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Estimating the European Central Bank's
“Extended Period of Time”

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Estimating the European Central Bank's "Extended Period of Time"

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Abstract

On July 4, 2013 the ECB Governing Council provided more specific forward guidance than in the past by stating that it expects ECB interest rates to remain at present or lower levels for an extended period of time. As explained by ECB President Mario Draghi this expectation is based on the Council's medium-term outlook for inflation conditional on economic activity and money and credit. Draghi also stressed that there is no precise deadline for this extended period of time, but that a reasonable period can be estimated by extracting a reaction function. In this note, we use such a reaction function, namely the interest rate rule from Orphanides and Wieland (2013) that matches past ECB interest rate decisions quite well, to project the rate path consistent with inflation and growth forecasts from the survey of professional forecasters published by the ECB on August 8, 2013. This evaluation suggests an increase in ECB interest rates by May 2014 at the latest. We also use the Eurosystem staff projection from June 6, 2013 for comparison. While it would imply a longer period of low rates, it does not match past ECB decisions as well as the reaction function with SPF forecasts.

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1. ECB Style Forward Guidance

Following ECB Governing Council statements in May and June that the monetary policy stance will remain accommodative for as long as necessary, on July 4, 2013 the Council took the unprecedented step of stating its expectation for future interest rates more specifically as follows:

“Looking ahead, our monetary policy stance will remain accommodative as long as necessary. The Governing Council expects the ECB interest rates to remain at present or lower levels for an extended period of time. This expectation is based on the overall subdued outlook for inflation extending into the medium term, given the broad-based weakness in the real economy and subdued monetary dynamics.”

By providing information on expected future policy decisions, policy makers remove some of the uncertainty faced by market participants, namely uncertainty about the policy makers’ own expectations. This type of forward guidance of market expectations is used more and more widely among central banks. Norges Bank and Sveriges Riskbank – the central banks of Norway and Sweden – belong to those that have moved furthest in this direction by regularly publishing their forecasts of policy rates together with their forecasts of inflation and economic activity.¹ They even add measures that reflect the likelihood of different policy paths depending on the uncertainty around the economic outlook.

ECB President Mario Draghi has explained the ECB’s approach to forward guidance by revealing information on policymakers’ expectations in more detail in the press conferences on July 4 and August 1, 2013.² On August 1, for example, he stated: *“our formulation of forward guidance is in line with our strategic framework, which is anchored in our assessment of the medium-term outlook for inflation, or price stability. And this outlook depends on economic activity and on money and credit developments. So this is our strategic framework, within which we can say that medium-term inflationary expectations remain firmly anchored.”*

Accordingly, the ECB statement on future policy rates is being conditioned on its macroeconomic outlook. This conditioning on the outlook is done in a way that is parallel to the ECB’s usual justification of the decision on current policy rates. It includes a review of the first pillar of the ECB’s strategy, its so-called economic analysis comprising the inflation and growth outlook, and the second pillar, its so-called monetary analysis or cross-checking with monetary and credit developments. Consequently, the anticipated policy rate path will change whenever policy makers’ expectations of future macroeconomic developments change. Thus, the ECB’s forward guidance does not necessarily stand in conflict with earlier ECB statements that the Governing Council does not pre-commit itself.

The exact numerical expectation of the policy path and the length of time, for which the Governing Council anticipates policy rates to stay at current or lower levels, remain uncertain to market participants. However, President Draghi has 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”*. This is precisely the purpose of this note. We use a particular reaction function, namely the interest rate rule from Orphanides and Wieland (2013) that matches past ECB interest rate decisions quite well, to project the rate path consistent with the macroeconomic outlook.

¹ See Norges Bank (2013) and Sveriges Riksbank (2013) for descriptions of their practice.

² Further information on the implementation of the ECB’s forward guidance and its motivation has been provided in a paper by Peter Praet, the Member of the Executive Board in charge of the Directorate General Economics (see Praet (2013)).

