
Munich Personal RePEc Archive

Inflationary Handicap Of The Monetary Transmission Mechanism: Evidence From Russia

Maslov, Alexander

Carleton University

1 June 2011

Online at https://mpra.ub.uni-muenchen.de/50036/
MPRA Paper No. 50036, posted 24 Sep 2013 01:11 UTC

Inflationary handicap of the monetary transmission mechanism: evidence from Russia

Alexander Maslov
PhD Candidate
Department of Economics
Carleton University
1125 Colonel By Drive,
Ottawa, ON, K1S 5B6
E-mail: alexander_maslov@carleton.ca
Phone: +1 613 255 2557

Abstract

The article is devoted to the analysis of impulses summoned by shifts in Russian economy's money supply. We catch these disturbances outgoing to primal elements of gross domestic product, i.e. consumption of goods and durables, capital investment, public expenditures and net export. Using VEC model we unravel long- and short-term relationship between money supply and named GDP components finding that in the short term the transmission effect is reversed. Monetary expansion creates critically high level of inflationary expectations which, via Hicks income effect, hampers major macroeconomic aggregates and impedes the development of raw-based economies. The long-term relationship is consistent with the theory of monetarism, compelling monetary authorities to refrain from excessive regulatory functions.

JEL Classifications: **E20, E52, E58**

Keywords*:* **money supply, monetary transmission mechanism, monetary policy**

1. Introduction

Money supply is closely linked with interest rates, which play a pivoting role in the monetary regulation of an economy. Nowadays, interest rates depict the majority of macroeconomic variables both in contemporaneous and lagged periods. They also reflect the condition of an economy, interrelating with the inflationary level, unemployment, stock prices, lending, performance margins etc... (Gaiotti and Secchi 2005, Meier and Muller 2006, Taylor 1999, Friedman and Kuttner 1992, Pill 1997 and many others). The interest channel of transmission mechanism was initially mentioned by Keynes more than half a century ago and after that there was a great number of works devoted to this subject, especially, starting from the end of the last century.

After the liberalization Russian economy was fevering with interest rate volatility, as if it reflected the whole surreptitious anguish of the economic mechanism. Russian economy has gone a long way from four-digit inflation in the beginning of 1990s to moderate paces of smooth decrease in interest rates level. Despite the default in August 1998 Russian economy managed to stabilize quickly due to favorable macroeconomic environment. From the beginning of the new century till the bankruptcy of Lehman Brothers, the economy was growing steadily, showing positive trends of macroeconomic development.

However, such rampant development was not free for Russian economy. It has become completely dependent on international markets of finance, commodities and utilities. The transmission mechanism of monetary policy was also affected. It has transformed into a transmission mechanism of global markets, i.e. the efforts of monetary authorities aimed at switching different rates are virtually futile as the true lever of the mechanism is beyond their grasp. There are still certain instruments used by Bank of Russia to regulate Russian economy, i.e. operations on the currency market, reserve rates policy and a few others. However, the transmission mechanism of Russian economy is triggered exceptionally by external macroeconomic conjuncture while the actions of Bank of Russia lag behind them and primarily create visibility of monetary supervision.

There is a huge amount of literature devoted to the transmission mechanism of monetary policy. One part is mostly connected with testing of different channels and their practical realization in different countries (Safaei and Cameron, 2003 (Canada), Ferreira, 2007 (Portugal), Suzuki, 2004 (Japan), Mallick and Agarwal, 2007 (India), Zhang and Sun, 2006 (China) and many others); while the other one - with elaboration of the specific channels, adding new variables and testing for new significances. Without mentioning B. Bernanke and M. Gertler (1989, 1995), B. Bernanke and A. Blinder (1988, 1992), F. Mishkin (1976, 1977, 1996, 1999, 2000, 2001), who have contributed indispensably to the understanding of the transmission mechanism, there are a lot of recent works, that study different transmission channels with new vigor: Taylor (1999), Angeloni, Kashyap, Mojon and Terlizzese (2003), Hall (1978), Flavin (1981), Campbell and Mankiw (1989, 1991), Davidson and Hendry (1981), Dalyand and Hadjimatheou (1981), Bacchella and Gerlach (1997) and many others. However, there is quite a specific channel of transmission impulses, which seems to have slipped through mentioned research agenda: the public expenditures channel. To complete our comprehension of the holistic mechanism we will suggest two ways this channel might operate.

One way is to note that in a market economy one of the most important sources of funding budget deficit is organized through the inner debt market, i.e. the Treasury bonds. The percent a government has to pay for its liabilities is dependent on many macroeconomic variables, including the level of interest rates in the country affecting discount and premium rates. Therefore when, for instance, interest rates fall down (under the influence of increase in money supply), bonds' yield diminishes accruing increment in available funding for government expenditures:

$$M \uparrow \rightarrow i \downarrow \rightarrow \gamma \downarrow \rightarrow G \uparrow \rightarrow Y \uparrow \tag{1}$$

where γ - Treasuries' yield. This is exactly the issue with recent macroeconomic policy in euro area. Euro Central Bank's monetary expansion policy sustained relatively low bonds' yield

rates for Greece, Ireland, Spain and other "drowning" countries thus only giving them more oxygen, but not pulling them off the water...As soon as interest rates were raised, economic aggregates began to stagnate.

