DNB Working Paper
No. 523 / September 2016

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DeNederlandscheBank
EUROSYSTEEM

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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

Working Paper No. 523

Septemberktober 2016

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Connecting the dots: market reactions to forecasts of policy rates and forward guidance provided by the Fed*

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September 2016

Abstract

This paper compares market reactions to forecasts of the policy rate path provided by FOMC participants ("dots") in the Summary of Economic Projections (SEP) with those to forward guidance provided by the FOMC in its statements. We find that market expectations of the time to lift-off from the zero lower bound are significantly affected in the expected direction by surprises in SEP dots and in forward guidance. We also find a significant impact of macroeconomic news on market participants' expectations of time to lift-off. These results are consistent with forward guidance about policy rates and SEP forecasts each contributing to the public's understanding of future Federal Reserve monetary policy, and with the conditionality of both forms of communication about future policy rates being understood. We also present evidence that market expectations concerning the time to lift-off are influenced by the maximum time to lift-off implied by forward guidance, the SEP and the economic outlook. An appendix provides the FOMC's forward guidance after each meeting from January 2012 to September 2015 and our interpretation of the implied days to liftoff.

Keywords: forward guidance, policy rate forecasts, zero lower bound.

JEL classifications: E52, E58.

* The views expressed are those of the authors and should not be taken to reflect those of the Bank for International Settlements, De Nederlandsche Bank, the Federal Reserve Board, or the Clearing House. We would like to thank Bill English, Sweder van Wijnbergen and participants in a seminar at De Nederlandsche Bank for helpful comments and discussions.

1. Introduction

This paper assesses the impact on financial markets of two alternative forms of communication that have been provided by the Federal Reserve on its future policy path. It compares market reactions to forecasts of the policy rate path provided in the Summary of Economic Projections (SEP) by FOMC participants – FOMC members plus non-voting Federal Reserve Bank presidents – without assigning forecasts by name (the "dots"), with those to forward guidance provided by the FOMC in their post-meeting statements.[1]

Empirical evidence presented in this paper suggests that both the dots and forward guidance influenced market expectations concerning the time to lift-off from the zero lower bound. Market expectations seem to be influenced by whatever form of communication – SEP forecasts, forward guidance, or the economic outlook – indicates the longest time until lift-off.

Forward guidance had been used systematically as early as 1997 by the Reserve Bank of New Zealand and 1999 by the Bank of Japan. As the global financial crises unfolded and policy rates approached their effective lower bound, the Federal Reserve and other central banks introduced forward guidance in an effort to influence long-term interest rates, aggregate demand, and inflation expectations (Moessner et al., 2016b, Den Haan, 2013). The Fed has used forward guidance extensively and explicitly since the FOMC meeting of 16 December 2008 (Del Negro et al., 2015). Communication about future policy rates can make monetary policy more effective and influence economic outcomes by affecting private sector expectations. Using data from the New York Fed's primary dealer survey, Femia et al (2013) find that the Fed's forward guidance helped convince market participants that the FOMC would not tighten until the economic picture had improved by more than had been previously thought.

The average of the dots and the FOMC's forward guidance issued just following the policy meeting can differ for several main reasons. First, the dots are individual forecasts prepared ahead of the policy meeting, while forward guidance can reflect committee dynamics.[2] One advantage of having a policy decision-making committee is that the interaction between policymakers during the meeting can generate insights and lead to a better outcome than the average of the individual views might allow.[3] An advantage of having anonymous dots is that this makes it easier for FOMC members to change their views in light of the discussions at the policy meeting.

Second, the group of FOMC participants (FOMC members plus the remaining Federal Reserve Bank presidents) is larger than the monetary policy decision making body (FOMC members only). Since the forecasts are anonymous, there is no one-to-one mapping to the forecasts of the policy decision making body.

A further difference is that the dots are provided regularly, whereas forward guidance is only provided/modified at special times chosen by the FOMC ("Aesopian guidance", see Moessner et al., 2016b), when the Committee is likely to have a particular reason to try to affect market expectations.

Another aspect is that the dots are each FOMC participant's projection of appropriate policy under their view of the most likely path for the economy. That is, the dots are the participant's modal outlook, rather than his or her mean outlook, and the dots are their view of appropriate policy, not necessarily their view of what will happen.

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[1] The FOMC consists of the seven Washington, D.C.-based governors at the Federal Reserve Board and five of the twelve regional Reserve Bank presidents, serving on a rotating basis.

[2] The SEP forecasts can be changed up until the conclusion of the first day of the two-day FOMC meeting.

[3] In the press conference following the April 2012 FOMC meeting, Ben Bernanke, then Chair of the FOMC indicated, commenting on the tension between the SEP forecasts and the forward guidance at that time stated: "…Well, there's certainly a range of views, as you've noted, but these projections are inputs into a Committee process. And it's in the Committee meeting that we had yesterday and today where we debate not only the possible outcomes, but also the risks, the uncertainties, all the things that inform our collective judgment." Transcript of Chairman Bernanke's Press Conference April 25, 2012, p. 6, http://www.federalreserve.gov/mediacenter/files/FOMCpresconf20120425.pdf .

Finally, changing forward guidance to an earlier lift-off could reduce the credibility of forward guidance and thereby reduce the effectiveness of forward guidance in the future. As a result, forward guidance is likely to be "stickier" than FOMC participants' forecasts of actual policy outcomes, particularly at times when the economic outlook is improving.

As highlighted in a recent survey of communication about future monetary policy rates, the empirical literature has provided mixed evidence on the effects of forward guidance on financial markets (Moessner et al., 2016b).[4] A number of studies find strong evidence that FOMC forward guidance announcements move asset prices (e.g. Gürkaynak et al., 2005; Moessner 2013, 2015; Campbell et al., 2012; and Del Negro et al., 2015). Several papers also show that market participants' interpret policy rate forecasts published by central banks under inflation targeting as Delphic (e.g. Moessner et al., 2016a). On the other hand, Goodhart and Rochet (2011) show that Swedish money market rates at longer horizons do not react to the surprise component in the future policy rate path published by the Riksbank. This suggests that at longer horizons, market participants expect announced policy rate paths to adjust to market expectations, rather than vice versa.

The empirical evidence may be inconclusive because an announcement by the central bank that it will keep the policy rate at the ZLB for longer than initially anticipated by market participants, has ex ante an ambiguous impact on financial markets (Del Negro et al., 2015). It will push up asset prices if market participants focus on the additional monetary stimulus announced by the central bank. But it will drive down asset prices if market participants focus on the possibility that the central bank took action because it had negative private information about the state of the economy. The interpretation chosen by market participants is likely to depend in very subtle ways on how central banks communicate as well as market participants' conviction that the FOMC is acting on private information. This conviction is likely to matter particularly if markets have fairly loose priors about the economic environment. In addition, forward guidance by publication of expected policy paths may be less effective when policy decisions are taken by committees, as argued by Goodhart (2013).

There has been increasing attention to how markets react to forward guidance about policy rates by a monetary policy committee versus to policy rate forecasts of individual committee members.[5] This paper provides empirical evidence on this issue. Our contribution is twofold. First, we provide a mapping of forward guidance statements into their implied time to lift-off from the ZLB. Second, we explore differences in the impact of surprises in the SEP dots and the FOMC's forward guidance on the time to lift-off implied by market interest rates.

The remainder of this paper is organized as follows. Section 2 describes the Fed's forward guidance and communication through the dots. Section 3 describes how we map these forms of communication into days to lift-off and presents the other data used in the empirical analysis. Section 4 presents the empirical model and our main results. Section 5 concludes.

2. Forward guidance and FOMC participants' forecasts

We next describe the evolution of forward guidance by the Fed since December 2008, when the FOMC began using forward guidance as a way to provide additional stimulus once they had established a target range for the federal funds rate of 0-25 basis points, what they considered then to be its effective lower bound.[6] At that meeting, the Committee indicated its anticipation that "weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time."

[4] For an earlier survey of central bank communication, see Blinder et al. (2008).

[5] For example, in a speech on 3 June 2016, Chicago Fed President Charles Evans explained the value added of the dots: "Omitting the dots would be pulling down a curtain to remove from view participants' broad judgments relating to the range of issues surrounding our policy deliberations." See also Derby (2016), Christensen and Kwan (2014), Dudley (2015), Powell (2016), Svensson (2015) and Yellen (2015).

