Interest Rates, ECB Communication and Inflation Expectations

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Abstract

Guiding and anchoring inflation expectations of the public are key tasks of modern central banks. In this paper we investigate how the European Central Bank (ECB) influences inflation expectations of professional forecasters. We argue that it is a good sign that interest rate changes as such are not significant in explaining inflation expectations: The ECB has been able to prepare professional forecasters inflation expectations well in advance such that they only marginally have to adjust their forecasts. Consequently, only surprise interest rate movements have an impact. The empirical results confirm this hypothesis.

Key words: interest rates, central bank communication, inflation expectations, ECB, professional forecasters

JEL classification: E31, E43, E52
1 Introduction

Recent literature has recognised and increasingly emphasize the importance of central bank communication. Beside the move toward greater central bank independence increasing the need for accountability of central banks, this has been triggered by modern macroeconomics in which expectation formation of economic agents play a crucial role. Recognition of the importance of the communications function in central banking is evident from the survey of the subject by Blinder et al. (2008). However, despite the increased attention, Blinder et al. (2008) conclude that most papers focus on financial market reactions, like interest rates or exchange rates, to central bank communication, thereby largely ignoring its effect on inflation expectations of the general public.\(^1\)

We are only aware of two studies that have investigated how central bank communication affects inflation expectations using survey data. Whereas Jansen and de Haan (2007) use inflation-indexed bonds to measure inflation expectations (and thereby again focus on financial market responses), Ullrich (2008) uses qualitative survey data. In this paper, we take quantitative inflation expectations of professional forecasters as collected by Consensus Economics. We test how effective the European Central Bank (ECB) is in moving inflation expectations of these professionals with their words (communication) and deeds (interest rate changes). Regarding their words we apply a battery of different communication indicators also used in Sturm and de Haan (2011) to proxy communication of the ECB.

Our results indicate that interest rate changes do not directly affect inflation expectations. This result seems at a first glance surprising. However, assuming that the ECB is a transparent and credible central bank, it is a good signal. Apparently, the ECB has been able to communicate its intentions regarding interest rate adjustments beforehand.

Interest rate changes thereby have been anticipated well in advance and hence inflation expectations adjusted accordingly. Only when focusing on surprise changes in the interest rate these become relevant. Furthermore, our results indicate that the words and deeds of the ECB affect medium-term expectations (with a horizon of up to 2 years) more than expectations regarding the current year.

The paper is organised as follows. In the next section we outline our theoretical deliberations and thereby lay out our empirical testing strategy. Section 3 describes the data. Section 4 presents the estimation results. The paper ends with some concluding remarks.

### 2 Theoretical Deliberations

We start from the assumption that the current average inflation expectation of professional forecasters \((\pi_t^E)\) is a weighted average of the average inflation expectations of the previous month \((\pi_{t-1}^E)\) and expectations based on the available new information—including the words and deeds of the central bank—as summarized in the vector \(X_t\):

\[
\pi_t^E = \alpha \pi_{t-1}^E + (1 - \alpha)X_t + \varepsilon_t. \tag{1}
\]

Ullrich (2008) does not find a significant response of a 6-months ahead qualitative expert forecast to the ECB main refinancing rate and argues that this forecast horizon is too short. Although in principle plausible, she neglects one important mechanism we want to highlight in this paper: Professionals closely follow the communication and the actions of the central bank and commonly assume that the behaviour of the central bank can be described by a policy reaction function. From the actions of the central bank and the current and expected state of the economy, they try to infer the this reaction function...
and thus estimate what one could call a *perceived* Taylor rule.² Hence, if the central bank prepares markets for upcoming policy rate changes, then it should not be a surprise that actual interest rate decisions turn insignificant once central bank communication is taken into account. Put differently, we argue that the theoretical response to the change of the interest rate depends strongly on the extent to which the perceived Taylor rule corresponds to the actual behaviour of the central bank.

