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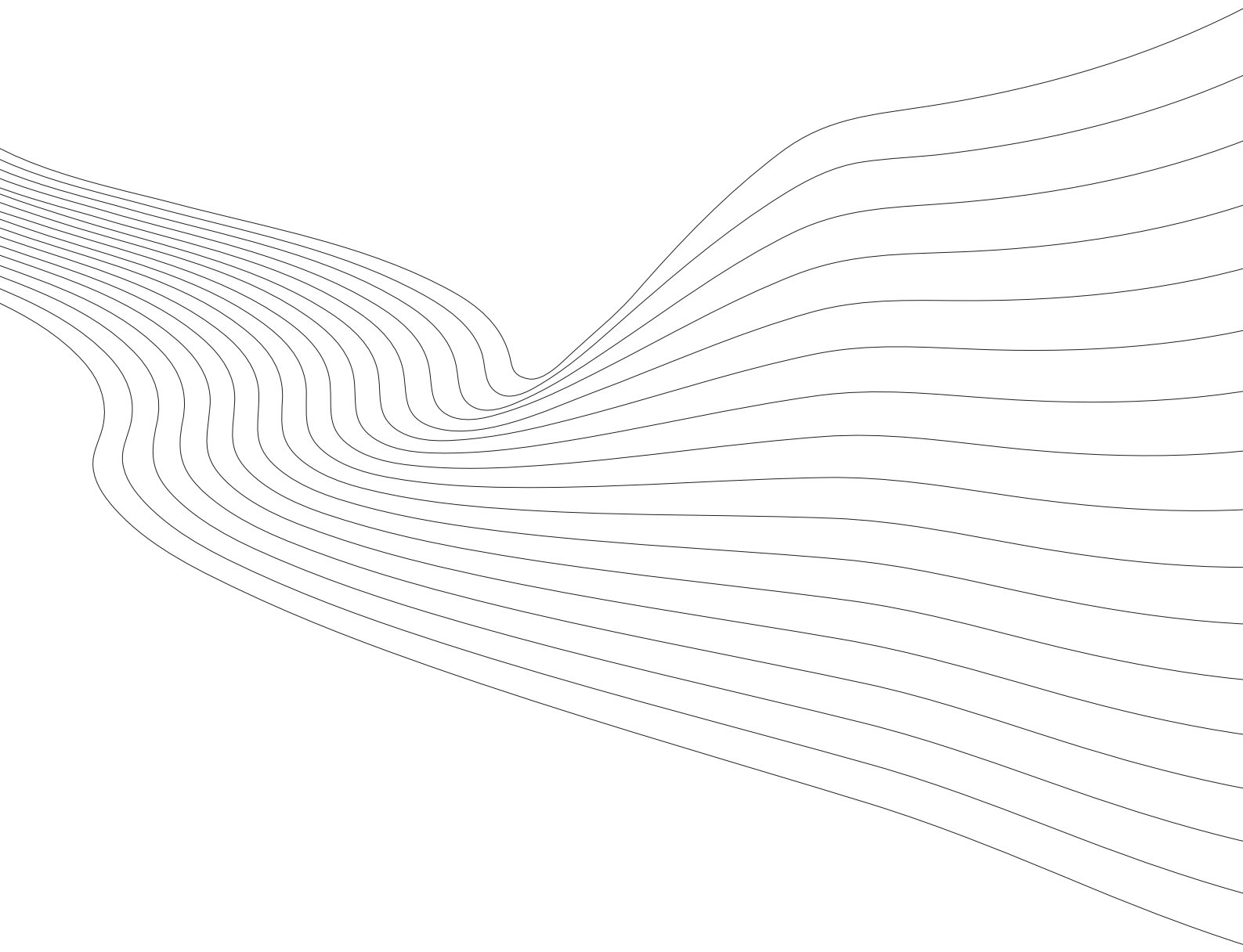

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Does central bank communication really lead to better forecasts of policy decisions? New evidence based on a Taylor rule model for the ECB

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Abstract

Nowadays, it is widely believed that greater disclosure and clarity over policy may lead to greater predictability of central bank actions. We examine whether communication by the European Central Bank (ECB) adds information compared to the information provided by a Taylor rule model in which real time expected inflation and output are used. We use five 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 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, E53, E3

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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. Nowadays, there is a strongly held belief among central bankers that a high degree of predictability is important. According to Poole (2001, p. 9), "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 communications 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. See also Ehrmann and Fratzscher (2009).

