# Is central bank communication really informative when forecasting interest rate decisions? New evidence based on a Taylor rule model for the ECB

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**Abstract**

We examine whether communication by the European Central Bank (ECB) adds information compared to the information provided by a Taylor rule model in which expected inflation and output are used. We use various indicators of ECB communication that are all based on the ECB President's introductory statement at the press conference following an ECB policy meeting. Our results suggest that even though the indicators are sometimes quite different from one another, they all add information that helps predict the next policy decision of the ECB. Furthermore, also when the interbank rate is included in our Taylor rule model, the ECB communication indicators remain significant.

**Key words**: ECB, central bank, communication, Taylor rule

**JEL code**: E52

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## 1. Introduction

Since monetary policy is increasingly becoming the art of managing expectations, communication has developed into a key instrument in the central bankers' toolbox. Greater disclosure and clarity over policy may lead to greater predictability of central bank actions, which, in turn, reduces uncertainty in financial markets. There is a strongly held belief among central bankers nowadays that a high degree of predictability is important. As Poole (2001, p. 9) put it: "The presumption must be that market participants make more efficient decisions … when markets can correctly predict central bank actions."

The extent to which central bank communication has been successful is very much an empirical issue. Therefore, it is no surprise that the empirical literature on central bank communication has seen major developments in recent years.[1] Many of these studies refer to the communication policy of the European Central Bank (ECB). There is substantive evidence that ECB communication move financial markets in the intended direction (see, for instance, Ehrmann and Fratzscher, 2007, Musard-Gies, 2006, and Brand et al., 2006). There is also a consensus that ECB communications increase the predictability of interest decisions by the ECB (De Haan, 2008). However, there is less agreement as to whether communication adds information compared to the information contained by macroeconomic variables that are typically included in a model based on the Taylor rule. For instance, whereas Heinemann and Ullrich (2007) and Rosa and Verga (2007) conclude that communication adds information not provided by these macroeconomic variables, Jansen and De Haan (2009) find that straightforward Taylor rule models outperform models using only communication indicators. These different outcomes can be caused by many factors, including the use of different indicators of ECB communication and different specifications of the Taylor rule model.[2]

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[1] See Blinder et al. (2008) for an extensive survey.

[2] Whereas Heinemann and Ullrich (2007) and Rosa and Verga (2007) use communication indicators that are based on the introductory statement of the ECB's President at the press conference following the ECB

Taylor (1993) suggested that a simple monetary policy rule relating the nominal short-term interest rate to inflation and the output gap accurately describes U.S. monetary policy over the period 1987-1992. The Taylor rule seems a reasonable description of central bank behaviour in other countries as well. However, as Svensson (2003) has shown, even if the ultimate objective of monetary policy is to stabilize inflation and output, a simple Taylor rule will not be optimal in a reasonable macroeconomic model. Interest rate changes affect inflation and output with a sizable lag. Therefore, monetary policy has to be forward-looking, i.e., it should be based on expected inflation and output. Some recent studies suggest that the use of expectations lead to very different estimates of a Taylor rule model for the ECB (Sauer and Sturm, 2007 and Gorter et al., 2008).

The purpose of this paper is to re-examine to what extent ECB communication adds information compared to the information provided by a Taylor rule model in which expected inflation and output are used when forecasting upcoming interest rate decisions. We employ various indicators of ECB communication that are all based on the ECB President's introductory statement at the press conference following an ECB policy meeting. We find that some of these indicators turn out to be significant in our Taylor rule model. In other words, it is worthwhile for financial market participants to read the ECB President lips, as this adds information about upcoming interest rate decisions that is not provided by expected inflation and expected output growth.

The paper is structured as follows. Section 2 presents our Taylor rule model for the ECB, while Section 3 describes the indicators of ECB communication used in the present analysis. Section 4 contains our estimation results. Finally, section 5 offers some concluding comments.

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policy meeting, Jansen and De Haan (2009) employ an indicator based on Bloomberg news reports. Also the estimated Taylor rule models differ across these studies.

## 2. The model

According to the Taylor rule, in setting its policy instrument (it) the central bank should react to deviations of inflation ($\pi t$) from its target ($\pi^*$) and to deviations of output ($y_t$) from potential ($y^*$):

$$i_t = (r^*+\pi^*) + \beta(\pi_t-\pi^*) + \gamma(y_t-y^*), \quad (1)$$

where $r^*$ is the neutral real interest rate, and $\gamma>0$, $\beta>1$.[3] As the ECB is known not to focus on the output gap (Gerlach, 2007), probably in view of the difficulty to measure it in a real time situation, we estimate a Taylor rule using output growth. Walsh (2004) and Geberding et al. (2004) argue that such a rule performs well in the presence of imperfect information. We assume a constant potential growth rate and include $\Delta(y_t-y^*)$ instead of $(y_t-y^*)$:

$$i_t = (r^*+\pi^*) + \beta(\pi_t-\pi^*) + \gamma(\Delta y_t-\Delta y^*). \quad (2)$$

