Bank i Kredyt 50(4), 2019, 411-428

BANK I KREDYT
BANK & CREDIT

Forward guidance and the private forecast disagreement – case of Poland

Jakub Rybacki*

Submitted: 19 November 2018. Accepted: 3 July 2019.

Abstract

During the period of policy easing in 2013 and prospective tightening in 2017–2019, Narodowy Bank Polski (NBP) applied forward guidance to manage the expectations of market participants. The goal of the policy was to lower the uncertainty related to the future interest rate decisions. We attempt to verify whether the central bank's communication indeed reduced disagreement, based on the professional forecasters' survey. We found that the forward guidance introduced in 2013 lowered the perceived interest rate risk. Abandoning the policy in 2014 increased the disagreement in a disproportionately large manner. The reintroduction of the policy in 2017 again allowed to reduce uncertainty. However, it took a year to strengthen its impact. The policy likely prevented an increase of disagreement during the NBP image crisis in late 2018. Our research highlights that it is relatively easy to lose confidence with ill-considered communication, but building credibility requires systematic long work.

Keywords: forward guidance, density forecasts, survey of professional forecasters

JEL: E52, E58

* SGH Warsaw School of Economics, Collegium of Economic Analysis; e-mail: jr70663@sgh.waw.pl.

1 Introduction

During the period of policy easing in 2013, Narodowy Bank Polski (NBP) introduced forward guidance as a policy tool. This decision followed similar moves made by major central banks, including the US Federal Reserve, the European Central Bank (ECB) and the Bank of England. The new policy assumed communication of expectations about future interest rate decisions to market participants. According to the NBP Inflation report, the aim of the forward guidance was to manage medium and long-term interest rate expectations, as well as to reduce uncertainty over policy developments in the medium term (NBP 2013).

The Monetary Policy Council (MPC) continued to provide interest rate predictions in the sixth--month horizon for approximately one year and suspended it in 2014. The forward guidance was reintroduced in 2017 by the new NBP President and MPC members. This policy aimed to trim expectations for a rate increase.

The aim of this study is to verify if the application of the forward guidance indeed reduced interest rate uncertainty based on the density forecasts of the NBP Survey of Professional Forecasters for the period from 2012 Q1 to 2019 Q1 (full available information at the moment of writing). We found that the six-month forward guidance introduced in 2013 lowered the perceived interest rate risk in the one-year and two-year horizon. On the other hand, abandoning the policy in 2014 increased short--term disagreement in a disproportionately large spectrum. The more pronounced forward guidance reintroduced in 2017 again allowed to reduce uncertainty. However its initial impact was rather moderate. It took over a year to significantly impact the long-term forecast. Overall our research highlights that it is relatively easy to lose confidence with ill-considered communication, but building credibility requires systematic long work.

This paper is structured as follows. The next section presents the subject literature highlighting the influence of central bank communication policies on professional forecasters' expectations. Section 3 discusses the content of the NBP Survey of Professional Forecasters, Section 4 describes the development of forward guidance policies in Poland. Section 5 provides the methodology of our research. Section 6 presents the estimation output. Finally, Section 7 concludes the paper.

2 Literature review

The aim of this section is to summarize studies on forward guidance in the broader context of the communication polices used by the central banks. We present how central banks' communication evolved during the last two decades and highlight why in this context publishing expectations regarding future interest rate decisions may have a limited relevance for market participants.

Studies on communication policies have become inevitable since the introduction of inflation targeting strategy by the Reserve Bank of New Zealand in 1990. Under such a regime a central bank usually pays more attention to their public policy announcements in order to maintain the credibility of its targets. Simultaneously, the amount of information released to the public increases. (Roger, Stone 2005).

There is a strong consensus that the introduction of a numerical inflation target by the majority of central banks in the 1990's per se anchored long-term expectations and allowed to reduce inflation

forecast disagreement in the long-term horizon (e.g. exceeding 1 year, see Mankiw, Reis, Wolfers 2003; Levin, Natalucci, Piger 2004; Crowe 2010), while the impact on short-term uncertainty was negligible (Cecchetti, Hakkio 2009). The experience of Poland has not deviated strongly from the general conclusions. Łyziak (2013) provided evidence that expectations of financial professionals and corporate sectors showed a strong convergence to the centre of the NBP target.

At the same time as the introduction of numerical targets, central banks started navigating market participants' expectations through more detailed discussions of the policymakers' stance (e.g. publishing a statement from the meeting and minutes, introducing press conferences with Q&A sessions). Swanson (2006) showed that increased transparency of the Federal Reserve allowed to improve rates predictability amongst financial professionals, even though there was no improvement in forecasting macroeconomic conditions (e.g. GDP, PCE/CPI inflation). The author concluded that explicit policy announcements introduced after 1994 also increased the response from market participants on policy signals from the Federal Open Market Committee (FOMC).

Eijffinger and Geraats (2006) reported lower volatility of the output gap and a reduction in interest rates in the Eurozone, the United States, and the United Kingdom, after central banks increased their transparency. On the other hand, the authors do not provide statistically significant results for smaller economies (e.g., the Swedish Riksbank, the Reserve Bank of New Zealand). Furthermore, researchers were frequently failing to produce universal rules on the communication strategy, e.g., how to manage expectations based on collective and individual communication (Ehrmann, Fratzscher 2007; Blinder et al. 2008). Similarly, the communication strategies used in Poland and in other CEE states have not always resulted in uncertainty reduction (see Rozkrut et al. 2007).

Another influential milestone in the central banks' communication was the regular publication of macroeconomic forecasts inside inflation reports. Numerous researchers have provided evidence that central banks' forecasts affect the consensus of private forecasters, especially in the longer horizons (Romer, Romer 2000; Hubert 2015). NBP introduced its macroeconomic projection in 2005 – publishing macroeconomic forecasts resulted in lower uncertainty regarding GDP growth (Kotłowski 2015).

The financial crisis of 2009 and the exhaustion of traditional monetary policy tools forced the major central banks to create new policies. One of the solutions was to communicate expectations regarding future interest rate development to market participants (known as forward guidance). Given the historical context, the introduction of such a tool tended to be a continuation of the strategies pursued in the previous decades.

