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Problems and Prospects of Development of the Oil Exchange Market in the Russian Federation

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ABSTRACT

In the context of speculatively priced Russian oil on the world energy market, the oil exchange market development in the Russian Federation is updated. The purpose of the article was to rationalize conditions ensuring the crude oil market pricing by means of exchange trade development. The main objective of the scientific search was to justify state oil purchase as the main factor in improving the Russian oil exchange market liquidity at the present stage of its development. An optimal level of the ratio of public expenditures for oil exchange purchase to Russia's GDP was determined. The optimal amount of public expenditures for oil exchange purchase for the second quarter of 2018 amounted to 2,384.64 billion rubles. The optimal amount of public expenditures for oil exchange purchase is 89.9 million tons per quarter. State procurement of such oil volumes as of today could ensure an increase in the oil exchange market liquidity. The research results may lay the groundwork for enhancing the state strategy efficiency to improve the pricing of Russia's energy resources. Some practical focus areas substantiated in the article would contribute to the exchange market development at the present stage as a factor in the formation of an actual market price for Russian oil

Keywords: Oil Market, Oil Exchange Market, Participants in Oil Exchange Trade, Oligopolistic Oil Market, Russian Oil Industry
JEL Classifications: G23, L52, O24

1. INTRODUCTION

In the current context, the Russian Federation is one of the three largest oil-producing countries in the world. Urals oil production in Russia is 10 times as high as the Brent oil production in the USA (BFOE crude oil basket). At the same time, the volumes of Urals and ESPO oil export blends (oil supplied via the Eastern Siberia-Pacific Ocean pipeline system) are twice as large as BFOE, Oman, and Dubai traded volumes. Despite this fact, 70% of transactions are pegged to Brent quotes, and about 30% are pegged to American WTI oil through a differential determined by world price-reporting agencies (Katyukha, 2018). In other words, what the world energy market coordinates is not an actual price for Russian oil but the size of a discount on the oil price that normally does not correspond to its fair value (Caldara et al., 2018). According to expert estimates, each short-received dollar per barrel of Russian oil with a daily export volume of 3.25 million barrels entails a loss of state revenue of 2.7 million dollars per day. A discount on the Urals oil price to the Brent grade is in the range of 3-6 dollars per barrel. Thus, the annual loss of the federal budget of the Russian Federation approximately amounts to 2-5 billion dollars (Katyukha, 2018).

The current ominous situation around the Russian oil pricing on the world market and the opaque manipulation methodologies of world

price-reporting agencies update the search for the Russian liquidity crude oil market development directions (Katyukha, 2018).

The Russian oil products exchange market is currently developing quite effectively and amounts to about 15-20% of the total supply to the domestic market, while the crude oil exchange trade has not gained significant momentum. The existing oil industry structure, a lack of popularization of the hydrocarbon exchange trade in Russia and the absence of a comprehensive legal framework for managing Mercantile Exchanges have led to a low level of oil exchange trade. Thus, as of 2017, the exchange trade volumes amounted to 0.4% of total oil supplies to the domestic market; the number of transactions decreased by 66% against 2013 and amounted to 1.321 million tons of crude oil (SPIMEX, 2017). Crude oil exchange trade is carried out almost exclusively on the Saint-Petersburg International Mercantile Exchange (SPIMEX) with a volume of 406 thousand tons and is represented by two corporate sellers – Bashneft-Polyus LLC and Zarubezhneft JSC (SPIMEX, 2017). Whereas, for example, the average daily traded value in futures contracts of Crude Oil Light Sweet alone on NYMEX (New York) is >2 times as high as the average daily crude production volume in the world (NYMEX Crude Oil Futures Live Chart), and the daily traded value of Brent on IPE (London) is 17 times as high as the volume of daily oil production in the UK, (International Petroleum Exchange, 2018).

In this regard, the scientific problem of elaborating approaches to ensuring the oil exchange trade development in Russia is being actualized. Efficient Russian oil exchange trade would help to unpeg the Russian oil prices from the Brent benchmark by forming its own benchmark that would reflect the fair value of Russian oil and be independent of a judgmental estimate of world price-reporting agencies. It would affect elimination of the price spread between Russian oil and Brent and would create opportunities for the formation of direct quotation for Russian Urals oil in the Urals futures exchange trade. It would reduce the room for possible manipulations aimed at lowering the oil prices by the market players, which means that it would positively affect its fair market valuation and prevent Russian oil producers' losses because of non-transparent pricing. It would also increase the marginality and investment attractiveness of the Russian financial market as a whole.

The purpose of the research was to substantiate scientific approaches to improving the liquidity of the crude oil exchange market in the Russian Federation through public exchange procurement of raw materials with the aim of actual market price fixation for Russian oil.

In the course of the study, the following scientific research tasks were solved: major destructive factors for the oil trade development in Russia were justified; the need for public oil procurement on petroleum exchanges as the main method of ensuring the stock trading liquidity under modern conditions was substantiated; an optimal amount of public expenditures and the volume of oil procurement on exchanges, which would provide an increase in the exchange market liquidity and a growth of Russia's GDP was determined; main practical focus areas of activity for the crude oil exchange trade development in the Russian Federation were substantiated.