Following Sturm and de Haan (2011), a standard linear Taylor-type monetary policy rule has the following form:

\[ i_t = \rho i_{t-1} + (1 - \rho) i^*_t + \varepsilon_t, \]

where \(i^*_t = \gamma_0 + \gamma_\pi (\pi_{t+k,t} - \bar{\pi}) + \gamma_y (y_{t+k,t} - \bar{y})\)

is the target rate, \(\pi_{t+k,t}\) is the inflation expectation \(k\) periods ahead, \(\bar{\pi}\) is the desired inflation rate, \(y_{t+k,t}\) is the expected growth rate, \(\bar{y}\) is the desired growth rate and \(i_t\) is the realized interest rate decision.³ \((\gamma_y, \gamma_\pi)\) reflect the attitude of a central bank keeping inflation close to the intended level relative to a growth target and \(\rho\) represents the inertia parameter.⁴

The professional forecaster approximates central bank policy using such a rule and tries, using past decisions, to estimate its parameters. This allows the professional forecaster to forecasts the upcoming interest rate decision \(\hat{i}_t^{\text{perceived}}\). If the actual decision of the central bank reflects the predicted policy outcome by the public (i.e. \(i_t^{\text{central bank}} = \hat{i}_t^{\text{perceived}}\)),

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²For a recent paper estimating such a by the public perceived Taylor rule see for instance Hamilton et al. (2010).

³In line with Gerlach (2007) who argues that the ECB is known not to focus on the output gap, probably in view of the difficulty to measure it in a real time situation, we follow Sturm and de Haan (2011) and estimate a Taylor rule using output growth. Walsh (2004) and Gerberding et al. (2005) argue that such a rule performs well in the presence of imperfect information.

⁴According to the Taylor principle, if inflation increases the nominal interest rate must increase more in order to raise the real interest rate. If this principle is violated, self-fulfilling bursts of inflation may be possible. Accordingly, we need \(\gamma_\pi > 1\).
this should not have an effect on inflation expectations. On the other hand, if the estimate from the perceived Taylor rule substantially differs from the actual ECB decision, a professional forecaster is likely to respond by adjusting his or her inflation expectations (and re-calibrating his or her perceived Taylor rule). Formulated differently, estimating a reduced form model and reporting an insignificant coefficient on the change of the main refinancing rate can merely reflect that the professional forecaster fully understands how the central bank acts and thereby is able to predict its actions perfectly. At the same time, this implies that actual policy surprises should have an impact on inflation expectations. In such a case, either the ex-ante expectations ($\pi_{t+k,t}$ and $y_{t+k,t}$), the forecaster’s idea on the sensitivity of the central bank to an inflation or growth shock ($\gamma_y, \gamma_\pi$), their estimate of the inflation inertia parameter ($\rho$) might not match those of the central bank, or the error term $\varepsilon_t$ differs from zero. We will test this hypothesis by using both the central bank’s main policy rate and a measure for policy rate surprises.

3 Data

For our analysis, we at least need expectations of professionals on inflation, the development of the main refinancing rate, measures of policy rate surprises and of central bank communication. Furthermore, these time series should be available in a consistent manner throughout our estimation period. We concentrate on the euro area and the monetary policy of the ECB covering the period January 1999 until April 2011.\footnote{Note that most of the communication indicators are not available after 2007. Some even already end in 2004. Only the KOF MPC is published regularly and thereby available throughout the whole time period.}

Regarding inflation and growth expectations, we use the poll conducted by Consensus Economics. On a monthly basis, Consensus Economics surveys around 100 professionals at major banks and forecast institutes in the EMU countries on their forecasts for the near
future, i.e. the current and the next year. Expected inflation and output growth time series have been constructed from these Consensus Economics forecasts. The Consensus data are not revised and, consequently, not subject to the real-time critique of Orphanides (2001). As Consensus Economics did not collect euro area forecasts before December 2002, we use country-specific forecasts, which are weighted by their share of GDP in the euro area GDP.7,8

Our interest rate variable is the Main Refinancing Rate (MRR) as determined by the ECB Governing Council (source: ECB). We control for interest rate surprises by deducting from the main refinancing rate the average (or median) expected rate as derived from the survey conducted by Reuters. One week before each Governing Council meeting Reuters asks up to 80 financial analysts about their expectations concerning the upcoming interest rate decision by the ECB Governing Council. Following Ehrmann and Fratzscher (2005), we use the mean and the median interest rate surprise (denoted as meansurp and mediansurp).