[6] The FOMC also used forward guidance in 2003 and 2004 (see Moessner and Nelson, 2008). As noted by Engen, Laubach, and Reifschneider (2015), forward guidance only provides stimulus if the public fails to understand how stimulative the Committee intends to be.

The objective of forward guidance was to stimulate the economy by reducing longer-term interest rates, either by convincing investors that the federal funds rate would be lower than anticipated, or by heading off a future increase in the expected path for interest rates. Former chair of the Federal Reserve Ben Bernanke summarized how forward guidance can stimulate the economy as well as a key challenge associated with forward guidance in a speech at the Boston Federal Reserve Bank in 2010 (Bernanke, 2010):

> A step the Committee could consider, if conditions called for it, would be to modify the language of the statement in some way that indicates that the Committee expects to keep the target for the federal funds rate low for longer than markets expect. Such a change would presumably lower longer-term rates by an amount related to the revision in policy expectations. A potential drawback of using the FOMC's statement in this way is that, at least without a more comprehensive framework in place, it may be difficult to convey the Committee's policy intentions with sufficient precision and conditionality.

The Committee shifted to date-based forward guidance at its August 2011 meeting when it stated that

> 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.[7]

Importantly, the guidance is not worded as a promise that the target range for the federal funds rate will remain unchanged until the specified date. Rather, it is expressed as a statement about the Committee's expectations for economic conditions.

The discussion in the minutes of the meeting of the decision to provide date-based guidance includes a notable recognition of the possibility that the guidance would be taken as a commitment as well as foreshadowing of the subsequent use of threshold-based guidance.

> In choosing to phrase the outlook for policy in terms of a time horizon, members also considered conditioning the outlook for the level of the federal funds rate on explicit numerical values for the unemployment rate or the inflation rate. Some members argued that doing so would establish greater clarity regarding the Committee's intentions and its likely reaction to future economic developments, while others raised questions about how an appropriate numerical value might be chosen. No such references were included in the statement for this meeting. One member expressed concern that the use of a specific date in the forward guidance would be seen by the public as an unconditional commitment, and it could undermine Committee credibility if a change in timing subsequently became appropriate. Most members, however, agreed that stating a conditional expectation for the level of the federal funds rate through mid-2013 provided useful guidance to the public, with some noting that such an indication did not remove the Committee's flexibility to adjust the policy rate earlier or later if economic conditions do not evolve as the Committee currently expects.[8]

In January 2012, two important changes in communication took place. First, the Committee strengthened its date-based guidance substantially, indicating that conditions were likely to warrant an exceptionally low federal funds rate until "at least late 2014."[9] In the minutes of the meeting, the Committee indicated that extending the horizon of the Committee's forward guidance would help provide more accommodative financial conditions by shifting downward investors' expectations regarding the future path of the target federal funds rate."[10]

Coincident with the new forward guidance, the Committee provided its first set of individual forecasts – projections of their assessment of the appropriate level of the FOMC's target – for the federal funds

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[7] http://www.federalreserve.gov/newsevents/press/monetary/20110809a.htm
[8] http://www.federalreserve.gov/monetarypolicy/fomcminutes20110809.htm
[9] http://www.federalreserve.gov/newsevents/press/monetary/20120125a.htm.
[10] Minutes of the Meeting of January 24-25, 2014, p. 15, http://www.federalreserve.gov/monetarypolicy/files/fomcminutes20120125.pdf

rate in the Summary of Economic Projections. "Appropriate" monetary policy is defined as policy the meeting participant judges to be "most likely to foster outcomes for economic activity and inflation that best satisfy his or her interpretation of the Federal Reserve's dual objectives of maximum employment and stable prices."[11] Participants provide projections for the target federal funds rate at the end of the current and subsequent two calendar years, for the spring and summer projections, and subsequent three calendar years for the fall and winter projections, and in the longer-run. The longer-run projections are defined as the levels to which the federal funds rate would converge under "appropriate monetary policy" and in the absence of further shocks."

During the January 2012 post-meeting press conference, the then Chairman of the FOMC (Ben Bernanke) stated:

> "Importantly, these policy assessments should not be viewed as unconditional pledges. Rather, just as with our economic projections, these policy projections reflect the information available at the time of the forecast and are subject to future revision in light of evolving economic and financial conditions."[12]

Somewhat confusingly, given the new forward guidance, 11 of 17 participants projected that appropriate policy at the end of 2014 would be higher than the then prevailing 0-25 basis point range (see Figure 1).[13] In the press conference after the meeting, Mr. Bernanke noted that there was a "9-to-1 vote in favor" of the assessment of late 2014 included in the statement, and that "presumably take-off would not be much earlier than that."[14] Mr. Bernanke's remarks suggest that, when the guidance and the forecasts disagree, the guidance should be seen as the Committee's collective position.

[Figure 1]

The Committee continued to provide the same forward guidance until its September 2012 meeting, when it extended the date once again, this time to "mid-2015."[15] One challenge with using date-based guidance is that by extending the date, the central bank can send a negative signal about its outlook for the economy (see Nelson, 2014). To address this challenge, in addition to extending the date, the Committee stated in the minutes of the meeting

> …that it expects that a highly accommodative stance of policy will remain appropriate for a considerable time after the economic recovery strengthens. That new language was meant to clarify that the maintenance of a very low federal funds rate over that period did not reflect an expectation that the economy would remain weak, but rather reflected the Committee's intention to support a stronger economic recovery.[16]

Another way to address the challenge of the negative signal inherent in stronger forward guidance is by communicating an expectation to maintain highly stimulative policy until the economy improves rather than for a specific time. The Committee took this approach in December 2012 when it adopted threshold-based forward guidance. At that meeting, the Committee indicated that it

> …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

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[11] See SEP, p.1, which is attached as an addendum to the minutes of the FOMC meeting held on 24-25 January 2012. http://www.federalreserve.gov/monetarypolicy/files/fomcminutes20120125.pdf

[12] Page 6 of the transcript of the press conference, http://www.federalreserve.gov/mediacenter/files/FOMCpresconf20120125.pdf.

[13] SEP of the Meeting of January 24-25, 2012, p. 4, http://www.federalreserve.gov/monetarypolicy/files/fomcminutes20120125.pdf

[14] Transcript of Chairman Bernanke's Press Conference. p.17 http://www.federalreserve.gov/mediacenter/files/FOMCpresconf20120125.pdf

[15] http://www.federalreserve.gov/newsevents/press/monetary/20120913a.htm.

[16] Minutes of the Meeting of September 12-13, 2014, p.9, http://www.federalreserve.gov/monetarypolicy/files/fomcminutes20120913.pdf

the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored.[17]

There are several notable characteristics of the guidance. First, it is based on thresholds, not triggers. The Committee was not committing to tighten policy when the conditions were met, it was indicating its expectation that it would keep policy highly accommodative at least until the conditions were met, subject to escape clauses. Second, and consistent with the threshold rather than trigger formulation, the unemployment rate threshold of 6-1/2 percent was above the Committee's NAIRU estimate at the time. Specifically, the central tendency for the unemployment rate in the longer run in the December 2012 SEP was 5.2 to 6.0 percent.[18] Third, the inflation threshold of 2-1/2 percent was above the Committee's inflation target of 2 percent and was based on inflation projected one- to two-years ahead, not current inflation. In light of the underutilization of labor resources at the time, the Committee left itself room to maintain its accommodative stance even if inflation moved a bit above its target; moreover, the use of projected inflation rather than current inflation smoothed through higher frequency fluctuations in inflation caused by variation in food and energy prices or other transitory factors.[19] Even though the threshold-based guidance linked the forward guidance more explicitly to economic conditions than date-based guidance, the Committee still included language stating that it was not a commitment. Specifically, the Committee stated that it in deciding when to tighten policy, it would "…also consider other information, including additional measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments."[20]

The statement also specifically indicated that the Committee viewed the new guidance as consistent with the earlier date-based guidance through mid-2015. As a result, we interpret the guidance in December 2012 as stating that the federal funds rate range would not be changed until June 17, 2015. For subsequent meetings in which the threshold-based guidance was used, we interpret the guidance as indicating that the federal funds rate range would not be changed until the unemployment rate fell below 6-1/2 percent. We focus exclusively on the unemployment rate because there was never a period when the inflation threshold was projected to be crossed.

