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evidence from the ECB

by Maddalena Galardo and Cinzia Guerrieri

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THE EFFECTS OF CENTRAL BANK'S VERBAL GUIDANCE: EVIDENCE FROM THE ECB

by Maddalena Galardo* and Cinzia Guerrieri**

Abstract

In this paper we propose a new indicator of central bank's verbal guidance, which measures communications about the future based on the frequency of future verbs in monetary policy statements. We consider the press conferences of the European Central Bank as a test case. First, we analyze the main determinants of our index and estimate the unexpected component. Second, we investigate the effects of the identified change in verbal guidance on daily movements in forward money market rates between September 2007 and December 2015. Our results show that financial markets' expectations on future short-term interest rates react to a communication shock about the future: after controlling for the standard policy rate shock and the announcement of unconventional monetary policies, the effect turns out to be negative and larger for longer horizons. This suggests that verbal guidance has proven to be an effective policy instrument for signalling an accommodative monetary policy stance.

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1 Introduction¹

After the onset of the Global Financial Crisis, the role of central bank communication has evolved remarkably. The close proximity of the policy rate to the effective lower bound and the impairments to the conventional interest rate channel of the monetary policy transmission mechanism have risen the need of shaping financial markets' expectations on future short-term interest rates through a forward-looking communication strategy.² In other terms, the signalling channel has gained momentum: as stated by Woodford (2005) "for not only do expectations about policy matter, but, at least under current conditions, very little else matters."³

In this paper we propose a new indicator of central bank's verbal guidance, which quantifies the forward-looking statements according to the frequency of future verbs used in the monetary policy press releases. To the best of our knowledge, we are the first to adopt this approach for identifying central bank communication about future.⁴ We exploit the fact pointed out by Chen

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²Please refer to Bernanke and Reinhart (2004) and Blinder (2010) for a discussion of the unconventional monetary policies at the zero lower bound.

³In fact, the world's major central banks have recently introduced or reinforced their guidance on the policy inclination, in order to convince firmly the financial markets that the future monetary policy stance will remain accommodative.

⁴Karapandza (2016) propose a similar approach to study the relationship between the firms' information about the future conveyed in the annual report and the stock returns.

(2013) that the English language “requires future events to be grammatically marked when making predictions”: according to the typological linguistic literature, English is classified as a *strong future-time reference* language which “requires speakers to encode a distinction between present and future events”.⁵ As a consequence, the identification of central bank communication about future is straightforward: we collect the future markers, namely the future auxiliary and semi-auxiliary verbs *will*, *shall*, *going to*.⁶ Moreover, this approach can be implemented in an automated fashion, which makes our index consistent and easy to replicate.⁷

Is this indicator effective for measuring the evolution towards a forward-looking communication? Is the impact of changes in verbal guidance on money markets rates relevant?

To convincingly answer these questions two major challenges need to be addressed. First, to have a precise measure of verbal guidance, the forward-looking communication related to the monetary policy stance needs to be disentangled from that related to other issues such as the projections of output growth and inflation. Second, since in a forward-looking environment financial markets react only to surprises, we need to identify the unexpected component of news in order to study the market response to communication about future.

In this paper we use the European Central Bank (ECB) as testing case.

To have a measure of verbal guidance which abstracts from communication

⁵On the contrary, the *weak future-time reference* languages (e.g. German) do not necessarily require to mark the future events through future markers (Chen (2013)).

⁶Please refer to Szmrecsanyi (2003).

⁷We also exploit the fact that all relevant information released by central banks are often available in the *lingua franca* of international financial markets, English.

not related to the future monetary policy stance, we restrict the analysis to the first section of the Introductory statement, we call *policy summary*, that is used to summarize the policy decision and communicate the policy inclination. The evidence shows that there has been a positive trend of the words used in the policy summary along with an increase of the future verbs, especially in the aftermath of the financial turmoil, with peaks at the end of 2011 and over 2014-2015. This period coincides with the decrease of the policy rates towards the effective lower bound (as shown in Figure 1) and the announcement of several types of unconventional monetary policies, suggesting that the communication strategy has evolved accordingly.

To obtain the unexpected component we follow a two-step approach. First, we compute the index from 2002 to 2015. We then identify the process of our ECB verbal guidance index given the information set available on the press conference day, in order to estimate the news that could explain financial markets' movements around that event.

In the second part of the paper, we investigate the effects of a shock to verbal guidance on the daily changes of money market rates. Our estimation procedure is based on a standard event-study regression analysis for a period that spans from September 2007 to December 2015. In particular, we look at the implied forward three-month Euribor rates at different horizons (Figure 2) which reflect the financial markets' expectations on future short-term interest rates. Our results show that the interest rates are negatively affected by an unexpected increase in verbal guidance on the press conference day, after controlling for the monetary policy shock. Although our verbal guidance index does not detect the tone of the forward-looking statements,

we acknowledge that the announcements on future policy intentions have been used mostly to communicate a longer-lasting accommodative stance from the beginning of the financial turmoil to nowadays. We interpret these results as evidence that verbal guidance has been an effective policy instrument to signal further accommodative monetary policy stance. These results are robust, *inter alia*, to the inclusion of dummy variables for the forward guidance announced on July 2013 and for the other unconventional monetary policies, suggesting that financial markets react not only to the announcement *per se* but also to the way the message is conveyed.

We contribute to the literature on ECB communication in several ways. First, our paper proposes a novel approach to measure the semantic content of central bank official releases. Former indicators of the ECB communication have been constructed to measure the direction of the policy stance: Ehrmann and Fratzscher (2007) classify the extracted sentences from inter-meeting speeches held by central bankers based on their interpretation of dovish or hawkish tone; a similar approach has been adopted by Rosa and Verga (2007) to identify the direction of the policy summary. We thus contribute to the semantic literature on the ECB communication by proposing a new index which does not consider words but only verbal tenses. We exploit the fact that the use of verbal tenses belongs to a precise and stable system of rules (the grammars) which are not dynamic entities as words are.⁸ Moreover, the grammars are not subjective rules and therefore no authors' interpretation is needed to identify the future tenses.

⁸Language is a dynamic entity and words can change meaning according to circumstances. In addition, new words can be introduced.

Second, other papers rely on the use of dummy variables to measure the type of information conveyed during the ECB press conference: for example, Ferrero and Secchi (2009) construct several dummies for each type of quantitative and qualitative announcement on the future monetary policy stance;⁹ Ehrmann and Fratzscher (2009) uses Reuters snaps on the economic outlook, inflation, money growth, and interest rates to construct several dummy variables accordingly. However, relying on dummy variables, though widely used, limits the validity of this empirical strategy, because it assumes that the entire announcement was a complete surprise. As pointed out by Christensen and Rudebusch (2012), this is likely to underestimate the interest rate response as, especially for the later announcements, market participants may have anticipated some actions. This drawback puts a premium on the need to have a measure of news shock, as we show in this paper.

Finally, our approach differs from the standard factor analysis applied by Brand et al. (2010) to the ECB for extracting monetary policy indicators relating to different time horizons.¹⁰ The authors analyze changes in forward money market rates occurring during a time window from 1:35 pm to 3:50 pm CET, and extract two orthogonal factors: changes at the short end of the forward curve are identified as jump news, whereas changes at longer maturities are identified as path news, i.e. related to the future

⁹Namely, numerical interest rate path (quantitative announcement), verbal hints on the future evolution of policy rates (qualitative announcement) with clear timing (clear qualitative announcement) or ambiguous timing (opaque qualitative announcement), and no announcement.

¹⁰This approach was firstly proposed by Gurkaynak et al. (2005) for identifying the future path of the policy factor associated with FOMC statements.

policy path communicated during the press conference.¹¹ Nevertheless, the factor analysis approach cannot reveal anything about why financial markets forecast a different forward path for interest rates after the statement release, or which aspect of the statement constitutes the news that changes their beliefs.¹² On the contrary, in this paper we show the evolution of language to communicate possible future moves and its effects on financial markets' expectations.

The remainder of the paper is organized as follows. Section 2 introduces our verbal guidance index and its application to the ECB. In this section we also analyze the main determinants of our index and identify the unexpected component. Section 3 presents the empirical strategy and the results. Section 4 concludes. The Appendix A provides details on the data used in this paper.

2 A New Index of Verbal Guidance

In this section we introduce a simple indicator of central bank communication about future based on the frequency of future verbs. We exploit a peculiarity of the English grammar, which allows us to identify the forward-looking statement in a very straightforward way. In general, the human spoken language can be described as a system of symbols and rules (the grammars) by which the symbols are manipulated, and every complete sentence is built around a verb that indicates the time when the action occurs (present, past

¹¹Moreover, the authors show that this indirect econometric method to construct measures of news is consistent with the information obtained from a direct measurement, based on intra day changes in money markets rate occurring during two separate time windows, i.e. 1:35-2:05 pm for the jump news and 2:20-3:50 pm for the path news.

¹²The limits of this kind of analysis are amply discussed in Woodford (2012).

and future). Particularly, English requires the use of future markers to mark the timing of future events in nearly all circumstances (Chen (2013)). The future markers are the auxiliary and semi-auxiliary future verbs *will*, *shall*, *going to* (Szmrecsanyi (2003)). As defined on the Oxford Dictionary, these verbs refer to actions stated as promises or commitments. In a robustness exercise, we extend the category of future markers to include verbs which convey a future meaning even if less certain: *to expect*, as it refers to something as likely to happen; *may* and *might*, as they express a possibility.¹³ In practice, we compute the frequencies of future markers in an automated fashion, through a *search words*-based computer-coded content analysis. This allows us to overcome one of the main caveat related to the standard literature based on subjective indicators, i.e. our index is not affected by personal judgments. Moreover, it can be easily replicated.

We then use the word counts to construct an objective indicator, we call the *verbal guidance index*, which is obtained as follows

$$VG_t = \frac{\sum_{i=1}^{M_t} FutureMarker_{i,t}}{N_t}$$

where t refers to the press statement, i denotes the future marker, M_t and N_t stand for the total number of future tenses and words in a given statement, respectively. The denominator reports the total number of words, N_t , to avoid the possibility that the phenomenon captured by the index may reflect the intensity of speaking by the central bank. One of the main advantages

¹³As defined on the Oxford Dictionary at <https://en.oxforddictionaries.com/verb>. Although *may* and *might* represents the present and past tense respectively, this distinction is rarely observed and they are generally acceptable as substitutes.

of our indicator is that it does not use glossaries, but verbal tenses. In other terms, it is not contest-dependent, as the use of verbal tenses belongs to a precise and stable system of rules which are not dynamic entities as words are.

2.1 Evidence from the European Central Bank

We explore the validity of our approach by considering the European Central Bank as testing case. The means by which information on future monetary policy is transmitted to the financial markets can include press releases, press conferences, bulletins, speeches and interviews. To the purpose of our analysis, we consider only the press conferences which follow the monetary policy meeting of the Governing Council, as they are held regularly in terms of frequency and are systematic in terms of structure.

Since January 2002 to December 2014 the press conference was held the first Thursday of every month, while starting as of January 2015 the frequency of the monetary policy meetings has been reduced from monthly to every six weeks.¹⁴ The timing of the communication strategy is the following: the press release reporting the decision on the key interest rates is issued at 1:45 p.m. CET/CEST; it is followed shortly by the press conference starting at 2:30 p.m., which is divided in two main sessions, i.e. the Introductory statement and the Question and Answer Session.¹⁵ The former reports all the necessary information concerning the ECB monetary policy stance in a

¹⁴Although the first press conference took place on January 1999, our sample starts from January 2002 because only since November 2001 ECB's President monthly press conference has a structure which can be precisely identified.

¹⁵The Introductory statement read by the Governor is published (almost) simultaneously online at <http://www.ecb.europa.eu/press/html/index.en.html>.

simple and systematic way, while the latter is often used to clarify ECB's message.

