Identifying the policy goals of the Central Bank of Russia[1]

Economists working in the field of monetary policy are currently enquiring into how a central bank can reconcile observance of certain rules with freedom of action and coordinate the goals and instruments of monetary policy. This topic has been treated in the classical works of John Maynard Keynes, Milton Friedman, R. Lucas, and T. Sargent, but many theoretical problems remain unresolved. The key debate revolves around how a monetary policy can be devised that will be optimal in specific economic conditions. If optimality of monetary policy in a particular set of conditions is to be achieved, the strategic goals, targets, and instruments of implementation have to be defined. Either particular rules have to be adopted or freedom of action has to be granted. The scope of the policy and the relationship with fiscal policy have to be defined.

Monetary policy is one of the key instruments of government regulation of the economy but its strategic goals are the same as those of general macroeconomic policy. These goals are: securing sustainable economic growth, high rates of employment, low rates of inflation and stability in the financial sector. However, monetary authorities have no means of directly controlling or managing these strategic goals or outcomes. Instead, they select a number of intermediary targets that they can control, for example the interbank credit rate, the money supply or the exchange rate[2].

[1] The present paper is based on the research published in: Drobyshevsky S.M., Trunin P.V., Kamenskikh M.V. "Analiz pravil denezhno-kreditnoy politiki Banka Rossii v 1999-2007". Nauchnye Trudy (Working papers) IET.M., 2009,№ 127

[2] See, for example: Clarida R., J. Gali and M. Gertler (1997): «Monetary Policy Rules in Practice: Some International Evidence», NBER Working Paper 6254.

In order to achieve the intermediary targets, a central bank employs such instruments as:

- Open market transactions, that is, sales and purchases of assets, including foreign exchange, government bonds and promissory notes of the Ministry of Finance;
- Obligatory reserves, that is, standards governing mandatory reserves to be held by credit organizations;
- Control over interest rates: the refinancing rate, rates of interest on deposits, REPO transactions and other kinds of credit. By managing interest rates on lending and deposit operations, the central bank regulates the amount of liquidity in the banking system according to changing economic circumstances.

A central bank deploys the instruments at its disposal in such a way as to control the dynamic of intermediary target variables. This means that by monitoring the values of these variables we can evaluate the effectiveness of the instruments employed. The strategic goals of the monetary authorities involves a certain dynamic of such variables as inflation, output and unemployment and the management of the intermediary target variables is a means of attaining the strategic goals. The values of the intermediary targets must be managed so as to ensure that the variables of the strategic goals attain the desired levels.

The behavior of the monetary authorities can be described using the so-called monetary policy rule, which links the dynamic of the intermediary target variables (interest rate, money supply, exchange rate) to output, inflation or some other strategic variable. Should the strategic goals deviate from a target value set by the central bank, it is assumed that the bank will act upon the intermediary targets, deploying the instruments of monetary policy available to it. To identify the rules a given central bank adheres to we have to establish correlations between the

intermediary targets and the strategic goals. If, within the framework of a particular model, the hypothesis of the absence of any correlation between the intermediary targets and the strategic goals is disproved, this will mean that an hypothesis relating to the operation of some rule or other can be upheld.

Identifying such rules is a matter of urgency for researchers, for knowledge of the rules according to which a central bank reacts to changing economic circumstances will make for a better understanding of economic processes overall and make forecasting more efficient. For example, the central bank might issue official statements that its objective is to maintain the exchange rate or inflation at a particular level, whereas its actions might not be conducive to these ends. Econometric evaluation of the application of rules will enable us to identify such discrepancies.

Research into problems in the monetary sphere in the period following the crisis of 1998[3] in Russia has demonstrated that many processes determining equilibrium in the money market, the interaction between the real and the financial sectors of the economy and price dynamics after the crisis underwent change. There is now a need for further in-depth research into various aspects of the monetary policy pursued by the Central Bank of Russia. Whereas during the early 2000s the data series were not long enough to permit any evaluation of the post-crisis policy of the CBR, we now have sufficient data to enable research to be carried out. The results obtained from the sample appear fairly reliable and can be used to identify the goals and tasks of monetary and credit regulation at the present time.

