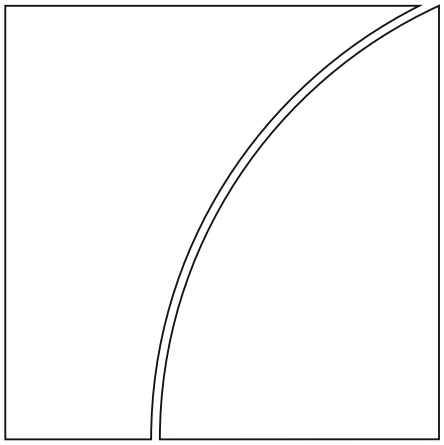
BANK FOR INTERNATIONAL SETTLEMENTS



BIS Working Papers

No 873

Effects of Fed policy rate forecasts on real yields and inflation expectations at the zero lower bound

by Gabriele Galati and Richhild Moessner

Monetary and Economic Department

July 2020

JEL classification: E52, E58.

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

BIS Working Papers are written by members of the Monetary and Economic Department of the Bank for International Settlements, and from time to time by other economists, and are published by the Bank. The papers are on subjects of topical interest and are technical in character. The views expressed in them are those of their authors and not necessarily the views of the BIS.

This publication is available on the BIS website (www.bis.org).

ISSN 1020-0959 (print)
ISSN 1682-7678 (online)

Effects of Fed policy rate forecasts on real yields and inflation expectations at the zero lower bound*

Gabriele Galati[a] and Richhild Moessner[b]

[a]*De Nederlandsche Bank, the Netherlands*
[b]*Bank for International Settlements, Switzerland and CESifo, Germany*

July 2020

Abstract

We study the effects of quantitative policy rate forecasts by the Federal Reserve on real yields and inflation expectations at the zero lower bound (ZLB). We study the effects of surprises in policy rate forecasts from the Summary of Economic Projections (SEP) on real yields and breakeven inflation rates derived from government bonds for forward rates across the yield curve. We find that surprises in the SEP policy rate forecasts significantly affect real yields in the expected direction across the yield curve. By contrast, breakeven inflation rates are little affected across the yield curve. In particular, five-year breakeven inflation rates five years ahead, a common measure of monetary policy credibility, are not significantly affected by surprises in SEP policy rate forecasts. This suggests that policy rate forecasts by the Fed at the ZLB managed to affect real yields without adversely affecting monetary policy credibility.

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

JEL classifications: E52, E58.

* We would like to thank Jakob de Haan, Bill Nelson and Christian Upper for helpful comments and discussions. The views expressed are those of the authors and should not be taken to reflect those of the Bank for International Settlements or De Nederlandsche Bank.

1. Introduction

An important channel in the transmission of monetary policy to aggregate demand is via long-term real interest rates. There are concerns that the unconventional monetary policy tool of forward guidance in the form of quantitative policy rate forecasts may not be effective at the zero lower bound (ZLB).

Long-term inflation expectations are a common measure of monetary policy credibility. There are also concerns that forward guidance through the publication of policy rate forecasts at the ZLB may be perceived by market participants as an unconditional commitment to a time-inconsistent policy, and thereby adversely affect monetary policy credibility.

We investigate both these concerns by studying the effects of the policy rate forecasts made by the Federal Reserve in its Summary of Economic Projections (SEP) at the ZLB on real yields and breakeven inflation rates across the yield curve. We do so by studying the effects of surprises in SEP policy rate forecasts on the dates of the publication of the SEP forecasts on real yields and breakeven inflation rates, using forward rates with horizons from two to ten years ahead derived from nominal and index-linked US government bonds.

There is no consensus in the literature on the effectiveness of unconventional monetary policy measures, including forward guidance and large-scale asset purchases, at the ZLB. There are concerns that unconventional monetary policy may not be sufficiently effective at the ZLB to ensure that inflation remains close to target. Evidence on the effectiveness of forward guidance has recently been surveyed in Moessner et al. (2017). Evidence on the effects of both forward guidance and large-scale asset purchases is reviewed in CGFS (2019).[1]

According to prominent theoretical models of forward guidance at the ZLB, the central bank can reduce long-term interest rates at the ZLB by promising to keep the future policy rates below levels consistent with its normal reaction function when the ZLB is no longer binding (Krugman, 1998; Eggertson and Woodford, 2003; Werning, 2011). But this policy is time-inconsistent. The costs of higher inflation only come later, so that the central bank has an incentive to renege on its promise in the future, and the effectiveness of this policy depends on the central bank's ability to commit.

