DOES ECB COMMUNICATION HELP IN PREDICTING ITS INTEREST RATE DECISIONS?

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Abstract

We examine the usefulness of communication by the European Central Bank for predicting its interest rate decisions. We use ordered probit models based on the Taylor rule which we estimate using statements by ECB officials as well as macroeconomic variables. Statements by ECB officials on the main refinancing rate and future inflation are significantly related to ECB decisions. However, an out-of-sample evaluation shows that communication-based models do not outperform models based on macroeconomic data in predicting decisions. Both sets of models only accurately predict decisions to leave interest rates unchanged.

JEL Code: E43, E52, E58.

Keywords: ECB communication, interest rate decision, Taylor rule, ordered probit models.

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1 Introduction

Nowadays many monetary authorities actively use communication as an instrument of monetary policymaking. Theoretically, communication may have little value added if the central bank credibly commits to a policy rule. For, if the public forms expectations rationally, the systematic part of policy will be deduced from the central bank's actions (see Woodford (2006)). Thus, when it comes to predicting interest rate decisions, it would be sufficient to interpret (forecasts of) economic data in view of the central bank's policy rule. However, most central banks do not adhere to a fixed rule. For example, Kohn and Sack (2004) describe how for the Federal Reserve's Federal Open Market Committee (FOMC) 'decisions involve considerable judgement and flexibility ... thus policy actions at any given time may be difficult to predict (p. 189)'. Likewise, president Trichet of the European Central Bank (ECB) has repeatedly stressed that the ECB takes its decisions one step at a time.[1] Therefore, by commenting on expected economic developments or by giving hints, the central bank may influence the financial markets' expectations of upcoming interest rate decisions. Indeed, there is increasing evidence that central bank communication has effects on financial markets.[2]

That the words of central bankers are considered to be relevant is also illustrated by the importance of '*central bank watching*': financial markets devote vast amounts of time and energy to predicting future policy decisions on the basis of the central bank's current actions and statements. Central banks may use various channels for their communications: regular publications (like Infla-

[1]For example, in the Q&A session after the interest rate decision on 2 March 2006, Trichet answered: 'We do not engage a priori in a series of interest rate hikes...we do not pre-commit ourselves unconditionally'.

[2]See, for instance, Bernanke, Reinhart, and Sack (2004) or Ehrmann and Fratzscher (2006).

tion Reports), congressional or parliamentary testimony, speeches, interviews, press conferences or statements after policy decisions and press releases. For economic agents, it is important to understand which of these channels is useful for predicting future policy decisions.[3]

This paper studies how useful one particular form of ECB communication, to wit statements by high-level policymakers, has been for predicting its interest rate decisions. First, we study whether this type of communication has been informative at all. Second, we consider how models based on central bank talk compare to models based on macroeconomic variables, such as inflation and the output gap. In all cases, we use ordered probit models based on the Taylor rule (see Taylor (1993)). The policy comments which we use are made by euro area central bankers in the form of interviews, speeches and press conferences during the first years of the European Economic and Monetary Union (EMU).[4]

Our results are as follows. Statements by euro area central bankers on the main refinancing rate and future inflation are significantly related to ECB policy decisions. In that sense, comments by central bankers are helpful for understanding interest rate decisions. However, communication-based models do not outperform models based on macroeconomic data in predicting interest

[3]For example, Pakko (2005) finds that asymmetric FOMC statements regarding the economic outlook and likely policy responses have contained significant predictive power for subsequent changes in the Federal funds target rate between 1984 and 2003. See also Lapp and Pearce (2000).

[4]We do not study the more recent years as Rosa and Verga (2005) or Heinemann and Ullrich (2005) are able to do. The benefit of our data-set is its richness: it includes statements by many euro area central bankers, also those comments given in between Governing Council meetings while Rosa and Verga (2005) and Heinemann and Ullrich (2005) only include the introductory statements of the ECB president at the press conference following an ECB interest rate decision.

rate decisions. This means that there is little *additional* information in this type of communication.

The remainder of this paper is structured as follows: section 2 outlines the ordered probit model, while section 3 presents the data. Section 4 compares both sets of models and section 5 considers the robustness of our findings. The final section offers our conclusions.

