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Does Central Bank Communication Signal Future Monetary Policy? The Case of the ECB

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Abstract:
We examine the European Central Bank's ad-hoc communication and explore how it informs future monetary policy decisions. Using the rich dataset of the inter-meeting verbal communication among the members of the European Central Bank's Governing Council between 2008 and 2014, we construct a measure of communication assessing its inclination towards easing, tightening or maintaining the monetary policy stance. We find that this measure provides useful additional information about future monetary policy decisions, even when we control for market-based interest rate expectations and lagged decisions. Our results also suggest that, in particular, communication shortly before monetary policy meetings, related to unconventional measures and/or by the ECB President explain the future ECB rate changes well. Overall, these results point to the importance of transparency in understanding the future course of monetary policy.
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Keywords: Central bank communication, ECB, monetary policy

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1 Introduction

Central banks currently use a wide set of communication tools to manage financial markets' expectations, and the use of these tools has become more intensive during the financial crisis (Blinder et al., 2017). Many central banks started operating in ultra-low interest rate environments and complemented their conventional monetary policy with a number of unconventional measures, such as asset purchases and forward guidance. As a result, the content of central bank communications has broadened, and central banks have started regularly communicating their views about asset purchases, liquidity conditions or interest rate commitments when referring to the stance of monetary policy.

In this paper, we examine whether central bank communication contributed to better monetary policy predictability during the crisis period (2008-2014) using detailed data on the European Central Bank's (ECB) verbal communication.[1] To our knowledge, this is a novel examination because the empirical literature investigating the effect of communication on monetary policy predictability has largely focused on examining how the voting records and minutes from monetary policy meetings are informative about the future course of monetary policy (Gerlach-Kristen, 2004; Horvath et al., 2012; El-Shagi and Jung, 2015; Jung, 2016). This body of literature almost unanimously finds that voting records improve monetary policy predictability, regardless of whether voting records are attributed.[2]

However, voting records are not available for the ECB, so there is no official record capturing the attitude of individual members of the Governing Council. We therefore collect all relevant verbal communication of the ECB Governing Council (GC) members, i.e., the speeches and interviews between policy meetings[3], and compute a simple indicator of ad-hoc central bank communications based on whether they were dovish, hawkish or neutral statements over time. Then, controlling for financial market expectations, we examine whether this indicator (labeled *comm*) is informative about future monetary policy.

We examine a number of policy-relevant issues regarding the effect of verbal communication on the predictability of monetary policy. First, we focus on how central bank representatives' verbal communication informs monetary policy. Second, we separately measure the effect of communication referring to unconventional measures. Third, we examine how informative verbal communication is for horizons longer than just an upcoming monetary policy meeting. Fourth, we shed light on whether the timing of central bank communication matters, i.e., whether a verbal communication shortly before a monetary policy meeting is more informative. Fifth, we examine whether statements of specific policy members, specifically the ECB President, provide clearer messages and/or better inform markets about future policy changes.

Our results suggest that ECB's ad-hoc verbal communication is relevant for the future course of monetary policy. This result also holds when controlling for interest rate expectations, which suggests that part of the communication is received well and is priced-in by market par-

[1] See de Haan and Jansen (2010) for an overview of ECB communication practices.

[2] Horvath et al. (2012) find that even a simple release of the voting ratio from monetary policy meetings helps predict future monetary policy in the Czech Republic.

[3] This is effectively any time other than on the days of monetary policy meetings.

ticipants, while other parts still add information value to the policy change at a policy meeting to come. Verbal communication focuses largely on the next monetary policy meeting, and it does not help predict monetary policy for longer than the upcoming meeting. Interestingly, we find that communication regarding unconventional measures and communication shortly prior to monetary policy meetings is particularly relevant. The result for the importance of communicating unconventional policies documents how the emphasis of central bank communication changed during the crisis. Finally, we also find that the communication of the ECB President is more addressed, sharper and highly informative about the future course of monetary policy.

The paper is organized as follows. Section 2 provides a brief literature survey. Section 3 introduces the data, and section 4 presents the empirical analysis. We conclude in section 5. Additional figures are available in the Appendix.

2 Related Literature

We provide a brief literature survey in this section and focus largely on empirical studies that examine the effect of central bank communication on the predictability of monetary policy.[4]

Gerlach-Kristen (2004) introduces a framework analyzing whether voting record is relevant to predicting future monetary policy. Using the voting record of the Bank of England's Monetary Policy Committee (MPC), Gerlach-Kristen (2004) develops an indicator (*skew*) and defines it as the difference between the mean and the median of the policy rate voted for by the individual MPC's committee members. In case of consensus, the mean and median coincide, and the *skew* is equal to zero. A positive (negative) value of *skew* suggests that some MPC members prefer higher (lower) rates than the majority. Gerlach-Kristen (2004) finds that *skew* is informative for future monetary policy. This finding suggests that some committee members receive signals about an "optimal" monetary policy rate (and vote accordingly) sooner than other committee members do. This result is also obtained by El-Shagi and Jung (2015) for the UK MPC using data from 1998-2014. Riboni and Ruge-Murcia (2014) also find that *skew* is significant but fail to find evidence that the seniority of MPC members matters.

Similarly to Gerlach-Kristen (2004), Horvath et al. (2012) assess the predictive power of the voting records of five inflation-targeting countries: the Czech Republic, Hungary, Poland, Sweden and the UK. Their results show that voting records are informative in all these countries. Horvath and Jonasova (2015) examine whether voting records are predictive of monetary policy two and three meetings ahead. While the voting records were informative up to three periods ahead prior to the financial crisis, the predictability horizon has shortened during the crisis, and the *skew* is now significant only for the next monetary policy meeting. This result is in line with the theoretical prediction of Horvath et al. (2016), who show that heightened volatility may blur the signal that the voting record typically provides.