2. MATERIALS AND METHODS

The expediency of oil exchange purchases by the state was substantiated based on a multifactor regression model, its standardized variables being the following: GDP growth rate of the Russian Federation, consolidated budget balance of the Russian Federation, the ratio of traded oil volumes on the SPIMEX to oil production volumes in the Russian Federation, the ratio of public expenditures for oil exchange purchase to the GDP of the Russian Federation. The regression model parameters were estimated by the least squares method.

Regression analysis served as the methodological basis of the research, its principle being as follows:

1. Evaluating the statistical relationship between the GDP growth rates in the Russian Federation, the consolidated budget balance of the Russian Federation, the ratio of traded oil volumes on the stock exchange to the oil production volume in the Russian Federation, the ratio of public expenditures on oil exchange purchase to Russia's GDP was calculated using a correlation coefficient (Equation 1) (Potekhina et al., 2016):

$$r_{xy} = \frac{\sum_{i=1}^{m}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{m}(x_i - \bar{x})^2 \sum_{i=1}^{m}(y_i - \bar{y})^2}} \quad (1)$$

Where r_{xy} is a correlation coefficient;
x_i is the independent variable value;
y_i is the dependent variable value;
$\bar{x}$, $\bar{y}$ are average values of the variables for the period under study (the fourth quarter of 2015 –the second quarter of 2018);
m is the number of periods.

The correlation coefficient value |0.1|–|0.3| stands for a weak constraint force; |0.3|–|0.5| – moderate; |0.5|–|0.7| – noticeable; |0.7|–|0.9| – high; |0.9|–|1| – very high.

Determining the nature of relationship between the indicators and analytical representation of the function of random variable y dependence on variables $x_1, x_2, \ldots, x_n$.

The method was used to determine the functions of dependence of GDP growth rate in the Russian Federation on the ratio of oil volumes traded on the exchange to the production volumes; the GDP growth rates on the ratio of public expenditures for oil exchange purchase to GDP; the consolidated budget balance on the ratio of public expenditures for oil exchange purchase to Russia's GDP.

In general, a multifactorial regression model has the following form (Mishra and Datta-Gupta, 2018):

$$Y = b_0 + b_1 * x^{(a_1)} + b_2 * x^{(a_2)} + \ldots + b_n * x^{(a_n)} \quad (2)$$

Where Y is a dependent variable;
x is an independent variable;
b_0 is an absolute term;
$a_{1,\ldots,n}$ are coefficients at the independent variable;
$a_{1,\ldots,n}$ is polynomial degrees.

The regression model parameters ($b_0, b_1, \ldots, _n, a_1, \ldots, _n$) are estimated by the least squares method. Its principle is to select model parameters whereby the sum of squared deviations of the actual values of a dependent variable from the predicted values is minimized (Mishra and Datta-Gupta, 2018):

$$\sum_i^N (Y_i - \overline{Y}_i)^2 \rightarrow min \quad (3)$$

where Y_i is the actual value of the dependent variable in the i-th period;
$\overline{Y}_i$ is the predicted value of the dependent variable in the i-th period;

Additional estimates used to analyze and process the data were Herfindahl-Hirschman Index (HH) and an indicator standardization method. According to the index, commodity markets are classified into the following groups:

- Group I: Markets with a high level of monopolization (concentration) (monopolistic markets) 1800 <HHI<10000;
- Group II: Markets with a moderate level of monopolization (concentration) (oligopolistic markets) 1000 <HHI <1800;
- Group III: Markets with a low level of monopolization (concentration) (competitive markets) HHI <1000

The HH (Equation 4) was used to estimate the oil market concentration level in Russia (Cruise et al., 2018):

$$HHI = \sum_{i=1}^n S_i^2 \quad (4)$$

where HHI is the HH;
S is the share of production (sales) of the i-th operator in the total output (sales) volume in the market;
n is the number of market operators, $i = 1...n$.

The use of data with different dimensionality in building regression models (absolute and relative ones) necessitated data standardization (Equation 5) (Rousseau et al., 2018):

$$X_{st} = \frac{X_i - \overline{X}}{\sigma} \quad (5)$$

where X_{st} is the standardized value of an indicator;
X_i is the actual value of the indicator;
$\overline{X}$ is the average value of the indicator;
σ is the standard deviation of the indicator.

3. RESULTS

Oil exchange trade is a permanent wholesale trading platform where contracts are concluded and crude oil buying and selling transactions are effected (Jia, 2018). All stock exchange transactions are handled according to strictly controlled generally accepted rules. Mercantile Exchanges contribute to the development of cooperative ties between oil sellers and buyers, act as a catalyst for the oil industry development that reduces commodity distribution costs and the working capital requirement, promote the development of scientific and technological progress, and stimulate the demand (Fracasso et al., 2018).