2 A Taylor rule model for interest rate decisions

The Taylor rule in its general form can be written as:[5]

$$i_t^* = \pi_t + r^* + \alpha_1(\pi_t - \pi^*) + \alpha_2 y_t \tag{1}$$

The rule models the policy interest rate (i_t^*) as a linear function of inflation (π_t), the equilibrium real interest rate (r^*), the difference between actual inflation and target inflation ($\pi_t - \pi^*$) and the output gap y_t. Since the ECB closely monitors developments in the money supply (M3), we also include the difference between actual money growth and its 'reference' level ($m_t - m^*$) in the Taylor rule:

$$i_t^* = \pi_t + r^* + \alpha_1(\pi_t - \pi^*) + \alpha_2 y_t + \alpha_3(m_t - m^*) \tag{2}$$

A financial analyst who wants to predict ECB interest rate decisions could estimate equation (2) using data on inflation, the output gap and the money supply. Alternatively, she may use the information which is contained in the communicated *interpretation* of these data series by the central bank. Both these approaches will be compared in the remainder of this paper.

[5] Taylor (1993) originally proposed the following rule to describe Federal Reserve policy: $i_t = \pi_t + 0.5y_t + 0.5(\pi_t - 2) + 2$ where i_t represents the federal funds rate, π_t the inflation rate, y_t the percent deviation of real GDP from a target. The coefficients on y and π as well as the equilibrium real interest rate of 2% were postulated rather than estimated.

There are several issues that need to be addressed when taking the Taylor rule to the data. First, as stressed by Orphanides (2001), data should be used which was actually available at the time of the interest rate decisions. Therefore, our macroeconomic data is taken from issues of the ECB's Monthly Bulletin (as in Coenen, Levin, and Wieland (2005)) and publications by Consensus Forecast. Second, there is the issue of using backward-looking or forward-looking information. We take an agnostic view on this issue. Backward-looking information may be an important input in the decision-making process as it presents the most recent information on the state of the economy. On the other hand, since the ECB aims at ensuring price stability in the medium run, it acts forward-looking. Because of these reasons, we use both backward-looking (HICP figures, output gap estimates) and forward-looking (inflation expectations, confidence indicators) macroeconomic variables. Third, the variables used should be stationary.[6] As in some cases we cannot reject the null hypothesis that the variables are I(1), we use the differenced version of equation (2):

$$\Delta i_t^* = (1 + \alpha_1)\Delta\pi_t + \alpha_2\Delta y_t + \alpha_3\Delta m_t \tag{3}$$

Most importantly, we take into account that ECB interest rate setting is a discrete rather than a continuous process by using an ordered probit model.[7] Building on (3) we postulate the following index function:

$$\Delta i_t^* = (1 + \alpha_1)\Delta\pi_t + \alpha_2\Delta y_t + \alpha_3\Delta m_t + \epsilon_t \tag{4}$$

where Δi_t^* is now a latent continuous random variable representing the preferred change in the ECB main refinancing rate. The actual interest rate decision Δi_t is represented as a ternary variable which has the value 0 if interest rates are

[6] See also Hu and Phillips (2004).

[7] A similar approach to modeling interest rate policy is used in Lapp, Pearce, and Laksanasut (2003) and Gerlach (2004).

kept constant, +1 if interest rate policy is tightened, and -1 if interest rate policy is eased. Interest rate policy is characterized by threshold behaviour: the main refinancing rate is only changed if the value of the index function is either lower than a lower threshold τ_1 or higher than an upper threshold τ_2. Both τ_1 and τ_2 are unobserved. Assuming that ϵ_t follows a standard normal distribution, we can write the probabilities of the different outcomes as:

$$Pr[\Delta i_t = -1|z_t] = \Phi(\tau_1 - z_t^{'}\beta)$$
$$Pr[\Delta i_t = 0|z_t] = \Phi(\tau_2 - z_t^{'}\beta) - \Phi(\tau_1 - z_t^{'}\beta)$$
$$Pr[\Delta i_t = 1|z_t] = 1 - \Phi(\tau_2 - z_t^{'}\beta)$$

where Φ denotes the cumulative standard normal distribution and z_t is a vector with explanatory variables. The ordered probit model is estimated using maximum likelihood procedures (see Maddala (1983)).