The subject literature describes two characteristics of central bankers' forward guidance (Campbell et al. 2012; Yates 2013; Evans 2017). First of all, commitments are conditional – declarations do not create a legal requirement to fulfil the obligations, but central banks need to weigh the potential costs related to the loss of their credibility. Secondly, communication can have either a quantitative or qualitative character.

Quantitative declarations are published in the form of a policy rate forecast seen as if the macroeconomic scenario provided by the central bank should materialize. Probably the most popular example of such a projection is the Fed *dot-plot*. Similar forecasts are also published by, for example, the Swedish Riksbank and Norwegian Norges (both banks presented their expectations even prior to the Global Financial Crisis).

Qualitative declarations consist of comments in the policy statement or verbal comments in the Question & Answers session at the press conference. A few examples of these statements from the US Federal Reserve (Fed), Bank of Japan (BoJ) and European Central Bank (ECB) are presented in Table 1.

The subject literature distinguishes between so-called Delphic and Odyssean forward guidance. The former has a general character and provides information on what market participants should expect in the case of no significant shocks. A good example of such a declaration is the Fed statement from August 2011. The policymakers communicated that rates should remain flat till mid-2013. Odyssean declarations are far more complex. Decision-makers communicate what economic conditions are necessary to change interest rates. Such declarations were introduced by the Fed in its statement from the December 2012 meeting. The FOMC highlighted that the policy rate should remain stable as long as the unemployment rate exceeds 6.5% and personal consumption expenditure (PCE) inflation forecasted by the Fed staff does not exceed the long-term target of 2% by more than 0.5pp.

Unfortunately, there is growing evidence that forward guidance failed to improve the predictability of interest rates. Kool and Thornton (2015) reported a similar forecast error in Sweden and Norway before and after the introduction of interest rate projection, which is perceived as a mature form of forward guidance. The performance of central banks predictions was similar to a random walk process. Furthermore, economies where central banks do not communicate their future policies achieved similar forecast errors for short-term interest rates. More recent studies by Jain and Sutherland (2018) confirmed no reduction in disagreement between forecasters on their projections of the future interest rate path.

Experience from developed economies leads to the conclusion that the marginal benefit of communicating future policy moves is small, as the benefits of increased transparency were consumed earlier, e.g. with projections of macroeconomics forecasts or policy announcements. The aim of this paper is to measure if the introduction of the forward guidance policy indeed resulted in lower disagreement of financial professionals in Poland. According to the author's knowledge, there has been no similar analysis published for the Central and Eastern Europe region so far.

3 NBP Survey of Professional Forecasters

This section discusses the content of the NBP Survey of Professional Forecasters (further SPF). The mentioned publication is a single poll, which aggregates information regarding the subjective perceptions of interest rate and macroeconomic uncertainty (regarding, for example, GDP growth, CPI Inflation). The survey describes the overall distribution by the three variables: the median of expectations, and the width of 50% and 90% confidence interval. Therefore, it provides much deeper information regarding the potential surprises and uncertainty compared to more popular surveys provided by Bloomberg or Reuters, where only the median of forecasts is published.

The SFP report was introduced in late 2011, but presently the NBP archives full reports from 2012 onwards only. The panel of professionals participating in the survey consists mainly of commercial banking analysts (approximately 80% of respondents), supported by experts from academic research groups (15% of participants) and employers' organizations (5%).

The forecasters are requested to provide their predictions of the NBP reference rate, Consumer Price Index (CPI) and Gross Domestic Product (GDP) with the confidence intervals. Secondly, NBP collects analysts' assumptions of the foreign exchange rate (EUR/PLN), oil prices (Brent), unemployment rate, wage in the national economy, as well as GDP in the Eurozone (however, without providing subjective information about forecast uncertainty). NBP aggregates the individual projections into a joint distribution (see methodology paper – Kowalczyk, Łyziak and Stanisławska 2013 – for further details).

For the purpose of this paper we are interested in predictions of the annual average of interest rate for the next year (T + 1) and two years ahead (T + 2). The SFP also contains the long-term forecasts (indicating the average rate for the next five years) and the quarterly forecast for the corresponding quarter one year and two years ahead. We do not investigate the long-term forecast disagreement as forward guidance usually affects rather short-term expectations (e.g. Swanson 2017).

The NBP Survey of Professional Forecasters also provides the forecasts for the horizon 4 and 8 quarters ahead. We found these predictions as less relevant in the context of policy makers' decisions compared to the forecast of annual averages dynamics (as central banks typically do not react to temporary changes). The dispersion of such macroeconomic forecasts may be affected by temporary shocks, e.g. GDP forecasts are likely to have greater disagreement for the periods following parliamentary elections and the introduction of new economic policies.

The major shortcoming of the survey is the relatively short sample – at the moment of writing there are 29 observations available. Therefore, previous research often tended to be inconclusive (e.g., Kowalczyk, Stanisławska 2016).

4 NBP and the forward guidance policy

The aim of this chapter is to describe the experience of NBP with the forward guidance policy, as well as to present significant events which affected interest rate forecast distribution. There are six major events in our investigated sample which need to be discussed in order to understand the changes in interest rate forecast uncertainty over time. Each of the mentioned events will have its representation in the final equation.

First of all, the Polish economy was close to falling into a recession from late 2012 to early 2013. During that time, economists presented different views on how strong an impulse the Monetary Policy Council (MPC) should provide in order to stimulate the economy, as well as how fast the monetary policy should be normalized. The economic downturn affected particularly the one-year ahead interest rate expectations of professional forecasters at the beginning of 2013.

Secondly, the MPC introduced short-term forward guidance in July 2013. Decision-makers communicated that interest rates should remain flat approximately in the six-month horizon. Those declarations were consistently continued till March 2014. At this meeting the MPC declared that the rates should remain flat till October. From that time the committee was reiterating this commitment, yet without prolonging the time horizon of forward guidance. The aim of the study is to verify if the MPC rhetoric actually lowered the dispersion of the rate forecasts at that time.