As part of the study of the oil exchange trade development, reduction in the cost of transporting oil and related costs should be noted as a functional advantage of stock exchanges. Oil production and recovery is concentrated in different regions of Russia: the Volga-Ural basin, Western and Eastern Siberia, the Timan-Pechora oil region, the Khanty-Mansiysk Autonomous Region, the Krasnoyarsk Region, the Yamalo-Nenets Autonomous Region, North Caucasus, and other regions (Kapustin and Grushevenko, 2018). Oil sales through Mercantile Exchange make it possible to avoid non-production costs for transporting oil to a sales area. Expenses for cargo insurance, cargo handling operations, escort and protection of goods are eliminated.

The expediency of the oil exchange market development, given the oligopolistic nature of the Russian energy market, is to arrange market pricing conditions. Exchange trade allows for equilibrium oil pricing to the greatest extent consistent with the current market environment. At present, quotes published by price-reporting agency Platts in Crude Oil Marketwire reviews form the pricing basis for Russian Urals oil (SP Global Platts, 2018). The main disadvantages of this pricing method are:

- Ill-conditioned delivery basis. The price for Dated Brent and the forward price for Dated Brent are determined on FOB terms (at the port of loading), while the Urals spread is determined on CIF terms and includes the cost of transportation from the port of loading to the destination, which, given the behavior and volatility of the oil market, makes the Russian oil pricing opaque (Caldara et al., 2018).
- Urals oil price pegging to Brent. The price for Russian oil is defined as a differential to a reference fuel grade of a different quality, with a different oil delivery place and with different market conditions (Caldara et al., 2018);
- Incorrect differential. The differential of Urals to the reference grade price is determined by Marketon-Close method by Platts agency; the method lacks transparency and conflicts with the interests of Russian oil producers for the following reasons: the number of market participants at the close of trading is limited and there is no mechanism to follow up and monitor the settlement of transactions recorded at the time of market closing. In fact, the current price fixation basis for Russian oil according to the Platts method is the position of bidders at the close rather than fundamental factors of oil markets. The consequence for Russian oil producers in the context of this pricing approach is to limit their ability to influence the price unlike other oil market players, which ultimately adversely affects the Urals oil price, keeping it at a relatively low level.

Due to the importance of the pricing problem for the oil industry development in Russia, the Government of the Russian Federation pays considerable attention to regulation in this area. The Ministry

of Economic Development of the Russian Federation (MED), the Federal Antimonopoly Service, and the Ministry of Energy of the Russian Federation (Minenergo) are actively involved in the elaborating a crude oil pricing methodology in accordance with the concept defined by draft law "On Oil and Oil Products Market Pricing in the Russian Federation" (Draft Federal Law, 2013). The formulas developed to calculate price indicators are based on export-alternative prices or netback, but exchange indication is not included in this approach. In addition, it should be emphasized that the proposed approaches of all the government agencies in their methods contain elements that have not been sufficiently substantiated, such as, for example, 5% and 20% differential in the MED and the Minenergo formulas, respectively (Oil-Expert, 2018). In general, the methods proposed by the Russian public agencies make it possible to determine prices for Russian oil more objectively than by the world agencies. However, they represent only a certain fair price reference and do not have a significant impact on the actual price for raw materials.

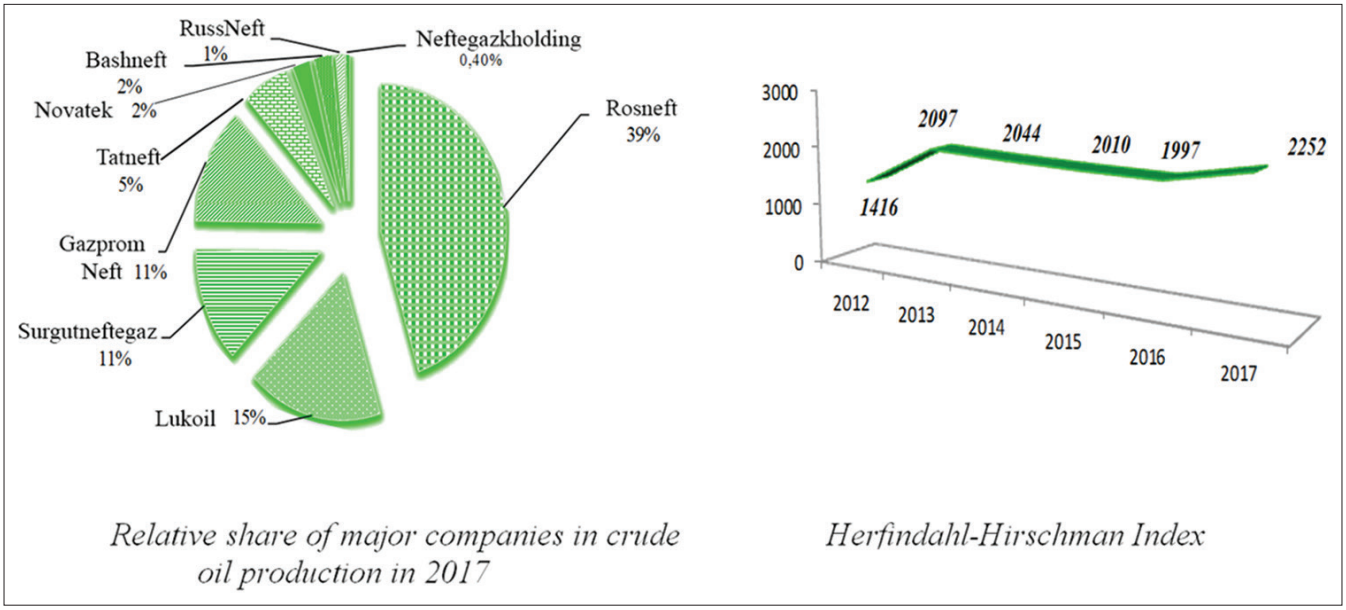
To improve the oil market pricing, it is necessary to have new benchmark grades, and the Russian Federation as one of the leading oil producers should be directly involved into this process. Formula calculation of oil prices should be gradually downgrade, while conditions for explicit market pricing through actually concluded transactions should be created, which is possible only through the development of a liquid exchange market in Russia.

