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# A Note on the Reactions of Real Yields to Different Types of Forward Guidance in the US

Frederik Neugebauer
*WHU - Otto Beisheim School of Management*

Ralf Fendel
*WHU - Otto Beisheim School of Management*

Nils Niederhagen
*WHU - Otto Beisheim School of Management*

## Abstract

We analyze the effectiveness of forward guidance in the United States in form of an event study. The results confirm that in general forward guidance has a significant adverse effect on US Treasury Inflation-Protected Securities yields. However, the parallel announcement of asset purchases dampens the effectiveness of forward guidance. By additionally decomposing forward guidance into three types we find that date-based is the most effective form while qualitative-based and threshold-based forward guidance show only minor impacts.

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**Contact:** Frederik Neugebauer - frederik.neugebauer@whu.edu, Ralf Fendel - ralf.fendel@whu.edu, Nils Niederhagen - nils.niederhagen@whu.edu.
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## 1. Introduction

Since the arrival at the zero lower bound, forward guidance (FG) has become an important monetary policy tool. Many studies discuss the theoretical implications (Woodford 2013, Del Negro et al. 2012, Campbell et al. 2016, McKay et al. 2015) and recent empirical research (Campbell et al. 2012, Moessner 2015, Raskin 2013) suggests significant effects of FG in the United States. This study is an explicit extension of Moessner (2015). By using the same data set and the identical methodology we additionally distinguish between qualitative-based FG, date-based FG and threshold-based FG to provide a more type-specific view on the effectiveness of FG.
The paper is structured as follows. Section 2 briefly describes the methodology and the data. Section 3 presents the empirical results, while the final section 4 concludes.

## 2. Methodology and Data

The methodology is identical to the one applied by Moessner (2015). We use the same data sources but we updated the data set. The sample period runs from June 1, 2004 to June 30, 2016.[1] For that period, we examine the reaction of US Treasury Inflation-Protected Securities (TIPS) yields to FG announcements by the Federal Open Market Committee (FOMC). We formally test two hypotheses.

*Hypothesis 1: 'FG has a significant adverse effect on market expectations of future short-term interest rates and, thus, causes an immediate reduction in US yields.'*

This tests whether the relationship between FG and yield changes obtained by Moessner (2015) still holds in the updated data set:

$$y^m(t) - y^m(t-1) = \alpha + \beta \times d_{FG} + \sum_{j=1}^{11} \left(\gamma_j \times surprise_j(t)\right) + \varepsilon_t \quad (1)$$

$$y^m(t) - y^m(t-1) = \alpha + \beta_1 \times d_{FG}^{nap} + \beta_2 \times d_{FG}^{wap} + \sum_{j=1}^{11} \left(\gamma_j \times surprise_j(t)\right) + \varepsilon_t \quad (2)$$

where $y^m(t) - y^m(t-1)$ represents the daily change in yields, i.e. TIPS forward, zero-coupon and par rates, respectively, with maturities from m = 2 to 10 years. The rates are taken from Gürkaynak et al. (2008). $d_{FG}$ is a dummy variable taking the value of one on days when FG is provided, and zero otherwise. Similarly, $d_{FG}^{wap}$ and $d_{FG}^{nap}$ are dummy variables differentiating whether asset purchase announcements happened or not. All relevant FG events are deduced from FOMC press releases and depicted in Table 1. The $surprise_j(t)$ variable takes the normalized surprise value measured through the difference between actual realizations and market expectations of each macroeconomic indicator on release dates provided by Bloomberg database.

[1] Due to public holidays the dates 09/06/2010, 02/20/2012 and 11/12/2012 are excluded from the data set. Furthermore, the dates 11/24/2011, 01/02/2012, 05/28/2012, 07/04/2012 and 09/03/2012 are omitted, since the data source shows exactly the same values for the respective previous day, which is suspicious. For the sake of brevity, the present study concentrates on TIPS yields only, while the results of Moessner (2015) were additionally checked using breakeven forward rates. We were able to replicate those findings as well, but they are less significant for the extended sample period. The results are available upon request.