We first estimate the ordered probit model using various proxies for the macroeconomic variables (i.e. $\Delta\pi_t, \Delta y_t$ and Δm_t). Next, we estimate the model using the interpretation of developments in these variables signaled by euro area central bankers. For each of the macroeconomic series, we substitute a signal variable S in the index function:

$$\Delta i_t^* = b_1 S_t^{\pi} + b_2 S_t^{y} + b_3 S_t^{m} + \epsilon_t \tag{5}$$

where S_t^{π} denotes the ECB signal on inflation, S_t^{y} denotes the signal on economic growth, and S_t^{m} denotes the signal on M3, and $\epsilon_t \sim N(0,1)$. Finally, we expand the analysis by taking into account that the ECB may also send *direct* signals on its next interest rate decision. We do so by estimating a model which also incorporates a signal variable S^i that is based on comments on the main refinancing rate. The index function in this case reads as:

$$\Delta i_t^* = b_1 S_t^{\pi} + b_2 S_t^{y} + b_3 S_t^{m} + b_4 S_t^{i} + \epsilon_t \tag{6}$$

3 Data

3.1 Macroeconomic data

For our backward-looking macroeconomic variables we use real-time monthly data on euro area inflation, industrial production (excluding construction) and money growth as published in the ECB Monthly Bulletin.[8] For inflation, we use the most recent value of the year-on-year change in HICP inflation. For money growth, we use the most recently reported value of the three-month moving average of annualised growth in M3. We use the published series of industrial production (excluding construction) to proxy the output gap y_t. There are only a limited number of monthly figures reported in each Monthly Bulletin. Therefore, we add historical Eurostat data for the months that are not reported, starting in 1985:1. We calculate the output gap as the difference between the natural logarithm of the index of industrial production (1995=100) and the trend of this series, where we use a HP filter with a smoothing parameter of 14,400 for de-trending.

To proxy inflation expectations we use data from Consensus Economics. Consensus surveys a number of financial institutions on a monthly basis asking for the expected change in consumer prices in the current and the next year. We use data for the eleven individual euro area countries that are surveyed.[9] For month x of a given year t, we compute expected inflation for each country as $[(13-x)/12]$ times the inflation forecast for the current year plus $(1-[(13-x)/12])$ times the inflation forecast for the next year. The national series are aggregated with annually-updated real GDP weights into an expected inflation

[8] As there were two interest rate decisions per month until November 2001, the monthly values are, in most cases, used to explain two subsequent decisions.

[9] We include Greece beginning in 2002. Luxemburg is not included in the survey.

series for the euro area. Usually, the survey is taken around the 10th of each month and published with a short lag. Therefore, if the interest decision was scheduled on or after the 15th of each month, we take the change in expectations between the current month and the previous. Otherwise, we take the lagged change.

The forward-looking output gap measure that we employ is based on the economic sentiment indicator (ESI) published by the European Commission. Gerlach (2004) and Sauer and Sturm (2006) already established the usefulness of the ESI in modeling ECB policy. The ESI is based on confidence indicators for consumers, the retail sector, the construction sector and the manufacturing sector. The data are obtained from the European Commission web-site.[10] We use the difference between the value of the ESI in a particular month and a long-term average. The long-term average is calculated using a rolling window consisting of the 144 preceding months.

3.2 Measuring communication

We obtained data on ECB communication by searching the Bloomberg newswire.[11] The search was performed by scanning the news headlines for keywords such as names of euro area central bankers (e.g. Duisenberg, Trichet, and Issing) or issues related to monetary policy (i.e. inflation, economic growth, M3, and interest rates). Having collected the relevant reports, we coded each central bank comment on a ternary scale (-1, 0, +1) reflecting the direction in which the central banker suggested that the variable was likely to develop. Table 1 gives a number of examples of comments on the interest rate and our classification

[10] http://europa.eu.int/comm/economy finance/indicators/business consumer surveys/bcsseries en.htm.

[11] See Jansen and De Haan (2005b) for further details on our data.

of these comments. Likewise, comments on lower (higher) levels of euro area inflation receive a -1 (+1), whereas statements with a positive (negative) outlook for economic growth or comments hinting at higher (lower) M3 growth are coded with the value +1 (-1).

We study the period from 4 January 1999 to 2 May 2002, during which the ECB took 75 interest rate decisions, the first on 7 January 1999, the last on 2 May 2002. On 12 occasions interest rates were altered: there were 5 downward and 7 upward changes. Our sample period captures most of the interest rate changes that the ECB has decided upon so far. Moreover, in this period financial markets were still getting accustomed to the new central bank so that communication was of paramount importance.

