Verbal Interventions by Various Officials of the Bank of Russia and Interest Rate Dynamics

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Abstract

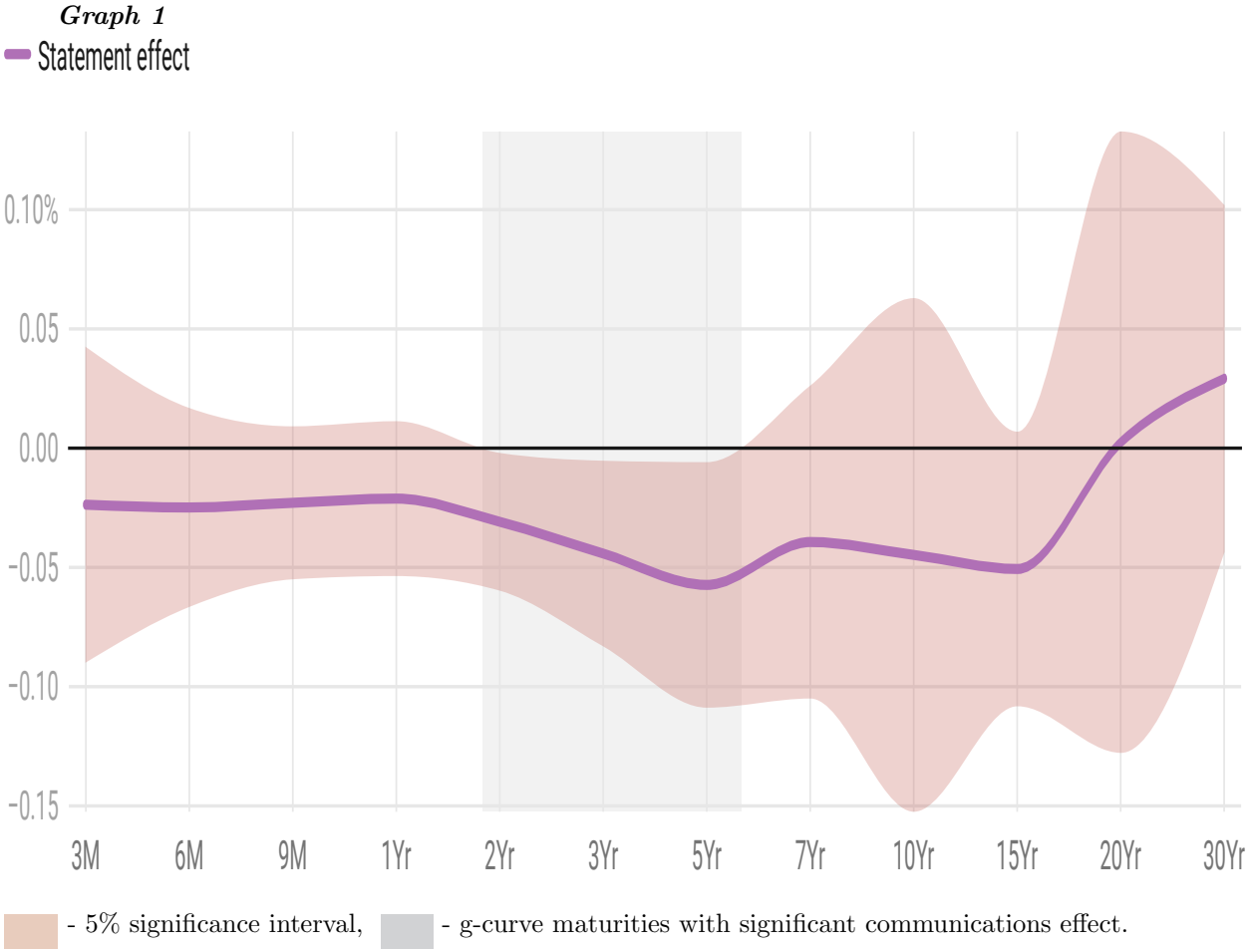
This paper aims to study the impact of the communication policy of the Bank of Russia on the Russian interest rates structure from 2014 to 2017 under transition to inflation targeting. All statements by various Central Bank officials, press service releases as well as published results of studies made by the Bank of Russia departments were taken as an object of study. To explore the structure of interest rates in the economy of the Russian Federation, the values of the zero-coupon yield curve of the Moscow Exchange were investigated. The results of the evaluation of various models of ARIMA, ARCH and GARCH, including asymmetric components, showed that the market reaction may depend on the personalities who made the statement. Market participants also perceive differences in the topic and the tone of statements. As well as market participants have at their disposal information on the areas of responsibility of certain officials of the Board of Directors of the Bank of Russia. In addition, the paper considers proposals to improve the effectiveness of communication policy taking into account the identified imperfections in the current policy.

1. Introduction

Studies devoted to the communication policy of the Central Banks has received increasing attention in scientific literature for last couple of decades (see [2], [9], [12]). The focus is usually on relationship between verbal interventions of monetary authorities and various macroeconomic indicators. For instance, most popular macroeconomic indicator to look at considering the effects of communication policy is an exchange rate and its volatility (see [5], [15], [16]). Nevertheless, the Bank of Russia in 2014 made the transition to the floating ruble exchange rate and to inflation targeting instead of targeting exchange rate. Then the key rate (which in Russian Federation is the minimum interest rate at Bank of Russia repo auctions for a period of one week or the maximum interest rate at Bank of Russia deposit auctions for a period of one week) became main instrument of the Central Bank to control inflation expectations in Russian economy. At the same time, in order to achieve inflation goals, it is becoming increasingly important for the regulator to manage interest rates in the economy by changing both the key rate and the formation of expectations among market participants. And such monetary policy became pretty popular nowadays (even for emerging markets as seen in the examples of Brazil, Chile, Czech Republic, Hungary, Mexico, Poland, the Philippines, South Africa, Thailand and others), which means that there is more and more interest in study of possible impact of communication

policy of monetary authorities on interest rates and related indicators. But still one can find small amount of studies about this issue. For instance, Buchel studied effect of ECB speaker's statements on credit default swaps and spread on bonds (see [10]). Fiordelisi showed that the information policy can affect such indicators as the value of shares of systemically important banks, interbank lending rates, and stock indices (see [13]). And even smaller number of studies focused on the interaction between verbal interventions and interest rates in the economy, as in the work of Rozkrut for bonds with a maturity of 2, 3 and 5 years (see [18]). Or for the statements of the Hungarian National Bank and several bond interest rates in a paper of Gabriel and Pinter (see [14]).

Graph 1



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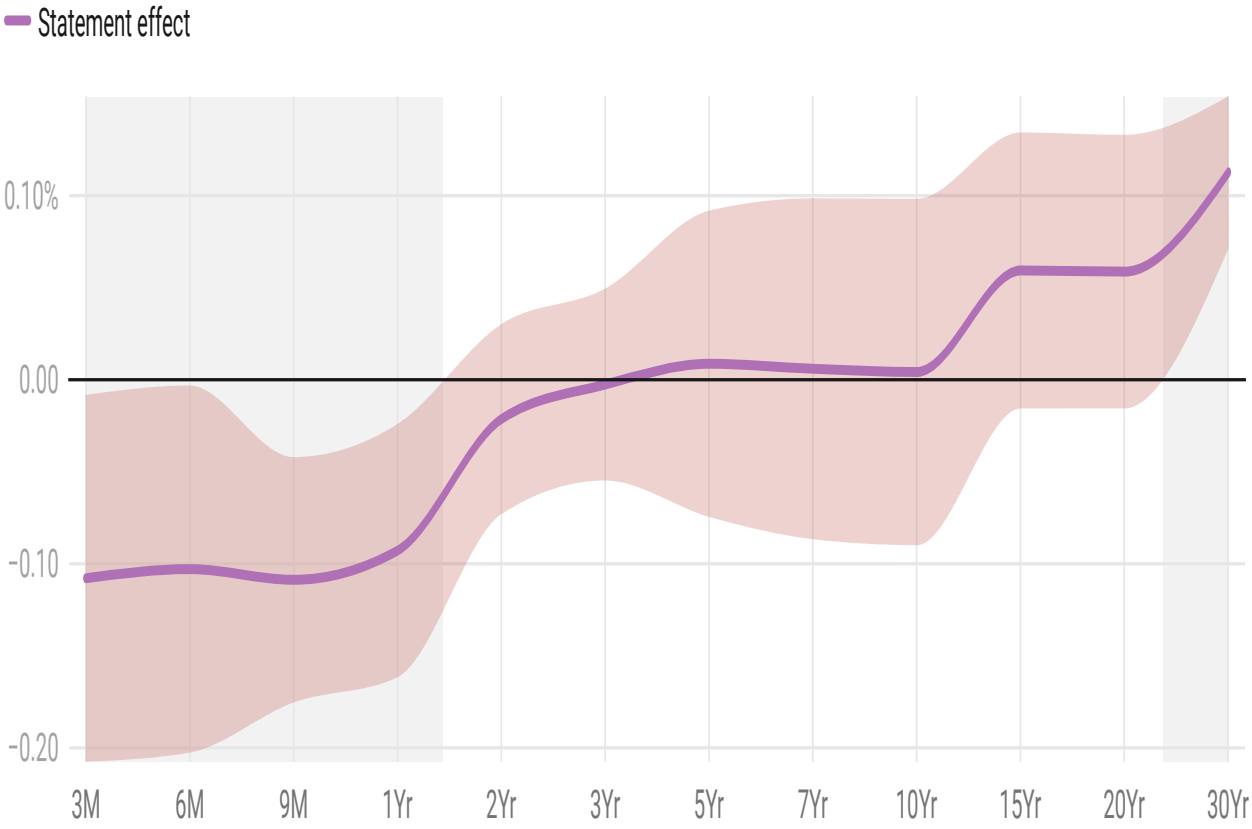

- 5% significance interval, - g-curve maturities with significant communications effect.

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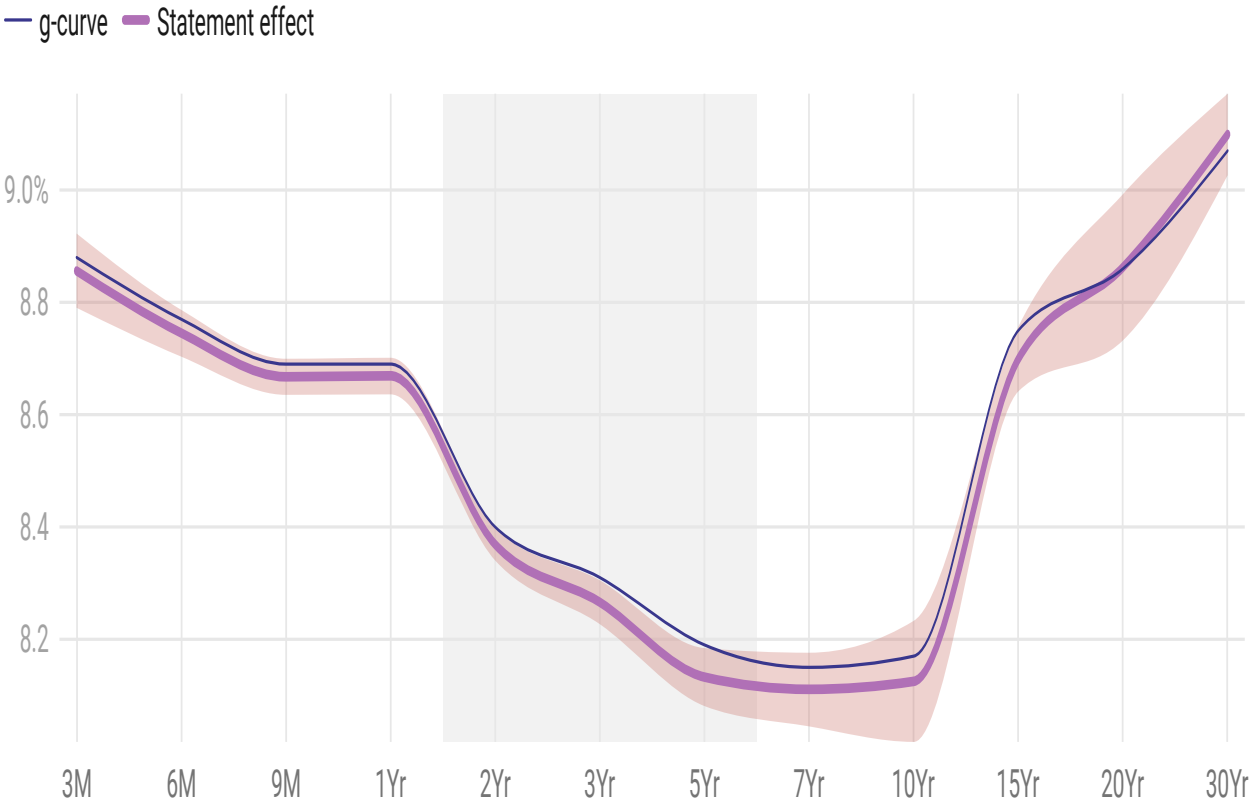

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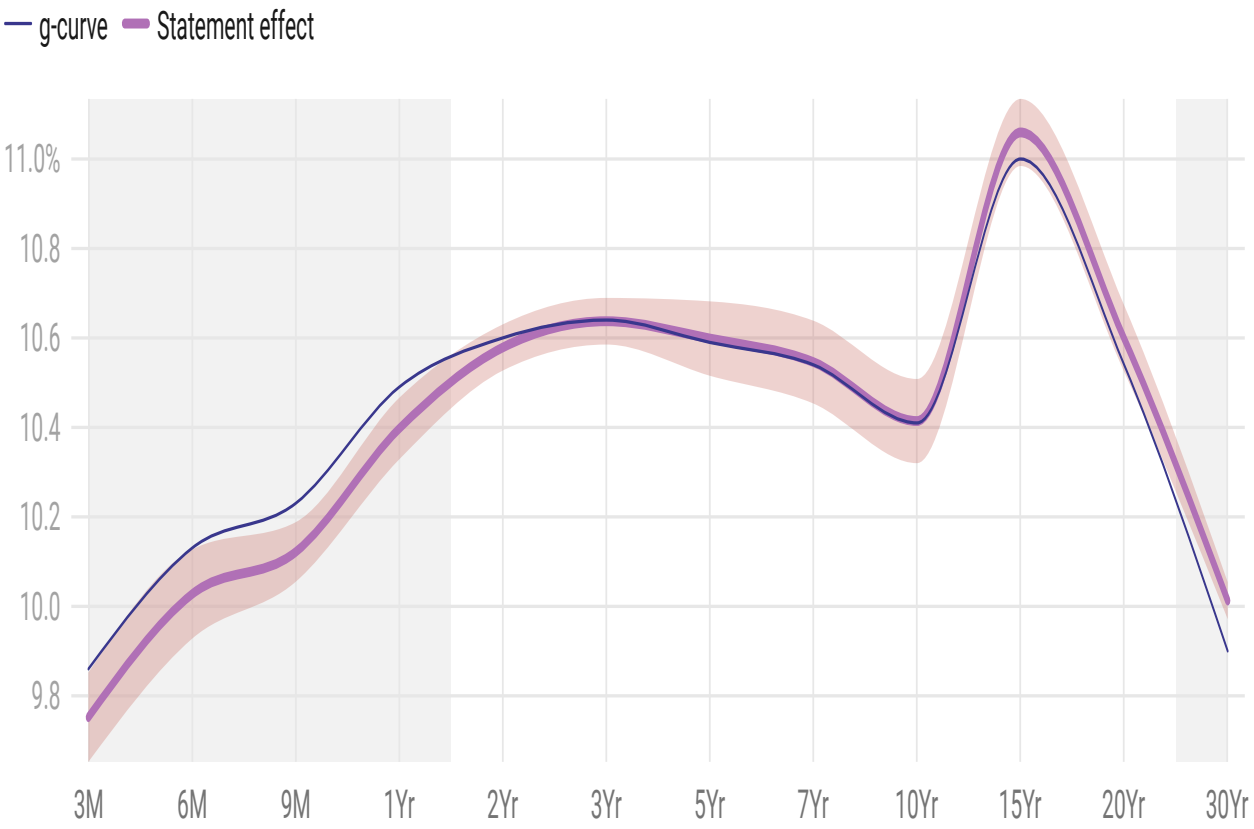