[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 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.

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. Most previous studies examining this issue used backward looking Taylor rule specifications. Employing 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 ECB communication turns out to be significant in our Taylor rule model. In other words, it is worthwhile for financial market participants to read the ECB President's lips, as this adds information about upcoming interest rate decisions that is not provided by expected inflation and expected output growth. This conclusion holds even when the interbank rate is included in our Taylor rule model.

1. THE MODEL

According to the Taylor rule, in setting its policy instrument (i_t) the central bank should react to deviations of inflation (π_t) from its target (π^*) 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 Gerberding 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 is defined as:

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

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:

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

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[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.

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

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 ρ 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).

2. DATA

Our data refer to the Euro area over the period 1999–2007, although some ECB communication indicators are only available for a shorter period. 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 month, major banks and forecast institutes 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]

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[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.

[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. As the survey is

[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.

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

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conducted at the beginning of each month, we consider the current month to belong to the remaining months in the current year.

(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 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 five 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 Ullrich (2007), the KOF Monetary Policy Communicator (MPC) as published by the KOF Swiss Economic Institute and used by Conrad and Lamla (2007)[8], and the indicator of Ullrich (2008).[9]

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[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.

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

[9] Katrin Ullrich kindly provided her indicator. Other ECB communication 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.

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. 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 future price stability and statements that reveal that the ECB sees downside risks to future price stability, relative to all statements about future price stability (including neutral ones). Hence, in contrast to the other communication indicators we consider, it only takes forward-looking statements into account. 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 future 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]

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.[10] As we are using daily information (aggregated to a monthly level), we need to

[10] Using a different methodology that we cannot employ due to lack of sufficient variability of our interest rate data, Kim et al. (2008) also estimate various Taylor rule models in their analysis of the predictability of interest rate decisions by the Bank of England. These authors do not include central bank communication in their model.

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]

3. 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.

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

[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 use the maximum number of observations possible. 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.

As both figures show, the estimated probabilities quite heavily depend upon these indicators. Estimates of the marginal effects confirm this. For instance, a one standard deviation increase in the value of the Rosa and Verga indicator (while keeping the other explanatory variables equal to their means) increases the probability of an interest rate hike by close to 13.5 percentage points.

[Insert Figure 4: Probability estimates]

[Insert Figure 5: Probability estimates including the interbank rate]

Finally, Table 5 shows the results for out of sample forecasts for three indicators that are available for years after 2004. Starting with the first interest rate decision in 2005, a total of 30 real-time one period ahead forecasts were produced. For each forecast the model was re-estimated to ensure that all information available at that moment in time was optimally used. The table shows the so-called Brier score (QPS) and the ranked probability score (RPS). Following Boero et al. (2009), these measures can be explained as follows. The Brier score is calculated as:

$$QPS = \frac{1}{T}\sum_{t=1}^{T}\sum_{k=1}^{K}(p_{kt} - d_{kt})^2 \tag{7}$$

where p_{kt} is a probability forecast of the outcome k (no change of the interest rate, an increase, or a decrease of the interest rate) at time t, while d_{kt} , k =1,...,K , takes the value 1 if the outcome x_t is k, while otherwise d_{kt} = 0. The range of QPS is usually $0 \leq QPS \leq 2$, where the lower bound corresponds to the best fit. The ranked probability score is calculated as:

$$RPS = \frac{1}{T}\sum_{t=1}^{T}\sum_{k=1}^{K}(P_{kt} - D_{kt})^2 \tag{8}$$

where P_{kt} and D_{kt} are the density functions of p_{kt} and d_{kt}, respectively. The RPS penalizes forecasts less severely when their probabilities are close to the actual outcome, and more severely when their probabilities are further from the actual outcome. Like the Brier score, its minimum value is 0. Its maximum value equals K-1.