Most previous studies that estimated a Taylor rule for the ECB used data for the actual (ex-post) inflation rate and the output gap. Svensson (2003) has shown that even if the ultimate objective of monetary policy is to stabilize inflation and output, a simple Taylor rule will not be optimal in a reasonable macroeconomic model. Because interest rate changes affect inflation and output with a sizable lag, monetary policy has to be forward-looking, i.e., it should be based on expected inflation and output. Sauer and Sturm (2007) and Gorter et al. (2008) therefore estimate Taylor rules using forward-looking (and real-time) data. Similarly, our model for monthly data is defined as:

$$i_t = (r^*+\pi^*) + \beta E_t(\pi_{t+12}-\pi^*) + \gamma(E_t\Delta y_{t+12}-\Delta y^*), \quad (3)$$

[3] According to the "Taylor principle", $\beta>1$, i.e., if inflation increases the nominal interest rate must increase more ($\Delta i>\Delta\pi$) in order to raise the real rate.

where $E_t$ is the expectations operator and the time index now refers to months.[4]

Generally, central banks adjust interest rates in small steps to the target rate $i^T_t$ (often referred to as interest rate smoothing), so that we can write:

$$i^T_t = (\alpha\Delta y^* + \pi^*) + \beta E_t(\pi_{t+12} - \pi^*) + \gamma(E_t\Delta y_{t+12} - \Delta y^*). \quad (4)$$

The actual interest rate, $i_t$, adjusts only slowly to this target, i.e.:

$$i_t = \rho i_{t-1} + (1 - \rho)i^T_t + v_t \quad (5)$$

or:

$$\Delta i_t = (1 - \rho)(i^T_t - i_{t-1}) + v_t\,, \quad (6)$$

where $\rho$ denotes the smoothing parameter and $v_t = \delta v_{t-1} + \varepsilon_t$. The observed inertia may also be explained by serially correlated error terms in the policy rule (omitted shocks like financial crises) (see Rudebusch, 2002).

## 3. Data

Our data refer to the Euro area over the period 1999–2007, but most ECB communication indicators are only available for 1999–2004. Our dependent variable is the Main Refinancing Rate (MRR) as determined by the ECB Governing Council (source: ECB). Real-time expected inflation and output growth time series have been constructed from Consensus Economics forecasts. These forecasts are used as a proxy for the ECB's expectations of inflation and output growth. The Consensus data are unique, not revised and, consequently, not subject to the real-time critique of Orphanides (2001).[5] Every

[4] Data restrictions force us to use a lead of 12 months.

[5] Orphanides (2001) has shown that the use of real-time instead of ex post data leads to very different estimated coefficients in Taylor rule models for the Federal Reserve.

month, major banks in the EMU-countries give their forecasts for the near future, i.e., the current and the next year. Euro area expected inflation and gross domestic product (GDP) growth series are constructed from these forecasts for all euro area countries except Luxembourg.[6]

[Insert Figure 1: Economic variables included in the Taylor rule model]

Figure 1 shows the MRR and expected inflation and expected output growth. In addition, the one-month Interbank Rate (IBR) is shown. As part of our robustness analysis, the difference between the MRR and the IBR is included as an additional control variable. Not surprisingly, both interest rates move closely together. Expected output growth and the MRR also move together to some extent, while the co-movement of expected inflation and the MRR seems to be limited since expected inflation hovers around the ECB's medium term objective of an inflation rate below, but close to 2 percent.

Various approaches have been developed in the literature to measure (the effects) of central bank communication (see Blinder et al., 2008 for more details). Starting with Kohn and Sack (2004), various studies have examined the effects of central bank communication events on the volatility of financial variables. The basic idea is that, if communications affect the returns on financial assets, the volatility of these returns should be higher on days of central bank communications, ceteris paribus, because the signals contain "news." Focusing on volatility makes it unnecessary to assign a direction to each statement. The most important weakness of this approach is that it cannot assess whether markets moved in the "right" direction. In other words, the Kohn and Sack approach may establishes that central bank communication creates news, but it is unable to determine whether it reduces noise.

[6] To convert the reported growth rates into monthly moving figures, we take as the 12-month forecast the weighted average of the forecast for the current and the following year, where the weights are x/12 for the x remaining months in the current year and (12-x)/12 for the following year's forecast. See also Smant (2002, p.7).

In another approach, communication is quantified in order to assess both the direction and magnitude of its effects on asset prices—and thus to determine to what extent communication has its intended effects. Communications must be classified according to their content and/or likely intention, and then coded on a numerical scale. Negative (positive) values are assigned to communications that are perceived as dovish (hawkish), and zero to those that appear to be neutral. Whereas some researchers restrict the coding to directional indications by using a scale between –1 and +1 (e.g., Ehrmann and Fratzscher, 2007), others (Rosa and Verga, 2007 and Musard-Gies, 2006) assign a finer grid that is at least suggestive of magnitude, e.g., by coding statements on a scale from -2 to +2 (e.g., Berger et al., 2006). The most important weakness of the second approach is that it is necessarily subjective, and there may be misclassifications. Indeed, various indicators that are based on the same information set differ quite substantially from one another, as we will show.