Several papers have studied whether forward guidance in the form of the publication of policy rate forecasts may be perceived by market participants as an unconditional commitment to a time-inconsistent policy, and thereby adversely affect monetary policy credibility. Moessner and Nelson (2008) and Detmers and Nautz (2012) find that policy rate forecasts by the Reserve Bank of New Zealand have been perceived as conditional forward guidance by financial market participants, rather than as unconditional commitment. Moessner et al. (2017) argue that while theory generally assumes that forward guidance is provided with commitment, in practice central banks have generally provided forward guidance without commitment. Consistent with this, by analysing the text of monetary policy statements in several countries, Sutherland (2020) finds that central banks have generally provided forward guidance without commitment. Feroli et al. (2016) find that date-dependent forward guidance has dampened the reaction of market interest rates to economic news in the United States. For a larger set of countries, Coenen et al. (2017) find the credibility of forward guidance is strengthened if the central bank has also embarked on a large-scale asset purchase programme. Moessner and Rungcharoenkitkul (2019) find that the ZLB and the Fed's forward guidance may both have dampened the market's sensitivity to news during the ZLB period in the wake of the global financial crisis, with the effects being difficult to disentangle. For Sweden and Norway, Natvik et al. (2020) find that communication of policy rate forecasts has not improved the accuracy of market participants' forecasts of future short-term interest rates.

There have only been few studies of the effects of the Fed's SEP policy rate forecasts. The effects of the Federal Reserve's SEP policy rate forecasts on nominal short-term money market interest rates have been studied in Bongard et al. (2019). The relationship of SEP policy rate forecasts with macroeconomic

[1] Central bank communication more generally has been reviewed in Blinder et al. (2008), and unconventional monetary policy measures at the ZLB have been discussed in Woodford (2012).

news has been studied in Gerlach and Stuart (2018). Hofmann and Xia (2020) study the effects of SEP policy rate forecasts on nominal government bond yields. Svensson (2015) compares SEP policy rate forecasts with market expectations. Our paper contributes to this literature by studying the effects of the Fed's SEP policy rate forecasts on real yields and breakeven inflation rates across the yield curve.

In addition to forward guidance in the form of quantitative SEP policy rate forecasts, the Federal Reserve also provided forward guidance in the form of qualitative policy rate guidance announcements at the ZLB. Moessner (2013) finds that qualitative forward guidance announcements by the Federal Reserve at the ZLB have been effective in lowering longer-term US nominal government bond yields at horizons of one to five years ahead.[2] Moessner (2015) finds that qualitative policy rate guidance announcements by the Fed led to a significant reduction in US real yields at horizons of two to five years ahead, whereas US long-term breakeven inflation rates were little affected.

We find that surprises in the SEP policy rate forecasts significantly affect real yields in the expected direction for horizons between three and ten years ahead. Surprises in SEP forecasts corresponding to an increase of 100 days in the projected time to lift-off by the Fed from the ZLB led to a reduction of around 6 basis points in forward real yields at medium horizons of three to six years ahead. By contrast, breakeven inflation rates across the yield curve are little affected by surprises in the SEP policy rate forecasts. In particular, five-year breakeven inflation rates five years ahead, a common measure of monetary policy credibility, are not significantly affected by surprises in SEP policy rate forecasts.

These results suggests that policy rate forecasts by the Fed at the ZLB managed to affect medium and long-term real yields, an important channel for the transmission of monetary policy to stimulate aggregate demand. Moreover, these results suggest that the policy rate forecasts were effective at the ZLB without adversely affecting monetary policy credibility.

The remainder of this paper is organized as follows. Section 2 describes the data, Section 3 presents the method and results, and Section 4 concludes.

2. Data

In the SEP, participants in the Federal Open Market Committee (FOMC) provide projections for the target federal funds rate at the end of the current and subsequent two calendar years and in the longer run (Figure 1).