2. A possible reaction function to be used for estimating the ECB's "extended period of time"

The interest rate rule used by Orphanides and Wieland (2013) (OW) takes the following mathematical form:

$$i_t = i_{t-1} + 0.5(\pi_{t+3|t} - \pi^*) + 0.5(q_{t+2|t} - q_{t+2|t}^*), \quad (1)$$

where i denotes the main policy rate set by the central bank. The rule assumes that the central bank changes the interest rate setting in response to deviations of the forecast for inflation from the central bank's target rate for inflation and to deviations of the forecast for GDP growth from the estimated growth potential. π denotes the rate of inflation, π^* the inflation target set by the ECB, q the growth rate of GDP and q^* the growth rate of potential GDP. The time index t describes one quarter and $t+3|t$ ($t+2|t$) is meant to denote the forecast of a certain 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.³

Despite its simplicity, this rule already incorporates two of the concerns mentioned by the ECB statement directly, namely the outlook for inflation and the outlook for economic activity. It does not include an explicit measure of monetary dynamics. However, such a rule could be extended to include ECB-style monetary cross-checking, for example, in form of the mathematical characterization developed in Beck and Wieland (2007, 2008).

Ideally, one would want to feed ECB Governing Council members' forecasts of inflation and output growth into the reaction function defined by the simple rule in equation (1). Such an approach was taken by Orphanides and Wieland (2008) who estimated simple interest rate rules for the United States using information on the forecasts of members of the Federal Open Market Committee published for many years in the semi-annual Humphrey-Hawkins reports.⁴ Given that President Draghi emphasized in the August press conference that the statement about future policy rates is an expectation by a very specific set policy makers,⁵ it would be appropriate to follow the same approach here.

Unfortunately, however, the inflation and output growth forecasts of ECB Governing Council members are not publicly available. Instead, Orphanides and Wieland (2013) use information from the survey of professional forecasters that is collected by the ECB and published in the second month of every quarter shortly after the policy meeting of that month. Specifically, they use not the yearly forecasts from that survey but rather 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 equation (1) is determined by the availability of data on forecasts.

³ Orphanides and Wieland (2013) show that a rule with these coefficients matches historical ECB rate decisions surprisingly well. They also investigate the optimal choice of such response coefficients as well as the forecast horizons by evaluation the stabilization performance of these rules in different macroeconomic models of the euro area.

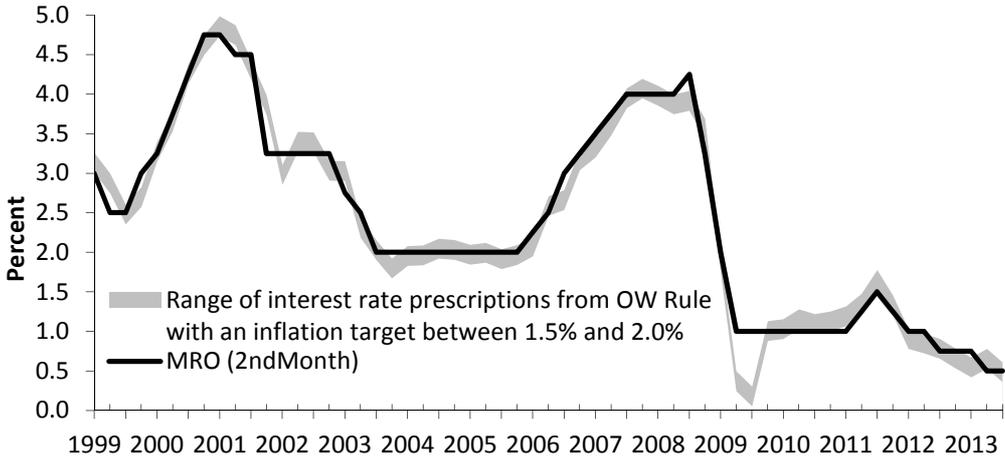
⁴ See also Wieland (2012) for an estimate of the likely date of lift-off of the federal funds rate in the United States.

⁵ The complete quote of Draghi is "... it is more than a forecast. Allow me to point out that the statement says 'We expect'. It does not say 'It is expected' and it does not say 'An international institution expects'; it says 'We - the policy-makers - expect the key ECB interest rates to remain at the present or lower levels for an extended period of time'. So, it is an expectation by a very specific set of policy-makers."

Furthermore, the relevant benchmarks in terms of inflation target and potential growth are not known with precision. The inflation objective of the ECB is defined as below but close to 2 percent. Therefore, OW use values of 1.5% and 2% to define a range of interest rate prescriptions that is consistent with the ECB's inflation objective. As to potential growth OW employ the estimate produced by the European Commission,⁶ because the ECB does not publish its own estimates of potential growth in the euro area.