The ECB's most important communication device is the President's introductory statement at the monthly press conference in which he reports on the decisions taken by the ECB's Governing Council (De Haan, 2008). Following meetings of the Council, which typically take place on the first Thursday of each month, the ECB announces the monetary policy decisions at 13:45 (CET). Some 45 minutes later, at around 14:30, the ECB President and Vice-President hold a press conference that comprises two elements: a prepared introductory statement that contains the background considerations for the monetary policy decision, and a Questions & Answers (Q&A) part during which the President and the Vice-President are available to answer questions by the attending journalists. The introductory statement is understood to reflect the position and views of the Council, agreed upon on a word-by-word basis by its members.

In our analysis we include four indicators that are all based on the introductory statement by the ECB President, namely an updated version of the index of Rosa and Verga (2007),[7] the aggregate index of Berger et al. (2006), the index of Heinemann and

[7] The original Rosa and Verga index ends in 2004. Carlo Rosa kindly provided an updated version of their indicator which allows us to also use more recent years.

Ulrich (2007) and KOF Monetary Policy Communicator (MPC) as published by the KOF Swiss Economic Institute and used by Conrad and Lamla (2007).[8,9]

Different from the other indicators, the KOF MPC is based on the interpretation of the introductory statements by the ECB President by Media Tenor, a media research institute. Media analysts read the text of the introductory statement of the monthly press conference sentence by sentence and code them.[10] The coding is aggregated by the KOF Swiss Economic Institute into an index by taking balances of the statements that reveal that the ECB sees upside risks to price stability and statements that reveal that the ECB sees downside risks to price stability, relative to all statements about price stability (including neutral ones). By construction, the values of the KOF MPC are restricted to be in the range of minus one to plus one. The larger a positive (negative) value of the KOF MPC, the stronger the ECB communicated that there are upside (downside) risks for price stability.

[Insert Figure 2: The ECB communication indicators]

Figure 2 shows the various ECB communication indicators that we use, while Table 1 shows the correlation of the various indicators. It becomes clear that the indicators are sometimes quite different from one another. Whereas the correlation coefficients amongst the first three indicators compiled by economists are around 0.8, their correlation with the KOF MPC is more modest.

[Insert Table 1: Correlation matrix]

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[8] Other indicators are based on other communication devices and are therefore not included. The index of Musard-Gies (2006) is only available for a short period and is therefore not included.

[9] Available at: http://www.kof.ethz.ch/communicator

[10] Media Tenor has a strong experience in coding articles of media releases and capturing their content. Their analysts achieve a high rate of correlation which means that doing this exercise twice should lead to almost the same outcome. Furthermore, the employees are well trained in semantic coding but are not professional economists.

The next step in our analysis is to estimate a forward-looking Taylor rule model for the ECB and to augment this model with the ECB communication indicators outlined above. As we are using daily information (aggregated to a monthly level), we need to decide at which moment in time to forecast the next interest rate decision. Two moments in time appear natural: i) at the day of and directly after the previous policy decision, and ii) the day the new Consensus forecasts are released (see Figure 3). At that day, there is new information on expected inflation and expected growth. We have decided to focus on the second option as it will be the hardest test for the ECB communication indicators to have any affect at all. After all, in this set-up information provided by the ECB communication is already captured in the Consensus forecasts and the interbank rate.

[Insert Figure 3: The timing in our model]

## 4. The estimation results

Table 2 shows our baseline model, i.e., the model without communication indicators and without the interbank rate. This model is first estimated with OLS as this allows transforming the estimated coefficients into the underlying structural parameters. All estimated coefficients are significant and have the expected sign. The structural parameters show that the results are in line with the so-called Taylor principle (i.e., $\beta>1$ (or $\kappa>0$)). According to the Taylor principle, if inflation increases the nominal interest rate must increase more (i.e., $\Delta i>\Delta\pi$) in order to raise the real rate. If this principle is violated, self-fulfilling bursts of inflation may be possible. The estimates also suggest that the MA(1) term is insignificant, i.e., $\delta=0$ (not shown).

As the ECB sets interest rates in steps and only discrete changes are observed, we prefer estimating ordered probit models. So in the remainder of the paper, all reported results refer to ordered probit estimates. The change in the main refinancing rate is transferred into a (-1,0,1)-dummy to reflect interest cuts, no changes, and interest rate

increases.[11] The final column of Table 2 shows the ordered probit results for the baseline model. They are similar to the OLS estimates.

[Insert Table 2: Baseline model: OLS and ordered probit models]

Tables 3 and 4 show the estimation results if we add the various ECB communication indicators. In each regression we optimize the number of observations. However, the conclusions are the same if we restrict the sample to those 64 observations (basically the 1999-2004 period) for which all indicators are available (results are available on request). The difference between both tables is that in Table 4 also the interbank rate is included as explanatory variable.