[Figure 1]

We use estimates of the Fed's expected days to lift-off from the ZLB from the SEP forecasts, *SEPDAYS*, defined as the time until the date at which the median expectation across the different forecasts has reached 37.5 basis points (not restricted to occur on FOMC meeting dates), from Bongard et al. (2020). These use linear interpolation between the yearly forecasted median expectations in order to estimate the dates when lift-off will occur based on the SEP forecasts. We assume that lift-off from the ZLB occurs if the median 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.

To construct the surprise in the Fed's expected days to lift-off from the ZLB on the dates of the publication of the SEP forecasts, we also use the following measure of market participants' expectations of the time to Fed lift-off as in Bongard et al. (2020). It is derived from data on a range of fed funds futures contracts from Bloomberg. 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 is defined as the date of lift-off from the ZLB.

US Treasury instantaneous real forward rates and breakeven inflation rates for horizons of two to ten years ahead are shown in Figures 2 and 3.

[2] For the euro area, Hubert and Labondance (2018) find that the European Central Bank's forward guidance announcements have lowered the term structure of private short-term interest rates at most maturities.

[Figures 2 and 3]

We also control for 11 US macroeconomic surprises in the regressions below. Surprises in those macroeconomic variables are included which have been shown to tend to have significant effects on US money market interest rate futures in 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). The surprises of these data releases are calculated by taking the difference between the real-time data releases and Bloomberg survey expectations, and they are then normalised by their standard deviations for comparability. The real-time data releases of these variables and the median survey expectations are taken from Bloomberg.

The sample comprises daily data from 1 January 2012 to 31 July 2015. The sample period starts in the month when the Federal Reserve started to publish forecasts of the policy rate as a new part of its SEP projections, in January 2012, when the policy rate was at the ZLB. The sample period ends close to lift-off of the policy rate from the zero lower bound, which happened in December 2015.

3. Method and results

We estimate standard event study regressions in daily differences, where we evaluate the reactions of daily changes in *m*-year-ahead US Treasury instantaneous real forward rates or breakeven inflation rates (in basis points), $\Delta y_t^m = y_t^m - y_{t-1}^m$, for horizons m = 2–10 years ahead, and 5 years 5 years ahead (m=5y/5y), to surprises in SEP policy rate forecast, $SEPDAYS_t^{sur}$, based on Bongard et al. (2020),

$$\Delta y_t^m = \alpha + \beta_1 SEPDAYS_t^{sur} + \beta_2 X_t + \varepsilon_t \qquad (1)$$

Here Δy_t^m is the daily change in the instantaneous real forward rate or breakeven inflation rate *m* years ahead. We study the reactions to surprises in policy rate forecasts, 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 (1) is estimated in differences as in standard event study regressions.

We include a vector of control variables, X_t, which contains the surprise components of 11 US macroeconomic data releases on the dates of their release, as described in Section 2, and is zero otherwise.

The variable for the surprise in the expected time to lift-off from the ZLB 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,

$$SEPDAYS_t^{sur} = SEPDAYS_t - E_{t-1}SEPDAYS_t \quad (2)$$

where $E_{t-1}SEPDAYS_t$ is the market's expectation of the SEP forecast on the day prior to its publication. As a proxy for the market expectation of the SEP's forecast, $E_{t-1}SEPDAYS_t$, we use the following expected time to lift-off on the day prior to publication of the SEP forecast (as in Bongard et al., 2020),

$$E_{t-1}SEPDAYS_t = SEPDAYS_{tp} + (FEDFDAYS_{t-1} - FEDFDAYS_{tp}) \quad (3)$$

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 (2) to (3) into equation (1), the regression equation for daily changes in the market's expected time to lift off is

$$\Delta y_t^m = \alpha + \beta_1[SEPDAYS_t - (SEPDAYS_{tp} + FEDFDAYS_{t-1} - FEDFDAYS_{tp})] + \beta_2 X_t + \varepsilon_t \quad (4)$$

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

[Table 1]

The results from equation (4) for real yields are shown in Table 1. We find that surprises in the SEP policy rate forecasts significantly affect real yields in the expected direction for horizons between three and ten years ahead. Surprises in SEP forecasts corresponding to an increase of 100 days in the projected time to lift-off by the Fed from the ZLB led to a reduction of around 6 basis points in forward real yields at medium horizons of three to six years ahead. Part of the reactions of long-term real yields could reflect changes in term premia. Hanson and Stein (2015) found that changes in monetary policy have surprisingly strong effects on forward real rates in the distant future, including ten-year forward real rates, and attribute this to changes in term premia.

