JEL Classification: E52, E58
Keywords: central bank communication; interest rates

Central Bank Communication and Interest Rates: The Case of the Czech National Bank*

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Abstract
We examine how written and oral central bank communications affect the level and volatility of interest rates. We use detailed daily data on the Czech central bank's communication in 2007–2012. We find that financial markets respond to central bank communication. Short-term interest rates rise if the bank communicates that economic conditions are good. The results suggest that written communication, but not oral communication, decreases the volatility of both short-term and long-term interest rates. The timing of communication has a key role, as comments made closer to the monetary policy meeting have a bigger calming effect on the markets. All in all, our results point to the importance of well-designed communication for reducing noise in the financial markets.

1. Introduction

The transparency about monetary policy communication has increased substantially during the last two decades (Geraats, 2009; Posen, 2003). Many central banks now provide very detailed statements about how they reached their decisions on policy interest rates and frequently communicate their views on the state of economy. What are the implications of this increased transparency, and do financial markets react to central bank communication? Clearly, central bank transparency and open communication do not have to be a goal *per se*, but central banks find them valuable if they help central bankers to achieve their goal of maintaining economic stability.

We gather an extensive dataset on how one of the most transparent central banks,[1] the Czech National Bank (CNB), communicates the economic outlook and its implications for monetary policy to the public. More specifically, we collect data on both written and oral communications. For written communication, we collect data on the release of inflation reports and monetary policy minutes, as they represent the main communication channels used by the central bank. For oral communication, we classify the statements made in the media by Czech central bank board members according to the likely direction of the interest rate change.

Since the Czech central bank explicitly targets inflation, we focus on how (and whether) its communication influences interest rates. Within this monetary policy regime, the central bank sets the (trajectory of the) interest rate in order to achieve

* We thank two anonymous referees and Aleš Maršál for helpful comments. We acknowledge support from the Grant Agency of the Czech Republic P402/12/G097.

[1] See Dincer and Eichengreen (2009) for an assessment of monetary policy transparency for 100 central banks around the world.

the inflation target over some time horizon. The financial markets respond to central bank communications if those communications represent news to the markets. Clearly, communication can also exert an effect on other financial variables, such as exchange rates or asset prices, but this has been empirically examined for the Czech case in some other studies (see Égert and Kočenda, 2013, and Fišer and Horváth, 2011).

Importantly, previous research has highlighted the role of the timing of central bank communication (Ehrmann and Fratzscher, 2007). As a consequence, we examine: (i) whether the Czech central bank's communication affects the interest rate (volatility), (ii) whether its communication becomes more potent as the monetary policy meeting approaches, and (iii) whether, in contrast to most of the previous literature, its communication affects not only short-term, but also long-term interest rates.

Our results suggest that financial markets respond to central bank communication. We find that central bank communication affects both the level and the volatility of short-term interest rates. It also affects interest rates at longer maturities to a certain degree. According to our results, although the communication does not affect the level of long-term interest rates, it still has an effect on their volatility. We also find that written communication has a calming effect on financial markets and that the timing of communication is important, so that comments closer to the monetary policy meeting have a stronger effect in terms of curbing interest rate volatility.

The paper is organized as follows. Section 2 provides a brief survey of previous research on Czech central bank communication. Section 3 discusses the data and empirical model that we use. The results are available in Section 4. Concluding remarks are provided in Section 5.

2. Related Literature on Czech Central Bank Communication

This section provides an overview of previous studies focusing on CNB communication. For an authoritative survey of central bank communication, see Blinder et al. (2009).

Rozkrut et al. (2007) evaluate the communication strategies of the Czech National Bank, the National Bank of Hungary, and the National Bank of Poland. They find that communication differs considerably across these banks, and that except for the CNB, policy makers' words do not often match their deeds. Their results show that central banks' communication influences the market expectations of future monetary policy decisions. The consistency of the policy makers' statements (the extent to which their words match their future deeds), communication strategy, and committee structure are found to influence the impact of central banks' communication on the predictability of monetary policy decisions.