The Committee retained the threshold-based forward guidance until December 2013. At that time, the unemployment rate had declined to 7 percent, and the minutes of the meeting indicate that the Committee anticipated that the federal funds rate would not be raised until well after the unemployment rate fell below the threshold of 6-1/2 percent. While the Committee considered lowering the threshold, it opted instead to provide qualitative guidance in the post-meeting statement "…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 6½ percent."[21] The guidance thus included a mix of thresholds and qualitative elements. We assume "well past" equals 6 months, and so interpret the guidance as indicating that the federal funds rate range would remain unchanged until 6 months after the unemployment rate fell below 6-1/2 percent.

In March 2014, the Committee concluded that it needed to change its forward guidance because it anticipated that the unemployment threshold of 6-1/2 percent would soon be crossed. At that time, the Committee was winding down its flow-based asset purchase program. At its height, the Committee had been purchasing $45 billion per month in Treasury securities and $40 billion per month in agency mortgage-backed securities. But at the December 2013 meeting, the Committee had reduced the pace of its purchases by $5 billion for each category of securities, and indicated that it would "likely reduce the pace of purchases in further measured steps at future meetings." The "measured steps" language was seen as indicating that the pace of asset purchases would be reduced in similar-sized steps at each meeting, and that asset purchases would therefore conclude around the October 2014 FOMC meeting.

[17] http://www.federalreserve.gov/newsevents/press/monetary/20121212a.htm
[18] SEP of the Meeting of December 11-12, 2012, p. 1. http://www.federalreserve.gov/monetarypolicy/files/fomcminutes20121212.pdf
[19] Statement of longer run goals, January 25, 2012, http://www.federalreserve.gov/newsevents/press/monetary/20120125c.htm
[20] http://www.federalreserve.gov/newsevents/press/monetary/20121212a.htm
[21] http://www.federalreserve.gov/monetarypolicy/files/fomcminutes20131218.pdf

The Committee tied its forward guidance for the federal funds rate to the asset purchase program, stating that the target range would be unchanged "for a considerable time after the asset purchase program ends…", thus mixing qualitative guidance ("considerable time") with date-based guidance. We interpret "considerable time" to equal six months, and so that the forward guidance implies the target range would be unchanged until April 2015. We choose 6 months in large part because Janet Yellen, then Chair of the FOMC, stated in the press conference following the March meeting that considerable time "means something on the order of six months…"[22]

Once the asset purchase program ended in October 2014, the Committee switched to exclusively qualitative guidance, opting for progressively weaker adjectives until essentially dropping forward guidance entirely in April 2015. In October 2014, the Committee stated that it likely would be appropriate to maintain the 0 to ¼ percent target range for the federal funds rate for a "considerable time following the end of the asset purchase program this month."[23] The post meeting statement in December 2014 indicates that the Committee "judges that it can be patient in beginning to normalize the stance of policy" but also that it sees its new guidance as consistent with the October guidance.[24] Consequently, we again interpret the guidance as pointing to April 2015. In January 2015, the Committee again retained the "patient" formulation. We take "patient" to mean at least three months; that is, unchanged policy until at least the June 2015 meeting.[25] In March, the Committee simply said that it saw an increase at the next meeting, in April, as "unlikely."[26] And in April, the Committee simply indicated that it would tighten policy when it had seen "further improvement in the labor market" and was "reasonably confident" that inflation would move back to 2 percent "over the medium term."[27] We interpret the April 2015 statement as consistent with policy tightening occurring at any subsequent meeting, and so read it as providing no forward guidance about lift-off.[28]

3. Data

The two key variables capturing communication by FOMC voting members and FOMC participants about future policy rates are days to lift-off derived from forward guidance announcements in FOMC statements, and days to lift-off from the Federal Reserve's SEP, using all responses. The SEP reports FOMC participants' projections for the target federal funds rate at the end of the current and subsequent two calendar years and in the longer-run.

A key contribution of this paper is the mapping of FOMC forward guidance into time to lift-off. To estimate the days to lift-off from FOMC forward guidance statements, *FGDAYS*, we interpret the statements to derive the days until the date at which the policy rate is expected to be increased by 25 basis points. For each statement we restrict the date where the policy rate would change to the nearest FOMC date, since rate changes typically occur at a meeting. For the statements that have threshold-based guidance (i.e. unemployment rate greater than 6.5 percent), we use the Survey of Professional Forecasters (SPF)[29] data to assess when market participants' forecasts would cross the threshold at the time of the statement. This approach is adopted to ensure that we interpret the forward guidance in the context of the economic developments and expectations of market participants at the time of the

[22] Transcript of Chair Yellen's Press Conference, 19 March 2014, p.14, (http://www.federalreserve.gov/mediacenter/files/FOMCpresconf20140319.pdf)
[23] http://www.federalreserve.gov/newsevents/press/monetary/20141029a.htm
[24] http://www.federalreserve.gov/newsevents/press/monetary/20141217a.htm
[25] In January and again in March 2004, the Committee stated that it "believes that it can be patient in removing its policy accommodation." It dropped "patient" from the statement in May, switching to "the Committee believes that policy accommodation can be removed at a pace that is likely to be measured." In June 2014 it tightened policy. http://www.federalreserve.gov/boarddocs/press/monetary/2004/20040504/default.htm
[26] http://www.federalreserve.gov/newsevents/press/monetary/20150318a.htm
[27] http://www.federalreserve.gov/newsevents/press/monetary/20150429a.htm
[28] The April 2015 statement, and many of the statements over the period we are considering, included guidance about the likely pace of tightening after liftoff, but we are focusing exclusively on guidance about the initial tightening from the effective lower bound.
[29] https://www.philadelphiafed.org/research-and-data/real-time-center/survey-of-professional-forecasters/

statement. In doing so, we identify dates of the publication of new FOMC forward guidance, as opposed to days when earlier forward guidance was repeated and no new guidance was provided.[30] Note, both the FOMC statements and SEP forecasts are released on the second day of the associated FOMC meeting. More information on our interpretation of the forward guidance is provided in Table A in the appendix.

To estimate the expected days to lift-off from the SEP forecasts, *SEPDAYS*, we estimate the time until the date at which the mean expectation across the different forecasts has reached 37.5 basis points (not restricted to occur on FOMC meeting dates). In a second measure, *SEPDAYS2*, we do the same but exclude the bottom 2 and top 3 SEP responses, since market participants reportedly discount the most extreme responses in order to focus on the consensus responses. For both measures, we use linear interpolation between the yearly forecasted mean expectations in order to estimate the dates when lift-off will occur based on the SEP forecasts. We assume that lift-off occurs if the mean crosses 37.5 basis points, 25 basis points above the middle of the FOMC's prevailing 0 to 25 basis point target range for the federal funds rate.

We use the following measure of market participants' expectations of the time to Fed lift-off. It is derived from a range of fed funds futures contracts, for which data are taken from Bloomberg. This measure has two main advantages. It is based on actual transactions, and it is available at high frequency. Interpolation of a range of fed funds contracts is used to estimate the number of days, *FEDFDAYS*, to the future date at which the mean expectation of the federal funds rate has reached 37.5 basis points, which we define as the date of lift-off from the ZLB.