The theoretical literature (Riboni and Ruge-Murcia, 2014; Horvath et al., 2016) examines the conditions under which *skew* is likely to be significant. The literature shows that

[4]We refer the reader to Blinder et al. (2008, 2017) for surveys regarding central bank communication.

the individual committee members must be heterogeneous (either having different preferences and information sets or different signals) and that the decision-making process regarding the monetary policy votes must allow for some degree of dissent. In addition, the votes must be non-strategic (i.e., each member casts a vote that, according to her/his opinion, maximizes the welfare of the economy, thus not giving a false signal to influence the deliberations of other committee members). The simulations of the model developed in Horvath et al. (2016) also suggest that the predictive power of *skew* increases with committee size (up to some reasonable size observed in real-world central bank committees) but worsens in more volatile economic environments and when committee members have less precise information about the state of the economy.

For the ECB, given that the voting records are not available, Pesci (2016) develops an alternative measure of future monetary policy stance based on the content of articles published by the media in the days around meetings of the ECB's GC (three-day intervals centered on ECB's monetary policy decisions). His measure is based on a script that searches articles for predefined combinations of words and counts their aggregate intensities. Each presence of any sequence is given a score of 1, -1 or 0, reflecting, respectively, a hawkish, dovish or neutral policy stance.[5] Pesci (2016) finds that his measure of ECB's monetary policy stance is informative about future monetary policy and that changes in the perception of the ECB's stance are due to the new information conveyed by the ECB president press conference.

Tobback et al. (2017) also develop a content-based indicator of the media's perception of the ECB policies, but in addition to the mechanistic approach of using predetermined words (semantic orientation), they use a classification model to predict the tone of the article to assess the language used at each press conference (Support Vector Machines method). They find that the latter method produces more reliable results, concluding that such an index could then be used to analyse the terms that are most frequently employed by media in relation to a likely future course of monetary policy. After inserting what they call the HD index to an extended Taylor rule, they find a positive role for ECB communication in enhancing the accuracy of market expectations, with the policy messages being well understood by media watchers.

This paper aims to complement the picture. While pursuing the same goal of shedding more light on how the ECB communication sharpens the market expectations, e.g., how informative the central bank communication is for the future monetary policy decisions, it focuses on ad-hoc communication between policy meetings rather than official communication in and around the meetings, as is the case in the aforementioned studies.

Certainly, collecting first-hand statements from policy makers could exhibit some different properties than having to rely on media coverage. In this regard, there is also related literature that assesses the ECB communication but does not focus on the monetary policy predictability. Jansen and de Haan (2005) examine the statements of ECB officials and find that these statements affect the conditional volatility rather than the conditional mean of the euro–dollar exchange rate. Jansen and de Haan (2009) estimate various Taylor rules for the

[5]Hawkishness is characterized in this paper as the willingness of a central bank to raise its policy rates in the near future, and dovishness represents the willingness to decrease it. A neutral stance represents the *status quo*.

ECB and show how written ECB communication helps in understanding how monetary policy rate is set. However, out-of-sample forecasting exercises suggest that central bank communication does not add predictive power to monetary policy rate forecasting based on macroeconomic data. Sturm and De Haan (2011) also examine ECB communication within the Taylor rule. Focusing on various aspects of communication measures based on the ECB President's introductory statement at the press conference, they find that the communication is informative for monetary policy decisions. Hayo and Neuenkirch (2010) examine US Fed verbal communication in 1998-2006 and construct a communication indicator as we do in this paper. Using this indicator, they estimate Taylor rules for the US Fed and find them to be relevant for monetary policy setting. Gertler and Horvath (2018) examine the effect of ECB ad-hoc communication on European financial markets using high-frequency data. The communication has the strongest effect on interest rates and the stock market, but the exchange rate response is weak.

3 Data

We draw from a rich database of verbal statements by the ECB's GC members that have appeared in Reuters News, are forward-looking and refer to monetary policy (either conventional or unconventional), inflation or economic outlook. Therefore, in contrast to many papers in this field, we do not utilize the voting record (given the consensual nature of actual monetary policy decision-making in the ECB, the voting record is not available) but instead construct a central bank communication indicator. This approach is supported by Bennani and Neuekirch (2017), who suggest the possibility of substituting the voting records of the ECB with speeches made by national central bank governors and Executive Board members to reveal their monetary policy preferences.

More precisely, we employ the ECB's GC communication dataset used in Gertler and Horvath (2018), which contains information on inter-meeting communication by the ECB's GC during the period 2008M06 - 2014M01. We focus only on communication with a forward-looking component, thereby obtaining 1384 policy statements. Gertler and Horvath (2018) classify each communication event into three categories depending on whether the communication event implies monetary tightening or easing (or *status quo*). Then, a value of 1 is assigned to a communication event expressing an upward risk to price stability, positive economic outlook or preference for future policy tightening, including unwinding unconventional policies. A value of -1 is assigned to opposite cases, and a value of 0 was assigned if communication is neutral in terms of economic outlook, price stability and monetary policy stance. We group these data into 66 inter-meeting intervals as follows.[6]

Let us denote the communication event as i and the inter-meeting period as τ, where τ is bounded between the monetary policy meetings in time t and $t+1$. The assigned value of

[6]During the period under scrutiny, the ECB's GC meetings were typically held on Thursdays of the first and third weeks of each month, but monetary policy itself was assessed only at the first meeting of the month. Therefore, we use monthly frequency in the time series. Modifications of the voting scheme introduced in 2015 do not apply because our sample ends in 2014.

the individual communication event is denoted as g_i, where $g_i \in \{-1, 0, 1\}$, and we denote that communication event g_i belongs to time period τ as $g_{i,\tau}$. Hence, the general communication indicator *comm* is defined as

