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Is ECB Communication Effective?

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Abstract

In its Monthly Bulletin of November 2002, the European Central Bank (ECB) stated that the monthly press conference held by its President represents one of its most important communication channels and that it provides a comprehensive summary of the policy relevant assessment of economic developments. After providing a glossary to translate the qualitative information of the press conferences into an ordered scale, we verify empirically whether and to what extent market expectations react to the information released by the ECB. We found that the public not only understand but also believe the signals sent by the European monetary authority.

Keywords: communication, credibility, ECB, glossary, Repo, Euribor, news approach
JEL classification: E50, E52, E58

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"To me, that is the hallmark of credibility: matching deeds to words. (...) Credibility means that your pronouncements are believed – even though you are bound by no rule and may even have a short-run incentive to renege. In the real world, such credibility is not normally created by incentive compatible compensation schemes nor by rigid precommitment. Rather, it is painstakingly built up by a history of matching deeds to words. A central bank that consistently does what it says will acquire credibility by this definition almost regardless of the institutional structure."
Alan Blinder, Central Bank in Theory and Practice (1998, page 64)

1   Introduction

Stein (1989, page 32) observes "Casual empiricism suggests that bond and exchange market traders pay careful attention to such pronouncements [of the central bank], even while bemoaning the uncertainties associated with trying to interpret them."

Is this casual empiricism also confirmed by the data? Do financial intermediaries understand the messages sent by the ECB about the future path of European monetary policy? Are these messages credible and, thus, believed and promptly incorporated in market expectations? These are some of the questions we try to answer with this paper.

Our starting point is that the efficacy of the monetary transmission mechanism, namely the link between the real economy and monetary policy, depends crucially on the ability of the monetary authority to impact the course of interest rates through financial market expectations. Greater transparency makes monetary policy more predictable as well as more effective in achieving its objectives.

This paper contributes to the literature in two central ways. First, from a methodological point of view, taking a different and relatively new approach, we analyse the semantic content of the news. And, second, we test the ECB's credibility and transparency, verifying empirically whether and to what extent market expectations react to the information released by the ECB.

Our main results can be summarized as follows. First, we provide a glossary to rank the information contained in the ECB President's monthly press conference into an ordered scale about the danger to European price stability and sustained economic growth. Second, we show that this ordinal variable explains the innovations (due to ECB's announcements) in market expectations about future monetary policy. Hence, even if the ECB is a relatively young multinational financial institution, it has already acquired a reputation for telling the truth. Put another way, our findings suggest that the market knows that ECB words are usually followed by facts (i.e., monetary policy moves consistent with what

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the ECB has previously announced). For instance, when the ECB's President states that "the overall prospects remain in line [or "are appropriate"] with price stability over the medium term", the Governing Council will not normally change the official rate at its next meeting, and financial intermediaries are fully aware of it.

1.1   Related literature

Empirical studies about the effect of news on market expectations are quite recent and concentrate their attention mainly on the determination of exchange rates. Nonetheless, the news approach has already been successfully used for the determination of stock and bond prices and futures on various financial instruments (Tivegna (2001), footnotes 21 and 22 provide some references).

The news variable usually consists of macroeconomic data releases (Kliesen and Schmid, 2004). Studies that analyse the news originating from central bank communications are somewhat less ubiquitous and, in a sense, may date back to the seminal paper of Romer and Romer (1989), where they examined the records of Federal Reserve policy deliberations (narrative approach) in order to identify exogenous (according to their claim) monetary policy shocks.

The most closely related paper to ours is Jensen and De Haan (2003), which focuses on the impact of news on the first moment (mean), rather than as usual on the second moment (volatility), of exchange rate determination[1]. Moreover, they consider explicit statements of ECB officials about both monetary policy and the euro during the first years of the European Monetary Union. Nonetheless, they try only partially to rank the statements of ECB officials into some ordinal scale representing the semantic strength of the content of the news.

Since one of the most important communication channels of the European Central Bank is the President's monthly press conference, this paper examines the content of these press releases explicitly. A glossary is constructed, and is used to transform (translate) the President's verbal expressions into a quantitative variable representing the likelihood of the next official interest rate move. We hypothesise

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[1] After this paper was independently written and presented at the LSE Money / Macro workshop in October 2004, we came across "Interest rate setting by the ECB: words and deeds" by Stefan Gerlach (CEPR Discussion Paper 4775, December 2004) which solves an empirical exercise similar to ours. However, some differences remain. First, we look at market reactions to ECB announcements rather than the consistency between ECB words and deeds. Second, our "risk to price stability" index is wider, spanning from -3 to +3 instead of from -2 to +2. Third, we look at the content of ECB President's press conference from January 2002 to December 2004, while Gerlach analyses the content of the Editorial of the ECB Monthly Bulletin from January 1999 to June 2004.

that this variable may explain the changes in market expectations between the moment before and after the ECB President's announcements of future monetary policy moves.

The outline of this paper is as follows. In the next section, we review the main theoretical results on the reasons why people should either pay attention or dismiss central bank communications. In section 3, we construct a glossary that translates the qualitative information of the ECB President's speeches during press conferences into an ordered scale. Section 4 presents our econometric approach and discusses the main empirical results. Finally, section 5 suggests important issues left for future study and concludes.

2   A theoretical background

In this section, we review the main theoretical results on the reasons why people should either pay attention or dismiss central bank's announcements.

In its Monthly Bulletin of November 2002, the ECB presented its own opinion on both transparency and effective communication. In particular (page 62), "a correct interpretation by the market of the monetary policy decisions taken by the central bank reduces the volatility of interest rates", and hence "a good understanding of monetary policy allows private agents to better manage and hedge their risks, which may contribute to reducing market uncertainty and enhancing economic welfare".