We also use a measure of expected days to lift-off inferred from a Taylor rule, *TDAYS*, estimated using private sector forecasts of inflation and unemployment from the SPF surveys, according to the following Taylor rule,

$$r_t^e = 4 + 1.5(\pi_t^e - 2) - 2.5(u_t^e - 5.5) \qquad (1)$$

where r_t is the interest rate implied by the Taylor rule (in percent), π_t is core personal consumption expenditure (PCE) inflation, and u_t is the unemployment rate, all in percent, and *e* denotes expectations. The date of lift-off is estimated as the date at which the interest rate implied by the Taylor rule reaches 37.5 basis points, using the same linear interpolation method as for our other variables. If the interest rate implied by the Taylor rule was already above our threshold of 37.5 basis points in the current quarter of the forecasts, the days to lift off was set to 1, since the rate implies lift-off should happen immediately. This was true for the last 5 of the 15 quarters in our dataset. We take this measure as a rough proxy for private sector expectations of the time to lift-off based on the outlook for the economy and an understanding of the Federal Reserve's reaction function, in the absence of communication about future policy rates by the central bank. We do not imply that the Federal Reserve actually follows such a Taylor rule. This measure has to be taken with caution in light of the argument recently reiterated by Dudley (2015) and Svensson (2015) that the loose relation between the federal funds rate, financial conditions and economic outcomes makes the use of a mechanical instrument rule inappropriate, as well as the apparent decline in the neutral federal funds rate in recent years, which suggests the intercept of the Taylor rule should be adjusted downward.[31]

We also construct two proxy measures for market participants' survey expectations of the FOMC's forward guidance-implied lift-off date by interpreting the publicly available information of responses to the New York Fed's Primary Dealer survey, denoted by $PDDAYS_t$ and $PDDAYS2_t$. Both variables are constructed similarly to our forward guidance variable and are restricted to FOMC meeting dates. $PDDAYS_t$ does not take into account that the dealers may update their expectations after the statement is released, and thus the expectation of the lift-off date implied by forward guidance stays constant until the next Primary Dealer survey. By contrast, $PDDAYS2_t$ changes the expectation to the actual forward

[30] As noted above, when the forward guidance is threshold-based, our estimate of the days to liftoff implied by the forward guidance, *FGDAYS*, depends on market participants' projections for the unemployment rate contained in the SPF. We identify days when the forward guidance language in the statement was changed.
[31] See, for example, Laubach and Williams (2015).

guidance-implied date once the forward guidance statement is released on the second day of the FOMC meeting.

The surprise in the FOMC's forward guidance is then calculated as $FGDAYS_t - PDDAYS_{t-1}$ for the first measure, and $FGDAYS_t - PDDAYS2_{t-1}$ for the second measure. The Survey of Primary Dealers is conducted by the Federal Reserve Bank of New York about one week before each FOMC meeting. Some of the surveys from the Survey of Primary Dealers contain questions about how respondents expect forward guidance to change at the next FOMC announcement date. Compared to market-based measures, this is a direct measure of market participants' views, which is not affected by technical factors, such as liquidity factors. But the questions and responses about the FOMC's forward guidance are often qualitative, rather than quantitative, and we interpret these responses to derive our proxy measures of these expectations. More information on the questions, survey responses, and interpretation of the Primary Dealer Survey are provided in Table B in the appendix.

Figure 2 shows the days to lift-off inferred from forward guidance statements, the SEP, federal funds futures, and based on the Taylor rule. Figure 3 shows the days to lift-off inferred from the SEP when dropping the bottom 2 and top 3 SEP responses, as well as the inferred survey expectations of time to lift-off from FOMC forward guidance derived from the Survey of Primary Dealers.

[Figures 2 and 3]

We also control for 11 US macroeconomic surprises and tapering announcements in the regressions below. The US macroeconomic indicators are chosen based on Moessner and Nelson (2008). They are non-farm payrolls, the ISM manufacturing index, the unemployment rate, retail sales, industrial production, housing starts, CPI inflation, PPI inflation, hourly earnings, the trade balance, and GDP (the advance estimate). We calculate surprises of these data releases by taking the difference between the real-time data releases and Bloomberg survey expectations, and these surprises are then normalised by their standard deviations to make the coefficients comparable.

We use daily data over the sample period 1 January 2012 to 31 July 2015.

4. Empirical method and results

We estimate how the different forms of FOMC communication about the expected future policy path influence market expectations of lift-off. In general, albeit using a number of different regression specifications, we seek to understand how market participants formed their expectations about the days until policy liftoff based on their outlook for the economy, FOMC communication in the form of forward guidance, and FOMC communications in the form of the SEP forecasts for policy. For example, if market participants completely understood the FOMC's monetary policy reaction function, did not see forward guidance as a commitment (or at least a convincing commitment) to a time-inconsistent path, and did not think the FOMC had private information, then market participants' expected days to liftoff could depend on their outlook for the economy (as summarized by the days to liftoff implied by the Taylor rule calculated using market projections for unemployment and inflation) alone. By contrast, market participants' expectations for liftoff could have been (and seem to have been) importantly influenced by FOMC communications. And since the forward guidance and SEP forecasts at times suggest different days to liftoff, regression analysis can help infer the relative importance market participants attached to each. Our work is similar to analysis about the impact on inflation expectations of announcing an inflation target, in which case market participants continue to form inflation expectations based on a number of factors, and the question is whether the inflation target becomes one of those factors.

We first estimate an empirical model that explains market forecasts of time to lift-off, $FEDFDAYS_t$, as a function of the days to lift-off inferred from the FOMC's forward guidance announcement in FOMC statements, $FGDAYS_t$, and the dots, $SEPDAYS_t$:

$$FEDFDAYS_t = \alpha + \beta_1 SEPDAYS_t + \beta_2 FGDAYS_t + \beta_3 TDAYS_t + \varepsilon_t \qquad (2)$$

In the regression equation (2) we also control for time to lift-off inferred from a Taylor rule, $TDAYS_t$, based on private sector forecasts of inflation and unemployment. We estimate equation (2) in log-levels, using OLS with Newey-West adjusted standard errors to account for autocorrelation and heteroskedasticity. The results are reported in Table 1.

[Table 1]

The results point to both forward guidance and the dots having a significant impact in the right direction on market forecasts of Fed lift-off.

As a robustness check, we re-estimated equation (2) after dropping the bottom two and top three responses in the SEP to avoid that results are driven by outliers among FOMC's projected policy paths. We find that this does not affect our conclusions (see Table 2). The coefficient on SEP forecasts remains significant and smaller than the coefficient on forward guidance.

[Table 2]

Next, we assess whether the market impact of a particular form of communication depends on whether time to lift-off implied by it is longest compared to the other forms of communication. We estimate a variant of equation (2) in which we interact each explanatory variable – time to lift-off inferred from the FOMC's forward guidance announcement, the dots and the Taylor rule – with a dummy variable (called $DUMMAXSEP_t$, $DUMMAXFG_t$, and $DUMMAXTR_t$ for the SEP, forward guidance, and the Taylor rule, respectively) which equals one when the expected days to lift-off are largest for that variable and zero otherwise, according to

$$FEDFDAYS_t = \alpha + \beta_1 SEPDAYS_t + \gamma_1 DUMMAXSEP_t * SEPDAYS_t + \beta_2 FGDAYS_t + \gamma_2 DUMMAXFG_t * FGDAYS_t + \beta_3 TDAYS_t + \gamma_3 DUMMAXTR_t * TDAYS_t + \varepsilon_t \quad (3)$$

This equation is again estimated in log-levels, with OLS using Newey-West adjusted standard errors.

The results, reported in Table 3, show that the significance of the market impact of forward guidance and the dots arises from when expected days to lift-off are largest for this variable among the explanatory variables. Moreover, the coefficients of forward guidance and the dots on those days are comparable. By contrast, on days on which an FOMC forward guidance statement implies a time to lift-off smaller than that implied by either SEP dots or a Taylor rule, that statement has little or no significant effect on the time to lift-off expected by market participants. We therefore find evidence to suggest that the dispositive communication is the one giving guidance for lift-off furthest out in time, ie the communication which is "binding".

[Table 3]

We next estimate standard event study regressions in daily differences, where we evaluate the reactions of the market's expected time to lift-off, $\Delta FEDFDAYS_t$, to surprises in SEP policy rate forecast, $SEPDAYS_t^{sur}$, and to surprises in FOMC forward guidance, $FGDAYS_t^{sur}$,

$$\Delta FEDFDAYS_t = \alpha + \beta_1 SEPDAYS_t^{sur} + \beta_2 FGDAYS_t^{sur} + \beta_3 X_t + \varepsilon_t \quad (4)$$

Here, $\Delta FEDFDAYS_t$ is the daily change in the time to lift-off implied by federal funds contracts. We study the reactions to surprises in the communication about future policy rates, since under rational expectations, asset prices incorporate all relevant information at time *t*, and change only upon the arrival of new information (surprises). Reflecting the same idea, equation (9) is estimated in differences as in standard event study regressions. In the regressions estimated in differences, we drop the Taylor rule based measure of time to lift-off, because it is difficult to say on which dates private agents incorporate news into their Taylor rule estimates.