$$comm_\tau = average(g_{i,\tau}) \tag{1}$$

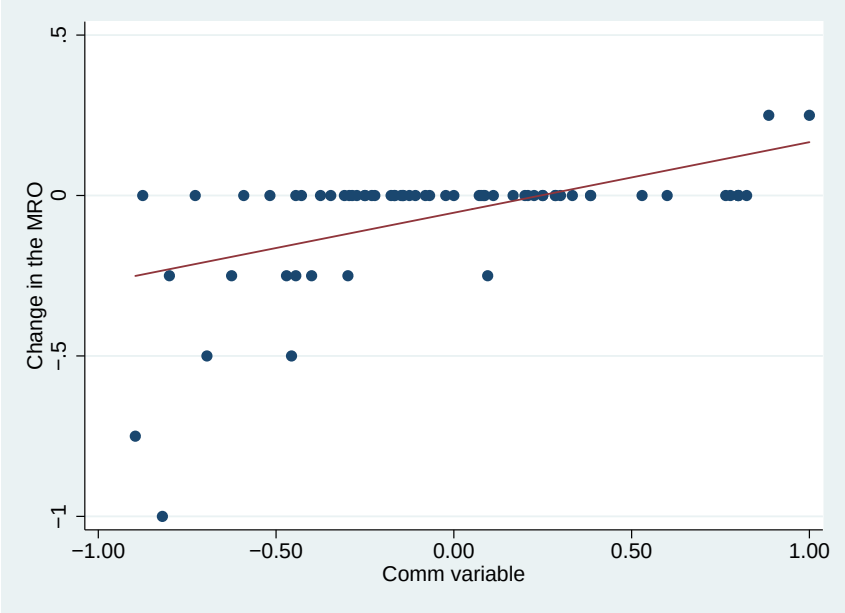
While our baseline estimations use $comm_\tau$, we use several more specific definitions of $comm_\tau$ to examine the predictive power of ad-hoc central bank communication by segments of interest. These specific definitions are summarized in Table 1.

Table 1: Specific ECB communication, *comm*, definitions

Variable	**Description**
Purdah-omitting *comm*	*comm* excluding all statements within 7 days before the GC meeting
Purdah-*comm*	*comm* within 7 days before the GC meeting
Presidential *comm*	*comm* of the ECB president alone
Monetary policy *comm*	*comm* related exclusively to monetary policy

For illustration, in Figure 1, we present a scatter plot of the $comm_\tau$ indicator vis-a-vis the future monetary policy rate change Δi_{t+1}.[7] Figure 2 presents the link between $comm_\tau$ and Δi_{t+1} over time. Both figures suggest a positive relationship, namely that higher (lower) values of $comm_\tau$ tend to be associated with rate hikes (cuts) at the upcoming policy meetings.

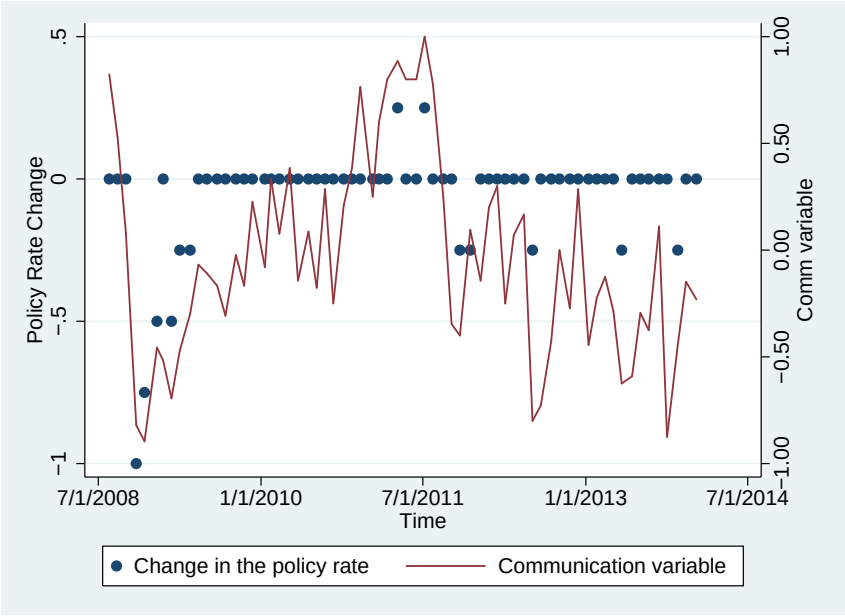
Figure 1: ECB's communication and changes to monetary policy



Notes: The figure presents the ECB's verbal communication indicator $comm_\tau$ and future monetary policy rate change Δi_{t+1}.

[7]Note that infrequent large policy cuts are stacked into one category in the regression analysis reducing the effect of outliers; more on this in the following section.

Figure 2: ECB's communication and changes to monetary policy over time



Notes: The figure presents the ECB's verbal communication indicator $comm_\tau$ and future monetary policy rate change Δi_{t+1} over time.

4 Empirical analysis

4.1 The Baseline Model: Does ECB Communication Signal Future Monetary Policy?

We broadly follow the econometric methodology of Gerlach-Kristen (2004) and Horvath et al. (2012) and use an ordered probit model to assess the significance of the central bank communication ($comm_\tau$) for the policy decision made at the upcoming policy meeting. The dependent variable reflects the changes in the main refinancing operation rate (MRO) and is split into categories depending on the magnitude: large rate cuts (-50 bpts or more), rate cuts (-25 bpts), no change and rate hikes (+25 bpts). Since large-magnitude policy changes rarely happen, all rate cuts larger than 25 basis points are stacked in one category.[8] As a consequence, this reduces the number of categories to 4 in total. The baseline model is defined as follows:

$$\Delta i_{t+1} = a_0 + a_1 \Delta i_t + a_2 comm_\tau + u_{t+1} \tag{2}$$

where Δi_t is the change in the MRO at time t and $comm_\tau$ represents the central bank communication variable obtained from the statements published between monetary policy meetings at t and $t+1$.

Furthermore, it is possible that information included in past communications ($comm_\tau$) has been absorbed into the monetary policy expectations. In such a case, central bank commu-

[8] No monetary policy hikes above 25 basis points occurred in the observed period. The number of categories was set according to the log-likelihood of competing models.

nication $comm_\tau$ would provide less additional information for the upcoming monetary policy actions. Following Gerlach-Kristen (2004), we expect financial market expectations to be expressed by the term structure, defined as a slope in the money market curve. We use the Euribor 1-, 3- and 12-month market rates.[9] The term structure for time t is computed for the last trading day preceding the day of the monetary policy meeting held at time $t+1$. The model including the term structure has the following form:

$$\Delta i_{t+1} = a_0 + a_1 \Delta i_t + a_2 comm_\tau + a_3(i_{t,L} - i_{t,S}) + u_{t+1} \tag{3}$$

where $i_{t,L}$ and $i_{t,S}$ represent a money market rate with a longer and shorter maturity one day before the monetary policy decision.