We also find that real yields are generally affected in the expected direction by US macroeconomic surprises when these are significant. As an example, the results of macroeconomic news on 5-year real forward rates 5 years ahead are shown in Table 2. This also suggests that markets understood the conditional nature of the Fed's SEP policy rate forecasts, since real yields continued to react to macroeconomic news.

[Table 2]

The results from equation (4) for breakeven inflation rates are shown in Table 2. By contrast to real yields, we find that breakeven inflation rates across the yield curve are little affected by surprises in the SEP policy rate forecasts. Breakeven inflation rates with horizons above 4 years ahead are all not significantly affected by surprises in SEP policy rate forecasts. In particular, five-year breakeven inflation rates five years ahead, a common measure of monetary policy credibility, are not significantly affected by surprises in SEP policy rate forecasts.

[Table 3]

These results suggests that policy rate forecasts by the Fed at the ZLB managed to affect medium and long-term real yields, an important channel for the transmission of monetary policy to stimulate aggregate demand, without adversely affecting monetary policy credibility. These results are consistent with the results of Moessner (2015) for another form of forward guidance provided by the Fed in addition to the quantitative SEP policy rate forecasts, namely qualitative policy rate guidance announcements. Moessner (2015) find that qualitative policy rate guidance announcements by the Fed led to a significant reduction in US real yields at horizons of two to five years ahead, whereas US long-term breakeven inflation rates were little affected.

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 (2), and the time to lift off implied by the previously made SEP forecast on the day prior to publication of the new forecast, $SEPDAYS_{t-1}$ (as in Bongard et al., 2020),

$$E_{t-1}SEPDAYS_t = \gamma(SEPDAYS_{tp} + FEDFDAYS_{t-1} - FEDFDAYS_{tp}) + (1-\gamma)SEPDAYS_{t-1} \quad (5)$$

Inserting equations (2) and (5) into equation (1), the regression equation for daily changes in *m*-year-ahead US Treasury instantaneous real forward rates or breakeven inflation rates (in basis points) becomes

$$\Delta y_t^m = \alpha + \beta_1[SEPDAYS_t - (\gamma(SEPDAYS_{tp} + FEDFDAYS_{t-1} - FEDFDAYS_{tp}) + (1-\gamma)SEPDAYS_{t-1})] + \beta_2 X_t + \varepsilon_t \quad (6)$$

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

[Table 4]

The results from equation (6) for real yields are shown in Table 4. We find that surprises in the SEP policy rate forecasts significantly affect real yields in the expected direction for all the horizons between two and ten years ahead. Surprises in SEP forecasts corresponding to an increase of 100 days in the projected time to lift-off by the Fed from the ZLB led to a reduction of around 9 basis points in forward real yields at horizons of two to four years ahead. Our results are therefore robust to using this alternative surprise measure, they even become somewhat stronger, with larger reductions in real forward rates, and at a larger range of maturities.

[Table 5]

The results from equation (6) for breakeven inflation rates are shown in Table 5. We again find that long-term breakeven inflation rates across the yield curve are little affected by surprises in the SEP policy rate forecasts. Breakeven inflation rates with horizons above 5 years ahead are not significantly affected by surprises in SEP policy rate forecasts (except for a small effect of 1.5 basis points for a 100-day surprise in the time to lift off at the 10-year horizon, which is significant at the 5% level). In particular, five-year breakeven inflation rates five years ahead, a common measure of monetary policy credibility, are again not significantly affected by surprises in SEP policy rate forecasts. But now shorter-term breakeven inflation rates at horizons of 5 years ahead or lower increase slightly, by 2 to 4 basis points, in response to a 100-day surprise in the time to lift-off.

