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SAINT-PETERSBURG

Yulia Vymyatnina

Monetary policy transmission and Bank of Russia monetary policy

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YULIA VYMYATNINA[**] Monetary Policy transmission and Bank of Russia Monetary Policy. **Working paper Ec-02/05.**

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Abstract:

The present study analysed monetary policy transmission mechanisms in Russia in the period of July 1995 – September 2004. Bank of Russia officially implements inflation targeting and in its "General foundations of monetary policy" declares monetary base and monetary aggregate M2 as its operational and intermediate targets and policy instruments, insisting that using interest rate as a policy tool would be inefficient due to underdevelopment of financial system. Such position assumes controllability of monetary base, stability of money multiplier, and existence and stability of money demand function. In order to check the implicit assumptions of the monetary policy conduct of the Bank of Russia the SVECM model was constructed, involving monetary aggregate M2, price level, real total trade as a proxy for output, interbank interest rate and average monthly exchange rate, with one cointegrating relation estimated. The estimated cointegrating relation was recognised to be a long-run money demand function. The hypothesis of price homogeneity was not rejected, and the resulting cointegrating relation describes money demand function for the real M2 money balances. The analysis demonstrated that using monetary aggregate as a tool of monetary policy leads to greater variability in output and prices, though the time period of reaction is somewhat shorter as compared to the situation with interest rate as a policy instrument. The role of interest rate and exchange rate channels in monetary policy transmission is evident in both cases of monetary policy instrument choice. The major policy recommendation from the results received is for the Bank of Russia to introduce interest rate management practice simultaneously with further development of financial system.

Keywords: transition; demand for money.

JEL classification numbers: E41.

European University at Saint-Petersburg

3 Gagarinskaia st., St.-Petersburg, 191187 RUSSIA

e-mail: econ@eu.spb.ru

[**] Department of Economics European University at St Petersburg #3, Gagarinskaya Str., St. Petersburg, 191187, Russia Tel: 00 7 812 275 11 30 Fax: 00 7 812 275 11 30 Email: yv@eu.spb.ru

1. Introduction

Recently a number of papers have been addressing the issues of monetary policy effectiveness and timing, including monetary policy transmission mechanisms. The motivation behind these studies is driven by the fact that monetary union in Europe raised new questions about the effectiveness of monetary policy and its influence on the real side of economy as well as the timing of this influence. The evidence on the transmission mechanism of monetary policy is an important guide for central banks in their policy conduct, and in every country the operating mechanism of monetary policy might be different depending, among other factors, on the available instruments, stability of the demand for money function, controllability of monetary aggregates. The unique combination of different factors influencing transmission mechanism in a country implies that monetary policy advice should be different for different countries.

The present chapter directly addresses the issues of monetary transmission mechanism in Russia by using structural vector error correction model (SVECM) as a special case of structural VAR approach. This approach allows both to account for the long-run properties of the variables and to impose structural relations coming from economic theory on the unconstrained VAR. SVECM is build in two steps: first, the cointegrating relations between endogenous variables are tested, than, after the resulting vector error correction model is approved by a set of diagnostic tests, the structural relations are imposed and tested. This approach allows, among other things, estimating the effects of monetary policy shocks by modelling impulse response functions, which clarifies the influence of monetary policy on the real side of the economy.

The chapter is organised as follows: next section gives theoretical background on monetary transmission mechanisms, the following section provides an overview of monetary policy in Russia. In the section 4 data used and econometric methodology are detailed, next section describes the results, and last section concludes.

2. Theoretical background and empirical findings

Monetary policy ascertains substantial impact on the real economic aggregates and therefore it is important to understand how the transmission mechanism of monetary policy works. Better understanding of transmission mechanism of monetary policy implies better choice of targets, instruments and timing as well as possibilities of fine-tuning the institutions responsible for the implementation of the policy of a central bank and/or government.

Major channels of monetary policy transmission are interest rate channel (through monetary aggregate and interest rate policy instruments), credit

channel, and exchange rate channel. Traditional textbook story of monetary policy operation implies transmission channel when central bank controls high-powered money or base money, and by changing the amount of base money is able to exercise desired impact of monetary policy. Changes in the base money, according to this theory, lead to changes in the monetary mass via money multiplier, which then result in disequilibrium on the money market, which lead to changes in interest rate in order to restore equilibrium. Changes in interest rates imply changes of investment and, to some extent, of consumption, and changes in output and prices follow. This type of monetary policy works only providing there exists a stable relation between the supply of real money balances and other economic indicators such as real output level, nominal interest rate, inflation expectations etc, i.e. a stable money demand function is required. Besides, this approach suggests the constancy or, at least, stability of the money multiplier in order for the monetary policy to exert predictable influence on the real side of the economy. (Howells, Bain, 2003, p. 178)

The interest rate channel of monetary policy transmission with the interest rate as a policy instrument has the following logic. When a central bank changes its refinancing rate (lending rate to commercial banks), it changes, in effect, the 'price' of additional funding the banks may need to continue with their current level of lending activities. This changes bank lending attractiveness for the clients, and leads to change in overall interest rates level in the economy. This, in turn, results in changes of the amount of new credit issued to finance investment decisions of the real sector of economy, leading to changes in the aggregate output and prices. This transmission channel of monetary policy is not constrained by the restrictive assumptions of using monetary aggregates as a policy tool and seems to be generally relied upon by most of central banks – according to the survey of Borio (1997) most of central banks use short-term interest rate as major policy instrument.