The main conclusion following from Table 5 is that generally the quality of the forecasts improves in comparison to the base model when the ECB communication measures are included in the model (both the QPS and RPS are closer to zero), thereby confirming our previous findings. Also in line with our previous findings is that the inclusion of the (non-lagged) KOF MPC measure of ECB communication does not improve upon the quality of the forecasts.

Our main result that inclusion of ECB communication indicators in most cases

leads to better forecasts of ECB interest rate decisions also holds when the interbank interest rate is included in the model. In fact, compared to the model that only includes Taylor rule variables, the forecasting ability of the model that takes up the interbank interest rate is hardly better.

[Insert: Table 5: Out of sample forecasting]

4. 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 five 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 the interbank interest rate does not contain all the information provided by the ECB communication indicators.

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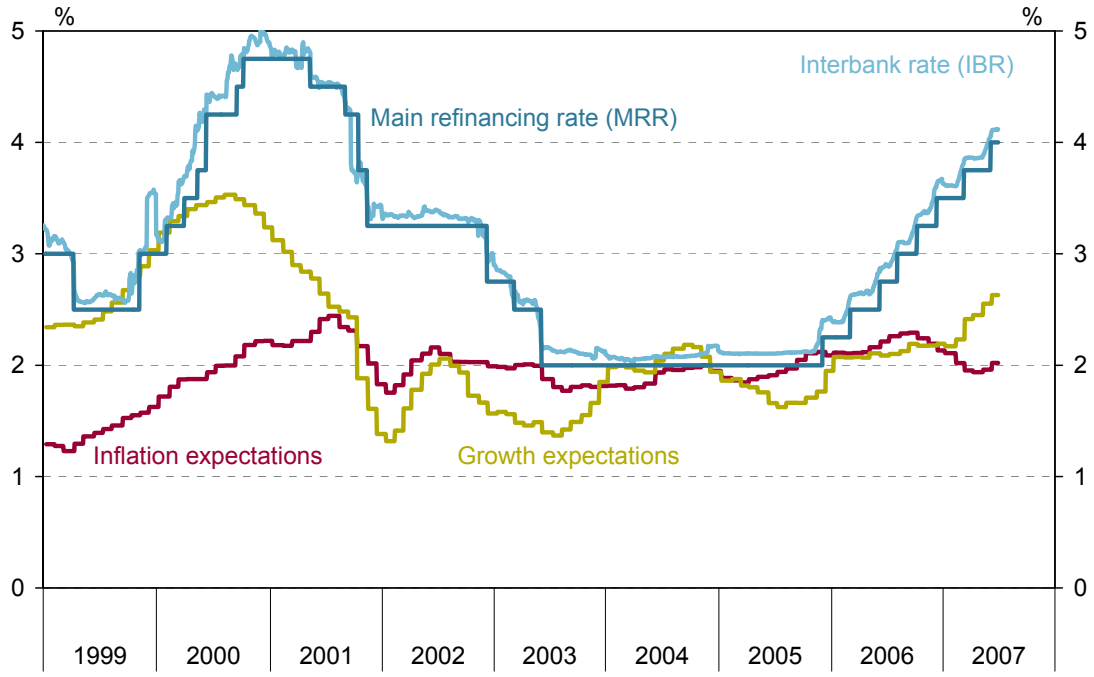
Figures