Table 2: Information content of communication for policy decision

	Base model	*12_3*	*12_1*	*3_1*
Δi_t	0.13 (0.28)	-0.21 (0.35)	0.14 (0.29)	0.06 (0.3)
Comm_τ	1.84*** (0.55)	1.27** (0.56)	1.47** (0.59)	1.92** (0.6)
Term structure	-	5.05** (1.97)	1.95* (1.07)	-0.93 (1.68)
Threshold -50	-1.72*** (0.57)	-0.31 (0.81)	-0.45 (0.96)	-2.06** (0.92)
Threshold -25	-1.05* (0.56)	0.51 (0.78)	0.26 (0.91)	-1.4 (0.88)
Threshold +25	2.79*** (0.67)	4.79*** (1.01)	4.24*** (1.02)	2.47*** (0.86)
Log-likelihood	-37.96	-33.13	-36.29	-37.83
Pseudo R^2	16.75%	24.73%	18.14%	13.93%

Notes: Robust standard errors are reported in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. Pseudo R^2 represents adjusted Mc Fadden pseudo R^2. The columns 12_3, 12_1, and 3_1 denote maturities in months of the appropriate money market curve.

We present the regression results in Table 2. Controlling for the lagged changes in policy rate, the coefficient a_2 (for *comm*) is positive and statistically significant, suggesting that ECB communication in general indeed signals future policy actions well. This result holds, even after controlling for financial market expectations (at various maturities), suggesting that communication adds information value and is not fully priced-in by financial markets. Hence, the baseline result suggests that transparent and clear communication has the capacity to improve monetary policy predictability.

Note that the coefficient a_2 is greater than one, but this does not suggest any potential non-stationarity because an ordered probit is a non-linear estimator. The values of McFadden's pseudo-R^2 are similar to those reported in Horvath et al. (2012). The figures presented in the

[9] We avoid using the EONIA rate for its observed spikes at the end of each maintenance period prior to 2012. The end of the maintenance period could coincide with the last trading date preceding the policy meeting (the date when measure of market expectations is calculated); hence, a slope of the money market curve defined with EONIA could be subject to bias.

Appendix provide a visual examination of the relationship between central bank communication *comm*, policy changes and financial market expectations.

4.2 Looking more periods ahead

As shown by Horvath and Jonasova (2015), the dissent that is expressed during a policy meeting may signal a change in the policy rate in the next meeting and for meetings further ahead. The rationale behind is that it may take some time for the majority of central bank board members to receive a new signal about the economy (one of the commonly mentioned possibilities is that it takes time for the so-called early bird central bankers to convince the rest of the board members about the necessity of a policy adjustment). Therefore, we investigate the relation between central bank communication *comm* and changes in the ECB's policy rate more than one meeting ahead. The estimations below cover two and three periods ahead and include the lagged interest rate change and the term structure:

$$\Delta i_{t+n} = a_0 + a_1 \Delta i_t + a_2 comm_\tau + u_{t+n} \tag{4}$$

$$\Delta i_{t+n} = a_0 + a_1 \Delta i_t + a_2 comm_\tau + a_3 (i_{t.L} - i_{t.S}) + u_{t+n} \tag{5}$$

where n stands for the n^{th} period after t.

Table 3: Information content of communication, two meetings ahead

	Base model	*12_3*	*12_1*	*3_1*
Δi_t	0.35 (0.31)	-0.11 (0.3)	0.33 (0.3)	0.31 (0.32)
Comm_τ	0.46 (0.42)	-0.37 (0.51)	-0.01 (0.49)	0.5 (0.42)
Term structure	-	6.35*** (1.88)	2.39** (0.99)	-0.65 (1.79)
Threshold -50	-0.9 (0.64)	0.81 (0.87)	0.6 (0.92)	-1.12 (0.85)
Threshold -25	-0.33 (0.6)	1.58* (0.86)	1.23 (0.9)	-0.56 (0.85)
Threshold +25	2.62*** (0.71)	5.08*** (1.17)	4.36*** (1.12)	2.4** (0.96)
Log-likelihood	-45.07	-37.28	-42.27	-44.99
Pseudo R^2	1.93%	16.07%	5.68%	0.02%

Notes: Robust standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Pseudo R^2 represents adjusted Mc Fadden pseudo R^2. The columns 12_3, 12_1, and 3_1 denote maturities in months of the appropriate money market curve.

The results describing the effect of the ECB communication on policy changes two meetings ahead are presented in Table 3. The *comm* variable is insignificant in all the estimated models. The estimation results are also associated with a lower pseudo-R^2, indicating a decrease in the goodness-of-fit. Therefore, while the previous results suggest that the ECB ad-hoc communication matters for the next policy meeting, it does not seem to matter at more distant

horizons (it is very likely that a signal fades out or is overlaid by a flow of other information arriving over time). This confirms the findings of the previous literature that most of the ad-hoc verbal interventions are short-lived.[10]

In Table 4, we provide the estimates of the information content of the ECB communication for monetary policy three meetings ahead. The results are consistent with those presented in Table 3 and confirm that ad-hoc central bank communication *comm* does not have effects longer than one meeting ahead.

Table 4: Information content of communication, three meetings ahead

	Base model	*12_3*	*12_1*	*3_1*
Δi_t	0.59** (0.28)	0.16 (0.27)	0.54* (0.28)	0.55* (0.29)
Comm_τ	-0.13 (0.41)	-0.85 (0.55)	-0.55 (0.49)	-0.09 (0.38)
Term structure	-	5.28*** (1.93)	2.09* (1.11)	-0.74 (1.79)
Threshold -50	-0.42 (0.59)	0.98 (0.89)	0.87 (0.96)	-0.68 (0.79)
Threshold -25	0.14 (0.53)	1.69* (0.87)	1.48 (0.93)	-0.11 (0.77)
Threshold +25	3.02*** (0.62)	4.9*** (1.15)	4.49*** (1.11)	2.77*** (0.83)
Log-likelihood	-45.40	-39.65	-43.34	-45.29
Pseudo R^2	1.25%	11.15%	3.44%	-0.61%

Notes: Robust standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Pseudo R^2 represents adjusted Mc Fadden pseudo R^2. The columns 12_3, 12_1, and 3_1 denote maturities in months of the appropriate money market curve.