[3] See: Drobyshevsky S.M., Kozlovskaya A.M. (2002). Vnutrenniye aspekty denezhno-kreditnoy politiki Rossii. Nauchnye Trudy (Working papers) № 45, IET.

The major premise of such an analysis is that in the implementation of a rule of monetary policy, a target value of the instrument of monetary policy (I^*) is set, which in Russia could be interest rates set by the CBR, the level of obligatory reserves or the refinancing rate. The target value is set on the basis of deviations of the values of the basic macroeconomic indicators available at the moment of time t[4] that constitute *the strategic goals* of implementation of monetary policy (output y, inflation □ , other strategic objectives z), from the corresponding target values, that is:

$$I_t^* = \bar{I} + \beta(\pi_t - \pi^*) + \gamma(y_t - y^*) + \delta(z_t - z^*), \qquad (1)$$

where $\bar{I}$ – long –term equilibrium value of the instrument.

Since the instruments of monetary policy change relatively seldom, the equation (1) cannot be tested directly. It is therefore assumed that the actual value of *the intermediary target* of long-term monetary policy (p), which the CBR seeks to influence in applying its instruments, is the linear combination of the target value of the instrument and the actual value of the intermediary target at the preceding moment of time:

$$p_t = (1-\rho)I_t^* + \rho p_{t-1} + \upsilon_t, \qquad (2)$$

where □ – is the coefficient responsible for smoothing the dynamic of the instrument.

Inserting (2) into (1), we obtain an equation that can be tested. However, since in Russia many intermediary targets of monetary policy are non-stationary variables, the equation needs to be tested in differences, and this makes it impossible to test the target level of an instrument of monetary policy.

[4] This logic is also applicable in the analysis of the long-term monetary policy rules based upon anticipated values of the target indicators. In this case the target values of the instruments of monetary policy are set according to the values of target indicators anticipated by the central bank at the moment of time t.

At this juncture, it should be noted that there are two approaches to the understanding of the rules of monetary policy. In one approach it is assumed that in the implementation of monetary policy a central bank is guided by the past values of target indicators, whilst he other assumes that the central bank acts according to the anticipated values of the target indicators. We shall demonstrate how both approaches can be applied in order to identify the actual goals and rules of monetary policy of the Bank of Russia.

Data Description

In testing the models, monthly data for the period April 1999 through December 2007 were employed. We take the view that dividing this time interval into sub-periods is inappropriate, given the short length of series that would be obtained, and in view of the fact that asymptotic features of the Generalized Method of Moments begin to manifest themselves only in relatively large samples. Besides, the post-crisis period in question displays certain general trends such as increase in the prices of energy resources, appreciation of the ruble in real terms and accumulation of gold and foreign exchange reserves and these provide a basis for the testing of econometric models over the entire time period.

The variables employed for the testing are given in *Table 1*.

Table 1: Variables employed in calculations

Variable	Unit of measure	Symbol	Data source
Consumer price index	% relative to the previous period	CPI	Rosstat
Rb/USD exchange rate	Rb to USD as of the end of the period, in logarithms	LN_ERUS	CBR
Value of the bi-currency basket[5]	Rb as of the end of the period, in logarithms	LN_ERBICR	CBR
Real effective exchange rate of the Rb.	Rb relative to the currency basket, in logarithms	LN_REER	IMF
Nominal effective exchange rate of the Rb.	Rb relative to the currency basket, in logarithms	LN_NEER	IMF
Interbank lending rate	% annualized, as of the beginning of the month	MBK	CBR
M0	Bn Rb as of the end of the period, in	LN_M0	CBR