[Insert Table 3: Ordered probit results with ECB communication indicators added]

[Insert Table 4: Ordered probit results including communication indicators and the interbank rate]

Two conclusions can be drawn from our estimations. First, the coefficients of the ECB communication indicators are significantly different from zero, although in some cases only at the ten percent level, except for the KOF MPC. However, according to the KOF MPC, the ECB already starts preparing the general public for interest rate changes more than 1 meeting in advance. Once it is lagged by one period, the KOF MPC turns significant, while the lag of the other indicators is not significant. Second, also if the interbank rate is included, the ECB communication indicators remain significant. The latter result implies that the interbank interest rate, although it is always significant, does not contain all the information provided by the communication indicators. Figures 4 and 5 show the implied probabilities of the estimates reported in tables 3 and 4, respectively.

[11] The results do not change in any meaningful way in case we distinguish between 50 and 25 basis point changes.

[Insert Figure 4: Probability estimates]

## 5. Conclusions

Does it pay to watch the lips of the ECB President in order to forecast the next policy decision of the ECB, or does it suffice to base a forecast on the most recent information regarding expected inflation and output? We examine whether ECB communication adds information compared to the information provided by a Taylor rule model in which expected inflation and output are used. We use various indicators of ECB communication that are all based on the ECB President's introductory statement at the press conference following an ECB policy meeting. Our results suggest that even though the indicators are sometimes quite different from one another, they add information that helps predicting the next policy decision of the ECB compared to the information provided by expected inflation and expected output growth. Furthermore, also when the interbank rate is included in our Taylor rule model, the ECB communication indicators remain significant. The latter result implies that also the interbank interest rate does not contain all the information provided by the ECB communication indicators.

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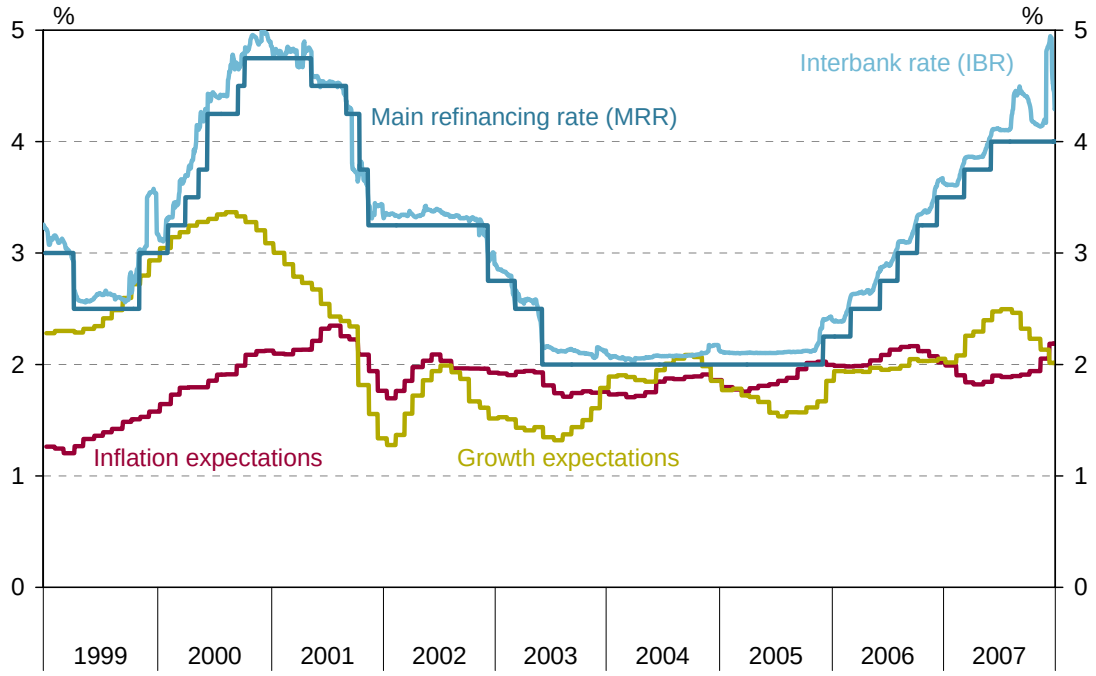
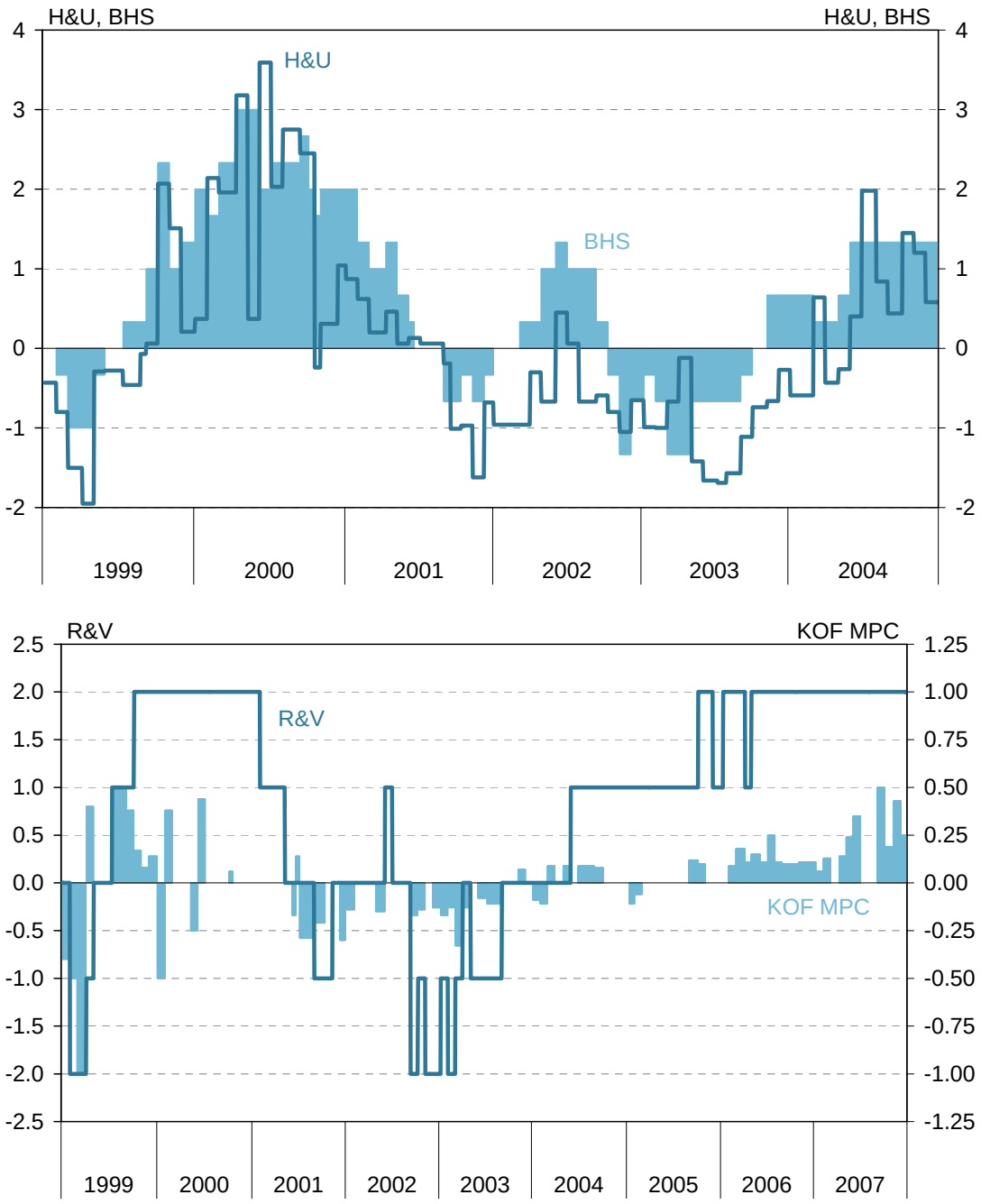
## Figures