The abandonment of forward guidance resulted in greater forecast disagreement. The rise of uncertainty was additionally fuelled by fears of personal conflict between MPC members and the NBP President after publication of a tape with a private conversation between the NBP President Marek Belka and the Minister of Internal Affairs Bartłomiej Sienkiewicz. The head of the central bank led an ambiguous discussion on the use of unconventional monetary policy instruments and seriously offended one of the Council Members (Wprost 2014). Bloomberg press agency columnist Mark Gilbert (2014) stated that this was an example of the worst behaviour of a central banker in Europe, which strongly reverberated in the financial markets.

Another episode resulting in greater volatility was related to the change of the NBP President and MPC members in 2016. Prior to the appointment of the central bank governor, politicians of the

governing PiS party communicated their preference for dovish executives, supporting unconventional easing (Polish Press Agency 2015).

The forward guidance policy was reintroduced in 2017 to trim expectations of interest rate hikes. The NBP President initially announced that the main policy parameters should remain stable in the period exceeding one year. Such a commitment soon became a usual habit during the MPC press conferences (see archival videos at the NBP YouTube channel).[1] From the second half of 2018 onwards, the NBP president has begun to indicate that stable rates are plausible towards the end of his term (2022), in order to solidify the forward guidance.

Finally, in Q4 of 2018 and 2019 Q1 there were two more significant crises related to the image of NBP. In November the president of the supervisory board of a commercial banking group published a tape with a corruption offer from the Chair of the Polish Financial Supervision Authority (KNF). There were allegations that the NBP President participated in the process. In 2019, several media outlets commented on the extraordinary salaries of the NBP public relations director and the director of the Office of the NBP President. Parliament implemented a bill forcing the central bank to reveal its payments to departmental directors. According to the governmental public opinion research centre (CBOS), the share of negative opinions about NBP increased from 7% to approximately 30%, while the number of supporters diminished by 10pp (from 55% to 45%). The shifts in the opinion polls were bigger than in 2013 with President Belka's tape – speculation about replacing the central bank governor was present in numerous media articles.

5 Methodology

This chapter presents the methodology of our research. We attempt to decompose interest rate disagreement, extracting the impact of economic uncertainty perceived by forecasters and the direct effects of NBP's communication policies.

Our aim is to build regressions describing the variance of interest rate forecasts made by professional forecasters. The uncertainty of interest rate forecasts is assumed to be related to the inflation and GDP growth uncertainty reported in the poll of forecasters. We also attempt to verify whether dummy variables describing events discussed in Section 4 have statistically significant effects.

Firstly, we discuss the variables that affect interest rate forecast uncertainty independently from forward guidance policy events. Following the findings of Romer and Romer (2000), and Gavin and Mandal (2000), the entry point of our analysis is the assumption that private forecasts respond proportionally to changes in the output gap and deviations from the inflation target (in line with the so-called Taylor rule). The generalized policy rule is given by the following formula:

$$i_t = i_t^* + \beta_1 * (\pi_t - \bar{\pi}_t) + \beta_2 * (y_t - \bar{y}_t) + e_t \tag{1}$$

where:

i_t – the central bank policy rate,

i_t^* – the long-run equilibrium rate natural rate perceived by monetary authorities,

[1] MPC press conferences are available at: https://www.youtube.com/playlist?list=PLE37C73CEC1E1E930.

$\pi_t - \bar{\pi}_t$ – the difference between the current CPI annual dynamics and the central bank inflation target,

$y_t - \bar{y}_t$ – the difference between the log of the current GDP level and its potential and unobservable level,

β_1 and β_2 – estimated parameters.

We assume that professional forecasters surveyed by NBP are capable of estimating the policy rule parameters, but disagree between themselves on the forecast values of y_t and π_t. With such assumptions, we are able to decompose the ex-ante forecast variance of interest rate. To achieve the analytical solution to the problem, we need to use two simplifying assumptions. Firstly, we need to proxy the output gap uncertainty by the disagreement related to GDP growth as only such a variable is reported in the survey. Such a hypothesis does not take into consideration the overall risk, e.g. risk related to the problem of output gap estimation.

Secondly, we expect that individual density forecasts for both GDP growth and CPI inflation are described with normal distribution. The real distribution is likely to vary over time, with possible asymmetrical skews.

Given a stable inflation target and no change in perception of the natural rate and potential output, interest rate forecast variance should be described by the following formula:

$$\sigma_{it}^2 = \beta_1^2 * \sigma_{y_t}^2 + \beta_2^2 * \sigma_{\pi_t}^2 + 2 * \beta_1 * \beta_2 * \rho(\pi_t, y_t) * \sigma_{y_t} * \sigma_{\pi_t} + e_t \quad (2)$$

where $\rho(\pi_t, y_t)$ is a Pearson correlation coefficient between forecasts of annual GDP growth dynamics and similarly defined CPI inflation increase, and σ_x is a standard deviation of the variable x.

We calculated standard deviations of policy rate forecasts, inflation forecasts and GDP forecasts based on the NBP Survey of Professional Forecasters, which describes forward looking expectations. For each single forecast of a specific economic variable the survey contains information about the width of the 50% confidence interval and the mean of the empirical distribution generated from the analysts' predictions.[2]

To derive the cross-sectional standard deviation of forecasts from the mentioned dataset we assumed that the forecasts in each case were randomly generated from the normal distribution. This assumption allows for a numerical derivation of the standard deviation statistic, yet it is a significant simplification. The actual distribution could be, for example, asymmetrical. Since the mean of the normal distribution is equal to its median, the 50% forecast confidence interval should match the interval between the 25th and 75th percentile of the forecast distribution under the assumption of normality. For a normally distributed variable, the distance between the 25th and the 50th percentile is equal 0.675 times the standard deviation of that variable. Therefore, we computed the cross-sectional standard deviation of each forecast from the range comprising 50% of all observations by dividing the reported width of the confidence interval by two and then by 0.675.

Such estimated standard deviations are used as observations in the case of the explained variable – interest forecast uncertainty, and explanatory variables, i.e. GDP growth uncertainty and CPI inflation uncertainty. The detailed description of data is presented in the Appendix.

[2] Please see the report at: https://www.nbp.pl/home.aspx?f=/statystyka/amakro/amakro.htm (Polish version only).