Böhm et al. (2012) analyze the coverage of CNB monetary policy in the media during the period of 2002–2007. They study articles in the four most relevant Czech daily newspapers. Their results indicate that surprising policy news is not perceived negatively in the media. Clearly, the media coverage is more extensive when the policy change is not expected. Interestingly, regardless of the direction of the move, the changes in interest rates are appreciated by the media. The media coverage is more negative when inflation rises, but also when inflation falls below zero.

Filáček and Saxa (2012) examine whether the CNB has a coordination effect on private sector forecasts. Their results suggest that there is a coordination effect for interest rate and inflation forecasts, but less so for exchange rate and GDP forecasts.

Bulíř et al. (2007) take a different perspective on assessing central bank communication. They examine whether the communication is internally consistent, i.e., whether inflation targets, inflation forecasts, and the verbal assessments of inflation factors contained in quarterly inflation reports provide an identical message to the public. They examine several central banks around the world, including the Czech central bank, and find that these central banks provided a largely consistent message during the years 2000–2005.

Fišer and Horváth (2010) analyze the effects of CNB communication, macroeconomic news, and the interest rate differential on exchange rate volatility using the GARCH model. They find that communication has a calming effect on the volatility of the exchange rate. Moreover, they discover that the timing of communication matters, as the financial markets respond more to communication before policy meetings than after them.

Horváth et al. (2012) examine whether the voting records of several central bank boards, including the CNB, are informative about future monetary policy. The results suggest that the voting records in all the central banks examined contain information that is new to the financial markets and provide a useful measure of the likely change of interest rates at the next monetary policy meeting.

Égert and Kočenda (2013) investigate the effects of macroeconomic news and central bank communication on the exchange rate in three Central European countries, including the Czech Republic. As regards central bank communication, they find that oral statements had an effect on the exchange rate only during the crisis period.

All in all, the analysis of Czech central bank communication is a burgeoning stream of literature, but to our knowledge the effect of communication on interest rate volatility has not been examined.

3. Data and Empirical Model

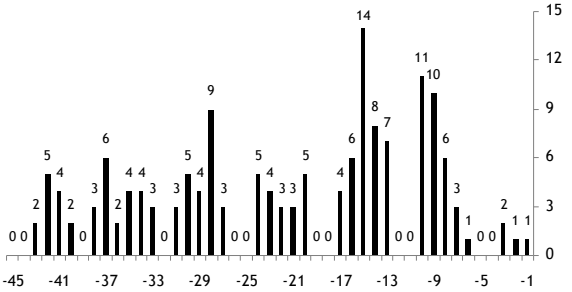
3.1 CNB Communication

The CNB adopted inflation targeting in 1998 and has gradually become one of the most transparent central banks in the world (Dincer and Eichengreen, 2009). The CNB Bank Board meets eight times a year.[2] These meetings are scheduled for the beginning of February, May, August, and November and the end of March, June, September, and December. The monetary policy meeting serves as an opportunity to change the policy rate. The decision is made public at around 1 p.m., followed by a press conference in the afternoon. The CNB releases the voting ratio during the press conference and communicates its interest rate decision, the forecasts, and the risks accompanying the forecast.

The minutes of the monetary policy meeting are made available approximately eight days after the meeting. Since 2008, the minutes have contained the indi-

[2] The Board met on a monthly basis until 2008 and held several extraordinary meetings after the introduction of inflation targeting.

