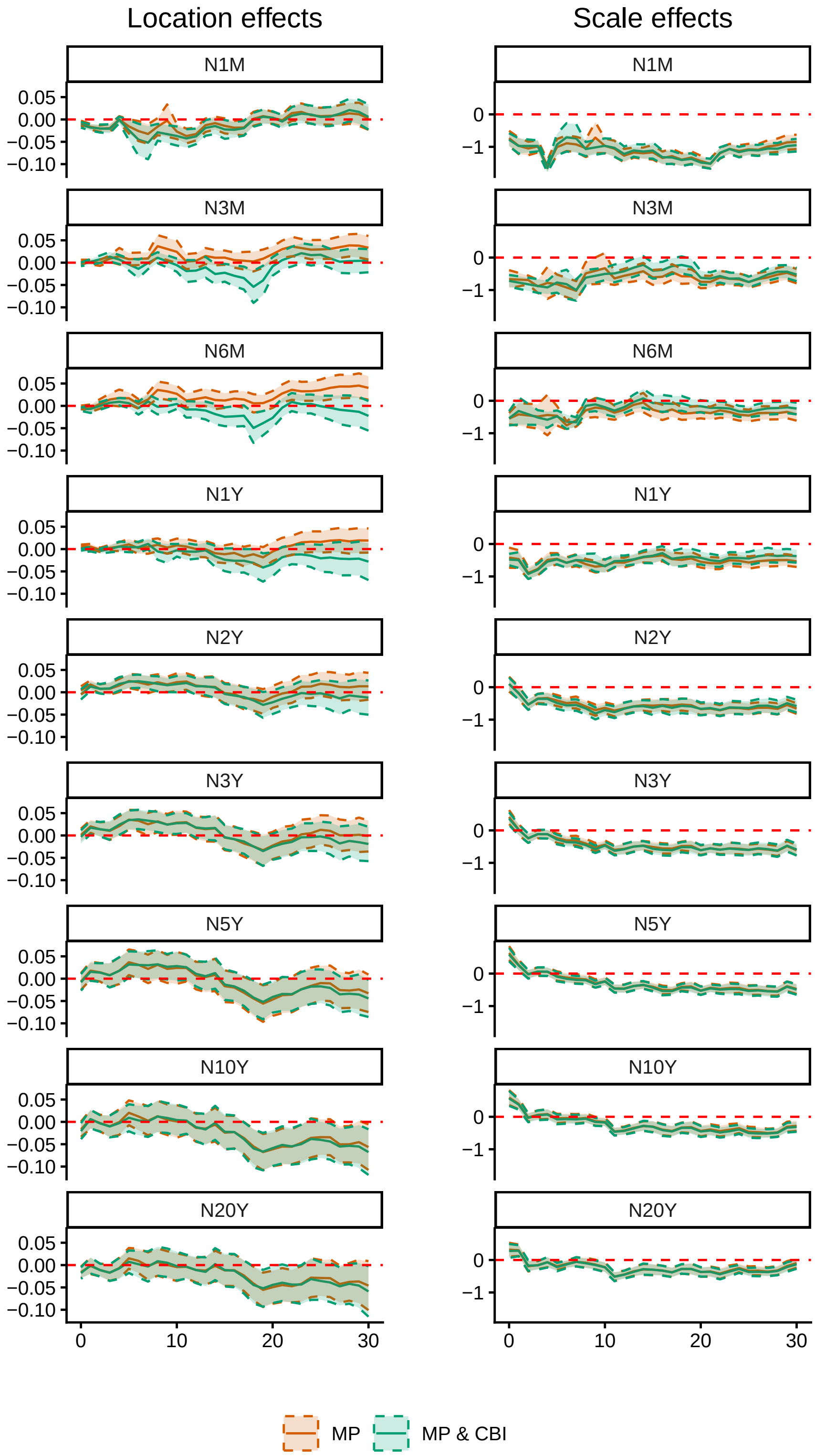

Figure 7: Effect of forward guidance: With and without accounting for central bank information shocks

Notes: The solid lines indicate the coefficients β and γ at horizon h for the location and scale effects respectively. The shaded areas correspond to a one standard deviation confidence interval.