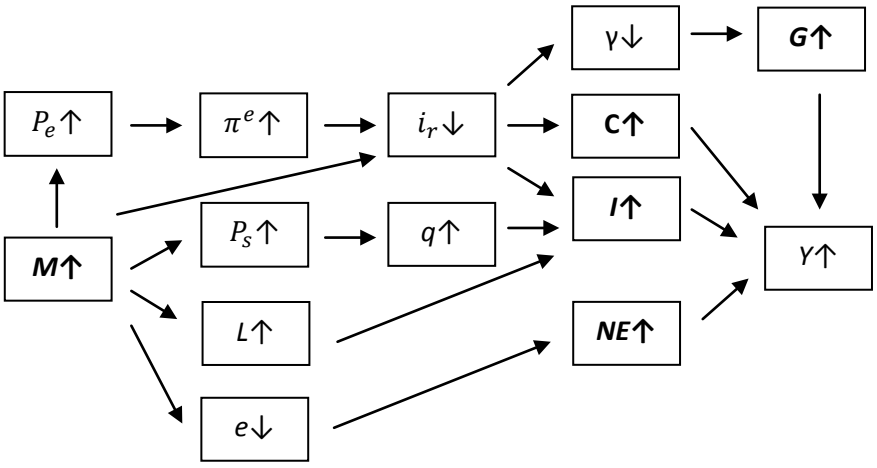
The second approach assumes that important macroeconomic government indicators like gold and currency reserves, balance of payment and external debt are denominated in foreign currency. Therefore, public finance and consequently expenditures are also affected by the exchange rate channel.

The transmission mechanism still remains insufficiently elucidated in Russian research papers. There are a few economists that are working on this subject. That is why there is still a broad field for investigation and testing robustness of different short- and long-run dependencies.

We believe there is one major inaccuracy made by Russian scientists when depicting the initial impulses of interest channel responses. They qualify either refinancing or REPO rates as those, summoning changes in the economy (Moiseev 2003, Kruchkova and Sapyan 2003). Yet, for instance, Zemcov (2009) showed that only 0.1% of banks' liabilities in Russia are funded by this source. Looking through the Russian modern history we notice that those rates rather adjust to financial shifts than actually initiate them. We have tested a number of interest rates to find any persuasive correlation with the components of GDP, but we didn't receive any statistically significant results. It made us turn to the basis of the transmission mechanism - money supply. There are two more reasons, underlying this decision. First, the refinance rate is set by the Bank of Russia quite rarely. The data, derived from its time-series is not sufficient to make any empirical conclusions. Secondly, we have already argued the exogenous nature of the transmission mechanism in Russia (Maslov and Ivanchenko, 2010). In case of Russian economy money supply serves as a great indicator on the one hand imbibing shifts in external macroeconomic conjuncture and on the other one - reflecting actions undertaken by the Bank of Russia.

Figure 1 shows that the last but one tier for transmission impulses, summoned by shifts in money supply, is comprised of primary GDP elements. The goal of the paper is to pin down those interdependencies and make implications for monetary policy.

Figure 1: An aggregated scheme of transmission channels



Note: *M* - money supply, *L* - real sector loans, *e* - exchange rate of a national currency, *Pe* - expected price level, *Ps* - stock prices, *q* - Tobbin's coefficient (capitalization of a company to its replacement cost), π_e - expected inflation, i_r - real interest rates, γ - Treasuries yield, *C* - consumption, *I* - investment, *NE* - net export, *G* - public expenditures, *Y* - gross domestic product

2. GDP and its components

The basic concept of the paper is to find statistically significant relationship between money supply and components of Russian gross domestic product using VEC approach due to the co-integration of the analyzed variables (this issue will be discussed later) and to give qualitative

valuation of uncovered interrelations corroborating policy implemented by Russian monetary authorities.

The motions of impulses summoned by shifts in money supply were analyzed in many papers, including those, mentioned above. In this research we are concerned with measuring pre-final magnitudes to understand how country-specific interdependencies affect the transmission mechanism. Along with quantitative analysis we would like to discuss a few important aspects of our research, making it more explicit.

The reasons we do not estimate direct impact of money supply on GDP are the following: Russian Statistics Agency does not estimate GDP on a monthly basis. Russian corporative legislation does not enforce companies to disseminate monthly data concerning their performance. Moreover, it is obvious that one month is not enough for a company to accomplish even its industrial missions. That is why the Agency calculates GDP values starting from quarter periods. Russian economy is "young" and doesn't have a commensurable period of stability. More or less, we might appeal only to the period starting from the beginning of the century and till Lehman Brothers' bankruptcy. If we construct time-series on this interval using quarterly data the significance of our statistical analysis will a priori be feeble since the sampling is too small. We should also note that gross domestic product is calculated by Statistical Services, whereas its components are obtained from real economy. Thus, by eliminating the last chain of transmission mechanism (→Y) we also get rid of the discrepancy that might stir in it.

3. Empirical investigation

3.1. Data sources

There isn't much statistics concerning Russian economy that can be used in econometric analysis. Moreover, it is still filled with distortions and garbling. The variables used in the model are as follows: money supply (M2), durables and consumer expenditures (C), capital investment (I), government expenditures (G) and net export (NE). All of the variables range from 2000:M1 to 2008:M9. Due to cyclical nature of GDP's elements they have been seasonally adjusted by means of X-11 Census 2 (Makridakis, Wheelwright и McGee, 1983). Information on money supply was obtained from the official website of central bank of Russian Federation (*http://www.cbr.ru/mkr_base/main.asp*), information on major aggregates was obtained from Russian Federal State Statistics Agency (*http://www.gks.ru/dbscripts/Cbsd/DBInet.cgi*) and statistical section of the economic journal, issued by State University-Higher School of Economics (*http://library.hse.ru/e-resources/HSE_economic_journal*).