4.3 Signal from statements about unconventional policies

Since the global financial turmoil in 2007, central banks around the world started implementing various unconventional policy measures beyond conventional interest rate adjustments. We follow the methodology of Borio and Zabai (2016) to classify each statement as related to either conventional or unconventional monetary policy.[11] For the two separate classes of statements, we then calculate two alternative measures of central bank communication. In doing so, we aim to assess the link between communication about unconventional monetary policy and future changes of ECB's policy rate separately.[12] Therefore, we estimate the following model:

$$\delta i_{t+1} = a_0 + a_3 \Delta i_t + a_2 comm_{\tau,unconv} + a_3 comm_{\tau,conv} + a_4(i_{t,L} - i_{t,S}) + u_{t+1} \qquad (6)$$

[10]For example, Blinder et al. (2017) argue that central banks often speak with too many conflicting voices.

[11]Borio and Zabai (2016) consider balance sheet policies, forward guidance and negative policy rates as unconventional measures.

[12]Note that we exclude those communication events that include statements related to both conventional and unconventional policy simultaneously.

where $comm_{\tau,unconv}$ represents the communication of unconventional policy measures and $comm_{\tau,conv}$ represents the communication of conventional short-term interest rate policy.

Table 5: Communication of conventional and unconventional measures separately

	Base model	*12_3*	*12_1*	*3_1*
Δi_t	0.08 (0.27)	-0.23 (0.33)	0.09 (0.27)	0.06 (0.3)
$comm_{\tau.unconv}$	1.48*** (0.44)	1.26*** (0.43)	1.43*** (0.45)	1.47*** (0.45)
$comm_{\tau.conv}$	0.72 (0.48)	0.4 (0.44)	0.4 (0.51)	0.74 (0.54)
Term structure	-	4.54** (1.89)	1.93* (1.14)	-0.23 (1.92)
Threshold 1	-2.03*** (0.57)	-0.74 (0.69)	-0.77 (0.9)	-2.12** (0.95)
Threshold 2	-1.27** (0.59)	0.21 (0.64)	0.07 (0.86)	-1.36 (0.92)
Threshold 3	3.06*** (0.67)	4.87*** (0.99)	4.53*** (1.14)	2.98*** (0.96)
Log-likelihood	-34.29	-30.65	-32.77	-34.29
Pseudo R^2	22.30%	27.80%	23.40%	20.23%

Notes: Robust standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Pseudo R^2 represents adjusted Mc Fadden pseudo R^2. The columns 12_3, 12_1, 3_1 denote maturities in months of the appropriate money market curve.

We present the results in Table 5. The results show that the communication of unconventional monetary policy $comm_{\tau,unconv}$ is statistically significant in all regression specifications and therefore helps predict the future changes in the ECB's policy rate. On the other hand, $comm_{\tau,conv}$ is statistically insignificant in all specifications. However, this result should not come as a surprise.

Since conventional policy and its communication are fairly standard, the market is typically able to read signals very well. In general, market participants price-in most of the information they understand into the yield curve (or money market curve). Therefore, if we separate ad-hoc communication on conventional policy, i.e., communication exclusively about interest rate policies, the future rate adjustments can be almost fully explained by the money market curve. In fact, this means that market has learned to read central bank communication on policy rates very well.

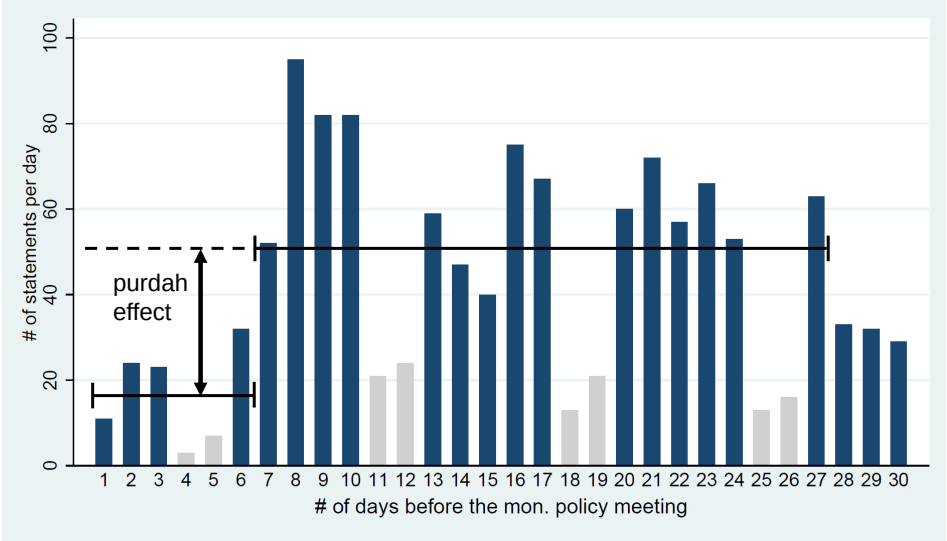
On the other hand, unconventional policies are still fairly new and diverse. Moreover, our sample ranges between 2008 and 2014, i.e., the period that closely corresponds to the first encounter of most of the unconventional policies in the euro area. Therefore, we believe that the market has been gradually learning to understand signals from ad-hoc central bank communication of unconventional policies. Still, the communication of conventional and unconventional policies tends to be collinear; i.e., communication of conventional easing policies takes place simultaneously with communication of unconventional policies, and the same applies for round(s) of tightening. Communication of unconventional policies in the form of ad-hoc policy statements

therefore proves to incorporate extra information that helps predict future conventional policy decisions. Further, this means that part of this communication by the Governing Council has not been fully understood by the markets or perhaps that there is just too much noise involved in communication from individual members of such a diverse body of policymakers.

4.4 The effect of the Purdah period

Central banks typically abstain from major statements prior to monetary policy meetings to avoid the risks of excessive volatility in financial markets. The term purdah was coined for this phenomenon (Ehrmann and Fratzscher, 2009). The ECB follows a 7-day purdah period prior to monetary policy meetings. We present a histogram in Figure 3, which shows considerably fewer policy statements in the week before a policy meeting (i.e., in the purdah period).