These results again suggests that policy rate forecasts by the Fed at the ZLB managed to affect medium and long-term real yields, an important channel for the transmission of monetary policy to stimulate aggregate demand, without adversely affecting monetary policy credibility.

4. Conclusions

An important channel in the transmission of monetary policy to aggregate demand is via long-term real interest rates. There are concerns that the unconventional monetary policy tool of forward guidance in the form of quantitative policy rate forecasts may not be effective at the zero lower bound (ZLB).

Long-term inflation expectations are a common measure of monetary policy credibility. There are also concerns that forward guidance through the publication of policy rate forecasts at the ZLB may be perceived by market participants as an unconditional commitment to a time-inconsistent policy, and thereby adversely affect monetary policy credibility.

We investigate both these concerns by studying the effects of the policy rate forecasts made by the Federal Reserve in its Summary of Economic Projections (SEP) on real yields and inflation expectations across the yield curve. We do so by studying the effects of surprises in SEP policy rate forecasts on real yields and inflation expectations, using forward rates with horizons from two to ten years ahead derived from nominal and index-linked government bonds.

We find that surprises in the SEP policy rate forecasts significantly affect real yields in the expected direction for horizons between three and ten years ahead. Surprises in SEP forecasts corresponding to an increase of 100 days in the projected time to lift-off by the Fed from the ZLB led to a reduction of around 6 basis points in forward real yields at medium horizons of three to six years ahead. By contrast, inflation expectations across the yield curve are little affected by surprises in the SEP policy rate forecasts. In particular, five-year inflation expectations five years ahead, a common measure of monetary policy credibility, are not significantly affected by surprises in SEP policy rate forecasts.

These results suggests that policy rate forecasts by the Fed at the ZLB managed to affect medium and long-term real yields, an important channel for the transmission of monetary policy to stimulate aggregate demand, without adversely affecting monetary policy credibility.

References

Blinder, A., Ehrmann, M., Fratzscher, M., de Haan, J. and D. Jansen (2008). Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence. Journal of Economic Literature, 46, 910–45.

Bongard, M., Galati, G., Moessner, R. and W. Nelson (2020). Connecting the dots: Market reactions to forecasts of policy rates and forward guidance provided by the Fed. International Journal of Finance and Economics, forthcoming.

Coenen, G., Ehrmann, M., Gaballo, G., Hoffmann, P., Nakov, A., Nardelli, S., Persson, E. and G. Strasser (2017). Communication of monetary policy in unconventional times. ECB Discussion Papers No. 2080.

CGFS (2019). Unconventional monetary policy tools: a cross-country analysis. CGFS Paper No. 63, Bank for International Settlements.

Detmers, G. and D. Nautz (2012). The information content of central bank interest rate projections: evidence from New Zealand, *The Economic Record*, 88(282), 323–9.

Eggertsson, G. and Woodford, M. (2003). The zero bound on interest rates and optimal monetary policy. Brookings Papers on Economic Activity 1, 193–233.

Feroli, M., Greenlaw, D., Hooper, P., Mishkin, F. and A. Sufi (2016). Language after liftoff: Fed communication away from the zero lower bound. Report prepared for the 2016 US Monetary Policy Forum, 26 February.

Gerlach, S. and R. Stuart (2018). Plotting interest rates: The FOMC's projections and the economy. CEPR Discussion Paper DP12768.

Gürkaynak, R., Sack, B. and Wright, J. (2008). The TIPS yield curve and inflation compensation, Working Paper, Federal Reserve Board Finance and Economics Discussion Series, No. 2008-05, Federal Reserve Board, Washington, DC.

Hanson, S. and J. Stein (2015). Monetary policy and long-term real rates. Journal of Financial Economics, 115, 429–448.

Hofmann, B. and D. Xia (2020). Effectiveness of central bank forward guidance through interest rate projections. Bank for International Settlements, manuscript.

Hubert, P. and F. Labondance (2018). The effect of ECB forward guidance on the term structure of interest rates. International Journal of Central Banking, December, 193-222.

Krugman, P. (1998). It's Baaack: Japan's slump and the return of the liquidity trap. Brookings Papers on Economic Activity 29, 137–206.