The ECB’s most important communication device is the President’s introductory statement at the monthly press conference in which he reports on the decisions taken by the ECB’s Governing Council (De Haan, 2008). The introductory statement is understood to reflect the position and views of the Council, agreed upon on a word-by-word basis by its members. For that reason, we include five indicators that are all based on the introductory statement made by the ECB President at the start of each press conference. Specifically, we use the same set of indicators also applied in Sturm and de Haan (2011), i.e. we use the

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6Orphanides (2001) has shown that the use of real-time instead of ex-post data leads to very different estimated coefficients in Taylor rule models for the Federal Reserve.

7To convert the reported growth rates into monthly moving figures, we take as the 12-month forecast the weighted average of the forecast for the current and the following year, where the weights are \( x/12 \) for the \( x \) remaining months in the current year and \( (12-x)/12 \) for the following year’s forecast. As the survey is conducted at the beginning of each month, we consider the current month to belong to the remaining months in the current year. This approach is common in this line of literature. See, e.g. Sturm and Wollmershäuser (2008), Doern et al. (2009) and Sturm and de Haan (2011).

8This procedure also allows us to directly correct for the changing composition of the euro area.
indicators of Berger et al. (2010), Heinemann and Ullrich (2007), Rosa and Verga (2007)\textsuperscript{9}, Ullrich (2008),\textsuperscript{10} and the KOF Monetary Policy Communicator as published by the KOF Swiss Economic Institute and used by e.g. Conrad and Lamla (2010).\textsuperscript{11,12}

Figures 2(a) and 2(b) show the different communication indicators and their evolution over time. Although all five intend to measure something similar and indeed are positively correlated to each other (not shown), there are still remarkable differences among them. Note that while the indicator of Berger et al. (2010) (BHS) is based on a more subjective way of coding, those of Heinemann and Ullrich (2007) (H&U), Rosa and Verga (2007) (R&V) and Ullrich (2008) (Ullrich) use code words or phrases. Finally, the KOF Monetary Policy Communicator (KOF MPC) uses content analysis techniques to be both subjective and reproducible.\textsuperscript{13}

Finally, we need to be clear on the timing of events. As we are dealing with expectations, it is important to understand on what information these are based. We know the exact dates at which Consensus Economics did release its results and the dates at which the governing council decisions were made and communicated via press releases. Whereas the consensus forecasts are released early in the month reflecting the forecasts during the first days of each month, to make interest rate decisions the ECB governing council meets at close to but not exactly a monthly frequency. To make sure that the latest available press release and interest rate decision is allowed to affect the consensus forecast we have carefully analysed the timing and thereby matched the different observations. Figure 2 depicts the normal sequence of events and Table 1 offers the summary statistics of the

\textsuperscript{9}The original Rosa and Verga index ends in 2004. Carlo Rosa kindly provided an updated version of their indicator which allows us to also use more recent years.

\textsuperscript{10}Katrin Ullrich kindly provided her indicator.

\textsuperscript{11}Available at: http://www.kof.ethz.ch/communicator.

\textsuperscript{12}Other ECB communication indicators, like the one of Jansen and De Haan (2009), are based on other communication devices and are therefore not included. The index of Musard-Gies (2006) is only available for a short period and is therefore not included. The communication data used in the present paper are available on request.

\textsuperscript{13}The coding is done by well-trained experts at an independent institute, Media Tenor (http://www.mediatenor.com), and based upon a detailed codebook fostering reproducability.
Figure 1: ECB Communication Indicators