The subject literature also reports that interest rate forecast uncertainty tends to be described by an autoregressive progress (e.g., Kotłowski 2015). We introduce the three-year historical time--series standard deviation of the central bank interest rate (based on realized data) as an additional explanatory variable to account for such dependency. Historical realizations provide more information on monetary policy surprises, which should influence the present decisions.

We also introduced a trend as an explanatory variable to verify if the downward slope reported by Swanson (2006) is still visible in the more recent period. Some reduction of disagreement of forecasts was possible not only due to the greater transparency of central banks, but also due to technological improvements, e.g. the development of modern and more accurate econometric models. The negative parameter would suggest that such a hypothesis is still valid.

We aim to verify if the introduction of forward guidance has an additional additive effect on forecast uncertainty. Five separate dummy variables were introduced. The first one takes the value of one in the period when the MPC used announcements about expected changes in interest rates (2013 Q2 – 2014 Q1), and the second dummy identifies the period when long-term forward guidance was introduced (between 2017 Q1 and the end of the sample at 2019 Q1).

We also introduce another dummy variable related to the lagged effects of the introduction of forward guidance. The positive value covers the period from 2018 Q2 to the end of the sample. The selected period is not random – in the mentioned quarters for the first time the median of professionals stopped pricing interest rate hikes in the two-year horizon (in line with the MPC guidance). Such a tendency was consolidated in the next quarters.

Finally, some unfavourable events were taken into account with another set of dummy variables, namely the depression period from 2012 Q4 to 2013 Q1, abandoning of forward guidance and the clash between the NBP President Marek Belka and the MPC after the leak of tapes (2014 Q2–Q3). During 2014 Q2–Q3 standard deviation was 10pp (30%) higher than the previous and next events, therefore the level shift is clearly visible. Possible shortening of the horizon should result in additive outliers in residuals. For further details see Figure 1 in the Appendix.

Another dummy is related to fears around the election of the new NBP President and the new MPC in Poland (2015 Q4 – 2016 Q2). In each of the mentioned periods there were expectations of a politically driven rate cut (despite higher inflation) visible in the central forecasts. The appointment of Adam Glapiński as the NBP President (first policy meeting in July of 2016) cut the speculation about imminent monetary policy changes.

Finally the last dummy is related to the NBP image crisis of 2018 Q4 and 2019 Q1. Details of the event, which occurred in both quarters, are described in the previous section. The complete econometric model is given by the following formula:

$$\sigma_{it}^2 = \beta_0 + \beta_1^2\sigma_{y_t}^2 + \beta_2^2\sigma_{\pi_t}^2 + 2|\beta_1||\beta_2|\beta_4\sigma_{y_t}\sigma_{\pi_t} + |\beta_3|\sigma_{ihist,t}^2 + \beta_Z Z_t + \varepsilon_t \tag{3}$$

where $\sigma^2_{ihist,t}$ is a three-year historical deviation of interest rates measured at time t and Z_t is a vector of dummy variables. β_4 is identical to $\rho(\pi_t, y_t)$ operator |*| denotes the absolute value.

The series of σ^2_{yt} $\sigma_{\pi t}$ and σ^2_{it} were transformed with the TRAMO-SEATS procedure in order to remove seasonal and irregular factors (Gomez, Maravall 1996). Calculations resulted in extraction of the smoothed trend estimates of the respective variables. The smoothed variables were used in our further

analysis. The presence of seasonal factors is related to different forecast horizons presented in quarterly surveys. For example, a prediction of average CPI inflation in the next year, released in the first quarter of the current year, requires an estimation of the state of the economy in the next seven quarters. In the case of the survey published in the fourth quarter of the year, the forecast horizon shortens to four quarters. Possible irregularities are the result of changes in the participation of respondents (the number of forecasters responding to the poll varies between iterations). The historical standard deviation of interest rates was not transformed ($\sigma^2_{ihist,t}$). Finally, all of the explanatory variables (except dummies) were standardized by subtracting the mean and dividing by the standard deviation of the respective variable in order to provide a simple economic explanation to the constant parameter. The estimate of β_0 should present the typical subjective standard deviation of (unobservable) interest rates probability distribution during an average economic condition.

The equations were estimated using the ordinary least squares (OLS) method. The Newey-West method was used to obtain heteroscedasticity and autocorrelation robust standard errors of parameter estimates. We also attempted to restrict parameters in such a manner that any increase of uncertainty regarding macroeconomic developments and adverse events ($Z_{negative}$) should always lead to higher rates uncertainty. Similarly, forward guidance ($Z_{positive}$) should only have a positive impact and lower disagreement. To successfully enforce such restrictions in the final equation, we replaced parameters β_i with an absolute function of these parameters. Instead of a linear estimation of β_4 we use a rescaled function $\frac{e^{\beta_4}}{1+e^{\beta_4}}$, limiting results to the range from -1 to 1. The final equation has the following form:

$$\begin{aligned}\sigma^2_{it} &= \beta_0 + \beta_1{}^2\sigma^2_{y_t} + \beta_2{}^2\sigma^2_{\pi_t} + 2\,|\beta_1|\left|\beta_2\right|\left(2\frac{e^{\beta_4}}{1+e^{\beta_4}}-1\right)\sigma_{y_t}\sigma_{\pi_t} + |\beta_3|\sigma^2_{ihist,t} \\ &+ \beta_5 * trend + |\beta_{Z_{positive}}|\,Z_{positive} - |\beta_{Z_{negative}}|\,Z_{negative} + \varepsilon_t\end{aligned} \tag{4}$$

6 Estimation results

This section discusses the impact of Narodowy Bank Polski communication policies on interest rate forecast uncertainty. We begin with an analysis of the impact on the divergence of one-year ahead interest rate forecasts. All the estimates of parameters in the section are rounded to 2 digit figures. Numbers describing the interval range are presented as integers.

According to our model, the standard deviation of the interest rate forecast equals 0.37 basis points (bp) in the sample. The value was derived using a square root of the estimated parameter β_0 which can be interpreted as the sample variance of σ^2_{it} in the absence of any events considered in our investigation.

Assuming the normal distribution of forecasts, the confidence intervals covering 99.99% of observations should span over 8 standard deviations. At such a level of confidence this range covers an area of 298bp. Concluding, even under such a conservative level of confidence professional forecasters should not believe that any increase or decrease of policy rates could be greater than 150bp (150bp is approximately equal to four standard deviations of the dependent variable, given the symmetry of a normal distribution).