*Hypothesis 2: 'The Effectiveness of FG in the US increases from qualitative to date-based to threshold-based guidance.'*

Following Gersbach and Hahn (2013) as well as Filardo and Hofmann (2014), there is a trade-off in FG policy between flexibility and effectiveness. The more the central bank binds itself to its announcement, the stronger should be the effect of FG. Though, the monetary authority loses flexibility at the same time. Hence, qualitative-based guidance should be less effective than date-based guidance and threshold-based should be the most effective type of FG. This extends the analysis of Moessner (2015) substantially. To our best knowledge, it has not been tested in the empirical literature yet.

Accordingly, $d_{FG}$ is disentangled into the aforementioned three different types:

$$y^m(t) - y^m(t-1) = \alpha + \beta_1 \times d_{QB} + \beta_2 \times d_{DB} + \beta_3 \times d_{TB} + \sum_{j=1}^{11} \left(\gamma_j \times surprise_j(t)\right) + \varepsilon_t \quad (3)$$

where $d_{QB}$, $d_{DB}$ and $d_{TB}$ are dummy variables taking the value of one on days associated with qualitative-based, date-based and threshold-based guidance, respectively. The classification of the events can be found in Table 1. All other variables are identical to the notation before. Hypothesis 2 implies that $0 > \beta_1 > \beta_2 > \beta_3$ holds.

As in equation (2) before, we also control for announcements of asset purchases in order to isolate the pure effect of FG:

$$y^m(t) - y^m(t-1) = \alpha + \beta_{1,1} \times d_{QB}^{nap} + \beta_{1,2} \times d_{QB}^{wap} + \beta_{2,1} \times d_{DB}^{nap} + \beta_{2,2} \times d_{DB}^{wap} + \beta_{3,1} \times d_{TB}^{nap} + \beta_{3,2} \times d_{TB}^{wap} + \sum_{j=1}^{11} \left(\gamma_j \times surprise_j(t)\right) + \varepsilon_t \quad (4)$$

where $d_{QB}^{nap}$ represents a dummy variable taking the value of one on days when qualitative FG is provided, but no statement concerning asset purchases is made (and zero otherwise), $d_{QG}^{wap}$ a dummy variable taking the value of one on dates when qualitative FG as well as asset purchases are announced concomitantly. Analogously, the respective dummy variables are also separated for the other two forms of FG, namely date-based ($d_{DBG}^{nap}$ as well as $d_{DBG}^{wap}$) and threshold-based ($d_{TBG}^{nap}$ as well as $d_{TBG}^{wap}$) guidance.

## 3. Results

The regression output for hypothesis 1 is presented in Table 2.[2] Standard errors are adjusted through the Newey-West methodology. In general, FG reduces the yields. For instance, a FG announcement leads to a mean reduction of eight basis points for the six years TIPS forward rate (see column 6 in Table 2). Hence, hypothesis 1 can be confirmed. If additionally asset purchase announcements are considered (equation 2), it becomes clear that FG is only effective when there are no announcements at the same time. This is a confirmation of Moessner (2015)

[2] We show the output for TIPS forward rates. Since the results for TIPS zero coupon and par rates are similar they are omitted for parsimony reasons and available upon request.

for the updated sample period. However, compared to her findings we have lower and less significant estimators and the short-term yields are not affected anymore.[3] This might be due to the fact that our updated study includes twice as many events (12 instead of 6 FG announcements). FG is becoming more and more a conventional monetary policy tool and because of a decreasing surprise component less effective over time. If investors get used to FG and even expect it, they react less sensible.

