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Lower for longer: The case of the ECB

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HIGHLIGHTS

- Simple forecast-based reaction function matches ECB decisions quite well until 2014.
- Forecasts of professional forecasters imply better fit than ECB staff forecasts.
- Starting in 2014 ECB has eased policy more aggressively.
- Indicates a "lower for longer" approach near zero interest rates.

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ABSTRACT

Research has suggested that monetary policy acts asymmetrically near zero interest rates. We match past ECB decisions with a simple forecast-based reaction function. The policy easing that started in 2013 has led to a deviation indicating a "lower for longer" approach.

1. Introduction

A number of contributions to research on monetary policy have suggested that central banks should conduct policy in an asymmetric fashion near zero nominal interest rates. Due to the low opportunity costs of holding cash, there is a lower bound on central banks' preferred policy instrument, the short-term rate on central bank reserves charged in bank-refinancing operations. Early contributions on policy near zero interest rates such as Reifschneider and Williams (2000) and Orphanides and Wieland (2000) found that an asymmetric approach would help reduce the impact of this constraint in macroeconomic models of a New Keynesian variety with nominal rigidities. As inflation and economic activity decline, policy should ease more aggressively than it would in the absence of the constraint. As economic activity recovers and inflation picks up, the central bank should act to keep interest rates lower for longer than without the bound. These findings were referred to by policy makers (cf. Bernanke, 2002) and confirmed in subsequent research using New Keynesian models with additional microeconomic foundations such as Adam and Billi (2006, 2007) and Nakov (2008). Most recently, the "lower for longer" argument has been used to justify delaying lift-off of the federal funds rate in the United States, for example by Evans et al. (2015).

In July 2013 the European Central Bank's (ECB) Governing Council provided specific forward guidance by stating that it expects ECB interest rates to remain at present or lower levels for an extended period of time. ECB President Draghi explained that an estimate of this period could be deduced from a reaction function. In this note, we investigate to what extent past ECB decisions can be explained with a simple reaction function and whether the policy easing implemented since summer 2013 deviates from it. As suggested by Orphanides and Wieland (2013) (OW) we estimate

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a rule that incorporates reactions to SPF forecasts for inflation and real output growth. The empirical fit is better with constant-horizon SPF forecasts from business economists than with ECB staff forecasts. Then, we compare the implications of the rule to recent ECB policy decisions. We find that the policy easing deviates from this reaction function since 2015, thereby indicating a lower-for-longer approach to monetary policy at the lower bound.

2. A reaction function that fits ECB policy quite well

The exact numerical expectation of the policy path and the length of time, for which the Governing Council anticipates policy rates to stay at present or lower levels, remain uncertain to market participants. However, in 2013, President Draghi stressed that "*there is no precise deadline for this extended period of time. As a matter of fact, you can ... extract a reaction function and, from there, estimate what would be a reasonable extended period of time*" (Draghi, 2013b). Hence, it is of great interest to compare the ECB decisions to a simple reaction function or policy rule (see also Bletzinger and Wieland 2013, 2016). The interest rate rule considered by Orphanides and Wieland (2013) (OW) takes the following form:

$$i_t = i_{t-1} + 0.5\left(\pi_{t+3|t} - \pi^*\right) + 0.5\left(q_{t+2|t} - q^*_{t+2|t}\right). \quad (1)$$

It is not a rule for the level of the policy rate such as the Taylor rule (Taylor, 1993), but for the first difference. Hence, it does not require an estimate of an equilibrium rate. Accordingly, the central bank changes the policy rate from the preceding level whenever the forecast for inflation deviates from the central bank's inflation objective or the GDP growth forecast deviates from the estimated growth potential. π denotes the rate of inflation, π^* the inflation target, q the growth rate of GDP and q^* the growth rate of potential GDP. The time index t is quarterly. Thus, the subscript $t+3|t(t+2|t)$ denotes the forecast of a particular variable 3 quarters (2 quarters) into the future. The reaction coefficients are set at 0.5 such that a one-percentage-point deviation of the inflation forecast from target or the output growth forecast from potential would result in a 50 basis point adjustment of the policy rate.[1]