The low level of the Russian oil market liquidity is determined by the current national oil industry structure that is characterized as oligopolistic and is represented by a few major oil companies: Lukoil, Surgutneft, Rosneft and medium-sized ones: Tatneft, Slavneft, Bashneft, and RussNeft. In general, the group of major oil companies accounts for up to 86% of oil production in Russia, while the group of "medium" and "small" companies accounts for only 14% (Figure 1) (Expert Online, 2018). The data have shown that in 2012 the Russian oil market was characterized as a moderately concentrated market, according to the HH calculated using Equation (4). However, after the purchase of *TNK-BP*, a highly monopolistic nature was inherent in the oil industry in Russia (Todorova, 2016) to only intensify in 2013-2017 (Figure 1). The current situation causes a lack of competition in the country's oil market, which prevents fair competitive oil pricing on the domestic market, and the presence of stiff barriers to entry for small and medium-scale oil producers. In addition, the current average cost of Russian oil production ranges from 10 to 15 dollars per barrel, which includes both operating costs and return costs of capital investment (Expert Online, 2017). According to experts, the explored oil reserves in Russia amount to 14 billion tons, which will suffice for 28 years with the current level of consumption (How Much Oil is Left in Russia, 2018). It means that future development of the country's oil industry will be based on hydrocarbon extraction from hard-to-recover reserves and the continental shelf where the cost of Russian oil extraction will be at least 50 dollars per barrel (Expert Online, 2017). Thus, a pricing trend towards higher prices for Russian oil is in evidence in the near future, which will further depress the opportunities for small and medium-sized producers to enter the market and will make it increasingly oligopolistic in nature.

Possessing its own capacities at virtually all petroleum production stages, Russia's major vertically integrated oil companies (VIOCs) have the predominant ability to flexibly regulate prices on the market in either direction they need, including to influence the price growth rates. Consequently, the current pricing process on the oil market in Russia is rather an analysis of companies' oligopolistic activity framework in the fuel and energy complex and identification of key factors for their development than an analysis of the market environment at the domestic level. The current situation creates risks of uncertainty that, along with high barriers to entry to the market, impede the crude oil exchange trade development (Takhumova et al., 2018; Vasiljeva, 2017).

In addition, it is necessary to take into account the fact that the predominant part of the crude oil volume in Russia is produced

Figure 1: The level of oil market concentration in the Russian Federation



by vertically integrated companies that supply it to their own refineries (Andrianov, 2017). In other words, they do not need to trade oil on the exchange market because trading is carried out outside the exchange market based on refineries or dispatch stations, which results in highly concentrated oil refining capital. This, in turn, enhances seller monopolization and reduces market competitiveness. Nevertheless, small and medium-sized oil companies operate in the Russian industry (there are about 250 of them) (FSSS, 2018) that do not yet use the oil exchange trade arrangements for various reasons.

Along with the existing transfer pricing system in the domestic oil market, the absence of a comprehensive legal framework to regulate the commodity and derivatives trading seems to be an essential destructive factor in the exchange market development. Today, the provisions of the Law of the Russian Federation "on trading in the organized market" are aimed at ensuring fulfillment of functions by trade exchanges, while there are no provisions for operational regulation of organized commodity trading facilities. Despite the activities of the mercantile exchange commission at the Federal Service for Financial Markets of the Russian Federation, authorized as a regulatory agency, no legally relevant statutory documents have appeared at this level, since the Federal Law "On Trading in the Organized Market" of 11.21.2011 does not provide for respective decisions on operational regulation of organized tenders among the functions of the Mercantile Exchange Commission (FZ-325, 2011).

The lack of global understanding of the core of the problem, as well as some misconceptions about how and why modern Mercantile Exchange market operates, on the part of the Russian regulator, that is, the Central Bank of the Russian Federation and the SPIMEX management, constantly lead to erroneous managerial decisions that only exacerbate the backwardness of the Russian crude oil and oil products exchange sector (Evstafeva, 2016). It means that there is no clear idea of what is traded on the modern Mercantile Exchange market and what place this market takes in the pricing and price risk management structure in major oil and oil products markets.