For these reasons transparency itself is an important component of the monetary policy framework, since it helps the public to anticipate central bank moves correctly, and therefore to reduce uncertainty and volatility in financial markets. Nonetheless, the ECB has sometimes been criticized for its unwillingness to make precise statements about its policy targets. For instance, the ECB's President might say that there is a strong risk to price stability, hence communicating to the market that he believes that the interest rate should increase further, but, at the same time, he may not specify exactly what he considers to be the "ideal" level.

Goodfriend (1986) dubbed this phenomenon "monetary mystique": the tendency of central banks (thus, not only the ECB) to be less than wholly and precisely revealing about their policy objectives.

From a positive standpoint, if economic agents form expectations rationally, then they should use all available information, including the central bank's information. Is this still true despite the degree of precision of the announcement? More generally, are rational expectations both a necessary and sufficient condition in order for the public to pay attention to central bank communication?

First Stein (1989) and later Garfinkel and Oh (1995) show through a monetary policy cheap-talk game that, in equilibrium, in order to be credible, a central bank can make only imprecise and fuzzy announcements about its future monetary policy. That is, the monetary authority can transmit to the public some of its private information only when it announces a range (rather than the precise point value) in which its future action will lie. In fact, in a partition equilibrium, if the central bank wants to lie, it has to declare a different subinterval with respect to the truthful one. Therefore, expectations will not be a continuous function of the central bank's declaration, and in practice telling small lies is equivalent to telling big ones. However, when the misalignment of preferences between the central bank and the public is not too large, in equilibrium, such big lies will be less attractive than telling the truth. Finally, note that the number of equilibrium partitions depends crucially on the congruence of preferences between the sender and the receiver.

Morris and Shin (2002) and Amato et al. (2002) show that when agents have access to some private information, social welfare is not always an increasing function of public information disclosures. In other words, if the central bank objective function consists of maximizing social welfare, then imprecise announcements are sometimes optimal. In the spirit of Lucas's "island economy" model, agents aim to take actions appropriate both to the underlying state (matching fundamentals motive) and to the action of other individuals (coordination motive). Over precise public information is detrimental because it induces the private agents to place too much weight on the public signal with respect to weights that would be used by the social planner.

Both Stein (1989) and Morris and Shin (2002) predict that in equilibrium the central bank's announcements are fuzzy. However, their reasons are different: in cheap-talk models perfect and fully precise communication would enhance welfare but it is not feasible, while in the second case it is not only feasible, but also optimal.

We are now in a position to state our main empirical prediction.

P0: *If the central bank has both more information than private agents and no incentive to fool them, then the public should rely on central bank announcements in forming expectations.*

Using a sort of a contrapositive argument, we can also claim the following.

P1: *If the public do not listen to central bank announcements (babbling equilibrium), then either the information set of the central bank is a subset of the information set of the private sector or the monetary authority suffers a severe time-inconsistency problem.*

P0 and P1 represent respectively our H_0 and H_1.

Note that several papers have recently provided indications that central banks produce better forecasts of the economic outlook than private sector forecasters (see, for example, Romer and Romer (2000), Joutz and Stekler (2000) and Peek et al. (1999)). Therefore, the rejection of P1 implies that the central bank is not systematically trying to cheat the public, by attempting to boost output through a time-inconsistent monetary policy.

3   A glossary to interpret the ECB President's press conferences

In its Monthly Bulletin of November 2002 (page 64), the ECB said that "The monthly press conferences held by the President and the Vice-President and the Monthly Bulletin are two of the most important communication channels adopted by the ECB. The President's introductory statement at the press conference provides a comprehensive summary of the policy-relevant assessment of economic developments. It is structured along the lines of the ECB's monetary policy strategy and agreed by the Governing Council. The monthly press conference includes a question and answer session, which is attended by various media representatives from across the euro area and beyond and provides a platform for the explanation of monetary policy decisions to the public. Transcripts are made available on the ECB's website only a few hours later. The press conference is thus an effective means of presenting and explaining discussion in the Governing Council and therefore the monetary policy decision-making process."[2]

The importance of the monthly press conferences is well known by financial operators. In the morning of its meeting days, the Governing Council decides whether or not to modify its key interest rates (till now, always between 25 and 50 basis points). In his introductory statement of the afternoon, the President explains the reasons for such a decision, and, much more important for the public, about the ECB's official opinion on the degree of danger to price stability and growth, and, therefore, of the

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[2] Note that usually both the Editorial of the Monthly Bulletin and the introductory statement report the same information concerning the ECB monetary policy stance. However, the Editorial is made available to the public after a time lag compared to the introductory statement.

possibility the Repo (which is the key ECB interest rate: the minimum bid rate on the main refinancing operations) might change in the near future.

In order to verify whether the market understands the ECB's messages contained in the President's press conferences and how it reacts to them, we have tried to build a rule associating the words used in the speeches to an ordered scale of numbers. These numbers should represent the intensity of the risk to price stability (or to growth) at the time of the meetings which the ECB wants to communicate to the market. This is important because the higher those risks are, the higher is the probability of some future monetary policy intervention (in other words, a change in the Repo). The reason for this is obvious: the higher the risk is already, the higher the probability that in the course of time the risk will reach the level that "triggers" a monetary policy intervention.

After constructing this qualitative variable, we compare this scale of risk with market expectations about future levels of the Repo: the purpose is to check if the two variables are mutually consistent. Of course, this comparison might turn out to be meaningless if either our measure of "risk" is very different from that perceived by the public, or if our measure of Repo expectations differs from those of the market.