Amongst macroeconomic variables, we found historical volatility and uncertainty regarding GDP growth as factors increasing the subjective divergence of policy rate forecasts. The parameter

corresponding to inflation forecast uncertainty turned out to be insignificant. A similar conclusion was valid in the case of the interaction between the GDP growth and CPI inflation forecasts. We were unable to reject the hypothesis that the linear effect related to the β_4 parameter equal to zero. There was also no statistically significant linear trend in the data.

Detailed results of the estimated model (4) are available in Table 2. The third column contains estimated parameters of the non-linear equation. To simplify interpretation, we calculated the values corresponding to the linear form in the second column. These values represent a linear marginal effect of the dependent variable (as a change in interest rate forecast variance) due to unit changes in the values of explanatory variables. Based on this information, we are capable to present binding conclusions about the change in ex-ante standard deviation of the interest rate forecast, as well as its confidence intervals.

The forward guidance introduced by NBP in 2013 had a small but statistically significant impact on the reduction of forecast disagreement. The standard deviation of interest rate forecasts was lower on average by 3bp under the forward guidance policy than without this regime. This should imply that the 99.99% confidence interval was narrowed by 25bp.

On the other hand, abandoning the declarations about future rate decisions and worries about the conflict of the NBP President with the MPC members (after the tape leak) led to a rapid increase in uncertainty. The ex-ante standard deviation of interest rate forecast increased by approximately 15bp, implying that the 99.99% confidence interval was covering the area wider by nearly 120bp in this period in comparison to other periods. The increased forecast disagreement sustained for 2 quarters. The rise of standard deviation was even greater when comparing to late 2012, when it was obvious that Poland would soon face an activity slowdown.

The policy noise prior to the appointment of Adam Glapiński as the President of NBP and new MPC members in early 2016 increased the standard deviation by approximately 2bp. It is clear that the limitations of the NBP Survey of Professional Forecasters could lead to an underestimation of the total impact, because there were no questions regarding expectations about unconventional policies in the NBP Survey of Professional Forecasters. Furthermore, the assumption of a symmetric distribution of interest rate forecasts is likely to overly simplify our observation of the response to the appointment of the NBP President. In this case, forecasters were more eager to highlight greater downward risks to the forecasts, i.e. the lower bound of the 90% range reported by the analysts was lower compared to the previous quarters, while the higher boundary shrank significantly.

Finally, the longer forward guidance (with one-year horizon ahead) reintroduced in 2017 also has a positive impact on lowering the forecast uncertainty, similarly to the effects of the forward guidance policies experienced in 2013. Our model suggests that standard deviation diminished totally by approximately 15bp in these periods in comparison to other periods (without forward guidance). However the impact was gradual – nearly half of the disagreement reduction occurred initially after policy introduction and the impact increased after a year with consistent communication of flat rates. Please keep in mind that the filtered technique used in the model is sensitive to the end of the sample instability, therefore strict magnitude of reduction may be altered with new data points. However the general conclusions are unlikely to change, given the scale of uncertainty reduction.

The forward guidance also prevented the rise of uncertainty during the image crisis related to KNF gate. Despite strong accusations and rumours about the potential resignation of the NBP President, the reported uncertainty regarding monetary policy did not increase (contrary to the case of 2014).

The estimation of the two-year forecast seems less robust, e.g. Durbin-Watson statistics suggest some autocorrelation, the residuals for the years 2017–2018 are more volatile, compared to the previous year.

The standard deviation of the two-year ahead interest rate forecasts stands at 0.66 percentage points and the 99.99% confidence interval of forecasts spans over the 530bp range in the sample. This means that forecasters should assume that the total interest rate increase or decrease would not exceed 285bp in nearly any case. Please note that the assumption of normal distribution does not take into consideration the problem of the effective lower bound – the distribution can freely span over the negative levels (e.g. -5%), while professional analysts are unlikely to present such views.

Parameter estimates of macroeconomic variables reveal a significant impact of both GDP growth forecast uncertainty and the historical interest rate volatility on the ex-ante subjective variance of interest rate forecasts (Table 3). The parameter corresponding to CPI forecast uncertainty and interactions between CPI forecasts and GDP forecasts was statistically insignificant. Contrary to Swanson (2006), we found no strong evidence of an interest rate uncertainty reduction trend. The parameter slope was statistically insignificant – it does not deviate strongly from zero. This result suggests that more transparent communications policies other than forward guidance has little effect in Poland – in the mentioned period NBP did not introduce major amendments to other policy tools, e.g. minutes, inflation projections.

The impact of the introduction of forward guidance in 2013 has a similar effect to the 1-year horizon (reduction of standard deviations was not greater than 3bp, 99.99% confidence intervals narrowed by approximately 20bp).

Returning to this policy in 2017 initially had a positive impact. However, again it took over a year for the MPC to convince professional forecasters that rates would remain flat. The strong reduction of disagreement is visible from the second quarter of 2018, over a year after the introduction of forward guidance. According to the model, the area covering 99.99% confidence intervals narrowed by approximately 165bp. Please keep in mind that the mentioned quantity has only an indicative character. First of all, we do not know if the policy has exhausted all of its potential yet, and secondly, the filtered techniques used (TRAMO-SEATS algorithm) are sensitive when it comes to the end of the sample.

7 Conclusions

Contrary to the experience of developed economies (Kool, Thornton 2015; Jain, Sutherland 2018), our research confirmed that the application of forward guidance lowered the disagreement regarding the next year's interest rate amongst private forecasters in Poland both in 2013 and 2017. The possible explanation of this phenomenon may be related to imperfections of individualistic comments provided by the MPC members. Rozkrut et al. (2007) argued that interviews describing the views of individual members did not reduce uncertainty regarding interest rate forecasts in Poland due to the noise created by pivotal voters. Our results indicate that a structured, collective communication allowed to consume benefits of greater transparency.

