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Capital outflow in the countries exporting oil and gas as a deterrent to the economic development

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ABSTRACT

The economies of the countries exporting oil and gas generally have a positive balance of trade and a current account surplus. However, among them there are countries facing the problem of capital outflows under the financial account of the trade balance, which reduces financial resources for the economic growth and diversification.

The main reasons for capital outflows lie in the specific features of the national law concerning foreign exchange as well as in the psychology of the behaviour of the economic agents carrying out activities on the territory in question. The capital outflow is caused not only by a higher exposure of business operations, corruption, weak competitiveness of the economy etc. The authors have demonstrated that the most vulnerable countries exposed to the highest level of the capital outflow risk are the countries with hybrid exchange rate regimes, in contrast to the countries adopting hard exchange rate pegs or the floating exchange rate regime. The changes in the behaviour of economic agents influencing the capital outflow during the transition of their currency exchange rate regimes to the floating regime have been studied on the example of Russia. Among the main parameters indicating excess capital outflows, the percentage of foreign currency denominated assets and liabilities in bank balance sheets has been chosen.

In the long term the pattern of behaviour of the economic agents in Russia will be similar to that of those in Norway and Canada, where even severe fluctuations of local currency exchange rates do not make money aggregates, the level of economy's monetization and the percentage of foreign currency denominated assets and liabilities in bank balance sheets fluctuate significantly.

Keywords: oil, gas, capital outflow, price shock, exchange rate regime.

1. Introduction

Capital outflow is one of the central problems that developing countries face. The lack of financial resources leads to the slowdown in renovation of fixed assets, contraction in lending and decline in the economic growth. The capital outflow under financial account may have no impact on the general level of the economy's monetization, since the "broad money" aggregate that includes cash in circulation as well as current and deposit accounts of bank customers, is usually chosen out of all money aggregates characterizing it.

As a rule, economists compare the monetization indicators among countries guided by comparable broad money indicators. However, there are customers' foreign currency accounts in the structure of this aggregate and they should be considered separately, especially in the economies where the percentage of foreign currency denominated assets and liabilities in bank balance sheets is excessively high.

The process of converting the assets and liabilities of bank balance sheets into foreign currency is related directly to the capital outflow. In our study, we are going to analyze the monetization fluctuations using different monetary supply aggregates in order to define more accurately its characteristics and patterns in the countries exporting oil and gas that have similar regulation practices.

2. Literature overview

The economic modeling for regulating the level of the economy's monetization employs two models: DSGE and ABM.

Dynamic Stochastic General Equilibrium (DSGE) models

The theoretical basis for this type of modeling are macroeconomic grounds in the framework of which the general dynamics of the economic system is the result of economic agents' optimization activities. At a micro-level the DSGE models consider economic agents' preferences and limitations that determine the range of their activities. This makes the DSGE models qualitatively different from the macroeconomic models in which aggregate indices are the framework for analysis. The parameters of preferences and limitations are structural, and therefore not influenced by the changes in the economic policy.

The active use of the DSGE models began at the end of the 1990s; they owe their wide expansion to being used by the Central Banks of different countries for elaborating the economic policy. Such models as SIGMA [Erceg, Guerrier, Gust 2006. pp. 111–144] of the Federal Reserve System (the USA), NAWM [Christoffel, Coenen, Warne 2008. p. 58] (European Central Bank), ToTEM [Murchison, Rennison 2006, p. 79] (the Bank of Canada) as well as GEM [Pesenti 2008. pp. 243–284] and GIMF [Kumhof, Laxton, Muir, Mursula 2010, p. 13] used by the IMF for studying the international economy are good examples.

In terms of its structure, any DSGE model is comprised of three essential components [Fagiolo G., Roventini A. 2012, pp. 27-29]:

- the dynamic version of the IS equation for modeling the national income;
- the New Keynesian Phillips Curve for modeling inflation;
- the Taylor rule for modeling the interest rate.

In addition to the mentioned key components, DSGE modeling requires distinguishing the trend and cyclical components, calculating a short-term deviation from the equilibrium, calculating the deflated variables, etc.

In contrast to the DSGE models as models of balanced dynamics, the Agent-Based models (AB) are new to the economic science; they study the economy as a complex misbalanced evolutionary system of economic agents.

Agent-Based models (ABM)

The "perfect storm" that followed the collapse of Lehman Brothers investment bank on 15 September 2008 and set off the Great Recession questioned the efficiency of the DSGE models as a leading tool for evaluating and elaborating the macroeconomic policy in the period of global crises. As one of the leading American economists P. Krugman noted, not only had the orthodox economists not managed to predict the approaching crisis, but they also had not even considered such a possibility and, what was even worse, they had been unable to provide the politicians with an efficient means for propelling the international economy into the phase of sustainable growth [Krugman 2011, pp. 307-312]. The assumptions of absolute rationality in neoclassic models proved the DSGE models incompetent in terms of evaluating and forecasting crisis-like phenomena arising by reason of the nonlinear character of the economic agents' behaviour.

The main goal of agent-based modeling is building the models proceeding on the basis of realistic assumptions of the behaviour and interaction of the agents. At the same time, the complex heterogeneous nonlinear character of the interaction between the agents imposes renouncing any kind of theoretical simplifications (like the agents' representativeness assumption or the idea of the economic system equilibrium), typical for the DSGE models, and concentrates fully on the misbalanced dynamics maintained by the interactions of heterogeneous agents. Therefore, in contrast to the neoclassic models, the main principles of the agent-based models are bounded rationality, heterogeneity of the agents and misbalanced dynamics of their interactions.

The main characteristics of the Agent-Based models are as follows [Fagiolo, Roventini 2012, p. 16]:

"The bottom-up view". The aggregate characteristics of the economy "populated" by economic agents are received as the macro-result of the dynamics of these agents. On the contrary, in the neoclassic models the analysis is carried out on the "from top to bottom" basis and it provides a definition of a representative agent bound with tough theoretical limitations of the system's rationality and equilibrium.