(a) Heinemann and Ullrich; Berger, de Haan and Sturm

(b) Rosa and Verga; Ullrich; KOF MPC
relevant variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min.</th>
<th>Max.</th>
<th>N</th>
</tr>
</thead>
<tbody>
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<td>1.14</td>
<td>1</td>
<td>4.75</td>
<td>154</td>
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<td>-0.5</td>
<td>0.5</td>
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<td>Mean Interest rate surprise</td>
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<td>0.09</td>
<td>-0.5</td>
<td>0.5</td>
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<td>Inflation</td>
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<td>0.8</td>
<td>-0.6</td>
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<td>Inflation expectations</td>
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<td>0.45</td>
<td>0.65</td>
<td>2.93</td>
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<td>Consensus growth forecast</td>
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<td>1.16</td>
<td>-2.4</td>
<td>3.59</td>
<td>154</td>
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<tr>
<td>Rosa and Verga index (-2,-1,0,1,2)</td>
<td>0.79</td>
<td>1.19</td>
<td>-2</td>
<td>2</td>
<td>109</td>
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<tr>
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<td>0.21</td>
<td>-1.95</td>
<td>3.59</td>
<td>73</td>
</tr>
<tr>
<td>Duisenberg wording indicator of Ullrich</td>
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<td>0.70</td>
<td>-1.64</td>
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<td>102</td>
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<tr>
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<td>0.01</td>
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<td>-0.42</td>
<td>0.56</td>
<td>154</td>
</tr>
<tr>
<td>Overall policy intention indicator of BHS</td>
<td>0.63</td>
<td>1.07</td>
<td>-1.33</td>
<td>3</td>
<td>73</td>
</tr>
</tbody>
</table>

Notes: All variables refer to the euro area. The actual inflation rate is based upon the overall HICP. The expectation variables reflect the information available shortly before the ECB governing council meetings.

Figure 3 shows the ECB’s main refinancing rates as well as the expectations of professionals regarding inflation and output growth. While there is a high correlation between the level of the main refinancing rate and inflation (not shown) there is no such clear pattern regarding inflation expectations. Although the inflation expectations reveal small peaks during episodes of rising inflation rates, they seem to be well anchored around the intended target rate of the ECB.

4 Results

First we test whether inflation expectations of professional forecasters are affected by their own lagged inflation expectations, the change in the main refinancing rate of the ECB and ECB communication. Results are presented in column (1) of Table 2. We observe that lagged inflation expectations are highly significant. One explanation is some partial adjustment mechanism where individuals stick to the same information set for a specific period of time due to sticky information or imperfect information. ? motivates this kind
Figure 2: Timing of Releases

- Council meeting
- Interest rate decision
- Press communiqué
- Inflation expectations
- Growth expectations

Time

Approximately one month
Figure 3: Expectations of Professional Forecasters and the Main Refinancing Rate of the ECB
of behaviour coining the term ‘rational inattention’. Moreover, as inflation is measured as year over year changes in the harmonised index of consumer prices causing overlapping information within a year, this series by construction reveals a high grade of persistence.\textsuperscript{14}

Furthermore, communication is of importance. Table 2 reveals that the KOF Monetary Policy Communicator has explanatory power. This indicator measures the risks to price stability as communicated by the ECB. The positive coefficient estimate therefore implies that an upward increase in the communicated risk to price stability subsequently leads to higher inflation expectations by professional forecasters.

Finally, the ECB main refinancing rate does not have significant explanatory power in this regression. In case interest rate increase came by surprise, then we would have ceteris paribus expected a significant reduction in the inflation forecasts. However, in case such a hike was largely expected, it might be considered as a confirmation that inflation is bound to increase. Assuming that this was already fully priced into the inflation forecast, this would imply an insignificant effect of the actual change in the main refinancing rate. Hence, our findings can be interpreted as that the underlying perceived Taylor rule of the professional forecasters describes the actual monetary policy of the ECB rather well. Furthermore, the ECB has in general done a good job in preparing this audience for upcoming interest rate decisions. In short, interest rate decisions did not come as a surprise and thereby did not lead to an adjustment of inflation expectations.

This does not imply that the public is not sensitive to interest rate changes per se: any unexpected interest rate change should lead to an adjustment in inflation expectations. Hence, we add our interest rate surprise measures to the equation while leaving the main refinancing rate in. Our surprise measures is the difference between the Reuters poll and the main refinancing rate of the ECB. Results for the median interest surprise and the