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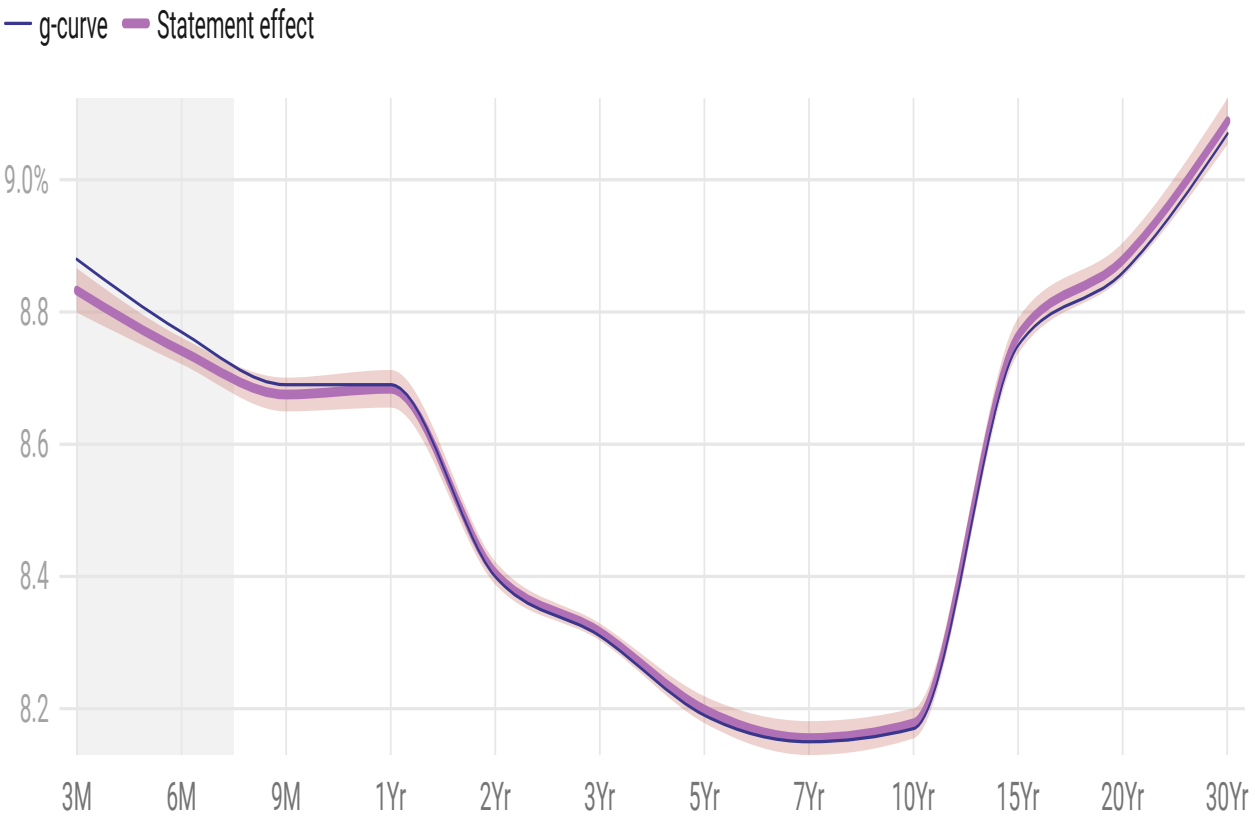

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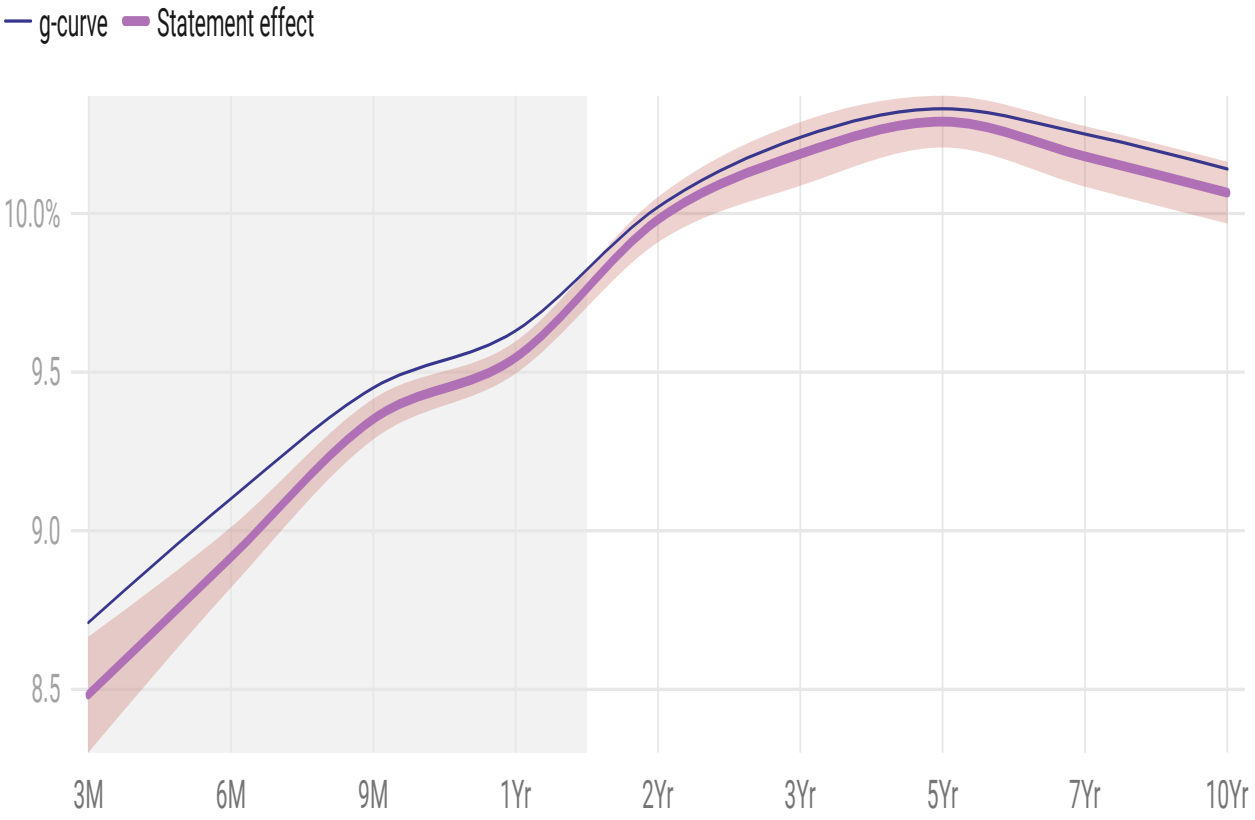

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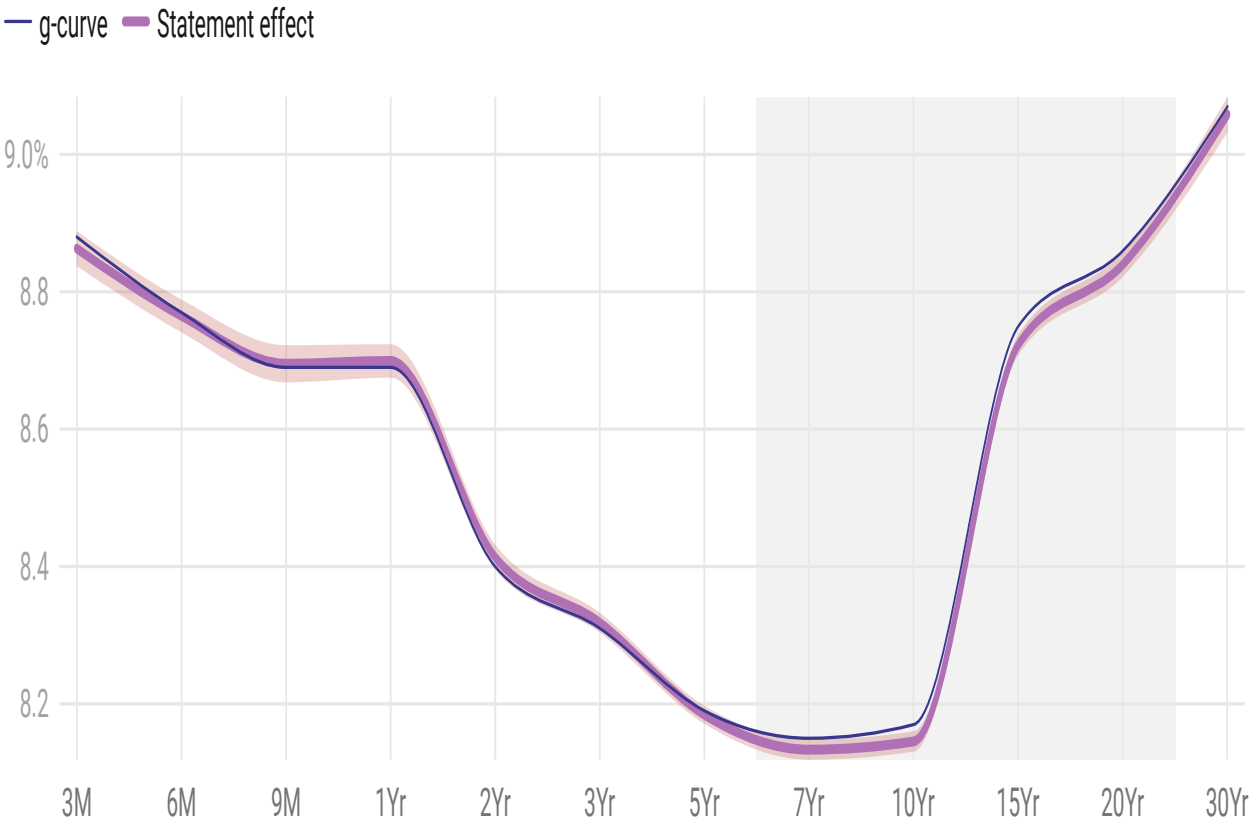

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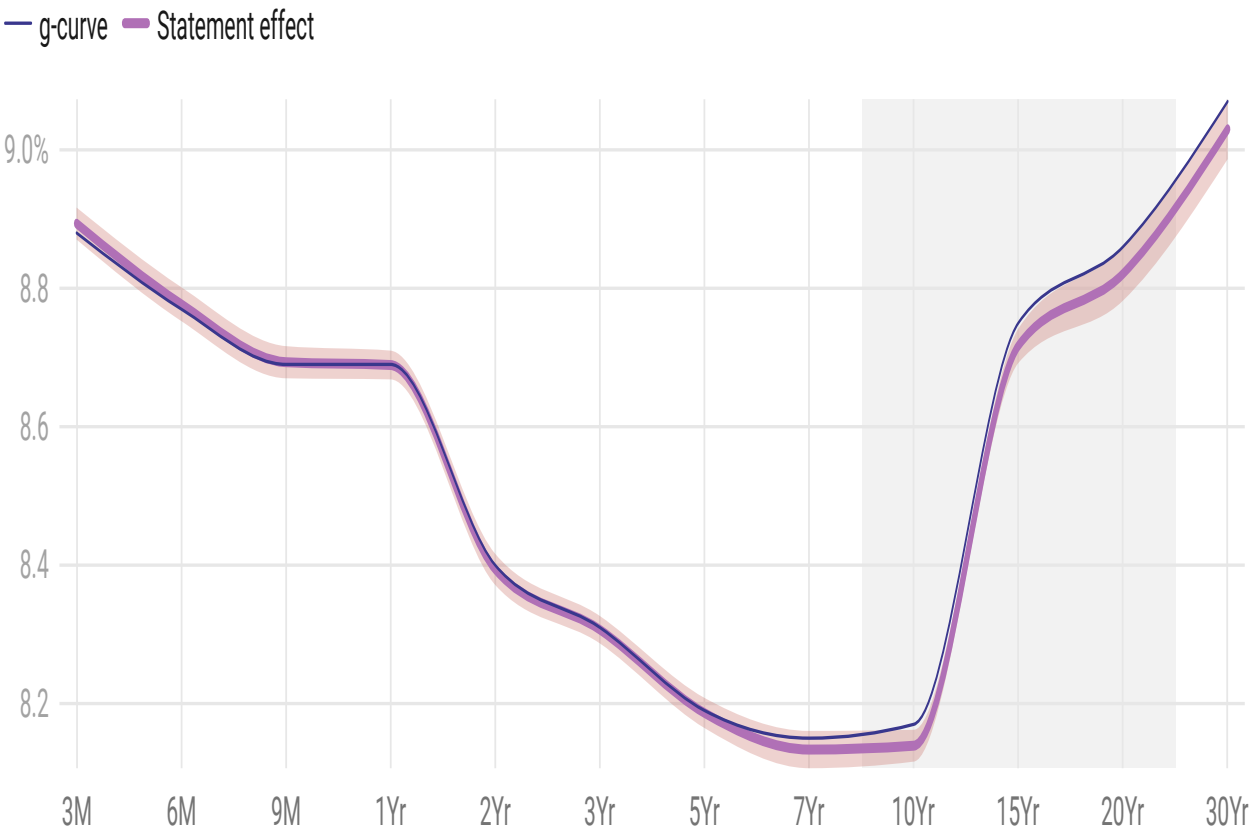

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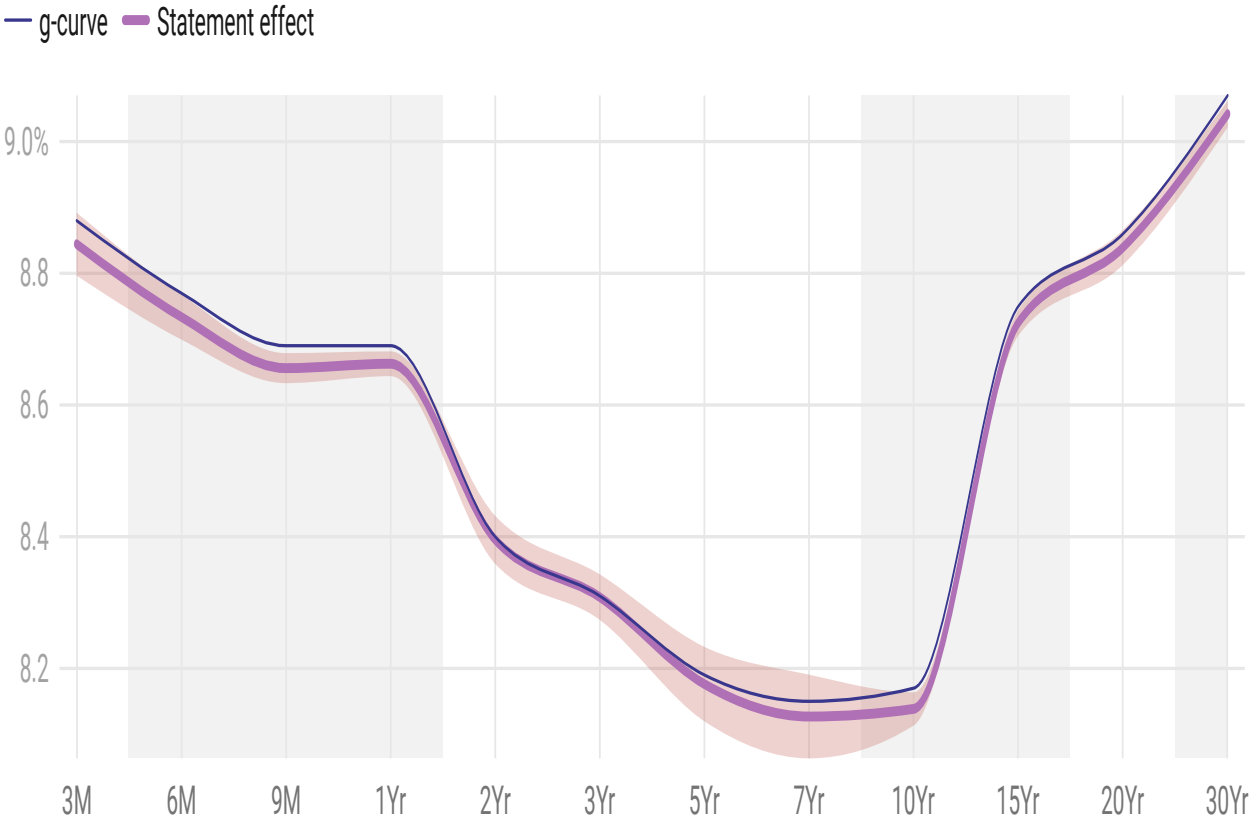