FIGURE 1

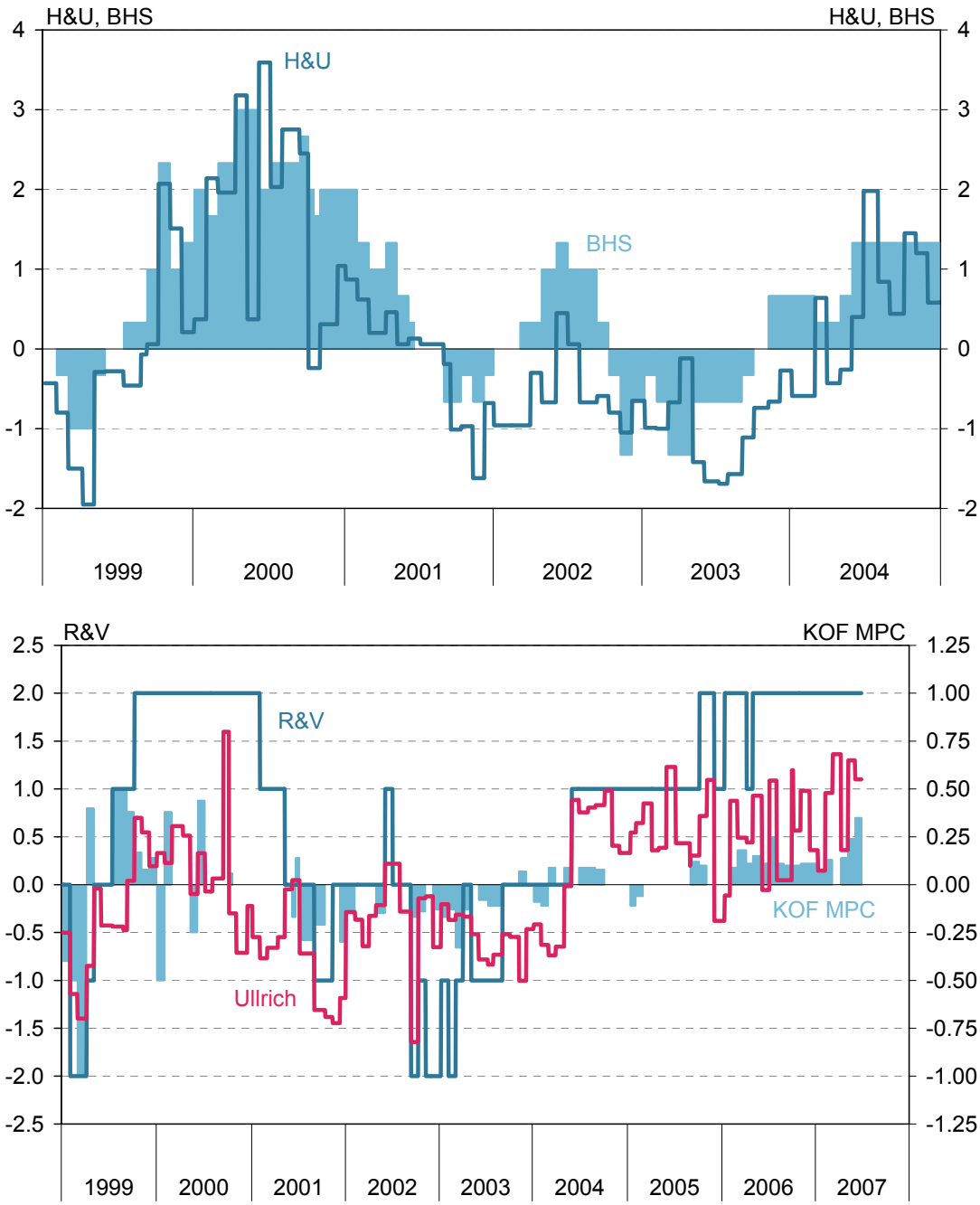
ECONOMIC VARIABLES INCLUDED IN THE TAYLOR RULE MODEL



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 are 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. Ullrich is the indicator of Ullrich (2008).