Ideally, one would want to feed ECB Governing Council members' forecasts of inflation and output growth into this reaction function. For example, Orphanides and Wieland (2008) have used publicly available forecasts of members of the Federal Open Market Committee to estimate a forecast-based rule for the United States.[2] Unfortunately, however, the inflation and output growth forecasts of ECB Governing Council members are not publicly available. Instead, like OW we use information from the Survey of Professional Forecasters (SPF) that is collected by the ECB and published in the second month of every quarter shortly after the policy meeting of that month. Specifically, we use the 4-quarters-ahead forecast from the most recent data point available. The respective forecast horizons – from the quarter of the policy decision and publication of the SPF survey – correspond to $t+3$ quarters for CPI inflation and $t+2$ quarters for GDP growth, due to the different timing and frequency of CPI inflation and GDP growth data releases. Hence, the different timing of the forecast deviations in the rule in Eq. (2) is determined by the availability of data on forecasts. Taking into account the ECB's inflation objective of close to, but below, two percent, OW consider a target range of 1.5%– 2.0%. As a consequence, the rule implies a range of interest rate prescriptions of a width of 25 basis points. As to potential growth we employ the estimate produced by the European Commission, because the ECB's estimate is not made public.[3] See Bletzinger and Wieland (submitted for publication) for all data used including a detailed description.

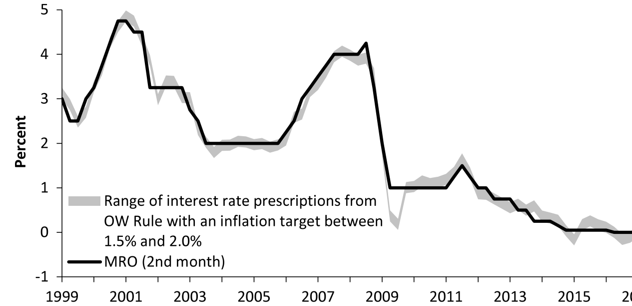

Fig. 1. MRO rate versus Orphanides and Wieland (2013) rule with SPF forecasts. **Notes:** The black line shows the ECB's interest rate on its main refinancing operations in the *second* month of each quarter from 1999:Q1 to 2017:Q1. The grey shaded area is constructed with the OW rule: MRO rate = (previous MRO rate) + 0.5(3-quarter ahead forecasted inflation deviation from target) + 0.5(2-quarter ahead forecasted GDP growth rate gap from potential). The lower line of the shaded area has an inflation target of 2% and the upper line a target of 1.5%. The forecast data is from the ECB Survey of Professional Forecasters (SPF) and EC AMECO.

Fig. 1 compares the historical interest rate prescriptions from the OW rule with the rate on the ECB's Main Refinancing Operations (MRO rate). The range of prescriptions matches ECB decisions very well. It does so even though the rule does not include additional information on monetary dynamics. This result is consistent with the finding that cross-checking the ECB's first pillar with longer-term trends in monetary and credit dynamics only requires occasional adjustments in the policy stance, while short-run information on money and credit may also be accounted for in the outlook for GDP (Beck and Wieland, 2007, 2008). As discussed further in Bletzinger and Wieland (2016), the good fit does not just result from including the lagged interest rate in the rule.

3. Regression results

OW do not report estimation results that would indicate what type of rule and what coefficient values provide the best empirical fit to the ECB's policy decisions. Besides determining point estimates and confidence intervals for the response coefficients, such estimation would provide information on the inflation target that is consistent with ECB policy decisions. Assuming that the target is constant over time and that the level of the interest rate does not feature a deterministic trend, the estimation equation can be written as:

$$\Delta i_t = \beta_0 + \beta_1\pi_{t+3|t} + \beta_2\left(q_{t+2|t} - q^*_{t+2|t}\right) + \varepsilon_t. \quad (2)$$

The implied inflation target is defined by the negative ratio of the intercept and the response coefficient on inflation, $\pi^* = -\beta_0/\beta_1$. Column 1 in Table 1 reports an ordinary least squares (OLS) regression of Eq. (2) using the data on SPF forecasts up to 2013 Q2. The endpoint is chosen to be prior to the new round of policy easing including asset purchases. The estimated coefficient on the inflation forecast of 0.49 is effectively the same as the 0.5 value used by OW. The coefficient on the output gap is a bit lower at 0.40. Yet, the OW value of 0.5 lies just at the upper border of the estimated 95% confidence interval. The point estimate of the inflation target of 1.72% lies just about in the middle of the 1.5% to 2% range used by OW and in Fig. 1. It is fully consistent with the official definition of the inflation objective by the ECB as close to,

[1] Orphanides and Wieland (2013) propose a rule with these coefficients and investigate the optimal choice of response coefficients and forecast horizons by evaluating the stabilisation performance in different macroeconomic models of the euro area.

[2] See also Wieland (2012) for an estimate of the likely date of lift-off of the federal funds rate in the US.

[3] To obtain quarterly estimates we interpolate the annual estimates from the annual macro-economic database (AMECO) of the European Commission.