The structure of the Introductory statement has remained quite the same since the very beginning: (i) the first part summarizes the ECB's monetary policy decision; (ii) the second part discusses both real and monetary developments in the Euro area; (iii) the last part concludes with some considerations on fiscal policy and structural reforms.

As we are interested in the communication about the future policy stance, we restrict the analysis to the first section of the Introductory statement, we call *policy summary*: this choice is motivated by the fact that the verbal guidance is communicated to the public after the explanation of the policy decision, generally in the forms of a policy inclination based on the risks to the primary objective of price stability.

This selection criterion allows us to extract the text of interest properly, and minimize the risks that our index might capture the future markers that refer to information other than the monetary policy verbal guidance, such as the developments and the projections of output growth and inflation that are generally discussed in the subsequent economic pillar.

Our sample covers 159 press conferences, starting from January 2002 to December 2015. Figure 3 shows the evolution of the ECB policy summary: the top graph plots the length measured by the number of words, while the bottom graph its share with respect to the Introductory statement. In both cases, the figure also reports the moving average over the previous 12 press conferences. Overall, the length of the policy summary has increased from 58 words on January 2002 to 436 words on December 2015, reaching

a maximum of 670 words on June 2014. This tendency does not reflect a mere increase of length of the Introductory statement: in fact, also the share has considerably increased from around 7% to around 37%, with a peak of around 47,5% on January 2015. The positive medium-term trends suggest that the ECB has provided over time more information about the monetary policy decision and its possible future path, especially after the beginning of the financial turmoil.

Before exploring the forward-looking content of the policy summary, we restrict the sample of words to be analyzed by considering only words which have a sparsity lower than 80 per cent (i.e. that appear once in at least 30 policy summaries), and by excluding numbers, stopwords (such as articles, prepositions, conjunctions) and ECB-related terms.¹⁶ Figure 4 summarizes our findings: the top panel shows the number of future markers, namely *will*, *shall* and *going to*. We also report *expect*, *may* and *might*, which convey a future message even if less certain. It is evident that the ECB generally uses *will* to communicate about future, while in none of the policy summary we could find the other future markers *shall* and *going to*. We observe a concentration of *expect* during November 2009-December 2010, a period characterized by the economic recession. Interestingly, *may* has been used twice in August 2012 to announce the OMT program and in general unconventional measures: “The Governing Council, [...], may undertake outright open market operation of a size adequate to reach its objective. Furthermore, the Governing Council may consider undertaking further non-standard monetary policy measures according to what is required to

¹⁶Please refer to Table A.1 in the Appendix.

repair monetary policy transmission”. So far, the OMT has been announced but never implemented, as its activation depends on the country request: the verb *may* refers indeed to a possibility, and not to something certain to happen. Finally, *might* has been used only few times at the very beginning of our sample.

The bottom part of Figure 4 plots the number of words of the policy summary versus the number of *will*. The evolution of *will* reflects the trend observed for the number of words, suggesting that there has been a shift towards explicit forward-looking statements over time. This evidence is reinforced by the content analysis provided by Figure 5, which reports a visual overview of the most frequent words in four main sub-periods, i.e. 2002-2006, 2007-2009, 2010-2012, 2013-2015. While the frequency of technical terms (e.g. monetary, price stability or inflation) is mostly constant over the four sub-periods, the frequency of *will* has increased.

In our view, these facts are consistent with the increasing need of managing financial markets’ expectations on the future path of short-term interest rates, especially in the recent years characterized by policy rates close to the effective lower bound. In this respect, we plot in Figure 6 the ECB’s Main Refinancing Operations Rate versus the number of *will* in the policy summary, by focusing on the period September 2007 - December 2015. We register the major peaks in the use of *will*: (i) on May 2009, coinciding with the beginning of a two-year period of unchanged policy rate at very low level; (ii) on June 2011, followed by an increase of the MRO rate on

July 2011;¹⁷ (iii) during August-December 2011, when the policy rate has been reduced to the “before-April 2011” level; (iv) on May 2013, preceding the announcement of forward guidance on July 2013; and (v) starting as of June 2014, when the Governor announced intensified preparatory work for purchases of asset-backed securities, to January 2015, when it was announced the extended asset purchase programme, in correspondence of the MRO approximating the zero level bound. This evidence suggests that the verbal guidance has been used mostly to signal further the accommodative monetary policy stance, with the exception of June 2011.

Yet we acknowledge that our analysis might be affected by the presence of future markers related to the ECB’s target and the outlook of inflation expectations. To tackle on the possibility that our index might contain some noise, which could produce a bias towards zero in the estimates, we identify manually the future markers related to the intentions of signalling some future action and to monitor closely a situation.¹⁸ Figure 7 plots the number of *will* computed through automated and manual computation: the paths are very close, suggesting that our methodology is effective in capturing the ECB’s verbal guidance.¹⁹

As examples, we report the text extracted from four Introductory statements which show clearly how the ECB has increasingly relied on explicit communication about future.

¹⁷On the contrary, when Trichet has increased firstly the MRO on April 2011 after a prolonged period of no changes, the number of *will* has been stable.

¹⁸We tried to reduce the probability of a wrong classification by doing our coding independently from one another. When we came up with a different coding for the same press conference, we have double-checked it together and agreed on a common value.

¹⁹In fact, the statements on the ECB’s monetary policy objective and the inflation expectations are generally constructed using the present verbal tense.

At the very beginning, the policy summary consisted of a very limited number of strings, and an implicit policy inclination was released through key words related to the risks to price stability: e.g. on January 2002 “We also confirmed that the current level of key ECB interest rates remains appropriate for the maintenance of price stability over the medium term”.

Starting as of September 2005, statements on the inflation expectations have been introduced, e.g. on April 2006: “It remains essential to ensure that medium to long-term inflation expectations in the euro area are kept solidly anchored at levels consistent with price stability. Such anchoring of inflation expectations is a prerequisite for monetary policy [...] With interest rates across the whole maturity spectrum still at very low levels in both nominal and real terms, [...], our monetary policy remains accommodative”.

During the crisis, we observe both an increase of wording and *will*, e.g. on June 2014: “[...] the measures will contribute to a return of inflation rates to levels closer to 2% [...] Looking ahead, the Governing Council is strongly determined to safeguard this anchoring. Concerning our forward guidance, the key ECB interest rates will remain at present levels for an extended period of time in view of the current outlook for inflation [...] Moreover, if required, we will act swiftly with further monetary policy easing”. On September 2015: “[...] Accordingly, the Governing Council will closely monitor all relevant incoming information. [...] In the meantime, we will fully implement our monthly asset purchases of €60 billion.”

The future verbal tenses are related to ensure that (i) the measures taken will be effective; (ii) the policy interest rates will continue to be low, (iii) the ECB is ready to react by easing further the monetary policy stance. In

other terms, to signal and convince financial markets that monetary policy stance will remain accommodative in the future.

In fact, as stated by the ECB President Mario Draghi: “Our response was to *place more emphasis on enhanced communication* - both regarding our commitment to our price stability objective, and regarding our assessment of and response to the rapidly changing economic and financial situation”, Draghi (2014).

2.2 The ECB’s Verbal Guidance Index

Given the evidence presented above, we compute two versions of our indicator of central bank verbal guidance for the ECB policy summary. The former includes only *will*, while the latter also *expect*, *may*, *might*:

$$VG_t = \frac{\sum_{i=1}^{M_t} FutureMarker_{i,t}}{N_t} \quad (1)$$

$$VG_t^e = \frac{\sum_{i=1}^{M_t} w * FutureMarker_{i,t}}{N_t} \quad (2)$$

where t refers to the press conference day; FutureMarker={will} in equation (1) and FutureMarker={will, expect, may, might} in equation (2); $w=\{0.5,1\}$ denotes the weights, where 0.5 refers to *expect*, *may*, *might* and 1 to *will*; M_t and N_t represent the total number of future markers and words in each policy summary, respectively.²⁰ Our weighting scheme is motivated by

²⁰We disregard *will* when it is preceded by the article *the*, as in this case it denotes a noun and not a verb. Moreover, we control for possible case-sensitive issue, by removing

the fact that *expect*, *may*, *might*, although convey a future message, refer to something as likely to happen or to a possibility, and therefore their message is less certain. Given that their frequency is very low in our sample, this choice should not have a crucial impact on the computation of the index.²¹ Figure 8 reports the two versions of the index: the main difference occurs during the period November 2009 - December 2010, which was characterized by a larger use of *expect* with respect to *will*. As expected, we observe large values of the index during the peak of the sovereign debt crisis in November 2011 (coinciding with the decrease of the Main Refinancing Operation rate, few months after the previous increases in April and July). Moreover, the highest values occur in the last part of our sample, during which several unconventional monetary policies have been announced, included the *Quantitative Easing* on January 2015.²²

2.3 The identification of the ECB verbal guidance shock

As emphasized by Kuttner (2001), in a forward-looking environment financial markets should react only to the surprise element of the monetary policy announcements. Therefore, in order to assess the market response to communication about future, we need to identify the unexpected component. To this purpose, we explore the process underlying the ECB verbal guidance

May from our counting.

²¹As someone could rightly point out, the use of these verbs could introduce more uncertainty about future and therefore have a negative effect on the volatility of financial markets. As we do not investigate this issue here, we leave this question open to further research.

²²Some examples of ECB policy summary and the corresponding verbal guidance index are reported in Appendix A.1.

index;²³ our hypothesis is that the financial markets participants form their prediction based on the following augmented autoregressive process:

$$\mathbb{E}[VG_t|I_{t*}] = \alpha + \sum_{i=1}^n \beta_i VG_{t-i} + Z_t^\top \gamma \quad (3)$$

where t stands for the press conference day, the frequency of VG_t reflects the timing of the ECB meetings and n refers to the past values; \mathbb{E} denotes the expectation conditional on the information set I_{t*} at the time just prior to the Governing Council press conference; Z_t is a vector of macro-financial control variables.

We estimate equation (3) with ordinary least squares and robust correction of standard errors for the period January 2002 - December 2015. The Appendix A.2 reports an extensive analysis of the data generating process underlying our index.

Table 1 reports the results under three specifications: (i) we only consider the autoregressive components up to two lags;²⁴ (ii) we add the expected policy rate measured as the mean from a Bloomberg survey; (iii) we include also the Consensus Economics forecasts twelve months ahead for the Euro Area GDP growth rate and the CPI inflation rate.²⁵ The inclusion of the forward-looking

²³As defined in equation (1). Results are consistent when we consider the verbal guidance index as defined in equation (2).

²⁴According to both Akaike and Schwarz Bayes information criteria. Higher lags turn out to be statistically insignificant.

²⁵The Consensus Economics forecasts are released for the current year and the following calendar year. Since the horizon is not constant, we approximate the forecast for the twelve months ahead as average of the forecasts for the current and next years, weighted by their shares in the forecast period. By adopting the same methodology as in Mehrotra and Yetman (2015), we compute the fixed horizon forecast according to this formula (for inflation as example):

$$\pi_t^f = \frac{k}{12} \pi_{t+k|t}^f + \frac{12-k}{12} \pi_{t+12+k|t}^f \quad (4)$$

macro variables is consistent with several contributions in literature which show that central banks respond to forecasts of future economic variables (Orphanides (2010)).²⁶

The results are as follows: the two lags are statistically significant and large under all specifications; the coefficient on the expected policy rate is statistically significant as shown in column (2), whereas it loses significance when we also include the forecasts for inflation and GDP growth. Indeed, as shown in Appendix A.2, the expectation on the policy rate captures all available and relevant information that hit the market before the press conference takes place.

The process that results better suited to predict the verbal guidance index is an AR(2) augmented using the expectation on the policy rate. The estimated persistence of the verbal guidance index is consistent with the findings of Amaya and Filbien (2015) which show that the content of the ECB press conference is similar over time.²⁷ The mechanism behind the negative sign of the estimated coefficient for the expected policy rate is at least twofold: a decreasing expected path for the policy rate may signal expected weaker economic conditions; at the same time, the approaching of the policy rate to the effective lower bound may rise the need of enhancing communication in

where $k \in \{1, 2, \dots, 12\}$ denotes the k -month ahead forecast horizon based on information available at time t .