Moessner, R. (2013). Effects of explicit FOMC policy rate guidance on interest rate expectations, Economics Letters, 121(2), 170-173.

Moessner, R. (2015). Reactions of real yields and inflation expectations to forward guidance in the United States, Applied Economics, 47(26), 2671–2682.

Moessner, R. and W. Nelson (2008). Central Bank Policy Rate Guidance and Financial Market Functioning. International Journal of Central Banking, 4(4), 193-226.

Moessner, R., Jansen, D. and J. de Haan (2017). Communication about future policy rates in theory and practice: A Survey. Journal of Economic Surveys, 31(3), 678-711.

Moessner, R. and P. Rungcharoenkitkul (2019). The zero lower bound, forward guidance and how markets respond to news. BIS Quarterly Review, March, p. 83–94.

Natvik, G., Rime, D. and O. Syrstad (2020). Does publication of interest rate paths provide guidance? Journal of International Money and Finance, 103.

Sutherland, C. (2020). Forward guidance and expectation formation: Cross-country evidence from survey data. Bank of Canada, manuscript.

Svensson, L. (2015). Forward Guidance. International Journal of Central Banking, 11(S1), 19-64.

Werning, I. (2011). Managing liquidity trap: monetary and fiscal policy. NBER Working Paper No. 17344.

Woodford, M. (2012). Methods of policy accommodation at the interest-rate lower bound. Paper presented at the Federal Reserve Bank of Kansas City Jackson Hole symposium on The changing policy landscape, 31 August– 1 September.

Tables

Table 1: Reactions of real yields to surprises in SEP policy rate forecasts at the ZLB

Dependent variable: Δy_t^m, daily changes in US Treasury instantaneous forward real rates m years ahead										
Variable	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	5y/5y forward
α	0.172	0.105	0.088	0.071	0.052	0.034	0.018	0.004	-0.006	0.028
β_1	-0.044	-0.058*	-0.063**	-0.060***	-0.055**	-0.049***	-0.043***	-0.038***	-0.033***	-0.046***
Adj. R^2	0.040	0.074	0.083	0.083	0.077	0.069	0.059	0.049	0.039	0.067
No. obs	859	859	859	859	859	859	859	859	859	859

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 1 January 2012 to 31 July 2015.

Table 2: Reactions of 5-year real yields 5 years ahead to surprises in SEP policy rate forecasts and macroeconomic news at the ZLB

Dependent variable: $\Delta y_t^{m=5y/5y}$, daily changes in 5-year US Treasury forward real rates 5 years ahead	
Variable	
α	0.028
β_1	-0.046***
Non-farm payrolls	7.567***
ISM	3.379***
Unemployment rate	-0.025
Retail sales	1.779**
Industrial production	0.068
Housing starts	2.866***
CPI	-1.553
PPI	-0.767
Hourly earnings	0.986
Trade	-0.093
GDP (advance)	-0.803
Adj. R^2	0.015
No. of observations	859

***, ** 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: Reactions of breakeven inflation rates to surprises in SEP policy rate forecasts at the ZLB

Dependent variable: Δy_t^m, daily changes in US Treasury instantaneous forward breakeven inflation rates m years ahead										
Variable	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	5y/5y forward
α	-0.028	0.048	0.034	0.0001	-0.037	-0.068	-0.091	-0.104	-0.109	-0.071
β_1	0.017	0.023	0.020**	0.012	0.005	0.0001	-0.002	-0.0003	0.003	0.002
Adj. R^2	0.001	0.014	0.017	0.014	0.011	0.010	0.012	0.017	0.024	0.015
No. obs	859	859	859	859	859	859	859	859	859	859

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 1 January 2012 to 31 July 2015.

Table 4: Reactions of real yields to surprises in SEP policy rate forecasts at the ZLB, using alternate proxy measure for market expectations of SEP forecasts

Dependent variable: Δy_t^m, daily changes in US Treasury instantaneous forward real rates m years ahead										
Variable	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	5y/5y forward
α	0.228	0.146	0.116	0.089	0.063	0.040	0.020	0.005	-0.007	0.034
β_1	-0.089**	-0.091***	-0.085***	-0.075***	-0.064***	-0.054***	-0.045***	-0.038**	-0.033**	-0.051***
γ	0.098	0.354	0.528**	0.653***	0.754***	0.839***	0.914***	0.976***	1.027***	0.838***
Adj. R^2	0.053	0.082	0.087	0.084	0.077	0.068	0.058	0.048	0.038	0.066
No. obs	859	859	859	859	859	859	859	859	859	859

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 1 January 2012 to 31 July 2015.