Interest rate channel of monetary policy transmission is closely intertwined with credit channel, since it is credit of commercial banks that plays an important role in interest rate transmission mechanism. Credit channel stresses the importance of taking amount of bank credit into account in monetary policy conduct by pointing out to the asymmetry in responses of the economy to restrictive and expansionary monetary policy stance. The consequences of the restrictive monetary policy might be more adverse for the economy in the absolute values of changes of real output compared to positive effects from expansionary policy. This is due to the fact that to issue loan for a bank is a costly procedure, and this means that if credit becomes more expensive after interest rate goes up, the risk of the credit being unpaid increases, and the share of unpaid sunk costs related to information gathering and processing concerning new credits tends to increase. Banks believe that in more difficult conditions there are less profitable investment projects and hence decline some clients in

their credit demand. Sometimes this leads, especially for small and medium companies, to difficulties in meeting even current monetary obligations, and they go bankrupt. The process resembles self-proving forecast and stresses the asymmetry of information and agency problems in this case. (Stiglitz, Greenwald, 2003) Studies of Gertler and Gilchrist (1993, 1994), and Domac (1999) demonstrated that companies with limited access to short-term borrowing (mostly small ones) had to decumulate inventories following the adverse monetary policy stance.

The importance of the exchange rate channel is viewed to be the highest under high capital mobility and flexible exchange rate. The change in the interest rate as an instrument of monetary policy in case of open economy will result in changes in interest rate differential and, depending on the degree of capital mobility in the country, there will be inflow or outflow of capital in the country (inflow for tighter monetary policy and outflow otherwise). Further, the effect depends on the liabilities of the central bank concerning domestic currency exchange rate. Provided the exchange rate is fixed, there is no room left for the monetary policy to be effective, since any active monetary policy actions of the central bank are offset by the necessity to stabilise the exchange rate back to the original level as shown by the Mundell-Fleming model. However, with flexible exchange rate monetary policy is effective to the extent free capital mobility is exercised in the country and to the extent central bank refrains from dirty float regime of exchange rate. In case of capital inflows under flexible exchange rate regime, the resulting influence of exchange rate transmission channel is unclear, since on the one hand investments should be increasing due to inflow of capital, and on the other hand increase in interest rates lowers investments and besides, under currency appreciation all domestic goods, including investment ones, become less attractive. The resulting influence depends on the interplay of these effects.

For the transition or emerging market economies the extent of the aforementioned channels' importance in transmission of monetary policy might be different from the well developed market economies. Issues of dollarisation and financial fragility become more important for such countries, which makes monetary aggregates as an instrument of monetary policy less controllable by the central bank, and the impact and extent of the impact of exchange rate channel becomes even more difficult to predict. Underdeveloped financial system in such countries usually results in central banks confining themselves to the use of monetary base rather than interest rate as a major policy instrument, implicitly assuming that interest rate channel per se does not work.

Recent empirical results demonstrate both differencies and similarities between developed and developing economies in terms of monetary policy transmission mechanisms. Thus, Camarero et al. (2002) have found out that in Spain there is evidence of interest rate and exchange rate channels of monetary

policy, Vlaar and Schuberth (1999) discovered that monetary targeting policy was questionable for the 14 countries of the EU, since controllability of broad monetary aggregate via policy variables is impaired. Chrystal and Mizen (2002) find that credit channel is important for monetary policy transmission in the UK, with a special stress in the process on lending to firms. Juselius and Toro (2005) has shown that in Spain after its accession in the European Monetary Union the effectiveness of monetary policy was mostly due to inflation adjustment within the union while in the pre-accession period the effectiveness of monetary policy was highly questionable. The examples of monetary policy transmission mechanism studies for the transition economies include the research by Kierzenkowski (2005) showing changing degree of pass-through from bank lending in Poland, Korhonen and Wachtel (2006) finding evidence on the existence of pass-through of exchange rate movements on to prices, Golodniak (2006) demonstrating existence of bank lending channel in Ukraine, Vymyatnina (2006) showing indirectly evidence of interest rate channel of monetary policy operating in Russia.