²⁶In a robustness exercise reported in Appendix A.2, we consider as control variables the official releases of the CPI inflation rate and the industrial production, PMI composite index, unemployment rate and ZEW Financial Market Survey index. The coefficients on these variables tuned out to be not statistically significant if included in the model along with the expected policy rate.

²⁷The authors follow the methodology proposed by Tetlock (2011) and measure the similarity of two successive ECB statements based on the proportion of textual information overlapping in both statements.

order to manage expectations.

In order to obtain a measure of real-time news, we re-estimate equation (3) as:

$$VG_t = \alpha + \beta_1 VG_{t-1} + \beta_2 VG_{t-2} + \gamma_1 \mathbb{E}[i_t] + \varepsilon \quad (5)$$

where $\mathbb{E}[i_t]$ denotes the expected policy rate and ε_t is the error term. We follow a recursive approach to compute the one-period ahead forecast, where the starting sample is composed by the first 30 observations and at each iteration the window increases by one unit. The unexpected component of the ECB verbal guidance index, we call verbal guidance shock (henceforth, *VGS*), is given by the difference between the actual and the predicted values (Figure 9).

3 Empirical Analysis

In this section we investigate whether and the extent to which an unexpected change in the communication about future may affect financial markets' beliefs. Our estimation procedure is based on a standard event-study regression analysis around the ECB's monetary policy Governing Council meeting.²⁸

²⁸As discussed in Gurkaynak and Wright (2013), the event-study approach is now a well recognized methodology for the identification of causal relationships in the macro-finance literature.

3.1 Data

To evaluate the impact of the verbal guidance on the signalling channel, we look at the daily changes of the Euribor rate after the press conference takes place. The Euribor (Euro Interbank Offered Rate) is a daily reference rate, determined and published at about 11:00 CET/CEST each working day, as the filtered average interbank interest rate at which European banks are prepared to lend to one another.²⁹ Our choice is motivated by the fact that the Euribor represents the benchmark rate of the large euro money market and reflects the expectations of financial markets on future short-term interest rates. Specifically, we use the spot rates for the three-month ($3M$), six-month ($6M$), nine-month ($9M$) and twelve-month ($12M$) maturities that were obtained from Thomson Reuters-Datastream. As the spot rate (e.g. $12M$) implicitly incorporates the expectations on *all* short-term interest rates over a specific horizon (e.g. 12 months), for our analysis we compute the implied k -month-ahead three-month forward rate, $f_t^{(k)}$, by the simple definition:

$$1 + f_t^{(k)} = \frac{(1 + r_t^{(k+3)})^{\frac{k+3}{12}}}{(1 + r_t^{(k)})^{\frac{k}{12}}} \quad (6)$$

where $k = \{3, 6, 9\}$, as a measure of expectations on the three-month rate in k months ahead (Figure 2).

Conditionally on the assumption that financial markets are efficient and respond only to news that could affect their belief about the future, we assume that: (i) on meeting days the relevant news concerns the policy rates (the Main Refinancing Operation and standing facilities rates) and the ECB

²⁹For more information, please refer to the official website <http://www.emmi-benchmarks.eu/euribor-org/euribor-rates.html>.

press conference; (ii) the expectation hypothesis holds; (iii) and the term premium is constant during a one-day window.³⁰

The first assumption implies that we need to control for the news related to the monetary policy rates. We use as proxy the difference between the Main Refinancing Operation rate and its market expectations, measured through the mean response of a Bloomberg survey among market participants.³¹

Given that the ECB has started to announce several non-standard measures in the aftermath of the financial turmoil, we also control for the announcements made during the press conference day.³² In particular, we distinguish between two broad categories of non-standard measures. The former includes the policies aimed at improving the liquidity conditions of the interbank markets, which were severely impaired by the financial crisis. Precisely, we include a dummy which takes value 1 when one of the following measures are announced: (i) the unlimited provisions of liquidity through fixed rate tenders with full allotment for the main refinancing operations (FRFA); (ii) extension of maturity for the long-term refinancing operations (LTRO); (iii) extension of the list of eligible collateral assets for refinancing operations; (iv) liquidity provision in foreign currencies through

³⁰Nonetheless, we acknowledge that someone could question the validity of this assumption after the onset of the crisis. It is a testable hypothesis and we leave the answer to it to future research.

³¹As robustness check (non reported), we measure the monetary policy shock as daily difference of the Eonia overnight rate, and the results are confirmed.

³²Please refer to Table A.4 in the Appendix for a list of all unconventional monetary policies covered in this paper. Our list is very similar to Falagiarda and Reitz (2015) up to 2012 and Altavilla et al. (2015) for the last years. As we consider only the announcements made during the regular monetary policy press conference, some relevant non-standard measures (e.g. the Securities Markets Programme) are not included.

swap lines with other central banks (FOR);³³ (v) the outright purchases of covered bonds (CBPP1 and CBPP2). The second category covers the asset purchases carried out in order to address the *redenomination risk* during the sovereign debt crisis and to activate other channels of the monetary policy transmission mechanism, such as the *portfolio rebalancing channel* and the *bank lending channel*.³⁴ In practice, we include a dummy which takes value 1 on the days the ECB announces: (i) purchases of government bonds carried out under the Outright Monetary Transactions (OMT); (ii) the extended asset purchases programme (APP);³⁵ (iii) the targeted longer-term refinancing operations (TLTRO).³⁶

We also include a dummy which takes value 1 when the forward guidance has been first announced on July 2013. Finally, we include a set of control variables that could affect the dynamics of the Euribor rate other than the ECB policy news: (i) the surprise related to the ECB forecasts for the GDP growth and inflation, defined as the difference between the ECB and the Survey of Professional Forecast (SPF) projections;³⁷ (ii) changes in the

³³Even if the main goal of the swap lines is to provide foreign currency liquidity to domestic banks, this instrument should mitigate the negative spillovers effects by protecting the euro area interbank market from external tensions, as discussed in the article "Experience with foreign currency liquidity-providing central bank swaps", Monthly Bulletin, August 2014.

³⁴For further discussion on the transmission channels see, among others, Falagiarda and Reitz (2015) for all the unconventional monetary policies implemented up to 2012, and Altavilla et al. (2015), Cova and Ferrero (2015) and Andrade et al. (2016) for the asset purchase programme.

³⁵This programme also covers the asset-backed securities purchase programme (ABSPP) and the covered bonds purchase programme (CBPP3). For more information, please see the ECB official webpage at <https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html>.

³⁶We include the TLTRO among these measures as they have been introduced mainly to affect the economy through the *bank lending channel*.

³⁷Starting as of June 2004, the ECB has released the macroeconomic projections on the press conference day, while the SPF projections are released around one week before.

Euro Stoxx volatility as a measure of aggregate risk;³⁸ (iii) three dummies corresponding to three main phases of the crisis that started in August 2007, namely the financial turmoil from 9 August 2007 to the collapse of Lehman Brothers, the Great Recession phase from 15 September 2008 until 7 May 2010, and the Eurozone sovereign debt crisis from May 2010 until November 2012;³⁹ (iv) a dummy which takes value 1 if Mario Draghi is the ECB’s President in charge.⁴⁰

3.2 Methodology

We estimate the following equation using ordinary least squares with robust correction of standard errors:

$$\Delta f_{t'}^{(k)} = \alpha^{(k)} + \beta_1^{(k)} VGS_t + \beta_2^{(k)} MPS_t + \beta_3^{(k)} FG + \beta_4^{(k)} REF_t + \beta_5^{(k)} UMP_t + Z_t^\top \gamma^{(k)} + \varepsilon_t^{(k)} \quad (7)$$

where the time index t' refers to the day after the press conference.⁴¹

Both projections are released on a quarterly frequency; we then assume that the surprise is zero when there are no releases. Finally, as both projections refer to current and next year, we compute the fixed horizon forecast using a slightly version of equation (4).

³⁸The Euro Stoxx volatility, as VIX in the US, is an index that provides a market-based measure of the volatility perceived by investors in the European stock market. The index is widely used as a proxy of aggregate risk perceptions in the euro area (Arghyrou and Kontonikas (2012), Glick and Leduc (2012) and Falagiarda and Reitz (2015), among others).

³⁹A similar identification of the crisis periods has been suggested by Drudi et al. (2012).

⁴⁰In a (non-reported) robustness exercise we also include the surprise of U.S. initial jobless claims, defined as the difference between the actual release and market expectations measured through the mean response of a Bloomberg survey among market participants. The release is issued every Thursday at 2:30 pm CET/CEST, contemporaneously with the ECB press conference. As the effect is almost null, we exclude it for parsimony.

⁴¹Given that the Euribor is fixed at 11:00 am CET/CEST, we compute the difference

The dependent variable, $\Delta f_{t'}^{(k)} = f_{t'}^{(k)} - f_t^{(k)}$, represents the first difference of the 3-month implied forward rate, where $k = \{3, 6, 9\}$; *VGS* is the verbal guidance shock, as defined in Section 2.3; *MPS* stands for the monetary policy shock; *FG* refers to the forward guidance dummy; *REF* is a dummy variable taking value one if *FRFA*, *LTRO*, *COLL*, *FOR*, or *CBPP* are announced and zero otherwise; *UMP* is a dummy variable taking value one if *OMT*, *APP*, or *TLTRO* are announced and zero otherwise; *Z* is the vector of control variables; and ε_t denotes the error term.

We focus on the meetings between September 2007 and December 2015. This period was mostly characterized by an accommodative monetary policy stance, as amply discussed in the evidence in Section 2.1, and therefore we expect that a positive shock to our index (an unexpected increased use of future markers) might have a negative instantaneous effect on financial markets' expectations.

3.3 Main results

We estimate equation (7) under three specifications. First, we estimate a baseline version of the model, where the announcements of all non-standard measures (i.e. *FG*, *REF* and *UMP*) are not included. Table 2 reports the results. As expected, the effect of a monetary policy shock on expectations on future short-term interest rates is positive; moreover it is statistically significant for all the horizons analyzed. In line with our hypothesis, the coefficients for the verbal guidance shock are all negative and significantly different from zero too. In other terms, our findings suggest that: (i) the ECB

from the day of the Governing Council meeting (t) to the day after (t').

communication about future influences expectations about future money market interest rates; (ii) an unexpected increase of future markers induces a reduction in the expected money markets rates. In addition, the effect is larger (in absolute value) for horizons between 6 and 9 months. This result can be explained by the fact that the verbal guidance aims at convincing firmly the financial markets participants that the monetary policy stance will remain accommodative in the medium term.

In order to quantify the magnitude of the effect of the *VGS*, we normalize by considering the impact of one standard deviation shock: the effect of the *VGS* has been around 1 basis point across the horizons. This effect can be relevant, given that the average (of the absolute value) of the change of forward money market rate on the press conference day is around 2 basis points in our sample. In specific days the effect is much larger: e.g. on June 2014, when several non-standard measures have been announced, the *VGS* has been around 0.086, corresponding to an impact between 2 and 3 basis points. Interestingly, the coefficient on the dummy which takes value 1 if the President in charge is Mario Draghi is negative and statistically significant for all three horizons. This result is consistent with the literature highlighting the importance of the central bank governors, according to which the reputation of the central bank president is relevant for shaping markets' expectations.⁴² In the second specification, we estimate the full model as defined in equation (7). Table 3 reports the results. As expected, the forward guidance (FG) announced on July 2013 had a relieving impact in reducing money market rates of almost 4 basis points for all horizons, while the money

⁴²See Sørensen (2014), Neuenkirch et al. (2013)

markets have been not affected by the announcements of unconventional monetary policies, as shown by other researches.⁴³ This can be due to several reasons. For example, Brunetti et al. (2011) show that during crisis long term refinancing operations are not effective in reducing prices and interbank market uncertainty due to the crowding-out effect that dominates the intervention news effect. Moreover, programs such as the OMT were oriented to alleviate the increasing tensions in the sovereign debt market, while the TLTRO to stimulate the bank credit to the economy. Even after controlling for the announcements of unconventional monetary policies, the coefficients of the verbal guidance shock are all negative and statistically significant. Actually, they are now bigger in magnitude: the effect is larger (in absolute value) than the baseline model, suggesting that omitting variables result in downwards biased estimation of the VGS. Finally, we estimate equation (7) by dropping the dummy variables for the non-standard measures, REF and UMP, which result to be not statistically relevant for explaining money market rates movements around the press conference day. In other terms, we estimate an extended version of the baseline model, by controlling for the announcement of forward guidance. Table 4 reports the results, which are fully consistent with the baseline model.