The structure of the introductory statements is always the same. An example of how an introductory statement is organized is given in Table 1. After some greetings, there is a brief assessment of the risk to price stability (shown in italics). An assessment giving information on growth, inflation, and monetary variables follows[3]. At the end of the economic and financial analysis, the brief assessments are repeated (again in italics in Table 1).

In his press conferences, the President[4] employs a very standardized form of language, and its main conclusions consist of a very limited number of key words or strings (in bold type in Table 1). Note that since the key words are not precise quantitative data, arranging them according to the level of the corresponding inflation or deflation risk cannot but be influenced by our personal judgements.

The European Central Bank has two targets: the first is price stability and the second is economic growth. The brief assessments in the President's speech typically convey information only on the risk (either upward or downward) for the primary target. The ECB's opinion on risks to economic growth is usually found in its comment on real economic variables (See in Table 1 the words "broadly balanced" in bold type), but, up to now, they have been important only in the case of extreme downward economic danger, indicated by strings such as "continue to monitor downside risks" or "there remain

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[3] On some occasions, either the former or the latter synthetic judgement is missing.
[4] There is no difference between the tone of Duisenberg's and Trichet's speeches: the President, in fact, simply reads a communiqué prepared by the whole Governing Council.

downside risks to the outlook for economic activity". In all other cases, it matters only the risk to price stability. In fact, note that a low level of growth usually accompanies a low level of inflation. In this case, the achievement of the ECB's primary target (inflation of somewhat less than 2% in the medium term) is fully compatible with its second objective.

In order to make the ECB's statements suitable for statistical computation, we ranked them according to the degree of risk to price stability assessed and communicated by the ECB. Table 2, which represents our mapping between words and numbers (hence, an ordered scale), is constructed using the following criteria:

- all expressions (either words or strings) have been ordered along with their everyday meaning. Thus, synonyms have been put together;

- our glossary consists of just seven words. All expressions are classified in an integer scale going from +3 (the highest upward danger to price stability) to -3 (the highest deflationary danger). Clearly, 0 corresponds to a situation in which there is neither inflationary nor deflationary danger according to the ECB's announcement.

- usually only the words and strings of the two brief assessments are considered. The ECB's specific assessment of the real sector is considered only when the downside risk is particularly high and is not already explicitly mentioned in the brief assessments. In Appendix 1, situations of extreme downward economic danger are highlighted in grey.

We performed a robustness check on our translation of the ECB's words (See Table 3, where the rows show our ordinal measure of the content of ECB statements, while the columns show the months passing between a given press conference and the nearest monetary policy intervention). Our translation seems quite coherent with the ECB's monetary policy actions. Moreover, Figure 1 shows that there is a strong link between our index and actual interest rate policy. A change in the Repo is usually preceded by a value of our index of at least 2 (in absolute value).

The complete chronological list of the ECB's statements and our correspondent measure of the degree of risk (January 2002 — December 2004) is given in Appendix 1. This list was mainly constructed by employing Table 2 as a glossary to translate the qualitative information of the press conferences into an ordered scale. When more than one word or string from Table 2 was employed in a press conference, the index of the degree of risk corresponds to the mean of the indices of each single expression used by the ECB. Since some statements seemed to us somewhat ambiguous, in order to better understand the ECB's messages, we took into account other parts of the speeches and constructed a sort of confidence (qualitative) interval (shown in the last 2 columns of Appendix 1).

The main reasons why we restrict our econometric analysis to this period, rather than the full operational life of the ECB (January 1999 - December 2004), are as follows. First, the period January 2002 - December 2004 is homogeneous. In fact, on the one hand, in these three years the press conference took place after each Governing Council meeting in which a decision on the Repo was taken (i.e., the first meeting of every month). On the other, in November 2001, the Governing Council decided that the Repo could be changed only at the first meeting of every month. Second, we posit that the first three years (1999-2001), a full interest rate cycle, were necessary for the public to understand and correctly interpret the ECB language (learning period). Third, we avoid exceptional events such as the millennium effect and the 11th September 2001 terrorist attack. Unfortunately, we consider an asymmetric period, in the sense that it features only interest rate cuts. However, note that our vocabulary (Table 2) has been constructed using the whole 6-year period, that features both interest rate cuts (eight times) and raises (seven times).

4   Market expectations on future Repo.

The main source for a measure of market expectations about future ECB monetary policy moves is the term structure of short-run interest rates (Gurkaynak et al., 2002), in particular the Euribor, the interbank market interest rates[5].

The course of events is as follows (See also Figure 2). At the onset of day t (at 11 a.m.), the market forms expectations about the future level of the Repo interest rate. During the day, there is the ECB Government Council meeting and at around 1:45, through an ECB press release, the new level of the Repo, in force for the following month, becomes public information. Finally, at 2:30 p.m., the ECB President's press conference takes place. Next morning (again at 11 a.m.), the market forms new expectations about the future level of the Repo, taking into account, among other things, the contents of the press conference. This stage game is repeated every month. Note that although the market updates its expectations every day (it would be better to say continuously), we are interested in investigating only the innovations in expectations caused by the ECB President's press conference.

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[5] Euribor data are published daily and refer to the 11 a.m. (CET) quotations. In particular, note that intraday (tick-by-tick) data are not available. The maturities quoted in this market are: Eonia (overnight), one, two and three weeks and from one to twelve months. For further details, see http://www.euribor.org/html/content/euribor_tech.html (lastly accessed 15-02-2005). Daily data on Euribor interest rates are downloadable from the Treasury Management website, http://www.tmpages.com/tmp55.htm (lastly accessed 15-02-2005), and, specifically, on the page of "EurIBOR: Comprehensive history from National Bank of Belgium and TMP: EONIA and EurIBOR (all terms)". The data set we have constructed is available from the authors upon request.