Secondly, we found a heterogenous impact of forward guidance. In a one-year forecast horizon significantly less binding declarations made by Marek Belka's MPC in 2013 had lower effects in reducing the disagreement than the stronger commitments of Adam Glapinski from 2017, but initially

the difference was rather small. It is possible that central bank communication tends to be more effective in a more uncertain environment – during the term of Marek Belka interest rate volatility was much greater than presently. Declarations from the central bank in such an environment may have a greater value to analysts compared to the period where policy is expected to be stable. Adam Glapinski's communication policy resulted in a stronger reduction of disagreement in 2018, after nearly a year of consistent messaging that rates should remain flat in the one or even two-year horizon to market participants.

A similar phenomenon was visible in the case of long-term forecasts – communication policy significantly lowered disagreement, but again it took over a year for the Monetary Policy Council to convince professional forecasters of the credibility of its declaration.

The estimated models showed asymmetry of reaction between consistent positivistic declarations of keeping the interest rate stable and negative events, e.g. communication incidents or political noise. Events showing the indecision of the Monetary Policy Council (e.g. the case of suspending the forward guidance policy in 2014) or shattering public perception of the relationship between the NBP President and other members led to a non-proportional increase in forecast disagreement. However the image crisis in 2018 Q4 suggests that credible forward guidance may prevent an increase in disagreement during such periods.

Overall, our research highlights that it is relatively easy to lose confidence with ill-considered communication, but building credibility requires systematic long work.

References

Blinder A.S., Ehrmann M., Fratzscher M., De Haan J., Jansen D.J. (2008), Central bank communication and monetary policy: a survey of theory and evidence, *Journal of Economic Literature*, 46(4), 910–945.

Campbell J.R., Evans C.L., Fisher J.D., Justiniano A., Calomiris C.W., Woodford M. (2012), Macroeconomic effects of federal reserve forward guidance, *Brookings Papers on Economic Activity,* 1–80.

Cecchetti S.G., Hakkio C. (2009), *Inflation targeting and private sector forecasts*, NBER Working Paper, w15424, National Bureau of Economic Research.

Crowe C. (2010), Testing the transparency benefits of inflation targeting: evidence from private sector forecasts, *Journal of Monetary Economics*, 57(2), 226–232.

Gavin W.T., Mandal R.J. (2000), *Forecasting inflation and growth: Do private forecasts match those of policymakers?*, Federal Reserve Bank of St. Louis Working Paper Series, 2000-026.

Ehrmann M., Fratzscher M. (2007), Communication by central bank committee members: different strategies, same effectiveness?, *Journal of Money, Credit and Banking,* 39(2–3), 509–541.

Eijffinger S.C., Geraats P.M. (2006), How transparent are central banks?, *European Journal of Political Economy,* 22(1), 1–21.

Gomez V., Maravall A. (1996), *Programs TRAMO (Time series regression with arima noise, missing observations, and outliers) and SEATS (Signal extraction in arima time series). Instructions for the User*, Documento de Trabajo, 9628, Banco de España.

Hubert P. (2015), Do central bank forecasts influence private agents? Forecasting performance versus signals, *Journal of Money, Credit and Banking*, 47(4), 771–789.

Jain M., Sutherland C. (2018), *How do central bank projections and forward guidance influence private-sector forecasts?*, Bank of Canada Working Papers, 18–2.

Kool C., Thornton D. (2015), How effective is central bank forward guidance?, *Review*, 97(4), 303–322.

Kotłowski J. (2015), Do central bank forecasts matter for professional forecasters?, *Czech Journal of Economics and Finance*, 65(6), 432–454.

Kowalczyk H., Łyziak T., Stanisławska E. (2013), *A new approach to probabilistic surveys of professional forecasters and its application in the monetary policy context*, NBP Working Paper, 142, Narodowy Bank Polski.

Kowalczyk H., Stanisławska E. (2016), *Are experts' probabilistic forecasts similar to the NBP projections?,* NBP Working Paper, 238, Narodowy Bank Polski.

Levin A., Natalucci F., Piger J. (2004), *Explicit inflation objectives and macroeconomic outcomes*, ECB Working Paper, 383.

Łyziak T. (2013), Formation of inflation expectations by different economic agents: the case of Poland, *Eastern European Economics*, 51(6), 5–33.

Mankiw N., Reis R., Wolfers J. (2003), *Disagreement about inflation expectations*, NBER Macroeconomics Annual, 18, 209–248.

Roger M., Stone M. (2005), *On target? The international experience with achieving inflation targets*, IMF Working Paper No. 5-163.

Romer C., Romer D. (2000), Federal Reserve information and the behavior of interest rates, *American Economic Review,* 90(3), 429–457.

Rozkrut M., Rybiński K., Sztaba L., Szwaja R. (2007), Quest for central bank communication: Does it pay to be "talkative"?, *European Journal of Political Economy,* 23(1), 176–206.

Swanson E. (2006), Have increases in Federal Reserve transparency improved private sector interest rate forecasts?, *Journal of Money, Credit and Banking*, 38(3), 791–819.

Swanson E. (2017), *Measuring the effects of Federal Reserve forward guidance and asset purchases on financial markets*, National Bureau of Economic Research Working Paper, w23311.

Web sources

CBOS (2019), *Oceny działalności instytucji publicznych*, access at 16 May 2019, https://www.cbos.pl/SPISKOM.POL/2019/K_044_19.PDF.

Evans C. (2017), *The future of Odyssean and Delphic guidance*, access at 16 May 2019, https://www.chicagofed.org/publications/speeches/2017/11-14-2017-future-odyssean-and-delphic-guidance-charles-evans-frankfurt-ecb.

Gilbert M. (2014), *Europe's worst central banker*, access at 8 November 2018, link: https://www.bloomberg.com/opinion/articles/2014-06-20/europe-s-worst-central-banker.

Wprost (2014), *Posłuchaj jak dogadywali się Belka i Sienkiewicz*, access at 8 November 2018, https://www.wprost.pl/tylko-u-nas/452744/posluchaj-jak-dogadywali-sie-belka-i-sienkiewicz.html.

Polish Press Agency (2015), *PiS view to NBP expanding funding roles don't carry QE-style mandate* access at 08-11-2018, https://financialobserver.eu/recent-news/pis-view-to-nbp-expanding-funding-roles-dont-carry-qe-style-mandate/.

