Does it Pay to Watch Central Bankers' Lips?
The Information Content of ECB Wording

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Abstract

In this analysis, the informational content of central bank rhetoric is assessed based on the experience with the ECB since 1999. Among the ECB's communication channels we focus on the monthly press conferences. Based on a counting of certain signal words we construct a wording indicator reflecting the "hawkishness" of monetary rhetorics. We then integrate this indicator into a standard Taylor type ordered probit model for the explanation of the interest rate. We show that the wording indicator can improve the model's fit when added to the standard explanatory variables. However, a model based solely on this indicator performs worse than the baseline. The results are confirmed by out of sample analysis where the determination of the wording indicators' weights is based on the early ECB period which, subsequently, is excluded from the tests. Our conclusion is that linguistic analysis can improve but not substitute more rigorous forecasting techniques based on hard economic data.

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1 Introduction

Central bank watchers, financial media and market participants pay considerable attention to central bankers' statements. Even slight nuances of wording are being scrutinised with regard to possible signals about future monetary policy decisions. In the financial press, lists of code words are reported together with their alleged monetary policy interpretation (e.g., without author (2003)). Examples exist where the linguistic analysis of central bank publications is used to construct a measure of rhetoric "hawkishness" which then serves as an input for assessing the monetary policy outlook (Mayer, 2004).

Practitioners' attention to central bank wordings stands in contrast to academic approaches to explain and forecast central bank decisions. In the literature, approaches dominate which are based on objectively quantifiable economic data, e.g. in the context of specifying Taylor type rules. This self-restriction is related to technical difficulties of quantifying rhetoric signals. A further and more serious reason, however, might be the assumption that financial market actors form expectations on the basis of the full set of available economic data and that central bank rhetoric does not include any informational value added. If the latter assumption were true the watching of central bankers' lips would have to be regarded as a forecasting technique being inferior to more technical approaches.

In our analysis, we try to assess the informational content of central bank rhetoric for future central bank rates based on the experience with the ECB since 1999. Among the ECB's communication channels we focus on the monthly press conferences.

In essence, we deal with two distinct but closely related questions: First, is central bank watching based *solely* on a counting of code words an efficient information technique in the sense that this strategy does not perform substantially worse than other more subtle

techniques? And second, do wording indicators *in addition* to hard economic data offer valuable information for the explanation of central bank rates?

Our results tend to negate the first question and to answer the second question in the affirmative. *Although the simple decoding of central bankers' messages cannot substitute a thorough analysis of economic data, our findings clearly support the rationality of central bank watchers' attention for linguistic specificities. Obviously, ECB wording has an information content which cannot fully be replicated by Taylor type regressions. Thus, it is rational information collecting when market actors pay attention to the subtleties of wording.*

While our approach is new and, to our knowledge, the usefulness of ECB words for forecasting its deeds has not been tested directly so far, this study is related to other strands of research dealing with monetary predictability and the impact of central bank communication on financial markets.

For example, the ECB has been surveyed regarding its transparency and communication policy. Ross (2002) examines the predictability of ECB policy decisions using the persistence of interest rate changes via the smoothing parameter included in the Taylor rule, federal funds futures to predict changes in the monetary policy of the Fed and the short-term end of a forward curve calculated by the Bank of England and the EONIA for the ECB. He concludes that the predictability of the ECB is lower than that of the other two banks. On the other hand, Gaspar et al. (2001) come to the conclusion, that announcements of monetary policy decisions do not change the stochastic behaviour of the EONIA, which indicates that market participants have anticipated interest rate decisions.

The bias announcement which had been practiced by the Fed is, of course, a very direct and explicit monetary signal which as such does not exist in the ECB's context. This bias announcement includes significant information, which may help to predict the Federal Reserve's interest rate decisions (Conley, Dupor and Mirzoev 2004).

By concentrating on the press conference given to explain the interest rate decisions, we can ignore the finding of Jansen and De Haan (2004) that statements of central bankers on interest rates, inflation and economic growth have been different and even contradictory with respect to central banker from the ECB and the national central banks of the euro area. However, over time, the interest rate statements have become less contradictory.

A further focus of related literature is the impact of announcements and communication on financial market variables like capital market rates or exchange rates. Andersson, Dillén and Selling (2001) find, that the long-term interest rates are influenced by signals from speeches of central bankers from the Swedish central bank. This influence might even be larger than unexpected changes in the official rate. Guthrie and Wright (2000) find a clear announcement effect for interest rates along all maturities in the case of New Zealand. Studies related to the impact of communication on exchange rates are Fratzscher (2004) and Jansen/de Haan (2002).

Faust, Swanson und Wright (2004) find little evidence that monetary policy surprises from the Federal Reserve convey superior information that may be used to improve the private sector forecast of statistical releases. This is a finding interesting in our context since central bank private information could be one of the reasons for the informative value added of central bankers' statements.

Summing up, the existing studies are of a more indirect nature compared to ours'. In many of these analyses, central bank announcements are seen to change market participants' expectations of the future monetary stance with immediate consequences for the pricing of certain financial assets. Our analysis is more focused and solely related to the first step of the logical chain, the link between communication and the likely future monetary path.