Decomposing FG into its three distinct forms, results in Table 3 show that date-based FG is the only effective one while other forms can be neglected. Date-based FG is highly significant for all maturities whereas qualitative-based FG is only significant for the long-term yields and threshold-based FG not at all when asset purchases are not controlled for (equation 3). When accounting for asset purchase announcements (equation 4), date-based FG remains the dominant form. However, threshold-based FG now has a significant positive impact for long maturities.[4] This confirms the diluting effect of parallel asset purchases on FG announcements as $d_{TB}^{nap}$ shows the expected signs. The significantly negative estimator for the 2-years yield of $d_{TB}^{wap}$ and longer-term maturities displaying a positive sign suggest a rotation of the yield curve: While in the short-term the expected effects of FG shows up, inflation expectations seem to emerge in the long-term in reaction to the asset purchase announcements. This might also explain why $d_{DB}^{nap}$ has a stronger impact than $d_{DB}^{wap}$ for long maturities. In case of $d_{TB}^{wap}$, inflation expectations dominate the announcement effect so that the sign changes. Hence, hypothesis 2 is rejected.

This is an astonishing result as we expected for all measures to be effective but to a different extent. Moreover, it is contradicting the theoretical literature because threshold-based FG should represent the strongest effect as it is the least flexible form. One explanation might be that by date-based FG investors can precisely plan their investments and therefore directly adjust the expectations which, in turn, reduces the yields. Qualitative-based FG might be too vague to have a significant impact. Threshold-based FG seems to be imprecise, too, because nobody knows when the threshold is reached. Even if the threshold is precise, the time of action after passing the threshold is in turn vaguely formulated (e.g. FG from December 18th, 2013: 'maintain the current target range for the federal fund rate *well past the time* that the unemployment rate declines below 6-1/2 percent'). In contrast, date-based FG is concrete and should have an effect if the announcement is credible.

## 4. Conclusion

In order to study the effectiveness of FG in the US, two hypotheses were tested. First, the general effectiveness of FG in reducing yields along different maturities was assessed through evaluating its influence on US TIPS yields (zero coupon, par and forward rates) for the period 6/2004 to 6/2016. A significant adverse effect on all interest rate classes was detected. This suggests that FG is able to alter market expectations of future interest rates and, thus, directly reduces current yields.

Second, the effectiveness of the different types of FG in the US – from qualitative to date-based to threshold-based guidance – was evaluated. Against the initial intuition, only date-based FG had a worth noting impact on yields across the different types of guidance. Consequently, the

[3] Compare Table 2 with the left columns in Tables 2 and 4 from Moessner (2015, p. 2677-2678).

[4] To check for robustness, equations (3) and (4) were also conducted for a three and five-day interval. The results are similar but a little less significant and available upon request.

FOMC might want to tend towards date-based guidance and re-evaluate the appeal of the other forms as market participants appear to react on date-based FG only.
For future research it seems worthwhile to employ the applied methodology to other economies and their central banks performing FG (e.g., the EU, UK, Japan). Similar results would certainly increase the general validity of the presented findings.

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## Appendix

Table 1: Overview of FG Announcements applied by the FOMC

| Date | Statement | Relevant Language | FG Type | Specific Asset Purchase Announcement |
|---|---|---|---|---|
| 16.12.2008 | The Federal Open Market Committee decided today to establish a target range for the federal funds rate of 0 to 1/4 percent. […] the Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time […] | some time | qualitative | no |
| 18.03.2009 | […] the Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent and anticipates that economic conditions are likely to warrant exceptionally low levels of the federal funds rate for an extended period. | extended period | qualitative | yes |
| 09.08.2011 | The Committee currently anticipates that economic conditions - including low rates of resource utilization and a subdued outlook for inflation over the medium run - are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013. | mid-2013 | date-based | no |
| 25.01.2012 | […] the Committee […] currently anticipates that economic conditions […] are likely to warrant exceptionally low levels for the federal funds rate at least through late 2014. | late 2014 | date-based | no |
| 13.09.2012 | […] the Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the economic recovery strengthens. […] the Committee […] currently anticipates that exceptionally low levels for the federal funds rate are likely to be warranted at least through mid-2015. | mid-2015 | date-based | yes |
| 12.12.2012 | the Committee […] currently anticipates that this exceptionally low range for the federal funds rate will be appropriate 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. The Committee views these thresholds as consistent with its earlier date-based guidance. In determining how long to maintain a highly accommodative stance of monetary policy, the Committee will also consider other information[…] When the Committee decides to begin to remove policy accommodation, it will take a balanced approach consistent with its longer-run goals of maximum employment and inflation of 2 percent. | 6-1/2 percent | threshold-based | yes |