Yates T. (2013), *Delphic or Odyssian?*, access at 24 November 2018, https://www.economist.com/free-exchange/2013/07/25/delphic-or-odyssian.

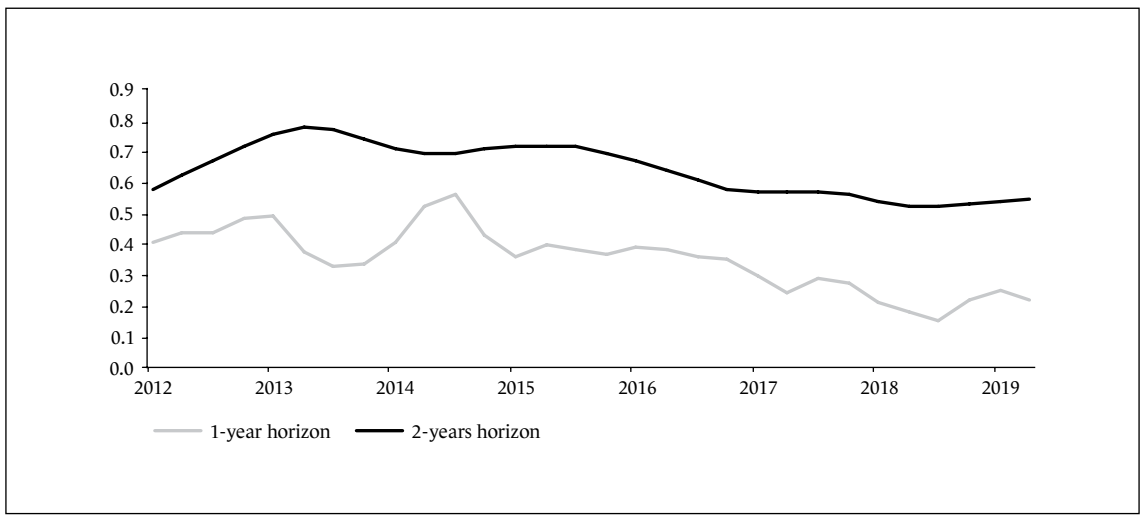
Appendix

Variables used within the model

The aim of this appendix is to present both the explained and explanatory variable. Each of the series presented in Figures 1–3 were implied based on a width of 50% confidence interval, published in the NBP Survey of Professional Forecasters. Such data was transformed with the TRAMO-SEATS algorithm to extract seasonal and irregular factors.

The interest rate uncertainty is presented in Figure 1. In the one-year horizon, the biggest uncertainty was reported firstly during the period of slowdown in early 2013 and after abandoning the forward guidance in 2014. The historically lowest uncertainty was recorded in 2018, under a regime of forward guidance and relatively low inflation.

Figure 1
Interest rate uncertainty – implied ex-ante standard deviation of forecasts

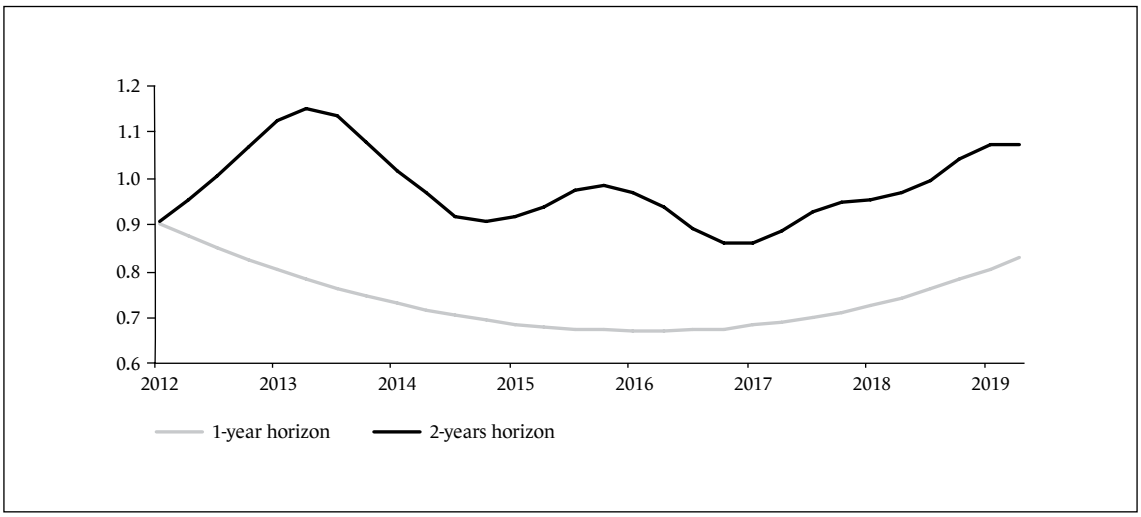


Source: author's calculations based on the NBP Survey of Professional Forecasters.

Figure 2 presents GDP growth uncertainty. The short-term indicator corresponds to the global activity – the highest readings were recorded prior to the Eurozone sovereign debt crisis and protracted slowdown in the Eurozone (there was a technical recession in Italy, German GDP growth for two consecutive quarters was close to zero).

Similar tendencies are lagged in the case of two-year uncertainty – greater uncertainty is visible right after the bottom of the slowdown. Domestically, there is also an idiosyncratic shock visible in late 2015 related to the change of government. The transition of power in the central bank was described in Section 4.