Our null hypothesis (cf. P0 in section 2) is that from day t to day t+1 the market takes into account the contents of the new ECB President's press conference in order to set its expectations about the future path of the ECB's monetary policy.

Our maintained hypotheses are that the market forms expectations rationally, using all available information, and that the only new information that systematically reaches the market, between the day of the Governing Council meeting and the day after, about future Repo changes are (1) the new Repo level and (2) the content of the President's press conference.

At the base of much empirical research there is the equivalence between the so-called implicit interest rates (F) and expectations of future market rates (i.e., expectation hypothesis):

$$F_{M,t} \equiv (M + 1)r_{M+1,t} - M\, r_{M,t} = E_t[r_{t+M}] + K_{M,t} \tag{1}$$

where $F_{M,t}$ is the value at time t of the one-month implicit interest rate referred to time $t + M$ months, $r_{M,t}$ is the one-month Euribor interest rate of M-month maturity and $K_{M,t}$ is a variable related to market liquidity, risk premium, etc. at time t referred to time $t + M$ months.

Borrowing from the central bank is an alternative to borrowing from other financial institutions in the interbank market. Hence, the two interest rates (Euribor and Repo) should be strongly correlated. Therefore, when considering a one-month maturity Euribor, it must be[6]:

$$r_{1,t} = (Repo_t + E_t[Repo_{t+1}] + ... + E_t[Repo_{t+h}] + ... + E_t[Repo_{t+29}]) /30 + L_t \tag{2}$$

where the time $t+h$ is measured in days, $Repo_t$ stands for Repo at time t, and L_t measures the spread between the Euribor market interest rates and the Repo. As is known, the mean value of L_t is greater than zero and its magnitude depends on both the effect of the banking sector liquidity conditions and the implicit (transactional) costs of the main refinancing operations.

If we denote by t the day of the monthly Governing Council meetings and t+1 the day after, we obtain the formula:

$$E_t[r_{t+M}] = (E_t[Repo_{t+M}] + 29E_t[Repo_{t+M+1}])/30 + E_t[L_{t+M}] \cong E_t[Repo_{t+M+1}] + E_t[L_{t+M}] \tag{3}$$

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[6] For simplicity, we assume that every month has thirty days and the Government Council always meets on the same day of the month.

$$E_{t+1}[r_{t+M+1}] \cong E_{t+1}[Repo_{t+M+1}] + E_{t+1}[L_{t+M+1}] \tag{4}$$

where M is measured in months.

By substituting eq. (1) into eq. (3) and (4), the expected (respectively, conditional on time t and t+1 information set) Repo level in force at time t+M+1 can be obtained by implicit Euribor interest rates $F_{M,t}$:

$$E_t[Repo_{t+M+1}] \cong F_{M,t} - K_{M,t} - E_t[L_{t+M}] \tag{5}$$

$$E_{t+1}[Repo_{t+M+1}] \cong F_{M,t+1} - K_{M,t+1} - E_{t+1}[L_{t+M+1}] \tag{6}$$

We now consider how the ECB press conference can influence market expectations. Suppose that, at time t, the morning of the day of the Governing Council meeting, market expectations $E_t[.]$ are derived on the basis of information set Ω_t, given by the union of the values known at t of a scalar, X_t (assumed to be a sufficient statistics for information on variables such as core inflation, HICP, economic sentiment indicator, exchange and interest rates, etc.), $Index_t$ (the previous month press conference), and $Repo_t$.

By supposing for simplicity a linear relation among explanatory variables, $E_t[.]$ can be written as:

$$E_t[.] = h_t X_t + k_t Index_t + k'_t Repo_t \tag{7}$$

At time t+1, the expectation conditional on the new information released on the afternoon of day t about both *Repo* and *Index* becomes[7]:

$$E_{t+1}[.] = h_{t+1}X_{t+1} + k_{t+1}Index_{t+1} + k'_{t+1}Repo_{t+1} \tag{8}$$

Given that from t-29 to t, a great deal of information about X hits the market, now we guess (and later empirically verify) that on the one side the importance of both $Index_t$ and $Repo_t$ for $E_t[.]$ is smaller

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[7] Note that $X_{t+1} = X_t$ by our maintained hypothesis. Moreover, note that $Index_{t+1}$ refers to the new press conference, while $Index_t$ refers to the conference that took place the previous month. Hence, $Index_t = Index_{t-29}$. The same applies for Repo: $Repo_t = Repo_{t-29}$. There is clearly a frequency issue (Ehrmann and Fratzscher, 2004) because data on Euribor are continuous (real-time), while ECB's news is released monthly.

than the one of $Index_{t+1}$ and $Repo_{t+1}$ for $E_{t+1}[.]$, while on the other the opposite happens for the importance of X_t. Hence, more formally,

$$k_t = \varphi\, k_{t+1},\ k'_t = \varphi'\, k'_{t+1}\ \ (where\ both\ \varphi\ and\ \varphi' \in [0,1])\ \ and\ \ h_t = \psi h_{t+1}\ (where\ \psi \geq 1) \qquad (9)$$

By substituting (9) in (7), and subtracting (7) divided by ψ from (8), we obtain:

$$E_{t+1}[.] - E_t[.] = (1/\psi - 1)\, E_t[.] + (1 - \varphi/\psi)\, k_{t+1}\, Index_t + k_{t+1}\Delta Index_{t+1} + (1 - \varphi'/\psi)k'_{t+1}Repo_t + k'_{t+1}\Delta Repo_{t+1} \qquad (10)$$