| | | | | |
|---|---|---|---|---|
| 18.12.2013 | […] now anticipates, based on its assessment of these factors, that it likely will be appropriate to maintain the current target range for the federal funds rate well past the time that the unemployment rate declines below 6-1/2 percent, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal. | well past 6-1/2 percent | threshold-based | yes |
| 19.03.2014 | [...] Committee continues to anticipate, based on its assessment of these factors, that it likely will be appropriate to maintain the current target range for the federal funds rate for a considerable time after the asset purchase program ends, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal […]The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run. | for some time after 6-1/2 percent | qualitative | yes |
| 29.10.2014 | However, if incoming information indicates faster progress toward the Committee's employment and inflation objectives than the Committee now expects, then increases in the target range for the federal funds rate are likely to occur sooner than currently anticipated. Conversely, if progress proves slower than expected, then increases in the target range are likely to occur later than currently anticipated. | sooner / later than expected (depending on the achievement of objective) | threshold-based | no |
| 28.01.2015 | In determining how long to maintain this target range, [...] will take into account a wide range of information […] Based on its current assessment, the Committee judges that it can be patient in beginning to normalize the stance of monetary policy. | patient | qualitative | no |
| 18.03.2015 | Consistent with its previous statement, the Committee judges that an increase in the target range for the federal funds rate remains unlikely at the April FOMC meeting. […] it will be appropriate to raise the target range for the federal funds rate when it has seen further improvement in the labor market and is reasonably confident that inflation will move back to its 2 percent objective over the medium term. | when it has seen further improvement in the labor market | threshold-based | no |
| 16.12.2015 | Given the economic outlook, and recognizing the time it takes for policy actions to affect future economic outcomes, the Committee decided to raise the target range for the federal funds rate to 1/4 to 1/2 percent. The stance of monetary policy remains accommodative after this increase, thereby supporting further improvement in labor market conditions and a return to 2 percent inflation. [...] the federal funds rate is likely to remain for some time below levels | some time | qualitative | no |

Note: Events were only included if there were new information, we do not consider repeating communications as FG. Of course, it depends on the interpretation of the formulation to which FG type one assigns a press release.
Source: Moessner (2015, p. 2675), Federal Open Market Committee (2016).

Table 2: Reactions of US TIPS forward rates to FG

| Equation (1) | 2 years | 3 years | 4 years | 5 years | 6 years | 7 years | 8 years | 9 years | 10 years |
|---|---|---|---|---|---|---|---|---|---|
| $d_{FG}$ | -0.0962 | -0.1116* | -0.1067* | -0.0966* | -0.0838* | -0.0705* | -0.0582 | -0.0481 | -0.0407 |
| constant | -0.0002 | -0.0000 | -0.0002 | -0.0003 | -0.0004 | -0.0004 | -0.0004 | -0.0004 | -0.0003 |
| Observations | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 |
| Adjusted R-squared | 0.016 | 0.019 | 0.017 | 0.014 | 0.011 | 0.008 | 0.006 | 0.005 | 0.005 |

| Equation (2) | 2 years | 3 years | 4 years | 5 years | 6 years | 7 years | 8 years | 9 years | 10 years |
|---|---|---|---|---|---|---|---|---|---|
| $d_{FG}^{nap}$ | -0.1006 | -0.1089 | -0.1030** | -0.0969*** | -0.0886*** | -0.0792*** | -0.0704*** | -0.0631*** | -0.0578*** |
| $d_{FG}^{wap}$ | -0.0901 | -0.1154 | -0.1117 | -0.0961 | -0.0772 | -0.0584 | -0.0414 | -0.0274 | -0.0171 |
| constant | -0.0002 | -0.0000 | -0.0002 | -0.0003 | -0.0004 | -0.0004 | -0.0004 | -0.0004 | -0.0003 |
| Observations | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 |
| Adjusted R-squared | 0.015 | 0.019 | 0.016 | 0.013 | 0.011 | 0.008 | 0.006 | 0.005 | 0.005 |