Table 1
Estimated interest rate rules.

Dep. Variable: first difference of MRO rate	(1) OLS with **SPF data** only	(2) OLS with **staff data** only	(3) NLS one unrestricted weight	(4) NLS one restricted weight	(5) NLS two unrestricted weights	(6) NLS two restricted weights
$\alpha_1 = \alpha_2$			1.20 [1.05; 1.34]	1.00 [0.96; 1.00]		
β_1	0.49 [0.25; 0.72]	0.07 [−0.15; 0.29]	0.70 [0.38; 1.02]	0.46 [0.09; 0.83]	0.78 [0.43; 1.13]	0.46 [0.09; 0.83]
α_1					1.06 [0.80; 1.31]	1.00 [0.32; 1.00]
β_2	0.40 [0.32; 0.49]	0.17 [0.07; 0.27]	0.40 [0.31; 0.49]	0.37 [0.28; 0.47]	0.39 [0.29; 0.48]	0.37 [0.22; 0.53]
α_2					1.35 [1.06; 1.64]	1.00 [0.85; 1.00]
$\pi^* = -\beta_0/\beta_1$	1.72 [1.60; 1.84]	1.79 [0.14; 3.44]	1.74 [1.65; 1.82]	1.74 [1.60;1.88]	1.79 [1.68; 1.90]	1.74 [1.57; 1.91]
R-squared	0.69	0.35	0.70	0.67	0.71	0.67
Adj. R-squared	0.68	0.33	0.69	0.65	0.69	0.64
Durbin–Watson stat.	2.05	1.61	2.37	2.17	2.40	2.17
Observations	58	50	50	50	50	50

Note: Whereas SPF data is available since 1991:Q1, the staff projections are only available since 2001:Q1. Thus, all columns except (1) make use of the shorter sample. All regressions use data until 2013:Q2. The 95% confidence intervals are given below the point estimates. The confidence intervals of the restricted weights are calculated by moving block bootstrapping with a block length of five quarters and 10,000 repetitions. In order to fully account for real-time considerations, we use the MRO difference in each quarter in which all data was available. Hence, column (1) uses the second month of the quarter and all others use the third month. If the second month rate is used instead, the estimation results do not change significantly.

but below, two percent. The 95% confidence interval ranges from 1.60% to 1.84%. Thus, our estimated interest rate reaction function supports the view that the ECB has been setting interest rates in line with its stated inflation objective over this period.

With an R-squared of 0.69 the fitted equation explains about two thirds of the changes in the MRO rate. By comparison, a regression of the first difference of the MRO rate on the lagged first difference results in an R-squared of only 0.23. Thus, the outlook for inflation and growth embodied in the SPF forecasts and the European Commission's estimate of potential growth provides substantial additional explanatory power. Furthermore, the OLS regression implies continuous interest rate adjustment. If the estimation were to take into account that interest rate changes typically occurred in steps of 25 or 50 basis points, it would explain an even greater part of the policy decisions.

SPF versus ECB staff forecasts

A natural question to ask is whether the ECB Governing Council's views would not be better approximated with the ECB Staff forecasts than the average of private sector SPF forecasts. ECB staff forecasts are only available in form of annual forecasts but not in form of constant-horizon forecasts from the most recent observation as in the case of the SPF. Thus, we approximate the constant-horizon forecasts called for in regression Eq. (2) by appropriately averaging annual staff forecasts (see Bletzinger and Wieland, submitted for publication). Of course, averaged annual forecasts likely ignore some of the variation in quarterly constant-horizon forecasts that might otherwise help explain the interest rate decisions. Since the staff forecasts are made available for the ECB Governing Council meeting in the third month of the quarter we use the value of the MRO rate at that time in the regression. The second column in Table 1 reports the estimates of Eq. (2) with ECB staff forecasts. The regression fit deteriorates substantially relative to the version with SPF forecasts. Also, the coefficient on the inflation forecast is not significantly different from zero.