We control for macroeconomic news by including X_t, a vector of control variables which contains the surprise components of 11 US macroeconomic data releases on the dates of their release, as described in Section 3, and whose elements are zero otherwise. The variable for the surprise in the expected time to lift-off from FOMC forward guidance statements, $FGDAYS_t^{sur}$, equals the surprise on the dates of the publication of new FOMC forward guidance,

$$FGDAYS_t^{sur} = FGDAYS_t - E_{t-1} SEPDAYS_t \quad (5)$$

where $E_{t-1}FGDAYS_t$ is the market's expectation of the new FOMC forward guidance on the day prior to its publication, and zero otherwise. As proxy measure for this expectation we use market participants' survey expectations of the FOMC's forward guidance-implied time to lift-off derived from the latest available New York Fed's Primary Dealer survey,

$$E_{t-1}FGDAYS_t = PDDAYS_{t-1} \quad (6)$$

which is constructed using the publicly available responses to the New York Fed's Primary Dealer Survey, as described in Section 3.

Similarly, the variable for the surprise in the expected time to lift-off from the SEP, $SEPDAYS_t^{sur}$, equals the surprise on the dates of the publication of the SEP forecasts, and zero otherwise, in order to capture news on dates when the SEP is published,

$$SEPDAYS_t^{sur} = SEPDAYS_t - E_{t-1}SEPDAYS_t \quad (7),$$

where $E_{t-1}SEPDAYS_t$ is the market's expectation of the SEP forecast on the day prior to its publication. In the absence of a perfect measure for the market expectation of the SEP's forecast, $E_{t-1}SEPDAYS_t$, we use as a proxy measure for it the following expected time to lift-off on the day prior to publication of the SEP forecast,

$$E_{t-1}SEPDAYS_t = SEPDAYS_{tp} + (FEDFDAYS_{t-1} - FEDFDAYS_{tp}) \quad (8)$$

where *tp* is the date of publication of the previously made SEP forecast prior to the new SEP publication date *t*. The expectation is calculated as the expected time to lift-off from the previous SEP forecast on the SEP publication date prior to the new SEP publication date, adjusted for the change in the market's expectation of time to lift-off implied by federal funds contracts between the prior SEP publication date and the day before the publication of the new SEP forecast. This proxy measure incorporates information from the previous SEP forecast, as well as information available to market participants up to the day prior to publication of the central bank's new forecasts. However, this measure will be influenced by changes in term premia and therefore may not reflect market participants' expectations accurately. In addition, market participants' expectations about time to lift off may differ from their judgements about how FOMC participants' views have changed.

Inserting equations (5) to (8) into equation (4), the regression equation for daily changes in the market's expected time to lift off becomes

$$\Delta FEDFDAYS_t = \alpha + \beta_1(SEPDAYS_{tp} + FEDFDAYS_{t-1} - FEDFDAYS_{tp}) + \beta_2(FGDAYS_t - PDDAYS_{t-1}) + \beta_3 X_t + \varepsilon_t \quad (9)$$

which is estimated via OLS with Newey-West adjusted standard errors to correct for heteroskedasticity and autocorrelation.

[Table 4]

The results from equation (9) are shown in Table 4. We find that the surprises of both SEP dots and of FOMC forward guidance are positive and significant, which implies that both forms of communication about future policy rates have been effective in influencing market expectations of the time to lift-off. The coefficient on SEP surprises equals 0.26 and is significant at the 5% level. The effect is larger and more significant than that of forward guidance, for which the coefficient equals 0.11 and is significant at the 10% level. However, the larger coefficient on SEP surprises might be partly due to an imperfect measurement of market expectations of forward guidance with the Primary Dealer Survey, and of market expectations of SEP forecasts.

We find that the coefficients on the surprises of both SEP dots and of forward guidance are positive but less than one, which is consistent with market participants understanding the conditionality of both forms of communication about future policy rates.

We also find that market participants expected time to lift-off is significantly affected in the expected direction by US macroeconomic surprises. From Table 4 we can see that the largest effect comes from non-farm payrolls (a positive 1 standard deviation of non-farm payrolls on average reduces the time to

lift-off by 31 days), followed by retail sales, housing starts and hourly earnings. This also suggests that markets seemed to understand the conditional nature of the Fed's SEP dots and forward guidance.

These results are consistent with forward guidance and SEP forecasts being interpreted as conditional guidance and forecasts, since market expectations continue to respond to macroeconomic news. This confirms the findings in Moessner and Nelson (2008) for the Reserve Bank of New Zealand's policy rate forecasts and the Fed's forward guidance prior to the financial crisis, and consistent with the results of Moessner, de Haan and Jansen (2016a) for the Riksbank's policy rate forecasts.

The corresponding results of equation (9) for the alternate SEP measure dropping outliers ($SEPDAYS2_t$) are shown in Table 5. The coefficient on the surprises of SEP forecasts excluding outliers is slightly smaller, but the results are otherwise very similar to those shown in Table 4 which includes all SEP responses.

[Table 5]

As a robustness test, we also include a second proxy measure for market expectations of SEP forecasts, which is a weighted average of the measure of equation (8), and the time to lift off implied by the previously made SEP forecast on the day prior to publication of the new forecast, $SEPDAYS_{t-1}$,

$$E_{t-1}SEPDAYS_t = \gamma(SEPDAYS_{tp} + FEDFDAYS_{t-1} - FEDFDAYS_{tp}) + (1-\gamma)SEPDAYS_{t-1} \quad (10)$$

Inserting equations (5) to (7) and (10) into equation (4), the regression equation for daily changes in the market's expected time to lift off becomes

$$\Delta FEDFDAYS_t = \alpha + \beta_1(\gamma(SEPDAYS_{tp} + FEDFDAYS_{t-1} - FEDFDAYS_{tp}) + (1-\gamma)SEPDAYS_{t-1}) + \beta_2(FGDAYS_t - PDDAYS_{t-1}) + \beta_3 X_t + \varepsilon_t \quad (11)$$

which is estimated via nonlinear least squares, using Newey-West adjusted standard errors.

[Table 6]

The results from equation (11) are shown in Table 6. We find that the surprises of both SEP dots and of FOMC forward guidance remain positive and significant. The coefficient on SEP surprises increases somewhat, to 0.33, and becomes more significant, at the 1% level. The coefficient on forward guidance remains little changed, at around 0.11.

The corresponding results of equation (11) for the alternate SEP measure dropping outliers are shown in Table 7. The coefficients on the surprises of SEP forecasts excluding outliers and on the surprises of forward guidance are slightly smaller, but the results are otherwise very similar to those shown in Table 6 which includes all SEP responses.

[Table 7]

Finally, for robustness we replace $PDDAYS_{t-1}$ by $PDDAYS2_{t-1}$ in equations (9) and (11), which does not change the results.

5. Conclusions

This paper compares market reactions to forecasts of the policy rate path provided by FOMC participants in the Summary of Economic Projections with those to forward guidance provided by the FOMC in its statements.

We find evidence that (1) forward guidance, (2) the SEP dots, and (3) the time to liftoff implied by the outlook for the economy each have a significant effect on market participants' assessments of the time to liftoff from the ZLB. Perhaps even more interesting, we find evidence that it is the maximum time to lift-off among the three determinants that influences market participants' outlooks.

We also find that market expectations of the time to lift-off from the zero lower bound are significantly affected in the expected direction by surprises in SEP dots and in forward guidance. SEP surprises have

a larger effect than forward guidance surprises. However, the result of a larger effect of SEP surprises might be partly driven by the imperfect measurement of market expectations of forward guidance and of SEP forecasts. These results are consistent with forward guidance about policy rates and SEP forecasts each contributing to the public's understanding of future Federal Reserve monetary policy.

We also find a significant impact of macroeconomic news on market participants' expectations of time to lift-off. These results are consistent with forward guidance about policy rates and SEP forecasts being interpreted as conditional in nature, since market expectations continue to respond to macroeconomic news, confirming the findings of Moessner and Nelson (2008) and Moessner et al. (2016a).

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Tables

Table 1

Dependent variable: LOG(FEDFDAYS)	
Variable	
α	4.653***
LOG(SEPDAYS)	0.075***
LOG(FGDAYS)	0.150***
LOG(TDAYS)	0.069***
Adj. R^2	0.91
No. of observations	932

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Sample period: 1 January 2012 to 31 July 2015.