Searching Bloomberg, we found 925 reports containing comments by three groups of central bankers, i.e. members of the ECB Executive Board (EB), national central bank (NCB) presidents, and high-level policymakers of the Bundesbank. That the words of high-level Bundesbank officials may be informative is illustrated by the following quote from a financial analyst: 'Bundesbank council members are probably as close as one can get to being a fly on the ECB's wall'(Bloomberg, 1 August 2001).

The data-set contains 277 statements on interest rates, 394 on inflation, 356 on economic growth and 98 on M3. EB members made 93 statements on interest rates, 149 on inflation, 157 on economic growth and 32 on M3. For NCB presidents, these figures are 135, 210, 174 and 49; for Bundesbank officials, the figures are 49, 35, 25 and 17. Table 2 shows the percentage of statements in each category per topic for the three groups of central bankers and for the full sample. As may be expected, most statements on interest rates were neutral. In contrast, most statements on economic growth were optimistic in nature.

Table 1: Examples of classification of ECB statements on interest rates

Date and time stamp	**Who?**	**Comments**	**News report headline**	**Code**
19 May 1999, 12:43	Trichet	'It would be inappropriate'	ECB's Trichet see no further scope for further ECB rate cuts	0
9 September 1999, 8:48	Quaden	'The next move will probably be a move upwards'	ECB's Quaden sees faster growth pushing rates higher	+1
31 October 1999, 22:05	Duisenberg	'Our inclination for higher rates has certainly risen somewhat'	ECB's Duisenberg sees 'inclination' for higher rates	+1
28 March 2000, 8:42	Rojo	Europe's growing economy is likely to lead to more interest rate increases	Bank of Spain's Rojo sees rate rise; Says stocks overvalued	+1
7 July 2000, 12:40	Issing	We are not running an activist policy.	ECB's Issing on economic growth in the Euro region: ECB comment	0
12 December 2000, 13:31	Welteke	'Under the given circumstances I regard current central bank rates as appropriate'	ECB's Welteke on inflation, interest rates, the euro: Comment	0
2 May 2001, 11:58	Noyer	'Current monetary policy is "conducive to economic growth" '	ECB's Noyer on inflation, growth in the Euro area	0
28 January 2002, 11:25	Noyer	'this could be a case for a slight reduction in benchmark rates'	Noyer says ECB may cut rates if growth, inflation slow, BZ says	-1

Notes: This tables gives examples of comments by euro area central bankers on interest rates. The first column lists the date and the time (in CET) at which the comment was reported by Bloomberg, the second column records who made the statement, the third column gives the actual comments, the fourth column gives the news report headline and the final column records how we categorise the statement.

Finally, it seems that Bundesbank officials were less optimistic on growth, more inclined to point towards rises in M3, and less neutral on interest rates.

Table 2: Ternary classification of ECB statements

	Comment by:			
	All officials	**Executive Board**	**NCB presidents**	**BuBa***
Comment on:				
Interest rate				
1	14.4	12.9	14.1	18.4
0	80.9	83.9	82.2	71.4
-1	4.7	3.2	3.7	10.2
Inflation				
1	24.2	23.5	24.3	28.6
0	43.3	47.7	39.5	45.7
-1	32.5	28.9	36.2	25.7
Economic growth				
1	75.4	82.8	72.4	52.0
0	10.1	7.0	12.1	16.0
-1	14.6	10.2	15.5	32.0
Money supply				
1	29.6	31.3	24.5	41.2
0	37.8	37.5	40.8	29.4
-1	32.7	31.3	34.7	29.4

*Notes: * Bundesbank officials excluding the President.*
The entries in this table are the percentages of the total number of statements per category per group. The sample period is 4 January 1999 to 2 May 2002.

Our aim is to relate communication on monetary policy in the time span between the interest rate meeting at time $t-1$ and the decision at time t to this latter decision. Therefore, we aggregate the coded statements over inter-meeting periods. We construct the measure S for ECB communication per particular topic as follows:

$$S_t^x = \frac{\sum_{\tau=1}^{t}(n_\tau^+ - n_\tau^-)}{N_t T_t} * \overline{NT} \quad (7)$$

where x may be either inflation, economic growth, money growth or interest rates, n_τ^+ denotes the number of statements with the value +1 on day τ, n_τ^- denotes the number of statements with the value -1, day $\tau = 1$ refers to the remainder of the day after the interest rate meeting at $t-1$, T_t denotes the number of days in the event window, and N_t denotes the total number of comments per topic for the event window related to the decision at time t. We re-scale the expression using the average value of NT in the sample: $\overline{NT}$. The indicator S captures the balance between upward and downward signals whilst at the same time correcting for the total number of comments and the number of days in the event window.