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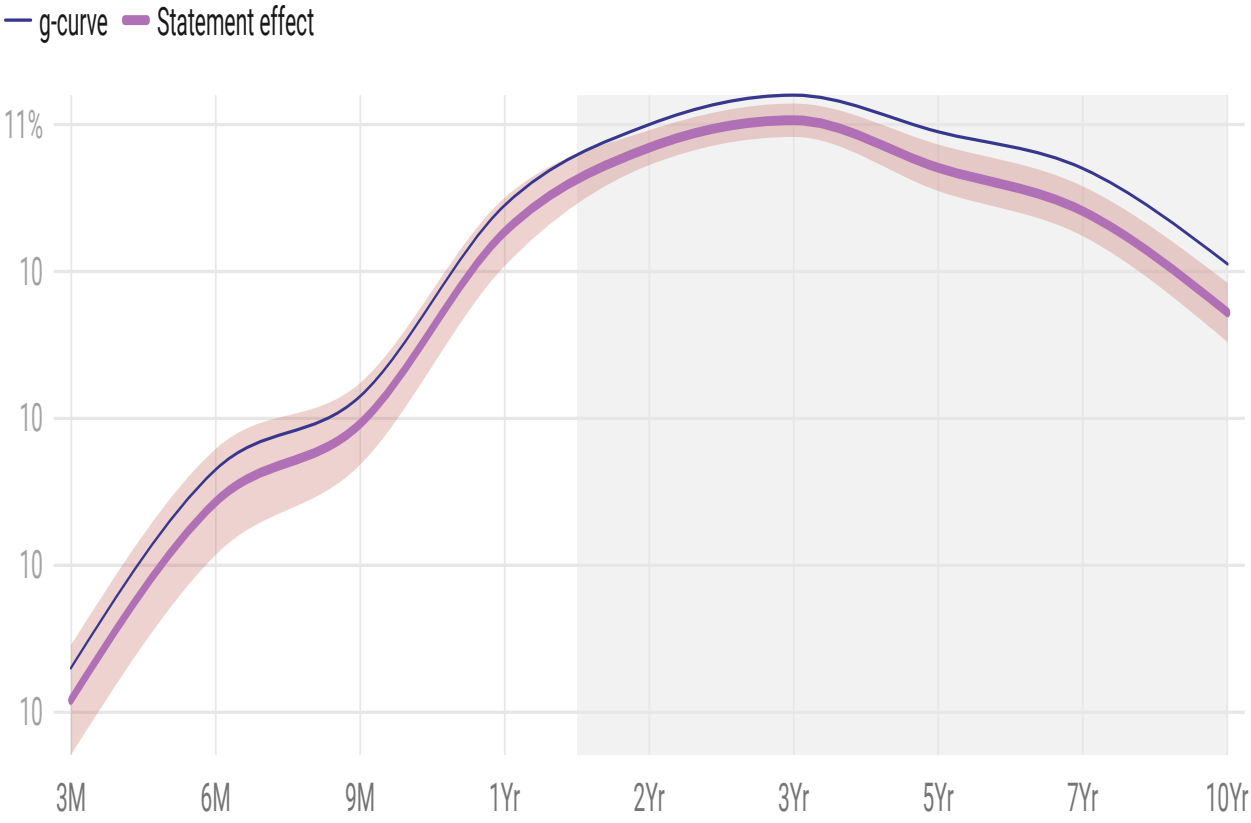

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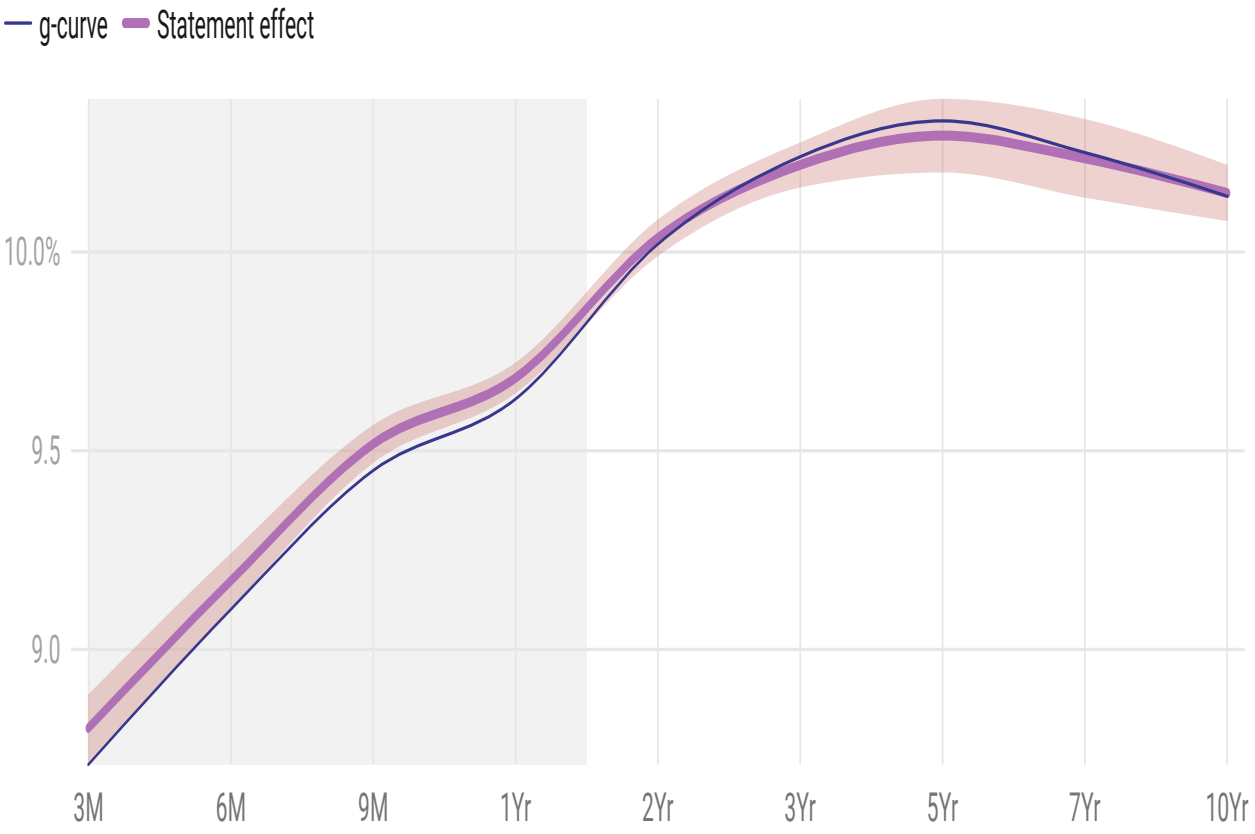

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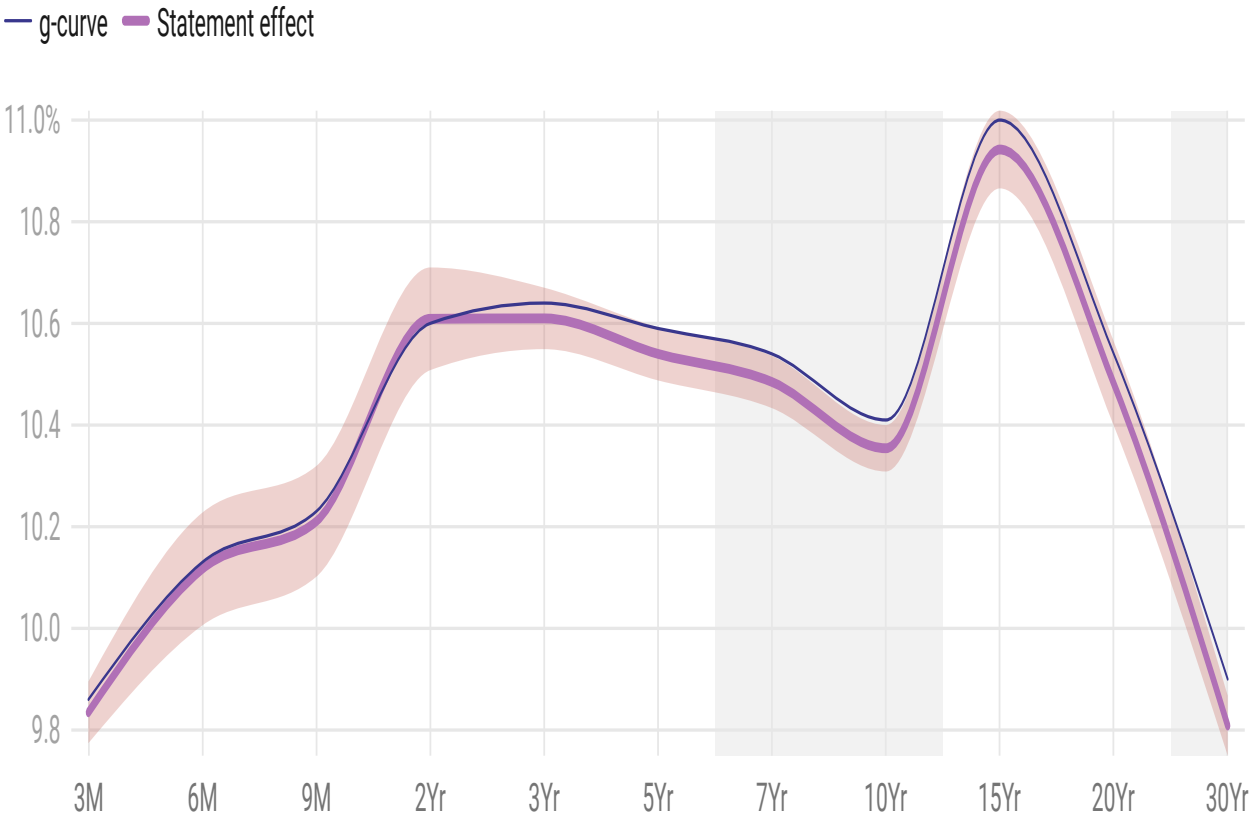

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Traditionally researchers examine impact of regular and/or irregular communication channels, taking into account both possible heterogeneity of signals and heterogeneity of reaction of market participants to them (see [4], [18]). The most common clustering is the separation of certain topics of statements made by monetary authorities (for example, statements about future monetary policy or statements about inflation risks). In addition to this, it is also possible to distinguish various tonality of statements, for example, expected increase/decrease of the discussed indicator (see [5]). However, another source of heterogeneity in the participants' perception of the regulator's communication policy market might be various authors of statements, in the case of the Bank of Russia, these are the Governor of the Central Bank of the Russian Federation, its Deputy Governors, advisers to the Governor, Directors of various departments, as well as interventions that do not have a specific author (such as published results of the Bank of Russia departments). This paper aims to complete existing research on the information policy of the Russian monetary authorities by examining the impact of the statements of individual regulator employees on interest rates in the economy. It seems to be an important addition to existing studies on the Russian market: structuring Bank's of Russia communication policy (see [3]), studying the impact of verbal interventions on the ruble exchange rate (see [5]), interbank lending rates (see [6]), inflation expectations (see [7]), stock indices (see [4]).

Interest rates in the economy (namely, the values of the Moscow Exchange zero-coupon yield curve), in comparison with many other indicators that may be affected by the Bank of Russia communication policy, have the advantage for analysis that they reflect both short-term and long-term expectations of economic agents. The zero-coupon yield curve of the Moscow Exchange is constructed using the Nelson-Siegel parametric model (see [17]). Parameters are calculated in real time on transactions and orders for federal loan bonds, and the curve values are published daily around 18:30 Moscow time. Therefore, in this paper, 12 values of so-called g-curve were used, covering the entire range of interest rates, for maturities from 3 months to 30 years. When examining the impact of irregular verbal interventions on interest rates, one should consider that market participants can perceive differently the same information from different Bank of Russia officials, and the reasons for this can vary. So the statements of the Governor of the Central Bank, Elvira Nabiullina, might be perceived with greater confidence than a similar statement made, for example, by the Director of the Monetary Policy Department due to the difference in their positions. In addition, statements on the state of affairs, for example, in the banking sector can be more closely listened for if they were made by the official responsible for banking supervision, and vice versa, the market may not perceive the information as relevant if the same official speaks out about reduced inflation risks in Russian economy if this issue is not included in his professional responsibilities.

The main research question of this work is the determination of factors that form a different perception by the market of verbal interventions from various representatives of the Bank of Russia (if there are such differences). To answer the research question posed, it is necessary to solve the following problems:
- To determine whether the statements of individual officials of the Bank of Russia are able to influence the structure of interest rates in the economy.
- To study the differences in perception between the topics of verbal interventions, to which 2 market participants listen or not, both for different authors of interventions and for different time periods within the whole period under review.
- Develop recommendations to improve the effectiveness of the Bank of Russia information policy, for example, whether it is necessary for the regulator to somehow limit the range of topics discussed by particular Bank's representative (as well as, on the contrary, encourage statements on certain topics) in order to get rid of irrelevant/noisy signals which might increase efficiency of current communication policy.

The study is similar in methodology to the paper of Telegin and Merzlyakov (see [1]). The database of verbal interventions for 4 years consists of 507 statements by various representatives of the Bank of Russia. Similarly are taken into account the presence of structural shifts in modeling the influence of verbal interventions, as well as necessity for adding variables responsible for macroeconomic dynamics, and necessity for using different ARIMA, ARCH and GARCH models when modeling the values of the zero-coupon yield curve. Initially, the following intervention authors and categories of authors were considered: Nabiullina Elvira, Yudaeva Ksenia, Shvetsov Sergei, Sukhov Mikhail, Simanovskiy Alexey, Pozdyshev Vasiliy, Moiseev Sergey, Tulin Dmitry, Dmitriev Igor, other authors (this category included authors with a small number of interventions) and non-personalized interventions (statements by the press service and published work rsults of various departments of the Bank of Russia). Individual authors were picked out on the basis of the number of interventions made, so for this reason, some deputy chairpersons of the Bank of Russia did not stand out in a separate category, but at the same time, Igor Dmitriev during the period under review only took a position of Director of the Monetary Policy Department of the Bank of Russia.

The novelty of study is as follows: this paper is the first attempt to study as detailed as possible the effect of verbal interventions of individual representatives of monetary authorities on interest rates in the economy, while taking into account not only the authors of the statements, but also various topics of verbal interventions and the tonalities of their statements. All of the above gives an extremely high level of specification for the statements of the regulator, which in the end should make it possible to formulate not only abstract recommendations to the central bank, but much clearer instructions to increase the effectiveness of communication policy.

The article has the following structure. Section 2 describes the verbal interventions of Bank of Russia officials. Section 3 discusses the hypotheses of possible mechanisms of impact of the statements made by particular officials of the Bank of Russia on the zero-coupon yield curve. Section 4 describes chosen econometric models of interest rates, macroeconomic variables, and verbal interventions. Section 5 is dedicated to econometric modeling the effects of verbal interventions. Section 6 presents the conclusions of the analysis and recommendations for improving the efficiency of communications of the Bank of Russia and/or monetary authorities operating in the similar circumstances.

2. Verbal interventions by officials of the Bank of Russia

To determine the effect of the statements made by particular officials of the Board of Directors of the Bank of Russia on the g-curve, the statements of the following authors are considered (hereinafter, for brevity, we will only denote the surname):
- Nabiullina Elvira, Governor of the Bank of Russia
- Yudaeva Ksenia, First Deputy Governor of the Bank of Russia
- Shvetsov Sergei, First Deputy Governor of the Bank of Russia
- Tulin Dmitry, First Deputy Governor of the Bank of Russia (from January 21, 2015)
- Sukhov Mikhail, Deputy Governor of the Bank of Russia (until October 3, 2016)
- Pozdyshev Vasiliy, Director of the Bank of Russia Banking Regulation Department (until May 4, 2014), Deputy Governor of the Bank of Russia (from 5 May 2014)
- Simanovskiy Alexey, First Deputy Governor of the Bank of Russia (until October 16, 2016), Adviser to the Governor of the Bank of Russia (from October 17, 2017)
- Moiseev Sergey, Director of the Financial Stability Department (until December 7, 2016), Adviser to the First Deputy Governor of the Bank of Russia (from December 7, 2016)

- Dmitriev Igor, Director of the Monetary Policy Department of the Bank of Russia
- Other authors (authors with a small number of verbal interventions are included in this category)
- Non-personalized interventions (press service statements and work results of various Departments of the Bank of Russia).

However, while considering the quantity of verbal interventions made by particular officials, one can find out that for most representatives of the Bank of Russia the number of statements on particular topics in particular time segment is too small (especially after dividing into positive and negative tonality). For this reason, we distinguish larger clusters of authors for further analysis:
- Nabiullina
- Yudaeva
- Non-personalized interventions
- Others: all interventions not included into first three categories
- Sum of the previous two categories (hereinafter - Others + non-personalized interventions).