Figure 3: Frequency of ECB ad-hoc communication between policy meetings



Notes: Purdah effect represents the difference between the average of statements in the non-Purdah vs. Purdah period, except the statements made during the weekend. The weekend statements are in grey color, the statements during working days are in black. The Purdah period is defined as the communication in less than 7 days prior to monetary policy meeting.

The motivation comes from Ehrmann and Fratzscher (2009), who provide evidence showing that there is a link between US interest rates' volatility and purdah communication. Following this line of thought, we aim to test the effect of ad-hoc communication recorded just a few days prior to policy meetings, since these (in the US case) "*have a large effect on US interest rates, about three to four times larger than those in the intermeeting period outside the purdah*" (Ehrmann and Fratzscher, 2009).

To test the importance of purdah communication, we distinguish two groups of communication: statements that occur during the purdah period and statements outside purdah. We assess the effect of both of these communication variables separately on the predictability of

future ECB's policy rate. We estimate the following equation:

$$\Delta i_{t+1} = a_0 + a_1 \Delta i_t + a_2 comm_{\tau,non-purdah} + a_3 comm_{\tau,purdah} + a_4(i_{t.L} - i_{t.S}) + u_{t+1} \quad (7)$$

Table 6: Timing of communication: The effect of Purdah

	Base model	*12_3*	*12_1*	*3_1*
Δi_t	0.06 (0.28)	-0.39 (0.34)	0.07 (0.29)	-0.03 (0.31)
$comm_{\tau.non-purdah}$	1.44** (0.57)	0.72 (0.65)	1.04 (0.64)	1.52** (0.61)
$comm_{\tau.purdah}$	0.71** (0.29)	1.02** (0.42)	0.8** (0.34)	0.72** (0.3)
Term structure	-	6.28*** (2.06)	2.26** (1.11)	-1.2 (1.78)
Threshold -50	-1.96*** (0.58)	-0.45 (0.9)	-0.59 (1.06)	-2.41** (1.01)
Threshold -25	-1.27** (0.56)	0.44 (0.88)	0.16 (1.00)	-1.72* (0.95)
Threshold +25	2.82*** (0.72)	5.51*** (1.15)	4.59*** (1.13)	2.4*** (0.92)
Log-likelihood	-37.05	-31.22	-35.18	-31.83
Pseudo R^2	16.56%	26.62%	18.37%	25.35%

Notes: Robust standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Pseudo R^2 represents adjusted Mc Fadden pseudo R^2. The columns 12_3, 12_1, and 3_1 denote maturities in months of the appropriate money market curve.

Table 6 shows the results of the estimations. Ad-hoc communication shortly before monetary policy meetings is informative for policy changes in all specifications; therefore, we confirm that making a policy statement shortly before a meeting tends to be more informative.

While non-purdah communication is more frequent and more noisy, its effect on the market is naturally weaker. Additionally, non-purdah communication more often relates to information that was available to the past meeting and therefore has already been absorbed by market expectations. On the other hand, purdah communication is less frequent; therefore, naturally, more attention is paid to it. The rationale is straightforward. In fact, any communication in the purdah period violates the silence agreed upon by policy makers and therefore is very likely to be of substance. The combination of such communication being of the essence and the shortness of time that remains until the next meeting makes it more likely that such communication is relevant to actual policy change.

Hence, while both purdah and non-purdah communications seem to matter, the purdah communication is particularly relevant. This result is broadly in line with that of Ehrmann and Fratzscher (2009). The significance of purdah *comm* in all regression specifications and the insignificance of non-purdah *comm* in some specifications may also suggest that it takes time for financial markets to process central bank news.

Another interesting finding that we may observe from Table 6 is that when the policy

rate responds to the slope of the money market curve, an ad-hoc statement that is made shortly before the meeting becomes more relevant. Developments in interest rate expectations naturally urge questions to be answered by policy makers, regardless of whether they are in a quiet period. If market expectations do meet with confirmatory ad-hoc communication, it is very likely to be the correct signal.

The results also confirm the importance of controlling for market expectations, which better reflect the monetary policy horizon. A term structure of a couple months does not capture the market expectations as well as would be observed if it stretched to closer to the monetary policy horizon (we use 12 months). The column on the far right of Table 6 confirms that ad-hoc communication may be informative for the policy rate if the market expectations are formulated inadequately.

4.5 The Role of the ECB President

As outlined earlier, large heterogeneity among the decision making body may introduce some noise into ad-hoc communication, which makes it more difficult for market agents to price in their expectations about future policy changes. It is therefore worthwhile to see how informative the ad-hoc communication of the President is separately.

Following Riboni and Ruge-Murcia (2010), we test whether presidential status in the ECB's GC matters for the prediction of future changes in policy rate. More precisely, we test whether it is sufficient to follow the communication of the ECB President separately for better understanding future ECB rate changes. Numerous market commentators and empirical evidence (for example, Gertler and Horvath (2018)) have attributed to the ECB President a critical role in terms of communicating policy and affecting the financial markets. The opinion of the ECB President may have greater weight because he presides over the discussion in the decision-making body, and because the President is more likely to communicate the strategic intentions of the central bank, his opinion may be more informative. The observed period incorporates 3 years of the presidential term of Jean-Claude Trichet and 3 years of the term of Mario Draghi.

We derive the communication variable based exclusively on the ECB's President's statements between GC meetings and make this subject to the same analysis.

$$\Delta i_{t+1} = a_0 + a_1 \Delta i_t + a_2 presidential\_comm_\tau + a_3(i_{t,L} - i_{t,S}) + u_{t+1} \tag{8}$$

Table 7 shows the results. The ECB President's communication appears to be significantly related to future changes in the central bank's policy rate, as shown by the positive and significant coefficients. At the same time, market expectations also explain future policy better. These results suggest that although the character of the President's communication is well anticipated by the markets (the slope of the money market curve explains future policy better than in the full sample), there is still extra value in these statements that do have capacity to inform future policy rate decisions. The analysis thus shows that ad-hoc communication of the

ECB President is clearer, or perhaps more consistent, than the variety of communications from GC members and remains informative for future policy rate changes.