3.2. Methodology

There are two basic models that can be applied in our analysis: VARM and VECM. If we were to employ VAR model, we would require our time-series to be stationary, but Dickey-Fuller test evidences towards the opposite: all time-series in levels are non-stationary (table 1). This fact is not only quantitatively revealed by corresponding tests, but also evident from both economic theory and practice. There is a long-time relationship between any component of GDP and the money supply with a deterministic upward trend (it can, at least, be inferred from the well-known quantitative money theory equation MV=PQ, or rewritten in the form of long-term equilibrium: $M=\gamma(C+I+G+NE)$. Therefore we will use VEC approach in our analysis.

Though the specifications of both models are well-known we will briefly describe them to sustain the logic of the paper. The VAR model proposed by Sims (1980) can be written as follows:

$$Y_t = \alpha + A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_n Y_{t-n} + \varepsilon_t \qquad (2)$$

where Y_t is an ($n \times 1$) vector of variables, α is an ($n \times 1$) vector of intercept values, A_t is an ($n \times n$) matrix of coefficients, n is the number of lags, ε_t is an ($n \times 1$) vector of error terms for $t = 1,2,...,T$. In addition, ε_t is an independently and identically distributed with zero mean. As it was said before, variables used in the model must be stationary in their levels.

The VEC model developed by Johansen (1988) can be written as follows:

$$\Delta Y_t = k + \Gamma_1 \Delta Y_{t-1} + ... + \Gamma_{p-1} \Delta Y_{t-p+1} + \Pi Y_{t-1} + u_t \quad (3)$$

where Δ is the difference operator; Γ denotes an ($n \times n$) matrix of coefficients and contains information regarding the short-run relationships among the variables; Π is an ($n \times n$) coefficient matrix decomposed as $\Pi = \alpha\beta$, where α and β are ($n \times r$) adjustment and cointegration matrices respectively, u_t - Gaussian white noise.

Cointegration test allows us to depict cointegrating vectors and denote restrictions to be imposed on the model to sustain its economic plausibility. The number of lags is defined by Akaike (AIC) and Schwartz (SC) criteria (Lütkepohl (1991); Grasa (1989)), whereas exogenousness of selected variables is supported by Granger (1969) causality test.

3.3. Unit root test

To depict the nature of the time-series we use a prevalent Augmented Dickey-Fuller (ADF) test proposed by Dickey-Fuller (1981), which null hypothesis is in the existence of a unit root. Table 1 shows results for the variables used in our analysis. As it can be inferred from the table every variable in levels is a non-stationary time-series. Money supply and net export become stationary after performing single differencing (Δ). Consumption, investment and government expenditures transform into stationary variables only after double differencing ($\Delta\Delta$).

Table 1: Augmented Dickey-Fuller test results

Variables	Intercept	Trend and Intercept
M2	9.315631	1.670334
ΔM2	-1.349335	-8.465558*
ΔΔM2	-8.225489*	-8.177344*
C	3.017557	3.531503
ΔC	0.281789	-1.424777
ΔΔC	-13.39418*	-13.40768*
I	-0.34496	-1.962398
ΔI	-1.674611	-1.953876
ΔΔI	-4.077872*	-3.994628
G	-0.287628	-2.218288
ΔG	-0.473925	-1.266045
ΔΔG	-6.971359*	-6.887345*
NE	1.165326	-2.913546
ΔNE	-5.534424*	-6.01019*
ΔΔNE	-3.427338	-3.380814

Note: (*a*) Sample period: 2000:M1 to 2008:M9 (*b*) * indicates the rejection of the null hypothesis of the presence of a unit root at 1% level (*c*) Δ - difference operator

Vector error correction model can only be applied to time-series integrated of the first order, i.e. $y_t \sim I(1)$. This is due to the fact that ECM is based on VAR model in 1st differences. As stated above, to avoid spurious regression VAR must be based on stationary data. Hoverer, differenced terms of variables used show that consumption, investment and government expenditures do not become stationary after the first differencing procedure, because these time series are integrated of the second order, i.e. $C_t \sim I(2), I_t \sim I(2), G_t \sim I(2)$. Thus, we have to tentatively perform

differencing of these variables so that when they are differenced one more time in the model all time-series become stationary. As a corollary our VEC model will be based on the following variables: *M2, NE, ΔC, ΔI* and *ΔG*.

3.4. Cointegration test

The cointegration test, formulized by Engle and Granger (1987), was further improved by Johansen (1988). The test is given by the following equation:

$$\lambda_{trace}(r \mid n) = -T \sum_{i=r+1}^{n} \log(1-\lambda_t) \tag{4}$$

where r is the number of co-integrating relations, n - variables. Null hypothesis is $H_0 : r \le 0 \rightarrow H_1 : r > 0$. Using Akaike (AIC) and Schwarz (SC) criteria along with the estimation of VAR model in levels we defined the optimal lag length as 12. Preliminary assumptions about the type of cointegration are presented in table 2.