Figure 1: Economic variables included in the Taylor rule model




Notes: The main refinancing rate and the one-month interbank money market rate stem from the ECB. Growth and inflation expectations are derived from the consensus forecasts as published by Consensus Economics Inc.

Figure 2: The ECB communication indicators




Notes: H&U, BHS, R&V and KOF MPC stand for the wording indicator of Heinemann and Ullrich (2007), the policy intention indicator of Berger et al. (2006), the updated Rosa and Verga (2007) indicator and the KOF Monetary Policy Communicator as used by Conrad and Lamla (2007), respectively.

Figure 3: The timing in our model

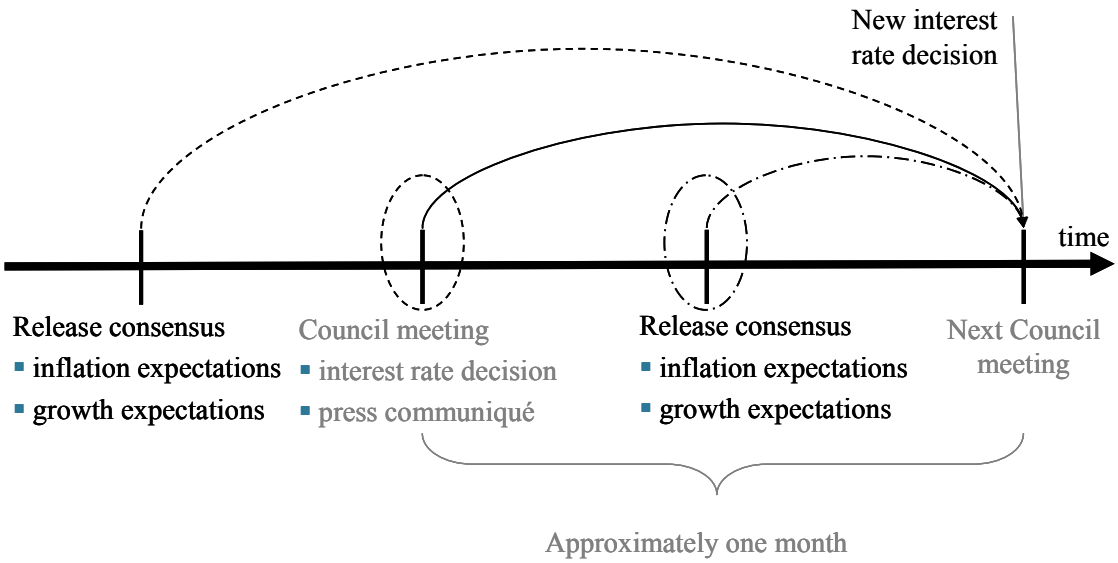
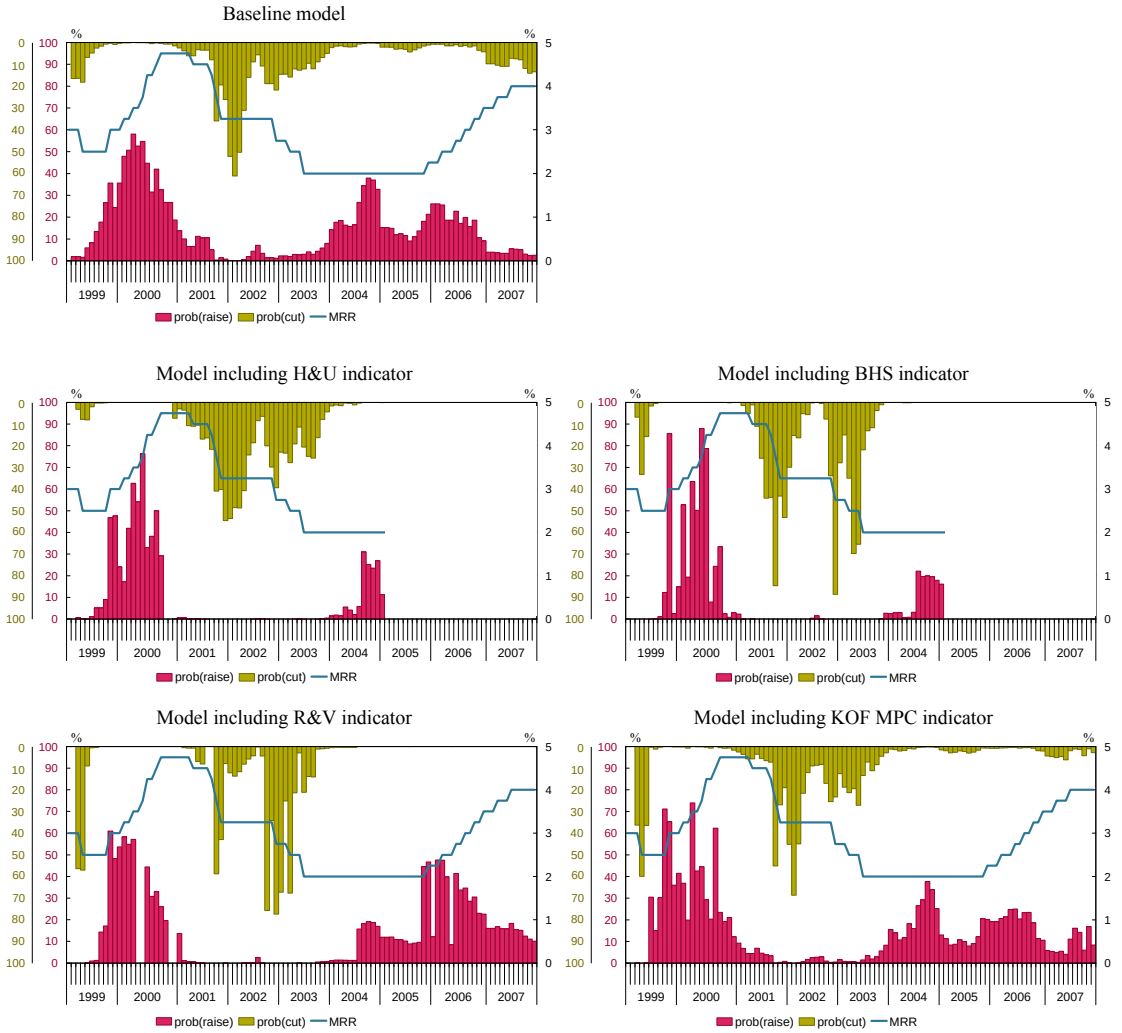
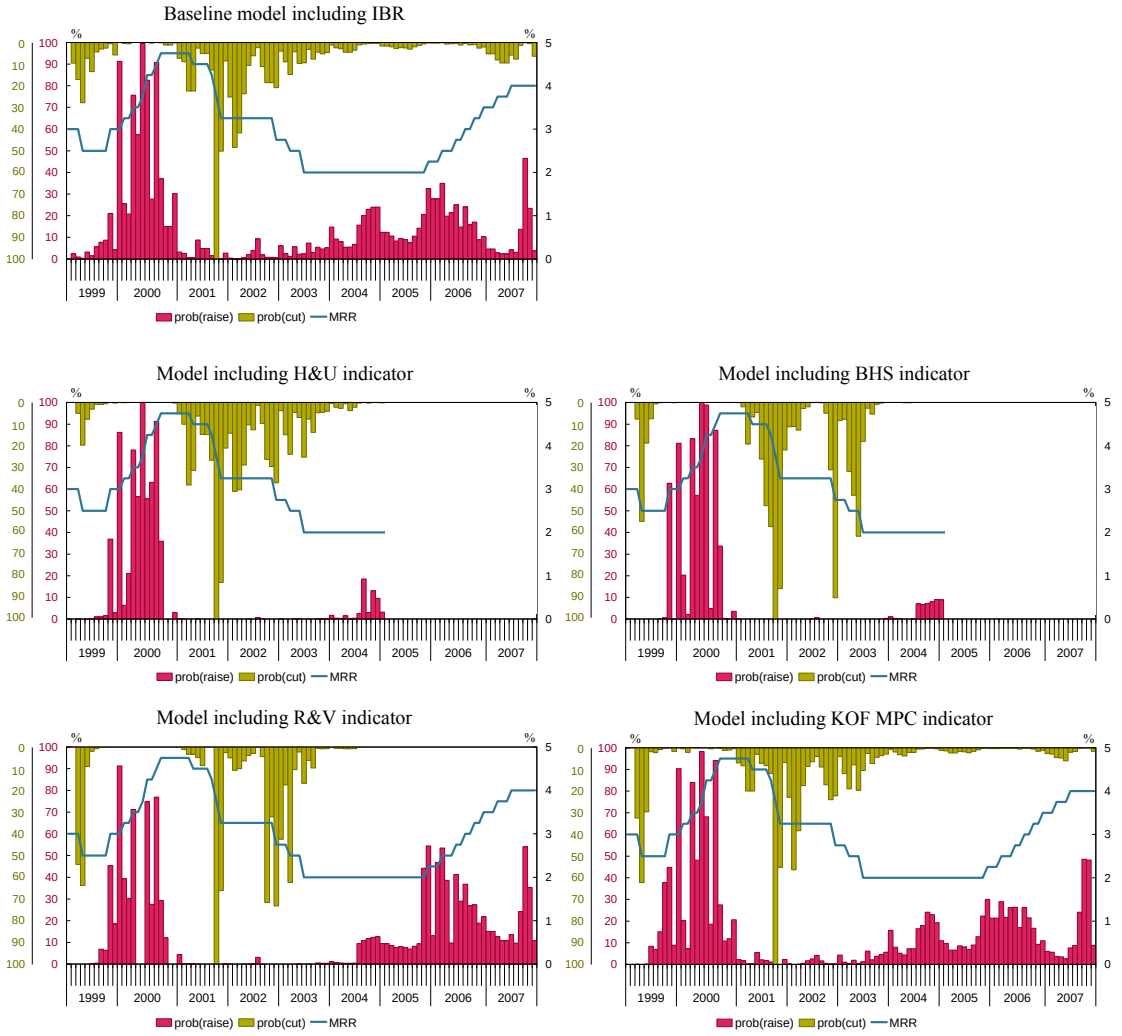