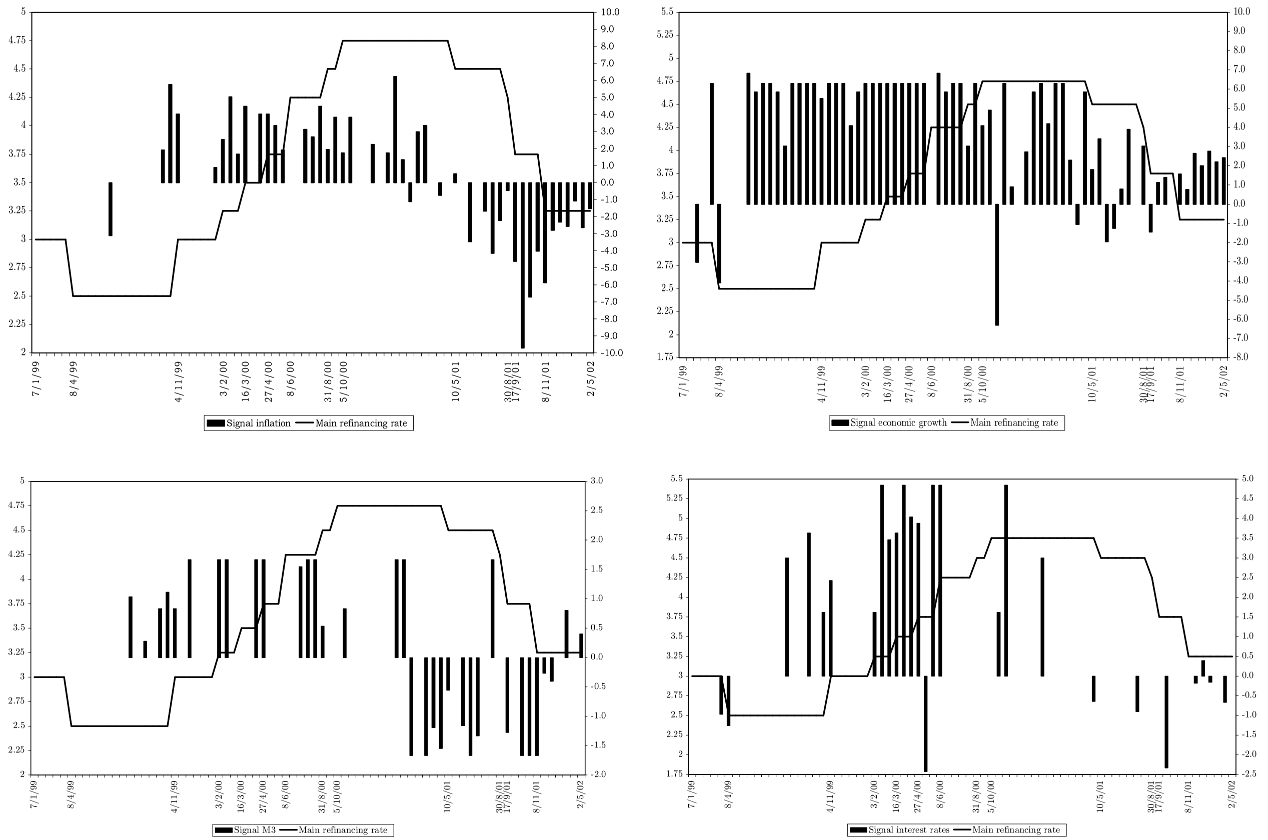
Figure 1 shows the four communication variables (bars) and the ECB main refinancing rate (solid line). The latter is taken from the ECB web-site.[12] A casual inspection of the graphs shows that in three cases the signal variables closely follow actual ECB interest rate policy. For inflation, M3 growth, and interest rates, we observe positive signals between mid 1999 and the beginning of 2001 when the ECB tightened policy a number of times. For the last part of the sample period during which the ECB reduced interest rates the signals are mainly negative. However, statements on economic growth are hardly related to interest rate decisions. Table 2 already indicated that comments on economic growth were positive most of the time. This suggests that this indicator is not a good predictor of actual ECB policy.