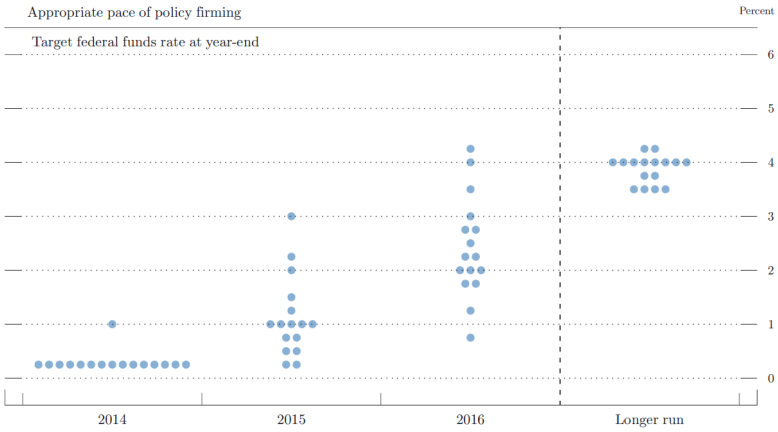
Table 5: Reactions of breakeven inflation rates to surprises in SEP policy rate forecasts at the ZLB, using alternate proxy measure for market expectations of SEP forecasts

Dependent variable: Δy_t^m, daily changes in US Treasury instantaneous forward breakeven inflation rates m years ahead										
Variable	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	5y/5y forward
α	-0.062	0.030	0.024	-0.007	-0.042	-0.075	-0.100	-0.116	-0.124	-0.080
β_1	0.044***	0.038***	0.028***	0.017**	0.009	0.005	0.006	0.009	0.015**	0.009
γ	-0.111	0.295	0.479**	0.461	0.122	-0.766	-1.278	-0.842	-0.434	-0.387
Adj. R^2	0.008	0.017	0.017	0.014	0.011	0.010	0.012	0.019	0.027	0.015
No. obs	859	859	859	859	859	859	859	859	859	859

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 1 January 2012 to 31 July 2015.