The relative importance of SPF forecasts versus ECB staff projections can be examined further with a nested regression:

$$\Delta i_t = \beta_0 + \beta_1 \left[\alpha_1 \pi^{SPF}_{t+3|t} + (1-\alpha_1)\,\pi^{staff}_{t+3|t}\right] + \beta_2 \left[\begin{array}{c} \alpha_2 \left(q^{SPF}_{t+2|t} - q^*_{t+2|t}\right) + \\ (1-\alpha_2)\left(q^{staff}_{t+2|t} - q^*_{t+2|t}\right) \end{array}\right] + \varepsilon_t. \quad (3)$$

Orphanides and Wieland (2008) and Wieland and Wolters (2013) use such nested regressions in order to estimate the role of forecasts versus outcomes for the U.S. Federal Reserve. Whereas we fix the forecast horizons according to the availability of the SPF data, we allow for different weights on SPF and ECB staff forecasts in non-linear least squares (NLS) regressions. Column 3 reports estimates for the case where the weight on the two types of forecasts is the same for inflation and output growth ($\alpha_1 = \alpha_2$), whereas column 5 reports estimates when the weights can differ. These NLS regressions do not restrict the weights to take values between 0 and 1, which is why they are referred to as unrestricted. It turns out that the estimated weights on the SPF forecast are greater than unity.

Thus, in the next step, we restrict the weights to be non-negative and to add up to one.[4] Running such a regression requires searching for local optima within the limited interval for the weights with the possibility of an interior solution. The resulting estimates are reported in columns 4 and 6. They indicate clearly that ECB interest rate decisions are better explained with SPF forecasts than with ECB staff forecasts. In both cases, the estimated weights are equal to unity. The regressions with both types of forecasts use the MRO rate from the third month in the quarter as dependent variable, because the ECB staff forecast only becomes available for the third-month meeting. At that time, the SPF forecasts are already a bit stale, which explains that the response coefficients are not always identical to the regression in column 1. Incidentally, the implied inflation target is very robust across all regressions.

4 To this end, the weights α_i and $1-\alpha_i$ are replaced in the regression with $e^{\theta_i}/\left(e^{\theta_i}+1\right)$ and $1/\left(e^{\theta_i}+1\right)$, respectively. Table 1 still reports the transformed variables $\alpha_i = e^{\theta_i}/\left(e^{\theta_i}+1\right)$.

One might be tempted to conclude from these regressions that the ECB Governing Council puts more weight on private sector SPF forecasts in making its policy decisions than on the projections prepared by his own staff. Yet, this would be an over-interpretation. The ECB staff prepares quarterly projections for up to three years for the ECB Governing Council, but only the annual forecasts have been made public throughout the full sample period. That is why we interpolate annual staff projections to obtain an approximation of constant-horizon projections. Quite possibly, the exact constant-horizon projections of the ECB staff would provide a better empirical fit than the constant-horizon SPF forecast. Unfortunately, however, the quarterly forecasts have only been made publicly available since March 2014. Otherwise, it would have been possible to compare with ECB staff constant-horizon forecasts.[5]

4. ECB policy with near zero interest rates

Next, we return to the question whether recent policy decisions reflect a "lower for longer" approach to monetary policy near zero interest rates. Fig. 2a shows that the interest rate prescriptions resulting from the estimated rule have moved above the MRO rate in 2015. The projection based on the 8-quarter head SPF forecasts as of 2016 Q1 calls for an increase in the policy rate in the course of 2016. Although the inflation forecast is below target, the forecast for GDP growth is sufficiently above the estimate of potential growth to induce an increase in the rate prescription. A more remote rise in the prescribed policy rate is obtained when using the SPF forecasts as of 2017 Q1, as shown in Fig. 2b.

By contrast the ECB has implemented substantial additional monetary easing since the start of 2015. With regard to policy rates, it has reduced the MRO rate to 0% and the rate on its deposit facility to −0.4%. Furthermore, it has offered targeted long-term refinancing operations under which banks can obtain liquidity at a fixed rate of −0.4% for up to four years. Additionally, the ECB has launched a large-scale asset purchase programme. These measures have contributed to a substantial reduction in current and anticipated future overnight interest rates.

The asset purchase programme has resulted in a rapid increase in the ECB's balance sheet. Specifically, the ECB announced in January 2015 government and private debt purchases on the scale of 60 billion euro per month. They were increased to 80 billion euro per month for some time and have been extended at least until December 2017. Such quantitative easing has substantial effects on medium- and longer-term rates along the yield curve via signalling and portfolio rebalancing channels. Indeed, early research on monetary policy near zero interest rates suggested resorting to balance sheet expansion when further policy easing is needed and recent contributions provide estimates of the effect of such measures (cf. Orphanides and Wieland, 2000; Auerbach and Obstfeld, 2005; Boeckx et al., 2014; Gambacorta et al., 2014; Georgiadis and Gräb, 2015).

The impact on rates is visible in the implied future overnight rates extracted from the yield curve. These rates have moved down substantially throughout 2015, 2016 and 2017. As shown in Fig. 2a, they stood more than 50 basis points below the prescriptions from our estimated reaction function in the first quarter of 2016. Fig. 2b indicates that this spread even increased to 75 basis points in the first quarter of 2017. The policy easing since 2015 has moved implied rates well below the estimated reaction function that describes historical ECB decisions quite well.