According to the research, all the major Mercantile Exchanges in the world do not carry out trade organization activities and are focused on the production of price indicators and high-tech services to hedge price risks from adverse price movements in the spot market (Yao, 2017).

Thus, with reference to the above, it can be stated that there are institutional, organizational, and technical problems of the mothballed oil exchange market in Russia that, of course, can only be resolved drawing on a balanced cooperation between the state and capital. The role of the state in this case is not only to remove the most significant obstacles to the creation of Russian fuel exchange but also to create a system of sufficient incentives for active oil exchange trade development.

At this stage, in order to develop the exchange oil market in the Russian Federation, it is necessary to ensure market liquidity – an increase in its capital capacity by attracting the maximum possible number of participants and amount of capital to operations on the organized market. One of the priorities for solving this current issue should be active participation of the state not only as a regulatory and institutional arrangement but also as a participant in the oil exchange trade. At this stage of stimulating the oil exchange market liquidity development, it is advisable for the state to streamline the oil and oil products procurement arrangements for state needs. Exchange purchase by the state can be made at the expense of consolidated or federal budget, procurement of publicly owned unitary enterprises, as well as other procurement listed by the Government of the Russian Federation. In this regard, the study determined the optimal amount of public expenditures on the crude oil procurement on the Russian stock market that would ensure its liquidity development and contribute to the country's GDP growth.

Added value is created on the oil exchange market through sale and resale of oil as an underlying asset (Sharma, 2017). This added value is included in GDP. The higher the purchase price, trading volumes, and the number of transactions in one asset are, the greater the added value is, and hence the GDP (Lyu et al., 2018; Paoli et al., 2018). Therefore, one of the instruments to ensure the GDP growth and the national economic development is formation of a liquid oil products market involving more sellers and buyers, and fair pricing.

A direct instrument for creating added value is an increase in market capitalization due to its two components: quantity and price. Quantity and prices, like in any other market, are influenced by supply and demand (Akhmetov, 2015). An offer is formed by oil producers. As an indicator to describe a change in supply, the research used the ratio of traded oil volumes on the exchange to production volumes. This indicator, in contrast to the absolute indicator of traded volumes or production volumes, allows for estimation of the prospects for increasing supply in the market by comparing the actual trade volumes with the potential ones (maximum possible that would correspond to the production volumes).

Demand is determined by the participation of consumer firms and the state in oil bidding. The purpose of the paper is to study the influence of the public oil procurement volume on the national economic situation and the exchange market liquidity; therefore, out of the indicators characterizing a change in the demand for oil, the ratio of public expenditures for oil to GDP was used. The analysis did not take the absolute value of public expenditures but their relative value compared to GDP in order to take into account the state participation rate in regulating the oil exchange market and creating demand for oil (Benkovskis and Wörz, 2018; Kilian and Zhou, 2018).

Indicators characterizing the participation of other consumers in the oil market are uncontrolled parameters depending on the level of the exchange market development and other factors. Therefore, they were not considered.

The amount of public expenditures directly impacts GDP, on the one hand, while on the other hand, it has a reverse influence on the

state budget balance. In addition, according to the Armey curve (6 curves proving that to "nudge" economic growth, one needs to reduce government spending Business Views, 2015), an increase in government spending only to a certain limit contributes to an increase in GDP, while a further increase in government spending contributes to its contraction as a result of demotivating traps for private entities and reduces their performance due to a high level of budget wealth redistribution.

Based on the above economic law, it is necessary to determine a favorable ratio of traded volumes and public procurement of oil on the exchange market, taking into account their impact on the real GDP level and the state budget balance. To do this, Equations (1)-(3) were used in the Statistica 13.0 program to build regression models of dependence of the real GDP growth rates on the ratio of exchange traded oil volumes to production volumes (Equation 6, Table 1), dependence of the real GDP growth rates on the ratio of public expenditures for oil exchange purchase to GDP (Equation 7, Table 1), dependence of the consolidated budget balance of the Russian Federation on the ratio of public expenditures for oil exchange purchase to GDP (Equation 8, Table 1).

The real GDP growth rates were taken as a resulting indicator for Functions (6) and (7) in order to neutralize the effect of inflation on changes in the GDP. All the other indicators in Models (6)-(8) were calculated as a ratio of cost indicators, whereby the effect of inflation is neutralized. Therefore, for these indicators their nominal values were used.

For building a dependence model, all the relative indicators were used except for Russia's consolidated budget balance indicator. This indicator, along with the ratio of budget balance to GDP, was used to assess the country's fiscal performance. However, from the macroeconomic perspective, a positive trend in the ratio of budget balance to GDP, on the one hand, may indicate fiscal efficiency if indicator changes are conditioned by an increase in the budget surplus. On the other hand, if an increase in the indicator is determined by GDP contraction, this indicates a lack of economic growth. Therefore, in order to ensure unambiguity in the interpretation of results, Model (8) used the absolute value of the budget balance as a resulting indicator. In this model, budget balance as a dependent variable is an absolute value; the ratio of government spending to GDP as an independent variable is a relative value. To bring the data into a commensurable form, the dependent variable (Y3) was standardized using Equation (5).