To conclude, our findings suggest that communication in the form of verbal guidance has been an effective policy instrument. The main advantage of including our variable is that it is continuous in time, as opposite to the dummy for the FG, and it is thereof able to capture the effect of the evolution

⁴³See Cecioni et al. (2011), for a review of the effects of unconventional monetary policies in the US and euro area interbank market until mid-2011.

of language. As amply discussed in Section 2.1, our index captures the future markers used to communicate information about the future monetary policy stance, such as forward guidance and the announcements of asset purchases. While the announcements on non-standard measures are not effective *per se*, our results suggest that financial markets' expectations react to the way the message is conveyed.

3.4 Robustness checks

In this section, we perform a series of robustness exercises and discuss the results for the extended model.⁴⁴ Our econometric analysis has been carried out in two steps. First, we determine the market prediction of the verbal guidance index immediately before the start of the press conference in order to estimate the news shock; second, we investigate the extent to which the identified innovation in communication about future can explain forward rate movements around event-days. In other words, we use a generated regressor in the second step. This fact may give rise to underestimated standard errors and hence to spurious significant regressor coefficients.⁴⁵ In order to account for the generated-regressor problem when computing coefficient estimates' standard errors, we check the robustness of our conclusions by using a bootstrap approach to statistical inference (see, e.g., Efron and Tibshirani (1993)). More specifically, we apply a sampling-with-replacement raw residuals bootstrap scheme with 1,000 repetitions. In Table 5 we report the estimation results: the coefficients of the verbal guidance shock

⁴⁴The results remain valid for the other specifications too.

⁴⁵See Pagan (1984) for more details on the generated regressors issue.

are qualitatively very similar to those obtained in the previous section where White-robust standard errors are used. This fact confirms that communication about future is indeed effective in moving money markets rates.

To further assess the robustness of our results, we estimate equation (7) using the surprise in the Verbal Guidance Index computed following equation (2). The Verbal Guidance Index we use here is computed adding as future markers *expect*, *may* and *might* to *will*. For this index we apply a weighting scheme that associates the weight 1 to *will* and 0.5 to the others. On the one hand, the new index captures a broader range of shades about the use of future tenses in communication. On the other, the inclusion of different future markers and the use of an arbitrary weighting scheme inevitably increase the noise in the index. The results reported in Table 6 show that the coefficients of VGS^e are, as well as those of VGS , all negative, increasing in absolute value with horizons and statistically significant.

Using an automated index to measure communication has pros and cons. On the one hand, our index is quite appealing since it is easy to construct, can be replicate, does not depend on time-varying glossary, and it is not undermined by a possible misclassification due to personal judgments. On the other, the way we compute the index may lead to the inclusion of noise in our estimation exercises. As described in section 2.1, the use of future tense markers (i.e. *will*) in the policy summary is generally related to the intention of signalling future monetary policy actions, but it could also refer to the intention to monitor closely a situation or to the expected return of inflation on target. While the first two instances can both be classified as signals

of future actions, the last instance is more dubious: it should signal that, given the current policy stance, no further action is needed. To tackle this issue we manually disentangle the future markers related to the intentions of signalling some future action to those related to other aspects of the monetary policy stance (Figure 7 compare the number of will obtained manually to the automated one). Once obtained the number of future markers which only refer to signalling future action, we proceed as usual in two steps: we construct the index as the ratio between the future tenses and the number of words of the policy summary, and then we identify the communication shock. Table 7 reports the estimation for the extended model using as verbal guidance shock the one computed manually. Results are confirmed.

Moreover, we have run an event-study analyses measuring changes in expectations in a one-day window around the press conference meeting. As it has been stressed out in the literature, a limitation of the event-study approach is that it relies on the assumption that financial markets are informationally efficient, i.e. it assumes that the majority of the impact of ECB communication occurs immediately. Hence, the choice of the event window length is crucial, since it involves a trade-off between keeping the interval narrow to avoid the noise produced by extraneous information, and choosing a wider window to identify potential delayed and/or anticipated reactions of market participants. In order to capture possible anticipated reactions to news by market participants, we extend our event window to two days, defined as difference between the day after and the day before the press conference. The results are reported in Table 8. The coefficients of our variable of interest, the VGS, are larger in absolute value for all the

horizons analyzed, the significance level and the measure of the goodness of fit increase. The results indicate that ECB news have been subject to anticipation effects, as there has been an increase quantitatively (in absolute value) and qualitatively in comparison to a one-day window. On the other hand, the results obtained using a two-day window are less accurate in comparison to those obtained using a one-day window, as extending the event window inevitably increases the noise in the estimates of the announcement effect.

So far we have considered changes in the Euribor forward rates to determine if and how the surprise in communication about future affects money market rates. Forward rates, due to the way they are computed, show sometimes erratic behavior at high frequencies and, more important for our perspective, include term premia. In short time windows, as those used in this analysis, the term premia should not change. However, for some important ECB communication, related for instance to the start of the APP programme, someone could question the validity of assuming a constant term premium. This could cause the increasing effect along horizons that we find for the coefficient of the verbal guidance shock. To asses this issue, we re-estimate the model using as alternative dependent variable the Eonia Swap Rates: these rates are transaction-based and not quote-based as in the case of the Euribor, hence they should reflect more clearly market expectations. Table 9 reports the results obtained for a two-day window for maturities from 3 months to 2 years. The coefficients of our variable of interest are, as in previous estimates, negative and increasing in absolute value with maturities until 6 months. The verbal guidance shock results to be no longer statistically

significant for maturities beyond 8 months.

Table 10 summarizes our results for the extended model for the horizon $k = 9$ in three cases, namely one-day window, one-day window with alternative index, and two-day window. Specifically, we report the effects of the verbal guidance and the monetary policy shocks, which are normalized by their standard deviations. Overall, the effect of a shock to verbal guidance is on average 1 basis point, and much larger than the monetary policy shock.

4 Concluding remarks

This paper has addressed a relevant question concerning central bank governance, i.e. whether and the extent which the verbal guidance has been effective in shaping the financial markets' expectations on future short-term interest rates. The answer to this question crucially depends on the way central bank communication is measured. Despite the burgeoning literature on this topic, our paper has proposed a novel approach based on the frequency of future markers in monetary policy statements. We have considered the European Central Bank communication strategy as a testing case. The main findings are as follows: (i) our *verbal guidance index* is able to capture the evolution towards explicit forward-looking statements, especially in the aftermath of the Global Financial Crisis and well before the forward guidance on key policy interest rates announced firstly on July 2013; (ii) the results from the econometric analysis have showed that using a future tense that is perceived by the public as a commitment in pursuing a particular monetary policy stance is indeed effective in shaping future short-term interest rates

expectations. In particular, the stronger is the surprise in speaking about future, the stronger is the effect on interest rates, especially for longer horizons.

To conclude, we have performed our analysis during a period characterized mostly by a dovish attitude, and thereof the results are valid in a context of accommodative monetary policy stance. Although it is not possible to state if these implications hold in a hawkish context too, our results shed light on the importance of the verbal tenses used to signal future actions.

A Appendix

A.1 Examples of ECB policy summary

Below we provide some examples of the ECB policy summary along with the corresponding Verbal Guidance Index, computed as in eq. (1) (VG) and in eq. (2) (VG^e).

- i. January 2002: “ [...] The Governing Council concluded that recent developments are in line with the interest rate decisions taken in the course of last year. We have therefore decided to keep the key ECB interest rates unchanged. We also confirmed that the current level of key ECB interest rates remains appropriate for the maintenance of price stability over the medium term.”

$VG: 0 \quad VG^e: 0$

- ii. June 2004: “ [...] Nevertheless, we are still of the view that the medium-term outlook remains in line with price stability. Accordingly, we left the key ECB interest rates unchanged. The low level of interest rates continues to support the economic recovery. We will remain vigilant with regard to all developments which could affect the risks to price stability over the medium term.”

$VG: 0.0238 \quad VG^e: 0.0238$

- iii. October 2006: “[...] Today’s decision will contribute to ensuring that medium to longer-term inflation expectations in the euro area remain solidly anchored at levels consistent with price stability. Such anchoring is a prerequisite for monetary policy to make an ongoing contribution

towards supporting sustainable economic growth and job creation in the euro area. [...] Our monetary policy therefore continues to be accommodative. If our assumptions and baseline scenario are confirmed, it will remain warranted to further withdraw monetary accommodation. The Governing Council will therefore continue to monitor very closely all developments so as to ensure price stability over the medium and longer term.”

VG : 0.0349 VG^e : 0.0349

- iv. January 2008: “ [...] The Governing Council remains prepared to act pre-emptively so that second-round effects and upside risks to price stability over the medium term do not materialise and, consequently, medium and long-term inflation expectations remain firmly anchored in line with price stability. Reflecting its mandate, such anchoring is of the highest priority to the Governing Council. The economic fundamentals of the euro area are sound. [...] We will continue to monitor very closely all developments over the coming weeks.”

VG : 0.0139 VG^e : 0.0139

- v. July 2010: “[...] Based on its regular economic and monetary analyses, the Governing Council views the current key ECB interest rates as appropriate. [...] Our monetary analysis confirms that inflationary pressures over the medium term remain contained, as suggested by weak money and credit growth. Overall, we expect price stability to be maintained over the medium term, thereby supporting the purchasing power of euro area households. [...] Monetary policy will do all that is

needed to maintain price stability in the euro area over the medium term. [...] We remain firmly committed to price stability over the medium to longer term. The monetary policy stance and the overall provision of liquidity will be adjusted as appropriate. Accordingly, the Governing Council will continue to monitor all developments over the period ahead very closely.”

VG : 0.0204 VG^e : 0.0306

- vi. April 2012: “ [...] Inflation rates are likely to stay above 2% in 2012, with upside risks prevailing. Over the policy-relevant horizon, we expect price developments to remain in line with price stability. Consistent with this picture, the underlying pace of monetary expansion remains subdued. [...] Medium-term inflation expectations for the euro area economy must continue to be firmly anchored in line with our aim of maintaining inflation rates below, but close to, 2% over the medium term. [...] This combination of measures has contributed to a stabilisation in the financial environment and an improvement in the transmission of our monetary policy. We need to carefully monitor further developments. [...]”

VG : 0 VG^e : 0.0049

- vii. July 2014: “ Based on our regular economic and monetary analyses, we decided to keep the key ECB interest rates unchanged.[...] The monetary operations to take place over the coming months will add to this accommodation and will support bank lending. As our measures work their way through to the economy, they will contribute to a return

of inflation rates to levels closer to 2%. Concerning our forward guidance, the key ECB interest rates will remain at present levels for an extended period of time in view of the current outlook for inflation. [...]"

VG : 0.1049 VG^e : 0.1049

Table A.1: Stop words

i	them	by	then	than
me	their	for	once	too
my	theirs	with	here	very
myself	themselves	about	there	ecb
we	what	against	when	government
our	which	between	where	governing
ours	who	into	why	council
ourselves	whom	through	how	today
you	this	during	all	year
your	that	before	any	
yours	these	after	both	
yourself	those	above	each	
yourselves	a	below	few	
he	an	to	more	
him	the	from	most	
his	and	up	other	
himself	but	down	some	
she	if	in	such	
her	or	out	no	
hers	because	on	nor	
herself	as	off	not	
it	until	over	only	
its	while	under	own	
itself	of	again	same	
they	at	further	so	

Notes: This table lists the stop words used for the text analysis, i.e. the words which are filtered out when computing the denominator for the Verbal Guidance Index. In content analysis stop words usually refer to the most common words in a language; here we include also the ECB-related words, such as “ECB” and “governing council”.