Heterogeneity. The agents are always inhomogeneous in terms of all their characteristics. Their aggregate features are the consequence of the repeated local interactions and cannot be defined by the requirements of limitations and equilibrium.

Nonlinearity. The character of the agents' interactions in the model is nonlinear. The correlation between the modeling level and macro-level is also nonlinear.

Endogeneity of interactions between agents. The decisions that an agent is taking at the present moment through the adaptive expectation mechanism depend on the decisions of other agents at preceding moments.

Bounded rationality and learning abili-

ty. The agents in the model are in free search within the changing dynamic environment which contributes to the emergence of innovations and subsequent emergence of new types of the behaviour of agents allowing quicker adaptation to the changing environment.

Genuine dynamics. The model is formed by irreversible dynamics. This implies that the agents form their own expectations of the future on the basis of information about preceding system conditions.

Constant endogenous innovations. The economic systems are unsteady. Their continuous development is related to the emergence of something new that incites the agents to learn and adapt.

The market selection mechanisms. The agents go through market selection criteria that can be complex and multidimensional.

The general structure of agent-based models

There is a system of agents (consumers, companies etc.) that can be organized according to the principle of hierarchy, the size of which can change with time. At any specific time t each agent i is characterized by a finite number of microeconomic variables $X_{i,t}$ and the macroeconomic parameters vector θ_i fixed within the time period considered. The economy is generally characterized by a certain number of fixed macroeconomic parameters θ_i.

At any specific time $t>0$ under given initial conditions and selected micro- and macroeconomic parameters $X_{i,0}$, one or more agents are chosen and their microeconomic variables are updated.

The agents selected for the update stage collect the available information on the preceding and current condition of subsets of other agents with whom they usually interact. On the basis of collected data the agents form the rules in the way that makes them similar to empirical data that an investigator might have received at the preliminary stage.

After the update stage is finished, a new set of macroeconomic variables flows into the economy for the next interaction. The aggregated values of X,t are calculated as the sum or average value of particular characteristics, similar to the definitions of statistical aggregates like the GDP, unemployment, etc.

Due to the nonlinear character of the decisions taken by the agents, the dynamics of micro- and macro variables can be described by random processes, therefore an investigator is forced to recourse to computer simulation in order to analyze the behaviour of the model in question.

The agent-based models can be a powerful tool for elaborating and taking decisions in the area of the economic policy. In view of the complex nonlinear character of economic decisions, these models have a range of advantages over the neoclassic ones which can be divided into two categories: theoretical and empirical.

Unlike the neoclassic ones, agent-based models do not imply theoretical limitations like the equilibrium assumption and rational expectations or representative agent assumptions, for example. The absence of strict theoretical requirements affords substantial flexibility of the model-building process causing no damage to its analysis. This approach implies that an investigator can replace the assumption if the model does not meet the expectations. In case of the neoclassic model it is impossible to simply replace one optimization assumption with another if the model has proved to be unsustainable, as this can have significant impact on its analytical solution.

As compared to the neoclassic models, the structure of the agent-based models allows applying them more easily considering the available information. First, it is possible to check the data comprising the model for compliance with the real facts; otherwise stated, to select the assumptions of the agents' interactions and individual behaviour in a way that will make them accord with the observations. Second, it is possible to check the modeling outcome for compliance with the real facts in a way that will make the model reproduce only the stylized facts that are of interest.

In order to conserve the analytical solubility, the neoclassic models are, as a rule, constructed for explaining one or two stylized facts. On the contrary, an agent-based model can easily explain a number of various empirical observations.

Nowadays this type of models is used to elaborate policies in different areas like the economic growth, industrial dynamics, market design, environment regulations and traffic control. However, in the economic literature considering agent-based models the main focus is on their use for evaluation of the influence of the macroeconomic policy during and after crises.

In particular, the agent-based models can be classified according to three main areas of the macroeconomic policy: fiscal policy, monetary policy and banking regulations.

3. Methodology

In the international practice there are three types of exchange rate regimes for the countries with a large share of the hydrocarbons

export in the GDP: the exchange rate fixed against the U.S. dollar with minor deflections in the longer term; the hybrid exchange rate regime, in which the central bank can sometimes intervene into foreign exchange trading, thus guiding the national currency exchange rate to the desired level or range; the floating exchange rate that implies limited intervention of the central bank into foreign exchange trading and that such intervention is counterproductive.

In the countries with hard exchange rate pegs the fiscal policy should be well-balanced and the inflation level should be low. Besides, the time intervals between the exchange rate pegs can last for decades which ensures the highest degree of trust to monetary regulatory authorities.

The hybrid exchange rate regimes (soft exchange rate pegs), characterized by maintaining a constant value of the currency against another currency or a currency basket, are typical for countries with higher inflation and an unstable budget system. These regimes are vulnerable to financial crises, and therefore the authorities of such countries are forced to devaluate the currency on a regular basis and reconsider the interim exchange rate pegs and parameters of the currency bands.

The floating exchange rate regimes allow absorbing the impact of the international goods market price shocks on the national fiscal system. However, in case of a weak economic structure this regime is fraught with inflation shocks along with significant dependence of the national economy on the external capital flows. This regime is adopted in most developed countries.

The transition of the Russian economy from the managed "dual currency basket" exchange rate to the floating exchange rate regime in 2014 allowed assuming that this parameter has similar influence on the countries with the same regime of national currency exchange rate management. Among the countries with no hard exchange rate pegs Canada, Norway and Mexico were chosen [Ershov 2015. pp. 32-50].

The authors' task was to search for similar mechanisms and, consequently, the parameters of economic management in general in the light of a significant influence of the share of the hydrocarbons export in the total GDP of the countries.