The ratio of government spending on the oil exchange purchase to GDP (X2) affects the budget balance (Equation 8) and the level of GDP (Equation 7). In this regard, to assess the total impact of variable X2, to bring Models (7) and (8) into a commensurable form for further processing, in addition to standardizing Y3 indicator, the GDP level indicator (Y2) is also to be standardized.

Due to limited information on oil trade on the SPIMEX that publishes data every month starting in August 2015 and a lack of monthly data on GDP and oil production volumes in the public domain, the regression models were built based on the indicator values for the fourth quarter of 2015 – the second quarter of 2018. The SPIMEX was taken as an example to study the oil exchange trade, whereby 99% of the organized oil and oil products trade is carried out (SPIMEX, 2018).

The following indicators suggest the adequacy of Models (6)-(8) built by the authors:

1. Multiple correlation coefficient whose values tend to 1;
2. Coefficient of determination whose values exceed the sufficient level of 0.75;
3. Fisher's F-test whose calculated values (10.18-13.68) exceed the tabulated value 5.12 at a significance level of 0.05.

Based on these criteria, at the 95% credible level it can be said that there is a statistical significance of the models of dependence of the real GDP growth rate and the consolidated budget balance of the Russian Federation on the volume of oil exchange trade and public expenditures for oil procurement in Russia.

Function f_1 shows that an increase in the volumes of oil exchange trade in relation to the production volumes contributes to an increase in GDP up to a certain point, whereupon an increase in the ratio of exchange traded oil volumes to the oil productions volumes would lead to GDP contraction.

The optimal value of the ratio of the exchange traded oil volumes to the production volumes (Equation 6), at which the maximum GDP growth rate is reached, is determined by finding the extremum of Function (6) through its derivative. The function extremum corresponds to the value of independent variable X_1, at which the

Table 1: Models of Russia's GDP level and consolidated budget balance dependence on the public expenditures for oil purchase at SPIMEX

Function symbol	Dependence function	Model adequacy indicator		
		R	R^2	F
f_1	$Y_1 = -1.33 * X_1^2 + 2.31 * X_1 + 0.23$ (6)	0.89	0.79	12.47
f_2	$Y_2 = -63.91 * X_2^2 + 16.62 * X_2 + 0.04$ (7)	0.94	0.88	13.68
f_3	$Y_3 = -2.57 * X_2 + 1.46$ (8)	0.88	0.77	10.18

Symbol legend: f_1 is a function of dependence of real GDP growth rates on the ratio of exchange traded oil volumes to production volumes, f_2 is a function of dependence of real GDP growth rates on the ratio of public expenditures for oil exchange purchase to GDP, f_3 is a function of dependence of the consolidated budget balance on the ratio of public expenditures for oil exchange purchase to GDP, Y_1 is the real GDP growth rates, Y_2 is the standardized real GDP growth rates, Y_3 is the standardized consolidated budget balance value, X_1 is an indicator of the ratio of exchange traded oil volumes to production volumes, X_2 is an indicator of the ratio of public expenditures for oil exchange purchase to GDP

derivative of function $Y_1^{'} = 0$ or does not exist (Equation 9). The coefficient at X_1^2 has a negative value (−1.33), therefore, the extremum of the function is its maximum value.

$$\begin{cases} Y^{'} = -1.33 * 2 * X_1 + 2.31 = 0 \\ X_1 = 0.87 \end{cases} \quad (9)$$

According to function f_1, the optimal value of the ratio of exchange traded oil volumes to the production volumes is 0.87, at which the real GDP growth rate reaches its maximum value.

The model of dependence of GDP growth rates on the ratio of public expenditures for oil exchange purchase to GDP (Equation 7, Figure 2a) confirmed the parabolic nature of GDP dependence on government spending on oil: an enhancing GDP growth with the share of government spending increased to 0.13 and a slowdown in GDP growth rates with the share of government spending in above 0.13. The maximum GDP growth rate is observed at the level of public oil procurement on the SPIMEX against GDP being 0.13.

Function f_3 (Equation 8, Figure 2b) demonstrates an inverse dependence between the following indicators: the consolidated budget balance decreases as the government spending increases.

Functions (7) and (8) are functions of dependence of national development indicators on the indicator of the ratio of public expenditures for oil exchange purchase to GDP. These functions describe a different nature of the independent variable (X_2) influence on the dependent one (Y_2, Y_3), expressed by parabolic and linear dependence functions, respectively. Therefore, in order to determine the optimal level of variable X_2, taking into account its influence on the GDP level and the consolidated budget balance, it is necessary to calculate the total macroeconomic effect of a change in the ratio of public expenditures for oil exchange purchase to GDP.

Dependent variables Y_2 and Y_3 are a standardized value and independent variable X_2 is one of functions f_2 and f_3, therefore, the total macroeconomic effect (macroeconomic cost effectiveness indicator) can be calculated as the sum of these functions (Figure 2c).