Database of statements made by officials of the Bank of Russia was collected from 1st January of 2014 to 31st December of 2017. The source of the interventions data was website of the TASS Information Agency - the most complete Russian news resource with the least news time lag; this method was repeatedly used when working with Russian data (see [1], [5]). If there was a link to the initial source in the news, then the message from the source was used (as, perhaps, more complete and/or appeared on the previous day). It should be noted that during the analysis only irregular verbal interventions were considered (that is, statements from press releases after meetings of the Board of Directors and during press conferences after meetings were excluded). The reason is that when modeling interest rates, changes in the key rate are taken into account using the dummy variable, and such changes are the main reason for the changes in interest rates on the days of Board meetings.

After eliminating duplicate news, 507 verbal interventions were left and divided into 10 following topics (one verbal intervention could contain signals on several topics) and statements on each topic were divided into 3 tonalities, literally positive, neutral and negative:
- Forward guidance: Tightening, Neutral signal, Easing (forward guidance - communication about the likely future course of monetary policy, in details - see *Fed FAQs*)
- Financial stability: Increase, Neutral signal, Decrease
- Inflation risks: Increase, Neutral signal, Decrease
- Economic growth: Acceleration, Neutral signal, Retardation
- Ruble exchange rate volatility: Increase, Neutral signal, Decrease (mostly ruble/dollar rate)
- Ruble exchange rate dynamics: Dollar growth, Neutral signal, Ruble growth
- Oil prices: Increase, Neutral signal, Decrease
- Banking sector: Positive news, Neutral signal, Negative news (state of affairs in the banking sector)
- Fiscal policy: Tightening, Neutral signal, Easing (with the independence of the fiscal and monetary authorities from each other, the regulator still expresses his opinion on the best budget policy, indirectly also providing information about his own actions in case of deviation of the implemented fiscal policy from the target)
- Instruments: Introducing new, Cessation of use (introduction of new instruments for the provision/absorption of liquidity for banks, which may affect the zero-coupon yield curve due to the fact that the cost of borrowing changes).

Data on the number of verbal interventions for used categories of authors, divided by topics and tonalities, is presented in the table below (also for methodology of data collecting - see [1]):

Graph 1

Speakers	All interventions	Forward guidance			Financial stability			Inflation risks			Economic growth			Ruble exchange rate volatility		
		Tightening	Neutral signal	Easing	Increase	Neutral signal	Decrease	Increase	Neutral signal	Decrease	Acceleration	Neutral signal	Retardation	Increase	Neutral signal	Decrease
All speakers	507	6	41	16	15	55	6	22	106	48	23	42	16	6	25	23
Nabiullina	100	4	17	9	7	17	0	5	35	14	5	18	4	2	5	8
Yudaeva	66	1	5	2	1	16	0	9	21	5	5	4	4	1	5	6
Non-personalized	192	0	8	1	4	15	5	6	35	19	9	17	7	3	8	6
Others	149	1	11	4	3	7	1	2	15	10	4	3	1	0	7	3

Speakers	Ruble exchange rate dynamics			Oil prices			Banking sector			Fiscal policy			Instruments	
	Dollar growth	Neutral signal	Ruble growth	Increase	Neutral signal	Decrease	Positive news	Neutral signal	Negative news	Tightening	Neutral signal	Easing	Introducing new	Cessation of use
All	1	69	13	4	19	19	47	146	37	13	14	0	21	4
Nabiullina	0	25	2	1	12	4	9	41	1	6	9	0	-	-
Yudaeva	0	9	3	1	4	6	3	5	1	4	3	0	-	-
Non-personalized	1	25	5	2	1	6	12	36	20	3	1	0	-	-
Others	0	10	3	0	2	3	23	64	15	0	1	0	-	-

To get the correct results in econometric analysis, we will set a limit of 5 statements - if number of verbal interventions of this tone of a certain category of authors on a given topic is less than 5, then we exclude the corresponding dummy variable from the model. This condition led to the fact that 2 topics had to be completely excluded from further analysis due to a lack of observations: Fiscal policy and Instruments, so there are 8 topics of verbal interventions, each contains 3 tonalities.

3.Mechanisms of the impact of the statements of individual representatives of the Bank of Russia on the zero-coupon yield curve

Let's discuss the possible mechanisms of impact of irregular verbal interventions on the zero-coupon yield curve values. Later on, the results of econometric analysis will confirm or reject hypotheses put forward. The most obvious transmission mechanism one can see in signals about forward guidance. Signals about easing monetary policy may lead to lower interest rates, if this information is perceived by market participants as new and reliable. This reaction can be explained with the fact that investors adjust in advance to a lower key rate expected in the future, gradually decreasing rates even now. Signals of tightening monetary policy, on the contrary, can lead to higher rates.

Interventions containing news about increasing inflation risks may shift up the zero-coupon yield curve, since with higher inflation, the Bank of Russia will adhere to a tighter monetary policy in the inflation targeting mode. Interventions containing news about lowering inflation risks are likely to shift the g-curve down.

Negative news about financial stability may be accompanied by an increase in the g-curve values, because a decrease in financial stability usually entails the depreciation of the ruble, and since limiting the inflationary effects of exchange rate dynamics is one of the targets of the regulator - Bank of Russia have to purse tightening policy. Accordingly, positive news about financial stability may lead to a decrease in the zero-coupon yield curve values.

Similarly, negative news for the banking sector state of affairs may cause an increase in the zero-coupon curve values, as news can be perceived as a negative signal for financial stability. Positive news can, on the other hand, cause a decrease in the curve values.

Positive news about economic growth could have a multidirectional effect on the g-curve. On one side, the acceleration of GDP growth indicates an increase in budget revenues and a decrease in the likelihood of default, which reduces the level of interest rates in the economy due to the greater attractiveness of Russian securities and lower risk premiums. On the other hand, faster GDP growth may precede a tighter anti-cyclical monetary policy of the Bank of Russia. However, the second effect, most likely, should have a lesser impact, since the considered period of time is characterized by a low level of GDP growth in Russia, in such circumstances the regulator cares more about conducting a monetary stimulus. Accordingly, negative statements about economic growth is likely to cause an increase in the values of the g-curve.

Like the positive statements about economic growth, the news about rising oil prices can be perceived by the market as a signal of an increase in budget revenues and a decrease in the probability of default, which should shift the g-curve down. On the other hand, news of lower future oil prices could lead to less attractive Russian securities, higher risk premiums and higher interest rates. However, the opposite effect may also be observed for news about oil prices. With a decrease in oil prices in the export-oriented economy of Russian Federation, a decrease in economic activity and, as a result of this, a decrease in inflationary pressure might be expected, which can lower interest rates.
Interventions about a decrease in the ruble exchange rate volatility may be the reason for the g-curve to shift down, as they may indicate greater stability of the ruble and greater financial stability. Conversely, news about the increased volatility of the ruble exchange rate may lead to a shift of the g-curve up.
Interventions about the depreciation of the ruble against other currencies may lead to an increase in the g-curve values under the action of the following mechanism: when the ruble depreciates, the cost of imported goods rises, and the Bank of Russia while targeting inflation will pursue a slightly more tightened monetary policy. News about the growth of the ruble against other currencies can lead to a decrease in the g-curve due to the contribution of the growth of ruble to the slowdown in inflation.

After all, one have to notice that main limitation for constructing models may be that verbal interventions should contain new and reliable information otherwise they cannot affect the g-curve values.

4.Specification of the models of the dependence between verbal interventions and the g-curve

Based on the methodology from the work of Telegin and Merzlyakov (see [1]), the sample is divided into 3 clusters, finding the points of structural breaks using the Minimum Description Length method (see [11]). The main reason for clusterization needed is the length of chosen time period, in which one can found big shifts in Russian economy such as start of the period with practically absence of economic growth, turn to inflation targeting, strong changes in exchange rate of ruble and so on. In the table below there are obtained break points for each of the 12 values of the zero-coupon yield curve:

Table 1: Dates of structural changes

Maturity, years	Beginning of segment, observation	End of segment	Date of start of segment	Date of end of segment	Averaging
0,25—10	0	294–343	01.01.14	10.03.15–21.05.15	from the beginning of 2014 to the 1st quarter of 2015
0,25—10	295–344	513–555	11.03.15–22.05.15	22.01.16–23.03.16	from the 2nd quarter of 2015 to the 1st quarter of 2016
0,25—10	514–556	1004	23.01.16–24.03.16	31.12.17	from the 2nd quarter of 2016 to the end of 2017
15—30	0	208	01.01.14	30.10.14	from the beginning of 2014 to October of 2014
15—30	209	408–413	31.10.14	21.08.15–28.08.15	from November of 2014 to August of 2015
15—30	409–414	1004	22.08.15–29.08.15	31.12.17	from September of 2015 to the end of 2017

As one can see, all 12 models have 2 structural break points. For further analysis one should also choose the most appropriate model specifications for each maturity and time period. If one wants to do some averaging of breakpoints in models for different maturities then it's easy to find that first time segment ends around the moment of ruble exchange rate crisis and transition to floating rate and inflation targeting (these events happened close enough to each other). And the end of the second time segment is located near the beginning of easing of monetary policy after long period o steady key rate (which, in turn, was rather a consequence of recovery processes in the Russian economy).

The choice was made between simple ARIMA models (with number of lags selected via using Minimum Description Length method) and dozen of model with ARCH components: ARCH(1), GARCH(1,1), IGARCH(1,1), EGARCH(1,1), SAGARCH(1,1), TARCH(1), TGARCH(1,1) (detailed specifications - in Appendix). Some of them are symmetric, but some includes asymmetric components to reflect the possibility of different perception of good and bad news by the market participants. Modeling interest rates dynamics within Russian economy, one have to take into account the export orientation of the Russian economy. For this reason, some regressors like oil prices or the ruble exchange rate should be added to the model as an independent variable. In this particular case as a proxy for measuring the state of the economy, a choice was made of 11 possible variables:

(1) Returns of the Moscow Exchange index at the time of opening the trading session

(2) Returns of the Moscow Exchange index at the time of closing

(3) Returns of the interbank lending rate

(4) Returns of Brent crude oil at the time of the opening of the exchange

(5) Returns of Brent crude oil at the time of the closing of the exchange

(6) Returns of daily changes in the price of Brent crude oil (from the previous indicator, the difference appears only on mismatch days days off with global holidays)

(7) Returns of Brent crude oil at 18:30 Moscow time (approximate time for the g-curve values to be

published)
(8) Returns of ruble to dollar exchange rate at the time the exchange opened
(9) Returns of ruble to dollar exchange rate at the time of closing the exchange
(10) Returns of the daily change in the ruble to the US dollar (from the previous indicator, the difference appears only on the days of the mismatch between the Russian days off and global)
(11) Returns of the ruble to the US dollar exchange rate at 18:30 Moscow time time (approximate time of publication of g-curve values).

In addition, significant fluctuations in interest rates are expected and seen on the days when the Bank of Russia changes key rate on a Board of Directors. Therefore, the model introduces a dummy variable that reflects the change in the key rate (in percentage points), which differs from zero in the days when key rated changes and otherwise equals to zero. As dummy variables we also use the indicators responsible for large outliers in the data (the logic behind it and detailed procedure of choosing dummies - see [1] and/or *online Appendix for the paper*) - extraordinary meetings of the Board of Directors of the Bank of Russia and the first trading (without restrictions) days of the year for the Moscow Exchange. Also it may be necessary to include lags of the dependent variable in the model, and choosing number of lags has been done with Minimum Description Length method (see [8]). Eventually a wide range of ARIMA, ARCH, and GARCH models were tested as possible suitable models. Algorithm of choosing best fitted model is the same as in the paper of Telegin and Merzlyakov (see [1] and/or *online Appendix for the paper*). Final specifications of the models:

Graph 2

Maturity, years	Segment number	State of the economy (1)-(11)	Key interest rate changes	Extraordinary meetings and first working days of the year	Algorithm result: best fitted model
0,25	Segment 1	(11)	+	+	GARCH(1,1)
	Segment 2	(11)	+	+	ARCH(1)
	Segment 3	(6)	-	+	GARCH(1,1)
0,5	Segment 1	(11)	+	+	GARCH(1,1)
	Segment 2	(11)	+	+	AR(1)-ARCH(1)
	Segment 3	(11)	+	+	GARCH(1,1)
0,75	Segment 1	(9)/(11)	+	+	GARCH(1,1)
	Segment 2	(11)	+	+	AR(1)-ARCH(1)
	Segment 3	(11)	+	+	GARCH(1,1)
1	Segment 1	(9)/(11)	+	+	GARCH(1,1)
	Segment 2	(11)	+	+	AR(1)-ARCH(1)
	Segment 3	(11)	-	+	GARCH(1,1)
2	Segment 1	(11)	+	+	GARCH(1,1)
	Segment 2	(11)	-	+	TGARCH(1,1)
	Segment 3	(11)	+	+	GARCH(1,1)
3	Segment 1	(11)	+	+	IGARCH(1,1)
	Segment 2	(9)/(11)	-	+	TARCH(1)
	Segment 3	(11)	-	+	GARCH(1,1)
5	Segment 1	(11)	-	+	TGARCH(1,1)
	Segment 2	(9)/(11)	+	+	ARIMA(0,0,0)
	Segment 3	(11)	-	+	SAGARCH(1,1)
7	Segment 1	(11)	-	+	IGARCH(1,1)
	Segment 2	(11)	-	+	ARIMA(0,0,0)
	Segment 3	(11)	+	+	IGARCH(1,1)
10	Segment 1	(11)	-	+	IGARCH(1,1)
	Segment 2	(11)	-	+	ARIMA(0,0,0)
	Segment 3	(11)	+	+	IGARCH(1,1)
15	Segment 1	(11)	+	+	ARIMA(0,0,0)
	Segment 2	(11)	-	+	ARIMA(0,0,0)
	Segment 3	(11)	-	+	EGARCH(1,1)
20	Segment 1	(11)	+	+	ARIMA(0,0,0)
	Segment 2	(11)	-	+	ARIMA(0,0,0)
	Segment 3	(11)	-	+	ARCH(1)
30	Segment 1	(11)	+	-	AR(1)-GARCH(1,1)
	Segment 2	(11)	+	+	EGARCH(1,1)
	Segment 3	(11)	-	+	GARCH(1,1)

Notes: "+" - this regressor should be included in the model, "-" - addition of this regressor does not improve the quality of the model.