Table 2

Dependent variable: LOG(FEDFDAYS)	
Variable	
α	4.600***
LOG(SEPDAYS2)	0.107***
LOG(FGDAYS)	0.128***
LOG(TDAYS)	0.066***
Adj. R^2	0.91
No. of observations	932

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Sample period: 1 January 2012 to 31 July 2015.

Table 3

Dependent variable: LOG(FEDFDAYS)	
Variable	
α	4.322***
LOG(SEPDAYS)	0.031**
*DUMMAXSEP*LOG(SEPDAYS)*	0.273***
LOG(FGDAYS)	-0.024
DUMMAXFG LOG(FGDAYS)*	0.277***
LOG(TDAYS)	0.058***
*DUMMAXTR*LOG(TDAYS)*	0.261***
Adj. R^2	0.918
No. of observations	932

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Sample period: 1 January 2012 to 31 July 2015.

Table 4

Dependent variable: ∆(FEDFDAYS)	
Variable	
α	-0.907
β_1	0.258**
β_2	0.106*
Non-farm payrolls	-31.392***
ISM	-3.751
Unemployment rate	0.564
Retail sales	-13.702***
Industrial production	-1.110
Housing starts	-12.709***
CPI	3.207
PPI	2.108
Hourly earnings	-9.656***
Trade	0.768
GDP (advance)	-2.546
Adj. R^2	0.083
No. of observations	928

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Sample period: 1 January 2012 to 31 July 2015.

Table 5

Dependent variable: ∆(FEDFDAYS)	
Variable	
α	-0.918
β_1	0.213***
β_2	0.106*
Adj. R^2	0.087
No. of observations	928

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Sample period: 1 January 2012 to 31 July 2015. Coefficients on macroeconomic surprises not shown. Using *SEPDAYS2* instead of *SEPDAYS*.

Table 6

Dependent variable: ∆(FEDFDAYS)	
Variable	
α	-0.993
β_1	0.333***
β_2	0.108*
γ	0.600**
Adj. R^2	0.086
No. of observations	928

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Sample period: 1 January 2012 to 31 July 2015. Coefficients on macroeconomic surprises not shown.

Table 7

Dependent variable: ∆(FEDFDAYS)	
Variable	
α	-0.972
β_1	0.234***
β_2	0.095*
γ	0.634
Adj. R^2	0.087
No. of observations	928

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Sample period: 1 January 2012 to 31 July 2015. Coefficients on macroeconomic surprises not shown. Using *SEPDAYS2* instead of *SEPDAYS*.

Figures

Figure 1: Appropriate pace of policy firming projects by FOMC members (the "dots")

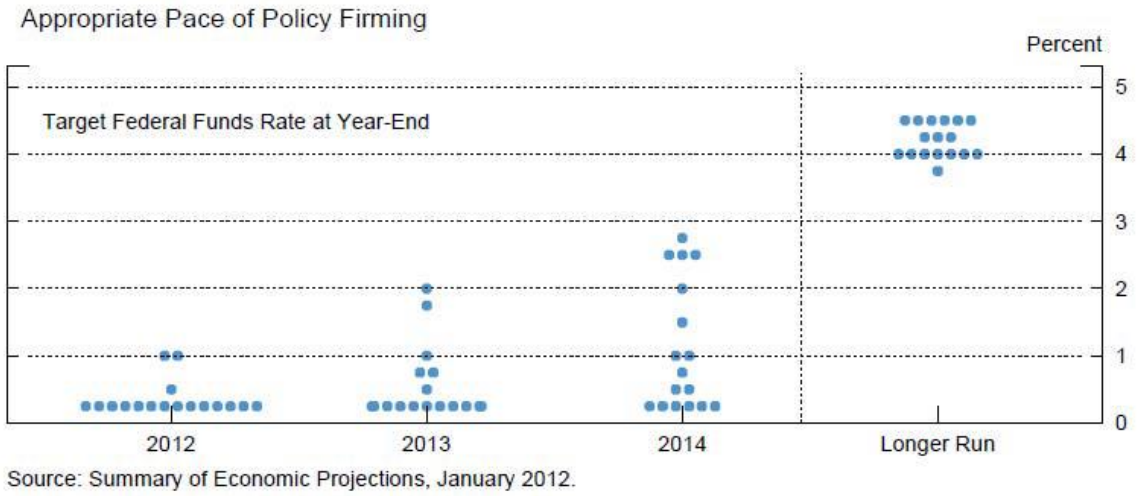
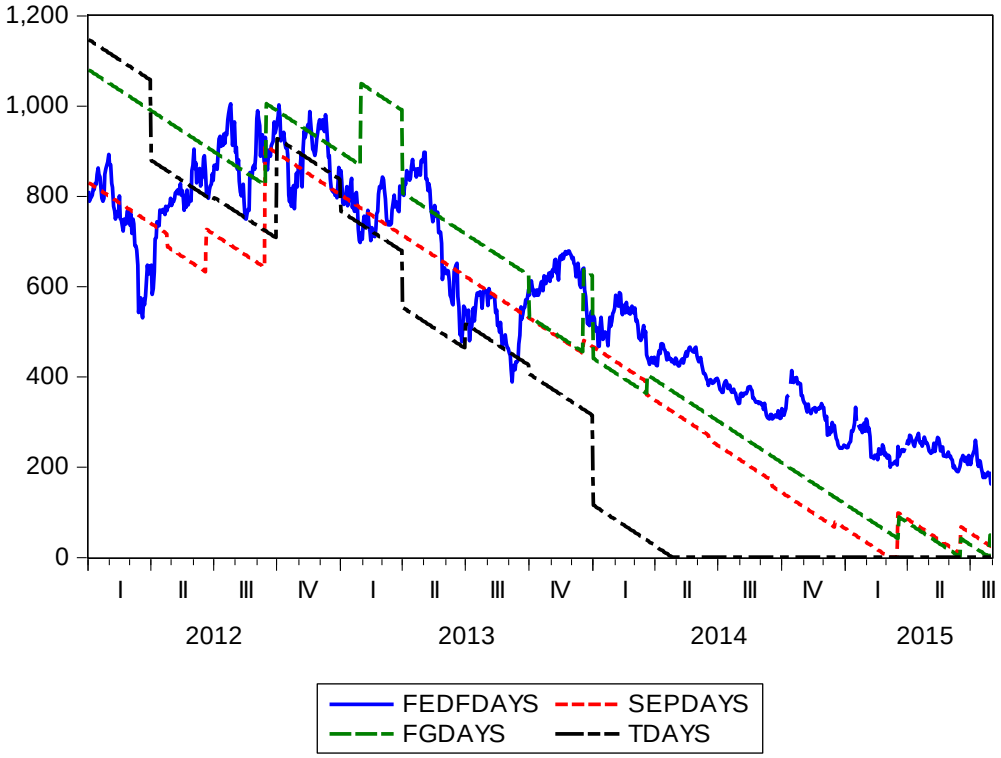
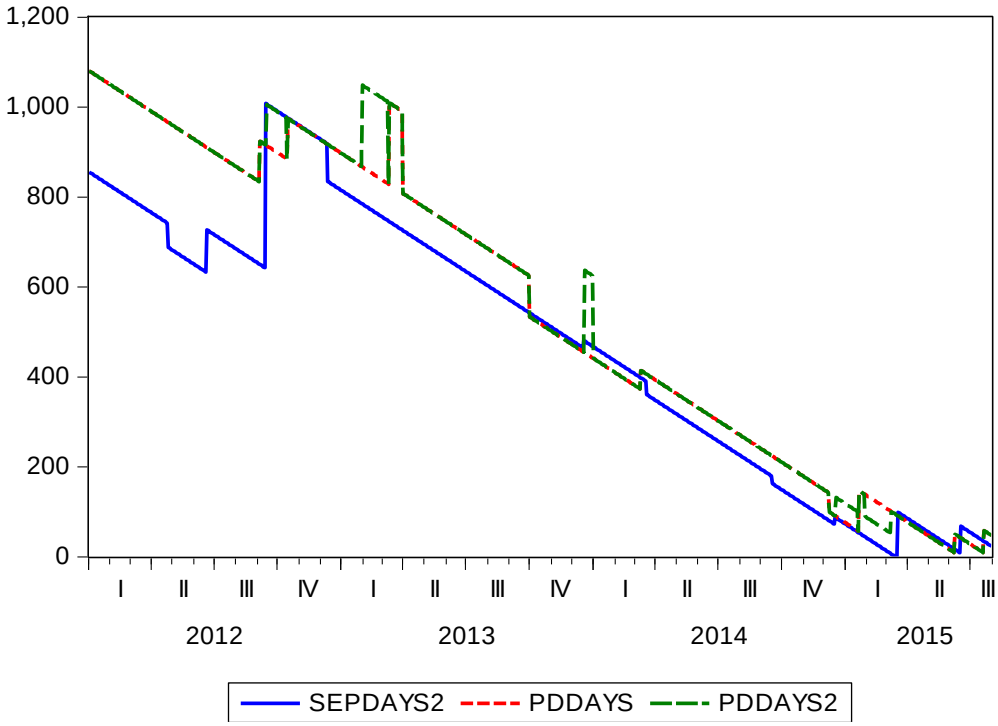