In the present case (see (5)), the expected value $E_t[.]$ of (10) relevant for our analysis is the expected Repo level, $E_t[Repo_{t+1+M}]$. After substituting (5) and (6) in (10), and rearranging terms, we have:

$$(F_{M,t+1} - F_{M,t}) = \beta_0 + \beta_1 F_{M,t} + \beta_{21}Index_t + \beta_{20}\Delta Index_{t+1} + \beta_{31}Repo_{t} + \beta_{30}\Delta Repo_{t+1} \qquad (11)$$

where $\beta_0 \geq 0^8$, $\beta_1 = (1/\psi - 1) \leq 0$, $0 \leq \beta_{21} = (1 - \varphi/\psi)k_{t+1} \leq \beta_{20} = k_{t+1}$, and $\beta_{31} = k'_{t+1}(1 - \varphi'/\psi) \geq 0$. Note that the left-hand side, $F_{M,t+1} - F_{M,t}$, approximates the changes in expectations for the M-month-ahead one-month forward rate contract (i.e., the change in expectations about the Repo level within M months).

We first estimated equation 11 (regression results not reported to preserve space): all coefficients are always of the expected sign, and β_1 turned out to be close (in absolute value) both to β_{31} and β_{30}. Moreover, the regression coefficients of $Index_t$ and $\Delta Index_{t+1}$ appeared to be not significantly different from each other. The Wald test (see Table 4) never rejects the joint null hypothesis $\beta_1 = -\beta_{31} = -\beta_{30}$, and $\beta_{21} = \beta_{20}$. Hence, in order to simplify the interpretation of our econometric results, in Table 5 we estimated the coefficients of the restricted regression, that is[9]:

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[8] Note that $-(K_{M,t} - K_{M,t+1}) + (E_t[L_{t+M}] - E_{t+1}[L_{t+M+1}]) \cong 0$, apart from a stochastic component. More precisely, we assume that the change in the risk-premium in this narrow window of time is small in comparison to the monetary policy surprise and the words used by the ECB's President. This assumption is at least loosely consistent with the findings by Evans and Marshall (1998) that risk premia in US Treasuries are not affected much by monetary policy shocks which tend to occur at FOCM meetings.

[9] Clearly, there is a problem of measurement error in the explanatory variables, especially in our $Index$. However, using IV estimator rather than least squares does not change substantially our results.

$$(F_{M,t+1} - F_{M,t}) = \beta_0 + \beta_1 \, (F_{M,t} - Repo_{t+1}) + \beta_2 \, Index_{t+1} \tag{12}$$

The equations (that is, the columns of Table 5) refer to the cases M from 1 to 5 months. Obviously for larger M, it is likely that the role of uncertainty about the future overweighs central bank communication (after all central banks are not omniscient!). As for our index for inflationary risk (Index), its mean value, (Riskmax+Riskmin)/2 of Appendix 1, is employed[10]. Our estimator is least squares with White covariance matrix (White, 1980).

Our first conclusion is that the ECB can influence to some extent the money market interest rates using just words, rather than deeds such as a change in the Repo. Therefore it appears that the European Central bank communication is quite effective. For example, consider the three-month-ahead one-month forward rate (namely, $F_{3,t}$). When the ECB President declares: "It is imperative to contain upward pressure to price stability", then $F_{3,t}$ on average jumps up of about 7 basis points (bp). Instead, when the ECB President declares: "Our monetary policy stance is consistent with price stability in the medium term, but we are carefully monitoring all downside risks to economic growth", then $F_{3,t}$ suddenly decreases more or less of 5 bp[11].

Second, Table 5 shows that the higher M, the higher the coefficient of $Index_{t+1}$, and the lower (in absolute value) the coefficient of $(F_{M,t} - Repo_{t+1})$. The intuition is straightforward: given an upward or downward inflation risk, a change in the Repo interest rate is more likely the longer is the time horizon considered. Furthermore, note that in general the constant too is higher, the higher M is. This fact can be explained, inter alia, by a liquidity premium positively correlated to the maturity of the Euribor contract.

Third, Table 5 suggests also that when M = 1 the coefficient of the variable $Index_{t+1}$ is both small and significantly different from zero only at 10% level. However, if we consider (regression results not reported) as a dependent variable $(F_{M,t+1} - F_{M,t-1})$, that is changes in market expectations from t+1 to t-1 (the day before the meeting), the coefficient of $Index_{t+1}$ increases (actually it doubles) and becomes significantly different from zero at 1% level (more precisely, at 0.001). Such result suggests that on the morning of the day of the meeting, there is some clues about the Governing Council's opinions that

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[10] By using the variable Risk of Appendix 1, R^2s are just slightly lower.

[11] To understand the order of magnitude, note that when $F_{3,t} = Repo_t$ (i.e., the level of market expectations at time t of the Repo rate in force within 3 months is the same as $Repo_t$), a Repo increase of 25 bp causes an innovation in expectations of about 4 bp. Hence, the consequences of ECB's words and deeds on market expectations about future monetary policy are of the same order of magnitude.

make expectations partially move in the right direction. In other words, in t the public already enjoys a great deal of information on the immediate future, and, thus, the content of the press conference adds little to its forecasting ability in the shortest term.

Fourth, in order to compare our methodology with that of Jensen and De Haan (2003), we added a new regressor, *sign* $(Index_{t+1})$[12], to the right-hand-side of (12). Table 6 summarizes the regression results. Apart for the case of M =1, our semantic news variable, $Index_{t+1}$, remains both significantly different from zero and with the right sign, while the direction of the news, *sign* $(Index_{t+1})$, is not only insignificant, but also with the wrong sign.