3. Overview of the Bank of Russia monetary policy

After the collapse of the Soviet Union, the Bank of Russia has assumed gradually full responsibility for the monetary policy conduct in Russia. Following the period of vague state fiscal and monetary policy in 1992 – mid 1995 with the results being first currency crisis of October 1994 and severe fiscal problems, in July 1995 the attempt to stabilise economy was launched with the issue of government short-term debt (GKO) and with the introduction of the crawling band exchange rate regime. Refinancing interest rate was gradually decreasing until November 1997 when first consequences of Asian financial crisis became evident. Mostly the monetary policy had passive character of adjusting to the circumstances

After the collapse of financial system in August 1998, Bank of Russia had to provide government and banking system with liquidity to overcome the crisis. It was stressed by the IMF staff (Balino, 1998; IMF, 2000) that after the crisis Bank of Russia was reluctant to use market-based instruments of monetary policy (e.g. interest rate management on different types of refinancing operations, Bank of Russia bonds) to ensure liquidity position of banking system, and relied instead on the reserve requirements rate, which was increased on four occasions by the mid 2000 (from 5% to 10% as the highest). In part this is explained by the fact that after the breakdown of the government short-term bonds system commercial banks preferred to deposit their excessive funds at the Bank of Russia. Since the end of the crisis, banking system has never experienced liquidity problems, and this provides an explanation of the failure of

Bank of Russia Lombard auctions in 2000 – 2003, which might be seen as an attempt to introduce interest rate management by the Bank of Russia.

Table 1. Dynamics of inflation, monetary aggregates and refinancing rates (in %%%)

Year	Inflation target*	Real inflation**	M0 growth**	M2 growth**	Rate of refinancing***
1992	—	2508,8		494,8	60
1993	—	839,9		409,3	139,3
1994	—	215,1		199,9	180,6
1995	—	131,3		125,8	185,8
1996	—	21,8		33,7	104,3
1997	—	11	27,3	29,7	32,5
1998	—	84,4	20,1	6,1	52,8
1999	—	36,5	64,9	62,8	57,2
2000	18	20,2	73,7	60,3	33,2
2001	12-14	18,6	22,3	38,9	25
2002	12-14	15,1	39,2	34,1	22,2
2003	10-12	12	50,5	55	18,4
2004	8-10	11,7	24,7	22,6	13,5

*Source: «Basic directions of the state monetary policy on 2000, 2001, 2002, 2003, 2004»

**Source: Bank of Russia http://www.cbr.ru

***Weighted average, source: Bank of Russia, http://www.cbr.ru

Since the financial crisis of 1998 Bank of Russia took more active position in monetary policy conduct starting since 1999 publication of "General foundations of the state monetary policy" where the detailed analysis of the current macroeconomic situation, Bank of Russia forecast of the future situation, policy targets and suggested policy instruments are described. The major goal of the Bank of Russia since 1999 has been gradual disinflation with the use of monetary methods, which is "to be led in very smooth way, since analysis of disinflation practices of other countries suggests that only smooth and consistent

disinflation policies gives the best results"[1]. Interestingly, only in 2003 Bank of Russia was successful in meeting the inflation target of 12%, though some doubts on the reliability of the data provided undermine this achievement. (see Table 1)

The intermediate target for the Bank of Russia is the percentage of increase in M2 monetary aggregate (national currency in circulation, demand and time deposits in national currency). This implicitly implies that there is a stable money demand function for the M2 aggregate, that Bank of Russia effectively controls monetary base, and that money multiplier for the M2 aggregate is stable. At the same time already in its "General foundations of the state monetary policy on 2001" Bank of Russia admits that the short-term statistical correlation between M2 and inflation weakens, which makes it not a very reliable intermediate target. Therefore, it is stated further, the target values on M2 increase are indicative only[2]. The M2 money multiplier is highly volatile (see Fig. 1), which also undermines the choice of intermediate target.

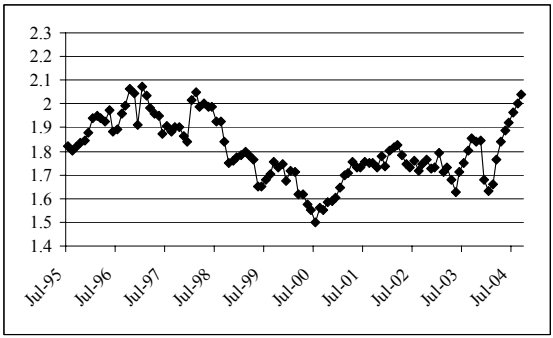

Figure 1. M2 money multiplier in Russia, July 1995 – September 2004. Source: Statistics of the Bank of Russia, www.cbr.ru

The operational goal of the Bank of Russia is the increase in money base, which is supposed to be under its control. However, according to the Law on Currency Control, all exporters are obliged to sell a certain proportion of export proceedings in foreign currency to the Bank of Russia. The latter is accordingly obliged to buy. In spite of the fact that Bank of Russia is the major player on the currency exchange market in Russia, its abilities to outplay export influence on the monetary base are limited. Purely monetary methods intended to keep monetary base from growing extensively in reply to high oil prices, were not

[1] CBR: "Basic directions of the state monetary policy on 2001", p. 19, http://www.cbr.ru
[2] CBR: "Basic directions of the state monetary policy on 2001", p. 48, http://www.cbr.ru

successful, and Stabilization fund was launched in order to restrain monetary mass increase.