A.2 The ECB's communication strategy

In this section we extensively analyse the data generating process underlying our ECB's verbal guidance index according to equation (3). Specifically, we alternatively include in the control matrix Z_t a larger number of macro-financial variables: the official releases of the CPI inflation rate, the unemployment rate and the industrial production for the Euro Area reported on Bloomberg Economic Calendar, as measures of the backward-looking information; the expected policy rate, the PMI composite index, the Consensus Economics forecasts twelve months ahead for the Euro Area GDP growth rate and the CPI inflation rate and ZEW Expectation of economic growth,⁴⁶ as forward-looking variables.

Regression results are reported in Table A.2. Column (1) shows the results for a model that only includes the expected policy rate, and the estimated coefficient is statistically significant. Columns (2) and (3) report the estimates of a model that considers alternatively several measures of current and expected economic activity without including the policy rate: the results suggest that the ECB uses communication about future in a countercyclical fashion, i.e. when unemployment increases the verbal guidance index increases while when inflation rises it decreases.⁴⁷ Columns

⁴⁶The ZEW Financial Market Survey is carried out on a monthly basis, it is updated at the end of each month around a week before the press conference. It displays the expectations of financial experts for the Eurozone. About 350 financial analysts from banks, insurance companies and large industrial enterprises participate in this survey. Among the respondents are experts from the finance, research and economic departments as well as traders, fund managers and investment consultants. The indicator reflects the difference between the share of analysts that are optimistic and the share of analysts that are pessimistic for the expected economic development in the Eurozone in six months.

⁴⁷The coefficient for the expected GDP growth is positive and seems to suggest the opposite. However, it is significant only at the 90 per cent level and not robust, while the

from (4) to (9) show that when we include both the macroeconomic variables and the expected policy rate, they are no longer significant. This could be explained by the fact that the policy rate depends on the policy makers' information set, which incorporates the information accessible to the financial markets participants too. Similarly to the model proposed by Gerlach and Lewis (2014), we estimate the following equation for the expected policy rate that includes the lagged value of the actual policy rate, as a measure of smoothness, and a set of macro variables:

$$i_t^f = \alpha + \beta i_{t-1} + Z_t^\top \gamma + \varepsilon_t \quad (8)$$

where i_t^f stands for the expected policy rate, i_t for the Main Refinancing Operation rate; Z_t is a vector of control variables, which includes alternatively several measures of current and expected economic activity; and ε_t denotes the error term.

In Table A.3 we report our results for the period January 2002-December 2015. The estimations confirm that the expected policy rate already includes backward and forward-looking information on the economic conditions.

unemployment rate is significant at the 99 per cent.

Table A.2: ECB Communication Strategy

VARIABLES	(1) index	(2) index	(3) index	(4) index	(5) index	(6) index	(7) index	(8) index	(9) index
Expected Policy Rate	-0.0054*** (0.0014)								
CPI Inflation		-0.0058** (0.0023)		-0.0047*** (0.0015)	-0.0013 (0.0025)	-0.0053*** (0.0014)	-0.0037** (0.0015)	-0.0063*** (0.0016)	-0.0054*** (0.0014)
Unemployment rate		0.0043*** (0.0012)	0.0040*** (0.0011)	-0.0025 (0.0025)	0.0039* (0.0022)				
Industrial Production		0.0009 (0.0015)				-0.0001 (0.0016)			
Expected CPI Inflation			-0.0081* (0.0044)				-0.0057 (0.0051)		
Expected GDP growth			0.0031* (0.0016)					0.0027* (0.0015)	
PMI Composite									-0.0000 (0.0003)
ZEW		-0.0002*** (0.0000)							
Constant	0.0325*** (0.0035)	-0.0037 (0.0126)	-0.0053 (0.0140)	0.0339*** (0.0048)	-0.0121 (0.0251)	0.0324*** (0.0035)	0.0389*** (0.0079)	0.0311*** (0.0033)	0.0326** (0.0130)
Observations	159	158	159	159	159	158	159	159	159
R-squared	0.110	0.213	0.162	0.113	0.121	0.107	0.122	0.125	0.110
Adjusted R-squared	0.105	0.192	0.146	0.102	0.110	0.0952	0.111	0.114	0.0989

Notes: January 2002-December 2015. The econometric method is OLS with Robust standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

Table A.3: The ECB Expected Policy Rate

VARIABLES	(1) Expected Policy Rate	(2) Expected Policy Rate
L.policyrate	0.9691*** (0.0299)	0.9100*** (0.0364)
CPI Inflation	0.0266** (0.0132)	
Unemployment rate	-0.0004 (0.0210)	-0.0378* (0.0223)
PMI Composite	0.0189*** (0.0047)	
ZEW Expectation	-0.0004 (0.0003)	0.0007** (0.0004)
Expected CPI Inflation		0.1121*** (0.0322)
Expected GDP growth		0.0607*** (0.0146)
Constant	-0.9630*** (0.3666)	0.2342 (0.2428)
Observations	158	158
R-squared	0.990	0.991
Adjusted R-squared	0.990	0.991

Notes: January 2002-December 2015. The econometric method is OLS with Robust standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

A.3 List of the macroeconomic series

1. Euribor rate, Source: Thomson Reuters-Datastream
2. Eonia rate, Source: Bloomberg
3. ECB official policy rates, Source: Bloomberg
4. Overnight Indexed Swap rates, Source: Bloomberg
5. Euro Stoxx Volatility Index, Source: Thomson Reuters-Datastream
6. CPI Inflation and GDP growth rate Expectations Current and Next Year, Source: Consensus Economics
7. ECB Macroeconomic Projections Current and Next Year, Source: ECB-SDW
8. SPF Macroeconomic Projections Current and Next Year, Source: ECB-SDW
9. Euro Area CPI year on year, Source: Bloomberg Economic Calendar
10. Euro Area Unemployment rate, Source: Bloomberg Economic Calendar
11. Euro Area Industrial production month on month, Source: Bloomberg Economic Calendar
12. ZEW Expectation of Economic Growth, Source: Bloomberg Economic Calendar
13. PMI Composite, Source: Markit

Table A.4: The ECB announcements of non-standard measures on press conference days

Date	Type	Description
06/09/2007	LTRO	The GovC has today decided to conduct a supplementary liquidity-providing longer-term refinancing operation with a maturity of three months.
08/11/2007	LTRO	The GovC today decided to renew the two supplementary longer-term refinancing operations.
10/01/2008	FOR	The GovC decided to conduct US dollar liquidity-providing operations.
07/02/2008	LTRO	The GovC decided to renew two outstanding supplementary longer-term refinancing operations.
04/09/2008	LTRO	The GovC decided to renew three outstanding supplementary longer-term refinancing operations.
05/03/2009	FRTFA, LTRO	The GovC decided to continue the fixed rate tender procedure with full allotment for all main refinancing operations, special-term refinancing operations and supplementary and regular longer-term refinancing operations.
07/05/2009	LTRO, CBPP1	The GovC decided to purchase euro-denominated covered bonds issued in the euro area, and to conduct liquidity- providing longer-term refinancing operations with a maturity of one year.
04/06/2009	CBPP1	The GovC decided upon the technical modalities of the CBPP1.
03/12/2009	FRTFA, LTRO	The GovC decided to continue conducting its main refinancing operations as fixed rate tender procedures with full allotment, and to enhance the provision of longer-term refinancing operations.
04/03/2010	FRTFA, LTRO	The GovC decided to continue conducting its main refinancing operations as fixed rate tender procedures with full allotment, and to return to variable rate tender procedures in the regular 3-month longer-term refinancing operations.
10/06/2010	LTRO	The GovC decided to adopt a fixed rate tender procedure with full allotment in the regular 3-month longer-term refinancing operations.
02/09/2010	FRTFA, LTRO	The GovC decided to continue to conduct its main refinancing operations as fixed rate tender procedures with full allotment, and to conduct 3- month longer-term refinancing operations as fixed rate tender procedures with full allotment.
02/12/2010	FRTFA, LTRO	The GovC decided to continue to conduct its main refinancing operations as fixed rate tender procedures with full allotment for as long as necessary, and to conduct 3- month longer-term refinancing operations.
03/03/2011	FRTFA, LTRO	The GovC decided to continue to conduct its main refinancing operations as fixed rate tender procedures with full allotment, and to conduct 3- month longer-term refinancing operations as fixed rate tender procedures with full allotment.
09/06/2011	FRTFA, LTRO	The GovC decided to continue to conduct its main refinancing operations as fixed rate tender procedures with full allotment, and to conduct 3- month longer-term refinancing operations as fixed rate tender procedures with full allotment.
04/08/2011	FRTFA, LTRO	The GovC decided to continue conducting its main refinancing operations as fixed rate tender procedures with full allotment, to conduct 3-month longer-term refinancing operations as fixed rate tender procedures with full allotment, and to conduct a liquidity- providing supplementary longer-term refinancing operation with a maturity of six months as a fixed rate tender procedure with full allotment.
06/10/2011	FRTFA, LTRO, CBPP2	The GovC decided to continue conducting its main refinancing operations as fixed rate tender procedures with full allotment, to conduct 3-month longer-term refinancing operations as fixed rate tender procedures with full allotment, to conduct two liquidity- providing supplementary longer-term refinancing operation with a maturity of twelve and thirteen months as a fixed rate tender procedure with full allotment, and to launch a new covered bond purchase program.
03/11/2011	CBPP2	The GovC decided upon the technical modalities of the CBPP2.
08/12/2011	LTRO, COLL	The GovC decided to conduct two longer-term refinancing operations with a maturity of three years, to increase collateral availability.

The ECB announcements of non-standard measures on press conference days (Continued)

Date	Type	Description
09/02/2012	COLL	The GovC approved specific national eligibility criteria and risk control measures for the temporary acceptance in a number of countries of additional credit claims as collateral in Eurosystem credit operations.
06/06/2012	FRTEFA, LTRO	The GovC decided to continue to conduct its main refinancing operations as fixed rate tender procedures with full allotment, and to conduct 3-month longer-term refinancing operations as fixed rate tender procedures with full allotment.
02/08/2012	OMT	The GovC stated that it may undertake outright open market operations of a size adequate to reach its objective.
06/09/2012	OMT, COLL	The GovC announced the technical details of OMT and decided on additional measures to preserve collateral availability.
06/12/2012	FRTEFA, LTRO	The GovC decided to continue conducting its main refinancing operations as fixed rate tender procedures with full allotment, and to conduct 3-month longer-term refinancing operations as fixed rate tender procedures with full allotment.
07/02/2013	FRTEFA	The GovC stated that its monetary policy stance will remain accommodative with the full allotment mode of liquidity provision.
07/03/2013	FRTEFA	The GovC stated that its monetary policy stance will remain accommodative with the full allotment mode of liquidity provision.
04/04/2013	FRTEFA	The GovC decided to continue with fixed rate tender procedures with full allotment.
02/05/2013	FRTEFA, LTRO	The GovC decided to continue the fixed rate tender procedures with full allotment for its main refinancing operations; this procedure applies also on 3-month longer-term refinancing operations.
07/11/2013	FRTEFA, LTRO	The GovC decided to continue the fixed rate tender procedures with full allotment for its main refinancing operations; this procedure applies also on 3-month longer-term refinancing operations.
05/06/2014	TLTRO, COLL, FRTEFA, LTRO, APP	The GovC decided to conduct a series of Target-TLTRO with a maturity of about 4 years and to extend the existing eligibility of additional assets as collateral; to continue conducting the MROs as fixed rate tender procedures with full allotment; to conduct the three-month longer-term refinancing operations to be allotted as fixed rate tender procedures with full allotment. He decided to suspend the weekly fine-tuning operation sterilising the liquidity injected under the Securities Markets Programme and intensified preparatory work for purchases of asset-backed securities.
03/07/2014	TLTRO	The GovC decided upon the technical modalities of the TLTRO.
04/09/2014	APP	The GovC stated that it will purchase a broad portfolio of simple and transparent asset-backed securities under an ABS purchase programme and a broad portfolio of euro-denominated covered bonds under a new covered bond purchase programme.
02/10/2014	APP	The GovC decided upon the technical modalities of the ABSPP and CBPP, including that the programmes will last at least two years.
06/11/2014	APP	Statement on the intention to buy covered bonds and asset-backed securities in order to expand the balance sheet towards the dimension in early 2012.
22/01/2015	APP, TLTRO	The GovC decided to launch an expanded asset purchase programme, encompassing the existing purchase programmes for asset-backed securities and covered bonds, until the end of September 2016. The Governing Council decided to change the pricing of the six remaining targeted longer-term refinancing operations.
05/03/2015	APP	The GovC decided upon the technical modalities of the EAPP, including that the programme will last until the end of 2016.
03/09/2015	APP	ECB signals the possibility of expansion of the EAPP beyond 2016.
03/12/2015	APP, FRTEFA, LTRO	The GovC decided to extend the asset purchase programme until the end of March 2017, or beyond if necessary; to reinvest the principal payments on the securities purchased under the APP; to continue conducting the main refinancing operations and three-month longer-term refinancing operations as fixed rate tender procedures with full allotment.
GovC stands for Governing Council of the ECB		