Finally, note that we have to treat our empirical results with the appropriate degree of caution because our sample is short: in fact, there are overall 33 observations available (since in August there is no press conference).

5   Conclusion

Blinder et al. (2001, page 9) first ask: "Does [central bank] communication really matter?" And then answer: "To date there is no research to report on, so we can only call upon casual experience to back our claim that it does, and quite a lot". This paper tries to econometrically support their claim. In particular, it represents a first attempt to measure the credibility and the reputation for reliability of a central bank (the ECB) in the market place. The main results of the empirical analysis are that the verbatim content of the ECB President's monthly press conferences seems to be sufficiently transparent, in the sense that it is possible to rank its expressions into an ordered scale of danger to either price stability or economics growth. The variable representing this scale is significant in explaining the change in the short-term market expectations on the money markets before and after the President's speeches.

The hypothesis that the ECB does not suffer a severe time-inconsistency problem (cf. P0 and P1 in section 2) cannot be rejected. Moreover, the ECB seems fairly effective in its job of communication to the public, and is thus able to influence market expectations on the short-term interest rate path using just words. On one hand, adding a statement in the same direction can reinforce the effects of a policy action (Kohn and Sack, 2003). On the other hand, the whole term structure of money market interest

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[12] The function sign (x) takes respectively value 1 when x > 0, 0 when x = 0 and -1 otherwise.

rates can be influenced by the central bank just by the words contained in its main communication tool, the President's press conference given in the afternoon on the days of the Governing Council meetings.

Of course some important issues are not considered in this paper and deserve to be further analyzed.

Interpretation of verbal documents cannot but be imprecise and subjective, in spite of all our efforts, and these ambiguities will never be fully cancelled out. The solution suggested in this paper about turning verbal expressions into an ordinal variable is just one possibility. Others may include software based on the relative frequency of words.

The econometric methods used in this paper are not the most satisfactory. The content of the ECB President's speeches, as of any other qualitative document, is of a fuzzy nature and hence fuzzy methods of estimations should be employed. Moreover, the only relevant information contained in our $Index_t$ is the kind of words used by the ECB's President. Therefore, using a dummy variable to indicate the presence / absence of a given word, rather than a scale, seems more appropriate to address the ordinality (instead of cardinality) nature of the problem. Unfortunately, our limited sample size prevented us from obtaining significant results[13].

If our qualitative scale is a good representation of the ECB's opinion about the risk to price stability, it should be possible to use it in analysing how the European Central Bank reacts to the main economic variables. In other words, by adding to our scale two more values, corresponding to the days the official interest rate is changed (maximum danger to price stability), a new sort of reactions function (or better opinion function) could be estimated. Optimal interaction between statements and actions is important for monetary policy, but too little is known about them and their relative impact on different variables (e.g. interest rates vs. exchange rates).

Finally, in this paper we found that the President's press conferences exert a significant effect on market expectations. But is the information content of such conferences entirely incorporated into market expectations? Has the market fully learnt how to interpret ECB statements or is it still learning? How does it react to a change in ECB communication channels? In fact, as the European Central Bank says, and as by now is well known in the literature, optimal communication is only a relative concept, depending on the receivers' characteristics too (Winkler, 2000). The qualitative President's press conference is not the only channel the ECB employs; there is also quantitative news, such as the

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[13] We constructed the following dummies: *Index* ≤ -2 (5 observations), -2 < *Index* < 0 (4 obs.), *Index* = 0 (14 obs.) and 0 < *Index* < 2 (9 obs.). Even if the *β*s are not always significantly different from zero, they have the right sign (negative for the first two and positive for the last one) and magnitude (the first *β* is larger in absolute value than the second one).

macroeconomic projections, that the ECB releases every three months. What is the impact of these different channels? How does their impact change when receivers change?

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Table 1. – An example of the ECB President's introductory statement

Introductory statement to the press conference
Jean-Claude Trichet, President of the ECB,
Lucas Papademos, Vice President of the ECB,
2 September 2004
With the transcript of the questions and answers

Ladies and gentlemen, (…)

We noted that the information which has become available in recent months indicates that the economic recovery in the euro area has maintained its momentum and should remain firm in the coming quarters. We have also witnessed somewhat higher inflation rates, mainly due to developments in oil prices. *At present, our judgment is that although **some upside risks** to price stability* exist, *the overall prospects remain **in line** with price stability over the medium term*. Accordingly, we have retained our monetary policy stance and left the key ECB interest rates unchanged. The level of interest rates is very low by historical standards, both in nominal and in real terms, lending support to economic activity. We will remain vigilant with regard to all developments which could imply risks to price stability over the medium term.

I shall now explain our assessment in more detail, turning first to the economic analysis.

The latest data releases confirm that the economic recovery in the euro area is continuing. (…)

Overall, the risks to these projections [= economic growth] seem to be **broadly balanced** (…)

However, recent oil price developments have had a visible direct impact on price developments (…)

Turning to the monetary analysis, the annual rate of M3 growth has moderated significantly (…)

The low level of interest rates (…)

*To sum up, while the economic analysis indicates that prospects are **consistent** with price stability being maintained over the medium term, a **number of upside risks need to be carefully monitored**.* Cross-checking with the monetary analysis also supports the case for strong vigilance with regard to the materialisation of risks to price stability.

(…)

NOTE: italic and bold types are ours.