4. Data

Among the essential parameters characterizing the macroeconomic situation in the countries considered the following were adopted:

- the Gross Domestic Product;
- the national currency exchange rate against the U.S. dollar;
- inflation level for the expired year;
- money aggregates M2 and M2x;
- international reserves;
- bank deposits;
- commercial bank loans.

Besides, such parameters reflecting the condition of the hydrocarbons markets of the countries considered as: the volumes of oil export, consolidated budget receipts, trade balance, the share of total oil export revenue in the GDP of the country considered and the current account of the balance of payments, were also admitted for consideration. As basic universal variables the U.S. dollar index and dynamics of Brent oil price per barrel were adopted.

At the first stage the study was carried out on the basis of the statistical data obtained from official sources of the countries considered and denominated in the national currency. With the purpose of consolidating all the parameters into the unified system of measurement, the study was carried out on the basis of the time series reflecting the rates of change of chain-weighted monthly increments of the parameters considered.

Table 1: Consolidated table of correlation between GDP values in national currency and financial market indices (from 2000 to 2015 year)

Countries	Nominal GDP, national currency billions	USD/ national currency	EUR/ national currency	Inflation,% per year	M2, national currency, billions	Int. reserves, USD billions	Deposits, national currency thousands	Credits, national currency,thousands
Russia	1,00	-0,14	-0,16	0,07	-0,03	-0,13	-0,09	-0,12
Norway	1,00	-0,02	0,01	-0,10	-0,26	0,03	-0,22	-0,08
Canada	1,00	-0,41	-0,06	0,33	-0,13	0,31	0,26	-0,04
Mexico	1,00	0,16	0,21	0,02	0,30	-0,15	0,00	0,52

Source: Authors' calculations based on the results of investigations.

Table 2: Consolidated table of correlation between GDP values in national currency and oil products export indices (from 2000 to 2015 year)

Countries	Oil export, USD million	Consolidated budget revenue per month, national currency billions	Trade balance USD billions	Oil export/ GDP	Current account of balance of payments, USD billion	USD index	Brent oil	Gold
Russia	0,96	0,05	0,19	0,91	-0,16	0,35	-0,28	-0,51
Norway	-0,06	0,04	-0,09	-0,97	0,00	-0,12	0,10	-0,13
Canada	0,44	-0,12	-0,08	0,44	-0,44	0,81	-0,87	-0,39
Mexico	-0,37	0,03	0,20	-0,36	0,10	0,86	-0,95	-0,70

Source: Authors' calculations based on the results of investigations.

No correlation was found between the dynamics of the chain-weighted GDP increments (in national currency) and essential macroeconomic parameters (Table 1). However, these figures showed a high level of dependence on the hydrocarbons export indicators in the economies considered (Table 2).

Besides, as shown in Table 2, a high level of dependency of the series considered on all basic parameters introduced earlier was detected.

The detected patterns allowed the investigators to assume the existence of immediate relations of a higher level between the parameters of the financial market reflecting the economic situation of the countries considered and prices for oil, the export of which is the principal source of income.

The results of studying the levels of correlation between the main national currency denominated parameters of the countries exporting hydrocarbons with the floating exchange rate regime and the main indicators of the international market show that in all countries of the group considered there is express unidirectional dependence of growth rates of the national currency exchange rates and the current accounts of balances of payments related to the increase in Brent oil prices growth rates.

In view of the abovementioned, it was decided to abandon the chain-weighted increment model typical for such cases and to apply one currency, the U.S. dollar, as the basic currency for estimating the cost of hydrocarbons in order to convert the values into a unified system of measurement.

The results of the analysis show clearly a high level of correlation of all parameters of the macroeconomic level of the countries considered denominated in one currency with the Brent oil price per barrel. This allows for quite accurate modeling of the economic agents' behaviour within each of the economies considered. The existence of countries with similar economic culture having a long-standing currency regulation cycle guarantees possessing information on the economic agents' behaviour in the Russian economy after the transition period expires.

5. Model

The basis for analyzing the level of the dependence of Russian economic agents on the dynamics of oil prices is the agent-based model built upon the interactions of households (legal and natural entities), commercial banks and the Central Bank. The system of indicators of the legal entities is shown in Table 3,4,5,6.

Table 3: Organizations

Assets		Liabilities	
M_{tf}*	M_{tf}	D_f*	D_f
	M_{tf}^C		
M_{df}*	M_{df}		D_f^C
	M_{df}^C		
B_f*	B_f	D_{of}*	D_{of}
	B_f^C		D_{of}^C
I_n			

Assets:

M_{tf}-demand deposits in national currency
M_{tf}^C- demand deposits in foreign currency
M_{df}* - deposit accounts:
M_{df}- deposit accounts in national currency;
M_{df}^C- deposit accounts in foreign currency;
B_f*- obligations:
B_f- obligation in national currency;
B_f^C - obligation in foreign currency;
I_n- other assets.

Liabilities:

D_f*- credits to organizations
D_f- credits in national currency;
D_f^C- credits in foreign currency
D_{of}*- obligations
D_{of}- obligations in national currency
D_{of}^C- obligations in foreign currency

Table 4: Individuals

Assets		Liabilities	
M_{0h}		D_h	
C_h			
M_{th}*	M_{th}		
	M_{th}^C		
M_{dh}*	M_{dh}		D_h^C
	M_{dh}^C		

где:

Assets:

M_{0h}- cash in circulation;
C_h- consumer expenditure;
M_{th}*- demand deposits;
M_{th}- demand deposits in national currency;
M_{th}^C- demand deposits in foreign currency;
M_{dh}- deposit accounts in national currency;
M_{dh}^C- deposit accounts in foreign currency.

Liabilities:

D_h-liabilities in national currency;
D_h^C- liabilities in foreign currency.