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Table 1: The ECB Verbal Guidance Index

VARIABLES	(1) index	(2) index	(3) index
L.index	0.2437*** (0.0817)	0.2005** (0.0836)	0.1853** (0.0806)
L2.index	0.4001*** (0.0876)	0.3548*** (0.0898)	0.3429*** (0.0917)
Expected Policy Rate		-0.0026** (0.0012)	-0.0019 (0.0014)
Expected CPI Inflation			-0.0042 (0.0042)
Expected GDP growth			0.0013 (0.0015)
Constant	0.0094*** (0.0023)	0.0163*** (0.0041)	0.0214*** (0.0070)
Observations	157	157	157
R-squared	0.305	0.325	0.333
Adjusted R-squared	0.296	0.312	0.311

Notes: January 2002-December 2015. The econometric method is OLS with Robust standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

Table 2: One-day event-study on k -month-ahead 3-month forward Euribor rate: Baseline model

	k=3	k=6	k=9
Verbal Guidance Shock	-0.2300* (0.1178)	-0.3316** (0.1561)	-0.3802** (0.1865)
Monetary Policy Shock	0.1378*** (0.0323)	0.1347*** (0.0391)	0.1430*** (0.0503)
Draghi	-0.0281** (0.0109)	-0.0315** (0.0146)	-0.0358** (0.0163)
EuroVIX change	-0.0036** (0.0018)	-0.0041* (0.0021)	-0.0055*** (0.0020)
Financial Turmoil	-0.0268 (0.0197)	-0.0204 (0.0278)	-0.0341 (0.0320)
Great Recession	-0.0393*** (0.0123)	-0.0448*** (0.0168)	-0.0449** (0.0193)
EMU Sovereign Debt Crisis	-0.0326*** (0.0106)	-0.0382*** (0.0136)	-0.0394*** (0.0146)
CPI forecast surprise	0.1073** (0.0452)	0.1535** (0.0694)	0.1655** (0.0811)
GDP forecast surprise	-0.0234* (0.0139)	-0.0289 (0.0214)	-0.0462* (0.0239)
Constant	0.0321** (0.0126)	0.0377** (0.0176)	0.0408** (0.0195)
Observations	96	96	96
R-squared	0.309	0.290	0.242
Adjusted R-squared	0.237	0.216	0.162

Notes: September 2007-December 2015. The econometric method is OLS with Robust standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

Table 3: One-day event-study on k -month-ahead 3-month forward Euribor rate: Full model

	k=3	k=6	k=9
Verbal Guidance Shock	-0.2318 (0.1645)	-0.4095** (0.1902)	-0.4303* (0.2285)
Monetary Policy Shock	0.1302*** (0.0361)	0.1297*** (0.0430)	0.1331** (0.0570)
Draghi	-0.0291** (0.0122)	-0.0341** (0.0164)	-0.0385** (0.0184)
EuroVIX change	-0.0036* (0.0019)	-0.0040* (0.0022)	-0.0053** (0.0021)
Financial Turmoil	-0.0275 (0.0206)	-0.0228 (0.0298)	-0.0355 (0.0345)
Great Recession	-0.0410*** (0.0131)	-0.0476*** (0.0180)	-0.0473** (0.0206)
EMU Sovereign Debt Crisis	-0.0328*** (0.0111)	-0.0398*** (0.0142)	-0.0399** (0.0153)
CPI forecast surprise	0.1131** (0.0478)	0.1575** (0.0724)	0.1719** (0.0847)
GDP forecast surprise	-0.0313** (0.0156)	-0.0326 (0.0215)	-0.0540** (0.0246)
Forward Guidance	-0.0357*** (0.0065)	-0.0424*** (0.0093)	-0.0358*** (0.0104)
REF	-0.0068 (0.0088)	-0.0012 (0.0110)	-0.0053 (0.0127)
UMP	0.0051 (0.0094)	0.0087 (0.0122)	0.0107 (0.0127)
Constant	0.0347*** (0.0129)	0.0403** (0.0183)	0.0436** (0.0202)
Observations	96	96	96
R-squared	0.326	0.299	0.249
Adjusted R-squared	0.228	0.198	0.141

Notes: September 2007-December 2015. The econometric method is OLS with Robust standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

Table 4: One-day event-study on k -month-ahead 3-month forward Euribor rate: Extended model

	k=3	k=6	k=9
Verbal Guidance Shock	-0.2598** (0.1204)	-0.3672** (0.1619)	-0.4106** (0.1945)
Monetary Policy Shock	0.1391*** (0.0325)	0.1363*** (0.0394)	0.1443*** (0.0509)
Draghi	-0.0285** (0.0111)	-0.0320** (0.0148)	-0.0362** (0.0165)
EuroVIX change	-0.0037** (0.0018)	-0.0042* (0.0021)	-0.0055*** (0.0020)
Financial Turmoil	-0.0285 (0.0197)	-0.0224 (0.0278)	-0.0358 (0.0320)
Great Recession	-0.0410*** (0.0125)	-0.0468*** (0.0170)	-0.0465** (0.0196)
EMU Sovereign Debt Crisis	-0.0342*** (0.0108)	-0.0401*** (0.0139)	-0.0410*** (0.0150)
CPI forecast surprise	0.1084** (0.0454)	0.1548** (0.0698)	0.1666** (0.0816)
GDP forecast surprise	-0.0238* (0.0139)	-0.0293 (0.0213)	-0.0466* (0.0239)
Forward Guidance	-0.0362*** (0.0065)	-0.0433*** (0.0094)	-0.0369*** (0.0105)
Constant	0.0339*** (0.0127)	0.0398** (0.0179)	0.0426** (0.0199)
Observations	96	96	96
R-squared	0.319	0.297	0.246
Adjusted R-squared	0.239	0.214	0.157

Notes: September 2007-December 2015. The econometric method is OLS with Robust standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

Table 5: One-day event-study on k -month-ahead 3-month forward Euribor rate: Extended Model, Bootstrap Estimation

	k=3	k=6	k=9
Verbal Guidance Shock	-0.2598* (0.1355)	-0.3672* (0.1933)	-0.4106* (0.2103)
Monetary Policy Shock	0.1391*** (0.0493)	0.1363** (0.0658)	0.1443* (0.0816)
Draghi	-0.0285** (0.0114)	-0.0320** (0.0152)	-0.0362** (0.0163)
EuroVIX change	-0.0037* (0.0020)	-0.0042* (0.0025)	-0.0055*** (0.0021)
Financial Turmoil	-0.0285 (0.0191)	-0.0224 (0.0281)	-0.0358 (0.0307)
Great Recession	-0.0410*** (0.0130)	-0.0468*** (0.0173)	-0.0465** (0.0201)
EMU Sovereign Debt Crisis	-0.0342*** (0.0120)	-0.0401*** (0.0149)	-0.0410** (0.0160)
CPI forecast surprise	0.1084** (0.0513)	0.1548** (0.0766)	0.1666* (0.0864)
GDP forecast surprise	-0.0238 (0.0186)	-0.0293 (0.0334)	-0.0466 (0.0338)
Forward Guidance	-0.0362*** (0.0067)	-0.0433*** (0.0099)	-0.0369*** (0.0107)
Constant	0.0339** (0.0135)	0.0398** (0.0177)	0.0426** (0.0198)
Observations	96	96	96
R-squared	0.319	0.297	0.246
Adjusted R-squared	0.239	0.214	0.157

Notes: September 2007-December 2015. The econometric method is OLS with Bootstrapped standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

Table 6: One-day event-study on k -month-ahead 3-month forward Euribor rate: Extended model with alternative verbal guidance index

	k=3	k=6	k=9
Verbal Guidance Shock	-0.2922** (0.1370)	-0.4244** (0.1914)	-0.4812** (0.2278)
Monetary Policy Shock	0.1399*** (0.0336)	0.1374*** (0.0383)	0.1456*** (0.0506)
Draghi	-0.0291** (0.0112)	-0.0329** (0.0150)	-0.0374** (0.0167)
EuroVIX change	-0.0036** (0.0018)	-0.0041* (0.0021)	-0.0054*** (0.0020)
Financial Turmoil	-0.0288 (0.0197)	-0.0230 (0.0276)	-0.0366 (0.0318)
Great Recession	-0.0412*** (0.0126)	-0.0473*** (0.0173)	-0.0472** (0.0199)
EMU Sovereign Debt Crisis	-0.0348*** (0.0111)	-0.0410*** (0.0144)	-0.0421*** (0.0155)
CPI forecast surprise	0.1086** (0.0450)	0.1550** (0.0693)	0.1669** (0.0809)
GDP forecast surprise	-0.0235* (0.0139)	-0.0289 (0.0213)	-0.0461* (0.0238)
Forward Guidance	-0.0358*** (0.0064)	-0.0431*** (0.0095)	-0.0368*** (0.0106)
Constant	0.0344*** (0.0129)	0.0408** (0.0184)	0.0439** (0.0204)
Observations	96	96	96
R-squared	0.322	0.302	0.251
Adjusted R-squared	0.242	0.220	0.162

Notes: September 2007-December 2015. The econometric method is OLS with Robust standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

Table 7: One-day event-study on k -month-ahead 3-month forward Euribor rate: Extended model with “manual” verbal guidance index

	k=3	k=6	k=9
Verbal Guidance Shock (manual)	-0.2964** (0.1306)	-0.4239** (0.1765)	-0.5018** (0.2134)
Monetary Policy Shock	0.1409*** (0.0339)	0.1388*** (0.0387)	0.1473*** (0.0501)
Draghi	-0.0297** (0.0113)	-0.0338** (0.0152)	-0.0387** (0.0170)
EuroVIX change	-0.0036** (0.0018)	-0.0041* (0.0021)	-0.0054*** (0.0020)
Financial Turmoil	-0.0297 (0.0197)	-0.0243 (0.0277)	-0.0384 (0.0319)
Great Recession	-0.0416*** (0.0127)	-0.0478*** (0.0173)	-0.0483** (0.0200)
EMU Sovereign Debt Crisis	-0.0354*** (0.0111)	-0.0419*** (0.0145)	-0.0435*** (0.0157)
CPI forecast surprise	0.1097** (0.0453)	0.1566** (0.0699)	0.1687** (0.0816)
GDP forecast surprise	-0.0223 (0.0140)	-0.0272 (0.0214)	-0.0441* (0.0240)
Forward Guidance	-0.0374*** (0.0067)	-0.0452*** (0.0097)	-0.0398*** (0.0109)
Constant	0.0374*** (0.0133)	0.0449** (0.0190)	0.0492** (0.0212)
Observations	96	96	96
R-squared	0.321	0.300	0.251
Adjusted R-squared	0.241	0.218	0.162