5. Estimates of the impact of verbal interventions of particular Bank of Russia officials on the zero-coupon yield curve

In this section, impact estimates of verbal interventions of particular Bank of Russia officials on the

g-curve are obtained. Since rather large number of ARIMA, ARCH, and GARCH models are estimated, for convenience of reading, only estimates of the MLE coefficients for the verbal interventions themselves are published below. As for the estimates of the remaining regressors, the variable responsible for the state of the economy is significant in all constructed models models, as well as dummies displaying large outliers in the data and changes in the key rate. For models in which one should face limitations in the dispersion equation, the constraints are satisfied ($\alpha+\beta \leq 1$) and their sum is quite close to 1. So, consider modeling the impact of the statements of particular representatives and groups of representatives of the Bank of Russia, starting with its Governor - Nabiullina Elvira:

Officials: Nabiullina Elvira

Graph 3

Maturity, years	Segment number	Forward guidance			Financial stability			Inflation risks			Economic growth		
		Tightening	Neutral signal	Easing	Increase	Neutral signal	Decrease	Increase	Neutral signal	Decrease	Acceleration	Neutral signal	Retardation
0,25	Segment 1		-0,0061		-0,0084			-0,0055	0,0069				
	Segment 2								0,0017	0,0039			
	Segment 3		-0,0026	-0,0027		-0,0017			-0,0005			-0,0037	
0,5	Segment 1		-0,0058		-0,0005			-0,0052	0,008				
	Segment 2								-0,0011	0,0041			
	Segment 3		-0,0014	-0,0028		-0,0009			-0,0005			-0,0016	
0,75	Segment 1		-0,0047		0,0027			-0,0058	0,0061				
	Segment 2								0,0009	-0,0016			
	Segment 3		-0,0009	-0,00026		-0,0016			-0,0006			-0,0012	
1	Segment 1		-0,0021		0,0042			-0,0049	0,0045				
	Segment 2									-0,0012			
	Segment 3		-0,0007	-0,0024		-0,0022 *			-0,0009			-0,0011	
2	Segment 1		0,0029		0,004 ***			-0,0023	0,0037				
	Segment 2								-0,001	0,0013			
	Segment 3		0,0016	-0,0037 **		-0,0026 **			-0,0005			0,0008	
3	Segment 1		0,0018		0,0029			-0,0034	0,0022				
	Segment 2								-0,0005	-0,0003			
	Segment 3		0,0017	-0,0053 **		-0,0025 *			-0,0007			0,0006	
5	Segment 1		-0,0038		0,0004			-0,0028	-0,0009				
	Segment 2								0,0004	-0,001			
	Segment 3		0,0018	-0,007 **		-0,002			-0,0009			0,0002	
7	Segment 1		-0,0035		0,0018			-0,0021	0,0011				
	Segment 2								0,0005	-0,0017			
	Segment 3		0,0015	-0,0048		-0,0026 *			-0,0013			0,0002	
10	Segment 1		-0,0006		0,003 **			-0,0008	0,0019				
	Segment 2								0,0007	-0,0021			
	Segment 3		0,0007	-0,0055		-0,0033 *			-0,0017			-0,0008	
15	Segment 1												
	Segment 2								0,0039	0,0066 **			
	Segment 3			-0,0058 *		-0,0029			-0,0018	-0,0037		-0,0015	
20	Segment 1												
	Segment 2								0,0039	0,0056 **			
	Segment 3			0,0003		-0,0019			-0,0013	-0,0044		-0,001	
30	Segment 1												
	Segment 2								0,0014 ***	0,0052			
	Segment 3			0,0032		-0,0002			-0,0007	-0,0043		-0,0001	

Maturity, years	Segment number	Ruble exchange rate volatility			Ruble exchange rate dynamics			Oil prices			Banking sector		
		Increase	Neutral signal	Decrease	Dollar growth	Neutral signal	Ruble growth	Increase	Neutral signal	Decrease	Positive news	Neutral signal	Negative news
0,25	Segment 1					-0,0066							
	Segment 2					-0,0109 **						0,0041	
	Segment 3					-0,0014			0,0024		-0,0008	0,0005	
0,5	Segment 1					-0,0054							
	Segment 2					-0,0102 **						0,0036	
	Segment 3					-0,0027			0,0017		-0,0009	0,0003	
0,75	Segment 1					-0,0032			-0,0013				
	Segment 2					-0,0106 ***						0,0019	
	Segment 3					-0,003			0,0004		-0,0009	-0,0001	
1	Segment 1					-0,002			-0,0018				
	Segment 2					-0,0089 ***						0,0043	
	Segment 3					-0,0024			-0,00002		-0,0014	-0,0004	
2	Segment 1					0,0047			-0,0002				
	Segment 2					-0,002						-0,0011	
	Segment 3					0,0024 ***			-0,0005		-0,0006	0,000003	
3	Segment 1					0,0009			-0,0035				
	Segment 2					-0,0002						-0,0015	
	Segment 3					0,003 *			-0,0011		-0,0004	0,0003	
5	Segment 1					-0,0018			-0,0031				
	Segment 2					0,0008						-0,0002	
	Segment 3					0,0031			-0,0005		-0,0007	0,0005	
7	Segment 1					-0,0014			-0,0021				
	Segment 2					0,0006						0,0005	
	Segment 3					0,0017			-0,0009		0,00005	0,0005	
10	Segment 1					-0,001			-0,0005				
	Segment 2					0,0004						0,0011	
	Segment 3					0,0009			-0,001		0,0004	0,0001	
15	Segment 1					-0,0019							
	Segment 2					0,0054							
	Segment 3					-0,0005			-0,0018		-0,00003	0,0004	
20	Segment 1					-0,0022							
	Segment 2					0,0056							
	Segment 3					-0,0006			-0,0001		-0,0006	0,0003	
30	Segment 1					-0,0031 *							
	Segment 2					0,0114 ***							
	Segment 3					-0,0008			0,0008		-0,0011	0,0005	

*Notes: *** - significance level 1%, ** - significance level 5%, * - significance level 10%, tonalities highlighted with gray color - those for which the number of observations in this time segment is not less than five, omissions mean the absence of 5 verbal interventions of this tonality in selected time period.*

As a results of the modeling, one can see that verbal interventions by Nabiullina on the topic of forward guidance had a significant impact on medium-term interest rates (2; 3; 5 years) of the g-curve from the 2nd quarter of 2016 to the end of 2017, as well as for the maturity T = 15 years from September of 2015 to the end of 2017. At the same time, only news on future monetary policy easing turned out to be significant, while for verbal interventions of all officials combined together (hereinafter, while comparing results with interventions of all officials - see all interventions impact in *Appendix, Graph 10*), only neutral signals had a significant effect. That is, market participants do not catch the intonation in the statements of all speakers of the regulator, but listen to the tonality of the signals of the Bank of Russia Governor. The direction of influence of signals about easing monetary policy is consistent with the hypothesis proposed in Section 3: they all reduce interest rates. Unfortunately, we cannot completely compare the influence of all statements and separately statements of Nabiullina, because the number of observations is not enough for a significant part of time segments (a similar problem will be encountered for other topics and authors of interventions).

Signals about financial stability have a significant impact on interest rates for T values from 1 year to 10 years, among them neutral signals are significant from the 2nd quarter of 2016 to the end of 2017 and signals about the growth of financial stability (positive) are significant from the beginning of 2014 until the 1st quarter of 2015. Neutral signals reduce values of the g-curve, while positive signals, on the contrary, contribute to their growth. The result for positive signals is not consistent with the proposed

hypothesis, but one have to mention that first time period can be characterized by the greatest risks to financial stability (including a sharp drop of the ruble, raising the key rate to 17 percent at an extraordinary meeting of the Board of Directors, etc.), so possible explanation for the obtained results might be that market participants believed the Bank of Russia was trying to reassure them using overly optimistic rhetoric. For 8 neutral signals, a significant effect on the g-curve is found in the same place as for the interventions of all authors (see Table #), while positive signals turned out to be significant only for the statements of the Governor.

Verbal interventions on inflation risks by Nabiullina practically nowhere have a significant effect on the g-curve, with the exception of rare regressors for long-term rates (T = 15; 20; 30 years). Verbal interventions on economic growth were insignificant, though only the following periods were considered: from the 2nd quarter of 2016 to the end of 2017 for short-term and medium-term interest rates and from September of 2015 to the end of 2017 for long-term rates. Moreover, for the totality of all verbal interventions, on the contrary, in some of these segments neutral signals about economic growth had a significant effect on the g-curve. Unfortunately, there were less than 5 statements about the ruble exchange rate volatility in each time segment; therefore, these models were not estimated.

Verbal interventions about the dynamics of the ruble exchange rate are mainly significant for short-term and medium-term interest rates. For T = 0,25; 0,5; 0,75 and 1 year neutral signals reduced the zero-coupon yield curve values in the period from the 2nd quarter of 2015 to the 1st quarter of 2016. For T = 2 and 3 years, neutral signals increased the g-curve values from the 2nd quarter of 2016 to the end of 2017. As a result, for short-term rates, Nabiullina's neutral statements had the same effect as the totality of the statements of all authors. However, it can be noticed that the modulus of the coefficient values for Nabiullina's statements is much higher than for the statements of all authors, that is, market participants listen more to the statements of the Bank of Russia Governor than to all of the Bank of Russia's interventions.

Oil price interventions turned out to be insignificant when considering in those time periods for which 5 or more verbal interventions were found: from the 2nd quarter of 2016 to the end of 2017 for short-term and medium-term rates, from September of 2015 to the end of 2017 for long-term rates and from the beginning of 2014 to the 1st quarter of 2015 for medium-term rates. Unfortunately, the signals about falling oil prices, which were significant for the entire set of interventions, could not be the object of analysis since there were less than 5 statements in each of the time segments. Verbal interventions on the state of affairs in the banking sector did not have a significant impact on interest rates, however, the number of time segments and tonalities for which 5 or more statements were observed is much less than for the statements of all authors, again narrowing down the space for analysis.

Officials: Yudaeva Ksenia

Now consider the verbal interventions of the First Deputy Governor of the Bank of Russia Yudaeva Ksenia:

Graph 4

Maturity, years	Segment number	Forward guidance			Financial stability			Inflation risks			Economic growth		
		Tightening	Neutral signal	Easing	Increase	Neutral signal	Decrease	Increase	Neutral signal	Decrease	Acceleration	Neutral signal	Retardation
0,25	Segment 1					0,0042		0,0036	-0,0012				
	Segment 2								0,001				
	Segment 3					-0,0017			-0,0053 ***				
0,5	Segment 1					-0,0022		-0,0004	0,0009				
	Segment 2												
	Segment 3					-0,0002			-0,0033 ***				
0,75	Segment 1					-0,0021		-0,0011	0,0003				
	Segment 2												
	Segment 3					-0,0001			-0,0017				
1	Segment 1					-0,0025		-0,0015	-0,0029				
	Segment 2												
	Segment 3					0,0004			-0,0007				
2	Segment 1					0,0007		-0,0009	-0,0049 *				
	Segment 2												
	Segment 3					0,0011			0,0006				
3	Segment 1					0,0044		0,0012	-0,0036 *				
	Segment 2												
	Segment 3					0,0004			0,0007				
5	Segment 1					0,0038		-0,0016	-0,0033				
	Segment 2												
	Segment 3					0,0001			0,001				
7	Segment 1					0,0002		-0,0024	-0,0033				
	Segment 2												
	Segment 3					-0,0005			0,0007				
10	Segment 1					0,001		0,0007	-0,0051				
	Segment 2												
	Segment 3					-0,0013			0,001				
15	Segment 1								-0,0003				
	Segment 2								-0,0092 **				
	Segment 3					-0,0005			0,0017				
20	Segment 1								-0,0003				
	Segment 2								-0,0109 ***				
	Segment 3					0,0013			0,0022				
30	Segment 1								0,0009				
	Segment 2								-0,0129 **				
	Segment 3					0,0018			0,0021				

Maturity, years	Segment number	Ruble exchange rate volatility			Ruble exchange rate dynamics			Oil prices			Banking sector		
		Increase	Neutral signal	Decrease	Dollar growth	Neutral signal	Ruble growth	Increase	Neutral signal	Decrease	Positive news	Neutral signal	Negative news
0,25	Segment 1					-0,0261 **							
	Segment 2												
	Segment 3												
0,5	Segment 1					-0,0203 ***							
	Segment 2												
	Segment 3												
0,75	Segment 1					-0,0104 ***							
	Segment 2												
	Segment 3												
1	Segment 1					-0,0087 ***							
	Segment 2												
	Segment 3												
2	Segment 1					-0,0039							
	Segment 2												
	Segment 3												
3	Segment 1					-0,0051							
	Segment 2												
	Segment 3												
5	Segment 1					-0,0039							
	Segment 2												
	Segment 3												
7	Segment 1					-0,0069							
	Segment 2												
	Segment 3												
10	Segment 1					-0,0074							
	Segment 2												
	Segment 3												
15	Segment 1												
	Segment 2												
	Segment 3											-0,0003	
20	Segment 1												
	Segment 2												
	Segment 3											-0,0005	
30	Segment 1												
	Segment 2												
	Segment 3											-0,0001	

*Notes: *** - significance level 1%, ** - significance level 5%, * - significance level 10%, tonalities highlighted with gray color - those for which the number of observations in this time segment is not less than five, omissions mean the absence of 5 verbal interventions of this tonality in selected time period.*

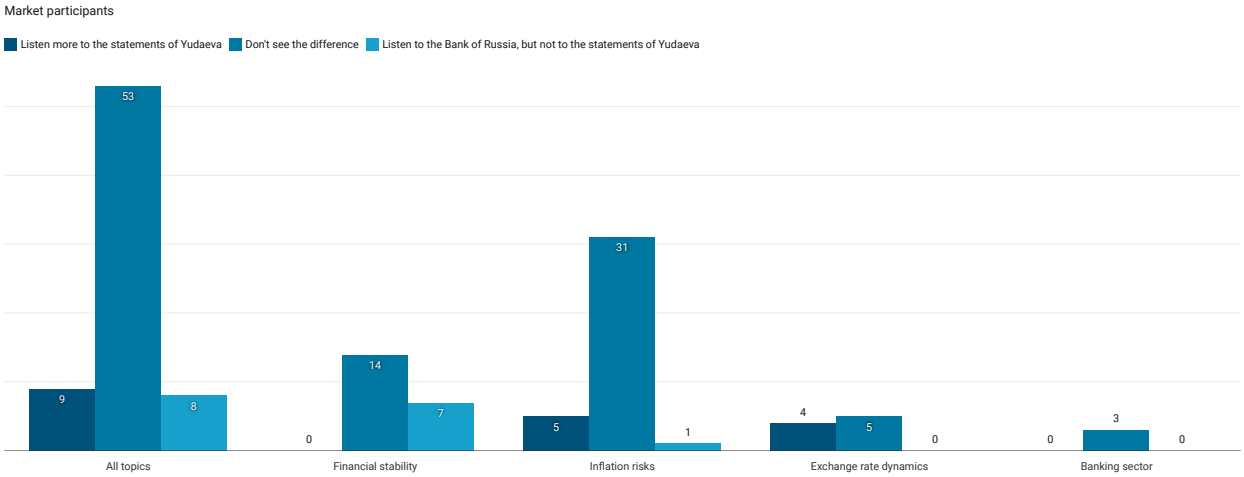
As one can see, the number of time segments and tonalities for which there are 5 or more observations, is much less even than for interventions of the Governor. This was partly the reason why the statements of the remaining officials of the Bank of Russia were combined into larger clusters. Accordingly, for signals about forward guidance, economic growth, ruble exchange rate volatility, oil prices and the state of the banking sector, the influence of Yudaeva's verbal interventions on the zero-coupon yield curve was not estimated due to a lack of observations. All news about financial stability turned out to be insignificant, though only impact of neutral signals was modeled and only in some of the time segments. Wherein, these signals turned out to be significant for the totality of all statements and statements of Nabiullina.

In some segments, neutral interventions on inflation risks turned out to be significant for short-term, medium-term and long-term interest rates (T = 0,25; 0,5; 2; 3; 15; 20; 30). Moreover, all statements made by Yudaeva reduced the corresponding values of the zero-coupon yield curve. And for many of these time periods, the interventions of all the speakers and the interventions of Nabiullina were insignificant. The reason for such difference may be that, according to the distribution of responsibilities between the Governor of the Bank of Russia and the First Deputy Governor of the Bank of Russia (see *Allocation of duties from cbr.ru*), it is Yudaeva who oversees the issues of economic forecasting and modeling, keeps statistics, and also coordinates and supervises the work of Statistics and Data Management Department, Research and Forecasting Department. Thus, market participants can listen especially for Yudaeva's words about inflation risks, based on the fact that this is her area of responsibility. Unfortunately, we cannot verify the impact of news with pronounced positive and negative signals (which had a significant effect on the g-curve for the totality of all verbal interventions), since we do not have enough observations of First Deputy Governor's statements in each of the time segments. In only 3 time segments for long-term rates (from September of 2015 to the end of 2017 for T = 15; 20; 30 years) it was possible to check the influence of Yudaeva's statements about the banking sector on the g-curve, all of them were insignificant.

The news about the dynamics of the ruble exchange rate had a significant impact on all short-term rates (maturities from 0,25 to 1 year) from the beginning of 2014 to the 1st quarter of 2015. Moreover, all neutral news reduced the values of the g-curve. Again, in this time period, interest rates were influenced only by the statements of Yudaeva (although the statements of all the officials and separately Nabiullina were significant in other time segments in which we cannot verify the effect of the statements of the First Deputy Governor due to a lack of observations). As in the case of news about inflation risks, the greater influence of Yudaeva's statements can be explained by the fact that she was in charge of establishing official exchange rates of foreign currencies against the ruble during this period (most of the first time segment was not related to the floating ruble exchange rate, which was established near the beginning of the second time segment).

To compare the influence of Yudaeva's statements and the totality of statements of all speakers, we analyze the segments and tonalities of statements for which there were at least 5 observations in both categories and see whose statements the market participants listened for more (that is, the corresponding regressor is significant at least at a 10 percent significance level):

Graph 5



As one can see, in general there is practically no difference (8 and 9 econometric models for time segments with significant regressors), however, market participants listen to Yudaeva more strongly than to all speakers of the Bank of Russia when it comes to topics that made up her area of responsibility (inflation risks and the dynamics of the ruble exchange rate). This fact can confirm hypothesis put forward in Section 3, but still there is quite small amount of Yudaeva's verbal interventions to draw strong conclusions.