[5] In its official statements, the CBR emphasized that the value of the bi-currency basket forms an operational benchmark of its exchange rate policy. Up to February 2005 it was the Rb/USD exchange rate that used to form the benchmark and the bi-currency basket was introduced as of February 1, 2005. Originally, the basket consisted of 10% Euro and 90% USD. The structure of the basket was gradually modified to allow for an increasing proportion of Euro and a diminishing proportion of USD. As of March 8, 2007, the weights of the currencies were revised and currently they are 45% and 55%, respectively. On the basis of this data we constructed an indicator that reflects the dynamic of the bi-currency basket. For the period up to February 2005 the value of the bi-currency basket is assumed to be equal to the exchange rate for the US dollar.

	logarithms		
Money supply in narrow terms	Bn Rb as of the end of the period, in logarithms	LN_BASE	CBR
Balances of correspondent accounts of credit organizations with the CBR	Bn Rb as of the end of the period, in logarithms	LN_CORR	CBR
Volume of export in the period	USD, in logarithms	LN_EXP	Rosstat
Index of industrial output	% to the prior period, in logarithms	IP[6]	Rosstat
Index of industrial output	Basic, in logarithms	LN_IP_AGR	Rosstat
Index of industrial output	% to the prior period, in logarithms	IP_HP	The authors' calculations
Output of basic sectors of the economy	% to the prior period, in logarithms	Y[7]	Rosstat
Output of basic sectors of the economy	As of the end of the period, in logarithms	LN_Y_AGR	Rosstat
Output of basic sectors of the economy	% to the prior period, in logarithms	Y_HP	The authors' calculations

[6] IP=d(LN_IP_AGR).
7 Y=d(LN_Y_AGR).

Unemployment rate	%, as of the end-month	UNEMPL	Rosstat
Velocity of the circulation of money[8]	In logarithms	LN_V	Authors' calculations
Changes in the velocity of the circulation of money	Relative to the prior period, in logarithms	d_LNV[9]	Authors' calculations
Balances on correspondent accounts relative to size of the money supply broadly defined	In logarithms	COR_H	Authors' calculations
Balances on correspondent accounts relative to size of the money supply	In logarithms	COR2	Authors' calculations

The Rb/USD exchange rate, the value of the bi-currency basket, indices real and nominal effective exchange rates of the Rb., monetary aggregates (M0, money supply), balances on correspondent accounts, the industrial output index, the output of basic industries, the velocity of circulation of money, exports, oil prices, the balances of correspondent accounts of credit organizations with the CBR relative to monetary aggregates were considered in logarithms, since the logarithm transformation enables one to linearize the model. We ran the ADL-test for unit roots (see *Table 3*).

[8] Money velocity was calculated as the average value over the preceding 12 months of the logarithm of the nominal output growth rate to money supply M_2 ratio. The nominal output growth rate forms the product of the increase rate of output of the basic sectors by CPI.
[9] D_LNV=d(LN_V).

Table 2: Results of the Extended Dickey-Fuller Test for Unit Roots

Label	Logarithm	Order of integration	Trend	Intercept	t-statistics	Significance level
LN_ERUS	+	1	–	–	–2.948	0.004
LN_ERBICR	+	1	–	–	–3.337	0.001
LN_REER	+	1	–	+	–4.542	0.000
LN_NEER	+	1	–	–	–3.789	0.000
MBK	–	0	–	–	–1.738	0.078
CPI	–	0	–	+	–4.376	0.001
LN_M0	+	1	–	+	–4.641	0.000
LN_BASE	+	1	–	+	–3.513	0.01
LN_CORR	+	1	–	+	–4.783	0.000
LN_EXP	+	1	–	+	–4.201	0.001
LN_IP_AGR	+	1	–	+	–8.247	0.000
UNEMPL	–	1	–	+	–5.815	0.000
LN_Y_ AGR	+	1	–	+	–8.856	0.000
LN_OIL	+	1	–	+	–4.1	0.002
LN_V	+	1	–	+	–3.257	0.02
COR_H	+	1	–	–	–4.818	0.000
COR2	+	1	–	–	–4.666	0.000

As demonstrated in *Table 2*, the hypothesis of the presence of the unit root in the interest rate and inflation series is not upheld. Monetary aggregates, balances on correspondent accounts, the index of industrial output, the index of basic industries, exports, nominal output, the real and nominal effective exchange rates of the ruble as well as the value of the bi-currency basket form integrated series of order 1. When testing the equations, we considered the first differences of the logarithm for the money aggregates, real industrial output, exports, the real and nominal effective exchange rates of the ruble and balances on correspondent

accounts, which corresponds to an assumption that, in implementing a policy, one takes into consideration not so much absolute values of the indicators, as their rates of growth. The first differences of the logarithm for these indicators form stationary series that can be employed for the purpose of testing.