Figure 1 Frequency of the CNB Speeches and Interviews before the Bank Board Meeting, 2007–2012



Notes: The chart represents the number of comments before the day of the Bank Board meeting.
Legend to the graph: "-1" for one day before the meeting, "-2" for two days before the meeting, "-3" for three days before the meeting, "-4" and "-5" four and five days before the meeting, respectively, etc.

vidual voting records. The minutes are discussed in greater detail in Horváth et al. (2012). Detailed transcripts of the board meetings as well as the so-called Situation Report on Economic and Monetary Developments and the Monetary Policy Recommendation are published with a six-year lag (available in Czech only). The CNB publishes inflation reports on a quarterly basis (in February, May, August, and November). The inflation report contains a summary of Czech economic developments and, importantly, provides detailed information on the forecast for the macroeconomic environment and associated risks.

In line with what is observed for major central banks (Ehrmann and Fratzscher, 2009), the communication intensity declines prior to the monetary policy meeting and the Czech central bank ceases to communicate with the public at all several days before the monetary policy meeting (see *Figure 1*).

3.2 Data

We collect daily data on CNB communication and interest rates (the Czech 10-year bond yield[3] and the 3M PRIBOR) from the CNB website. Our sample runs from January 2007 to December 2012, which makes 1,495 observations. The frequency of the data is daily.

PRIBOR$_t$ and Yield10Y$_t$ are the bases for calculating our dependent variables. The remaining variables are explanatory. The definitions of all the variables are available below. The descriptive statistics are available in *Table 1*.

DEPENDENT VARIABLES:

PRIBOR$_t$ daily data on three-month PRIBOR (Prague InterBank Offered Rate). It is the interest rate at which banks provide loans to each other on the Czech interbank market;

$Yield10Y_t$ Czech 10-year government bond yield.

[3] Instead of government bonds, we also tried to use 10-year interest rate swaps (IRS). Unlike IRS, government bond yields are directly influenced by the sovereign credit risk. However, our GARCH-type estimates showed that the results with IRS exhibit non-stationary volatility.

Table 1 Descriptive Statistics

	PRIBOR	Yield10Y	Comments	Minutes	Timing	IR
Mean	2.13	4.04	0.11	0.04	3.98	0.02
Maximum	4.52	5.42	1.00	1.00	45.00	1.00
Minimum	0.50	1.84	0.00	0.00	0.00	0.00
Std. deviation	1.16	0.77	0.31	0.18	10.25	0.13
Skewness	0.62	-0.74	2.56	5.08	2.51	7.70
Kurtosis	1.90	3.29	7.53	26.81	7.94	60.35
Observations	1496	1496	1496	1496	1496	1496

EXPLANATORY VARIABLES:

IR_t dummy variable describing the release of the inflation report:

$$IR_t = \begin{cases} 1 & \text{on all days the inflation report is released,} \\ 0 & \text{otherwise.} \end{cases}$$

$minutes_t$ dummy variable describing the minutes:

$$minutes_t = \begin{cases} 1 & \text{on all days the minutes are released,} \\ 0 & \text{otherwise.} \end{cases}$$

$comments_t$ dummy variable showing whether or not there was a comment on that day. A comment is defined as an oral or written statement made by a member of the Bank Board concerning interest rates, the economic outlook, inflation, or the exchange rate. These data come from the CNB website ("Media service—Interviews, articles" and "Media service—speeches, conferences, seminars–Speeches"):

$$comments_t = \begin{cases} 1 & \text{on all days a comment is made,} \\ 0 & \text{otherwise.} \end{cases}$$

$direction_t$ dummy variable capturing the direction[4] of the comment:

$$direction_t = \begin{cases} +1 & \text{positive comment,} \\ -1 & \text{negative comment,} \\ 0 & \text{otherwise.} \end{cases}$$

$timing_t$ describes how the influence of a Bank Board comment gets stronger as the date of the monetary policy meeting approaches. A comment that occurs on the day of the meeting has a value of 45, a comment from the previous day has a value of 44, a comment made two days before the meeting has a value of 43, and so on.[5] In consequence, comments closer to the monetary policy meeting get a greater weight.