Analytical expression of function f has the form:

$$Y = -63.91 * X_2^2 + 14.1 * X_2 + 1.5, \quad (10)$$

Where is a macroeconomic cost effectiveness indicator of public expenditures for oil exchange purchase;

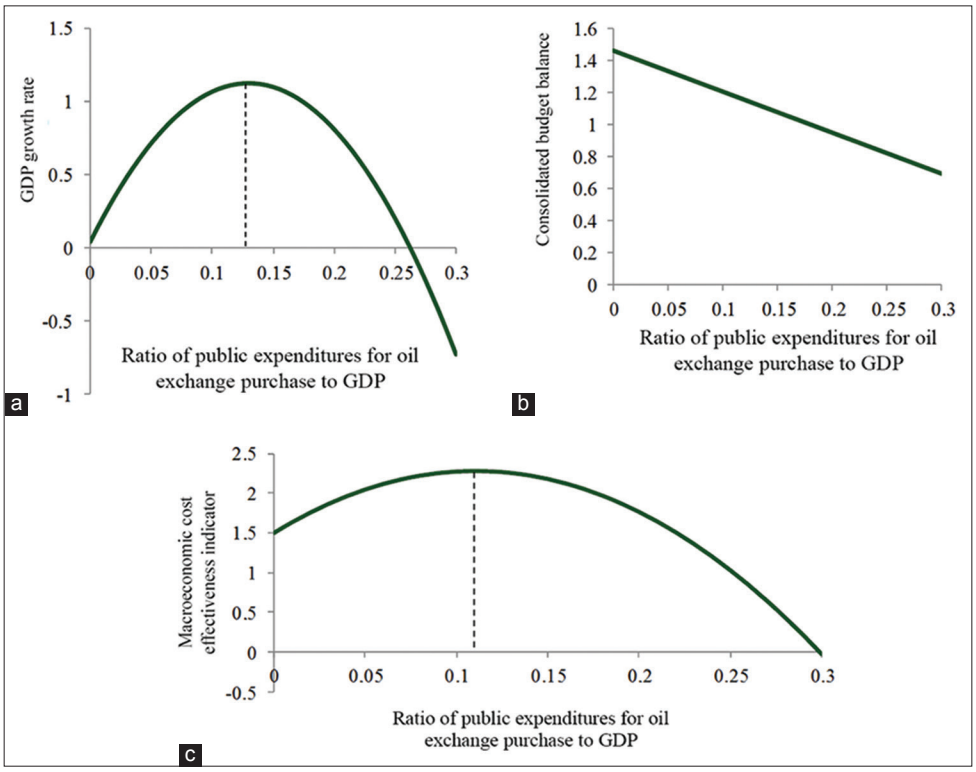
X_2 is an indicator of the ratio of public expenditures for oil exchange purchase to GDP.

Based on the obtained Function (10), the optimal level of the ratio of public expenditures for oil exchange purchase to GDP, at which the macroeconomic efficiency function f is maximized, is the indicator value equal to 0.11.

5. DISCUSSION

Thus, based on the optimal value of the ratio of public expenditures for oil exchange purchase to GDP, calculated in an empirical study and equal to 0.11, and the GDP for the second quarter of 2018 amounting to 21,678.6 billion rubles (FSSS, 2018) it is possible to identify the optimal amount of government spending on oil

Figure 2: Function f curves, (a) function f_2 curve, (b) function f_3 curve, (c) function f curve



exchange purchase that would contribute to an increase in the Russian stock exchange market liquidity. The optimal amount of government spending on oil exchange purchase in the second quarter of 2018 amounted to 2,384.64 billion rubles. In the second quarter of 2018 SPIMEX traded only crude oil, its weighted average exchange price in the second quarter amounted to 26,525 rubles per ton of oil (SPIMEX, 2018). Based on the government oil purchase volume and its exchange price, the optimal amount of government procurement of crude oil at this price level would be 89.9 million tons per quarter. It is public procurement of such a volume of oil that can ensure the oil exchange market liquidity today, while the extension rate of the volume of public oil exchange purchases and sales must be commensurate with the extension rate of the total exchange traded volumes.

Experts agree that a traded volume that would be sufficient for objective crude oil pricing ranges from 15% to 30% of the total market. State participation in the early stages can ensure exactly such a level of the oil market capitalization, which in the process would be forming fair oil prices and lay the groundwork for attracting a large number of participants to the exchange market and carrying out major transactions. Currently, 299 organizations that produce and sell oil in Russia can become market players. These include: 117 organizations affiliated with 11 VIOCs and producing 87% of the total oil volume in the Russian Federation; 179 independent companies that are not affiliated with VIOCs, extracting 10.2% of oil; 3 companies operating under a production sharing agreement and producing 2.8% of the overall oil volume in the Russian Federation (MERF, 2018).

Each group of potential oil exchange market players in Russia obtains their own specific benefits. Small oil companies have two exchange trade priorities. The first one is the possibility of extracted oil free sale on the trading floor at the highest possible price with no reference to the refinery. The second one is purchase of oil at prices significantly lower than the netback price on foreign trading floors with subsequent oil exports to the world market at a higher price.

The main priority for oil refineries both affiliated with VIOCs and independent ones is purchasing the required raw materials on the exchange market after intra-company deliveries at the lowest price in order to maximize the oil refining margin. In addition, the exchange market may become the only source of raw materials for independent refineries in the future.