Table 2: Preliminary assumptions about trend and intercept in the data

Rank of co-integration	None, no trend, no intercept	None, no trend, intercept	Linear, no trend, intercept	Linear, trend, intercept	Quadratic, trend, intercept
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	27.987	27.987	27.94134	27.94134	27.56742
1	27.30312	26.80774	26.76007	26.73738	26.44835
2	26.77546	26.20763	26.1875	25.96259	25.723
3	26.43718	25.86643	25.82776	25.4858	25.27409
4	26.40506	25.76365	25.73639	25.34958	***25.1353'***
5	26.62484	25.77332	25.77332	25.32333	25.32333
Schwarz Criteria by Rank (rows) and Model (columns)					
0	36.26456	36.26456	36.35686	36.35686	36.1209
1	35.8566	35.38881	35.45151	35.45641	35.27775
2	35.60485	35.09221	35.15485	34.98513	34.82831
3	35.54249	35.05452	35.07104	34.81185	***34.65532'***
4	35.7863	35.25525	35.25558	34.97914	34.79245
5	36.28199	35.56843	35.56843	35.2564	35.2564

Note: ' indicates the lowest value of the corresponding criteria

The results of Johansen's cointegration test with the defined specifications are given in table 3.

Table 3: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	p-values
None *	0.737853	304.2122	79.34145	0.0000
At most 1 *	0.611373	182.3767	55.24578	0.0000
At most 2 *	0.487619	96.3693	35.0109	0.0000
At most 3 *	0.301323	35.51883	18.39771	0.0001
At most 4	0.031252	2.889283	3.841466	0.0892

Note: * denotes rejection of the hypothesis at the 0.05 level

In case of one cointegrating vector normalized coefficients produce long-term relationship depending on the chosen explanatory and functional variable. When there are two and more vectors linear restrictions are required because otherwise it is impossible to identify the vectors. The most

prevalent way to do so is to nullify one of the vector components. These linear restrictions should be non-reciprocal. The results of the trace test in table 3 with a 10% probability of rejecting the hypothesis testify for presence of four cointegrating equations, which could also be corroborated by economic logic. Imposing linear restrictions on each vector we receive final set of cointegrating equations where money supply depicts every of GDP elements in the long run (table 4).

Table 4: Normalized co-integrating coefficients and adjustments

Normalized co-integrating coefficients (standard error in parentheses)				
ΔC	**ΔI**	**ΔG**	**NE**	**M2**
1	0	0	0	-0.018559 (-0.00156) [-11.2505]
0	1	0	0	-0.000752 (-0.00036) [-1.98161]
0	0	1	0	-0.004039 (-0.00023) [-16.7704]
0	0	0	1	-0.571838 (-0.38561) [-1.40127]
Adjustment coefficients (standard error in parentheses)				
D(DC)	-0.635639	1.069399	-1.04323	0.000294
	(-0.28782)	(-1.6139)	(-1.00142)	(-0.0009)
D(DI)	-0.143791	0.185114	-0.184455	0.000265
	(-0.04234)	(-0.23742)	(-0.14732)	(-0.00013)
D(DG)	-0.052715	0.265537	-0.70955	0.001103
	(-0.08736)	(-0.48987)	(-0.30396)	(-0.00027)
D(NE)	-1.265833	2.934672	-27.39645	-0.003214
	(-1.56714)	(-8.78749)	(-5.45263)	(-0.0049)
D(M2)	-13.37689	110.9771	80.21735	0.052296
	(-5.49815)	(-30.83)	(-19.13)	(-0.01721)

Note: (*a*) errors in parentheses are not normally distributed (*b*) [] denotes t-statistics

On the one hand it is economically unreasonable to annihilate relations among elements combining GDP. On the other hand it is plausible to suggest that in the long term this interdependence is washed out since every element strives to its own equilibrium with money supply, thus leaving mentioned correlations only to short-run fluctuations. This hypothesis can also be underpinned by the matrix of correlation for selected variables built on the investigated period of time (table 5). As it can be inferred from the table there isn't any significant correlation among investigated GDP's components in the long run.

Table 5: Correlation matrix of investigated GDP's elements

Variables	ΔI	NE	ΔG	ΔC
ΔI	1.000000	0.007105	0.036966	-0.161354
NE	0.007105	1.000000	-0.021700	-0.046549
ΔG	0.036966	-0.021700	1.000000	-0.397669
ΔC	-0.161354	-0.046549	-0.397669	1.000000

Note: (*a*) Correlation matrix is based on contemporaneous values; (*b*) Sample period: 2000:M1 to 2008:M9

Following Engle and Granger (1987) the cointegration vector is defined as $(1,-\beta)$. Thus, from the previous discussion our co-integrating equations can be written in the following truncated form:

$$C = 18{,}6 * 10^{-3} M2 \tag{5}$$

$$I = 0{,}75 * 10^{-3} M2 \tag{6}$$

$$G = 4{,}04 * 10^{-3} M2 \quad (7)$$

$$NE = 571{,}83 * 10^{-3} M2 \quad (8)$$

The hypertrophic coefficient in the last equation is consistent with the reality of Russian economy. Russia is an exporting country and the intensity of money circulation significantly depends on world market prices and the ruble exchange rate. Since these macroeconomic variables are way more volatile than the "domestic" independent variables of the first equations, it is plausible to suggest that long-run relationship between money supply and net export is the most unstable one. Furthermore, adjustment and cointegration coefficients are opposite. It supports the hypothesis that the higher the coefficient of a cointegrating vector is, the less time it takes for the variables of the equation to achieve equilibrium.