[4] "Positive comment" represents the an improved economic outlook or an inclination toward tightening monetary policy, and "negative comment" represents the a weaker economic outlook or an inclination toward easing monetary policy. We are aware that the coding of this variable is, to a certain extent, subjective and we therefore exclude this variable from some regression specifications to evaluate the stability of our results.

[5] The value of 45 is set because the Bank Board's meetings are held eight times a year. There are 360 days in a year, so 360 ÷ 8 = 45.

3.3 Econometric Model

We use the threshold generalized autoregressive conditional heteroskedasticity (*TGARCH*) model (Zakoian, 1994) to evaluate the effect of central bank communication on interest rate volatility. The general model is specified as follows:

$$\Delta r_t = \mu + \upsilon\left(direction_t\right) + \xi_t \tag{1}$$

$$\sigma_t^2 = \gamma + \alpha\xi_{t-1}^2 + \beta_1\sigma_{t-1}^2 + \beta_2\xi_{t-1}^2 I_{(\xi_{t-1}<0)} + \sum_{i=1}^{n}\delta_i CB_{it} \tag{2}$$

where r_t denotes the log of the interest rate. The error term, ξ_t, in the mean equation (1) is $\xi_t = \sigma_t e_t$, where σ_t is the volatility of Δr_t and ξ_t is an iid variable. In equation (2), $I(\cdot) = 1$ if $\xi_{t-1} < 0$ and 0 otherwise. In this model, good news, $\xi_{t-1} > 0$, and bad news, $\xi_{t-1} < 0$, have different effects on the conditional variance. The conditional variance equation (2) additionally includes a constant γ, the *ARCH* term ξ_{t-1}^2, the GARCH term σ_{t-1}^2, and variables capturing the effect of central bank communication, CB_{it}. The model is estimated via maximum likelihood using the BHHH algorithm for optimization, and is estimated for all business days in the sample.

Our goal is to examine whether the coefficients δ_i capturing central bank communication are significant. It is important to note that a *priori* the coefficients δ_i can be negative, positive, or insignificant. Positive (negative) coefficients imply that the central bank increases (reduces) the interest rate volatility. Note that in the case of tick-by-tick data the coefficients are unlikely to be negative, as news will change the price of financial assets and therefore increase its volatility by definition. In the case of daily data, this does not have to be so and the estimated coefficient can be negative (see also Fišer and Horvath, 2010). Insignificant coefficients δ_i indicate that central bank communication does not represent news for the financial markets.

As an alternative to the TGARCH model, we also employ the exponential generalized autoregressive conditional heteroskedasticity (*EGARCH*) model (Nelson, 1991). The motivation is to include a different GARCH-type model which allows for asymmetries in financial market dynamics to examine the stability of our results. The EGARCH model is specified as follows:

$$\Delta r_t = \mu + \upsilon\left(direction_t\right) + \xi_t \tag{3}$$

$$\log\left(\sigma_t^2\right) = \kappa + \alpha\left|\frac{\xi_{t-1}}{\sqrt{\sigma_{t-1}^2}}\right| + \gamma\frac{\xi_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \beta\log\left(\sigma_{t-1}^2\right) + \sum_{i=1}^{n}\varphi_i CB_{it} \tag{4}$$

4. Results

This section contains the results of the econometric estimation evaluating whether central bank communication affects short-term and long-term interest rates. Using the TGARCH model as the baseline, we examine whether central bank communication influences the level and volatility of interest rates.