Figure 2: Different measures of expected days to lift-off from the ZLB



Notes: *FEDFDAYS* are expected days to lift-off from the ZLB derived from federal funds futures contracts; *FGDAYS* are expected days to lift-off derived by interpreting FOMC forward guidance statements; *SEPDAYS* are expected days to lift-off derived from SEP forecasts; *TDAYS* are expected days to lift-off inferred from a Taylor rule. See the main text for details.

Figure 3: Additional measures of expected days to lift-off from the ZLB



Notes: *SEPDAYS* are expected days to lift-off derived from SEP forecasts excluding the bottom 2 and top 3 SEP responses. *PDDAYS* and *PDDAYS2* are measures of market participants' survey expectations of the FOMC's forward guidance-implied time to lift-off derived by interpreting the New York Fed's Primary Dealers survey. See the main text for details.

Appendix Table A: Forward guidance and its interpretation

This appendix lists post-meeting forward guidance statements by the FOMC. Text used to map FOMC forward guidance into time to lift-off is marked in bold.

January 25, 2012

> In particular, the Committee decided today to keep the target range for the federal funds rate at 0 to 1/4 percent and 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 late 2014**.
>
> *Interpretation: 0-1/4 percent at least until December 17, 2014*

March 13, 2012

> Same
>
> *Interpretation: 0-1/4 percent at least until December 17, 2014*

April 25, 2012

> Same
>
> *Interpretation: 0-1/4 percent at least until December 17, 2014*

June 20, 2012

> Same
>
> *Interpretation: 0-1/4 percent at least until December 17, 2014*

August 1, 2012

> Same
>
> *Interpretation: 0-1/4 percent at least until December 17, 2014*

September 13, 2012

> In particular, the Committee also decided today to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that **exceptionally low levels for the federal funds rate are likely to be warranted at least through mid-2015**.
>
> *Interpretation: 0-1/4 percent at least until June 17, 2015*

October 24, 2012

> Same
>
> *Interpretation: 0-1/4 percent at least until June 17, 2015*

December 12, 2012

> In particular, the Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and 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.**
>
> *Interpretation: 0-1/4 percent at least until June 17, 2015 (because of final sentence)*

January 30, 2013

In particular, the Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and 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.

Interpretation: 0-1/4 percent at least until projected unemployment rate falls below 6-1/2 percent (inflation criterion is nonbinding).

March 20, 2013

Same

Interpretation: 0-1/4 percent at least until projected unemployment rate falls below 6-1/2 percent (inflation criterion is nonbinding).

May 1, 2013

Same

Interpretation: 0-1/4 percent at least until projected unemployment rate falls below 6-1/2 percent (inflation criterion is nonbinding).

June 19, 2013

Same

Interpretation: 0-1/4 percent at least until projected unemployment rate falls below 6-1/2 percent (inflation criterion is nonbinding).

July 31, 2013

Same

Interpretation: 0-1/4 percent at least until projected unemployment rate falls below 6-1/2 percent (inflation criterion is nonbinding).

September 18, 2013

Same

Interpretation: 0-1/4 percent at least until projected unemployment rate falls below 6-1/2 percent (inflation criterion is nonbinding).

October 30, 2013

Same

Interpretation: 0-1/4 percent at least until projected unemployment rate falls below 6-1/2 percent (inflation criterion is nonbinding).

December 18, 2013

The Committee also reaffirmed its expectation that the current exceptionally low target range for the federal funds rate of 0 to 1/4 percent 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. In determining how long to maintain a highly accommodative stance of monetary policy, the Committee will also consider other information, including additional measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments. **The Committee 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.

Interpretation: "Well past" is assumed to equal six months. So 0-1/4 percent at least six months after until projected unemployment rate falls below 6-1/2 percent (inflation criterion is nonbinding).

January 29, 2014

Same

Interpretation: 0-1/4 percent at least six months after until projected unemployment rate falls below 6-1/2 percent (inflation criterion is nonbinding).

March 19, 2014

Beginning in April, the Committee will add to its holdings of agency mortgage-backed securities at a pace of $25 billion per month rather than $30 billion per month, and will add to its holdings of longer-term Treasury securities at a pace of $30 billion per month rather than $35 billion per month.

…

The 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, and provided that longer-term inflation expectations remain well anchored.[32]

Interpretation: Asset purchase program projected to end after October 2014 meeting. "Considerable time" equals six months. So 0-1/4 percent at least until April 29, 2015 (the first meeting conclusion date at least six months after the end of October).

April 30, 2014

Same (asset purchases were again reduced by $5 billion for each type).

Interpretation: 0-1/4 percent at least until April 29, 2015.

June 18, 2014

Same (asset purchases were again reduced by $5 billion for each type).

Interpretation: 0-1/4 percent at least until April 29, 2015.

July 30, 2014

Same (asset purchases were again reduced by $5 billion for each type).

Interpretation: 0-1/4 percent at least until April 29, 2015.

September 17, 2014

Same (asset purchases were again reduced by $5 billion for each type).

Interpretation: 0-1/4 percent at least until April 29, 2015.

October 29, 2014

The Committee anticipates, based on its current assessment, that **it likely will be appropriate to maintain the 0 to 1/4 percent target range for the federal funds rate for a considerable time following the end of its asset purchase program this month,** especially if projected

[32] Even though the statement says "continues to anticipate", the guidance based on the end of asset purchases was not used in the previous statement.

inflation continues to run below the Committee's 2 percent longer-run goal, and provided that longer-term inflation expectations remain well anchored.

Interpretation: 0-1/4 percent at least until April 29, 2015.

December 17, 2014

Based on its current assessment, **the Committee judges that it can be patient in beginning to normalize the stance of monetary policy. The Committee sees this guidance as consistent with its previous statement that it likely will be appropriate to maintain the 0 to 1/4 percent target range for the federal funds rate for a considerable time following the end of its asset purchase program in October**, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal, and provided that longer-term inflation expectations remain well anchored.

Interpretation: 0-1/4 percent at least until April 29, 2015 (because of assertion that guidance is same as previous).

January 28, 2015

Based on its current assessment, the Committee judges that it can be patient in beginning to normalize the stance of monetary policy.

Interpretation: "Patient" is assumed to mean at least three months. So *0-1/4 percent at least until June 17, 2015*

March 18, 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. The Committee anticipates that 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. This change in the forward guidance does not indicate that the Committee has decided on the timing of the initial increase in the target range.

Interpretation: 0-14 percent at least until June 17, 2015.

April 29, 2015

The Committee anticipates that 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.

Interpretation: No guidance.

June 17, 2015

Same

Interpretation: No guidance.

July 29, 2015

Same

Interpretation: No guidance.

September 17, 2015

Same

Interpretation: No guidance.

Appendix Table B: Expectations of forward guidance derived from Primary Dealers' Survey

Question: Do you expect any changes in the FOMC statement and, if so, what changes?