3.5. Error correction model

The idea of VEC model is to take into account long-term dependencies among analyzed variables which are reflected in cointegrating vectors. Thus, the model combines results that would have been received by VAR model without losing similarity in stochastic or deterministic trends, substantiating long-term relationship. Although the majority of research papers use response functions to evaluate the VECM, we will use another approach, based on compounding the equations and estimating their coefficients. Equation (4) shows that ECM consists of two parts. The first part, i.e. ΠY_{t-1}, has been analyzed in the previous subsection. Now we have to concatenate it with the second part of the model that is based on differenced VAR of non-stationary data of the first order. The short-run relationship is given in the table 6.

Table 6: VEC estimates for differenced series with M2 as exogenous variable

Lags	D(ΔC)	D(ΔI)	D(ΔG)	D(NE)
D(M2(-1))				-0.22643
D(M2(-2))	-0.02968	-0.00637	-0.00863	-0.19054
D(M2(-3))			-0.00862	
D(M2(-4))		-0.0093	-0.00899	
D(M2(-5))		-0.00556		
D(M2(-6))	-0.04199	-0.00625		-0.29574
D(M2(-7))				-0.37366
D(M2(-8))		-0.00563		-0.23123
D(M2(-9))	-0.03829	-0.00768		-0.24159
D(M2(-10))				-0.23167
D(M2(-11))	-0.04815	-0.01072	-0.00939	
D(M2(-12))				-0.30399
Sum:	-0.1581	-0.05151	-0.03564	-2.09485

Note: (*a*) Coefficients which t-statistics ≥ 2 are provided

Table 7 presents coefficients of the cointegration equations, estimated trend and constant for short-run relationship. From estimated coefficients of both long- and short-run relationships we can finally denote analytical form of the equations connecting every of investigated GDP's elements and money supply. However, before doing so we have to test the model for its statistical significance.

Table 7: Estimated coefficients of the co-integration equations, trend and constant for short-run part of the ECM

Variables	D(C)	D(I)	D(G)	D(NE)	D(M2)

CointEq1	-0.635639	-0.143791	-0.052715	-1.265833	-13.37689
	[-2.08680]	[-3.20890]	[-0.57016]	[-0.76324]	[-2.29895]
CointEq2	1.069399	0.185114	0.265537	2.934672	110.9771
	[0.62612]	[0.73673]	[0.51219]	[0.31556]	[3.40134]
CointEq3	-1.04323	-0.184455	-0.70955	-27.39645	80.21735
	[-0.98436]	[-1.18309]	[-2.20572]	[-4.74765]	[3.96227]
CointEq4	0.000294	0.000265	0.001103	-0.003214	0.052296
	[0.30807]	[1.88990]	[3.80999]	[-0.61925]	[2.87156]
C	-14.03616	-3.74551	-5.054277	-186.1459	-87.34958
	[-1.22777]	[-2.22707]	[-1.45654]	[-2.99043]	[-0.39997]
TREND	0.631117	0.188559	0.264216	8.944035	8.536426
	[1.08730]	[2.20821]	[1.49967]	[2.83000]	[0.76987]

Note: [] denotes t-statistics

The R-square of the model is 0,99. The amount of lags evidently contributes to such a high level of connection, yet Wald's lag exclusion test indicated that there were no significant lags, that could be excluded from the model. The residuals were analyzed by autocorrelation LM and White heteroscedasticity tests. Both procedures showed that the residuals are normally distributed and are not lag-correlated. As mentioned above, we intentionally didn't use impulse response functions and variance decomposition procedure, aspiring to show that final equations are more informational ex post, i.e. when forecasts are not required.

$$\Delta C = -0{,}64(-18{,}6*10^{-3} M2 + 0{,}53(T) - 40{,}22) - 0{,}158M2 + \sum DC_{I,G,NE} + u_t \quad (9)$$

$$\Delta I = 0{,}18(-0{,}75*10^{-3} M2 - 0{,}07(T) + 1{,}47) - 0{,}05M2 + \sum DC_{C,G,NE} + 0{,}2(T) - 3{,}8 + u_t \quad (10)$$

$$\Delta G = -0{,}71(4{,}04*10^{-3} M2 + 0{,}35(T) - 9{,}32) - 0{,}036M2 + \sum DC_{C,I,NE} + u_t \quad (11)$$

$$\Delta NE = -0{,}003(571*10^{-3} M2 - 71(T) - 2785) - 2M2 + \sum DC_{C,G,I} + 9(T) - 186{,}15 + u_t \quad (12)$$

where (T) indicates trend's estimation, $\sum DC_{x...y}$ - conforming discrepancy of stochastic correlation among GDP elements.

Equations for I and NE are statistically less robust than the equations for C and G. Taking into account the fact that consumption occupies the largest part of Russian GDP (Korishenko, 2005), the leverage of the equations for net export and investment is less significant.