In the next section we give a brief exposition of our analytical strategy, followed by the construction of a wording index in section 3. Section 4 presents our central econometric test. Section 5 summarizes our findings and concludes.

2 Analytical approach

There are basically two different potential explanations for the markets' attention to central bank wording. Our empirical strategy is designed to differentiate between both.

First, information strategies based on the exegesis of central bank statements may be a cost-efficient alternative to more rigorous approaches based on implicit or explicit models and a collection of all relevant data. The Fed's former bias announcement illustrates this interpretation: If a central bank credibly states what it intends to do in the coming months, market participants could try to economize on forecasting efforts and – in the extreme – even stop devoting any resource to this activity apart from following official statements.

The second explanation points towards a less demanding function of rhetoric signals. Even if these signals may not be able to replace more thorough forecasting techniques they might be useful to improve these forecasts. This should be the case if one of the following two conditions is fulfilled: The central bank has private information on data being relevant for future monetary decision or market actors are uncertain about the correct decision model. As cited above, for the Fed the study of Faust, Swanson und Wright (2004) does not support the existence of substantial private information but the situation could be different for Europe. Furthermore, the relative short history of the ECB is a strong argument in favour of model uncertainty on the side of ECB watchers. For example, it may be unclear how (common knowledge) data on heterogeneous developments in the Euro zone affect the decision making in the Council (Heinemann and Hüfner, 2004). In these cases, wording signals can be an input to forecasting models being able to improve the model's fit.

Our empirical strategy, consecutively, tests for both potential functions. I.e. we test the following two distinct hypotheses:

Hypothesis 1:

Central bank watching and de-coding of wording is a substitute for thorough model analyses.

Hypothesis 2:

Wording includes information helpful to improve the explanation of interest rate decisions based on standard explanatory models.

In order to test hypothesis 1, we check the fit of a model explaining ECB rates solely on the basis of their own history and our wording indicator. Hypothesis 2 is tested by augmenting a standard Taylor equation with our wording indicator as additional regressor.
Before proceeding with this strategy, in the following section, we describe the construction of our wording index.

3 Learning and the construction of a wording index

Our attempt to decode and quantify the ECB's rhetoric messages starts by identifying possible signal words and further characteristics of communication policies. In order to base the analysis on a regular stream of communication signals we focus on ECB press conferences which offer a monthly frequency and which are carefully analysed by ECB watchers. On the basis of these potential code words our construction of the wording index that can be interpreted as describing a simple learning process of ECB watchers. The learning process assumes that observers of monetary policy look for significant differences in the frequencies of potential code words in different monetary policy phases. Monetary phases are classified depending on the subsequent interest rate policies, i.e. whether the month of observation is preceding a period with rate cuts, rate increases and unchanged rates, respectively. Observing

significant differences in frequencies among these monetary phases, subsequently allows ECB observers to draw conclusions from wording about future monetary decisions.

A convincing test for the usefulness of any such learning process must rely on out of sample analysis. This means that the period of learning on the one hand and the period of testing the learning results' usefulness on the other hand need to be non-overlapping. Therefore, we construct two variants of our wording indicators based on different periods in order to prepare for out of sample testing in the next section.

Starting point is the identification of potential code words. Among ECB watchers, different lists of code word exist (for example: Without author (2003)). From these lists and judging on the basis of our reading of the ECB's president's introductory statements to the press conferences, we take account of the words and phrases summarized in Table 1. Since we base our wording index on statistical testing the analysis has to focus on relatively few central of relatively frequent words and phrases and we cannot take account of more subtle differences in formulations.

We also include into our list a variable measuring the length of the President's introductory statement. This communication characteristic could play a role assuming that preparing the ground for a change in interest rates might need more words compared to a situation of continuing passivity.

Table 1: Potential code words

Code word	**Examples**
"appropriate"	The Governing Council concluded that the information which had become available in recent weeks confirmed that the current level of key ECB interest rates remains **appropriate** for the maintenance of price stability over the medium term (7 March 2002). Overall, the current monetary policy stance remains **appropriate** to preserve a favourable outlook for price stability in the medium term (6 February 2003).