In addition, as alternative indicators describing economic activity, the output of basic sectors of the economy, and as an index of industrial production we examined deviations from the long-term trend, which is consistent with the assumption that the central bank seeks to prevent a deviation of output (y) from its equilibrium value (y*) . In order to determine an equilibrium value, we employed the Hodrick-Preskott filter. Then, following Orphanides's methodology[10], we calculated (y-y*).

Monetary Policy Rules based upon past values of the target variables

The general specification of an equation designed to test the hypothesis concerning the operation of monetary policy rules based on past values of the target indicators can be presented in the following form:

$$r_t = c + \sum_{i=1}^{j} a_i \pi_{t-i} + \sum_{i=1}^{k} b_i y_{t-i} + \sum_{i=1}^{l} c_i z_{t-i} + \sum_{i=1}^{m} d_i r_{t-i} + e_t, \qquad (3)$$

where π represents inflation, y – output, z – is an additional parameter of monetary policy, and parameters j,k,l,m highlight the number of lags. Variable r stands for the intermediary target of monetary policy. As intermediary targets, we examined the following:

- interest rate on the interbank lending market;
- value of the bi-currency basket;
- money supply in narrow terms[11];
- balances of the correspondent accounts of commercial banks;

[10] Orphanides A. (2000). Activist Stabilization Policy and Inflation: The Taylor Rule in the 1970s. Board of Governors of the Federal Reserve System.

[11] Monetary base in narrow terms includes cash and required reserves.

- balances of the correspondent accounts of commercial banks relative to monetary aggregate M2;
- balances of the correspondent accounts of commercial banks relative to money supply.

As potential strategic goals of monetary policy we analyzed the following:

- Rate of growth of GDP in real terms;
- Rate of unemployment
- Index of industrial output
- Inflation
- Effective exchange rate of the ruble[12]
- Velocity of circulation of money

The test was run using the generalized least-squares method (GLSM). During testing, we also considered the influence on the intermediary targets of an exogenous factor - the oil price. The linear time trend was tested in the equations and seasonality was eliminated by adding dummy variables. The number of lags for dependent variables was identified on the basis of their statistical significance. Finally, to factor in the serial correlation of mistakes and heteroscedasticity, we employed testing with errors in the Newey-West form.

The results obtained using GLSM are given in *Table 3*. For each strategic monetary policy objective, the *Table* refers to the value of the coefficient under the first lag, t- statistics, and the number of significant lags of a given indicator in the model.

[12] Originally, we considered the real effective exchange rate of the ruble to be a strategic goal of monetary policy, but by contrast with the nominal effective exchange rate, which is employed in the final equations, it proved to be statistically insignificant. In all likelihood the insignificance of the real effective exchange rate can be attributed to its strong correlation with the consumer price index.

Table 3: Results of testing Monetary Policy Rules

based on past values of target indicators

Intermediary target / **Ultimate objective**	Interbank credit rate **MBK**	Money supply, narrow definition **d(ln_BASE)**	The bi-currency basket value **d(ln_ERBICR)**	Balances of credit orgs' corr. accounts with CBR **d(ln_CORR)**	Balances o credit orgs corr. accounts to monetary base in broad terms ratio **d(COR_H**
CPI	0.306 (0.572) L	–0.001 (0.399) L	0.001 (0.315) L	**–0.017+** (0.074) L	**–0.025*** (0.097) L
Y			0.000 (0.972) L3	–0.001 (0.578) L	**–0.005**** (0.002) L
IP	0.065 (0.109) L4	**–0.001**** (0.000) L3			
UNEMPL	0.03 (0.931) L2	–0.001 (0.510) L2	0.001 (0.357) L3	–0.001 (0.830) L	–0.005 (0.679) L
d(LN_V)	–30.17 (0.427) L2	–0.07 (0.649) L	0.133 (0.127) L2	1.115 (0.143) L3	1.270 (0.153) L4
d(LN_NEER)	29.96 (0.555) L	**–0.315**** (0.010) L2		**–1.476+** (0.065) L2	**–2.473+** 0.023 L2