Figure 1 compares the historical interest rate prescriptions from the OW rule to the ECB policy rate on its main refinancing operations (MRO Rate). The range of prescriptions spanned by the 1.5 percent and 2 percent assumptions on the inflation objective matches the ECB's interest rate decisions very well. It does so even though the rule does not include additional information on monetary dynamics. This result is consistent with the idea that cross-checking the ECB's first pillar with longer-term trends in monetary and credit dynamics only leads to occasional adjustments in the policy stance, while short-run information on money and credit may also be accounted for in the outlook for GDP.

Figure 1: MRO Rate versus Orphanides and Wieland (2013) Rule with SPF Forecasts



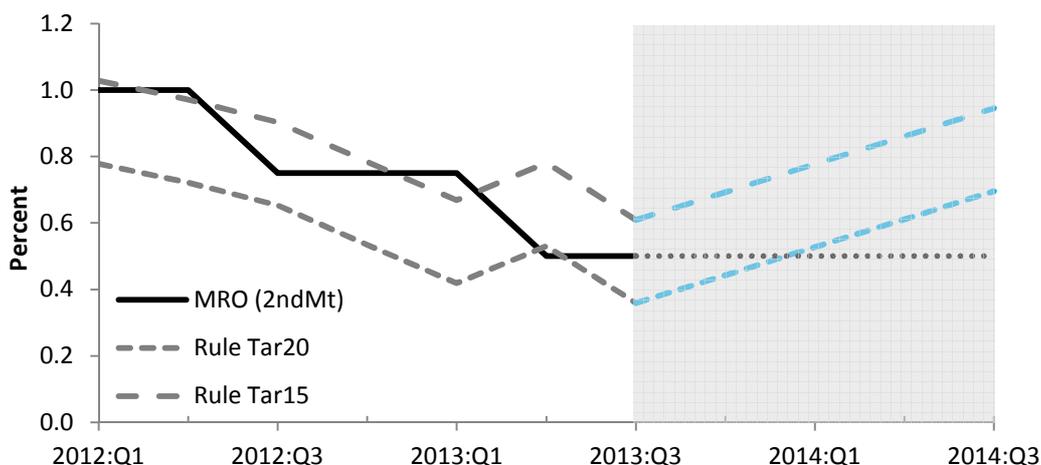
Notes: The black line shows the ECB's interest rate on its main refinancing operations in the *second* month of each quarter from 1999:Q1 to 2013:Q3. The gray shaded area is constructed with the OW Rule: $MRO\ rate = (previous\ MRO\ rate) + 0.5(3\text{-quarter\ ahead\ forecasted\ inflation\ deviation\ from\ target}) + 0.5(2\text{-quarter\ ahead\ forecasted\ GDP\ growth\ rate\ gap\ from\ potential})$. The lower line of the shaded area has an inflation target of 2 percent and the upper line a target of 1.5 percent. The forecast data is from the ECB Survey of Professional Forecasters (SPF).

3. Projecting the future interest rate path and estimating the ECB's "extended period of time"

In order to use the reaction function to project future prescriptions for the MRO rate one requires predictions of future forecasts. For example, to project the interest rate in 2013:Q4, the forecast of inflation between 2013:Q3 and 2014:Q3 based on 2013:Q4 information is needed. As indicated by the law of iterated expectations this forecast is identical to the forecast of inflation between 2013:Q3 and 2014:Q3 based on 2013:Q3 information. Accordingly we construct the forecasts for inflation and output for the relevant horizon using the information from the SPF data published on the ECB website on August 8, 2013. As the forecast horizon moves into the future, it is also necessary to interpolate available SPF forecasts. The detailed derivations can be found in the appendix to this note.

⁶ To obtain quarterly estimates OW interpolate the annual estimates from the annual macro-economic database (AMECO) of the European Commission.