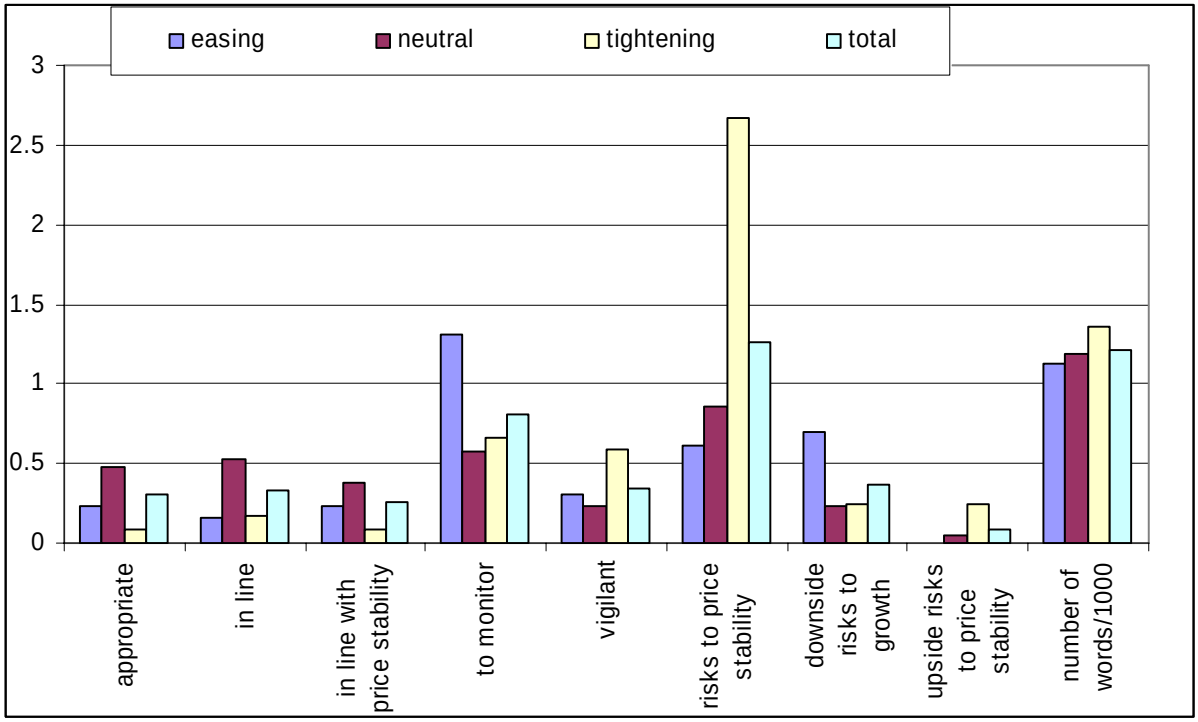
	We judge the current monetary policy stance **appropriate** to maintain a favourable outlook for price stability in the medium term. Hence, we have decided to keep our key rates unchanged (9 January 2003).
"in line"	On the basis of our regular economic and monetary analysis, we have not changed our assessment that the current stance of monetary policy remains **in line** with the maintenance of price stability over the medium term (1 April 2004). In summary, the economic analysis indicates that the main scenario for price developments in the medium term continues to be **in line** with our definition of price stability (4 December 2003).
"in line with price stability" (specific aspect of "in line")	To sum up, the economic analysis indicates that the medium-term outlook for price developments remains **in line** with price stability (1 July 2004). Nevertheless, we are still of the view that the medium-term outlook remains **in line** with price stability (3 June 2004).
"monitor"	The Governing Council will carefully **monitor** future developments and assess whether conditions for price stability continue to develop favourably (8 May 2003). In view of the high uncertainty on future growth, and its implication for medium-term inflationary developments, the Governing Council has discussed extensively the arguments for and against a cut in the key ECB interest rates. The view has prevailed to keep interest rates unchanged. However, the Governing Council will **monitor** closely the downside risks to economic growth in the euro area (7 November 2002). As always, we will continue to **monitor** carefully all developments that could affect our assessment of risks to price stability over the medium term (6 May 2004).
"vigilant"/"vigilance"	The Eurosystem will remain **vigilant** in assessing upside risks to price stability and will take appropriate action if and when required (13 April 2000). The Governing Council will remain **vigilant** with regard to all developments which could affect the risks to price stability over the medium term (1 July 2004).
"risks to price stability"	We will remain vigilant with regard to all developments which could affect the **risks to price stability** over the medium term (4 June 2004). As always, we will continue to monitor carefully all developments that could affect our assessment of **risks to**

	price stability over the medium term (6 May 2004).
"upside risks to price stability"	To sum up, annual inflation rates should fall below 2% in 2005, but a number of medium-term **upside risks to price stability** need to be carefully monitored (7 October 2004).
"downside risks to growth/economic activity"	Overall, with regard to the cyclical situation, recent data confirm our earlier expectations that there are still **downside risks for output growth** (4 March 1999). Sources of **downside risks** – including oil prices, imbalances in the global economy, financial market uncertainties and their impact on consumption, investment, and thus on employment – will be monitored closely (10 October 2002).
number of words	

In order to test these words' informational content we count their use in the introductory statements in each monthly ECB press conferences. In order to safeguard a high degree of objectivity we abstain from taking into account the context of the terms' use apart from unequivocal negations. For example, we do treat a statement like "there is no risk to price stability" as if "risk to price stability" was not mentioned. We then group observations into periods of neutrality, tightening and easing bias. Our grouping criterion is the observed interest policy of the two months following the press conference.

Figure 1 shows frequency means of code words depending on the character of the monetary policy stance judged on the basis of the interest rate decision in the following two months. Press conferences preceding interest rate increases are characterized by a more frequent use of "vigilant" and "(upside) risks to price stability". Apart from that, statements are longer. During more passive stages the ECB president more frequently uses words like "appropriate" and "in line". A code word used more frequently in phases preceding interest rate cuts is "to monitor" and "downside risks to growth". In addition, statements are relatively short in the months before rate cuts take place.