Lagged/time delayed intermediary targets and other regressors					
Lagged/time delayed intermediary target	0.568** (0.000) L	–0.102** (0.004) L	0.280 (0.008) L	–0.291** (0.000) L	–0.750** (0.000) L
T		0.001** (0.005)			
CONST				1.760+ (0.065)	3.383+ (0.037)
Number of observations	98	99	98	99	98
R^2	0.584	0.770	0.268	0.742	0.567
adj. R^2	0.537	0.735	0.164	0.703	0.500
AIC	–486.2	–647.9	–774.3	–288.8	–214.4
BIC	–514.7	–611.6	–740.7	–252.4	–178.2
F-statistic	12.23	21.91	2.589	18.85	8.474
F-statistic(prob)	0.000	0.000	0.0056	0.000	0.000

Note. «+» – $p<0.10$, «*» – $p<0.05$, «**» – $p<0.01$.

As we can see from *Table 3*, the strategic monetary policy goals represented by output indices in real terms, nominal effective exchange rate, and consumer prices emerged as being statistically significant in the equations. The results suggest that the CBR has endeavored to hold back inflation: once the CPI began to increase, the

Bank of Russia pursued a policy of containment by lowering the rates of growth of balances of corresponding accounts of commercial banks. The response to a deceleration of economic growth was a policy of stimulus that took the form either of increasing the money supply or the balances of correspondent accounts. Interestingly, the response to an appreciation of the ruble was a contraction of the money supply and of the correspondent accounts of commercial banks, which is most probably a consequence of the policy of the Central Bank of seeking to reduce inflation by allowing the ruble to appreciate. In other words, whenever the Bank of Russia did not counteract the appreciation of the rule by buying foreign currency, the money supply and correspondent accounts grew more slowly.

It is worth noting that our evaluations of the various monetary policy rules based on past values of target indicators demonstrate that the interest rate, which is a critical intermediary target in the monetary policy of many developed countries, does not have this function in Russian monetary policy: applying the appropriate equation for the interbank credit rate, no significant co-relation was found with the strategic goals of monetary policy.

We have demonstrated that in its monetary policy the CBR pursues such strategic goals as the exchange rate, whereas balances on the correspondent accounts of commercial banks serve as intermediary targets.

However, the regulatory bodies responsible for monetary policy are not so much guided by past values of the macroeconomic variables as by their anticipated future values. However, it is evident, given the inertia to which most economic processes are prone, that the factors that determine the anticipated values of variables include their past values. Let us now examine the monetary policy rules that are based upon future values of the target indicators.

Monetary Policy Rules based upon future values of target variables

In evaluating the rules of monetary policy that operate when the regulatory bodies apply future values of output, inflation, unemployment, exchange rate target indicators we used the Generalized Method of Moments.

As developed by L. Hansen in 1982[13], this method (GMM) has a number of advantages that especially relevant to a study of the dynamics of intermediary targets of monetary policy.

Firstly, unlike the LSM, the GMM does not require the assumption of a normal distribution of changes in an intermediary target. In asymptotic approximation it is sufficient to assume a stationary state and ergodity of the time series concerned, as well as the existence of corresponding moments.

Secondly, the GMM tests and their standard errors are consistent, even if their balances display a conditional heteroscedasticity. Since, in the evaluation of a continuous process by discreet observations we encounter the problem of aggregation of the data in time, which affects distribution of balances, this feature of the GMM mitigates the impact of discreet approximation on any error of evaluation of parameters.