FIGURE 3

THE TIMING IN OUR MODEL

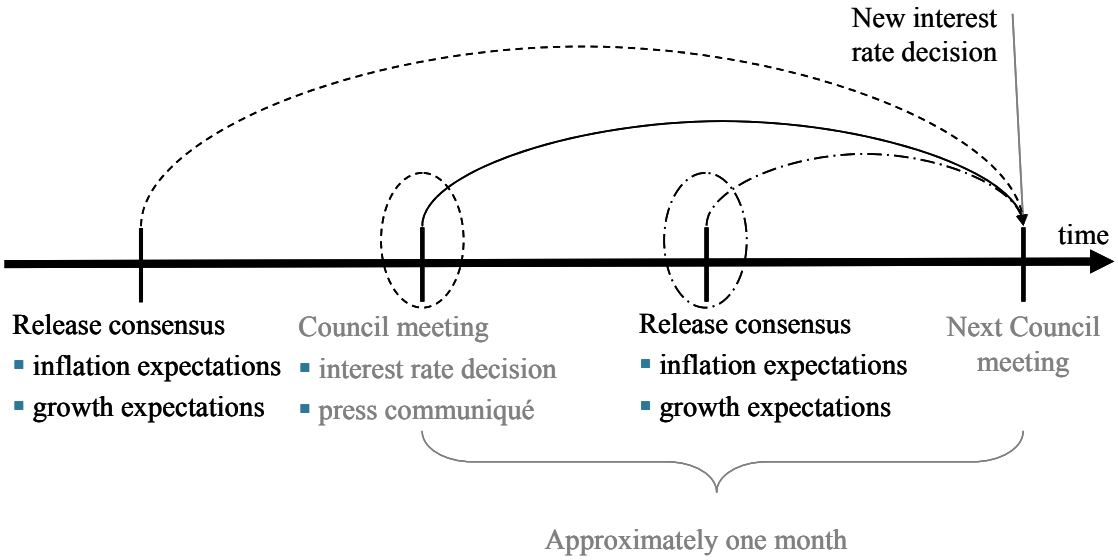
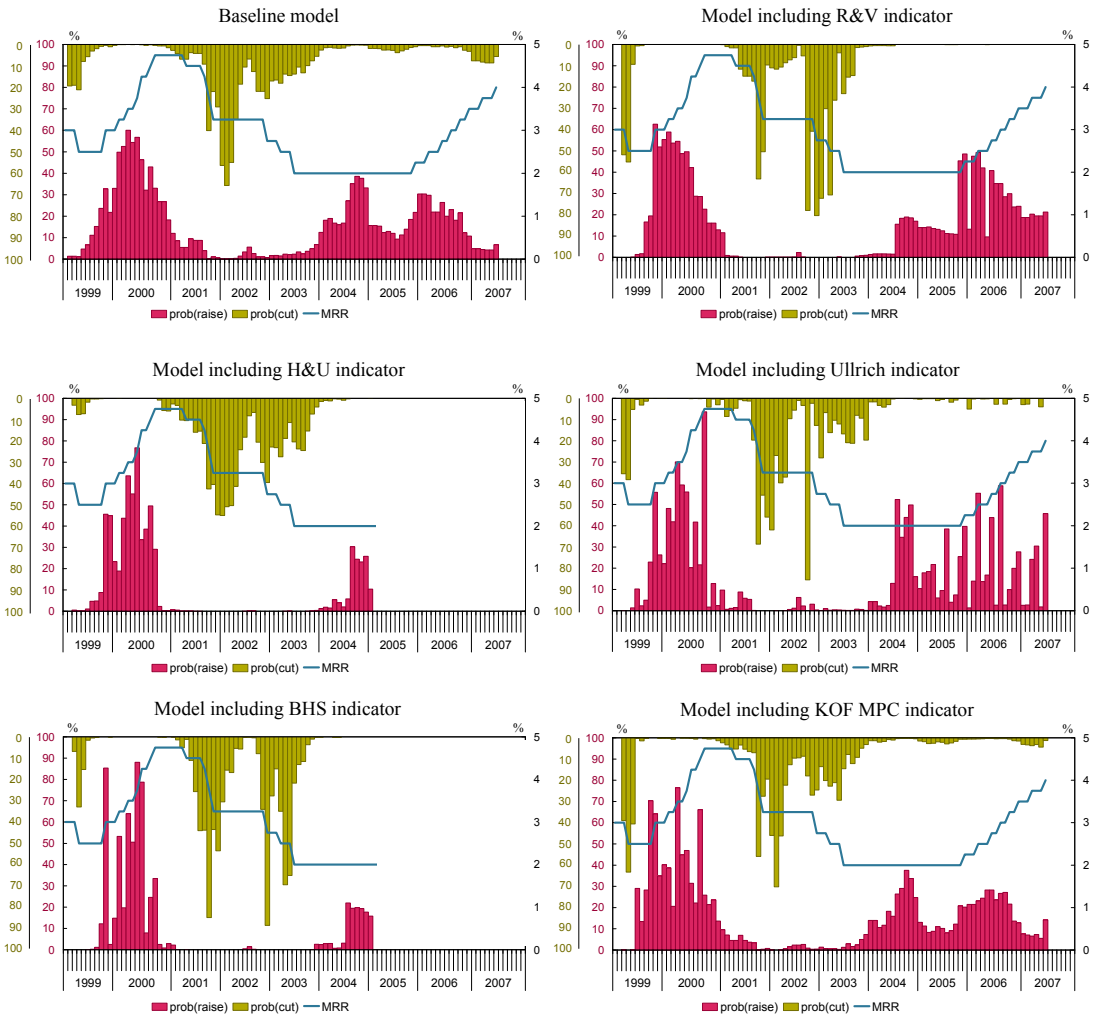