Figure 1: Frequency means of code words in press conferences depending on monetary policy phase (era Duisenberg 1999:01-2003:10)



However, not all of these differences are significant. Tables 2 and 3 summarise the results of ANOVA tests for the equality of means in the frequency of these words' frequencies for the period January 1999 – October 2003 which is the period of Wim Duisenberg being ECB president and for a two year sub-section of the Duisenberg era, respectively.

Table 2: Analysis of variance – Duisenberg era

	period	N	mean	F-statistic	significance	η^2
appropriate	easing	13	0.23	3.24	0.049	0.131
	neutral	21	0.48			
	tightening	12	0.08			
	total	46	0.30			
in line	easing	13	0.15	2.58	0.087	0.107
	neutral	21	0.52			
	tightening	12	0.17			
	total	46	0.33			
in line with price stability	easing	13	0.23	1.46	0.243	0.064
	neutral	21	0.38			
	tightening	12	0.08			
	total	46	0.26			
to monitor	easing	13	1.31	2.90	0.066	0.119
	neutral	21	0.57			
	tightening	12	0.67			
	total	46	0.80			
vigilant	easing	13	0.31	2.13	0.132	0.090
	neutral	21	0.24			
	tightening	12	0.58			
	total	46	0.35			
risks to price stability	easing	13	0.62	14.49	0.000	0.403
	neutral	21	0.86			
	tightening	12	2.67			
	total	46	1.26			
upside risks to inflation	easing	13	0.00	1.86	0.168	0.080
	neutral	21	0.05			
	tightening	12	0.25			
	total	46	0.09			
downside risks to growth	easing	13	0.69	3.17	0.052	0.128
	neutral	21	0.24			
	tightening	12	0.25			
	total	46	0.37			
number of words	easing	13	1129	2.19	0.124	0.092
	neutral	21	1186			
	tightening	12	1355			
	total	46	1214			

η^2 is computed as between-groups sum of squares divided by total sum of squares.

Table 3: Analysis of variance - restricted database 1999-2000

	period	N	mean	F-statistic	significance	η^2
appropriate	easing	2	0.00	0.35	0.709	0.038
	neutral	7	0.00			
	tightening	12	0.08			
	total	21	0.05			
in line	easing	2	0.00	2.41	0.118	0.211
	neutral	7	0.57			
	tightening	12	0.17			
	total	21	0.29			
in line with price stability	easing	2	0.50	3.38	0.057	0.273
	neutral	7	0.71			
	tightening	12	0.08			
	total	21	0.33			
to monitor	easing	2	3.00	9.41	0.002	0.511
	neutral	7	0.43			
	tightening	12	0.67			
	total	21	0.81			
vigilant	easing	2	0.00	5.40	0.015	0.375
	neutral	7	0.00			
	tightening	12	0.58			
	total	21	0.33			
risks to price stability	easing	2	1.50	6.30	0.008	0.412
	neutral	7	0.71			
	tightening	12	2.67			
	total	21	1.90			
upside risks to inflation	easing	2	0.00	0.68	0.519	0.070
	neutral	7	0.00			
	tightening	12	0.25			
	total	21	0.14			
downside risks to growth	easing	2	1.00	3.41	0.055	0.275
	neutral	7	0.14			
	tightening	12	0.25			
	total	21	0.29			
number of words	easing	2	1459	0.10	0.909	0.076
	neutral	7	1351			
	tightening	12	1355			
	total	21	1364			

η^2 is computed as between-groups sum of squares divided by total sum of squares.

On the basis of a 10% significance level the signal words with the exception of three phrases ("vigilant", "in line with price stability" and "upside risks to inflation") show significant differences in mean frequencies for the whole Duisenberg era. The ANOVA results for the first two year differ with "in line" and "appropriate" being insignificant and "vigilant" and "in line with price stability" gaining significance. Those code words which do not show significant differences in mean are excluded from the following calculations. The differences in the mean length of the statements miss significance and are dropped as well.

Since the ANOVA assesses differences in mean across all groups it does not give a direct insight on pair-wise differences. For this purpose, for the words with significant F-tests we present least significant distance tests (Table 4 and Table 5) indicating which of the pair-wise differences in means show significance.

Table 4: Pair-wise differences in means (least significance distance) – Duisenberg era

		difference in mean	significance
appropriate	neutral vs easing	0.25	0.124
	tightening vs. easing	-0.15	0.411
	tightening vs. neutral**	-0.39	0.019
in line	neutral vs easing*	0.37	0.059
	tightening vs. easing	0.01	0.953
	tightening vs. neutral*	-0.36	0.075
to monitor	neutral vs easing**	-0.74	0.025
	tightening vs. easing*	-0.64	0.081
	tightening vs. neutral	0.10	0.771
risks to price stability	neutral vs easing	0.24	0.522
	tightening vs. easing***	2.05	0.000
	tightening vs. neutral***	1.81	0.000
downside risks to growth	neutral vs easing**	-0.45	0.023
	tightening vs. easing**	-0.44	0.049
	tightening vs. neutral	0.01	0.952