Table 2 TGARCH: The Effects of the CNB Communication on PRIBOR

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
μ	-36.9*	-68.4*	-119.9*	-54.3*	-125.7***	-140.7	-123.2	-83.4*
	[22.0]	[39.8]	[66.0]	[33.1]	[49.0]	[65.1]	[55.1]	[53.3]
v (direction$_t$)								284.9**
								[125.6]
α	5.37***	14.3***	20.8***	9.44***	18.6***	14.2***	15.2***	14.4***
	[0.11]	[0.21]	[0.06]	[0.17]	[0.34]	[0.18]	[0.69]	[0.80]
$ß_1$	1.04***	0.85***	0.45***	0.94**	0.55***	0.34***	0.39***	0.48***
	[0.04]	[0.06]	[0.05]	[0.05]	[0.05]	[0.04]	[0.04]	[0.05]
$ß_2$	-0.17*	-0.39***	-0.08	-0.26***	-0.10	-0.00	-0.02	-0.07
	[0.09]	[0.09]	[0.08]	[0.10]	[0.08]	[0.07]	[0.08]	[0.43]
γ	0.00	-0.02***	-0.01***	-0.00	-0.01	0.33***	0.26***	0.24***
	[0.01]	[0.00]	[0.00]	[0.01]	[0.03]	[0.02]	[0.04]	[0.05]
δ_1 (*minutes*$_t$)	-3.71***			-7.91***		-14.8***	-15.4***	-14.7***
	[0.40]			[0.40]		[1.16]	[1.01]	[0.66]
δ_2 (*comments*$_t$)		0.71**		1.95***	3.96***		4.58***	3.68**
		[0.30]		[0.50]	[0.01]		[1.32]	[1.75]
δ_3 (*timing*$_t$)			-0.36***		-0.42***		-0.40***	-0.30***
			[0.04]		[0.00]		[0.00]	[0.06]
δ_4 (IR_t)	-4.10***	-13.9***	-14.3**	-9.43***	-15.2***	-12.6***	-14.9***	-14.4***
	[0.41]	[0.01]	[0.04]	[0.17]	[0.03]	[3.35]	[3.19]	[3.04]
AIC	-6.23	-6.37	-6.23	-6.54	-6.25	-6.22	-6.00	-6.29
N	1495	1495	1495	1495	1495	1495	1495	1495

Notes: Standard errors are shown in brackets below the coefficients. *AIC* is Akaike information criterion. ***, ** and * denote significance at 99%, 95% and 90%, respectively. The values of μ, v, α, δ_1, δ_2, δ_3 and δ_4 are multiplied by 10^5, their standard errors are also multiplied by 10^5.

Table 3 TGARCH: The Effects of the CNB Communication on 10Y Bond

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
μ	13.1	-7.76	-7.86	-5.81	-11.3	-6.26	-8.55	-3.26
	[55.7]	[32.4]	[31.4]	[31.5]	[33.1]	[30.9]	[31.9]	[50.1]
v (direction$_t$)								96.7
								[290.8]
α	6.11***	0.33***	0.47***	0.10**	0.47***	0.30***	0.15**	4.11***
	[55.7]	[0.03]	[0.05]	[0.05]	[0.05]	[0.06]	[0.06]	[0.25]
$ß_1$	0.1***	0.04***	0.04***	0.04***	0.04***	0.04***	0.04***	0.07***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.05]	[0.00]	[0.00]	[0.01]
$ß_2$	0.07**	0.07***	0.07***	0.06***	0.06***	0.06***	0.06***	0.12***
	[0.03]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.03]
γ	0.74	0.92***	0.91***	0.93***	0.91***	0.92***	0.93***	0.76***
	[0.01]	[0.01]	[0.00]	[0.01]	[0.01]	[0.01]	[0.01]	[0.02]
δ_1 (*minutes*$_t$)	-21.9***			2.82***		1.94***	3.72***	-14.3**
	[1.69]			[0.67]		[0.72]	[0.80]	[1.19]
δ_2 (*comments*$_t$)		0.09		0.34*	0.07**		1.10***	13.3**
		[0.22]		[0.22]	[0.33]		[0.27]	[2.06]
δ_3 (*timing*$_t$)			-0.02***		-0.03***		-0.03***	-0.19***
			[0.00]		[0.00]		[0.00]	[0.03]
δ_4 (IR_t)	-0.49	-0.26	-0.38	0.00	-1.08	-0.05	-0.65	-3.17***
	[3.12]	[0.85]	[0.85]	[0.88]	[0.85]	[0.88]	[0.91]	[1.91]
AIC	-5.76	-5.96	-5.96	-5.96	-5.96	-5.96	-5.96	-5.81
N	1495	1495	1495	1495	1495	1495	1495	1495