\textsuperscript{14}We deal with this econometrically by, next to including the first and second lag of the dependent variable, also using Newey and West robust standard errors. Moreover we later split this series into expectations for the upcoming year and expectations for the current year.
mean interest rate surprise are presented in columns (2) and (3). Except for the main refinancing rate, the inclusion of these surprise measures only slightly affect the coefficient estimates of the remaining variables. Both, the lagged expectations and the KOFMPC remain highly significant. Interestingly, the variable measuring the interest surprise, i.e. the deviation for the perceived interest rate, shows the expected negative sign. However, is insignificant. Notably also the statics regarding the coefficient estimate on the interest rate change improve a lot. In columns (4) and (5) we split the expectations that are merged into expectations regarding inflation this year and expectations regarding the coming year. As we believe that the ECB is forward looking there should be stronger impact on expectations in the next year. Indeed this hypothesis is strongly confirmed. Both the interest rate change as well as the surprise component become significant and show the expected signs. This result confirms our presumption any unexpected decision of the ECB exerts strong influence on the inflation expectations of professional forecasters. Correcting for these unexpected changes, the main refinancing rate actual turns significantly positive indicating that, although in principle expected, the policy change does appear to be interpreted as signal that inflation development are more pronounced than initially thought.

Although less pronounced, central bank communication (beyond the mere interest decision) remains effective in steering inflation expectation independent of the specification we choose and despite that we cannot control for any surprise component in the speeches. Our results therefore underline the importance of this instrument relative to the main refinancing interest rate.

In a next step we conduct several robustness checks. First, we estimate column (5) with different communication indicators. The results are presented in table 3. While the results regarding the interest rate change hold, no communication indicator except the KOFMPC show a significant impact. Certainly the short time series can explain partly this performance.
We include both the expected change in economic growth and the most recent inflation release as additional control variables in table 5. Our results hold also for adding oil prices and the exchange rate as further explanatory variables.

Notably the aggregate data might be not representative for the individual professional forecasters if the normality assumption is for instance not met. To account for this and employ efficiency gains we estimate equation (5) of Table 2 for the individual forecasters and report the kernel density forecasts of the 61 resulting coefficient estimates in Figure 4. This exercise overall confirms our previous results. It seems that the majority of the professional forecaster adjust their expectations downwards with positive interest rate surprise and upwards when risk to inflation are communicated. An interesting observations arises regarding central bank communication. This distribution seems to be bi-modal. It leads to the conclusion that there are two groups of expert. One group that asserts a lot of attention to communication and corresponds accordingly and another groups that responds to central bank communication much less.

As a final robustness check we test whether inflation expectations in each of the member countries can be modelled in a similar fashion. Although the ECB has an area-wide focus, communication would be simplified if inflation expectations would be formed similarly. To analyze the homogeneity of responses in inflation expectations to words and deed of the ECB we estimate country-specific inflation expectation. Results are presented in Table 4. Overall our story seems to hold. However, among the EMU countries there exist substantial heterogeneity of the response to announcements and deed.

5 Conclusion

In this paper we have analyzed the impact of central bank decisions and communication on the formation of inflation expectations by professional forecasters. As the key task of
Table 2: Explaining inflation expectations of professional forecasters

<table>
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<tr>
<th>VARIABLES</th>
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<th>(3)</th>
<th>(4)</th>
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<td>Infl.Exp</td>
<td>Infl.Exp</td>
<td>This.Year</td>
<td>Next.Year</td>
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<td>1.674***</td>
<td>1.670***</td>
<td>1.119***</td>
<td>1.080***</td>
</tr>
<tr>
<td></td>
<td>(0.097)</td>
<td>(0.103)</td>
<td>(0.104)</td>
<td>(0.057)</td>
<td>(0.099)</td>
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<tr>
<td>SecLagDep</td>
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<td>-0.733***</td>
<td>-0.730***</td>
<td>-0.219***</td>
<td>-0.188*</td>
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<tr>
<td></td>
<td>(0.097)</td>
<td>(0.102)</td>
<td>(0.103)</td>
<td>(0.078)</td>
<td>(0.101)</td>
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<td>0.077</td>
<td>-0.180</td>
<td>0.198***</td>
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<td></td>
<td>(0.037)</td>
<td>(0.043)</td>
<td>(0.047)</td>
<td>(0.226)</td>
<td>(0.053)</td>
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<td></td>
<td>(0.075)</td>
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<td>(0.468)</td>
<td>(0.072)</td>
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<tr>
<td>Mean Interest Rate Surprise</td>
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<td></td>
<td>-0.054</td>
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<td></td>
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<td></td>
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<td></td>
<td>(0.077)</td>
</tr>
<tr>
<td>KOF Monetary Policy Communicator</td>
<td>0.070**</td>
<td>0.062**</td>
<td>0.060**</td>
<td>0.323*</td>
<td>0.093***</td>
</tr>
<tr>
<td>(KOF MPC)</td>
<td>(0.027)</td>
<td>(0.028)</td>
<td>(0.028)</td>
<td>(0.185)</td>
<td>(0.030)</td>
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<td>Constant</td>
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<td></td>
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<td>(0.024)</td>
<td>(0.024)</td>
<td>(0.105)</td>
<td>(0.074)</td>
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<td>150</td>
<td>150</td>
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<tr>
<td>R-squared</td>
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<td>0.985</td>
<td>0.985</td>
<td>0.894</td>
<td>0.923</td>
</tr>
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</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1
Table 3: Explaining inflation expectations of professional forecasters with different communication indicators