Figure 4: Probability estimates




Notes: The first two figures do not include any communication indicators. The probabilities of the remaining figures are based upon the regressions reported in Table 3 and include both lags of the communication indicators.

Figure 5: Probability estimates including the interbank rate




Notes: The first two figures do not include any communication indicators. The probabilities of the remaining figures are based upon the regressions reported in Table 4 and include both lags of the communication indicators.

**Tables**

Table 1: Correlation matrix

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| (1) MRR | | -0.02 | 0.43 | 0.62 | 0.21 | 0.27 | 0.32 | 0.04 |
| (2) $IBR_{t=CF}$ - MRR | *-0.07* | | -0.20 | 0.31 | 0.35 | 0.29 | 0.40 | 0.13 |
| (3) Inflation exp. | *0.52* | *-0.25* | | -0.01 | 0.26 | 0.14 | 0.15 | 0.17 |
| (4) Growth exp. | *0.55* | *0.35* | *-0.03* | | 0.51 | 0.71 | 0.77 | 0.16 |
| (5) R&V | *0.25* | *0.36* | *0.07* | *0.73* | | 0.78 | 0.87 | 0.52 |
| (6) H&U | *0.28* | *0.28* | *0.16* | *0.72* | *0.78* | | 0.81 | 0.33 |
| (7) BHS | *0.29* | *0.40* | *0.15* | *0.76* | *0.87* | *0.81* | | 0.28 |
| (8) KOF MPC | *-0.08* | *0.06* | *0.04* | *0.19* | *0.42* | *0.34* | *0.29* | |

Notes: The correlation coefficients reported in italic (lower-left triangle) all use the same 63 observations during 1999–2004. Each of the correlation coefficients reported in the upper-right part use the maximum number of observations available during 1999–2007.