However, it is necessary to take into account the fact that attracting new entrants to over-the-counter market is possible only if the oil exchange price is indicative. Certainly, with an increase in the market liquidity, the oil quotation will become more indicative, whereas the importance of calculated price indicator will gradually come down. In this regard, a no less important element in the Russian oil exchange market development is consolidation of information on preliminary prices, including a premium or a discount in relation to the benchmark crudes. This information can be consolidated based on the following: data on off-exchange transaction registration, data obtained as a result of oil sales through the SPIMEX unified trading facility, and others.

The consolidation of information would make it possible to form reliable oil price indicators taking into account the liquidity of trade at SPIMEX. That, in turn, would allow for timely monitoring and regulation of the market in the event crisis situations and antitrust infringement are identified, as well as for stimulating the growth in oil volumes traded on the exchange market. At present, the task of forming an indicator that would reflect both the exchange component to reduce risks associated with price volatility on foreign trading floors and netback prices to reduce the risk of monopoly control over the exchange market of oil and oil products by major participants in exchange trade is relevant.

Taking into account the high level of Russia's domestic oil market concentration under the current conditions, it is necessary to use the power of the state in order to expand the competition mechanism to ensure the exchange market development. This contradicts the economic theory that the higher the market liberalization level is, the less government participation is therein. However, according to the authors, at this stage it is the state that can provide an increase in the exchange market liquidity and openness by implementing the following package plan:

- Ensuring performance of the system of state agencies for operational control of the oil exchange market with an approved list of relevant competencies;
- Definition and legislative recognition of a minimum threshold for exchange sales of no <3% of the annual volume of oil produced by major Russian oil companies. According to expert estimates, the total sales amount of raw materials after the introduction of this legal provision may well reach 18–20 mln tons per year, and the share of major extractive companies will be at least 12 million tons (Temnichenko, 2018);
- Definition and legislative recognition of a minimum threshold for oil exchange purchase for government organizations and the volume of consolidated budget expenses for oil exchange purchase;
- Development of a financial freedom assurance system for speculative traders in the oil market and a mechanism for protection of a speculative margin and a free flow of capital, including financial intermediaries;
- Creation of specialized public funds to support exchange initiatives;
- Development of a program on the SPIMEX taxation preferential system for products traded on the derivatives market and an incentive program for preferential lending to speculative traders;
- Formation and implementation of a program to stimulate the oil market players to ensure the exchange market liquidity to create a new price standard;
- Development of an interaction program for Russian oil companies for them to distribute part of the overproduced oil among those who do not fulfill their quotas for oil sales at SPIMEX;
- Active marketing promotion of the Russian oil benchmark among domestic and foreign market players, as well as among representatives of the financial market;
- Ensuring reliability of the supply infrastructure and a stable quality of Russian oil. In these terms, the authors mainly refer to Russian Urals oil and focus on capital maintenance of fixed

assets of oil companies and refineries in order to improve the quality of the oil grades they produce. An increase in the refined oil volumes in the territory of the Russian Federation from Bashkiria and Tatarstan so that it is not fed to export pipelines and, consequently, does not raise the sulfur content.

- Implementation of the package plan presented above would help attract additional players to the exchange oil market in Russia, which would reduce the possible share of major players and oligopolization of the market.

6. CONCLUSION

This research is aimed at determining an optimal level of public expenditures for oil exchange purchase that would contribute to the growth of Russia's GDP and to competitive price fixation for Russian oil.

The empirical research data allows for the following conclusions:

1. Under the conditions of a stable oligopolistic structure of the oil industry in Russia, a high level of the domestic oil market concentration and a lack of a comprehensive legal framework in regulating the raw materials trade and the crude oil exchange trade have not gained proper momentum. As a result, the modern Russian oil market operates on the basis of a transfer pricing system for oil and is characterized by a strong correlation dependence on the level and volatility of Brent oil prices. The current situation has made it possible to ensure the oil exchange market liquidity at the present stage of its development only through the public oil exchange purchase.
2. The developed models of dependence of Russia's GDP level and consolidated budget balance on the public oil procurement volumes on the SPIMEX allowed the authors to determine the optimal ratio of government spending on oil exchange purchase to the country's GDP at the rate of 0.11. Consequently, the optimal amount of government purchases of crude oil that would contribute to the growth of Russia's GDP and increase the exchange crude oil market liquidity at this price level would be 89.9 million tons per quarter.
3. The presented system of optimization measures to be taken by the state for the oil exchange trade development in the Russian Federation is based on institutional, technical, and legislative changes in the exchange mechanism control. Practical implementation of this package plan by the state, as well as ensuring purchase of an appropriate amount of oil on the SPIMEX would promote the necessary level of oil trading capacity, conduce a fair competitive oil pricing policy on the domestic market, ensure its indicativeness, and lay the groundwork for attracting numerous participants in exchange trade and for settlement of major exchange transactions. It would allow for formation of Russian oil benchmark among domestic and foreign market players as well as for elimination of the price spread between Russian oil and Brent.

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