Officials: non-personalized interventions

Now it's time to assess the impact of non-personalized interventions on the zero-coupon yield curve:

Graph 6

Maturity, years	Segment number	Forward guidance			Financial stability			Inflation risks			Economic growth		
		Tightening	Neutral signal	Easing	Increase	Neutral signal	Decrease	Increase	Neutral signal	Decrease	Acceleration	Neutral signal	Retardation
0,25	Segment 1					-0,0014							
	Segment 2					0,008			0,0135 *				
	Segment 3		-0,0006						0,00003	0,0002	0,0006	-0,0019	
0,5	Segment 1					-0,0032							
	Segment 2								0,0103				
	Segment 3		-0,0025 *						0,0001	-0,0011	-0,0008	-0,0006	
0,75	Segment 1					-0,0039							
	Segment 2								0,0061				
	Segment 3		-0,0032 *						-0,0001	-0,0012	-0,0011	0,0006	
1	Segment 1					-0,0038							
	Segment 2								0,0018				
	Segment 3		-0,0029 *						-0,00003	-0,001	-0,0011	0,0011	-0,0007
2	Segment 1					-0,0015							
	Segment 2								-0,001				
	Segment 3		-0,0012						-0,0005	-0,0016 ***	0,0002	0,0016	
3	Segment 1					0,0001							
	Segment 2								-0,0019				
	Segment 3		-0,0002						-0,0007	-0,0006	0,0008	0,001	
5	Segment 1					-0,0008							
	Segment 2								-0,0003				
	Segment 3		-0,002						-0,0008	0,0002	0,0012	-0,0007	
7	Segment 1					-0,0037							
	Segment 2								-0,0007				
	Segment 3		-0,003						-0,0009	-0,0001	-0,00005	-0,002 **	
10	Segment 1					-0,0055							
	Segment 2								-0,0036				
	Segment 3		-0,0024						-0,0004	-0,0007	-0,0011	-0,003 ***	
15	Segment 1												
	Segment 2					-0,0065							
	Segment 3		-0,0026 **					-0,0049 **	0,0005 ***	-0,0023 *	-0,0017	-0,0031 ***	0,0005
20	Segment 1												
	Segment 2					-0,0051							
	Segment 3		-0,0023					-0,0033	0,0008	-0,0016	-0,0013	-0,0021 **	-0,0014
30	Segment 1												
	Segment 2					-0,0095 ***							
	Segment 3		-0,0015					-0,001	0,0009	-0,0002	0,0009	-0,0013	-0,0019

Maturity, years	Segment number	Ruble exchange rate volatility			Ruble exchange rate dynamics			Oil prices			Banking sector		
		Increase	Neutral signal	Decrease	Dollar growth	Neutral signal	Ruble growth	Increase	Neutral signal	Decrease	Positive news	Neutral signal	Negative news
0,25	Segment 1					0,0043						0,0091	0,0105
	Segment 2											0,095	
	Segment 3		0,0012			0,0015					0,0004	0,0001	-0,0023
0,5	Segment 1					0,0036						0,0031	0,0117
	Segment 2											0,0061	
	Segment 3		0,0021			0,0008					0,0014	0,0004	-0,0021
0,75	Segment 1					0,0019						0,0005	0,0104
	Segment 2											0,0028	
	Segment 3		0,0017			0,0004					0,0022	0,0004	-0,0011
1	Segment 1					0,0001						-0,001	0,0067
	Segment 2											0,0011	
	Segment 3		0,0008			-0,0001					0,0024	0,0001	0,0006
2	Segment 1					0,0044						-0,0018	-0,0013
	Segment 2											0,002	
	Segment 3		-0,0006			-0,0007					0,0006	-0,0006	0,0012
3	Segment 1					0,0086 *						-0,0009	-0,0003
	Segment 2											0,0021	
	Segment 3		-0,0008			-0,0004					0,0007	-0,0005	0,0006
5	Segment 1					0,0087 ***						-0,0011	-0,0009
	Segment 2											0,0036	
	Segment 3		-0,0002			-0,0004					0,0018	-0,0001	0,0003
7	Segment 1					0,0075 **						-0,0013	0,0003
	Segment 2											0,0037	
	Segment 3		-0,0001			-0,002					0,0023	0,0003	-0,0002
10	Segment 1					0,0067 **						-0,003	0,0008
	Segment 2											0,0049	
	Segment 3		0,0006			-0,0038 ***					0,0028	-0,0003	-0,0007
15	Segment 1												
	Segment 2					0,0023						0,0044	
	Segment 3		0,0008			-0,0038 ***				-0,0026 ***	0,0009	0,00002	-0,0012
20	Segment 1												
	Segment 2					-0,0009						0,0081	
	Segment 3		-0,0001			-0,0044 **				-0,0037 ***	-0,0004	0,0004	0,00002
30	Segment 1												
	Segment 2					-0,0001						0,0021	
	Segment 3		0,0002			-0,0044 *				-0,0029 *	-0,0006	0,0005	0,0001

*Notes: *** - significance level 1%, ** - significance level 5%, * - significance level 10%, tonalities highlighted with gray color - those for which the number of observations in this time segment is not less than five, omissions mean the absence of 5 verbal interventions of this tonality in selected time period.*

The number of signals about the future monetary policy is small enough, therefore regressions were estimated only for the periods from the 2nd quarter of 2016 to the end of 2017 for short-term and medium-term rates and from September of 2015 to the end of 2017 for long-term rates. Verbal interventions by the press service of the Bank of Russia and departments proceedings had an impact on the g-curve for four values of T = 0,5; 0,75; 1; 15. All these statements reduced the values of the zero-coupon yield curve. Moreover, the significance of these interventions coincides with the significance of the statements of all speakers (including the sign of the coefficient), while Nabiullina's interventions did not affect market participants. The magnitude of these effects is practically the same as the effects of the statements of all authors. Verbal interventions on financial stability are practically not significant (however, again, a much smaller number of tonalities is checked for a smaller number of time segments compared to all verbal interventions). Statements about inflation risks are occasionally significant, but there are no clusters of segments or nearby maturity values that would be significantly affected by these interventions, unlike, for example, Yudaeva's statements on the same topic. Signs of significant coefficients differ and some of them are contrary to the hypotheses put forward in Section 3.

Neutral signals of economic growth significantly reduce the zero-coupon yield curve values for all maturities from 7 to 20 years: in a period from the 2nd quarter of 2016 to the end of 2017 for T = 7; 10 years and from September of 2015 to the end of 2017 for T = 15; 20 years. Interventions of all officials had a similar effect, while Nabiullina's statements did not affect interest rates in these time periods. Verbal interventions on the volatility of the ruble exchange rate did not affect expectations and

decisions of market participants, as well as interventions on the state of affairs in the banking sector. For signals about oil prices due to a lack of observations in most segments, only 3 models were built with the inclusion of signals about falling oil prices for T = 15; 20; 30 years from September of 2015 to the end of 2017. Moreover, in all models, these signals had a significant impact on the zero-coupon yield curve, reducing the corresponding values of the zero-coupon yield curve.

Neutral signals about the dynamics of the ruble exchange rate had a significant impact on the medium-term and long-term interest rates: for T = 10 in the period from the 2nd quarter of 2016 to the end of 2017, for T = 3; 5; 7; 10 from the beginning of 2014 to the 1st quarter of 2015 and for T = 15; 20; 30 from September of 2015 to the end of 2017. At the same time, in 2014, these signals reduced the ruble exchange rate against the dollar, and in other time segments they increased the ruble exchange rate. This direct dependency between current dynamics and tonality can be called by the fact that non-personalized interventions at least partially concentrate on discussing current dynamics instead of making strong forecasts for the market but in this case, such logic is incorrect, because only medium-term and long-term rates are affected (not the short-term rates, which should be logical while discussing current dynamics). The interventions made by Nabiullina and Yudaeva for these maturities of interest rates in these segments had practically no effect on the values of the g-curve, whereas for the totality of all interventions, these regressors were partially significant. However, and vice versa, non-personalized interventions did not affect short-term rates, while the statements of other examined clusters of speakers significantly affected short-term rates. So all these facts can be better explained by the fact that research results of various departments of the Bank of Russia (which to a large extent constitute non-personalized interventions) are more focused on long-term forecasting than the statements of other representatives of the Bank of Russia, who, in conversations with the press, discuss the current agenda more. And the direct dependence between current dynamics and perception of neutral sygnals perhaps should be attributed to the fact that market participants did not perceive these signals as completely neutral, finding negative trends in them.

Officials: others

Let us now consider the statements of other authors. The following Bank of Russia officials are combined in this category: Shvetsov, Tulin, Sukhov, Pozdyshev, Simanovsky, Moiseev, Dmitriev, as well as authors with a small number of verbal interventions (around 1-3):

Graph 7

Maturity, years	Segment number	Forward guidance			Financial stability			Inflation risks			Economic growth		
		Tightening	Neutral signal	Easing	Increase	Neutral signal	Decrease	Increase	Neutral signal	Decrease	Acceleration	Neutral signal	Retardation
0,25	Segment 1												
	Segment 2												
	Segment 3		-0,004						-0,0025	-0,0007			
0,5	Segment 1												
	Segment 2												
	Segment 3		-0,0041 **						-0,0031 ***	-0,0016			
0,75	Segment 1					0,0014							
	Segment 2												
	Segment 3		-0,0039 ***						-0,0028 ***	-0,0017			
1	Segment 1					0,003							
	Segment 2												
	Segment 3		-0,0032 ***						-0,0015 *	-0,0021			
2	Segment 1					0,0025							
	Segment 2												
	Segment 3		-0,0006						-0,001	-0,0015			
3	Segment 1					0,0069							
	Segment 2												
	Segment 3		-0,0002						0,0001	-0,0003			
5	Segment 1					0,0041							
	Segment 2												
	Segment 3		-0,0017						0,0008	-0,001			
7	Segment 1												
	Segment 2												
	Segment 3		-0,0028						0,0004	-0,0029			
10	Segment 1												
	Segment 2												
	Segment 3		-0,0038 **						-0,0004	-0,003			
15	Segment 1												
	Segment 2												
	Segment 3		-0,0028 **						0,0006 ***	-0,001			
20	Segment 1												
	Segment 2												
	Segment 3		-0,0024						0,0013	-0,0018			
30	Segment 1												
	Segment 2												
	Segment 3		-0,0031 ***						0,0017	-0,0029 **			

Maturity, years	Segment number	Ruble exchange rate volatility			Ruble exchange rate dynamics			Oil prices			Banking sector		
		Increase	Neutral signal	Decrease	Dollar growth	Neutral signal	Ruble growth	Increase	Neutral signal	Decrease	Positive news	Neutral signal	Negative news
0,25	Segment 1										0,0106 **	-0,0039	
	Segment 2		-0,0044			-0,0045 **					-0,0113	-0,0027	-0,0026
	Segment 3										0,0047	-0,0013	
0,5	Segment 1										0,0079 **	-0,0022	0,0026
	Segment 2		-0,0043			-0,0042 *					-0,0102	-0,0053	-0,0013
	Segment 3										0,0042 *	-0,0003	
0,75	Segment 1										0,0071 ***	-0,0007	0,0026
	Segment 2		-0,0037			-0,0036					-0,01	-0,0058 *	-0,0019
	Segment 3										0,0044 **	0,0001	
1	Segment 1										0,0055 ***	-0,0003	0,0031
	Segment 2		-0,0034			-0,0034					0,0005	-0,0051 **	
	Segment 3										0,0027	-0,0001	
2	Segment 1										0,0016	-0,0031	-0,0013
	Segment 2		-0,003 ***			-0,0064 ***					-0,0045	-0,0031	0,0009
	Segment 3										-0,0001	0,0003	
3	Segment 1										-0,002	-0,0029	-0,0018
	Segment 2		-0,0032 ***			-0,0028 *					-0,0018	-0,0033	-0,0028
	Segment 3										-0,0005	0,0002	
5	Segment 1										-0,0036	0,0018	0,0018
	Segment 2		-0,0046 ***			-0,0005					0,0004	-0,003	-0,0047 *
	Segment 3										-0,0011	-0,0005	
7	Segment 1										-0,0014	0,0026	0,0023
	Segment 2		-0,0055 ***			-0,0011					0,0011	-0,0027	-0,0052 **
	Segment 3										-0,0014	-0,0008	
10	Segment 1										0,0008	-0,00002	0,0036
	Segment 2		-0,0063 ***			-0,002					0,0005	-0,0039	-0,0053 **
	Segment 3										-0,0004	-0,001	
15	Segment 1											-0,0015	
	Segment 2										-0,0034	-0,0018	-0,0053
	Segment 3		-0,0029			-0,0035 ***					-0,0007	-0,0006	0,0013
20	Segment 1											-0,0014	
	Segment 2										-0,0124	-0,0009	-0,0055
	Segment 3		-0,0033 ***			-0,0032 ***					-0,0012	-0,00005	0,0011
30	Segment 1											-0,0024	
	Segment 2										0,0049	-0,0042	-0,0092 ***
	Segment 3		-0,0016			-0,0029 ***					-0,0018	-0,0002	0,0018

*Notes: *** - significance level 1%, ** - significance level 5%, * - significance level 10%, tonalities highlighted with gray color - those for which the number of observations in this time segment is not less than five, omissions mean the absence of 5 verbal interventions of this tonality in selected time period.*

Verbal interventions about forward guidance significantly affect short-term (T $\leq$ 1 year) interest rates from the 2nd quarter of 2016 to the end of 2017 and long-term (T $\geq$ 15 years) interest rates from September of 2015 to the end of 2017. Moreover, all neutral signals affect on the zero-coupon yield curve in the same way, reducing its values. For short-term rates, the influence of signals from this category of authors is similar to the influence of non-personalized interventions and the totality of all interventions, while for long-term interest rates, the influence of other categories of authors was not revealed. Interventions on financial stability do not affect the values of the zero-coupon yield curve. There were less than 5 signals about economic growth and oil prices movements in all time segment from other speakers; therefore, the corresponding models were not built. For verbal interventions about inflation risks, it was possible to identify a significant relationship with the values of the zero-coupon yield curve for three short-term rates in a period from the 2nd quarter of 2016 to the end of 2017 and for two separate long-term rates. At the same time, most of the neutral signals reduce the corresponding g-curve values, as well as the negative signals for T = 30 years (which is consistent with the hypothesis put forward in Section 3 that the reduction of inflation risks raises expectations of monetary policy easing). The values of maturity and time segments for which the influence of verbal interventions of other representatives of the Bank of Russia was revealed partially coincide only with the corresponding maturities and time periods for Yudaeva's statements and the totality of all verbal interventions, while for the remaining categories of authors, statements about inflation risks were insignificant.

Neutral signals about the ruble exchange rate volatility affected the g-curve for all maturities from 2 to 10 years from the 2nd quarter of 2015 to the 1st quarter of 2016, as well as for T = 20 years from November of 2014 to August of 2015. All these statements reduced the corresponding values of the curve. At the same time, no such influence was observed for the remaining categories of speakers (for the totality of all statements a relationship was established only with short rates, non-personalized statements had no effect, and the number of statements of Nabiullina and Yudaeva were less than 5). Unfortunately, for the time segments related to 2014, 2016 and 2017, there were not enough observations for verbal interventions, so the relationship between verbal interventions and interest rates was not studied. Similar restrictions related to the number of observations touched on statements about the ruble exchange rate dynamics. A significant relationship was established for T = 0,25; 0,5; 2; 3; 15; 20; 30 for periods from the 2nd quarter of 2015 to the 1st quarter of 2016 and from November of 2014 to August of 2015. However, for the remaining time segments it is not possible to verify the effect of verbal interventions, as well as to check the effect of interventions with a strong pronounced tonality (about the growth/fall of the ruble). All significant neutral interventions reduced the corresponding g-curve values. Discussing statements about the banking sector, a significant relationship was found with positive and neutral statements by the category of other officials for short-term interest rates (T $\leq$ 1 year) for all time segments. It also revealed the effect of negative tonality statements on interest rates for T = 5; 7; 10 and 30 years in the period from the 2nd quarter of 2015 to the 1st quarter of 2016 and from November of 2014 to August of 2015. All negative and neutral news reduced the values of the g-curve, while positive, on the contrary, contributed to their growth.