Table 5: Commercial banks

Assets		Liabilities	
K_{cb}		M_{tf}* M_{th}*	M_{tf}
K_b^C			M_{tf}^C
O_b			
B_b			
B_b^C		M_{df}* M_{dh}*	M_{df}
D_f D_h	D_f		M_{df}^C
	D_f^C		

K_{cb}- accounts at the Central bank
K_b^C- accounts at the foreign banks
O_b- mandatory reserves
B_b- obligations in national currency
B_b^C- obligations in foreign currency

Table 6: Central bank

Assets	Liabilities
IR	M_0h
	G
C_{cb}	K_{cb}
C_{cb}^{c}	
B_{cb}	

IR-international reserves
C_{cb}- credits to commercial banks in national currency
C_{cb}^{c}- credits to commercial banks in foreign currency
B_{cb}- stocks in national currency
M_0h- cash in circulation
G- central government requirements
K_{cb}- accounts at the Central bank

In accordance with the results of the previous studies the input parameters were: Brent oil prices, the national currency exchange rate and the parameters reflecting the share of oil and gas revenues in the budget. In view of that, the following indicators describing the financial flows of the economic agents' interactions mentioned above were adopted for analysis.

f1 cash in circulation h;
f2 demand deposits in national currency;
f3 demand deposits in foreign currency;
f4 deposit accounts in national currency;
f5 deposit accounts in foreign currency;
f6 liabilities in national currency;
f7 liabilities in foreign currency;
f8 demand deposits in national currency;
f9 deposit accounts in foreign currency (nominated in national currency);
f10 deposit accounts in national currency (nominated in national currency);
f11 deposit accounts in foreign currency;
f12 credits in national currency;
f13 credits in foreign currency (nominated in national currency;
f14 deposit accounts in foreign currency (nominated in foreign currency);
f15 deposit accounts in foreign currency (nominated in foreign currency;
f16 credits in foreign currency (nominated in foreign currency);
f17 accounts at the Central bank;
f18 accounts at the foreign banks;
f19 mandatory reserves;
f20 obligations in national currency;
f21 obligations in foreign currency;
f22 credits to commercial banks in national currency;
f23 credits to commercial banks in foreign currency;
f24 international reserves;
f25 Investments of Central bank in the securities in national currency;
f26 central government requirements to Central bank.

The statistical data showing the economy's monetization level and its dependence on the export of hydrocarbons were adopted as parameters of the study:

x1 GDP nominal USD /month.;
x2 USD/RUB;
x3 Inflation rate, % ;
x4 Money supply M1, bn.USD;
x5 International reserves, bn. USD;
x6 Deposits in banks, t. USD;
x7 Credits to economy, t. USD;
x8 Oil export, mln. USD;
x9 Revenues of state budget, bn. USD;
x10 Trade balance, bn. USD;
x11 Oil export/GDP nominal;
x13 USDX – dollar index;
x14 Brent, USD.

The results of the primary correlation analysis showed a high level of dependence of the total volume of current foreign currency denominated demand deposits and the total volume of foreign currency denominated time deposits of legal entities on the nominal Gross Domestic Product, national currency exchange rate against the U.S. dollar, money aggregate M1, volume of international foreign-exchange reserves, total deposits on the accounts of Russian commercial banks, the volume of oil products export in USD, the consolidated budget receipts, the U.S. dollar index and Brent oil price.

According to the resulting model, the indicated parameters have a primary impact on the functions describing the financial flows of the legal entities directly related to foreign currency:

1. The current foreign currency denominated demand deposits: F9 (x2,x4,x5,x14)
2. The foreign currency denominated time deposits of legal entities: F15 (x1,x2,x4,x5,x8,x9, x13,x14)
3. The foreign currency denominated bank debts of legal entities: F16 (x10,x11,x14)

Consequently, the initial point of the oil-pri-

ce shock pulse input was detected within the study of the oil prices impact on macroeconomic indicators. According to the model shown in Table 12, the mentioned flows being part of the commercial banks' liabilities, immediately distort the bank balance in case they change. Similarly, , being an immediate constituent of the commercial banks' assets, influences the general performance of the foreign currency component of the bank balance.

The concluding description of the economic agents system was modeled by the authors of the study as follows:

- for the system of households as legal entities:

$$M_{tf}^{c} = \underset{0,0485}{-0,0224} + \underset{1,7419}{1,0462} * X2 + \underset{1,6908}{1,2548} * X4 + \underset{1,9275}{0,9775} * X5 - \underset{0,6337}{0,3823} * X14 + \varepsilon;$$

$$M_{df}^{c} = \underset{0,0129}{0,0175} + \underset{0,0684}{0,1282} * X1 + \underset{0,1553}{0,0671} * X2 - \underset{0,1615}{0,0937} * X4 - \underset{0,2045}{0,1576} * X5 +$$

$$+ \underset{0,2902}{0,4612} * X8 + \underset{0,0151}{0,0149} * X9 - \underset{0,2562}{0,5668} * X13 - \underset{0,0564}{0,0052} * X14 + \varepsilon;$$

$$D_{f}^{c} = \underset{0,0032}{0,0007} + \underset{0,0168}{0,0063} * X10 - \underset{0,0338}{0,0105} * X11 - \underset{0,0055}{0,0038} * X14;$$

- for the system of commercial banks:

$$A_{кб}^{c} = K_{b}^{C} + B_{b}^{C} + 0,0007 + 0,0063 * X10 - 0,0105 * X11 - 0,0038 * X12 + \varepsilon;$$

$$P_{CB}^{c} = -0,0049 + 0,1282 * X1 + 1,1133 * X2 + 1,1611 * X4 + 0,8199 * X5 + 0,4612 * X8 + 0,0149 * X9 - 0,5668 * X13 - 0,3878 + 0,4612 * X8 + 0,0149 * X9 - 0,5668 * X14 + \varepsilon;$$

- for the Central Bank:

$$\Delta A_{цб}^{c} = 0,07 * \Delta D_{df}^{c}$$

ε - small quantity.