Besides, from exercising control over monetary base (both directly through changes in required reserve ratio and indirectly through exchange market interventions) Bank of Russia uses measures of direct control over commercial banks to influence their lending and thus to restrict monetary mass growth. A number of requirements are to be satisfied by commercial banks in their lending activities: not to lend to one company more than 5% of the own capital of the bank, not to draw a credit line to its shareholders over 20% of the own capital of the bank, not to use more than 25% of own capital to buy stocks of one company[3]. All these measures imply that Bank of Russia assumes monetary aggregate to be an effective instrument of monetary policy.

4. Data and econometric methodology

We use the SVECM approach to take into account long-run properties of variables and to test some economic considerations concerning the structure of the external shocks influence on the economy.

The data employed are M2 monetary aggregate (*m2*), consumer price index (*p*), real total trade as a proxy for real output (*y*), average monthly exchange rate (*e*) and interest rate on the inter-bank market (*i*). All data are monthly for the period July 1995 – September 2004 available on the Website of the Bank of Russia www.cbr.ru and of the State Statistical Committee www.gks.ru . The choice of period is explained by the availability of data. All data are taken in natural logarithms in order to adjust for possible scale effect and also for the possible cointegrating relation to have long-run money demand function interpretation.

Econometric analysis proceeded in the following steps. First, all data were analysed for the order of integration with the use of ADF tests. In order to increase the power of ADF tests, the general to specific approach was used with the initial lag length of 15 and further removal of insignificant lags. For the series that visually exhibited tendency to have a break in September-October 1998 after the financial crisis, namely, for exchange rate, price level and real total trade, Perron (1994) tests for innovative outliers (accounting for changes in intercept and slope of the trend) were carried out.

Next step was to estimate cointegrating relations using the reduced-rank methodology proposed by Johansen (1988). Then five-equation VECM was built of the form

[3] Federal Law on the Bank of Russia, №65-ФЗ (from 12.07.99), art. 66, 69, 72

$$\Gamma_0 \Delta x_t = \alpha \beta^{'} x_{t-1} + \Gamma_1 \Delta x_{t-1} + ... + \Gamma_4 \Delta x_{t-4} + \Psi D_t + \varepsilon_t \qquad (1)$$

where $x_t = (m2_t, p_t, y_t, i_t, e_t)$ and D_t stands for deterministic variables which include constant and centred seasonal dummy for December, as price level and real total trade variables demonstrated 'end of year' changes of larger variance than for the other months. The lag length of the VECM was chosen on the basis of Akaike and Schwartz information criteria.

The resulting VECM model accounted for the results of Jonahsen cointegration tests and was tested for adequacy. In particular, the tests for normality, autocorrelation, heteroscedasticity and lag misspecification were conducted. After that stability of cointegrating relations was tested, and structural modelling was applied to the resulting VECM model.

5. Estimation results

First the data were checked for the order of integration by using ADF tests and for the three series – price level, real total trade and exchange rate – Perron tests for innovative outlier were conducted. The results are summarised in the table 2 below.

Thus, according to the results of the tests all series involved were considered to be integrated of order 1 with trend in levels. None of the series was recognised to be stationary with a break in the form of innovative outlier.

Next, the Johansen test for the existence of cointegrating relations was performed. The results are presented in the table 3.

VECM was built with 4 lags initially, accounting for 1 cointegrating relation. Statistics for lag exclusion demonstrated that the third lag was insignificant in all equations at 5% significance level, and the lag structure was changed to include lags 1, 2 and 4. In this specification all lags were significant at 5% significance level at least in 3 equations of the model.

Table 2 Results of tests on the order of integration

Levels					
Test	*m2*	*p*	*y*	*i*	*e*
ADF	-3.301460 (-3.474864)* C, trend			0.248755 (-1.9434) C, trend	
Perron		-1.227674 (-5.08) C, trend	-4.182593 (-5.08) C, trend		0.873639 (-5.08) C, trend
First differences					
Test	*m2*	*p*	*y*	*i*	*e*
ADF	-7.954108 (-2.8915) C	-3.898003 (-2.8915) C	-10.68771 (-2.8915) C	-7.713820 (-2.8915) C	-23.77667 (-2.8915) C

*Critical value of statistics in parentheses.

Table 3. Results of Johansen reduced-rank test for the order of integration

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**5 Percent Critical Value**
None **	0.258277	76.90863	68.52
At most 1	0.200769	45.53684	47.21
At most 2	0.130858	22.00585	29.68
At most 3	0.063367	7.279760	15.41
At most 4	0.003859	0.406023	3.76

*(**) denotes rejection of the hypothesis of cointegration absence at the 5%(1%) level. Trace test indicates 1 cointegrating equation(s) at both 5% and 1% levels.

Table 4. Misspecification tests for VECM

Test	m2	p	y	i	e
Normality (Jarque-Bera, $\chi^2(2)$	1.983467 (0.3709)	42.91307 (0.0000)	3.206900 (0.2012)	1.893576 (0.3880)	1.595494 (0.4503)
Heteroscedasticity $\chi^2(33)$	33.11691 (0.4616)	20.52011 (0.9557)	38.92031 (0.2206)	23.47306 (0.8897)	37.09058 (0.2859)
Heteroscedasticity F(33,71)	0.991214 (0.4972)	0.522602 (0.9790)	1.267222 (0.2010)	0.619460 (0.9347)	1.175109 (0.2809)
Statistics related to the whole VECM					
Heteroscedasticity $\chi^2(495)$					467.3321 (0.8092)
Residual autocorrelation LM test (8 lags)					14.71142 (0.9479)

P-value in parentheses.