At the same time, the GMM is applicable solely to evaluations of large samples, that is, observed characteristics are achieved from large number of observations. In the majority of cases the GMM evaluations appear asymptotically effective, but they are rarely effective in the case of final samples. For this reason, analysis of the rules of monetary policy of the CBR was applied to monthly data for the entire period 1999 to 2007.

[13] Hansen L.P. (1982). Large sample properties of Generalized Method of Moments estimators // *Econometrica*. # 50. P. 1029–1054.

Underlying the method is an *a priori* exposition of the fulfillment of the population orthogonality condition, which takes the form $E[\mathbf{z}' g(\mathbf{y}, \mathbf{X}, \boldsymbol{\theta})] = \mathbf{0}$, where $g(\bullet)$ – continuous function from the matrix of the observed values of endogenous and exogenous variables (y, X) and the vector of parameters $\boldsymbol{\theta}$, z – vector of instrumental variables that are independent of the parameters. Then a sample analogue of the condition of orthogonality $m(\mathbf{y}, \mathbf{X}, \boldsymbol{\theta}, \mathbf{z})$ is built, and the following expression is minimized by $\bar{\boldsymbol{\theta}}$:

$$J(\bar{\boldsymbol{\theta}}) = m(\mathbf{y}, \mathbf{X}, \bar{\boldsymbol{\theta}}, \mathbf{z})' \cdot \mathbf{W} \cdot m(\mathbf{y}, \mathbf{X}, \bar{\boldsymbol{\theta}}, \mathbf{z}), \qquad (4)$$

where W – optimally selected Newey-West matrix.

If the selection of matrix W is optimal, values of a given expression are distributed as $\chi 2$. The product of $J(\bar{\boldsymbol{\theta}})$ by the number of observations, aka J-statistic is also distributed as $\chi 2$, with the number of constraints being equal to the difference between the number of constraints imposed on the moments and the number of tested parameters. According to the zero hypothesis, all the constraints are effective. This statistic serves as an indicator of the quality of a regression model tested with the use of the GMM.

Whereas in the given case the scale of the amount of information available to the monetary authorities and, accordingly, the number of orthogonal conditions are in excess of the number of parameters, the model becomes over-determined and we are entitled to test fulfillment of the imposed constraints using Hansen's J-statistic, which is a characteristic of the quality of the equation tested with the use of GMM.

As instrumental variables for testing the regression we used delayed values for the intermediary and strategic goals of monetary policy, the oil price and the monetary aggregates M0 and M2. Using appropriate statistics from this set, we selected those variables for which the conditions of orthogonality were met.

We tested the model in the following form:

$$r_t = \alpha_0 + \alpha_1 r_{t-1} + E_{t-1}(y_{t+n} - y^*) + E_{t-1}(\pi_{t+n} - \pi^*) + E_{t-1}(z_{t+n} - z^*) + e_t\,, \qquad (5)$$

In other words, it was assumed that in implementing its monetary policy, the Central Bank based its decisions upon an assumed deviation of the strategic goals of monetary policy from the target value. It was also assumed that the CBR forecasts such deviations on the basis of information received over moments of time prior to moment t. In testing the regression equation, actual values over the period t+n are considered to be prognostic. We selected an optimal number of periods n proceeding from the value of statistic R^2; we examined the number of periods n in which the value of R^2 was maximal.

The results of testing the variants of rules of monetary policy are given in *Table 4*. For each strategic goal of monetary policy the *Table* provides the value of the coefficient for its value at the moment t+1, the t- statistic, and a number of significant prognostic values of a given indicator in the model. In the course of the testing, we ran the Pagan-Hall heteroscedasticity test, which showed that a zero hypothesis on homoscedasticity of balances is rejected only for one specification of the model. It will be recalled that the GMM tests prove to be consistent even if heteroscedasticity in the balances is present.