In accordance with the studies carried out, a significant influence of the parameters considered on all the agents of the economic system concerned was detected. The upward deviation of the Brent oil price growth rate by 1% causes slowdown in the buildup of current demand deposits by 0.38%, and foreign currency denominated current deposits of legal entities by 0.05%. Such an event might allow the commercial banks to expect a decrease in the growth rates of bank foreign exchange liabilities by 0.56%.

For Russia, which is a country where the share of oil and gas export makes more than a half of its export, the exchange rate regime is of crucial importance [Dvoretskaya 2015. pp. 20-28]. The exchange rate regime affects the evaluation of capital flows and parameters of money supply.

In November 2014 the Bank of Russia changed the exchange rate regime of the Russian ruble, switching from targeting the exchange rate within the currency band of a dual-currency basket to floating. As a consequence, the principles of forming the monetary flows in the financial system of the country changed as well. The Russian national currency became more sensitive to oil prices fluctuations. Despite the increased volatility of the foreign exchange market, the federal budget became more predictable, as the exchange rate fluctuations started synchronizing with the oil prices dynamics and, consequently, the ruble denominated oil and gas budget receipts became more stable than in the times of currency band policy. In effect, the Bank of Russia sacrificed stability of the exchange rate for financial stability.

6. Results

The authors chose countries that have both a floating exchange rate regime and a significant share of oil and gas export in the GDP structure. Apart from Russia, such countries as Norway, Canada and Mexico meet these conditions as well. The dynamics of the share of oil and gas export in the GDP in the mentioned countries is shown in fig. 1.

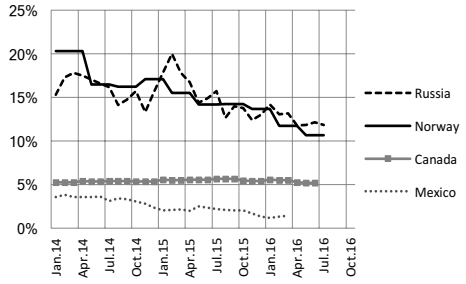

Figure 1: The share of oil and gas export in the GDP structure, %
Source: calculated based on the data of Federal Service of State Statistics (Rosstat) and state statistical agencies of Norway, Canada and Mexico

The simultaneous decline of this indicator in the group of countries considered and the fall in oil prices starting from the middle of 2014 is obvious.

One can notice that the oil and gas export in the GDP structure gained an even more prominent role in Russia than in Norway over the past two years. If, at the beginning of 2014, oil and gas export made up 20% of the Norwegian economy, in the middle of 2016 this indicator fell to 10.7%. As for Russia, within the same period the share of oil and gas export declined from 15% to 11.8%.

Russian oil exporters strive to compensate the income lost due to the decline in oil price by escalating the volumes of production and sales. Norway is unable to take similar steps due to specific characteristics of their fields [Glazyev 2015, pp. 21-59].

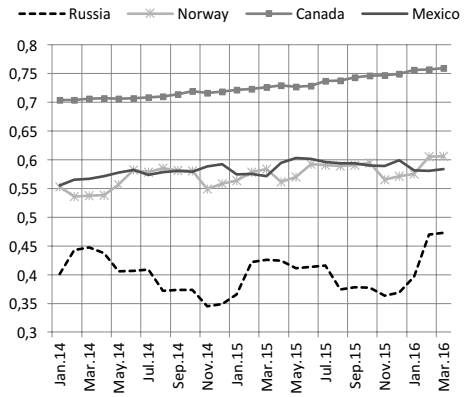

Figure 2: The level of monetization in the economies of Russia, Norway, Mexico and Canada (M2/GDP).
Source: made on the basis of the data provided by the Bank of Russia, Bank of Canada, Bank of Mexico, Bank of Norway

The level of monetization in the economies considered behaves in the following way in terms of basic money aggregate M2 (fig. 2). The most volatile monetization dynamics is observed in Russia, which was determined by severe fluctuations of the exchange rate during the period considered, as compared to the same indicators in other countries under study. Only starting from the middle of 2016 the ruble's volatility got back to normal parameters typical for most floating "commodity currencies".

Among the countries considered the most stable monetization dynamics are observed in the Canadian economy, which is now characterized by the upward trend. Its gradual growth from 0.7 to 0.76 starting from 2014 can be noticed.

The insignificant fluctuations of monetization level during the same period are observed in Mexico and Norway (in a range between 0.53 and 0.61).

As noted previously, the severest magnitude of monetization fluctuations in terms of M2 aggregate/GDP is typical for Russia. Since the beginning of 2014 four successive trends have been observed in the monetization dynamics in Russia:

1) decline from 0.45 to 0.34 within the period from February to November 2014;

2) growth from 0.34 to 0.42 within the first quarter of 2015;

3) decline from 0.42 to 0.36 within the period from the second quarter of 2015 to the beginning of 2016;

4) Growth from 0.36 to 0.47 starting from the beginning of 2016.

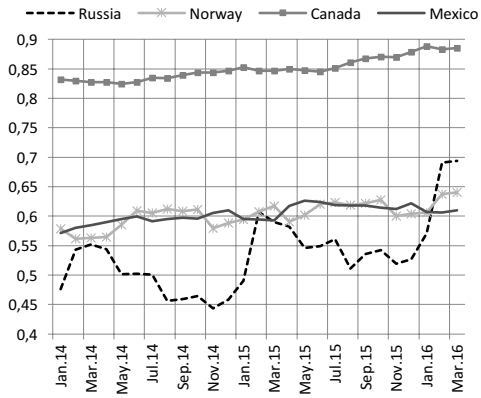

Figure 3: Monetization level in the economies of Russia, Norway, Mexico and Canada (M2x/GDP).
Source: made on the basis of the data provided by the Bank of Russia, Bank of Canada, Bank of Mexico, Bank of Norway

Equally sizable fluctuations of the monetization level of the Russian economy are typical for the M2x/GDP aggregate as well (fig. 3.3), as the foreign currency denominated accounts in commercial banks are also taken into consideration in it, apart from the traditional money aggregate M2. Tellingly, it was this indicator in terms of which Russia outranked Mexico and Norway in 2016.