Further, the adequacy of VECM with one cointegrating vector was tested for misspecification by using tests on normality, heteroscedasticity and autocorrelation. The results of the tests are given in table 4.

As the misspecification tests indicate, the major problem of the received model is non-normality of price level. However, according to Gonzalo (1994) this is not a serious problem, since Johansen's cointegration method is reported to be robust to non-normality of error terms. The tests for heteroscedasticity and residual autocorrelation indicate the correct choice of the model. The stability of the model was checked with the use of inverse roots of AR characteristic polynomial. Since one cointegrating relation was estimated, four roots are equal to unity and others are strictly less, which imply stability of the estimated model (see Fig. 2).

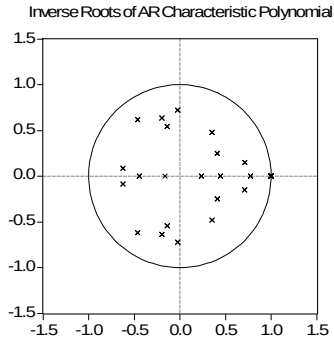

Figure 2. Inverse roots of AR characteristic polynomial for VECM.

The cointegrating vector received was identified as long-run money demand function, and price homogeneity restriction was tested. The restriction imposed is recognized as binding with the value of test statistics of 5.64 with the corresponding p-value of 0.017. The resulting cointegrating relation is defined as follows:

$$m2_t - p_t = 0.755 + 1.196\, y_t - 0.134 i_t - 0.377 e_t . \quad (2)$$

It is interesting to note that the elasticity of money demand for real money balances in exchange rate is greater than in interest rate. This demonstrates the long-living tendency of Russian monetary system non-credibility and, as a consequence, the inclination of economic agents to adjust holdings of foreign currency in greater scale than holdings of bank deposits under equal percentage changes of exchange and interest rate correspondingly.

The stability of the obtained cointegrating relation was checked by means of CUSUM and CUSUMQ tests of residuals. The results of these tests and cointegrating relation in dynamics are shown on Fig. 3 – 4. As might be seen from the graphs below, the cointegrating relation defined as a long-run money demand is unstable, especially at the beginning and at the end of the studied period. Instability in the beginning is explained largely by barter persistence in the economy at that time, financial crisis of 1998 and by high currency substitution (elasticity of substitution in 1995 – 2000 between Russian ruble and US dollar was between 2 and 3, see Fridman and Verbetsky, 2001). Second period of instability starting approximately in 2002 might be explained by changes in the agents' expectations, nominal appreciation of ruble in relation to the US dollar, official introduction of euro into circulation and the corresponding reallocation of currency and deposits portfolio. The results indicate that money demand function undergoes substantial changes in the last

few years, which is in line with the view of the Bank of Russia about lessening of statistical correlation between M2 aggregate and inflation. Thus, generally the estimated VECM is stable though the cointegrating relation is non-stable over time due to adjustment process.

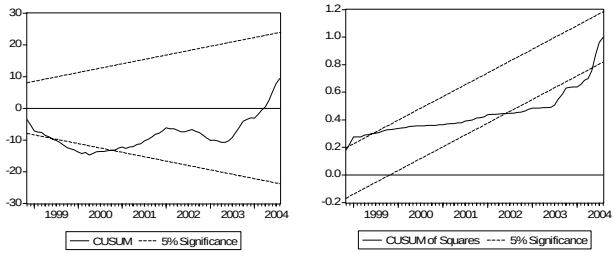

Figure 3. Results of CUSUM and CUSUMQ tests of residuals of the estimated cointegrating relation.

Further, in order to estimate transmission channels of monetary policy, the structural modeling was applied to the resulting VECM. Generally under structural modeling the innovations ξ of the reduced form of VAR are linked to structural disturbances ε in the following form: $\Gamma_0 \xi_t = B\varepsilon_t$. Usually orthogonality of structural shocks is assumed, which implies $B = I$. In this case in order to identify structural VECM, the matrix Γ_0 has to be estimated. The restrictions to be imposed on the Γ_0 matrix are obtained by constructing log-linear macroeconomic model of the economy consisting of reaction rule of the Bank of Russia, aggregate demand function, augmented Phillips curve, equation related to the term structure of interest rates and balance of payments. Instantaneous reactions to external shocks in the equilibrium conditions described by these equations form the structural relations to be analysed within the VECM. When building the structural model the following considerations were taken into account.