Figure 2: Projected Rate Path using the OW Rule with SPF Forecasts until 2014:Q3



Notes: The black line shows the ECB's interest rate on its main refinancing operations in the *second* month of each quarter from 2012:Q1 to 2013:Q3. The gray dashed lines show the OW Rule: $MRO\ rate = (previous\ MRO\ rate) + 0.5(3\text{-quarter\ ahead\ forecasted\ inflation\ deviation\ from\ target}) + 0.5(2\text{-quarter\ ahead\ forecasted\ GDP\ growth\ rate\ gap\ from\ potential})$. The lower gray line has an inflation target of 2.0 percent and the upper line a target of 1.5 percent. The blue lines show the projected rate path implied by available inflation and output growth forecasts. The forecast data is from the ECB Survey of Professional Forecasters (SPF).

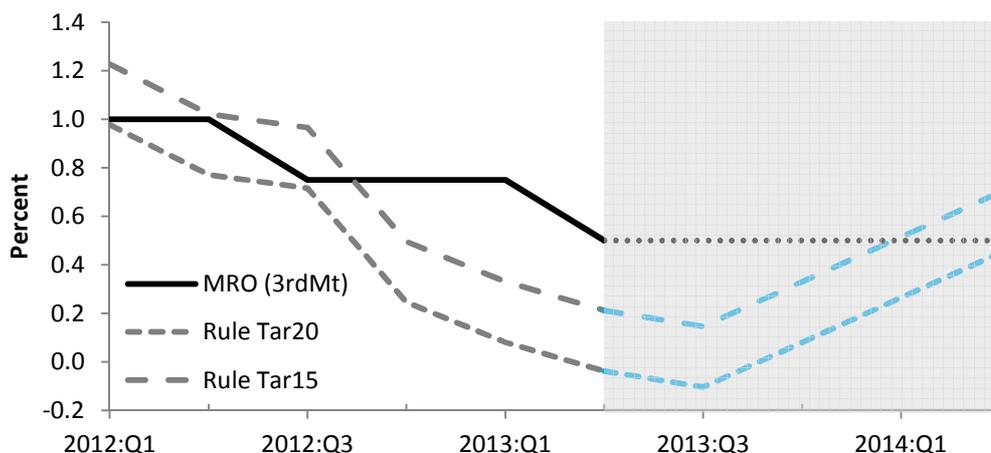
Figure 2 displays the resulting projection of the interest rate path with a 1.5% and a 2% inflation target (blue dashed lines). The lower projection (based on the 2% target) breaches the current setting of the MRO rate in the first quarter of 2014. By the second quarter of 2014 the full range of projected interest rate prescriptions has risen above the current MRO rate of 50 basis points. As the relevant timing of the MRO rate is the second month of the quarter, this projection implies that the ECB should anticipate raising its key interest rates at the latest by May 2014. The exact numbers for the interest rate projections are provided in the appendix.

4. What about using Eurosystem staff projections of inflation and growth instead of the SPF?

It is certainly reasonable to think that Eurosystem staff forecasts of inflation and GDP growth constitute a better measure for approximating the expectations of ECB Governing Council members than the survey of professional forecasters. Even so, if one feeds the staff forecasts into the rule defined by equation (1), the resulting interest rate prescriptions do not match historical decisions by the Governing Council as well as in the case of the SPF forecasts. One important reason may be the lack of staff forecasts of the horizon used in the rule that is the 4-quarter-ahead from the most recent data release. While the staff forecasts must be generated in-house at a quarterly frequency, the ECB only publishes the yearly numbers. Averaging yearly forecasts, however, does not always get close to the near-term quarterly forecasts, that is, the $t+3$ and $t+2$ horizons used in the rule.

Nevertheless, **Figure 3** provides the projected interest rate path with the OW rule using the most recent Eurosystem staff forecasts that were published on June 6, 2013. The comparison is made relative to the MRO rate in the 3rd quarter of each month because that is the date of the publication of the staff projections. It is directly apparent from the figure, that the rule with staff forecasts would already have prescribed lower interest rates in the last three quarters and projects interest rates to stay lower for longer than with the SPF forecast. The detailed calculations are provided in the appendix. Given that the rule with staff forecasts does not match historical ECB rate decisions as well as the rule with SPF forecasts we tend to discount the estimate of the ECB's "extended period time" that is computed with the staff forecasts.

Figure 3: Projected Rate Path using the OW rule with Staff Forecasts until 2014:Q2



Notes: The black line shows the ECB's interest rate on its main refinancing operations in the *third* month of each quarter from 2012:Q1 to 2013:Q2. The gray dashed lines show 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 gray line has an inflation target of 2.0 percent and the upper line a target of 1.5 percent. The blue lines show the projected rate path implied by available inflation and output growth forecasts. The forecast data is interpolated from the ECB staff forecasts.