Table 7: The effect of ECB President's communication

	Base model	*12_3*	*12_1*	*3_1*
Δi_t	0.46* (0.25)	-0.08 (0.32)	0.38 (0.27)	0.44* (0.27)
President_comm$_\tau$	0.89*** (0.28)	0.72** (0.33)	0.72** (0.3)	0.91*** (0.33)
Term structure	-	5.79*** (1.86)	2.47** (1.01)	-0.4 (1.78)
Threshold -50	-1.0** (0.44)	0.27 (0.64)	0.39 (0.78)	-1.14 (0.82)
Threshold -25	-0.37 (0.46)	1.1* (0.64)	1.09 (0.75)	-0.5 (0.82)
Threshold +25	3.09*** (0.63)	5.3*** (0.98)	4.88*** (0.97)	2.96*** (0.84)
Log-likelihood	-40.34	-33.30	-37.36	-40.31
Pseudo R^2	11.79%	24.37%	15.92%	9.76%

Notes: Robust standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and and 1% levels, respectively. Pseudo R^2 represents adjusted Mc Fadden pseudo R^2. The columns 12_3, 12_1, and 3_1 denote maturities in months of the appropriate money market curve.

Again, we split the statements into those that relate to conventional policies and those that relate to unconventional policies to replicate the divide that we have observed in the full sample.

Table 8: The effect of ECB President by type of communication

	Base model	*12_3*	*12_1*	*3_1*
Δi_{t-1}	0,38* (0,21)	-0,16 (0,29)	0,32 (0,24)	0,35 (0,22)
President_conv_comm$_\tau$	0,56** (0,27)	0,22 (0,28)	0,37 (0,3)	0,57* (0,29)
President_unconv_comm$_\tau$	1,19*** (0,32)	1,31*** (0,34)	1,18*** (0,32)	1,2*** (0,34)
Term structure	-	6,58*** (1,89)	2,65** (1,09)	-0,37 (1,84)
Threshold 1	-1,43*** (0,41)	0,04 (0,61)	0,06 (0,76)	-1,56* (0,86)
Threshold 2	-0,66 (0,41)	1,16** (0,55)	0,96 (0,7)	-0,78 (0,78)
Threshold 3	2,93*** (0,59)	5,57*** (1)	4,92*** (0,96)	2,8*** (0,78)
Log-likelihood	-36,48	-28,96	-33,38	-36,46
Pseudo R^2	17,74%	31,33%	22,12%	15,70%

Notes: Robust standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The columns 12_3, 12_1, and 3_1 denote the inclusion of financial market expectations and 1, 3 and 12 denote the maturity of 1, 3 and 12 months, which enter into the term structure.

Indeed, we find that despite the markets' absorption of a reasonable amount of information regarding future policy adjustments (as reflected in higher coefficients and significance

of the slope parameter), guidance related to unconventional policies has even slightly more explanatory power than for the complete group of policymakers. On the other hand, Table 8 suggests a good market understanding of conventional policy, in contrast to communication of unconventional policies, since no extra explanatory power for future rate adjustments comes from the communication of interest rate outlook by the President.

5 Conclusions

We assess whether ECB verbal ad-hoc communication (speeches, interviews, statements) is informative for future monetary policy rate changes. We introduce an indicator that measures whether ECB communication is leaning towards tightening, easing or not changing monetary policy. To appreciate the censored nature of monetary policy rate, we apply an ordered probit model to study the effect of ECB ad-hoc communication on future monetary policy, controlling for lagged monetary policy and financial market expectations.

We contribute to that literature that employs voting records and minutes to explain future monetary policy in inflation targeting central banks (Gerlach-Kristen, 2004; Horvath et al., 2012; Jung, 2016). We differ from this body of literature by examining verbal ad-hoc communication (ECB voting records are not available) in a low interest rate environment that is characterized by the implementation of unconventional monetary policy. Therefore, in addition to typical questions, such as the role of governor in shaping the future course of monetary policy, we evaluate the importance of conventional vs. unconventional monetary policy communication in understanding future policy.

We find that monetary policy preferences expressed through ECB officials' communication contribute to better understanding of the future course in monetary policy. This finding is robust, even when including financial market expectations and lagged monetary policy in the model. However, while our communication indicator is helpful for predicting monetary policy at the next monetary policy meeting, it fails to predict it at more distant horizons. This result suggests that the financial market fully prices-in the ECB communication at distant horizons.

We also find that the timing of ECB communication is important for understanding monetary policy. We make a distinction between communication a week before a monetary policy meeting (i.e., the purdah period) and more than a week before the meeting. Communication in the purdah period is particularly relevant. Therefore, this result broadly corresponds to previous findings (Ehrmann and Fratzscher, 2009) on the excessive effect of purdah communication on financial markets.

Overall, our results are considerably robust in suggesting that i) the communication of conventional policies has been transparent and ii) as a result, upcoming changes to policy rates are well explained by market expectations. The main message, however, is that iii) the communication of unconventional policies is informative for the near-future policy setting, especially when such communication comes from the President and in the quiet period (purdah) shortly before the policy meeting.

Finally, we show that the statements delivered by the ECB President constitute a suf-

ficient proxy for an upcoming monetary policy decision. Overall, our paper shows that central bank transparency, as manifested by open and clear communication, is critical for monetary policy predictability.