<table>
<thead>
<tr>
<th>Depvar</th>
<th>Infl. Exp. Next Year</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tr>
<td>LagDep</td>
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<td>1.051***</td>
<td>1.077***</td>
<td>1.116***</td>
<td>1.065***</td>
<td>1.080***</td>
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<td>(0.146)</td>
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<td>(0.111)</td>
<td>(0.138)</td>
<td>(0.099)</td>
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<tr>
<td>SecLagDep</td>
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<td>-0.188</td>
<td>-0.233*</td>
<td>-0.230**</td>
<td>-0.225*</td>
<td>-0.188*</td>
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<td></td>
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<td>(0.120)</td>
<td>(0.135)</td>
<td>(0.103)</td>
<td>(0.132)</td>
<td>(0.101)</td>
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<td>0.076***</td>
<td>0.127***</td>
<td>0.088***</td>
<td>0.117***</td>
<td>0.154***</td>
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<td></td>
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<td>(0.026)</td>
<td>(0.037)</td>
<td>(0.026)</td>
<td>(0.033)</td>
<td>(0.052)</td>
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<td>Median Interest Rate Surprise</td>
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<td>-0.207***</td>
<td>-0.178***</td>
<td>-0.197***</td>
<td>-0.129*</td>
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<td></td>
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<td>(0.036)</td>
<td>(0.032)</td>
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<td>0.159***</td>
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Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
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<th>Median Surprise</th>
<th>Rosa and Verga Constant</th>
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*** p<0.01, ** p<0.05, * p<0.1, +p <0.15
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<td>Median Interest Rate Surprise</td>
<td>-0.129*</td>
<td>-0.134**</td>
<td>-0.094**</td>
</tr>
<tr>
<td></td>
<td>(0.067)</td>
<td>(0.054)</td>
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<td>KOF Monetary Policy Communicator (KOF MPC)</td>
<td>0.076**</td>
<td>0.070**</td>
<td>0.021</td>
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<tr>
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<td>(0.030)</td>
<td>(0.031)</td>
<td>(0.030)</td>
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<td>GDP Growth next year</td>
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<td>Expected %-change in the US$-Euro exchange rate</td>
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<td>150</td>
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<tr>
<td>R-squared</td>
<td>0.958</td>
<td>0.963</td>
<td>0.967</td>
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Figure 4: Kernel Density Plots Coefficient Estimates based on individual data

(a) Change of the Main Refinancing Rate

(b) Median Interest Rate Surprise

(c) KOF Monetary Policy Communicator

Notes: Kernel density plots for 61 individual professional forecasters’ coefficient estimates. Grey line represents density plot weighted with a goodness-of-fit measure ($R^2$).
a central bank is to steer inflation expectations of the public it is important to know how deeds and words are perceived. Using inflation expectations of professionals and a battery of communication indicators we can show that communication is an important tool to guide expectations.

Furthermore we find that the change in the main refinancing rate is insignificant in the first place. This has to be interpreted as a good sign if the ECB prepares the public well in advance. For interest rate changes that were not anticipated we find falling inflation expectations.
References


Sturm, J.-E. and de Haan, J. (2011). Does central bank communication really lead to