5. What about normative concerns? Should other interest rate benchmarks be given weight in the policy decision?

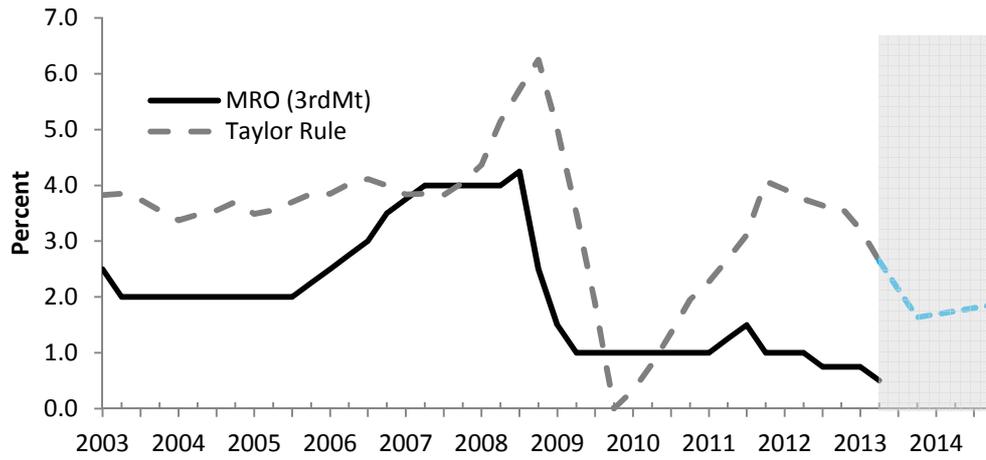
While the OW rule with SPF forecasts matches historical ECB rate decisions surprisingly well, one need not necessarily conclude that its rate prescriptions are best or most effective in a normative sense. For example, Orphanides and Wieland (2013) use several empirical macroeconomic models of the euro area to evaluate which rules are most effective in terms of stabilizing output and inflation fluctuations. It turns out that a rule of the form of equation (1) that is based on recent nowcasts of inflation and output growth performs more robustly in terms of stabilizing output and inflation under model uncertainty than the same rule with forecasts. Here, model uncertainty refers to the uncertainty about which model provides the closest representation of the true macroeconomic dynamics in the euro area.

Furthermore, there are other well-known benchmarks that could be used. The well-known Taylor rule (see Taylor 1993) has provided a useful signal ahead of the financial crisis by indicating that policy rates in the United States were too low for too long prior to 2007 (see Taylor 2007). The Taylor rule refers to the level of the policy rate and not only to the change of the policy rate as equation (1). An additional difference is that the Taylor rule includes nowcasts rather than forecasts and uses the output gap, that is, the deviation between the level of actual output from potential, rather than the growth rate. Thus, it is defined as follows:

$$i_t = 2 + \pi_t + 0.5(\pi_t - \pi^*) + 0.5(Q_t - Q_t^*) / Q_t^*, \quad (2)$$

where Q refers to the level of GDP rather than its growth rate. **Figure 4** uses Eurosystem staff and EU Commission nowcasts to generate rate prescriptions from the original Taylor rule for the euro area. It would prescribe higher interest rates at the current juncture and in the future.

Figure 4: MRO Rate versus Taylor Rule with Staff and AMECO Nowcasts



Notes: The black line shows the ECB's interest rate on its main refinancing operations in the *third* month of each quarter from 2003:Q1 to 2013:Q2. The gray dashed lines show the Taylor rule: $MRO\ rate = 2 + 0.5(\text{current inflation deviation from target}) + 0.5(\text{current GDP gap from potential in percent})$. The blue line shows the projected rate path implied by available inflation and output gap forecasts. The forecast data is interpolated from the ECB staff and AMECO forecasts.

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Appendix

This appendix presents the raw data collected from the SPF, ECB staff and EC AMECO and our calculations with it. It should always be kept in mind that the rule we use is a forecast-based rule. Hence, the inflation rate used to determine the interest rate in quarter t is the forecasted inflation rate for $t+3$, based on information in quarter t . Similarly, the growth rates of GDP and potential GDP are the forecasted values for $t+2$, based on information in quarter t . For the historical values in figures 1 to 4, real time data has been employed throughout. The calculation of the projected future forecasts based on the latest information available is illustrated for the growth rate of potential GDP in **table 1**.