Table 4: Results of testing Monetary Policy Rules

based on future values of target indicators

Intermediary target / **Ultimate objective**	**MBK**	**d(ln_BASE)**	**d(ln_ERBICR)**	**d(ln_CORR)**	**d(COR_H**
CPI	**1.068**** (0.002) F4	**–0.005*** (0.012) F4	–0.001 (0.168) F4	**–0.066**** (0.000) F6	**–0.068**** (0.000) F6
Y	**0.112**** (0.000) F4	0.000 (0.285) F	0.000 (0.366) F2	**–0.004*** (0.026) F3	**–0.002*** (0.045) F4
d(LN_UNEMPL)	**–0.751*** (0.040) F	0.003 (0.617) F2	0.000 (0.692) F6	0.026 (0.257) F4	**0.041**** (0.005) F4
d(LN_V)	14.70 (0.718) F	**–0.735*** (0.024) F2	–0.077 (0.392) F4	**–5.045*** (0.025) F5	–0.350 (0.727) F
d(LN_NEER)	**91.48+** (0.088) F3	0.147 (0.782) F3		**–3.401*** (0.014) F4	**–2.772+** (0.070) F4
Lagged/time delayed intermediary targets and other regressors					
MBK	0.590**				

	(0.000)				
d(LN_BASE)		–0.313** (0.000)			
d(LN_ERBICR)			0.324** (0.003)		
d(LN_CORR)				0.206* (–0.039)	
d(COR_H)					–0.476** (0.000)
d(COR2)					
T	–0.044* (0.026)				0.001* (0.044)
CONST	–87.84* (0.020)	0.607** (0.007)	0.115+ (0.057)	6.780** (0.001)	6.132** (0.000)
Number of observations	93	93	94	93	90
$R^2$1	0.702	0.589	0.545	0.519	0.587
$R^2$2	0.731	0.520	0.636	0.526	0.536
$R^2$3	0.848	0.293	0.485	0.317	0.678
$R^2$4	0.790	0.454	0.353	0.321	0.427
$R^2$5	0.732	0.512	.	0.454	0.430
J-statistics	31.90	21.96	18.22	18.77	21.52
J-statistics (prob)	0.522	0.462	0.441	0.406	0.309
Pagan-Hall statistics(prob)	0.514	0.362	0.0814	0.464	0.821

Note. «+» – p<0.10. «*» – p<0.05. «**» – p<0.01.

As we see from the above calculations, the hypothesis of fulfillment of conditions of orthogonality (see above) is not rejected for any of the models constructed, whilst the forecast variables are fairly well explained by the instrumental variables (a high value of R^2 for the relevant equations).

The results of the tests of rules based on anticipated values of target indicators proved to be better than those for the rules based on past values of the strategic goals of monetary policy. This is what we would expect, given that central banks nowadays pay a great deal of attention to economic forecasts. In so far as the results obtained in the tests of both kinds of rules are generally consistent, we would give preference to rules that are based on anticipated values of the strategic goals of monetary policy.

The "worst" scores were obtained for the intermediary target represented by the bi-currency basket. Specifically, the statistical data provide no grounds for thinking that the Bank of Russia employs this indicator as an intermediary target of monetary policy. At the same time, our results do not contradict the hypothesis that the bi-currency basket serves as an important guideline for the CBR – an anticipated strengthening of the ruble leads to a relaxation of monetary policy.

Additionally, we have managed to demonstrate that the hypothesis that both CPI and the rate of change in output in real terms figure amongst the strategic goals of monetary policy of the CBR is not in contradiction with the data: an anticipated escalation of inflation or a surge in GDP growth rates result in a tightening of monetary policy by means of a raising interest rates, a reduction in the money supply or a reduction of the balances of correspondent accounts of commercial banks with the CBR. At the same time, it should be noticed that a correlation between intermediary monetary policy targets and output might be a consequence of the impact of fundamental macroeconomic correlations – an acceleration of the GDP growth rates might be accompanied by a reduction in the rate of growth of

the money supply as a result of the freezing of a considerable proportion of the revenues of the foreign currency revenues of exporters.