*/**/***: significance at 10%/5%/1%

Table 5: Pair-wise differences in means (least significance distance) - restricted database 1999-2000

		difference in mean	significance
vigilant	neutral vs easing	0.00	1.000
	tightening vs. easing*	0.58	0.074
	tightening vs. neutral***	0.58	0.007
in line with price stability	neutral vs easing	0.21	0.613
	tightening vs. easing	-0.42	0.307
	tightening vs. neutral**	-0.63	0.020
to monitor	neutral vs easing***	-2.57	0.001
	tightening vs. easing***	-2.33	0.001
	tightening vs. neutral	0.24	0.518
risks to price stability	neutral vs easing	-0.79	0.413
	tightening vs. easing	1.17	0.208
	tightening vs. neutral***	1.95	0.002
downside risks to economic growth	neutral vs easing**	-0.86	0.019
	tightening vs. easing**	-0.75	0.030
	tightening vs. neutral	0.11	0.594

*/**/***: significance at 10%/5%/1%

The significant pair-wise tests are used to decide the sign of the specific code word in our indicator. A positive sign is attributed to those words for which tests significantly show larger frequencies in tightening compared to easing periods, tightening compared to neutral periods or in neutral compared to easing periods. A negative sign is assigned to words where the significant relative frequencies are opposite. Those words where significant pair-wise tests indicate the largest frequencies in the neutral periods obtain a zero weight. Thus, the resulting indicator is, by construction, positively associated with an increasing "hawkishness" of ECB rhetoric.

Additional information for the learning oriented construction of our wording index comes from the η^2 statistic (measuring the share of the total variance attributable to differences in means between the three different kinds of periods). η^2 is used to provide a weight for the informational contents of different code-words.

Summing up, our wording index *WI* is constructed using frequency of code words x_i as follows:

$$WI_t = \sum_{i=1}^{k} \frac{nobs(x_{i,t}) - meanobs(x_i)}{stdv(x_i)} * sign(x_i) * \eta^2(x_i)$$

The index adds for each period the (standardized) number of observations. These numbers are weighted by the η^2 in order to account for the differences in the informational content of code words. The sign of each individual code word is determined on the basis of significant pair-wise tests in Tables 4 and 5 as described.

We calculate two indicators: First, WI_D which is based on the information from the complete Duisenberg period January 1999 until October 2003, and, second, WI_{9900}, which only reflects a learning process from the first two years (1999-2000) of the Duisenberg era. The latter indicator is used in the next section for out of sample testing.

Figure 2 presents the two resulting wording indicators together with the minimum bid rate on the main refinancing operations (MRO). While both indicator variants are highly correlated they show differences in behaviour in particular towards the end of the period covered. Since spring 2004, both indicators reveal increasing hawkishness of monetary rhetorics (not being followed by monetary action) with the increase being more pronounced for WI_{9900} compared to WI_D.

Figure 2: Wording Indicators and the Minimum Bid Rate on the MROs

4 Econometric analysis

Starting point of our model is a standard ordered probit setup where the Governing Coucil either increases or decreases the interest rate or leaves it unchanged depending on the divergence between the current target and the interest rate of the last period, $i_t^* - i_{t-1}$. The ECB Council is modelled to decide on the basis of certain critical thresholds, μ_j, j=1,2, generating an inactive zone:

$$\Delta i_t < 0 \quad if \quad i_t^* - i_{t-1} \le \mu_1$$
$$\Delta i_t = 0 \quad if \quad \mu_1 < i_t^* - i_{t-1} \le \mu_2$$
$$\Delta i_t > 0 \quad if \quad i_t^* - i_{t-1} > \mu_2$$

We assume that the target rate is defined on the basis of a smoothing adjustment towards i_t^F which is the optimal rate of the fully specified model guiding the decision of the Council:

$$(1) \qquad i_t^* = \rho\, i_{t-1} + (1-\rho)\, i_t^F .$$

A Taylor type interest rate is possibly an incomplete approximation of i_t^F. We model this by regarding the fully specified model as a weighted average of a Taylor target rate i_t^T and a second target rate, i_t^O, which includes those other aspects in Council preferences which are not taken account of in the Taylor approach and for which central bank watchers hope to get information from wording analyses:

$$(2) \qquad i_t^F = \eta\, i_t^T + (1-\eta)\, i_t^O .$$

Thus, i_t^O is our analytical reference point for which communication and signals become relevant. Only in the extreme case of the Taylor rule explaining the monetary world completely, both target interest rates are identical and the target rate of the fully specified model equals the Taylor interest rate. The intended interest rate i_t^O can be explained by the intended change of the interest rate, Δi_t^O, based on the interest rate of the last period, $i_t^O = i_{t-1} + \Delta i_t^O$. Combining this with equations (1) and (2) we get:

$$(3) \qquad \begin{aligned} i_t^* &= \rho i_{t-1} + (1-\rho)\left[\eta i_t^T + (1-\eta) i_t^O\right] \\ &= \left[\rho + (1-\rho)(1-\eta)\right] i_{t-1} + (1-\rho)\left[\eta i_t^T + (1-\eta)\Delta i_t^O\right]. \end{aligned}$$

In regard to our econometric specification we now have to specify the Taylor equation. Here, we follow Gerlach (2004) and use the inflation rate, π, the output gap, $\bar{y}$, or a related measure and money growth, Δm, as explanatory variables. Reflecting the availability of monthly data we generally use lagged values:

$$(4) \qquad i_t^T = \alpha + \beta\pi_{t-1} + \gamma\,\bar{y}_{t-1} + \delta\,\Delta\, m_{t-1}.$$