Notes: Standard errors are shown in brackets below the coefficients. *AIC* is Akaike information criterion. ***, ** and * denote significance at 99%, 95% and 90%, respectively. The values of μ, v, α, δ_1, δ_2, δ_3 and δ_4 are multiplied by 10^5, their standard errors are also multiplied by 10^5.

Our regression results are provided in *Table 2* and *Table 3*. *Table 2* contains the regression results with the short-term interest rate as the dependent variable. We provide eight different specifications in order to assess the robustness of the results. The results suggest that the direction of comments has an effect on the level of short-term interest rates. Comments expressing that economic conditions are good are likely to be associated with an increase in interest rates.

We also find that central bank communication matters for the volatility of short-term interest rates. Both the monetary policy minutes and the inflation report exert a negative effect, i.e., they have a calming effect on the financial markets. This is in line with some previous studies on the effects of central bank communication, such as Jansen and de Haan (2005) and Fišer and Horváth (2010). Interestingly, we do not find this calming effect for oral communication.

Finally, the timing of central bank communication is important, according to our results. The financial markets react more strongly to statements made closer to the day of the monetary policy meeting. In addition, we find that the asymmetric term in the TGARCH model is negative and often significant. This result suggests that bad news has a disproportionately greater effect on volatility than good news, which is a widely observed phenomenon in the financial markets.

Our results with the long-term interest rate as the dependent variable are provided in *Table 3*. They suggest that central bank communication to a certain extent affects interest rates even at longer maturities. The level of short-term interest rates is not affected, but the volatility is. This is an interesting result, because central banks typically communicate about the near-term economic outlook (note that the typical monetary policy horizon of central banks is 1–2 years), but rarely about the more distant future. Otherwise, the results largely confirm our findings in *Table 2*.

We subject our regression results to further robustness checks. First, we use a different asymmetric GARCH model and estimate the EGARCH model instead of TGARCH models. In addition, we restrict β_2 from Eq. (2) to be zero and we therefore estimate simple GARCH models, too. The estimation of the GARCH models is a further check of the stability of our results. The results largely confirm our baseline findings showing that financial markets respond to central bank communication. The results are available upon request.

5. Concluding Remarks

We analyze the importance of central bank communication for the level and volatility of short-term and long-term interest rates in the Czech Republic using the GARCH, TGARCH, and EGARCH modelling frameworks. Using daily data in 2007–2012, we find that financial markets respond to central bank communication.

More specifically, we find that more positive statements about economic conditions are followed by an increase in short-term interest rates. Central bank communication matters for interest rate volatility, too. Written communication, as captured by the monetary policy minutes and inflation reports, exerts a calming effect on the financial markets. However, we fail to find this calming effect for oral communication.

Importantly, our findings show that the timing of central bank communication plays an important role. Comments made closer to the monetary policy meeting have

a stronger effect on interest rate volatility. Our results also indicate that central bank communication matters to a certain extent for interest rates at longer maturities, too. To summarize, we find that Czech central bank communication affects financial market expectations, in line with what we observe for many developed central banks (see de Haan, 2008).

Our analysis could be extended in several ways. The communication of individual board members could be studied in order to evaluate whether communication by some members, such as the governor, has a stronger effect on interest rates. The monetary policy meetings are held eight times a year, but a new macroeconomic forecast is released at only four of them. The variable capturing the timing of central bank communication could differentiate between these two types of meetings. In addition, multivariate GARCH models could be employed to study the effects of central bank communication jointly on more financial assets.

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