[5] Another drawback of the public staff projections is that they do not fully reflect ECB staff projections. The figures are provided, on a rotating basis, by staff of the ECB only (March and September publications) and staff of the national central banks and the ECB (June and December publications). Thus, the methodology of the projections changes within the same time series. This makes it even harder to judge what the actual expectations of the ECB Governing Council members are.

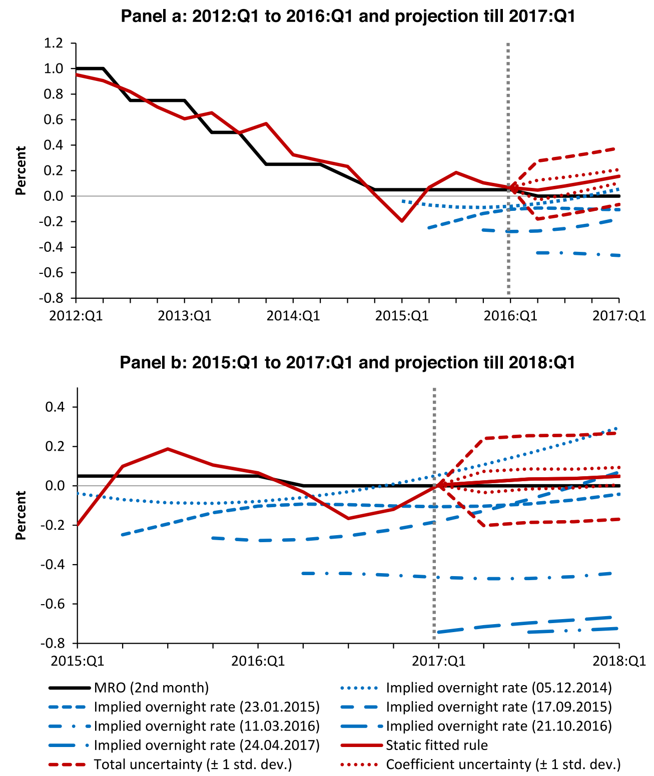

Fig. 2. Estimated reaction function vs MRO and implied future overnight rates. **Notes:** The black line shows the ECB's interest rate on its main refinancing operations in the *second* month of each quarter. The blue lines show the implied overnight rates from the ECB calculated at different points in time. The red lines show the fitted and projected values from the regression given in column 1 of Table 1 using 2016Q1 and 2017Q1, respectively, as the starting point for the projection. The red dashed and dotted lines show the forecasted values plus/minus one standard deviation using total and only coefficient uncertainly, respectively.

5. Conclusion

The forward guidance provided by the ECB Governing Council since summer 2013 includes the expression that "*the Governing Council expects the key ECB interest rates to remain at present or lower levels for an extended period of time*" (Draghi, 2013a). As suggested by ECB President Draghi, we have used an estimated reaction function to evaluate whether the ECB as embarked on a "lower for longer" approach to monetary policy near zero interest rates.

Since 2015 ECB policy has moved below the reaction function that fits historical ECB decisions quite well. This reaction function corresponds to a forecast-based first-difference rule as suggested by Orphanides and Wieland (2013). It employs SPF forecasts of inflation and output growth that were available to the ECB Governing Council in real time. Our estimated response coefficients turn out to be quite close to the coefficients assumed by OW. Furthermore, our estimate of the numerical inflation target is consistent with the ECB's definition of the objective of close to, but below, two percent. We find that available annual ECB staff forecasts do not improve the reaction function's fit, which may be explained by the lack of historical constant-horizon staff forecasts.

Additional monetary policy easing since 2015 includes deposit rate cuts, fixed-rate long-term refinancing operations and large-scale asset purchases. These have contributed to a decline in market interest rates. In particular, anticipated future overnight rates derived from the yield curve have moved substantially further below the interest rates implied by the reaction function.

Contributions to the literature on monetary policy at near zero interest rates suggest that a ''lower for longer'' approach is effective in reducing deflation risk (see Orphanides and Wieland, 2000; Eggertsson and Woodford, 2003; Evans et al., 2015). Yet, there are countervailing effects to be considered. For example, a long period of low interest rates is likely to increase the risk of financial instability and asset-price driven boom–bust cycles (see Taylor, 2007) and may create incentives for euro area member states' governments to postpone consolidation and reform efforts that are much needed to raise potential growth (see BIS, 2015; GCE, 2015).

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