Based on these considerations, the central bank would change the interest rate according to equation (5) which is the basis for our regressions:

$$(5) \qquad i_t^* - i_{t-1} = \Delta^* i_t = -(1-\rho)\eta i_{t-1} + (1-\rho)\left[\eta(\alpha + \beta\pi_{t-1} + \gamma\bar{y}_{t-1} + \delta\Delta m_{t-1}) + (1-\eta)\Delta i_t^O\right] + \varepsilon_t,$$

where ε denotes the error term. In the estimation, we add the lagged change of the interest rate as proposed in Judd and Rudebusch (1998) in order to account for the short run dynamics of the process. Consequently, our estimation model is the following:

$$(6) \qquad \Delta^* i_t = a_1 i_{t-1} + a_2\pi_{t-1} + a_3\bar{y}_{t-1} + a_4\Delta m_{t-1} + a_5\Delta i_t^O + a_6\Delta i_t + \varepsilon_t$$

where Δi denotes the change in the interest rate on the MRO.

The following data are used: Our interest rate i denotes the interest rate on the main refinancing operations (MRO) (Source: ECB). The yearly inflation rate π is based on the harmonized index of consumer prices HICP (Source: Eurostat). The output gap $\bar{y}$ is calculated as the difference between the index of industrial production and the HP filtered series (Source: Eurostat). Alternatively, the economic sentiment indicator, published by the European Commission, is used in the form 100*log((*esi*-$\overline{esi}$)/$\overline{esi}$), where $\overline{esi}$ is the mean of the series (Galí et al. 2004). With Δm we denote the annual growth rate of the monetary aggregate M3 averaged over the last three months (Source: ECB).

We employ our wording indicator *w* as a proxy for Δi_t^O. Thus, the explanatory value of this indicator is to reveal the extent to which rhetoric signals contain information about the monetary decision process which is not included in the standard Taylor approach variables.

Using the wording indicator we face the problem that not every month has seen an ECB press conference and sometimes there were two of these events in one month. There are 15 missing values for the monthly time series of the wording indicator from 1999:1 to 2004:12 and two months (March 2000, June 2001) with two press conferences. We treat this problem by replacing missing values by the mean of the preceding and following months and the double values are replaced by their respective average.

Table 4 shows descriptive statistics of the explanatory variables. The maximum interest rate steps are ±0.5 percentage points. The economic sentiment indicator *esi* displays the highest variance.

Table 6: The used time series span from 1999:1 to 2005:4 has 73 observations in each series.

	i	Δi	π	$\bar{y}$	esi	Δm	WI_D	WI_{9900}
Mean	3.05	-0.01	2.02	0.01	-1.05	6.20	0.00	-0.20
Median	3.00	0.00	2.10	-0.10	-2.20	5.90	-0.11	-0.30
Maximum	4.75	0.50	3.10	2.82	13.32	8.70	1.09	2.62
Minimum	2.00	-0.50	0.80	-2.65	-13.91	3.77	-1.09	-2.73
Std. Dev.	0.94	0.18	0.46	1.12	7.68	1.33	0.49	1.20

As standard in Taylor regressions we expect the following signs: a higher inflation rate should lead to a higher probability of an interest rate increase. The same holds for the output gap, the economic sentiment and money growth. The lagged change of the interest rate is to reveal smoothing behaviour. Last but not least, the wording indicator should show a positive sign

since a high indicator value signals a large extent of "hawkishness" leading to a higher probability of an interest rate increase.

According to our testing strategy described in section 2 we estimate basically three variants of a model explaining ECB interest rate changes. Our baseline model is a standard Taylor approach. We contrast this first to both a "naïve" central bank watcher model where no information is used but wording and the interest rate's history and second to a Taylor equation augmented by the wording index.

We apply this testing strategy to two periods with the different wording indicators described above in order to supply both within and out of sample insights. The first set of regressions (Table 7) represents a within sample approach: The Duisenberg era wording indicator (WI_D) is used to explain interest rate decisions which have been used to construct this indicator. The second set of regressions (Table 8) is an out of sample exercise: The wording indicator employed (WI_{9900}) was constructed on the basis of information from periods (1999-2000) not included in the estimation period (2001:01 – 2005:03). It thus can be interpreted to represent the following sequence of learning: The first two years of the newly established central bank are used by ECB watchers to learn about the meaning of code words. Subsequently, this new knowledge is available to improve predictability of interest rate decisions. Although being the superior approach judging on methodological considerations, the second set of regressions suffers from a loss of observations excluding all cases of increasing interest rates from the analysis.

Our baseline regressions are presented in columns (1) and (5) where μ_1 and μ_2 denote the estimated thresholds separating the categories (in 5 only one threshold exists since the covered period does not include any increases in interest rates). Estimations using the output gap as an alternative to the economic sentiment indicator are contained in the appendix. For the full sample (1), all explanatory variables included in the standard Taylor approach are significant, at least at the 10 percent level, whereas in the restricted regression (5), apart from

the lagged interest rate only economic sentiment is significant and, therefore, the other Taylor variables are dropped resulting in the specification (6).