4 Results for the ordered probit models

Table 3 shows the estimation results for five ordered probit models of interest rate decisions. Columns 1 and 2 present the outcomes using backward-looking

[12] The data may be accessed at www.ecb.int

Figure 1: Communication signals and the ECB main refinancing rate



The bars (right axis) represent the communication signals per topic for each of the 75 event windows. The dates on the horizontal axis correspond to ECB rate changes and the sample endpoints (DDMMYY). The line shows the level of the ECB main refinancing rate (left axis).

variables (inflation, industrial production, and M3 growth). Column 3 shows estimates employing forward-looking variables (inflation expectations and the ESI), while columns 4 and 5 contain results using ECB communication variables.

The two models based on communication variables have the best fit. If we include signals on inflation, economic growth, and M3, we find a pseudo-R^2 of 0.15 (column 4). If we include the direct signal on the interest rate, the pseudo-R^2 rises to 0.20. In contrast, the two models using backward-looking variables have a very poor fit. Including data on HICP, industrial production, and M3 results in a fit of 0.07 (column 1). None of these variables are significant at the 10% level. When we drop the M3 variable the pseudo-R^2 drops to 0.04, but the inflation variable becomes significant at the 10% level with a point estimate of 1.29. The fit of the Taylor rule estimated with forward-looking variables lies between the other four models. The coefficients of expected inflation and the economic sentiment indicator are significantly different from zero.

Table 4 reports marginal effects for four specifications: two using macroeconomic data and two using communication variables.[13] We find particularly strong results for the forward-looking macroeconomic variables. A 1%-point increase in our measure of inflation expectations leads to an increase in the probability of higher interest rates of 0.56. For the measure based on the economic sentiment indicator a 1%-point increase leads to a 0.39 rise in the probability of higher interest rates and reduces the probability of a rate reduction by 0.23. Also, we find that a 1%-point increase of realized HICP inflation increases the probability of a higher interest rate by 0.20. The effects of the communication variables are smaller in absolute terms: a 1-point higher signal on euro area in-

[13]In the remainder of the paper, we no longer report results for the model including changes in money growth given its insignificance. Results including M3 are similar to those reported.

Table 3: Full sample results for ordered probit models

	(1) Macro data (backward)	(2) Macro data (backward)	(3) Macro data (forward)	(4) ECB comments	(5) ECB comments
$\Delta\pi$ (HICP)	0.86	1.29*	-	-	-
	(0.57)	(0.66)			
Δy (Ind. prod.)	-0.02	0.04	-	-	-
	(0.19)	(0.17)			
ΔM3	-1.02	-	-	-	-
	(0.67)				
$\Delta\pi^e$ (Consensus)	-	-	4.36**	-	-
			(2.10)		
Δy (ESI)	-	-	3.01***	-	-
			(0.98)		
Signal on:					
Inflation	-	-	-	0.13**	0.08
				(0.06)	(0.06)
Economic growth	-	-	-	0.05	0.06
				(0.07)	(0.06)
M3	-	-	-	0.27*	0.27
				(0.17)	(0.18)
Interest rates	-	-	-	-	0.22*
					(0.12)
τ_1	-1.65	-1.51	-1.78	-1.55	-1.47
τ_2	1.36	1.42	1.53	1.79	2.05
Log pseudo-L	-38.31	-39.47	-35.55	-35.00	-33.08
Pseudo-R^2	0.07	0.04	0.14	0.15	0.20

*Note: This table gives results for ordered probit models of ECB interest decisions. The sample period is 4 January 1999 to 2 May 2002. Standard errors in parentheses, */**/*** denotes significance at the 10/5/1 % level. We use Hubert-White robust estimates of variance in all cases.*

flation decreases the probability of a policy easing by 0.01, while a 1-point higher signal on the main refinancing rate increases the likelihood of tighter policy by 0.02. The fact that the marginal effects for the communication variables are smaller may be due to different scales of measurement.