The inference of the equations above is extremely important. Empirical results contradict theoretically logical and applied transmissions, evidenced in developed countries. If, in theory, changes in money supply have commensurable impact on GDP elements, in Russian practice this influence is opposite, at least in the short-run. There may be several hypotheses explaining this phenomenon. We deem that the most plausible one is that money supply is robustly correlated with inflation in Russian economy (Nalivaisky and Ivanchenko, 2004). In its turn, inflation, especially its expectations, is a severe macroeconomic factor intimidating Russian investors and consumers. Therefore, the increase of inflation causes consumption (income effect) and investment (the decrease of real interest rates) to fall down dragging public expenditures. In case of net export, the increase in nominal interest rates (adjusting to the inflation level) makes Russian currency more attractable thus strengthening it and consequently lowering the pecuniary volume of net export.

The long-time equilibrium is consistent with theoretical assumptions of monetarism about relationship of this kind, i.e. that money supply does not have any significant impact on GDP in the long-term. This implication can be made from the cointegrating vectors that testify incommensurable influence of money on GDP in short and long runs, i.e. in the long run it is very weak. This implication is quite important as it shows that perturbances in external macroeconomic conjuncture will eventually be reflected on the price level in Russian economy. From short-term

dependencies we see that collateral-free liquidity auctions, decrease of minimal reserves requirements and other measures undertaken by the Bank of Russia in its vain attempts to provide monetary expansion have an opposite effect on the economy due to the external nature of Russian transmission mechanism.

4. Conclusion

Our analysis was devoted to the transmission mechanism in Russian economy. We didn't empirically analyze the structure of each channel but showed final impact that money supply has on major GDP elements in short and long periods of time. In the long-run the assumption about the neutrality (at least partial) of money is underpinned by received empirical results. In the short-run all major transmission channels contradict theoretically elaborated and practically realized responses of real sector to shifts in money supply. It happens so because the increase in money supply swiftly augments the level of prices, pressurizing inflationary expectations and decreasing real consumption.

Our findings are quite important for perception of the role Russian monetary authorities should undertake. On the one hand they should focus on ruble exchange rate, since the instability of net export equation is the highest jeopardy for Russian economy. On the other hand, without free floating of national currency manipulated exchange rates hinder the other equations. However, if Bank of Russia ceases the control of national currency's corridor, the consequences will be even more disastrous. Russian's economy is consistently dependent on import. Taking into account anxious expectations concerning national currency and further uncertainty deemed by investors, it is highly likely that if Bank of Russia loosens its grasp on the national currency its level will significantly depreciate, thus making import more expensive and compelling prices to rise. So in both cases Bank of Russia remains the prisoner of the Russian "raw" economy. Until it is industrialized, modernized and infused with new financial paradigm, Bank of Russia should be moderate in its policy. It cannot prevent Russian economy from external turbulences, but it can smooth their impact by concentrating all its efforts on targeting inflationary level. Since interest rates policy is not efficient as the nature of Russian transmission mechanism bears external characteristics, there are two primary instruments that should be put at the edge of such agenda: operations on open currency market allowing to sustain the robustness of national currency partially influencing the price level within the country and minimal reserves policy, setting safe levels of capital sufficiency.

References

Angeloni, I., Kashyap A., Mojon B. and Terlizzese D. 2003. Monetary transmission in the euro area: does the interest rate channel explain all? *NBER Working paper 9984* http://www.nber.org/papers/w9984.

Bacchella, G. 1997. Consumption and Credit Constraints: International Evidence. *Journal of Monetary Economics,* No. 40, pp. 207-38.

Bernanke, B. and Blinder, A. 1988. Credit, Money and Aggregate Demand. *American Economic Review,* No. 78, pp. 435-439.

Bernanke, B. and Gertler, M. 1989. Agency costs, net worth and business fluctuations. *American Economic Review,* No. 79, pp. 14-31.

Bernanke, B. and Blinder, A. 1992. The Federal Funds Rate and the Channels of Monetary Transmission. *American Economic Review,* No. 82, pp. 901-921.