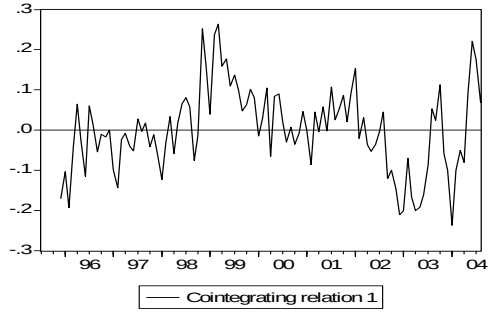

Figure 4. Dynamics of cointegrating relation changes through time.

The description of the Bank of Russia reaction rule was taken to include not only the reaction in money supply stock, which is the major policy instrument both according to the Bank of Russia official statements and to the research in the field (see e.g. Esanov et al. 2004), but also the elements of hybrid or Ball rule including interest rate and exchange rate as reaction mechanisms. The research on the applicability of this rule draws a mixed picture (Esanov et al, 2004), but at the same time Bank of Russia admits dirty floating of ruble and attempts to adjust refinancing rate to the existing conditions.

In description of the aggregate demand equation reaction to the external shocks, the following issues were taken into account: Granger causality from prices to monetary aggregate found in some studies (Esanov et al. 2004, Vymyatnina, 2006), impact of price level changes in the output proxy and exchange rate. The latter is explained by the high dependency of the Russian market as a whole upon the oil price, which is reflected in the exchange rate.

The augmented Phillips curve for the case of Russia is suggested to be non-vertical, since Russia is still far from the equilibrium conditions, and the supply side of the economy is intertwined with the price level and exchange rate changes. The term structure is likely to impose its influence upon prices and exchange rate though to a limited extent in both cases. And finally, the balance of payments specification is taken to be standard and relating the shocks of the exchange rate with the innovations in all other variables of the model.

The resulting matrix of links between innovations and structural shocks looks as follows:

$$\begin{pmatrix} 1 & 0 & 0 & \gamma_{14} & \gamma_{15} \\ \gamma_{21} & 1 & \gamma_{23} & 0 & \gamma_{25} \\ 0 & \gamma_{32} & 1 & \gamma_{34} & \gamma_{35} \\ 0 & \gamma_{42} & 0 & 1 & \gamma_{45} \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54} & 1 \end{pmatrix} \begin{pmatrix} \xi_{m2} \\ \xi_p \\ \xi_y \\ \xi_i \\ \xi_e \end{pmatrix} = \begin{pmatrix} \varepsilon^{MS} \\ \varepsilon^{AD} \\ \varepsilon^{AS} \\ \varepsilon^{TS} \\ \varepsilon^{BP} \end{pmatrix} \quad (3)$$

The scheme for identification suggested by this matrix imposes over-identifying restrictions, and the hypothesis of over-identification is not rejected with LR test giving $\chi^2(2) = 0.3614$ and the corresponding p-value of 0.8347.

The responses of all variables to the structural innovations in monetary aggregate and in interest rate were further analysed. Both innovations can be regarded as unexpected by economic agents policy actions by the Bank of Russia. The results are compared in order to check for the more efficient instrument and for the channels driving monetary policy conduct. The responses to the structural innovations in policy instruments are presented on Fig. 5 – 6.

When comparing results of the reaction to the usage of two alternative monetary policy instruments, it should be noted first of all that the results provided indicate that using monetary aggregate as a policy tool might be not so good choice for the Bank of Russia in pursuing goals of inflation decrease. Even though the first differences in price level (i.e. inflation) reacts on a larger scale to the change in the monetary aggregate, further adjustment process is more volatile with substantial inflation pick after several periods and longer process of adjustment to the new equilibrium. The influence on inflation of the change in interest rate is less in scale and in time length, and results in less volatile transition of prices to the new equilibrium. Besides, the output proxy reacts smoother to the change in interest rate, again with less variation and does not lead to serious output decline corresponding to temporary inflation pick under the usage of monetary policy aggregate. These considerations might be taken into account by the Bank of Russia when planning for the development of its policy instruments.

In case of using monetary aggregate as a policy instrument, the exchange rate adjusts after initial large change approximately the same time and with more or less the same dynamics as under interest rates used as a policy instrument. On the other hand, the scale of adjustments in exchange rate is greater under innovations in interest rates. Hence, exchange rate channel exists and is more important when interest rates are used as an instrument of monetary policy.