Table 2. – *Expressions used in ECB's official statements and our measure*
of the degree of risk to price stability

| ECB's main statements: the most important keywords	degree of risk
Imperative that upward pressure to be contained – Essential short-term movements of inflation do not become protracted and translate into second round effects – [We assure that] price stability in the euro area will be maintained – [We assure that ECB will] take appropriate action if and when required – Risks [to price stability] are upward (upside) – The risks to price stability are confirmed - Vigilant (vigilance) – Alert – Assessed continuously. – Close monitored. – Continuous close attention	+3
Both confident and vigilant - Good however vigilant - Downward risks have receded further. -	+2
The downside risks have disappeared – Somewhat less favourable – Upward pressure remain contained – rather balanced – Mixed signals – Uncertainty – [Price perspectives are] less satisfactory but further evidence is needed	+1
Appropriate – Favourable – Compatible – Consistent – In line – Balanced – No strong pressures either upward or downward – Absence of significant pressures either upwards or downwards	0
Upward risks to price stability have diminished [even if not fully disappeared] – Improvement [in inflation risks] – Inflationary pressures have further diminished (or: are lower) – Favourable, but there are some [downside] risks – Appropriate but remain downside risks – Balanced but monitor closely all [downside] factors	-1
Consistent, but carefully monitor all [downside] risks to economic growth – Monitor carefully all [downside] factors relevant to economic growth – Downside risks are still relevant – Economic slowdown is still cause for concern – Downside risks are not vanished	-2
[Strong] downside risks for economic activity – Monitor closely the downside risks to economic growth.	-3

NOTE: January 1999 – December 2004.

Table 3. – *Robustness check of our translation*

Index range	decrease at t +			no change within 3m	increase at t +		
	1m	2m	3m		3 m	2 m	1 m
(2,3]	0	0	0	0	0	0	0
(1,2]	0	0	0	0	0	0	0
(0,1]	0	0	0	6	0	0	0
{0}	0	0	0	12	0	0	0
[-1,0]	0	2	0	2	0	0	0
[-2,-1]	0	0	2	1	0	0	0
[-3,-2]	3	1	1	0	0	0	0

NOTE: January 2002 – December 2004; m stands for month.

Figure 1. – *Our index of the risk for price stability (index) and the Repo changes*
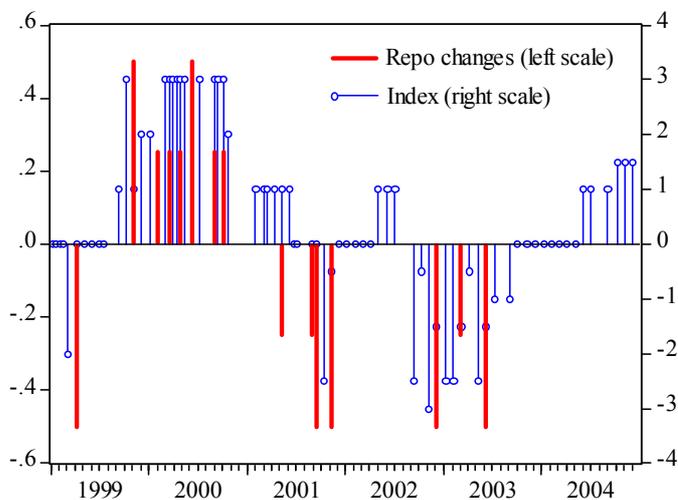
NOTE: January 1999 – December 2004.

Figure 2. – *Timing*

NOTE: ■ Press conference

Table 4. - *Wald test of the joint hypothesis $\beta_{21} = \beta_{20}$, $\beta_{31} = 0$ in eq.* 11

Wald	M				
Test	1	2	3	4	5
F-statistic	0.333	0.367	0.608	0.238	0.118
Chi-square	0.313	0.348	0.602	0.213	0.093

NOTE: January 2002 - December 2004. Least squares with White covariance matrix, p-value is reported.

Table 5. - *Changes in the expectations about the level of the Repo after M month.*

Dependent variable: $(F_{M,t+1} - F_{M,t})$	M				
	1	2	3	4	5
Const.	0.025	0.034	0.039	0.039	0.037
	(4.227)	(3.858)	(4.123)	(3.799)	(3.472)
$(F_{M,t} - Repo_t - \Delta Repo_{t+1})$	-0.194	-0.214	-0.157	-0.143	-0.129
	(-4.017)	(-3.986)	(-3.667)	(-3.139)	(-3.174)
$Index_{t+1}$	0.005	0.017	0.024	0.026	0.030
	(1.781)	(3.810)	(3.397)	(3.566)	(3.194)
R-squared	0.486	0.529	0.305	0.306	0.249
Adjusted R-squared	0.452	0.497	0.258	0.260	0.199

NOTE: January 2002 - December 2004. Least squares with White covariance matrix, Student's t in brackets.

Table 6. - *Importance of the semantic news variable.*

Dependent variable: $(F_{M,t+1} - F_{M,t})$	M				
	1	2	3	4	5
Const.	0.025	0.034	0.039	0.038	0.036
	(4.434)	(3.778)	(3.973)	(3.746)	(3.421)
$(F_{M,t} - Repo_t - \Delta Repo_{t+1})$	-0.195	-0.213	-0.146	-0.136	-0.120
	(-4.172)	(-3.979)	(-3.172)	(-2.841)	(-2.974)
$Index_{t+1}$	-0.001	0.019	0.033	0.032	0.038
	(-0.113)	(2.176)	(2.034)	(2.095)	(2.224)
$Sign\ (Index_{t+1})$	0.010	-0.004	-0.016	-0.011	-0.016
	(1.241)	(-0.305)	(-0.733)	(-0.481)	(-0.625)
R-squared	0.510	0.530	0.319	0.312	0.257
Adjusted R-squared	0.459	0.481	0.248	0.241	0.180

NOTE: January 2002 - December 2004. Least squares with White covariance matrix, Student's t in brackets.