The observed monetization leap means a substantial increase in the investment potential accumulated in the Russian banking system. It turns out that the currency re-evaluation became a key factor of the positive dynamics of the Russian economy's general monetization. But if we consider the economy's monetization without foreign currency deposits, we will see that the Russian economy is still characterized by sub-monetization and closes the four countries considered with the M2/GDP indicator at the level of 0.48.

The change in monetization dynamics trends took place during the same time periods, but the magnitude of fluctuations in terms of different aggregates varies significantly, especially in Russia.

If in other countries there is almost no difference in the fluctuations of the monetization level, depending on the choice of a numerator indicator in the monetization formula, in Russia it was important due to the exchange rate fluctuations and high interest rates (fig. 4).

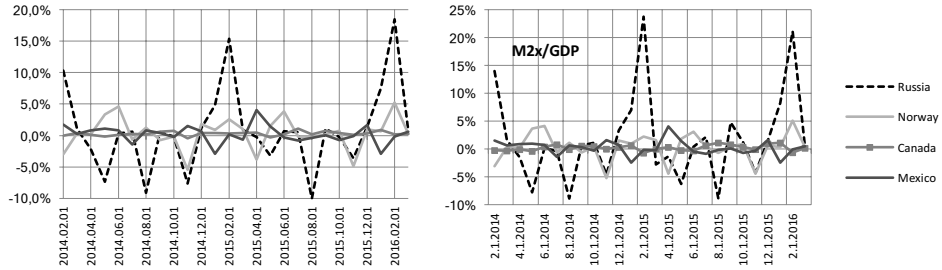

Figure 4: The magnitude of monetization level fluctuations in the economies of Russia, Norway, Mexico and Canada

Source: made on the basis of the data provided by the Bank of Russia, Bank of Canada, Bank of Mexico, Bank of Norway

Figure 5 shows the dynamics of the money aggregates M2x/M2 ratio by countries considered. Its notable growth in Russia along with neutral dynamics in Canada, Mexico and Norway is obvious.

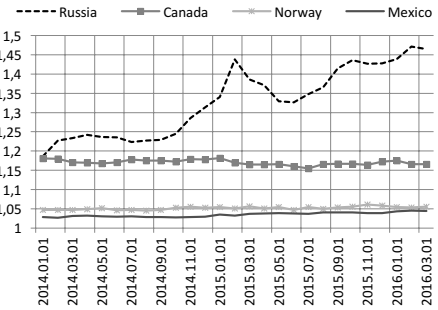

Figure 5: M2x.M2 ratio in Russia, Norway, Mexico and Canada.

Source: made on the basis of the data provided by the Bank of Russia, Bank of Canada, Bank of Mexico, Bank of Norway

Such significant fluctuations of Mx2/M2 ratio in Russia reveal that the level of foreign currency predominance on the bank accounts is such that it immobilizes a significant part of financial resources required for its development. Put simply, the currency is allocated abroad by the Russian banks and not converted into loans in the domestic market.

For the Russian exporters it is no use attracting foreign currency debt funding from the Russian banks. The crediting of resources industries is quite insignificant in Russia. As for the foreign currency lending to the importers, it has been in decline lately due to general economic stagnation and lowered consumer activity.

At the end of 2011, the growth of the Russian economy started slowing down. Along with that another wave of converting the assets of Russian firms and households into foreign currency began. Consequently, for 2.5 years the foreign currency accounts of the legal entities increased from USD 100 billion to USD 193 billion by the middle of 2014. Afterwards their growth stopped and started to decrease gradually to reach the actual USD 167 billion. The increment rate of foreign currency accounts of natural entities turned out to be more inertial and stable. At the present moment the foreign currency denominated assets of natural entities in banks amount to the estimated USD 93 billion (fig. 6).

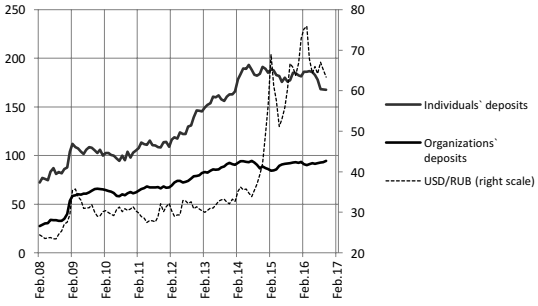

Figure 6: The dynamics of foreign currency accounts (USD billion) in Russian bank system and USD/RUB exchange rate

In contrast to the crisis of 2008-2009, the ruble exchange rate fluctuations did not have a significant impact on the behaviour of commercial bank depositors. A substantial fall of the ruble exchange rate did not trigger rapid conversion of the households' assets into foreign currency, and the firms partially locked in the profits derived from the generated foreign exchange gain.

But after relative stabilization of the ruble in 2016 no conversion of households' assets back into ruble is being observed, which is seen as an adverse factor. People still keep a substantial share of their bank savings in foreign currency and they do not seem to want to change their preferences.

As for the firms, their balance of foreign currency denominated bank loans and foreign exchange deposits in the Russian banking system drifted to the latter. As fig.7 shows, from the beginning of 2013 it left the negative values area and passed to the positive values area, which can be interpreted as the surplus of foreign exchange accumulations possessed by legal entities in relation to the foreign currency denominated indebtedness.