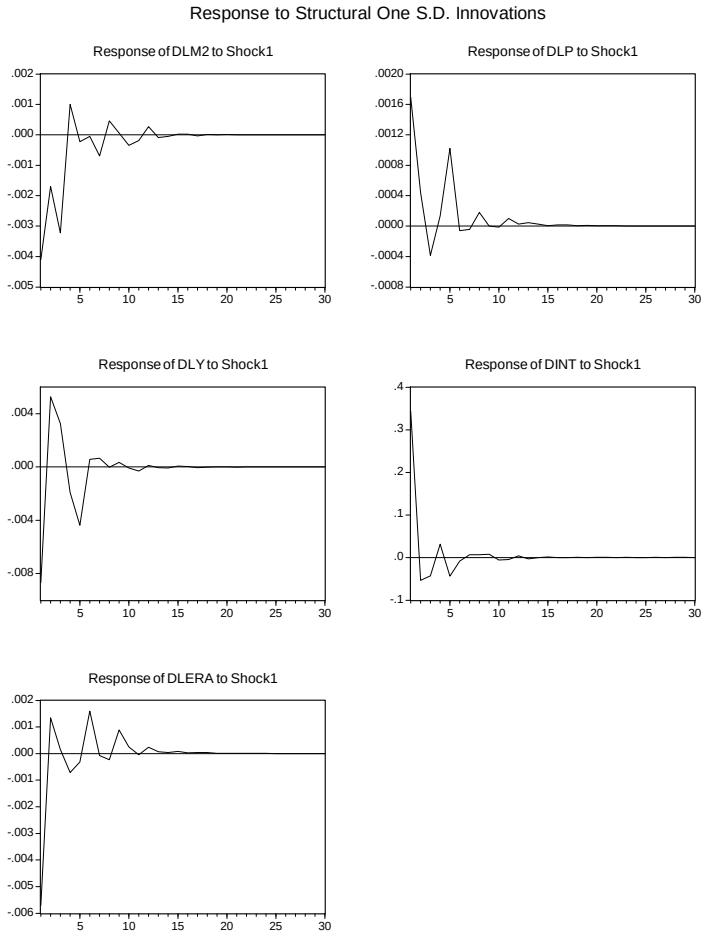

Figure 5. Responses of variables to innovation in monetary aggregate of one standard deviation.

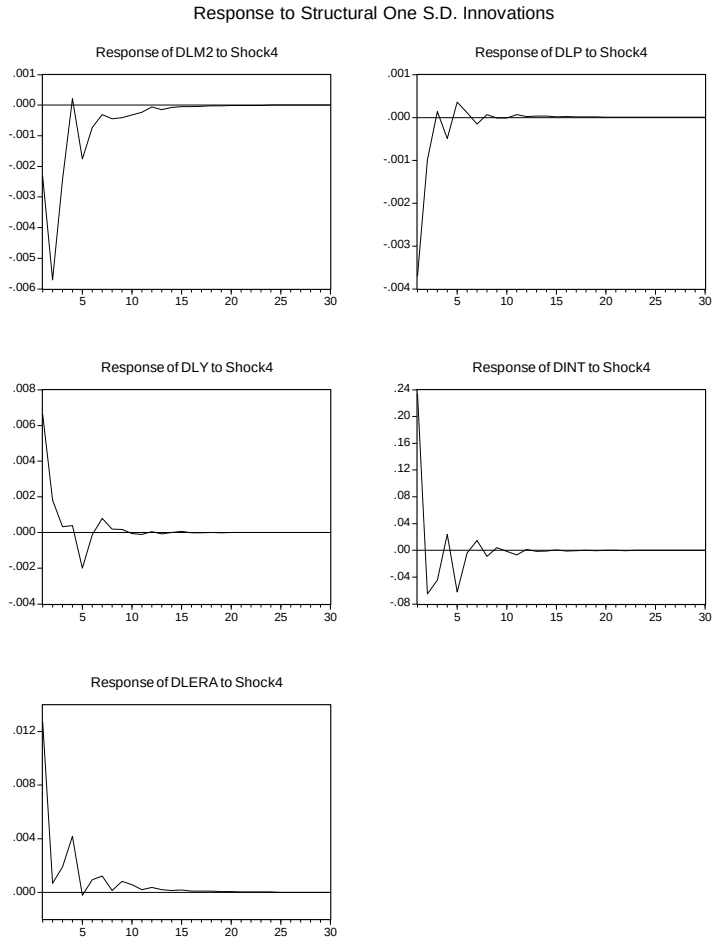

Figure 6. Responses of variables to innovation in interest rate of one standard deviation.

Interest rate changes exhibit approximately the same dynamics in both cases, though with larger in scale initial changes when monetary aggregate is used as a policy instrument. This indicates the existence and importance of the interest rate channel in monetary policy transmission under both policy instruments.

6. Conclusions

The present study analysed monetary policy transmission mechanisms in Russia in the period of July 1995 – September 2004. Bank of Russia officially implements inflation targeting and in its "General foundations of monetary policy" declares monetary base and monetary aggregate M2 as its operational and intermediate targets and policy instruments, insisting that using interest rate as a policy tool would be inefficient due to underdevelopment of financial system. Such position assumes controllability of monetary base, stability of money multiplier, and existence and stability of money demand function. At the same time Bank of Russia admits weakening of statistical correlation between inflation and monetary aggregates.