As with the testing of rules based on past values of the target indicators, it transpired that an anticipated rise in the effective exchange rate of the ruble leads to a tightening of monetary policy. In other words, the monetary authorities reacted to fluctuations in the effective exchange rate by applying instruments of monetary policy in ways that ran counter to stabilization of the exchange rate. We have to assume that this was because exchange rate policy figures prominently in the struggle of the CBR to control inflation. Confronted by increasing price inflation, the Bank of Russia has recourse to a tightening of monetary policy, notwithstanding the consequence of appreciation of the national currency. In other words, in periods of increasing inflation, CBR would be relatively unconcerned about the appreciation of the ruble and would tend to buy smaller amounts of foreign currency. As a result, the ruble would appreciate at a time when inflation was slowing down.

The results confirm that in implementing its monetary policy the CBR employed a variety of intermediary targets. These included interest rates, money supply and the balances of the accounts of commercial banks with the CBR. The Bank of Russia has not yet acquired a clear conception of how to implement its monetary policy. This is because of the rapidly changing internal and external economic environment in which the policy has to be implemented and because of the relative underdevelopment of the Russian financial market and banking system.

Finally, it should be noted that the results obtained bear witness to a fairly low rate of inertia of the intermediary monetary policy targets – the value of coefficients for the lagged/time delayed intermediary targets values does not exceed 0.6 (by

comparison the figures for developed economies are 0.90-0.95)[14] and this can be attributed to the greater volatility of Russia's financial market, which frequently compels the CBR to react to changing circumstances in the market.

Overall, the results are consistent with the widespread view that, following the crisis of 1998, the CBR understood its principal task to be the maintenance of the exchange rate whilst ensuring the stability of the banking system. But as time passed, the CBR gradually began to devote more attention to such "traditional" strategic goals of monetary policy as inflation and economic growth.

Conclusions

The testing of two specifications of monetary policy rules (one based upon past values of the strategic goals of monetary policy and the other on anticipated values) has demonstrated that from a statistical perspective the operation of a rule based on forecast values is more consistent with the empirical data. Although the bi-currency basket was officially declared to be an operational guideline of the CBR, we were not able to reject the hypothesis concerning the absence of any response of this indicator to forecast values of the Bank's various strategic goals. In other words, it is likely that the CBR did not, in practice, employ the value of the bi-currency basket as an intermediary target in monetary policy. At the same time the results obtained are not in conflict with the hypothesis whereby the bi-currency basket is an important target indicator for the CBR – an anticipated appreciation of the ruble results in a relaxation of monetary policy and this is consistent with results obtained in the testing of vector auto regressions.

We have also managed to demonstrate that price stabilization can be considered a strategic goal of the CBR – an anticipated increase in inflation or increase in the GDP growth rate was followed by an increase in interest rates, a contraction in

[14] Clarida R. Gali J. Gertler M. (1997). Monetary Policy Rules in Practice: Some International Evidence. NBER Working Paper 6254.

money supply or a reduction in the balances of correspondent accounts of commercial banks with the CBR. Interestingly, an anticipated increase in the effective exchange rate of the ruble makes for a tightening of monetary policy. In other words, the monetary authorities reacted to fluctuations in the effective exchange rate by deploying instruments of monetary policy in a direction contrary to that of stabilization. Thus, in periods of a higher inflation, the CBR was less concerned about the appreciation of the ruble and purchased less foreign currency. As a result, the ruble would appreciate at a time when inflation was decreasing. This suggests that that the Bank of Russia attaches a higher priority to low inflation than to the exchange rate.

Our results demonstrate that over the period in question the CBR employed a variety of intermediary monetary policy targets: interest rates, money supply and balances of the accounts of commercial banks with the Bank of Russia. The diversity of the intermediary targets can be attributed primarily to the rapidly changing domestic and external circumstances in which monetary policy is implemented.

Finally, let us note that our research demonstrated a low inertia rate of the intermediary targets – the coefficients under the lagged/time delayed values of the intermediary targets did not rise above 0.6. This is most likely due to the relatively high volatility of Russia's financial market, which compelled the CBR rapidly to adjust its current monetary policy according to circumstances in the market.