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Appendix

Figure A1: Informative power of the term structure obtained from the 12-month and 3-month Euribor rates

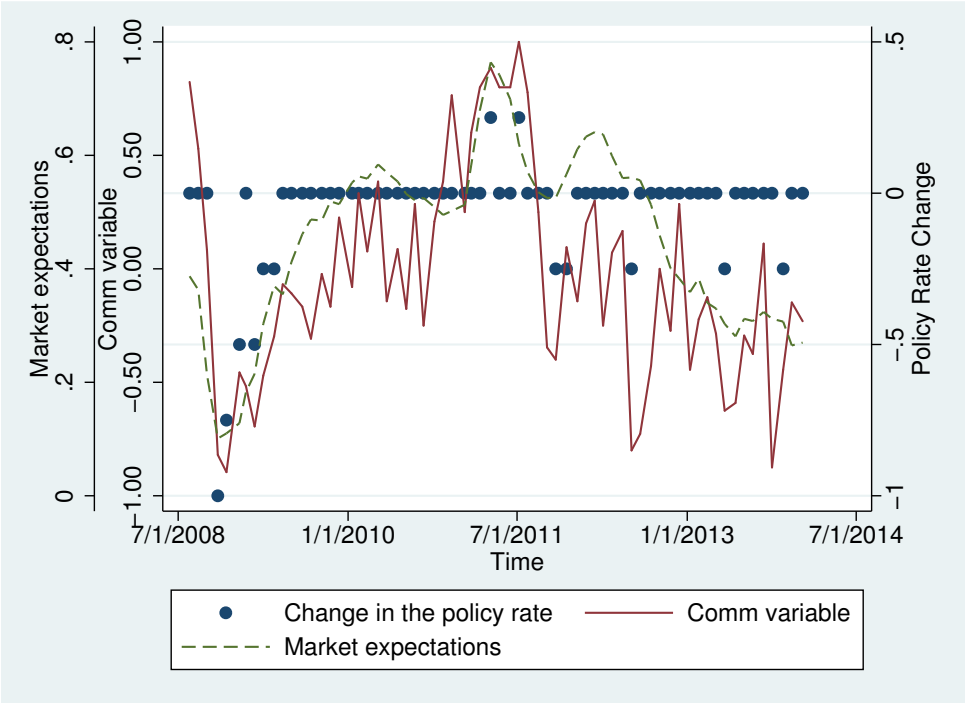


Figure A2: Informative power of the term structure obtained from the 12-month Euribor and 1-month Euribor

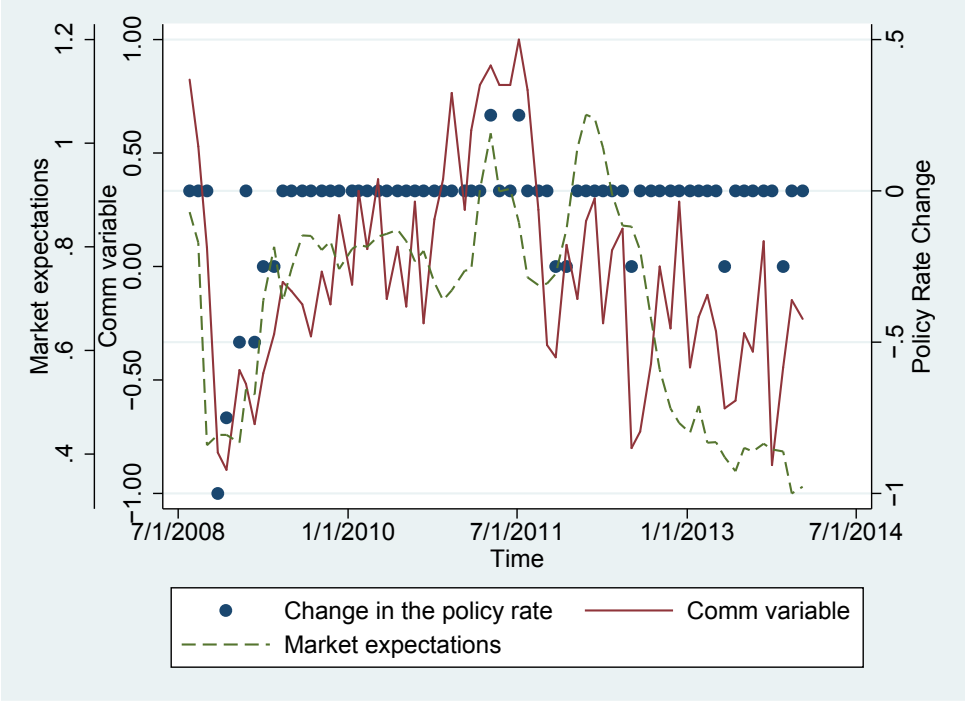
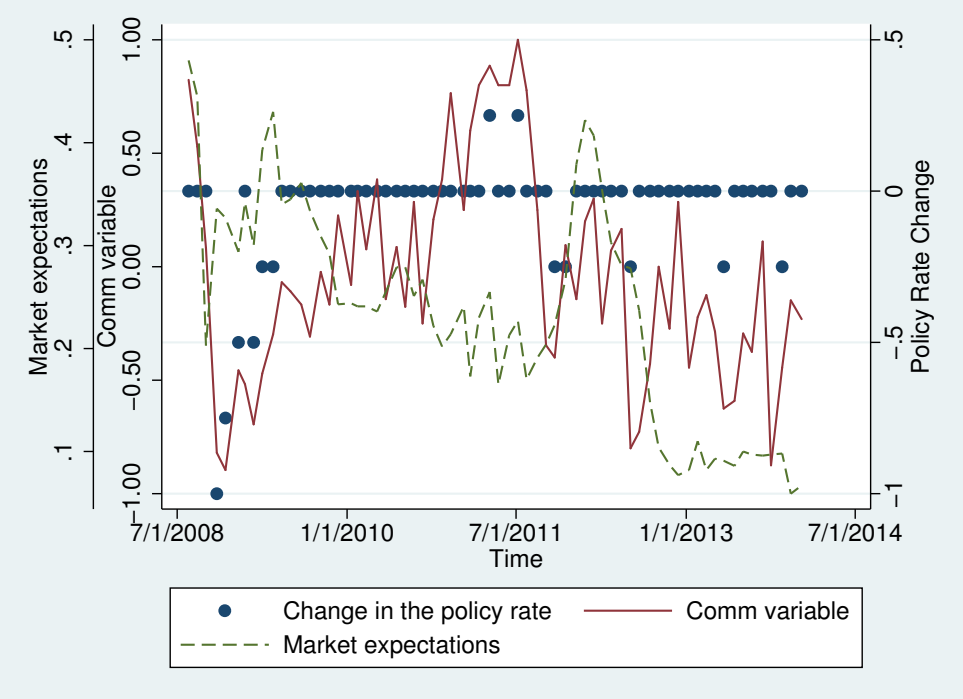


Figure A3: Informative power of the term structure obtained from the 3-month Euribor and 1-month Euribor



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