Table 2: Baseline model: OLS and ordered probit models

| | OLS (1) | | Implied structural parameters (2) | | Ordered Probit (3) |
|---|---|---|---|---|---|
| $MRR_{t-1}$ | -0.105 *** | ρ | 0.895 *** | $MRR_{t-1}$ | -1.006 *** |
| | (-3.480) | | (29.780) | | (-3.928) |
| Inflation $exp._{t=CF}$ | 0.165 * | β | 1.581 ** | Inflation $exp._{t=CF}$ | 1.772 ** |
| | (1.670) | | (2.084) | | (2.274) |
| Growth $exp._{t=CF}$ | 0.191 *** | γ | 1.823 *** | Growth $exp._{t=CF}$ | 1.762 *** |
| | (4.092) | | (6.309) | | (4.712) |
| Constant | -0.389 ** | r* | 1.086 *** | | |
| | (-2.187) | | (6.316) | | |
| Observations | 101 | | | | 101 |
| R-squared | 0.223 | | | | |
| Log likelihood | 51.59 | | | | -56.65 |

Notes: The sample uses all observations available during the 1999-2007 period. In columns (1) and (2) t statistics are in parentheses. In column (3) robust z statistics are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Ordered probit results with ECB communication indicators added

| | R&V (1) | H&U (2) | BHS (3) | MPC (4) | R&V (6) | H&U (7) | BHS (8) | MPC (9) |
|---|---|---|---|---|---|---|---|---|
| $MRR_{t-1}$ | -0.855 *** | -0.969 *** | -0.997 ** | -0.964 *** | -0.805 *** | -0.933 ** | -0.952 ** | -0.885 *** |
| | (-2.888) | (-2.631) | (-2.417) | (-3.717) | (-2.580) | (-2.363) | (-2.356) | (-3.350) |
| Inflation $exp._{t=CF}$ | -0.056 | 0.136 | -0.582 | 1.522 ** | 0.310 | -0.363 | -0.531 | 1.129 |
| | (-0.062) | (0.110) | (-0.544) | (2.071) | (0.318) | (-0.246) | (-0.488) | (1.365) |
| Growth $exp._{t=CF}$ | 0.873 * | 1.600 ** | 0.572 | 1.702 *** | 0.883 | 1.230 | 0.612 | 1.539 *** |
| | (1.777) | (2.454) | (0.989) | (4.261) | (1.636) | (1.709) | (1.058) | (3.856) |
| $Comm.ind._{t-1}$ | 1.131 *** | 0.462 * | 1.619 *** | 0.887 | 1.111 *** | 0.470 * | 1.722 *** | 0.741 |
| | (3.921) | (1.795) | (3.215) | (1.296) | (3.083) | (1.748) | (2.869) | (1.092) |
| $Comm.ind._{t-2}$ | | | | | 0.003 | 0.328 | -0.207 | 1.856 *** |
| | | | | | (0.009) | (1.263) | (-0.476) | (2.920) |
| Observations | 98 | 67 | 68 | 101 | 94 | 65 | 67 | 100 |
| Log likelihood | -41.74 | -30.93 | -23.68 | -55.82 | -38.97 | -30.05 | -23.58 | -52.64 |

Note: Robust z statistics are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Ordered probit results including communication indicators and the interbank rate

| | R&V (1) | H&U (2) | BHS (3) | MPC (4) | R&V (6) | H&U (7) | BHS (8) | MPC (9) |
|---|---|---|---|---|---|---|---|---|
| $MRR_{t-1}$ | -0.799 ** | -0.816 ** | -1.111 ** | -0.883 *** | -0.770 ** | -0.802 ** | -1.090 ** | -0.829 *** |
| | (-2.325) | (-2.220) | (-2.184) | (-3.217) | (-2.193) | (-2.066) | (-2.332) | (-2.933) |
| $IBR_{t=CF}$ - $MRR_{t-1}$ | 4.594 ** | 7.27 *** | 7.425 *** | 5.541 *** | 4.355 ** | 7.336 *** | 7.389 *** | 5.141 *** |
| | (2.210) | (2.578) | (2.756) | (2.892) | (1.972) | (2.629) | (2.735) | (2.710) |
| Inflation $exp._{t=CF}$ | 0.435 | 0.597 | 0.461 | 2.047 *** | 0.846 | 0.613 | 0.474 | 1.664 ** |
| | (0.466) | (0.465) | (0.417) | (2.659) | (0.862) | (0.425) | (0.426) | (2.005) |
| Growth $exp._{t=CF}$ | 0.563 | 1.000 | 0.335 | 1.334 *** | 0.691 | 0.979 | 0.340 | 1.225 *** |
| | (1.100) | (1.499) | (0.561) | (3.332) | (1.286) | (1.206) | (0.563) | (3.049) |
| $Comm.ind._{t-1}$ | 1.082 *** | 0.635 * | 1.782 *** | 0.704 | 1.047 *** | 0.638 * | 1.809 *** | 0.609 |
| | (3.937) | (1.709) | (3.401) | (0.967) | (2.997) | (1.685) | (2.903) | (0.863) |
| $Comm.ind._{t-2}$ | | | | | 0.006 | -0.032 | -0.063 | 1.527 ** |
| | | | | | (0.021) | (-0.115) | (-0.121) | (2.501) |
| Observations | 98 | 67 | 68 | 101 | 94 | 65 | 67 | 100 |
| Log likelihood | -37.15 | -23.52 | -18.12 | -48.21 | -35.20 | -23.44 | -18.11 | -46.40 |

Note: Robust z statistics are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.