***, **, and * illustrate 1%, 5%, and 10% significance levels, respectively. Newey-West-adjusted standard errors. Coefficients of the eleven macroeconomic surprise variables are excluded to increase readability. Sample period: 06/02/2004 − 06/30/2016.

Table 3: Reactions of US TIPS forward rates to different types of FG

| Equation (3) | 2 years | 3 years | 4 years | 5 years | 6 years | 7 years | 8 years | 9 years | 10 years |
|---|---|---|---|---|---|---|---|---|---|
| $d_{QB}$ | -0.0542 | -0.1160 | -0.1499 | -0.1583 | -0.1508 | -0.1350 | -0.1161* | -0.0973* | -0.0807* |
| $d_{DB}$ | -0.1529*** | -0.1709*** | -0.1593*** | -0.1333*** | -0.1036*** | -0.0765*** | -0.0547*** | -0.0393*** | -0.0297** |
| $d_{TB}$ | -0.1055 | -0.0614 | -0.0135 | 0.0076 | 0.0141 | 0.0139 | 0.0108 | 0.0061 | 0.0005 |
| constant | -0.0002 | -0.0000 | -0.0002 | -0.0003 | -0.0004 | -0.0004 | -0.0004 | -0.0004 | -0.0003 |
| Observations | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 |
| Adjusted R-squared | 0.016 | 0.020 | 0.020 | 0.019 | 0.016 | 0.012 | 0.009 | 0.007 | 0.006 |

| Equation (4) | 2 years | 3 years | 4 years | 5 years | 6 years | 7 years | 8 years | 9 years | 10 years |
|---|---|---|---|---|---|---|---|---|---|
| $d_{QB}^{wap}$ | -0.1152 | -0.2265 | -0.2632 | -0.2598 | -0.2386 | -0.2099 | -0.1787 | -0.1479 | -0.1197 |
| $d_{QB}^{nap}$ | -0.0123 | -0.0401 | -0.0719 | -0.0886 | -0.0904 | -0.0835* | -0.0732* | -0.0627* | -0.0541* |
| $d_{DB}^{wap}$ | -0.1738*** | -0.1673*** | -0.1433*** | -0.1126*** | -0.0815*** | -0.0535*** | -0.0301*** | -0.0121*** | 0.0005 |
| $d_{DB}^{nap}$ | -0.1424*** | -0.1727*** | -0.1673*** | -0.1436*** | -0.1146*** | -0.0879*** | -0.0670*** | -0.0529*** | -0.0449*** |
| $d_{TB}^{wap}$ | -0.0231*** | 0.0226 | 0.0574*** | 0.0778*** | 0.0883*** | 0.0925*** | 0.0917*** | 0.0867*** | 0.0776*** |
| $d_{TB}^{nap}$ | -0.1871 | -0.1448 | -0.0838 | -0.0620 | -0.0595 | -0.0639** | -0.0694*** | -0.0735*** | -0.0758*** |
| constant | -0.0002 | 0.0000 | -0.0002 | -0.0003 | -0.0004 | -0.0004 | -0.0004 | -0.0004 | -0.0003 |
| Observations | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 | 3036 |
| Adjusted R-squared | 0.018 | 0.023 | 0.023 | 0.022 | 0.019 | 0.015 | 0.012 | 0.009 | 0.008 |

***, **, and * illustrate 1%, 5%, and 10% significance levels, respectively. Newey-West-adjusted standard errors. Coefficients of the eleven macroeconomic surprise variables are excluded to increase readability. Sample period: 06/02/2004 − 06/30/2016.