FIGURE 4

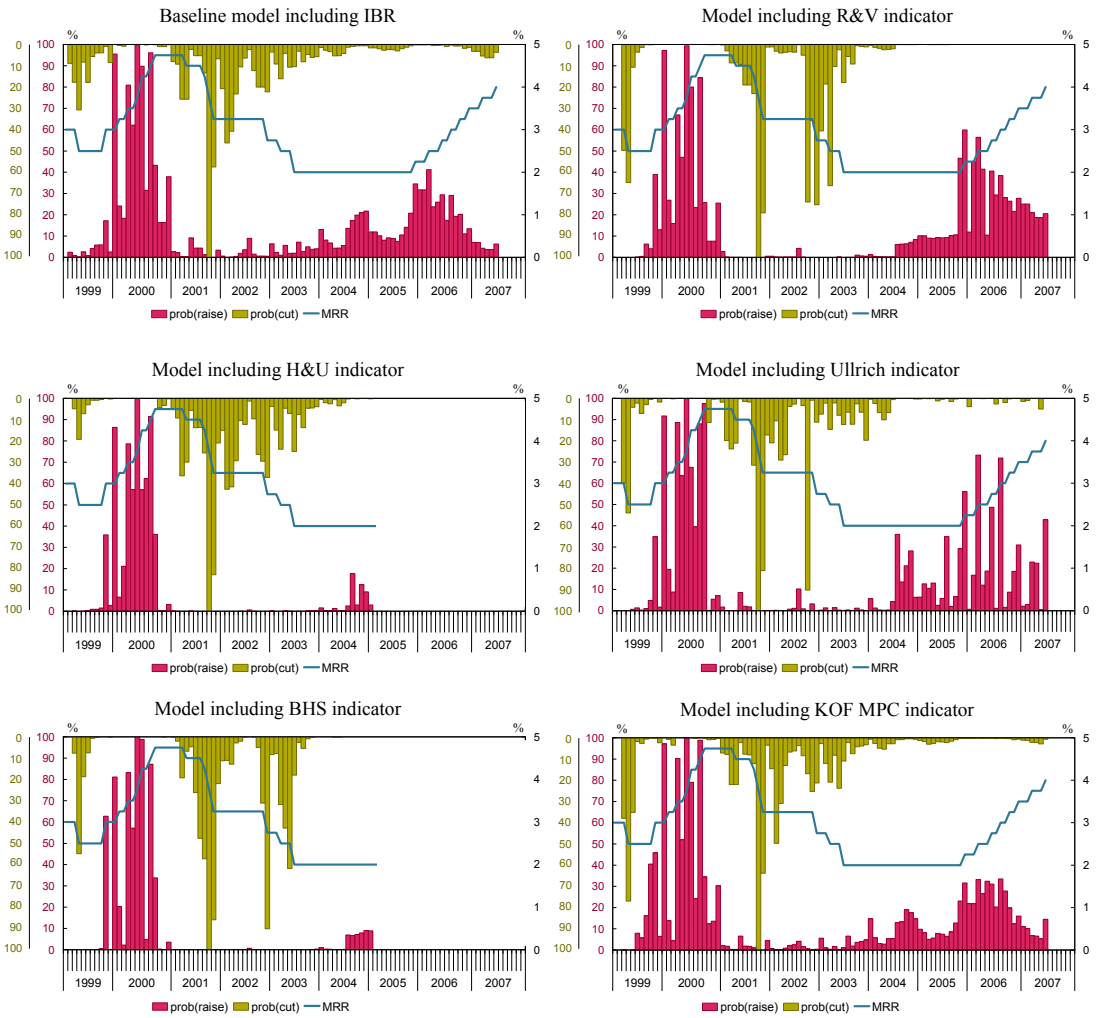
PROBABILITY ESTIMATES



Notes: The first figure does 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 figure does 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)	(9)
(1) MRR		-0.08	0.41	0.62	0.16		-0.15		-0.05
(2) $IBR_{t=CF}$ - MRR	*-0.08*		-0.21	0.32	0.32		0.26		0.06
(3) Inflation exp.	*0.56*	*-0.25*		0.02	0.28		0.18		0.18
(4) Growth exp.	*0.59*	*0.34*	*0.07*		0.55		0.21		0.16
(5) R&V	*0.30*	*0.36*	*0.12*	*0.76*			0.68		0.48
(6) H&U	*0.26*	*0.29*	*0.16*	*0.70*	*0.75*				
(7) Ullrich	*-0.06*	*0.31*	*0.07*	*0.42*	*0.62*	*0.70*			0.39
(8) BHS	*0.32*	*0.40*	*0.17*	*0.78*	*0.88*	*0.79*	*0.61*		
(9) KOF MPC	*-0.04*	*0.05*	*0.08*	*0.21*	*0.41*	*0.33*	*0.33*	*0.28*	

Notes: The correlation coefficients reported in italic (lower-left triangle) use a fixed sample of 68 observations during 1999–2004. Each of the correlation coefficients reported in the upper-right part use the 96 observations which cover January 1999 until June 2007.

TABLE 2

BASELINE MODEL: OLS AND ORDERED PROBIT MODELS

	OLS (1)		Implied structural parameters (2)		Ordered Probit (3)
MRR_{t-1}	-0.109 ***	ρ	0.891 ***	MRR_{t-1}	-1.048 ***
	(-3.53)		(28.96)		(-4.06)
Inflation $exp._{t=CF}$	0.154 *	β	1.414 **	Inflation $exp._{t=CF}$	1.700 **
	(1.74)		(2.12)		(2.50)
Growth $exp._{t=CF}$	0.187 ***	γ	1.725 ***	Growth $exp._{t=CF}$	1.756 ***
	(4.18)		(6.35)		(4.93)
Constant	-0.381 **	r*	0.766 ***		
	(-2.31)		(5.25)		
Observations	96				96
R-squared	0.225				
Log likelihood	47.97				-54.20