Officials: non-personalized interventions and other officials

Since for the last two categories of authors there were less than 5 observations in many time segments, to increase the number of considered intervention models, we study another category of speakers, combining non-personalized interventions and statements by all representatives of the Bank of Russia, except

Graph 8

Maturity, years	Segment number	Forward guidance			Financial stability			Inflation risks			Economic growth		
		Tightening	Neutral signal	Easing	Increase	Neutral signal	Decrease	Increase	Neutral signal	Decrease	Acceleration	Neutral signal	Retardation
0,25	Segment 1				0,0212	-0,0004							
	Segment 2					0,0082			0,0075 *	0,0021			
	Segment 3		-0,0019					-0,0006	-0,0007	-0,00003	0,0013	-0,0014	
0,5	Segment 1				0,0115	-0,002							
	Segment 2					0,0042			0,006 *	0,0022			
	Segment 3		-0,0032 ***					-0,0001	-0,001	-0,0011	-0,0005	-0,0004	
0,75	Segment 1				0,004	-0,0016							
	Segment 2					0,0012			0,0037	0,0016			
	Segment 3		-0,0036 ***					0,0006	-0,001	-0,0012	-0,001	0,0007	
1	Segment 1				0,0005	-0,0011							
	Segment 2								0,0002	-0,0016			
	Segment 3		-0,0031 ***					0,0028	-0,0005	-0,0013 *	-0,001	0,0011	-0,0007
2	Segment 1				-0,0008	-0,0001							
	Segment 2					-0,0054 *			-0,0023	-0,0016 ***			
	Segment 3		-0,001					0,0028	-0,0006	-0,0014 ***	0,0003	0,0015	
3	Segment 1				0,0037	0,0016							
	Segment 2					-0,0031			-0,0016	-0,0011			
	Segment 3		-0,0002					0,0017	-0,0004	-0,0005	0,0008	0,001	
5	Segment 1				0,0056	0,0001							
	Segment 2					-0,00001			0,0004	0,0014			
	Segment 3		-0,0018					-0,0009	-0,0003	-0,0001	0,0005	-0,0003	
7	Segment 1				0,0055	-0,0037							
	Segment 2					0,0023			0,0002	0,0031			
	Segment 3		-0,0029					-0,0022	-0,0005	-0,0009	-0,001	-0,0015	
10	Segment 1				0,006	-0,005							
	Segment 2					0,0035			-0,0015	0,0031			
	Segment 3		-0,0032 **					-0,0029	-0,0004	-0,0013	-0,0018	-0,0025 ***	
15	Segment 1												
	Segment 2				0,0087	-0,0017							
	Segment 3		-0,0028 ***	0,0011		-0,0021		-0,002	0,0006 ***	-0,0015 *	-0,0013 ***	-0,0026 ***	-0,0004
20	Segment 1												
	Segment 2				0,0051	-0,0005							
	Segment 3		-0,0023 **	0,0011		-0,0022		-0,0014	0,001	-0,0015	-0,0011	-0,0021 **	-0,0024
30	Segment 1												
	Segment 2				0,0061	-0,0037							
	Segment 3		-0,0025 **	0,0011		-0,0015	0,0051 **	-0,0004	0,0011	-0,0015	-0,0013	-0,001	-0,0026 *

Maturity, years	Segment number	Ruble exchange rate volatility			Ruble exchange rate dynamics			Oil prices			Banking sector		
		Increase	Neutral signal	Decrease	Dollar growth	Neutral signal	Ruble growth	Increase	Neutral signal	Decrease	Positive news	Neutral signal	Negative news
0,25	Segment 1					0,0105	-0,0044				0,0125 **	0,0005	0,0091 *
	Segment 2		-0,0044			-0,0069 ***				0,0084	-0,0075	0,0009	-0,004
	Segment 3		0,0015			0,0003					0,0024	-0,0006	-0,0002
0,5	Segment 1					0,0073	-0,0048				0,0093 **	-0,0002	0,0069
	Segment 2		-0,0043			-0,0064 ***				0,0076	-0,006	-0,002	-0,0009
	Segment 3		0,0019			-0,0003					0,003 *	0,0001	-0,0014
0,75	Segment 1					0,0052	-0,0074				0,0078 ***	-0,0002	0,0061
	Segment 2		-0,0037			-0,0054 **				0,0059	-0,0056	-0,0031	-0,0016
	Segment 3		0,0016			-0,0007					0,0036 **	0,0002	-0,0011
1	Segment 1					0,0019	-0,006				0,006 ***	-0,0004	0,0036
	Segment 2		-0,0034			-0,004 *					-0,0022	-0,0034	-0,0075 ***
	Segment 3		0,0009			-0,0009				0,0047	0,0026 *	-0,0001	0,0003
2	Segment 1					0,0005	0,0032				0,0019	-0,0025	-0,0014
	Segment 2		-0,003 ***			-0,0051 ***				-0,0041 ***	-0,0033	-0,0014	0,0016
	Segment 3		-0,0003			-0,0012					0,0002	-0,0001	0,0013
3	Segment 1					0,0035	0,0061				-0,0015	-0,0021	-0,0012
	Segment 2		-0,0032 ***			-0,0023				-0,0047 ***	-0,0037	-0,0014	-0,0002
	Segment 3		-0,0004			-0,0005					0,0001	-0,0001	0,001
5	Segment 1					0,007	0,0016				-0,0025	0,0008	0,0001
	Segment 2		-0,0046 ***			-0,0008				-0,0032 *	-0,0043	-0,0009	-0,0025
	Segment 3		0,0006			-0,0001					0,0002	-0,0004	0,0003
7	Segment 1					0,0061	0,0008				-0,0006	0,002	0,0011
	Segment 2		-0,0055 ***			-0,0014				-0,0027	-0,0038	-0,0006	-0,0024
	Segment 3		0,0005			-0,0012					0,0005	-0,0004	-0,0005
10	Segment 1					0,0044	0,0029				0,0013	-0,0008	0,0019
	Segment 2		-0,0063 ***			-0,0024				-0,0022	-0,0033	-0,0011	-0,0021
	Segment 3		0,0006			-0,0032 ***					0,0015	-0,0008	-0,0005
15	Segment 1										-0,001	-0,0034	0,004
	Segment 2					0,0074	0,006				0,0013	-0,0001	-0,0031
	Segment 3		-0,0015	-0,0062 ***		-0,0034 ***				-0,0025 ***	-0,00005	-0,0004	-0,0002
20	Segment 1										-0,0009	-0,0032	0,0034
	Segment 2					0,0052	0,0061				-0,0061	0,0013	-0,0024
	Segment 3		-0,0021 **	-0,0046 **		-0,0035 ***				-0,0033 **	-0,0009	0,0001	0,0004
30	Segment 1										0,0007	-0,0037	0,0022
	Segment 2					-0,0061 ***	0,0054				0,0024	-0,0019	-0,0071 **
	Segment 3		-0,001	-0,0043 *		-0,0033 ***				-0,0027 *	-0,0013	0,0001	0,0007

*Notes: *** - significance level 1%, ** - significance level 5%, * - significance level 10%, tonalities highlighted with gray color - those for which the number of observations in this time segment is not less than five, omissions mean the absence of 5 verbal interventions of this tonality in selected time period.*

Verbal interventions about future monetary policy had a significant impact on the values of the zero-coupon yield curve for short-term interest rates (maturities - 0,5; 0,75 and 1 year) from the 2nd quarter of 2016 to the end of 2017 and for long-term rates (T = 10; 15; 20; 30 years) from the 2nd quarter of 2016 to the end of 2017 and from September of 2015 until the end of 2017. All of these neutral statements reduce the corresponding g-curve values. Signals with pronounced tonality on a topic of financial stability have practically no effect on the g-curve. However, the only segment in which there were at least 5 statements about a decrease in financial stability (for T = 30 years from September of 2015 to the end of 2017) showed a significant relationship between the negative statements and interest rates - in accordance with the hypothesis from the Section 3, negative signals about financial stability shifted the values of the zero-coupon yield curve up. For signals about inflation risks, there are no large groups of time segments/maturities for which a significant relationship with the g-curve values would be established, while certain significant verbal interventions reduce interest rates when signals appear to reduce inflation risks (again, in accordance with the hypotheses put forward in Section 3) and increase interest rates for neutral signals. Last described effect might be caused by expectations of agents: in this period of time inflation rate was steadily declining and neutral signals came into conflict with current expectations for the continuation of such decline, leading to the interest rate growth.

Verbal interventions on economic growth affected only long-term interest rates ($10 \leq T \leq 30$) from the 2nd quarter of 2016 to the end of 2017 and from September of 2015 to the end of 2017. All signals, regardless of their tonality, lowered the values of the zero-coupon yield curve. Similar direction of the effects of news about both accelerating and slowing economic growth can probably be caused by the fact that for market participants, news of both tones differed from expectations in the same direction (for example, Bank of Russia pronouncements even about slight slowdown of economic growth anyway turned out to be more positive than the actual expectations of market participants). For interventions about the ruble exchange rate volatility, a dependence was established with the values of the zero-coupon yield curve for T = 2; 3; 5; 7; 10 in the period from the 2nd quarter of 2015 to the 1st quarter of 2016 and for T = 15; 20; 30 from September of 2015 to the end of 2017. Both neutral and positive (indicating a decrease in the ruble exchange rate volatility) signals were found to be significant, while all of them reduced the corresponding values of the g-curve. Time segments and tonality for which the interconnection of interest rates and interventions on the volatility of the exchange rate partially coincides with the interventions of the category of other officials, however, after combining the other authors and non-personalized interventions, many more significant regressors were found (which should partially be associated with a large number of time periods with no less than 5 observations). Moreover, the statements of all representatives of the Bank of Russia could hardly affect interest rates.

For the dynamics of the ruble exchange rate, significant effect has been identified both on long-term ($T \geq 10$) and short-term interest rates ($T \leq 2$), but only for neutral signals about the dynamics of the ruble. All neutral signals affect the same way, reducing the g-curve values. The effect on short-term rates is similar to the reaction of market participants on the signals of other distinguished categories of speakers, which may be due to the fact that the time period from the 2nd quarter of 2015 to the 1st quarter of 2016 was the most volatile for the Russian ruble. But for long-term rates, it can be said that market participants listened more strongly to the statements of the category of other officials and non-personalized interventions than to the signals of Nabiullina and Yudaeva. For signals of rising/falling oil prices, only the influence of negative signals was studied, since for the remaining tonalities, not enough

intervention observations were found. A relationship was established between the signals of falling oil prices and medium-term (T = 2; 3; 5) and long-term (T = 15; 20; 30) interest rates. All statements on this topic reduced the values of the g-curve, both from the 2nd quarter of 2015 to the 1st quarter of 2016 for medium-term rates, and from September of 2015 to the end of 2017 for long-term rates. Interest rates reduction may be caused by the expected decrease in inflationary pressures due to falling prices for main export commodities and a slowdown in the economy. The influence of the statements of the considered category of speakers is similar to the influence of all verbal interventions on this topic, the signs of the coefficients coincide, the values are almost identical, which may be due to the fact that Nabiullina and Yudaeva rather rarely used negative signals in their statements about oil prices, adhering to a more neutral rhetoric.

Verbal interventions on the state of affairs in the banking sector affect almost only short interest rates ($T \leq 1$), while the relationship is found mainly for positive statements that contribute to an increase in the g-curve values. Negative statements generally reduce the values of the zero-coupon yield curve. For neutral signals, a significant relationship could not be established. The structure of significant statements about the banking sector (time segments, tonalities and effects) is almost identical to that of the statements of a category of other officials, while for the totality of statements of all speakers a significant relationship could not be established, that is, market participants listen mainly to other representatives of the Bank of Russia (not to Nabiullina, Yudaeva, press service statements or particular departments statements). However, this category of speakers of the regulator is too heterogeneous, so in the next section we will consider separately the statements of the Bank of Russia representatives responsible for banking supervision, whose verbal interventions are probably better captured by market participants.

Officials: Bank of Russia Deputy Governors, responsible for banking supervision
Statements about the banking sector contain the largest number of observations (that is, they are best suited for dividing into separate categories of officials), however, they do not significantly affect the zero-coupon yield curve in the categories of already considered speakers. Therefore, for statements regarding the banking sector, it is also possible to try to single out precisely those members of the Board of Directors of the Bank of Russia who are responsible for banking supervision (Sukhov, Tulin, Pozdyshev, Simanovsky). The hypothesis is that, perhaps, market participants are more likely to respond to verbal interventions of precisely those representatives of the Bank of Russia who are responsible for making decisions in this sector of economy (this effect was observed, for example, for those areas that are within the scope of Yudaeva's responsibilities). Estimates of the coefficients of the respective regressors in the models:

Graph 9

Maturity, years	Segment number	Banking sector		
		Positive news	Neutral signal	Negative news
0,25	Segment 1	0,0106 **	-0,0033	
	Segment 2	-0,0083	-0,0024	-0,0024
	Segment 3	0,0053	-0,0015	
0,5	Segment 1	0,008 **	-0,0017	0,0027
	Segment 2	-0,0077	-0,0062	-0,0013
	Segment 3	0,0043 *	-0,0007	
0,75	Segment 1	0,007 ***	-0,0002	0,0026
	Segment 2	-0,0086	-0,0065 *	-0,0019
	Segment 3	0,0039 **	-0,0001	
1	Segment 1	0,0055 ***	0,0003	0,0031
	Segment 2		-0,0054 *	
	Segment 3	0,0009	-0,00001	
2	Segment 1	0,0017	-0,0026	-0,0012
	Segment 2	-0,0049	-0,0024	0,0009
	Segment 3	-0,0004	0,0004	
3	Segment 1	-0,002	-0,0028	-0,0018
	Segment 2	-0,0021	-0,0025	-0,0027
	Segment 3	-0,0011	0,0002	
5	Segment 1	-0,0036	0,0019	0,0018
	Segment 2	0,0005	-0,0029	-0,0047 *
	Segment 3	-0,002	-0,0008	
7	Segment 1	-0,0014	0,0025	0,0023
	Segment 2	0,0013	-0,0034	-0,0053 **
	Segment 3	-0,0018	-0,0015	
10	Segment 1	0,0008	-0,0006	0,0037
	Segment 2	0,0007	-0,0046	-0,0053 **
	Segment 3	0,0003	-0,0018 *	
15	Segment 1		-0,0031	
	Segment 2	-0,0035	-0,0008	-0,0052
	Segment 3	-0,0005	-0,0014	
20	Segment 1		-0,0028	
	Segment 2	-0,0125	0,0002	-0,0055
	Segment 3	-0,0013	-0,0006	
30	Segment 1		-0,0042	
	Segment 2	0,0048	-0,0027	-0,0092 ***
	Segment 3	-0,0018	-0,0007	

*Notes: *** - significance level 1%, ** - significance level 5%, * - significance level 10%, tonalities highlighted with gray color - those for which the number of observations in this time segment is not less than five, omissions mean the absence of 5 verbal interventions of this tonality in selected time period.*

As expected, the interventions of these four officials have a slightly greater effect on the zero-coupon yield curve than the estimates for all interventions or interventions separately of Nabiullina, Yudaeva, non-personalized interventions or statements by other representatives of the Bank of Russia, even though the models were not built for all time segments due to a lack of observations. Positive statements are significant for short-term interest rates in the period from the beginning of 2014 to the 1st quarter of 2015 and from the 2nd quarter of 2016 to the end of 2017. Negative statements are mainly significant for medium-term rates from the 2nd quarter of 2015 to the 1st quarter of 2016. Neutral news occasionally

has a significant impact on some of the g-curve values, but there are no neighboring maturities groups for which this regressor would be significant. As one can see, interventions of negative tonality had a significant impact just in the most difficult period for the banking sector of the Russian Federation (in 2015, banking sector profits were minimal for the 4 years under review and amounted to 192 billion rubles, whereas, for example, in 2016 increased sharply to 930 billion rubles). And the positive news, on the contrary, had an impact in the years that were fairly calm for the banking sector. The conclusion is that market participants not only capture the tone of statements of the Central Bank officials responsible for banking supervision, but also listen more to news that is consistent with their assessment of the current situation.

6. Conclusions and recommendations

The main purpose of this work was to study the determinants that form a different perception of verbal interventions coming from various officials of the Bank of Russia and to establish the very fact of the existence of such differences and impact of verbal interventions on market participants. As a result of the analysis performed in the previous section, it was found that statements by different authors on the same topic in the same time period do have different effects on interest rates in the economy. First of all, we have to notice that every official or group of officials reviewed from the Bank of Russia has at least some influence on the market expectations, that is their verbal interventions do have an impact on interest rates. At the same time, the hypothesis of differences in positions as an explanatory factor for differences in the effectiveness of the information policy of particular officials did not find adequate confirmation. Market participants do not pay great attention to hierarchy in Bank of Russia's structure, which was best seen while comparing influence of the Governor's interventions with influence of it's Deputy Governors. However, next hypothesis was confirmed: market participants to a greater extent listen to statements on precisely those topics for which speaker is responsible.