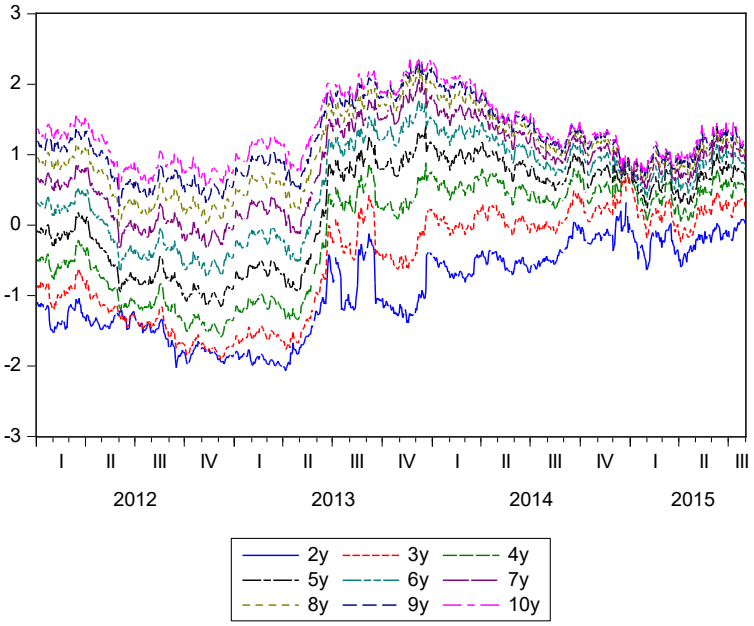
Figures

Figure 1: SEP policy rate forecasts by the Federal Reserve, March 2014



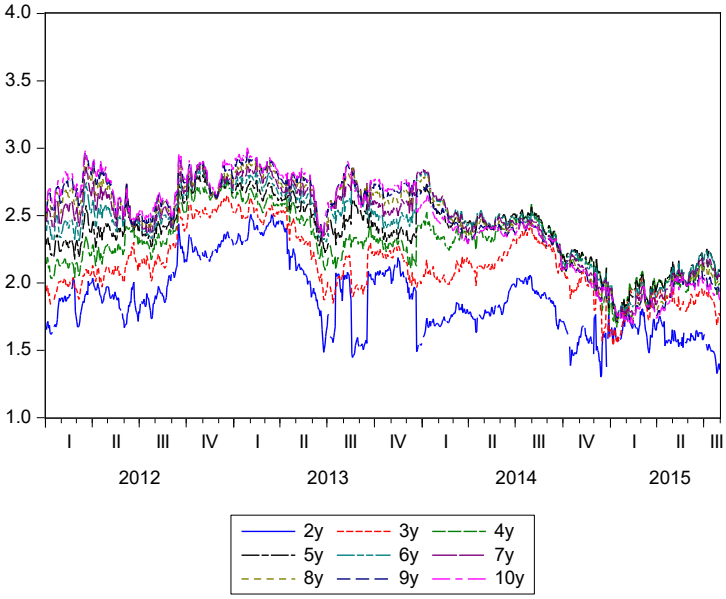
Source: Federal Reserve, https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20140319.pdf .

Figure 2: US Treasury instantaneous forward real rates at the ZLB, 2 to 10 years ahead (in per cent)



Source: Computed following the methodology of Gürkaynak et al. (2008) as made available on the Federal Reserve website at http://www.federalreserve.gov/pubs/feds/2008/200805/200805abs.html .

Figure 3: US Treasury instantaneous forward breakeven inflation rates at the ZLB, 2 to 10 years ahead (in per cent)



Source: Computed following the methodology of Gürkaynak et al. (2008) as made available on the Federal Reserve website at http://www.federalreserve.gov/pubs/feds/2008/200805/200805abs.html .

Previous volumes in this series

872 July 2020	Effects of credit restrictions in the Netherlands and lessons for macroprudential policy	Gabriele Galati, Jan Kakes and Richhild Moessner
871 July 2020	The Matthew effect and modern finance: on the nexus between wealth inequality, financial development and financial technology	Jon Frost, Leonardo Gambacorta and Romina Gambacorta
870 July 2020	International spillovers of forward guidance shocks	Callum Jones, Mariano Kulish and Daniel M Rees
869 June 2020	How well-anchored are long-term inflation expectations	Richhild Moessner and Előd Takáts
868 June 2020	Debt De-risking	Jannic Cutura, Gianpaolo Parise and Andreas Schrimpf
867 June 2020	The effectiveness of macroprudential policies and capital controls against volatile capital inflows	Jon Frost, Hiro Ito and René van Stralen
866 May 2020	Model risk at central counterparties: Is skin-in-the-game a game changer?	Wenqian Huang and Előd Takáts
865 May 2020	The drivers of cyber risk	Iñaki Aldasoro, Leonardo Gambacorta, Paolo Giudici and Thomas Leach
864 May 2020	Global and domestic financial cycles: variations on a theme	Iñaki Aldasoro, Stefan Avdjiev, Claudio Borio and Piti Disyatat
863 May 2020	Pension contributions and tax-based incentives: evidence from the TCJA	Ahmed Ahmed and Anna Zabai
862 May 2020	On the instability of banking and other financial intermediation	Chao Gu, Cyril Monnet, Ed Nosal and Randall Wright
861 May 2020	Dealers' insurance, market structure, and liquidity	Francesca Carapella and Cyril Monnet
860 April 2020	Dollar invoicing, global value chains, and the business cycle dynamics of international trade	David Cook and Nikhil Patel
859 April 2020	Post-crisis international financial regulatory reforms: a primer	Claudio Borio, Marc Farag and Nikola Tarashev
858 April 2020	The Janus face of bank geographic complexity	Iñaki Aldasoro and Bryan Hardy

All volumes are available on our website www.bis.org.