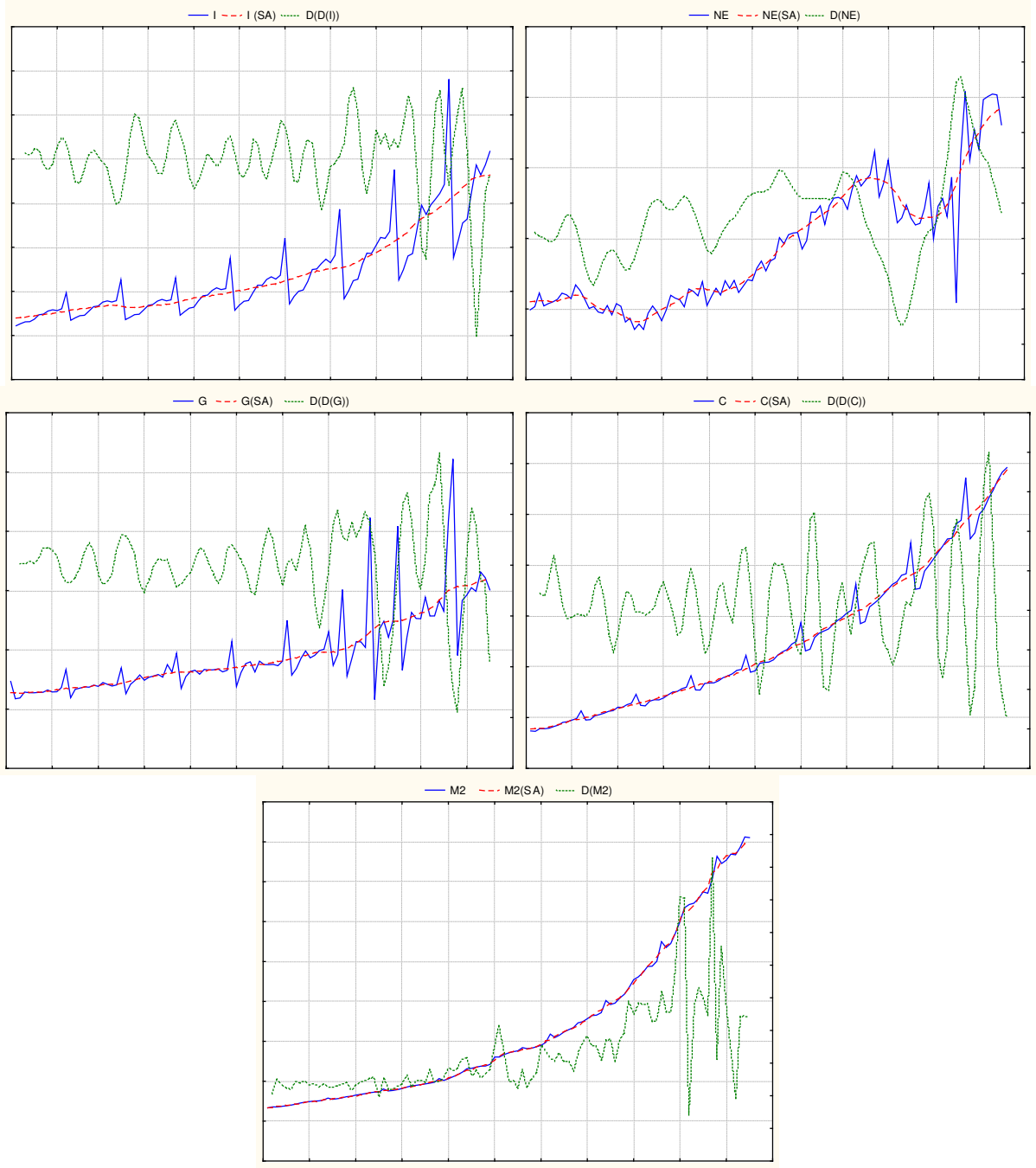
Bernanke, B. and Gertler, M. 1995. Inside the black box: the credit channel of monetary policy transmission. *NBER Working paper 5146* http://www.nber.org/papers/w5146.

Brunner, K. 1974. Monetary Management, Domestic Inflation, and Imported Inflation. In: A.Z. Robert (Ed.) *National Monetary Policies and the International Financial System*, pp. 179-208. Chicago: University of Chicago Press.

Campbell, J. and Mankiw, G. 1989. Consumption, Income, and Interest Rates: Reinterpreting the Time Series Evidence. *NBER Working paper 2924* http://www.nber.org/papers/w2924.
Campbell, J. and Mankiw, G. 1991. The Response of Consumption to Income: A Cross-Country Investigation. *European Economic review,* No. 35, pp. 715-721.
Chepurin, M.N. and Kiseleva, E.A. 2002. Economics: textbook – 5th edition. Kirov: ACA (in Russian).
Davidson, H. 1981. Interpreting Econometric Evidence: Consumers' Expenditures. *European Econometric Review,* No. 16, pp. 177-92.
Dalyand, Vince and Hadjimatheou, G. 1981. Stochastic Implications for the Life Cycle – Permanent Income Hypothesis: Evidence of the UK Economy. *Journal of Political Economy* No. 89, pp. 596-599.
Dickey, D. A. and Fuller, W. A. 1981. Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica,* No. 49, pp. 1057-1072.
Engle, R. F. and Granger, C. W. J. 1987. Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica,* No. 55, pp. 251-276.
Ferreira, C. 2007. The Bank Lending Channel Transmission of Monetary Policy in the EMU: A Case Study of Portugal. *The European Journal of Finance,* No. 2, pp. 181–193.
Flavin, M. A. 1981. Adjustment of Consumption to Changing of Expectations About Future Income. *Journal of Political Economy*, No. 89, pp. 974-1009.
Friedman, BM and Kuttner, KN. 1992. Money, income, prices and interest rates. *American Economic Review,* No. 82, pp. 472–492.
Grasa, A. A. 1989. *Econometric Model Selection: A New Approach?* Dordrecht: Kluwer Academic Publishers.
Hall, R. 1978. Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and evidence. *Journal of Political Economy,* No. 86, pp. 971-989.
Ivanchenko, I.S. 2006. Research on the Russian Transmission Mechanism of Monetary Policy. *Finance and Credit,* No. 14, pp. 2-11 (in Russian).
Ivanchenko, I. and Maslov, A. 2011. Money field theory: in pursue of formalism. *International Journal of Humanities and Social Sciences*, No. 8, pp. 19-29.
Ivanchenko, I. and Maslov, A. 2010. "Methodological Eclecticism of Transmission Mechanism of Monetary Policy. *Voprosy Economiki,* No. 12, pp. 99-106 (in Russian).
Johansen, S. 1988. Statistical Analysis of Cointegrating Vectors. *Journal of Economic, Dynamics and Control*, No. 12, pp. 231-254.
Johansen, S. and Juselius, K. 1992. Testing Structural Hypotheses in a Multivariate Cointegration Analysis of the PPP and the UIP for UK. *Journal of Econometrics,* No. 53, pp. 211-244.
Korishenko, K.N. 2005. Structural factors of monetary transmission mechanism: tendencies and perspectives. *Economics and Policy*, No. 2, pp. 7–25 (in Russian).
Krasavina, L.N. 2006. Reduction of Inflation Rate in Strategy of Innovative Development of Russia. *Money and Credit*. No. 9, pp. 12-20 (in Russian).
Krjuchkova, I.P. and Sapjan, M.U. 2003. Transmission Mechanism of Monetary Policy and Peculiarities of its Functioning in Russian Economy. *Bankovskoe Delo*, No. 9, pp. 6-17 (in Russian).
Lütkepohl, H. 1991. *Introduction to Multiple Time Series Analysis*, New York: Springer-Verlag.
MacKinnon, J. G., Haug, M. A. and Michelis, L. 1999. Numerical Distribution Functions of Likelihood Ratio Tests for Cointegration. *Journal of Applied Econometrics*, No. 14, pp. 563-577.
Makridakis, S. G., Wheelwright, S. C. and McGee, V. E. 1983. *Forecasting: Methods and applications (2nd ed.).* New York: Wiley.
Mallick, H. and Agarwal, S. 2007. Impact of real interest rates on real output growth in India: A long-run analysis in a liberalized financial regime. *The Singapore Economic Review*, No. 2, pp. 215-231.
Mishkin, F. S. 2001. The transmission mechanism and the role of asset prices in monetary policy. *NBER Working Paper 8617* http://www.nber.org/papers/w8617.