Which of these models is better suited to predict the next interest rate decision? To answer this question, we use rolling-window out-of-sample forecasts. We start by estimating each model using the first 25 observations and then generate the probability that each model attaches to a decision of higher, constant, or lower interest rates at $t = 26$. Next, we re-estimate the models using the first 26 observations and predict the decision at $t = 27$, and so on. In general, the models give accurate predictions in cases when rates were left unchanged. That is to say, the probability of constant interest rates is equal to or larger than 50% in most of these cases. Only in 5% of the cases do we find a predicted change when actually no change took place.

However, the models have great difficulty in predicting interest rate *changes*. Figure 2 summarizes the key results. For each decision point, the figure shows the probability that the models attach to a decision for either higher (top panel) or lower interest rates (bottom panel) at time t. The top panel focuses on the period during which the ECB tightened policy, while the bottom panel focuses on the period during which monetary policy was eased. The timing of the interest rate changes is denoted by the bars. The figure shows that the models fail to generate a probability of change of at least 50% in all cases when rates were actually changed. The closest prediction is for 27 April 2000 when both models based on communication generate a probability of higher rates of 34%. There is no clear ranking for the models in terms of ability to predict changes in the main refinancing rate. Overall the differences are small. For decisions to

Table 4: Marginal effects

	Effects on:											
	$\Pr[\Delta i_t = -1]$				$\Pr[\Delta i_t = 0]$				$\Pr[\Delta i_t = 1]$			
	Macro data		Comments		Macro data		Comments		Macro data		Comments	
$\Delta\pi$ (HICP)	-0.15	-	-	-	-0.05	-	-		0.20**		-	-
Δy (Ind. prod.)	0.00				0.00				0.01			
$\Delta\pi^e$ (Consensus)		-0.34				-0.22				0.56**		
Δy (ESI)		-0.23**	-	-		-0.16	-			0.39**	-	-
Signal												
Inflation			-0.01*	-0.01			0.00	0.00			0.02	0.01
Ec. growth	-	-	0.00	0.00	-	-	0.00	0.00	-	-	0.01	0.01
M3			-0.02	-0.02			-0.01	-0.01			0.03	0.03
Interest rates	-	-		-0.02	-	-		-0.01	-	-		0.02*

*Note: Marginal effects are evaluated at sample means. */**/*** denotes significance at the 10/5/1 % level.*

tighten policy the model with backward-looking macroeconomic data is most accurate in three of the six cases. However, for decisions to ease policy it is least accurate in two out of four cases. For both types of decisions, the model with forward-looking variables gives the best prediction in four out of ten cases. However, it gives the worst prediction in two cases and also incorrectly predicts changes in the policy rate on two occasions. In five out of ten cases, one of the communication-based models gives the best prediction. However, in the other cases, these models generate the worst prediction. Additionally, both communication models incorrectly predict three changes in the policy rate.[14]

5 Robustness

We explored the robustness of the results in several directions.[15] First, we re-estimated the ordered probit models using also lags of the explanatory variables. Central bankers may signal rate changes earlier than in the inter-meeting period which we use as the event window. Also, in setting the interest rate, they may take lagged values of the macroeconomic variables into account. However, including more lags does not change our main results. Most importantly, we are unable to substantially improve the forecasting ability of the models.

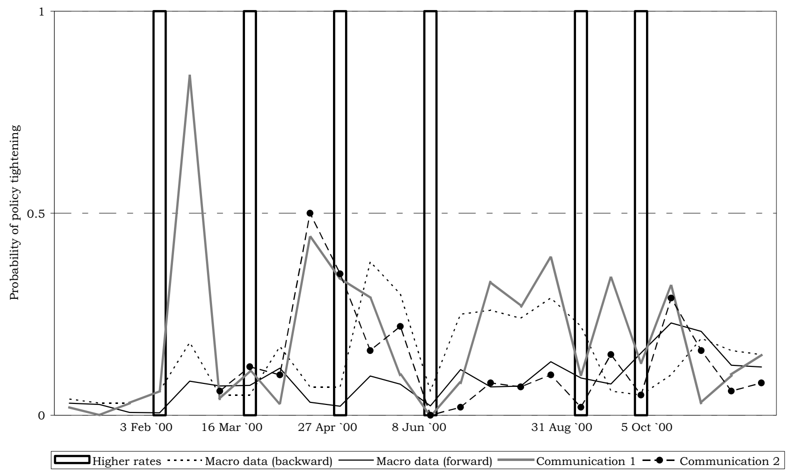
Second, we considered whether allowing for interest rate smoothing may

[14]The decision to lower rates by 50 basis points on 17 September 2001 was unscheduled. It came in the aftermath of the 9/11 terrorist attacks in the United States. In this individual case, the results may be biased in favor of the communication-based models. After such an event, communication will adjust more quickly and be more readily available than forward-looking variables.