Appendix 1

Meeting	Δ Repo	Risk for price stability (main synthetic judgment)	Economic growth (Analysis of real sector variables)	Risk	Risk (min)	Risk (max)
3-01-2002		**Appropriate**	**confirmed economic activity was weak** in the second half of 2001 and probably so in early 2002; however, **signs point to a gradual recovery** in this year. Continued close monitoring of further incoming information is thus warranted	0	-1	0
7-02-2002		**Appropriate**	**resumption** of economic growth	0	0	0
7-03-2002		**appropriate**	economic growth to levels **in line with potential**	0	0	0
4-04-2002		**appropriate**	**Positive outlook** for the euro area economy	0	0	0
2-05-2002		**somewhat less favourable; specific temporary factors**	**uncertainties** surrounding the strength of the current upswing	1	1	1
6-06-2002		**less satisfactory**; further evidence is needed	the assessment of the short-term dynamics of real activity is still surrounded by **uncertainty**	1	1	1
4-07-2002		risks remain **tilted to the upside; mixed signals**	**uncertainty** surrounding the strength of the economic upturn has not diminished	1	1	2
12-09-2002		**appropriate; balanced**	**[downward] risks to the economic outlook need to be monitored closely**	-3	-3	-2
10-10-2002		**balanced**	**difficult precise assessment** of the timing and strength of the economic upswing	0	-1	0
7-11-2002		Governing Council has discussed extensively the **arguments for and against a cut; monitor closely the downside risks** to economic growth	real GDP continued **to grow only moderately**; however, **for the time being**, economic growth is expected to return to rates close to potential in the course of 2003; very difficult to predict the timing and strength of the economic upswing	-3	-3	-3
5-12-2002	-0.50	**inflationary pressures are easing**; sluggish economic expansion; **downside risks to economic growth have not vanished**	**economic growth** will also remain **subdued** in the coming months	-2	-2	-1
9-01-2003		**appropriate**	**still downside risks** to the outlook for economic activity	-3	-3	-2
6-02-2003		**appropriate**	there **remain downside risks** to the [economic] outlook	-3	-3	-2
6-03-2003	-0.25	the outlook for price stability over the medium term has **improved**	a **very modest rate of economic growth** expected this year.	-1	-2	-1
3-04-2003		**remain in place // consistent**	Real GDP **growth** is expected to remain **below potential growth** for part of **next year; further** ahead, however, conditions exist for a **recovery**	0	-1	-1
8-05-2003		**consistent; important downside risks** to the economic recovery have **diminished** // risks to price stability over the medium term **remain limited**.	**there continue to be downside risks**	-3	-3	-2
5-06-2003	-0.50	**improved significantly // more favourable**	**economic growth in the first half of 2003 is likely to be very weak**	-1	-2	-1
10-07-2003		**appropriate // favourable**	**expect a gradual strengthening; nevertheless, downside risks are still relevant**	0	-2	0
4-09-2003		**appropriate; favourable // favourable**	**Downside risks have declined but not disappeared**	0	-2	0

Date	Keywords (price stability)	Keywords (growth)	min		max
2-10-2003	**favourable; appropriate // favourable**	The short-term risks of a gradual recovery appear to be broadly **balanced**	0	0	0
6-11-2003	**favourable**; appropriate // **favourable**	The [growth] short-term risks appear to be **balanced**	0	0	0
4-12-2003	**appropriate // in line**	The [growth] risks appear to be **balanced**	0	0	0
8-01-2004	**appropriate // in line**	The [growth] short-term risks remain **balanced**	0	0	0
5-02-2004	**appropriate // in line**	risks remain **balanced**	0	0	0
4-03-2004	**favourable**; appropriate // **in line**	**recovery** in the course of 2004 and 2005 remains valid; broadly **balanced**	0	0	0
1-04-2004	**in line // in line**	recovery to continue in 2004 and to **strengthen** over time	0	0	0
6-05-2004	**price stability** will be **maintained** over the medium term // **in line**	the conjunctural indicators available still provide **mixed evidence**	0	0	0
3-06-2004	**in line // in line**; however ... **some upside risks** need to be taken into account	**continuation of the recovery** remain in place; risks and uncertainties in both directions	1	1	1
1-07-2004	**in line // in line**; case for **continued vigilance** with regard to the materialisation of **upside risks to** price stability	**recovery** of economic activity will **continue**	1	1	1
2-09-2004	**in line // consistent**; **a number of upside risks** need to be carefully monitored.	**continuation of the recovery** remain in place	1	1	2
7-10-2004	**consistent** // 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**	the economic **recovery** in the euro area is **continuing**	1	1	2
4-11-2004	// underlying domestic inflationary pressures **are contained**, but a number of medium-term upside risks to price stability need to be **monitored closely**	the basic determinants of economic activity remain consistent with **continuing economic growth** in 2005.	1	1	2
2-12-2004	// underlying inflationary pressures are **still contained**, but a number of medium-term upside risks to price stability need to be **monitored closely**	The conditions remain in place for economic **growth to proceed**	1	1	2

NOTE: The main keywords of the President's Introductory Statement (03-01-2002 – 2-12-2004) and our measure of the degree of risk to price stability and growth (Risk = our measure of risk; min = our minimum value, max = our maximum value; after "//": final statement). Situations of extreme downward economic danger have been highlighted in grey.

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