Mishkin, F. S. 1976. Illiquidity, Consumer Durable Expenditure, and Monetary Policy. *American Economic Review*, No. 4, pp. 642-654.
Mishkin, F. S. 1977. What Depressed the Consumer? The Household Balance-Sheet and the 1973-1975 Recession. *Brookings Paper on Economic Activity*, No. 1, pp. 123-164.
Mishkin, F. S. 1996. Understanding Financial Crises: A Developing Country Perspective. In: Bruno, M. and Pleskovic, B. *Annual World Bank Conference on Development Economics*, pp. 29-62. World Bank, Washington D.C.
Mishkin, F. S. 1999. Lessons from the Asian Crisis, *Journal of International Money and Finance*, No. 4, pp. 709-723.
Mishkin, F. S. 1999. International Experiences with Different Monetary Policy Regimes. *Journal of Monetary Economics,* No. 3, pp. 579-606.
Mishkin, F. S. 2000. Inflation Targeting in Emerging Market Countries. *American Economic Review*, No. 2, pp. 105-109.
Modigliani, F. 1971. Monetary Policy and Consumption. In: *Consumer Spending and Monetary Policy: The Linkages*, pp. 9-84. Boston: Federal Reserve Bank of Boston.
Moiseev, S.R. 2002. Transmission mechanism of monetary policy. *Finance and Credit*, No. 18, pp. 38-51 (in Russian).
Nalivaisky, V.U. and Ivanchenko, I.S. 2004. Analysis of the Russian Money Supply Mechanism. *Finance and Credit*, No. 20, pp. 11-23 (in Russian).
Pantula, S. G. 1989. Testing for Unit Roots in Time Series Data. *Econometric Theory*, No. 5, pp. 256-271.
Pesaran, H. H. and Shin, Y. 1998. Generalized Impulse Response Analysis in Linear Multivariate Models. *Economic Letters*, No. 58, pp. 17-29.
Pill, H. 1997. Real interest rates and growth: Improving on some deflating experiences. *Journal of Development Studies*, No. 34, pp. 85–110.
Rizhkovskaya, O.V. 2008. Approaches to the choice of regime and optimal criteria of monetary policy of transitional period. Minsk, *National Bank of Belarus.*
Safaei, J. and Cameron, N. 2003. Credit channel and credit shocks in Canadian macrodynamics – a structural VAR approach. *Applied Financial Economics,* No. 13, pp. 267–277.
Sarno, T. 1998. Real Interest Rates, Liquidity Constraints and Financial Deregulation: Private Consumption Behavior in the UK. *Journal of Macroeconomics*, No. 20, pp. 221- 242.
Shaw, E. 1973. Financial Deepening in Economic Development. Oxford: *Oxford University Press.*
Sims, C. A. 1980. Macroeconomics and Reality. *Econometrica*, No. 48, pp. 1-48.
Sims, C. A. 1992. Interpreting the Macroeconomic Time Series Facts. *European Economic Review,* No. 36, pp. 975-1011.
Suzuki, T. 2004. Credit channel of monetary policy in Japan: resolving the supply versus demand puzzle. *Applied Economics*, No. 36, pp. 2385–2396.
Taylor, MP. 1999. Real interest rates and macroeconomic activity. *Oxford Review of Economic Policy*, No. 15, pp. 95–113..
Zhang and Sun, 2006. China's consumer credit sector expansion and monetary transmission mechanism: what should China's Central Bank do? *Journal of Chinese Political Science*, No.11, pp. 285-302.
Zemcev, A. 2009. Sources of funding for Russian banks http://www.raexpert.ru/researches/credit_org/bank2 (in Russian).

Appendix: Graphical interpretation of the data sets used in the paper



Note: (*a*) Time period 2000:M1 to 2008:M9 (*b*) SA - seasonally adjusted (*c*) D - difference operator