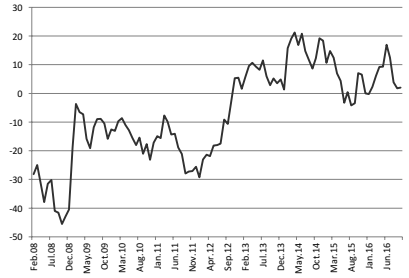

Figure 7: Dynamics of foreign currency accounts (USD billion) in Russian banking system and USD/RUB exchange rate

Over the last years, the Bank of Russia almost did not interfere in the processes of the conversion of assets into foreign currency in the banking sector. There are only restrictive regulations in respect of a permissible open currency position of a particular commercial bank stipulated by the Bank of Russia Instruction No 124-*И* dd. "On the volumes (limits) of open currency positions, their calculation methodology and special aspects of carrying out control over the credit institutions in terms of compliance with them". In accordance with this document, the daily sum of all long (short) open currency positions in certain foreign currencies and certain precious metals should not exceed 20% of the own funds (capital) of the credit institution. Any long (short) open currency position in certain foreign currencies and certain precious metals as well as the balance position denominated in rubles should not exceed 10% of the own funds (capital) of the credit institution on the day-to-day basis.

These are quite severe restrictions that do not allow bankers to convert foreign exchange deposits into rubles and allocate them in assets denominated in Russian currency. Theoretically, the ruble hedging transactions can be carried out in the forward market. However, the tightness of this market in Russia and costliness conditioned by a substantial interest rate gap between ruble denominated deposits and foreign exchange deposits do not allow the banks to apply this tool to the full extent.

However, Russian banks do not tend to maintain the negative currency position even with due account for the limit of balance position in respect of the ruble. Figure 8 shows the calculated data in respect of the open currency position indicators in the banking system of Russia from 2009 to 2016 in general. Throughout the whole period there was not a single day when the open foreign exchange position in the banking system of Russia had a negative value.

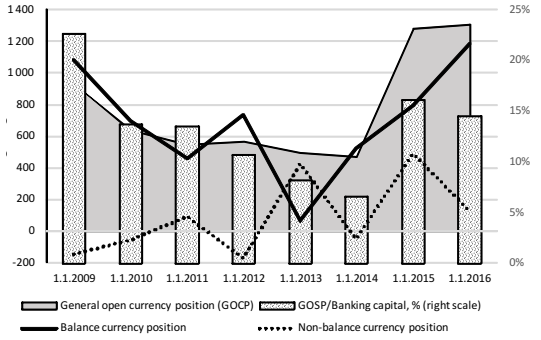

Figure 8: Dynamics of indicators of the open foreign exchange position in the Russian banking system

It can be seen from figure 8 that from the beginning of 2013 the volume of the balance long open currency position in the banking system grew from an almost neutral level of RUB 66 billion to RUB 1.2 trillion.

This means that commercial banks made a bid for the fall of the ruble market value, as the long foreign exchange position is profitable for the banks in case the national currency depreciates, which was exactly what happened in the following years.

The model of the economic agents' behaviour in Russia has always been different from the behaviour of similar agents in countries with the floating exchange rate regime, which has been caused by the fact that over the last 25 years legal and natural entities have been living in expectation of a sudden weakening of the national currency caused by external factors. It

can be noted that such psychology of the agents has been formed in almost all countries dependent on the raw materials export where the hybrid exchange rate regime was maintained. On the one hand, there was no systemic trust to the national currency; on the other hand, the monetary regulation authorities were incapable of securing long-term stability of the exchange rate. The long-term weakening trend after 2 or 3 years of a relatively stable national currency with a narrow range of fluctuations initially contributed to the opening of the short national-currency positions by banks and individuals.

It was particularly typical for such countries as Russia, Kazakhstan and Azerbaijan. In these countries the Central Banks tended to target the exchange rate within narrow bands. This was done quite successfully in the favourable commodity prices environment. The regulating authorities bought an increasing flow of foreign exchange revenue from the market, thus replenishing the international reserves. However, with the oil prices decline, these countries proved unable to withstand the speculators' pressure and the national currencies exchange rates were allowed to weaken.

Unfortunately, the period of adaptation to the new exchange rate regime in Russia coincided with a cycle of drops in energy prices, which confirmed the general lack of the economic agents' trust to the ruble. In any case, there were no widespread closures of short open currency positions in respect of the ruble.

From our point of view, a substantial period of floating of the Russian national currency should pass, so that the absence of the regulating authority in free trading would ensure its fluctuations in both directions. As a consequence, having an expressly short position in respect of the Russian currency will be disadvantageous for the economic agents due to the uncertainty of the future scenarios. Eventually the model of the economic agents' behaviour in Russia is going to be analogous to the one in Norway and Canada, where even under the conditions of severe fluctuations of the national currency, there are no sizable fluctuations of money aggregates and the economy's monetization level.

In case the inflation in Russia decreases to the target level and this result is maintained in the longer term, it is very likely that the stability in the behaviour of the economic agents will be attained. An impediment to these plans can be a high degree of the economy's monopolization, the absence of structural economic reforms and high dependence on international market price shocks in respect of the energy supplies.

7. Suggestions

The authors' suggestions in respect of limiting the capital outflow are as follows:

1. Tightening the restrictions in respect of long foreign exchange positions by the level of 5% of the capital, with a stable level of permissible short foreign exchange position of 10% from the bank's capital;

2. Gradual withdrawal of foreign exchange deposits from the effect of the law "On insurance of the bank deposits". For example, it is necessary to conserve the provisions of this law in respect of the existing foreign exchange deposits of individuals, but it should be abolished for the newly established foreign exchange deposits starting from a certain moment in the future. In this case, the depositor will either withdraw the remaining money from the account or convert it into rubles and allocate it on bank deposits in rubles with corresponding security guarantees.