Notes: September 2007-December 2015. The econometric method is OLS with Robust standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

Table 8: Two-day event-study on k -month-ahead 3-month forward Euribor rate: Extended Model

	k=3	k=6	k=9
Verbal Guidance Shock	-0.3526*** (0.1295)	-0.4512** (0.1839)	-0.5291** (0.2021)
Monetary Policy Shock	0.1922*** (0.0545)	0.1901*** (0.0578)	0.1636*** (0.0507)
Draghi	-0.0385*** (0.0120)	-0.0445*** (0.0162)	-0.0506*** (0.0177)
EuroVIX change	-0.0053* (0.0028)	-0.0058* (0.0030)	-0.0072** (0.0030)
Financial Turmoil	-0.0413** (0.0206)	-0.0386 (0.0299)	-0.0465 (0.0330)
Great Recession	-0.0602*** (0.0142)	-0.0671*** (0.0188)	-0.0649*** (0.0201)
EMU Sovereign Debt Crisis	-0.0426*** (0.0116)	-0.0517*** (0.0153)	-0.0519*** (0.0162)
CPI forecast surprise	0.1307*** (0.0487)	0.1817** (0.0766)	0.1887** (0.0832)
GDP forecast surprise	-0.0270 (0.0181)	-0.0301 (0.0282)	-0.0472* (0.0263)
Forward Guidance	-0.0406*** (0.0074)	-0.0478*** (0.0106)	-0.0425*** (0.0111)
Constant	0.0441*** (0.0137)	0.0528*** (0.0193)	0.0579*** (0.0207)
Observations	96	96	96
R-squared	0.401	0.343	0.302
Adjusted R-squared	0.330	0.266	0.220

Notes: September 2007-December 2015. The econometric method is OLS with Robust standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

Table 9: Two-day event-study on Overnight Indexed Swap rates: Extended Model

	3 months	4 months	5 months	6 months	7 months	8 months	9 months	1 year	18 months	2 years
Verbal Guidance Shock	-0.2349 (0.1538)	-0.3493** (0.1543)	-0.3613** (0.1656)	-0.4049** (0.1755)	-0.3474* (0.1859)	-0.3979* (0.2066)	-0.3169 (0.2072)	-0.3270 (0.2401)	-0.1254 (0.3034)	0.0148 (0.3595)
Monetary Policy Shock	0.2916*** (0.0918)	0.3082*** (0.0989)	0.2819*** (0.1003)	0.2376** (0.0909)	0.2548*** (0.0913)	0.2259** (0.0976)	0.2040** (0.0976)	0.2442** (0.1198)	0.2603* (0.1313)	0.3149** (0.1397)
Draghi	-0.0348** (0.0147)	-0.0321** (0.0161)	-0.0349** (0.0172)	-0.0333* (0.0184)	-0.0308 (0.0188)	-0.0312 (0.0197)	-0.0331* (0.0197)	-0.0393* (0.0218)	-0.0263 (0.0266)	-0.0309 (0.0293)
Euro VIX change	-0.0054*** (0.0018)	-0.0064** (0.0025)	-0.0076** (0.0029)	-0.0090*** (0.0030)	-0.0094*** (0.0030)	-0.0097*** (0.0031)	-0.0092*** (0.0025)	-0.0094*** (0.0029)	-0.0123*** (0.0040)	-0.0127*** (0.0042)
Financial Turmoil	-0.0464** (0.0187)	-0.0411* (0.0208)	-0.0448* (0.0233)	-0.0430* (0.0251)	-0.0460* (0.0264)	-0.0486* (0.0280)	-0.0528* (0.0297)	-0.0670** (0.0337)	-0.0635 (0.0400)	-0.0761* (0.0420)
Great Recession	-0.0616*** (0.0174)	-0.0571*** (0.0195)	-0.0549** (0.0218)	-0.0505** (0.0232)	-0.0526** (0.0243)	-0.0483* (0.0262)	-0.0529** (0.0253)	-0.0567* (0.0290)	-0.0331 (0.0353)	-0.0328 (0.0375)
EMU Sovereign Debt Crisis	-0.0331*** (0.0120)	-0.0334** (0.0127)	-0.0345** (0.0133)	-0.0308** (0.0138)	-0.0370*** (0.0139)	-0.0351** (0.0148)	-0.0335** (0.0150)	-0.0383** (0.0168)	-0.0324* (0.0191)	-0.0343* (0.0198)
CPI forecast surprise	0.0772** (0.0322)	0.0792** (0.0386)	0.0834* (0.0449)	0.0785 (0.0497)	0.0990* (0.0536)	0.1073* (0.0575)	0.1112* (0.0627)	0.1280* (0.0706)	0.1471* (0.0842)	0.1445* (0.0856)
GDP forecast surprise	-0.0350 (0.0279)	-0.0284 (0.0241)	-0.0364 (0.0251)	-0.0483* (0.0248)	-0.0628** (0.0286)	-0.0660** (0.0315)	-0.0755** (0.0363)	-0.0874** (0.0395)	-0.0948** (0.0453)	-0.0920** (0.0441)
Forward Guidance	-0.0256*** (0.0061)	-0.0323*** (0.0070)	-0.0388*** (0.0079)	-0.0421*** (0.0085)	-0.0424*** (0.0090)	-0.0488*** (0.0098)	-0.0495*** (0.0097)	-0.0536*** (0.0109)	-0.0596*** (0.0134)	-0.0578*** (0.0142)
Constant	0.0411** (0.0160)	0.0398** (0.0177)	0.0415** (0.0190)	0.0376* (0.0203)	0.0368* (0.0210)	0.0376* (0.0220)	0.0382* (0.0221)	0.0459* (0.0244)	0.0286 (0.0299)	0.0326 (0.0322)
Observations	96	96	96	96	96	96	96	96	96	96
R-squared	0.422	0.405	0.352	0.318	0.333	0.292	0.270	0.251	0.237	0.236
Adjusted R-squared	0.354	0.335	0.276	0.238	0.255	0.209	0.184	0.163	0.147	0.146

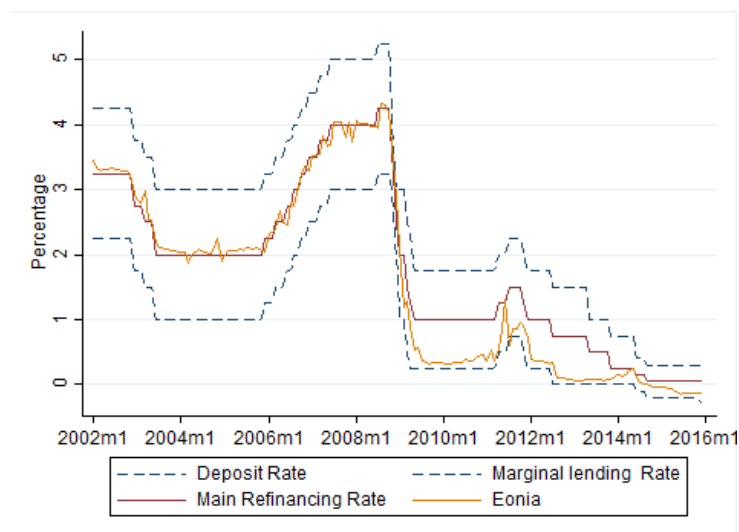
Notes: September 2007-December 2015. The econometric method is OLS with Robust standard errors in parentheses. ***, **, * indicate significance at the 99%, 95% and 90% level, respectively.

Table 10: Order of magnitude of verbal guidance shock and monetary policy shock for $k = 9$ (in basis points)

	(1)	(2)	(3)
$\beta_1 * \sigma_{VGS}$	-0.80	-0.94	-1.03
$\beta_2 * \sigma_{MPS}$	0.69	0.70	0.79

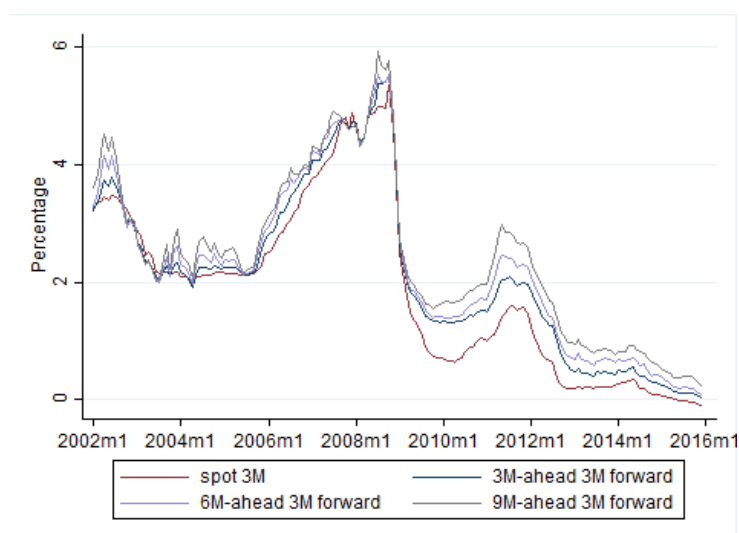
Notes: The table shows the magnitude of the effects for the extended model estimated as: (1) one-day window, (2) one-day window for the verbal guidance index as define in eq. 2, (3) two-day window.

Figure 1: Evolution of the ECB Policy Rates



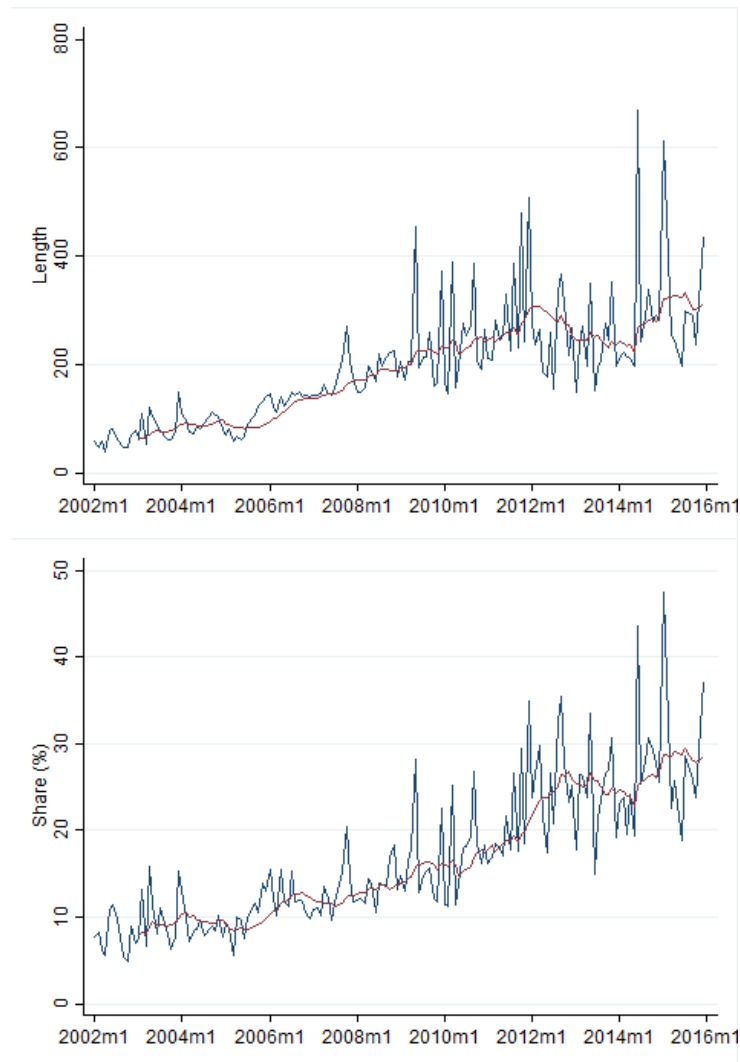
Notes: The graph plots the ECB official policy rates and the Eonia overnight rate. Source: Bloomberg.