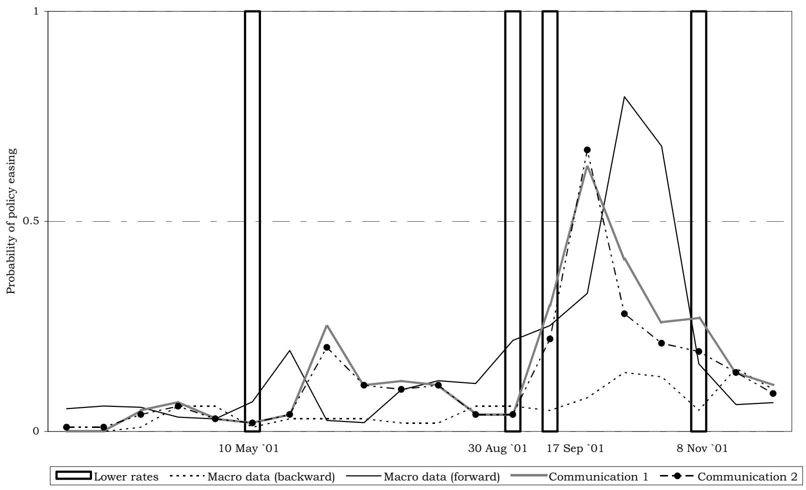
[15]We only describe the results of these extensions in broad terms here. Detailed results are available on request from the corresponding author.

Figure 2: Probabilities of higher and lower interest rates

Higher rates:



Lower rates:



The vertical axis denotes the probability of either higher (top panel) or lower interest rates (bottom panel). The lines represent the four models discussed in the text. The bars denote the time of interest rate changes.

influence the results. We implemented this by including lagged values of the interest rate decision Δi_t into the model. However, this adjustment also did not improve the ability of the models to predict interest rate changes, although in some cases the lagged decisions were significant.

Third, we considered an alternative weighting scheme for the communication indicator variables. Comments made closer to meetings may be more important as they are based on more as well as more recent information. Therefore, we re-calculated the signal variables by weighing them by the distance (measured in days) to the next decision. However, this also did not improve the predictive power of the models based on communication.[16]

Finally, in order to check whether it is appropriate to include comments by high-level officials of the Bundesbank we created separate signal variables for this group of central bankers. It turned out that the communication variables are significant in the ordered probit model which suggests that including Bundesbank statements is justified. An earlier version of this paper (Jansen and De Haan (2005a)) provides a further discussion on this issue.

6 Conclusions

This paper has studied the predictability of ECB interest rate decisions based on ECB communication and macroeconomic data. We find that decisions are most closely linked to changes in inflation expectations and economic sentiment. However, comments by euro area central bankers on the main refinancing rate and future inflation are also helpful in modeling interest rate decisions. At the

[16]An additional extension could be using only those comments which led to significant changes in prices of financial assets. This would help to identify those comments which were considered informative by financial market participants.

same time, we find no great difference in the predictive power of models based on communication and macroeconomic data. In general, the models have great difficulty in explaining changes in the main refinancing rate. However, decisions to leave rates unchanged are usually correctly predicted. Our results differ from Rosa and Verga (2005) who find that statements by the ECB president at the press conference following an interest rate decision have predictive power, even if Taylor-rule like variables are included. This suggests that different channels of central bank communication may not be equally informative.

Finally, how time-dependent are our conclusions? We have studied the early years of the Economic and Monetary Union when the ECB had just begun its operations. Possibly, communication has become more informative over time. On the other hand, the ECB is still a relatively young institution which faces the continuous challenge of explaining monetary policy to a diverse audience. There are various indications that financial markets are still struggling to determine what role different types of economic data play in setting the ECB monetary policy. For example, this topic often arises during Q&A sessions after ECB interest rate decisions. Finding adequate ways to communicate on monetary policy is therefore likely to remain one of the greatest challenges for the ECB in the coming years.

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