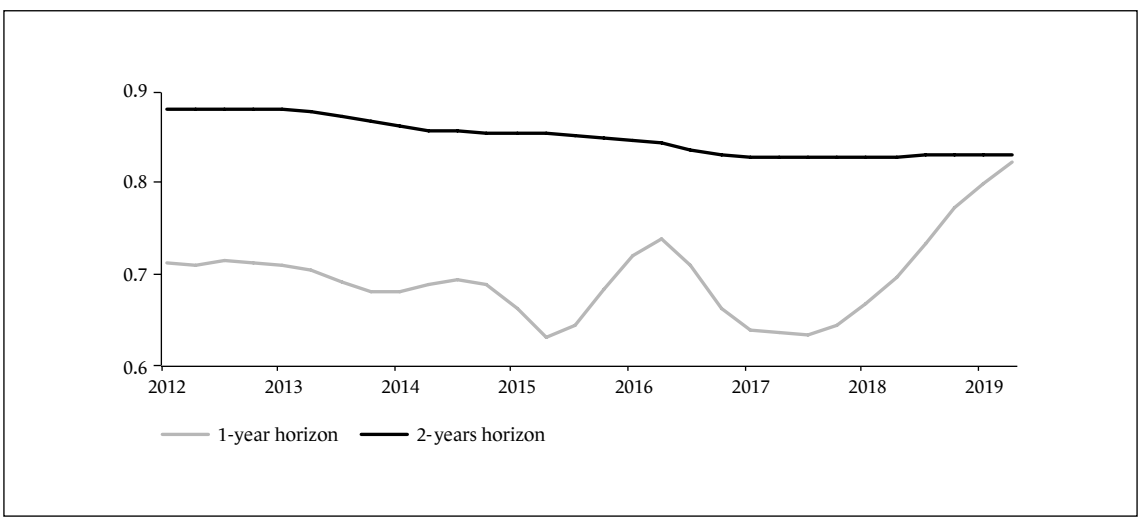
Figure 2
GDP uncertainty – implied ex-ante standard deviation of forecasts



Source: author's calculations based on the NBP Survey of Professional Forecasters.

Finally, the last charts present inflation uncertainty. The two-year uncertainty is rather persistent – we see a benign downward trend visible as inflation globally tends to be less volatile. In the case of one-year uncertainty, the dynamic is greater – there are two periods of inflation target undershooting in 2015 and 2017. At the moment of writing (2019), the uncertainty is elevated due to the unclear cost of electrical energy, after a strong increase of CO_2 emission rights.

Figure 3
CPI uncertainty – implied ex-ante standard deviation of forecasts



Source: author's calculations based on the NBP Survey of Professional Forecasters.

In the paper we also refer to interactions between both forecasts. There is a positive correlation between GDP and CPI forecast uncertainty visible both in the one and two-year horizons. The Pearson correlation coefficient stays at 0.53 and 0.43 (rounded to a two digit figure) respectively, which allows to reject the hypothesis that there is no coincidence between variables.

Table 1
Examples of qualitative forward guidance

ECB – July 2013 (Delphic guidance)	The Governing Council expects the key ECB interest rates to remain at present or lower levels for an extended period of time
Fed – August 2011 (Delphic guidance)	The Committee currently anticipates that economic conditions – including low rates of resource utilization and a subdued outlook for inflation over the medium run – are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013
Fed – December 2012 (Odyssean guidance)	The Committee decided to keep the target range for the federal funds rate at 0 to 0.25% and currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6.5%, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2% longer--run goal, and longer-term inflation expectations continue to be well anchored. The Committee views these thresholds as consistent with its earlier date-based guidance
BoJ – July 2018 (Delphic guidance)	The Bank intends to maintain the current extremely low levels of short- and long-term interest rates for an extended period of time, taking into account uncertainties regarding economic activity and prices including the effects of the consumption tax hike scheduled to take place in October 2019

Source: BoJ, ECB and Fed policy statements.

Table 2
One year ahead interest rate forecast uncertainty

	Model parameters				
	coefficient – linear form	**coefficient – estimation**	**standard error**	**t-statistic**	**probability**
Constant	0.14	0.14	0.01	27.63	0.00
GDP uncertainty*	0.13	0.13	0.01	9.72	0.00
Historical rates volatility**	0.02	0.02	0.01	3.08	0.01
Forward guidance – 6M**	-0.03	0.03	0.01	2.78	0.01
Forward guidance – 1Y**	-0.05	-0.05	0.01	-3.64	0.00
Forward guidance – 1Y (from 2018 Q2)**	-0.04	-0.04	0.01	-5.29	0.00
Abandoned FG & Belka's clash with MPC**	0.13	-0.13	0.01	-11.00	0.00
Glapinski's appointment**	0.02	0.02	0.01	2.94	0.01
2012 depression**	0.07	0.07	0.02	4.01	0.00
Model diagnostics					
R-squared	0.91	Mean dependent var.		0.13	
Adjusted R-squared	0.89	S.D. dependent var.		0.07	
S.E. of regression	0.02	Akaike info criterion		-4.39	
Sum squared resid	0.01	Schwarz criterion		-4.01	
Log likelihood	71.62	Hannan-Quinn criterion		-4.27	
F-statistic	31.93	Durbin-Watson stat.		2.15	
Prob. (F-statistic)	0.00				
Sample (adjusted): 2012Q1 – 2019Q1					
Included observations: 29 after adjustments					

Notes:
Coefficient of variables denoted with * were estimated with a power function $\beta^2()$ variables denoted with ** with an absolute value function $|\beta|$ ()n line with equation (4). In the third column we present originally estimated parameters of mentioned functions. In the second column, values of linear form were presented to simplify interpretation of marginal effects.
Source: author's calculations.

Table 3
Two years ahead interest rate forecast uncertainty

	Model parameters				
	coefficient – linear form	**coefficient – estimation**	**standard error**	**t-statistic**	**probability**
Constant	0.44	0.44	0.01	35.37	0.00
GDP uncertainty*	0.07	0.26	0.01	18.01	0.00
Historical rates volatility**	0.05	0.05	0.00	12.41	0.00
Forward guidance – 6M**	-0.03	-0.03	0.01	-3.21	0.00
Forward guidance – 1Y**	-0.06	-0.06	0.02	-3.15	0.00
Forward guidance – 1Y (from 2018 Q2)**	-0.17	-0.17	0.03	-5.79	0.00
@TREND	0.00	0.00	0.00	0.80	0.43
Model diagnostics					
R-squared	0.97	Mean dependent var.		0.42	
Adjusted R-squared	0.96	S.D. dependent var.		0.11	
S.E. of regression	0.02	Akaike info criterion		-4.63	
Sum squared resid.	0.01	Schwarz criterion		-4.30	
Log likelihood	74.15	Hannan-Quinn criterion		-4.53	
F-statistic	110.46	Durbin-Watson stat.		1.54	
Prob. (F-statistic)	0.00				
Sample (adjusted): 2012Q1 – 2018Q3					
Included observations: 27 after adjustments					

Source: author's calculations.