January 17, 2012

Response: Nearly all dealers expected the FOMC's forward rate guidance language in the FOMC statement to be revised at the January meeting. Several dealers expected that the statement would reference or be consistent with FOMC participants' federal funds target rate projections to be provided in the advance projection materials from the Summary of Economic Projections (SEP). Several dealers believed that the Committee would drop the phrase "at least through mid-2013" from the statement entirely, while some predicted that the calendar-based guidance would remain, but be pushed out further into the future.
Interpretation: 0-1/4 percent until Dec 17, 2014

March 5, 2012

Response: Several dealers expressed the expectation that there would be no change to the monetary policy-relevant portions of the statement, while a couple of others expected no change to the economic assessment.
Interpretation: No change, 0-1/4 percent until Dec 17, 2014

April 16, 2012

Response: Many dealers expected either no changes or very limited changes to the monetary policy section of the April FOMC statement.
Interpretation: No change, 0-1/4 percent until Dec 17, 2014

June 11, 2012

Response: Many dealers expected the FOMC to introduce some form of easing at the June meeting. A few dealers thought the Committee might update its forward guidance on the target federal funds rate.
Interpretation: 0-1/4 percent until Dec 17, 2014

July 23, 2012

Response: Some dealers hypothesized that the FOMC might extend the forward rate guidance in the statement, while a few expected that such a change was likely. Of those, a couple specifically cited their expectation for the guidance to be extended to "mid 2015". A few dealers also noted that the Committee could strengthen the language suggesting the FOMC is prepared to provide additional policy accommodation. Some dealers expected no material changes to the August FOMC statement.
Interpretation: 0-1/4 percent until Dec 17, 2014

September 4, 2012

Response: Most dealers expected that the forward guidance on the path of the federal funds rate would be extended into 2015. Several dealers specified that the guidance to be extended to "mid-2015" and a couple of dealers expected that the forward guidance would be extended past mid-2015.
Interpretation: 0-1/4 percent until March 18, 2015

October 15, 2012

Response: Many dealers expected no significant changes to policy in the October FOMC statement, and anticipated that the overall characterization of economic conditions would remain downbeat.
Interpretation: no change, 0-1/4 percent until June 17, 2015

December 3, 2012

No mention of forward guidance in the response.
Interpretation: no change, 0-1/4 percent until June 17, 2015

January 22, 2013

Response: All of the dealers expected no significant changes to the policy statement, with several dealers expecting a somewhat shorter discussion of thresholds. Several dealers noted that the FOMC may acknowledge easing financial strains.
Interpretation: no change, 0-1/4 percent until June 17, 2015

March 11, 2013

Response: Most dealers expected no major changes to be made to the FOMC statement.
Interpretation: no change, 0-1/4 percent until projected unemployment rate falls below 6.5

April 22, 2013

Response: Some dealers noted that they did not expect any significant changes to the May FOMC statement. Regarding the changes dealers did expect, many saw the FOMC acknowledging recent weaker economic data, with several referencing the softer inflation and labor market data
Interpretation: no change, 0-1/4 percent until projected unemployment rate falls below 6.5

June 10, 2013

No mention of forward guidance in the response.
Interpretation: no change, 0-1/4 percent until projected unemployment rate falls below 6.5

July 22, 2013

Response: Some dealers expected no material changes to the July FOMC statement. …Several dealers also thought that it was possible that the Committee may decide to strengthen or reinforce the current forward rate guidance.
Interpretation: no change, 0-1/4 percent until projected unemployment rate falls below 6.5

September 9, 2013

Response: Some dealers thought that the Committee could clarify or strengthen the forward guidance on the target rate as soon as the September FOMC meeting, with several stating that this was their base case scenario. Specifically, further conditioning the first target rate hike on the rate of inflation being above a certain level was noted by several dealers. Lowering the 6.5 percent unemployment rate threshold was also noted as a possibility by several dealers.
Interpretation: 0-1/4 percent until projected unemployment rate falls below 6.5

October 22, 2013

Response: Most dealers noted that they did not expect changes to the language on the expected path of policy rates and forward guidance on the target federal funds rate in the October FOMC statement.

Interpretation: no change, 0-1/4 percent until projected unemployment rate falls below 6.5

December 9, 2013

Response: Many dealers noted that they did not expect changes to the language on the expected path of policy rates and forward guidance on the target federal funds rate in the December FOMC statement. Several dealers believed that the statement would include changes to the current structure of forward guidance, with those dealers citing either the institution of an inflation floor, a lowering of the unemployment rate threshold, or further qualitative guidance on the path of policy rates.
Interpretation: no change, 0-1/4 percent until projected unemployment rate falls below 6.5

January 21, 2014

Response: Most dealers noted that they expected no change to communication on the expected path of policy rates or forward guidance on the target federal funds rate.
Interpretation: no change, 0-1/4 percent at least six months after projected unemployment rate falls below 6.5

March 10, 2014

Response: Most dealers expected the Committee to revise its forward rate guidance at the March meeting. Many dealers expected the FOMC to remove the quantitative unemployment rate threshold and emphasize the need to see improvement in a broad range of labor market indicators before raising the target rate. Some dealers expected additional emphasis to be placed on the target rate remaining low so long as inflation is projected to run below the Committee's 2 percent objective. Several dealers also expected the quantitative inflation thresholds to be removed, and several expected the Committee to emphasize a gradual pace of increase in the target rate following the first increase. Several dealers expected no substantive changes to the forward rate guidance at the March meeting.
Interpretation: 0-1/4 percent until the April 29, 2015 meeting

April 22, 2014

Response: Many dealers noted that they expected no change to communication on the expected path of the policy rate or the forward guidance on the target federal funds rate. Several dealers expected the Committee to amend or remove the language from the March statement indicating that the change in the forward guidance was not a change in policy intentions.
Interpretation: no change, 0-1/4 percent until the April 29, 2015 meeting

June 9, 2014

Response: Most dealers noted their expectation for no change in the forward guidance on the target federal funds rate.
Interpretation: no change, 0-1/4 percent until the April 29, 2015 meeting

July 21, 2014

Response: Most dealers expected no change in the forward guidance on the target federal funds rate.
Interpretation: no change, 0-1/4 percent until the April 29, 2015 meeting

September 8, 2014

Response: Many dealers expected no material change to the forward guidance on the target federal funds rate in the September statement. Several dealers expected the reference to "considerable time" to be adjusted or removed from the statement, or viewed the risk of it being modified as elevated.

Interpretation: no change, 0-1/4 percent until the April 29, 2015 meeting

October 20, 2014

Response: Several dealers expected that the phrase "after the asset purchase program ends" would be removed from the forward-guidance language in the October statement. Several dealers anticipated that the reference to "considerable time" would remain in the October statement, while several others expected that it would be altered or removed. Several dealers expected that the forward-guidance language would be modified to further emphasize the data dependency of the policy outlook. Several dealers anticipated that there would be no significant change to the forward-guidance language.
Interpretation: "considerable time" or 6 months, 0-1/4 percent until the April 29, 2015 meeting

December 8, 2014

Response: Many dealers expected that the Committee would alter or remove the language referencing "considerable time" in the December statement.
Interpretation: 3 months, 0-1/4 percent until the March 18, 2015 meeting

January 20, 2015

Response: Many dealers expected that the Committee would alter or drop the forward guidance language referencing "considerable time" at the January meeting, while some dealers reported that they anticipate that the Committee would not make any material changes to the forward guidance at the January meeting.
Interpretation: 0-1/4 percent until the June 17, 2015 meeting

March 9, 2015

Response: Most dealers expected that the Committee would remove or modify the "patient" language in the March statement. Some dealers expected the FOMC to emphasize that the path of monetary policy is data dependent. Several dealers expected the Committee to communicate that the initial policy tightening is going to be determined on a meeting-by-meeting basis.
Interpretation: 0-1/4 percent until the June 17, 2015 meeting

April 20, 2015

Response: Most dealers did not expect a significant change in the Committee's communication regarding the expected path of policy rates or the forward guidance. Several dealers noted that they expected the Committee to highlight a continued emphasis on data dependency.
Interpretation: no change, 0-1/4 percent until the June 17, 2015 meeting

June 8, 2015

Response: Many dealers did not expect a significant change in the Committee's communication regarding the expected path of policy rates and forward guidance on the target federal funds rate.
Interpretation: no change, 0-1/4 percent until the July 29, 2015 meeting

July 20, 2015

Response: Most dealers expected there to be no change in the communication on the expected path of policy rates and/or forward guidance on the target federal funds rate. Several dealers indicated that the statement might reflect an increased likelihood that the first increase in the target range could occur later this year.
Interpretation: no change, 0-1/4 percent until the September 17, 2015 meeting

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