The naïve regressions (2) and (7) based solely on the wording indicator and past values of the interest rates show a poorer fit compared to the Taylor specification (1) and (6). Even though the wording indicator is significant in both approaches, it cannot fully substitute the more thorough economic modelling.

Table 7: Coefficients of the ordered probit estimation (z-statistic in brackets)

	(1)	(2)	(3)	(4)
Adjusted sample		1999:3 – 2005:3		1999:3 – 2005:2
i_{t-1}	-0.85**	-0.14	-0.78**	-0.79**
	(-2.23)	(-0.84)	(-1.96)	(1.98)
Δi_{t-1}	-2.78*		-3.18**	-3.17**
	(-1.94)		(-2.06)	(2.06)
π_{t-1}	1.24**		1.78*	1.18*
	(1.96)		(1.78)	(1.79)
esi_{t-1}	0.35***		0.34***	0.33***
	(4.11)		(3.85)	(3.81)
Δm_{t-1}	0.94***		1.01***	1.00***
	(2.69)		(2.85)	(2.85)
$WI_{D,t-1}$		1.31***	0.92	0.97*
		(3.26)	(1.62)	(1.69)
μ_1	3.33	-1.90***	3.75	3.65
	(1.23)	(-3.16)	(1.36)	(1.33)
μ_2	7.70***	-0.13**	8.35***	8.23***
	(2.58)	(-1.99)	(2.76)	(2.74)
Log likelihood	-28.41	-40.94	-26.99	-35.32
Restr. log likelihood		-47.44		-45.21
Pseudo R^2	0.4011	0.1371	0.4311	0.2189

Significance at the 1 (***), 5 (**), 10 (*) per cent level

Table 8: Coefficients of the ordered probit estimation (z-statistic in brackets)

	(5)	(6)	(7)	(8)
		2001:1 – 2005:3		
i_{t-1}	-1.24	-1.46**	-0.79**	-6.63**
	(-1.45)	(-2.13)	(-2.36)	(-2.24)
Δi_{t-1}	-3.90			-9.99*
	(-1.55)			(-1.88)
π_{t-1}	-0.07			
	(-0.06)			
esi_{t-1}	0.31**	0.17**		0.74**
	(2.15)	(2.01)		(2.09)
Δm_{t-1}	0.66			
	(0.32)			
$WI_{9900,t-1}$			0.67*	2.85**
			(1.70)	(2.19)
μ	-2.57	-6.92**	-4.09***	-29.52**
	(-0.38)	(-2.40)	(-2.93)	(-2.26)
Log likelihood	-12.84	-14.53	-15.79	-7.02
Restr. log likelyhood		-20.40		
Pseudo R^2	0.3705	0.2876	0.2261	0.6556

Significance at the 1 (***), 5 (**), 10 (*) per cent level

Regressions (3) and (8) test for the informative added value of ECB rhetoric by augmenting the Taylor specification by our wording indicators. This indicator turns out to be significant nearly at the 10 per cent level (p-value = 0.1032) in the within sample regression and significant at the 5 per cent level in the out of sample regression. The regressions' fits increase with the inclusion of the wording indicators; the improvement is particularly marked for the out of sample analysis (as can be seen from a comparison of (8) with (6)).

A slight shortening of the estimation period (by one period, ending in 2005:02 instead of 2005:03, see regressions (4)) improves the significance of the wording indicator in the within sample approach reflecting the outliers of this indicators towards the end of the covered period (see figure 2).

To assess the influence of the variables on the probability of an interest rate decrease, increase or of an unchanged interest rate, the marginal effects of the variables are evaluated at their

mean and displayed in Table 9. For some of the variables the sum of the probabilities does not add to zero because of truncation effects.

If the mean of the wording indicator increases by one point, this would lead to a decrease in the probability of an interest rate cut by 0.03 and to an increase in the probability of an unchanged interest rate or increasing interest rate by 0.01 or 0.02, respectively, for model (3). Thus, the size of the marginal effect of the wording indicator is comparable to that of the inflation rate, money growth or the lagged interest rate. The high degree of interest rate smoothing reported in other studies (e.g. Fourçans and Vranceanu 2004) is apparent in these equations, too. The lagged change of the target interest rate has the largest effect on probabilities.

Table 9: Marginal effects of change in mean of the explanatory variable

	Change of probability of interest rate decrease Prob(y=0)			Change of probability of unchanged interest rate Prob(y=1)			Change of probability of interest rate increase Prob(y=2)		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
i	0.04	0.02	0.03	-0.02	-0.00	-0.01	-0.02	-0.02	-0.02
Δi	0.13		0.12	-0.05		-0.05	-0.08		-0.07
π	-0.06		-0.04	0.02		0.02	0.04		0.03
esi	-0.02		-0.01	0.01		0.00	0.01		0.01
Δm	-0.04		-0.04	0.02		0.01	0.03		0.02
w		-0.17	-0.03		0.01	0.01		0.16	0.02

5 Conclusions

In this paper's title we pose the question „does it pay to watch central bankers' lips"? Judging on the experience with the ECB we answer this question in the affirmative. Compared to technical approaches based on standard Taylor equations and solely hard economic data the

exploitation of rhetoric signals can be helpful to better explain what the central bank is doing. This result is confirmed on the basis of out of sample analysis where the period on which the wording indicator's choice of weights is based is not included in testing this indicator's significance. Thus, we tend to accept the hypothesis that wording includes information helpful to improve the explanation of interest rate decisions based on standard explanatory models. This also indicates that Taylor regressions are not able to capture the realities of monetary policy completely – a fact which seems sometimes to be ignored in the literature.