Table 1: Raw data and calculation of potential GDP growth rates

Potential Growth	2013	2014
	0.351	0.477
Calculation		Potential Growth(+2)
2013:Q2	$=1.00(2013) + 0.00(2014)$	0.351
2013:Q3	$=0.75(2013) + 0.25(2014)$	0.382
2013:Q4	$=0.50(2013) + 0.50(2014)$	0.414
2014:Q1	$=0.25(2013) + 0.75(2014)$	0.446
2014:Q2	$=0.00(2013) + 1.00(2014)$	0.477

Note: The two raw data figures are taken from the EC AMECO publication on May 3, 2013.

Furthermore, the SPF contains two inflation forecasts from the most recent data release, which correspond to the third and the seventh quarter ahead from the current quarter. The published GDP growth rates are a two-quarter and a four-quarter-ahead forecast. Since the final SPF data point is given by 2013:Q3, future inflation and growth forecasts are calculated as in table 1. The forecasts and resulting OW rule prescriptions, which are also visible in figure 2, are shown in **table 2**.

Table 2: Raw data and calculation of the forecast-based OW Rule with SPF forecasts

Quarter	Raw SPF Data from 2013:Q3	Inflation Rate		GDP Growth Rate		Potential Growth(+2)	OW Rule (Target 2.0)	OW Rule (Target 1.5)
		2014:Q2	2015:Q2	2014:Q1	2015:Q1			
	MRO Rate(-1)	Inflation(+3)	Growth(+2)	Potential Growth(+2)	OW Rule (Target 2.0)	OW Rule (Target 1.5)		
2013:Q3	0.50	1.50	0.60	0.38	0.36	0.61		
2013:Q4	0.50	1.55	0.75	0.41	0.44	0.69		
2014:Q1	0.50	1.60	0.90	0.45	0.53	0.78		
2014:Q2	0.50	1.65	1.05	0.48	0.61	0.86		
2014:Q3	0.50	1.70	1.20	0.51	0.70	0.95		

Note: The four raw data figures are taken from the ECB SPF 2013:Q3 publication. The OW Rules are calculated as: $MRO\ rate(-1) + 0.5[Inflation(+3) - Target] + 0.5[Growth(+2) - Potential\ Growth(+2)]$. The *Potential Growth(+2)* number in 2014:Q3 is extrapolated by assuming the same change as between the two preceding observations.

Finally, figure 3 is constructed the same way as figure 2 just with ECB staff data. These are not only published one month later in each quarter (hence, the benchmark MRO rate and the relevant real-time numbers of potential output might differ) but the growth rates always refer to years instead of quarters. Hence, the most current numbers belong to 2013:Q2. Nonetheless, we already use the

knowledge that the MRO rate has been cut from 0.75 to 0.50 percent for the forecasts. **Table 3** contains all the resulting information.

Table 3: Raw data and calculation of the forecast-based OW Rule with staff forecasts

Raw Staff Data from 2013:Q2		Inflation Rate		GDP Growth Rate		
		2013	1.40	2013	-0.60	
		2014	1.30	2014	1.10	
Quarter	MRO Rate(-1)	Inflation(+3)	Growth(+2)	Potential Growth(+2)	OW Rule (Target 2.0)	OW Rule (Target 1.5)
2013:Q2	0.75	1.38	-0.60	0.35	-0.04	0.21
2013:Q3	0.50	1.35	-0.18	0.38	-0.10	0.15
2013:Q4	0.50	1.33	0.25	0.41	0.08	0.33
2014:Q1	0.50	1.30	0.68	0.45	0.26	0.51
2014:Q2	0.50	1.28	1.10	0.48	0.45	0.70

Note: The four raw data figures are taken from the ECB staff June 2013 publication. The OW Rules are calculated as: $MRO\ rate(-1) + 0.5[Inflation(+3) - Target] + 0.5[Growth(+2) - Potential\ Growth(+2)]$. The *Inflation(+3)* number in 2014:Q2 is extrapolated by assuming the same change as between the two preceding observations.

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