The task to check the implicit assumptions of the monetary policy conduct of the Bank of Russia was set up. In order to fulfill it, the SVECM model was constructed, involving monetary aggregate M2, price level, real total trade as a proxy for output, interbank interest rate and average monthly exchange rate, with one cointegrating relation estimated. The estimated cointegrating relation was recognised to be a long-run money demand function. The hypothesis of price homogeneity was not rejected, and the resulting cointegrating relation describes money demand function for the real M2 money balances. The money demand function estimated is prone to instability at the beginning and at the end of the studied period. Instability at the beginning can be explained by the barter persistence in the economy, high rate of currency substitution and financial crisis of 1998 that resulted in changes of behavioural characteristics of the economic agents. Instability at the end of the period under study might be explained by the changes in the agents' expectations concerning exchange rate (nominal ruble appreciation from the end of 2002 till mid-2004 and the euro introduction in circulation), which led to portfolio reallocations and the corresponding adjustments in the money demand function. These circumstances together with instability of money multiplier and questionable ability of the Bank of Russia to control the base money suggest that using monetary aggregates as monetary policy instruments might not be the best choice, since the assumptions allowing for successful use of these policy tools are violated.

Structural constraints were imposed on the estimated VECM and the responses of VECM variables to innovations in alternative instruments of monetary policy (monetary aggregate and interest rate) were analysed. The analysis demonstrated that using monetary aggregate as a tool of monetary

policy leads to greater variability in output and prices, though the time period of reaction is somewhat shorter as compared to the situation with interest rate as a policy instrument. The role of interest rate and exchange rate channels in monetary policy transmission is evident in both cases of monetary policy instrument choice.

The major policy recommendation from the results received is for the Bank of Russia to introduce interest rate management practice simultaneously with further development of financial system. The plans for broader use of interest rate management are declared by the Bank of Russia at least since 2000, and the major reason for not using interest rate more extensively as a policy instrument is claimed to be the underdevelopment of financial structure. The present study suggests that even in conditions of continuous development of financial system, interest rate management might be a better policy option.

References

Balino T.J.T. (1998) Monetary policy in Russia. Finance development, *quarterly magazine of the IMF*, 35 (4).

Bank of Russia (2000), General foundations of the state monetary policy on 2001, http://www.cbr.ru

Bank of Russia, official data statistics, http://www.cbr.ru

Borio C.E.V. (1997) Monetary policy operating procedures in industrial countries. *Bank for International Settlements, Working Paper* #40.

Camarero M., Ordóñez J., Tamarit C.R. (2002) Monetary Transmission in Spain: a Structural Cointegrated VAR Approach, *Applied Economics*, 34: 2201-2212.

Chrystal A, Mizen P. (2002) Empirical evidence for credit effects in the transmission mechanism of the United Kingdom, in *Monetary Transmissions in Diverse Economies*, (eds: L. Mahadeva and P. Sinclair) Cambridge University Press, 167-190.

Domac I. (1999) The Distributional Consequences of Monetary Policy: Evidence from Malasia, *World Bank Policy Research Working Paper* #2170.

Esanov A., Merkl C., Souza L.V (2004) Monetary Policy Rules for Russia, BOFIT, *WP*#11/2004.

Friedman A., Verbetsky A. (2001) Currency Substitution in Russia, Moscow, *EERC*.

Gertler M., Gilchrist S. (1994) Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms, *Quarterly Journal of Economics*, 109, 2: 309-340.

Gertler M., Gilchrist S. (1993) The Role of Credit Market Imperfections in the Monetary Transmission Mechanism: Arguments and Evidence, *Scandinavian Journal of Economics*, 95/1: 43-64.

Golodniak I. (2006) Evidence on the Bank Lending Channel in Ukraine, *Research in International Business and Finance*, forthcoming.

Gonzalo J. (1994) Five Alternative Methods of Estimating Long-Run Equilibrium Relationships, *Journal of Political Economy*, 102: 1228-1247.

Howells P.G.A., Bain K. (2003) Monetary Economics: Policy and its Theoretical Basis (Palgrave Macmillan).

IMF (2000) Russian Federation: Selected Issues. *IMF Staff Country Report*, #00/15.

Johansen S. (1988) Statistical Analysis of Cointegration Vectors, *Journal of Economic Dynamics and Control*, 12: 231-254.

Juselius K., Toro J. (2005) Monetary Transmission Mechanisms in Spain: the Effect of Monetisation, Financial Deregulation and the EMS, *Journal of International Money and Finance*, 24(3): 509-531.

Kierzenkowski R. (2005) The Multi-regime Bank Lending Channel and the Effectiveness of the Polish Monetary Policy Transmission During Transition, *Journal of Comparative Economics*, 33(1): 1-24.

Korhonen I. Wachtel P. (2006) A Note on Exchange Rate Pass-through in CIS Countries, *Research in International Business and Finance*, forthcoming.

Perron P. (1994) Trend, Unit Root and Structural Change in Macroeconomic Time Series, in B. Bhaskara Rao (ed.), *Cointegration for the Applied Economics*, Macmillan Press, UK.

State Statistical Committee, official data statistics, http://www.gks.ru

Stiglitz J., Greenwald B. (2003) Towards a New Paradigm in Monetary Economics (Cambridge University Press).

Vlaar P.J.G., Schubert H. (1999) Monetary Transmission and Controllability of Money in Europe: a Structural Vector Error Correction Approach, *Staff Reports 36, De Nederlandsche Bank, Amsterdam*.

Vymyatnina Y. (2006) How Much Control Does Bank of Russia Have over Money Supply? *Research in International Business and Finance*, forthcoming.

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