It should be stressed that our wording indicator based on statistical reasoning is nevertheless rather mechanical and only an approximation for the information content of wording. It cannot capture the art of reading between the lines of central bankers' statements. In this sense our results for the informative contents of wording must be regarded to be of a conservative nature.

Although our analysis hints to the usefulness of rhetoric signals it also indicates its limitation. Market participants benefiting from a correct prediction of monetary decisions are well advised to employ also more rigorous models for their forecasts in addition to listening to ECB press conferences. Our findings largely indicate that judgements based solely on analysing central bankers' speeches are inferior to more refined approaches based on models and economic data.

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Appendix

Estimations using the output gap

	(1)	(2)	(3)	(4)
Adjusted sample	1999:3 – 2005:3		2001:1 – 2005:3	
i_{t-1}	-0.36*	-0.37*	-1.27**	-1.68***
	(-1.66)	(-1.66)	(-2.46)	(-2.81)
π_{t-1}	-0.96**	-0.82*		
	(-2.32)	(1.89)		
y_{t-1}	0.79***	0.64***	0.91**	0.93**
	(3.53)	(2.64)	(2.29)	(3.31)
$WI_{D,t-1}$		0.91**		
		(1.98)		
$WI_{9900,t-1}$				0.78*
				(1.79)
μ_1	-4.62***	-4.51***	-5.46***	-7.79***
	(-3.86)	(-3.52)	(-2.88)	(-3.20)
μ_2	-1.38	-0.98		
	(-1.42)	(-0.95)		
Log likelihood	-38.71	-39.55	-14.06	-12.13
Restr. log likelyhood	-47.67		-20.40	
Pseudo R^2	0.1880	0.2333	0.3106	0.4053

Significance at the 1 (***), 5 (**), 10 (*) per cent level

Figure A: Policy rate and probabilities of policy rate changes for model (1).

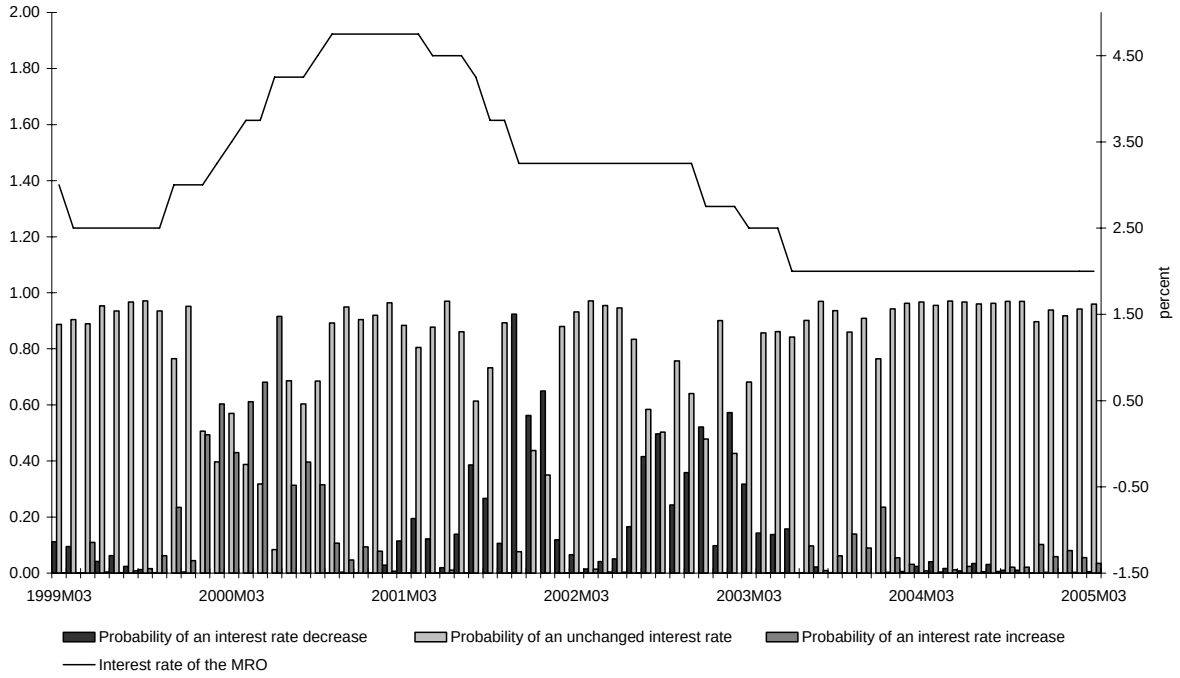

Figure B: Policy rate and probabilities of policy rate changes for model (3).