Accordingly, an increase in the effectiveness of the Bank of Russia communication policy is possible if the regulator would be able to more widely disseminate those practices that effectively influence market expectations and also reduce the use of non-working communication policy instruments. One of the possible recommendations for changing the information policy might be reducing number of statements made by officials on topics that are not directly related to their area of responsibility within the Bank of Russia. Such signals often do not have any impact on market participants, which, for example, could be observed for Yudayeva's interventions on financial stability. And provided that the intensity of the aggregate of all communications of the Central Bank is nearly maintained, these statements can be partially delegated to another speaker from the regulator, for example, in the case of financial stability interventions described just above - to the Governor. Another factor that reduces the effectiveness of information policy is the fuzziness of signals, which is characteristic of some topics and authors of statements. Thus, interventions on economic growth, for example, turned out to be practically insignificant for the market, with the exception of some non-personalized verbal interventions. That is, with some certainty, one can say that the market participants trust more to various analytical materials and proceedings of the Bank of Russia, which contain information about economic growth, but not the statements of individual speakers of the regulator. And at the same time, one of the possible problems of personalized communications about economic growth is the fuzziness of the signal sent, expressed in the most streamlined wording. In such situation, it may be an effective measure to reduce the intensity of personalized statements by Bank of Russia individual employees in order to prevent excessive noise within the relevant signals received by market participants mostly in the form of analytical materials from the regulator. But there is a third category of topics of verbal interventions. For example, statements about the forward guidance can be called completely coordinated with each other, since almost all categories of speakers in a similar way

affect market participants expectations. Accordingly, we can conclude that the forward guidance policy is quite effective (in terms of conveying the consolidated position of the Bank of Russia to market participants), and the market receives approximately the same signals from all officials of the Bank of Russia. Talking advices to monetary authorities caught up in similar conditions as the Bank of Russia did in 2014-2017, we have to notice that strictly prescribing areas of responsibility might be a good advice, because this measure could outline a circle of officials to whom market participants will listen a lot, which may help the regulator to form intended interest rate expectations even on a long horizon.

Appendix

Models used:
GARCH(1,1)

$$Y_{t,T} = \gamma_0 + \gamma_1 R_{rub,t} + \gamma_2 X_{1,t} + \gamma_3 X_{2,t} + z_t$$
$$z_t = \sqrt{\sigma_t^2} e_t$$
$$\sigma_t^2 = \alpha_0 + \alpha_1 z_{t-1}^2 + \beta_1 \sigma_{t-1}^2$$

ARCH(1)

$$Y_{t,T} = \gamma_0 + \gamma_1 R_{rub,t} + \gamma_2 X_{1,t} + \gamma_3 X_{2,t} + z_t$$
$$z_t = \sqrt{\sigma_t^2} e_t$$
$$\sigma_t^2 = \alpha_0 + \alpha_1 z_{t-1}^2$$

IGARCH(1,1)

$$Y_{t,T} = \gamma_0 + \gamma_1 R_{rub,t} + \gamma_2 X_{1,t} + \gamma_3 X_{2,t} + z_t$$
$$z_t = \sqrt{\sigma_t^2} e_t$$
$$\sigma_t^2 = \alpha_0 + \alpha_1 z_{t-1} + \beta_1 \sigma_{t-1}^2, \qquad \alpha_1 + \beta = 1$$

ARIMA

$$Y_{t,T} = \gamma_0 + \gamma_1 R_{rub,t} + \gamma_2 X_{1,t} + \gamma_3 X_{2,t} + \gamma_4 Y_{t-1} + z_t,$$

Asymmetric ARCH-models:
EGARCH(1,1)

$$Y_{t,T} = \gamma_0 + \gamma_1 R_{rub,t} + \gamma_2 X_{1,t} + \gamma_3 X_{2,t} + z_t$$
$$z_t = \sqrt{\sigma_t^2} e_t$$
$$\log \sigma_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i g(z_{t-i}) + \sum_{j=1}^{p} \beta_j \log \sigma_{t-j}^2, \qquad g(z_t) = \delta_1 z_t + \delta_2(|z_t| - \sqrt{2/\Pi}), \quad z_t \sim iid(0,1)$$
$$\log \sigma_t^2 = \alpha_0 + \alpha_1(\delta_1 z_{t-1} + \delta_2(|z_{t-1}| - \sqrt{2/\Pi})) + \beta_1 \log \sigma_{t-1}^2$$

SAGARCH(1,1)

$$Y_{t,T} = \gamma_0 + \gamma_1 R_{rub,t} + \gamma_2 X_{1,t} + \gamma_3 X_{2,t} + z_t$$

$$z_t = \sqrt{\sigma_t^2} e_t$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 z_{t-1} + \beta_1 \sigma_{t-1}^2$$

TARCH(1)

$$Y_{t,T} = \gamma_0 + \gamma_1 R_{rub,t} + \gamma_2 X_{1,t} + \gamma_3 X_{2,t} + z_t$$

$$z_t = \sqrt{\sigma_t^2} e_t$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 z_{t-1} + \alpha_2 I_{t-1} z_{t-1},$$

$$I_t = \begin{cases} 1, & z_t < 0 \\ 0, & z_t \geq 0 \end{cases}$$

TGARCH(1,1)

$$Y_{t,T} = \gamma_0 + \gamma_1 R_{rub,t} + \gamma_2 X_{1,t} + \gamma_3 X_{2,t} + z_t$$

$$z_t = \sqrt{\sigma_t^2} e_t$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 z_{t-1} + \alpha_2 I_{t-1} z_{t-1} + \beta_1 \sigma_{t-1}^2,$$

$$I_t = \begin{cases} 1, & z_t < 0 \\ 0, & z_t \geq 0 \end{cases}$$

Graph 10

Maturity, years	Segment number	Forward guidance			Financial stability			Inflation risks			Economic growth			Ruble exchange rate volatility		
		Tightening	Neutral signal	Easing	Increase	Neutral signal	Decrease	Increase	Neutral signal	Decrease	Acceleration	Neutral signal	Retardation	Increase	Neutral signal	Decrease
0,25	Segment 1		-0,0076 **		0,0022	0,0008		0,0008	0,0014	-0,007		0,0034	-0,0084			0,0019
	Segment 2		-0,0013			0,004		0,0099	0,0042	-0,0005		0,0062	0,0026		-0,007	0,0017
	Segment 3		-0,0026 *	0,0009		-0,0022		-0,0007	-0,0012 *	-0,0007	0,0001	-0,0018			-0,0002	
0,5	Segment 1		-0,0075 ***		0,0023	-0,0018		-0,0012	0,0022	-0,0071 *		0,0005	-0,0054		-0,0139	-0,0001
	Segment 2		-0,0018			-0,0001		0,0076	0,0021	0,0001		0,0055	0,0045		-0,007 *	0,0015
	Segment 3		-0,0032 **	-0,0005		-0,0014		-0,0002	-0,0012 *	-0,0011	-0,0006	-0,0006			0,0007	
0,75	Segment 1		-0,0071 **		0,0017	-0,0016		-0,0029	0,0007	0,0002		-0,0004	-0,0038		-0,0122	0,0001
	Segment 2		-0,0034			-0,0008		0,005	0,0011	-0,0021		0,0056	0,0051		-0,0056 *	0,0029
	Segment 3		-0,0029 ***	-0,001		-0,0017		0,0006	-0,001 *	-0,0011	-0,0006	0,00005			0,0007	
1	Segment 1		-0,0055 **		0,0013	-0,0014		-0,003	-0,0014	0,002		-0,0024	-0,0049		-0,0105	0,0002
	Segment 2					-0,0029			0,0017	-0,0029					-0,0041 *	0,0033 ***
	Segment 3		-0,0018 **	-0,0008		-0,0017 **		0,0027	-0,0007	-0,0012	-0,0007	0,0002	-0,0007		0,0002	
2	Segment 1		-0,0016		0,0006	-0,0001		-0,0019	-0,0021	0,0071		-0,0056 *	0,0012		-0,0016	0,0024
	Segment 2		-0,0036 *			-0,0002		-0,000002	-0,0016	-0,0011		0,0001	0,0004		-0,0029 **	-0,0011
	Segment 3		0,0005	-0,0007		-0,0015 **		0,0028	-0,0004	-0,0013 **	-0,0004	0,0012 *			-0,0007	
3	Segment 1		-0,0005		0,0015	0,0018		-0,0019	-0,0022	0,0063		-0,0074 ***	0,0007		-0,0012	0,0032
	Segment 2		-0,0026			0,0017		0,0026	-0,001	-0,0004		0,0016	0,0003		-0,0022	-0,0011
	Segment 3		0,0007	-0,0003		-0,0014 **		0,0016	-0,0003	-0,0008	-0,0006	0,0009			-0,0008	
5	Segment 1		-0,0041 *		0,0006	0,0009		-0,0021	-0,0032	-0,0002		-0,006 ***	0,0003		-0,002	-0,0003
	Segment 2		-0,0007			0,0035		0,0044 **	0,0005	0,0008		0,0036	0,0007		-0,0027	-0,0006
	Segment 3		-0,0001	-0,0005		-0,0012 **		-0,0009	-0,0003	-0,001	-0,0008	0,0001			-0,0002	
7	Segment 1		-0,0043		0,0011	-0,0019		-0,002	-0,0015	-0,0011		-0,0027	0,0014		-0,0053	-0,0022
	Segment 2		-0,0008			0,0044		0,0036 *	0,0001	0,0016		0,0045 *	0,0008		-0,0032	0,0013
	Segment 3		-0,0007	-0,0001		-0,0017 ***		-0,0022	-0,0006	-0,0018	-0,0013	-0,0007			-0,0005	
10	Segment 1		-0,0011		0,0022	-0,0032		-0,0008	-0,0007	0,0035		-0,00002	0,0038 *		-0,0078	0,0004
	Segment 2		-0,0013			0,0047		0,0028	-0,0008	0,0017		0,0048 *	0,0011		-0,0038 *	0,0025
	Segment 3		-0,0013	0,0004		-0,002 ***		-0,003	-0,0007	-0,0022 **	-0,0016	-0,0014 *			-0,0004	
15	Segment 1		-0,0019			-0,0023		0,0024	0,001	-0,0037						
	Segment 2		0,0021		0,0048	0,0034		-0,0016	-0,001	0,0072 *			-0,0029		0,0063	0,0067
	Segment 3		-0,0016 ***	0,0006 ***		-0,0014 *		-0,0016	0,0002	-0,0019 **	-0,001	-0,0018 ***	0,001		-0,0022	-0,0042
20	Segment 1		-0,002			-0,0019		0,0016	0,0011	-0,0033						
	Segment 2		0,0021		0,0035	0,0009		-0,003	-0,0015	0,0054			-0,0029		0,0071	0,006
	Segment 3		-0,0008	0,0011		-0,0009		-0,0004	0,0006	-0,0015	-0,0005	-0,0014	-0,0003		-0,0022 *	-0,0024
30	Segment 1		-0,0015			-0,0011		0,0006	0,0011	-0,0016						
	Segment 2		0,0059 ***		0,003	0,0007		-0,0026 ***	-0,0009	0,0042			-0,0043		0,0044	0,0003
	Segment 3		-0,0012	0,0022		0,0001		-0,0001	0,0008	-0,0014	-0,0008	-0,0006	-0,0006		-0,0006	-0,0018

Maturity, years	Segment number	Ruble exchange rate dynamics			Oil prices			Banking sector			Fiscal policy			Instruments	
		Dollar growth	Neutral signal	Ruble growth	Increase	Neutral signal	Decrease	Positive news	Neutral signal	Negative news	Tightening	Neutral signal	Easing	Introducing new	Cessation of use
0,25	Segment 1		-0,0027	-0,0093		-0,0034	0,0034	0,0048	-0,0013	0,007				-0,0069	
	Segment 2		-0,0056 **	0,0063			0,0007	-0,0079	0,0018	-0,004	-0,0171 *	0,0072			
	Segment 3		0,0002			-0,0005	-0,0025	0,0014	-0,0003	-0,0005	-0,0072 ***	0,0015			
0,5	Segment 1		-0,0027	-0,0069		-0,0032	0,0036 **	0,002	-0,0012	0,0057				-0,0028	
	Segment 2		-0,006 ***				-0,0017	-0,0067	-0,0008	-0,0009	-0,0147 *	0,0067			
	Segment 3		-0,0007			0,000006	-0,0009	0,002	0,0001	-0,001	-0,0055 ***	-0,0012			
0,75	Segment 1		-0,0024	-0,0037		-0,0018	0,0029 *	0,0034	0,00002	0,0059				-0,0005	
	Segment 2		-0,0065 ***				-0,0017	-0,0054	-0,0023	-0,0016	-0,0111 **	0,004			
	Segment 3		-0,0012			-0,0007	0,0007	0,002 *	0,0001	-0,0006	-0,0043 **	-0,0015 *			
1	Segment 1		-0,0016	-0,006		-0,0013	0,001	0,0033	-0,00004	0,0047				0,0001	
	Segment 2		-0,0061 ***					-0,0022	-0,0016	-0,0071 ***	-0,0096 ***	0,0011			
	Segment 3		-0,0013 *			-0,0006	0,0016	0,001	-0,0001	-0,0006	-0,0016	-0,0013			
2	Segment 1		0,0022	-0,0054		0,0021	-0,0059 ***	-0,0011	-0,002	-0,0004				0,0012	
	Segment 2		-0,0033 **				-0,0047 ***	-0,0014	-0,0015	0,0012	-0,006 ***	-0,004 ***			
	Segment 3		-0,0001			-0,0005	0,0005	-0,0001	-0,00003	0,0012	-0,0006	0,0004			
3	Segment 1		0,0003	0,0002		0,003	-0,0069 ***	-0,0033	-0,0018	-0,0011				0,0011	
	Segment 2		-0,0015				-0,0047 ***	-0,0026	-0,0014	-0,0005	-0,0072 ***	-0,0034 **			
	Segment 3		0,0004			-0,0009	-0,0007	0,00005	0,0001	0,0009	-0,001	0,0008			
5	Segment 1		0,0004	-0,0011		0,0051	-0,0093	-0,0016	0,0007	-0,0003				-0,0004	
	Segment 2		-0,0004				-0,0039 *	-0,0039 *	-0,0003	-0,0023	-0,0086 ***	-0,0022			
	Segment 3		0,0009			-0,0001	-0,0013	0,0003	-0,00004	0,0003	-0,0019	0,0017			
7	Segment 1		-0,00004	-0,0036		0,0054	-0,0048	-0,0008	0,0015	0,0001				0,0001	
	Segment 2		-0,0002				-0,0042 *	-0,0037	0,0002	-0,0024	-0,0086 ***	-0,002			
	Segment 3		-0,0003			-0,0006	-0,0016	0,0007	-0,0001	-0,0004	-0,0048	0,0017			
10	Segment 1		-0,0001	-0,0053		0,0046	-0,0043	-0,0027	-0,0004	-0,0001				-0,0005	
	Segment 2		-0,0008				-0,0047 *	-0,0029	-0,0001	-0,0023	-0,008 ***	-0,0015			
	Segment 3		-0,0021 *			-0,0008	-0,0018 **	0,0013	-0,0004	-0,0004	-0,0061	0,003 **			
15	Segment 1		-0,0025					-0,0035	-0,0025	0,0005				-0,0006	
	Segment 2		0,0053	-0,0032		0,0029		0,002	0,0005	-0,0031				0,0061	
	Segment 3		-0,0028 ***			-0,0018	-0,0023 ***	-0,00001	-0,0002	-0,0002	-0,0072 ***	0,0028			
20	Segment 1		-0,0033 **					-0,0034	-0,0022	-0,0002				-0,0012	
	Segment 2		0,0045	-0,0031		0,002		-0,0045	0,0013	-0,0025				0,0055	
	Segment 3		-0,0025 **			-0,0004	-0,0031 **	-0,0008	0,0001	0,0003	-0,0071 ***	0,0022			
30	Segment 1		-0,0036 ***					-0,0032	-0,0024	-0,00001				-0,0006	
	Segment 2		0,0053 **	-0,0067		0,0014		0,0037	-0,0008	-0,0076 **				0,0067	
	Segment 3		-0,0023 **			-0,0002	-0,003 **	-0,0011	0,0002	0,0007	-0,0068 ***	0,0018			

*Notes: *** - significance level 1%, ** - significance level 5%, * - significance level 10%, tonalities highlighted with gray color - those for which the number of observations in this time segment is not less than five, omissions mean the absence of 5 verbal interventions of this tonality in selected time period.*

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