3. To continue increasing the gap between the minimum reserves requirements for bank deposits in Russian and foreign currency. Starting from August 2016 this gap makes two percentage points. It is advisable to drive the reserve requirements in respect of foreign currency deposits from the current 7% to the maximum values stipulated by the law "On the Central Bank of the Russian Federation" (20%). In this case banks will be forced to weaken the long open foreign exchange position, since maintaining it will be unprofitable, as well as to impair several-fold the conditions of keeping deposits in foreign currency for the customers.

8. Discussions

The foreign exchange regulation should be considered in two aspects. On the one hand, the regulating authority should define the regulatory constraints for carrying out foreign exchange operations; on the other hand, it should establish the national currency exchange rate regime against other currencies.

There are many ways to transfer the capital, with the main being as follows: fictive export, securities market, insurance, construction and erection works, consulting, marketing and transport services, etc. The scale of Russia's capital outflow is counted in tens of billions of U.S. dollars per year. However, the discussion about the liberal foreign exchange policy in Russia was closed in the mid-2000s and there are no restrictions in respect of the cross-border capital movement.

In this regard searching for an efficient combination of regulatory and limiting constraints

in respect of the percentage of foreign currency denominated assets and liabilities in bank balance sheets and increasing the investment attractiveness of the national security market tools is a key factor of the stability of the financial account of the country's balance of payments. The latest data revealing a dramatic decrease in the capital outflow from Russia under the financial account of the balance of payments are indicative of taking the right steps in this direction.

References

Al-Abri, A., 2013, *Oil Price Shocks and Macroeconomic Responses: Does the Exchange Rate Regime Matter?*, OPEC Energy Review, Vol. 37, pp. 1–19.

Broda, C., 2004, *Terms of Trade and Exchange Rate Regimes in Developing Countries*, Journal of International Economics, Vol. 63, pp. 31–58.

Buetzer, S., Habib, M.M., Stracca, L. 2012, *Global Exchange Rate Configurations Do Oil Shocks Matter?*, IMF WP Series, No. 1442.

Cardarelli, R., Elekdag, S., Kose, M.A., 2010, *Capital inflows: Macroeconomic implications and policy responses*, Economic Systems, Vol. 34, No. 4, pp. 333-356.

Christoffel, K., Coenen, G., Warne, A., 2008, *The New Area-wide Model of the Euro Area: A Microfounded Open-economy Model for Forecasting And Policy Analysis*, ECB Working Paper, No. 944.

Domaschenko, D., 2016, *Correlation between Economic Growth, Oil Prices and the Level of Monetization of Economy*, Oil and Gas Exporting Countries: Challenges for Russia. Economic and social changes-facts trends forecast. Vol. 1, No. 43, pp. 96-107. doi: 10.15838/esc/2016.1.43.6.

Domaschenko, D.V., Finogenova, Y., 2015, *Analiz trendov denezhno-kreditnoy sistemy i finansovyh rynkov*, M.:PRUE., No. 1. doi: 10.21835/dksfr/1.2015.

Dosi, G., Fagiolo, G., Roventini, A., 2010, *Schumpeter Meeting Keynes: A Policy-Friendly Model of Endogenous Growth and Business Cycles*, Journal of Economic Dynamics & Control, Vol. 34, pp. 1748-1767.

Erceg, C.J., Guerrier, L., Gust, C., 2006, *SIGMA: A New Open Economy Model for Policy Analysis*, International Journal of Central Banking, Vol. 2, No. 1, pp. 111–144.

Fagiolo, G., Roventini, A., 2012, *Macroeconomic Policy in DSGE and Agent-Based Models*, Economix, Working Paper 2012-17, pp. 1-33.

Filis, G., Chatziantoniou, I., 2014, *Financial and monetary policy responses to oil price shocks: evidence from oil-importing and oil-exporting countries*, Review of Quantitative Finance and Accounting, Vol. 42, No. 4, pp. 709-729. doi: 10.1007/s11156-013-0359-7.

Finogenova, Y.Y., Nosov, V.V. 2015, *Modelling of factors, affecting the financial state of the world economies: challenges and opportunities for Russia*, Financial centers in the world system. International scientific-practical conference. M.: Publit, pp. 15-19.

Koh, W.C., 2016, *Oil price shocks and macroeconomic adjustments in oil-exporting countries*, International Economics and Economic Policy, pp. 1-24. doi: 10.1007/s10368-015-0333-z.

Korhonen, I, Juurikkala, T., 2009, *Equilibrium exchange rates in oil-exporting countries*, Journal of Economics and Finance, Vol. 33, No. 1, pp. 71-79. doi: 10.1007/s12197-008-9067-x.

Krugman, P., 2011, *The Profession and the Crisis*, Eastern Economic Journal, Vol. 37, pp. 307-312.

Kumhof, M., Laxton, D., Muir, D., Mursula, S., 2010, *The Global Integrated Monetary and Fiscal Model (GIMF) Theoretical Structure*, IMF Working Paper, No. 10/34.

Muhammad, N, Reza, A, Mohammad, I, Marashdeh, H.A., 2015, *Financial development and economic growth: an empirical evidence from the GCC countries using static and dynamic panel data*, Journal of Economics and Finance, Vol. 1, pp. 1-19. doi: 10.1007/s12197-015-9331-9.

Murchison, S., Rennison, A. 2006, *ToTEM: The Bank of Canada's New Quarterly Projection Model*, Bank of Canada Technical Report, No. 97.

Nourzad, F., 2002, *Financial development and productive efficiency: A panel study of developed and developing countries, Journal of Economics and Finance*, Vol. 26 (2), pp. 138-148. doi: 10.1007/BF02755981.

Pesenti, P., 2008, *The Global Economy Model: Theoretical Framework*, IMF Staff Papers, No. 55 (2), pp. 243–284.