Notes: The sample uses all observations available during the 1999-2007 (June) 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	H&U	Ullrich	BHS	MPC	R&V	H&U	Ullrich	BHS	MPC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
MRR_{t-1}	-0.740 **	-0.995 ***	-0.616 **	-1.009 **	-0.993 ***	-0.748 **	-0.979 **	-0.776 ***	-0.965 **	-0.864 ***
	(-2.261)	(-2.736)	(-2.208)	(-2.478)	(-3.639)	(-2.245)	(-2.516)	(-2.694)	(-2.424)	(-2.999)
Inflation $exp._{t=CF}$	-0.153	0.121	0.611	-0.554	1.486 **	-0.153	-0.285	1.089	-0.502	1.043
	(-0.190)	(0.106)	(0.775)	(-0.561)	(2.240)	(-0.184)	(-0.212)	(1.282)	(-0.497)	(1.357)
Growth $exp._{t=CF}$	0.669	1.585 ***	1.316 ***	0.574	1.693 ***	0.665	1.285 **	1.547 ***	0.617	1.494 ***
	(1.372)	(2.623)	(3.201)	(1.033)	(4.357)	(1.347)	(2.011)	(3.509)	(1.109)	(3.741)
$Comm.ind._{t-1}$	1.131 ***	0.451 *	1.189 ***	1.613 ***	0.764	1.099 ***	0.459 *	1.379 ***	1.717 ***	0.761
	(3.891)	(1.812)	(3.909)	(3.188)	(0.972)	(3.170)	(1.846)	(3.673)	(2.857)	(0.986)
$Comm.ind._{t-2}$						0.047	0.311	-0.519 *	-0.210	1.928 ***
						(0.163)	(1.233)	(-1.687)	(-0.481)	(2.623)
Observations	96	68	96	68	96	95	67	95	67	95
Log likelihood	-41.91	-30.81	-45.45	-23.64	-53.68	-41.87	-30.05	-44.16	-23.54	-50.62

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	H&U	Ullrich	BHS	MPC	R&V	H&U	Ullrich	BHS	MPC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
MRR_{t-1}	-0.406	-0.850 **	-0.441	-1.142 **	-0.747 ***	-0.407	-0.853 **	-0.628 **	-1.120 **	-0.610 **
	(-1.157)	(-2.341)	(-1.566)	(-2.220)	(-2.676)	(-1.147)	(-2.234)	(-2.031)	(-2.362)	(-2.100)
$IBR_{t=CF}$ - MRR_{t-1}	6.278 **	7.284 ***	6.990 ***	7.452 ***	6.951 **	6.266 **	7.400 ***	7.533 ***	7.414 ***	6.858 **
	(2.020)	(2.586)	(2.584)	(2.774)	(2.342)	(2.014)	(2.659)	(2.887)	(2.752)	(2.136)
Inflation $exp._{t=CF}$	0.107	0.621	1.179	0.477	1.871 ***	0.083	0.704	1.806 **	0.492	1.380 *
	(0.123)	(0.523)	(1.455)	(0.466)	(2.817)	(0.0905)	(0.530)	(2.083)	(0.475)	(1.894)
Growth $exp._{t=CF}$	-0.046	1.031 *	0.812 *	0.369	1.136 ***	-0.058	1.071	1.068 **	0.376	0.934 **
	(-0.084)	(1.686)	(1.949)	(0.638)	(2.778)	(-0.103)	(1.502)	(2.276)	(0.640)	(2.284)
$Comm.ind._{t-1}$	1.125 ***	0.618 *	1.253 ***	1.777 ***	0.964	1.097 ***	0.612 *	1.518 ***	1.806 ***	0.948
	(3.993)	(1.686)	(3.816)	(3.375)	(1.068)	(3.189)	(1.689)	(3.378)	(2.891)	(1.074)
$Comm.ind._{t-2}$						0.044	-0.048	-0.741 **	-0.068	1.880 ***
						(0.153)	(-0.182)	(-2.186)	(-0.130)	(2.671)
Observations	96	68	96	68	96	95	67	95	67	95
Log likelihood	-35.53	-23.47	-37.73	-18.10	-45.00	-35.50	-23.44	-35.71	-18.09	-42.75

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

TABLE 5

OUT OF SAMPLE FORECASTING

	QPS		RPS	
	without IBR	incl. IBR	without IBR	incl. IBR
Base model	0.466	0.453	0.239	0.230
Using one lag of the communication indicator				
R&V	0.395	0.382	0.198	0.191
Ullrich	0.393	0.375	0.197	0.188
KOF MPC	0.465	0.452	0.237	0.228