Figure 2: Evolution of the Implied Forward Euribor Rate



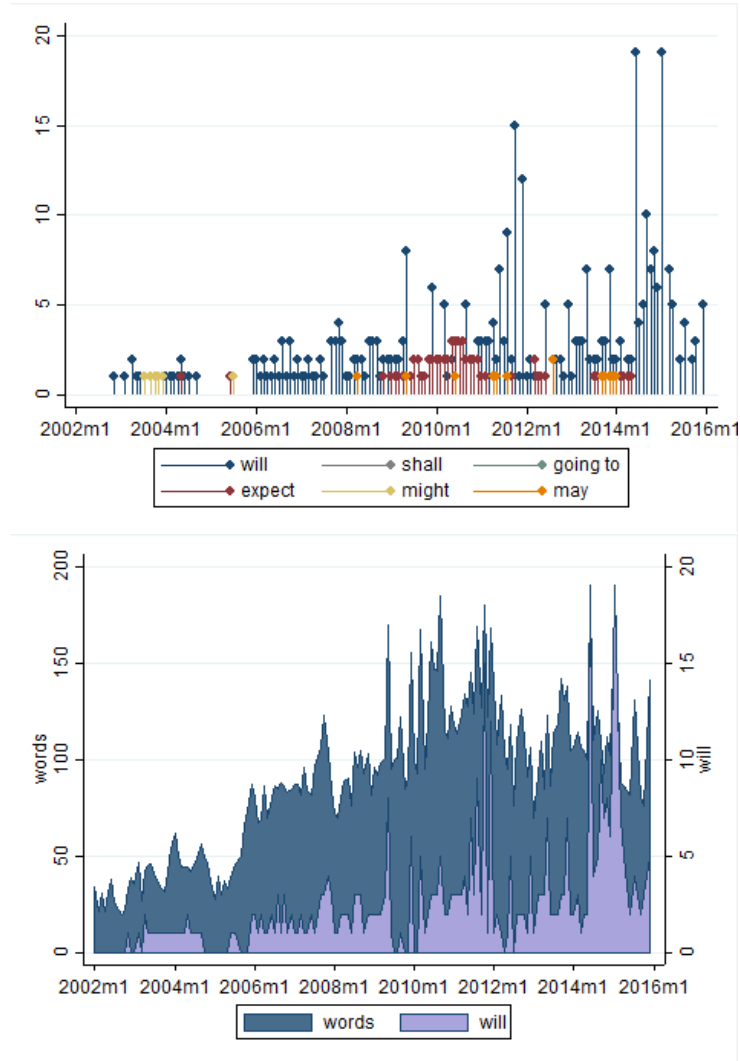
Notes: The graph plots the implied k -month-ahead three month forward rate and the three month spot rate on the ECB press conference days. Source: Thomson Reuters-Datastream.

Figure 3: Evolution of the ECB policy summary



Notes: The top graph reports the number of words of the ECB *policy summary* (blue line) and a moving average covering the previous 12 press conferences (red line). The bottom graph shows the share of the *policy summary* with respect to the Introductory statement (blue line) and a moving average covering the previous 12 press conferences (red line).

Figure 4: Evolution of the future markers



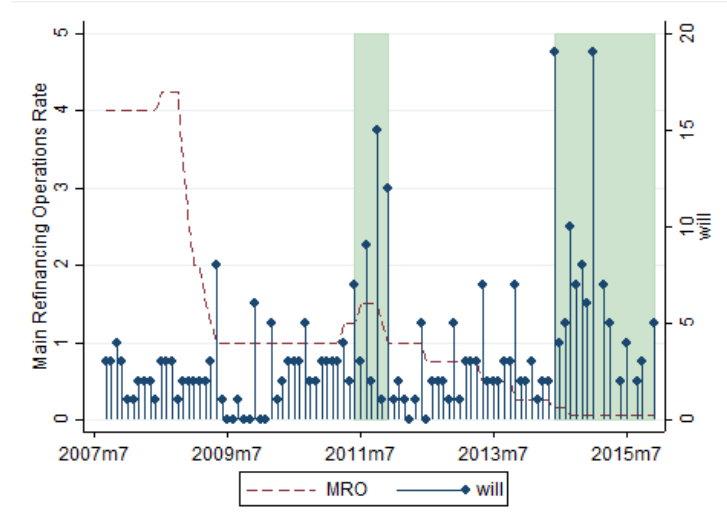
Notes: The top graph shows the number of future markers of the ECB *policy summary*, including *expect*, *may* and *might*. The bottom graph reports the number of words and *will*. The number of words does not include numbers and stopwords. Only words with a sparsity lower than 80% are considered.

Figure 5: The Word Clouds: an overview of the policy summary



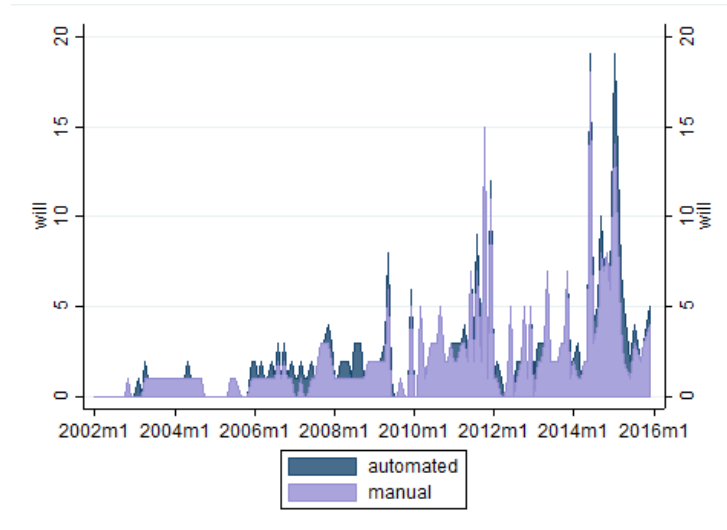
Notes: The 100 most frequent words. The size of each word maps the frequency. The future markers are highlighted in blue for explanatory purpose.

Figure 6: The ECB's MRO rate *versus* the future marker *will*



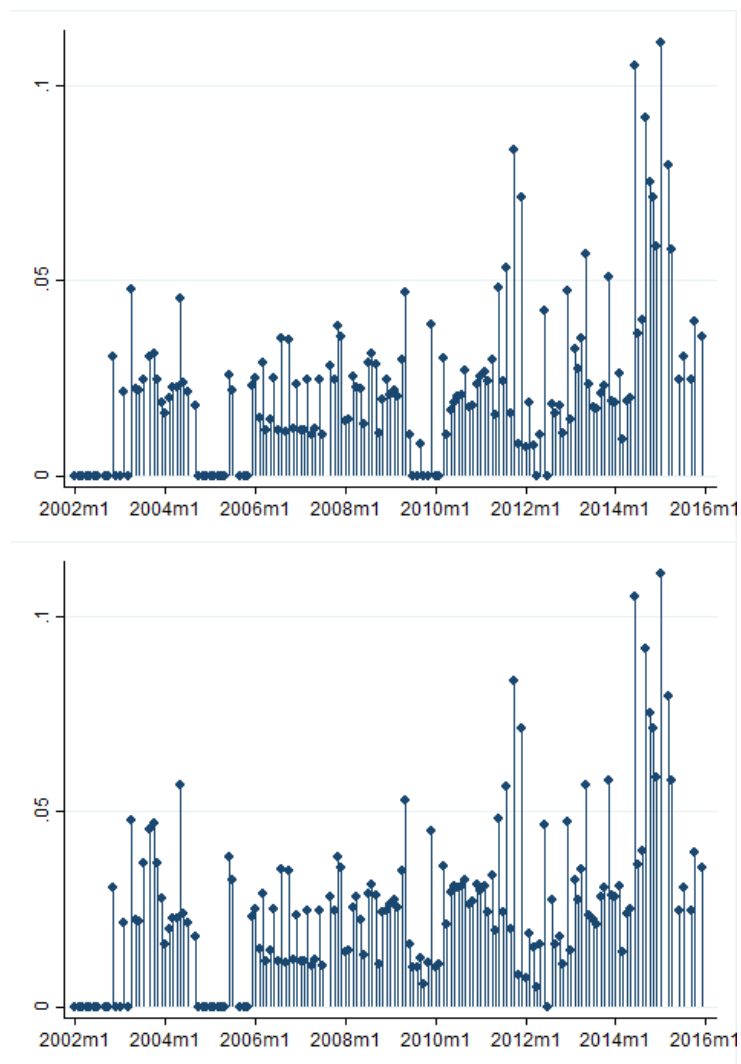
Notes: The graph plots the ECB Main Refinancing Operations Rate and the number of *will* used in the *policy summary*.

Figure 7: *Will*: Automated vs Manual Computation



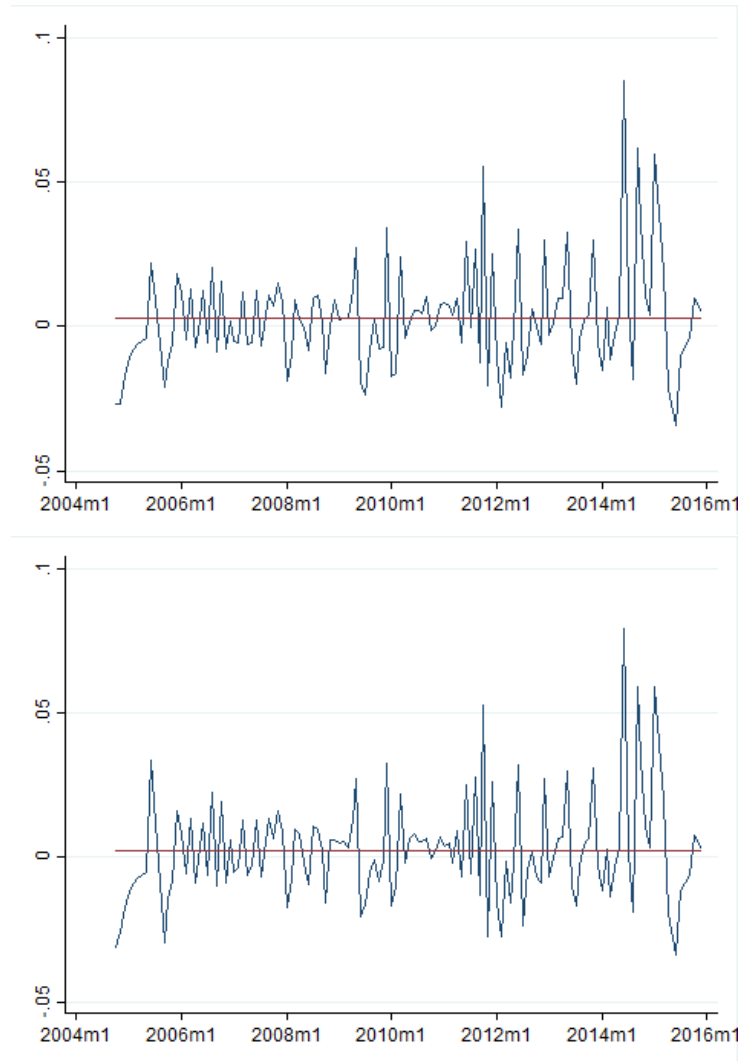
Notes: The graph plots the number of *will* computed through automated approach versus manual computation.

Figure 8: The ECB Verbal Guidance Index



Notes: The top graph reports the ECB Verbal Guidance Index as defined in eq. (1). The bottom graph shows the ECB Verbal Guidance Index as defined in eq. (2).

Figure 9: The ECB Verbal Guidance Shock



Notes: The top graph reports the *VGS* (blue line) and its average (red line) when the index is computed as in eq. (1). The bottom graph shows the *VGS* (blue line) and its average (red line) when the index is computed as in eq. (2).

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