The Relationship between Oil Prices and Exchange Rate in Russia

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ABSTRACT

This paper studies the relationship between oil price and the exchange rates in Russian Federation. There is a close interrelation between the currency rate of dollar to ruble and oil prices. The regression model has accurately shown this interrelation. The interrelation with a foreign policy factor - sanctions of the USA and the European Union is also revealed. There is a close interrelation between the currency rate of dollar to ruble and oil prices. The regression model has accurately shown this interrelation. Oil prices of the Brent oil is the dominating factor in a currency exchange rate formation mechanism of ruble, at least, in the long term. When world oil prices are stabilized and sanctions cancelled, currency fluctuations and uncertainty will be minimized. The findings of this paper may be used by foreign and domestic investors while taking decisions because all the shocks impact on the economy in short and long term.

Keywords: Oil Price, Exchange Rate, Interrelation with a Foreign Policy Factor
JEL Classifications: C58, F31, Q35

1. INTRODUCTION

Russia takes the sixth place in the world on export of crude oil that determines value of this resource in structure of its gross domestic product (GDP) and impact on the exchange rate of national currency. During the different periods of time amounts of oil extraction grew or were reduced, but practically always oil acted as the main export product of the country. In 1991-1999 oil constituted up to 30% of GDP though during this period the economy of Russia experienced deep recession which was followed by high inflation, fall of inflow of investments, growth of an external debt and other negative signs. The economic reforms which were carried out in the nineties have provided liberalization of the prices and foreign trade, transition from planned to market economy have strengthened relations of the currency rate and oil prices.

Dynamics of growth rates of GDP of Russia in many respects depends on the change in price for oil which influence was especially felt during the periods of crises of 1998-1999 and 2008-2009 (Figure 1). While during stable periods of development of economy this dependence was shown to a lesser extent (2004-2007).

In December, 2014 there was a ruble exchange rate collapse in relation to dollar and euro and the currency crisis has begun. Crisis has been caused by imposition of economic sanctions and fall of oil prices that promoted further recession in economy.

In 2015 dropping prices on oil and economic sanctions promoted decrease in a level of development of economy. For the first half of the year 2015 decrease in GDP has constituted 3.5%. Devaluation of the Russian currency and fall of the stock market have led to the fact that market capitalization of the Russian companies has returned on the level of 2005. According to International settlements bank, actual effective ruble exchange rate by September, 2015 has decreased concerning December, 2013 by 30.4%.

Figure 1: Russian gross domestic product and the oil price

Depreciation of ruble became one of major factors of increase in inflation and, as a result, promoted decrease in real disposable incomes of the population and long-term chilling of the consumer demand. According to the Ministry of Economic Development of the Russian Federation, according to the results of 2015, inflation in Russia has grown to 12.91%. Oil prices fluctuations play a major role in explaining the real exchange rate movements. The main objective of this study is to determine the strength of the dynamic relationship between crude oil price and exchange rate. A good understanding of the nature of comovement of oil prices and exchange rate is crucial for traders and institutional investors.

2. LITERATURE REVIEW

International researches show that at the movement of hydrocarbons as goods any couple being the importer and exporter will be always presented and, therefore, the model constructed on introduction of foreign exchange rate as a factor will always be reasonable and practically confirmed (Branson, 1981).

Generally, all researches in the world can be divided into some groups where main criterion of allocation is their point of view on influence of rate of national currency and force of such influence (Clarida, 1994; Dornbusch, 1980; Golub, 1983; Krugman, 1983, Rickne, 2009).

The first group of researchers draw a conclusion about influence of a cross rate on prices of oil on the basis of their conducted researches. Amano and Norden (1998) showed this dependence in the late nineties of last century in the American market, Akram (2004) and Issa et al. (2006) came to similar conclusions on researches held in the markets of Norway and Canada respectively. Further in the second half of zero years Chen and Chen (2007) showed similar processes in the countries of the big seven, Coudert et al. (2008) showed such communication once again in the American market and at the same time Narayan (2008) showed such tendency on the Fiji Islands, Mendez-Carbajo (2011) investigated the markets of Dominican Republic. Well known scientists such as Lizardo and Mollick (2010) conducted large-scale research on the markets of Canada, Mexico, Norway and Russia as regarding to oil exporters and gave comparison with the countries of euro zone and also came to confirmation in exchange rate influences on oil prices.

The following group of researchers speaks about stochastic dependence between the considered factors and the conducted researches. Indjehagopian et al. (2000) at the beginning of zero years in the markets of Holland, Germany and France, then also Sadorsky (2000) in the markets of the USA together later with Zhang et al. (2008), who investigated also future markets of hydrocarbons, they all confirm such point of view. Similar conclusions are received by researchers during the same period and over very other countries and regions, so, for example, Yousefi and Wirjanto (2004) in the first half of zero years conducted researches in the markets of hydrocarbons of Indonesia, Iran, Nigeria and Saudi Arabia.

One more group of researchers revealed inversely proportional dependences between prices of oil and exchange rate. In particular two researchers came to such conclusions being Huang and Tseng (2010) in the analysis of behavior of the market during this period in the USA.

However there is a number of scientists having researches led to conclusions that a stable relation between these factors is not identified. In particular Habib and Kalamova (2007) came to such conclusions in a market research of Saudi Arabia, Wu et al. (2011) on the selected markets of the USA and Mohammadi and Jahn Parvar (2010) in the markets of thirteen countries came to such conclusions. Our research shows the relationship between oil prices and exchange rate and other variables such as a sanctions and percent rate of the Central Bank.

3. EMPIRICAL APPROACH

We will carry out the econometric analysis to reveal the major factors influencing the currency rate of ruble (Breitung, 2006; Hosoya, 1991). Monthly data from January, 2000 to January, 2016 are taken. We will make a hypothesis that the currency rate of ruble depends on world oil prices. We will construct the model using eviews showing interrelation between the currency rate of dollar to ruble and Brent brand oil prices during the period from 2000 to 2016 (Table 1).

3.1. The Oil Price and Exchange Rate
The equation in general is significant because P (F-statistic) is equal 0.0,00,000, that is the hypothesis of insignificance of the equation is rejected (Table 1). All variables are significant because P (t-statistic) is equal 0.0,000, that is the hypothesis of insignificance of independent variables is rejected. The standard mistake is equal 1.64 rubles that is a good indicator for this model.

As it is temporary ranks therefore auto-regression of the first order has been used. Before its introduction we use a method of creation of an auto correlated correlogram (Table 2).

Correlogram of a temporary row after the first value quickly decreases with each subsequent order. For this reason the AR (1) variable - auto-regression of the first order then the model became significant (Table 1) has been entered.

Table 1: Influence of oil price on ruble exchange rate

Dependent variable: USDRUR				
Method: Least squares				
Sample (adjusted): 2000M02 2016M01				
Included observations: 192 after adjustments				
Convergence achieved after 6 iterations				
Variable	Coefficient	Standard error	t-statistic	P
BRENT	−0.1,08,615	0.0,18,285	−5.9,40,033	0.0000
C	30.91,966	5.3,09,718	5.8,23,221	0.0000
AR (1)	1.0,29,976	0.0,13,085	73.71,151	0.0000
R²	0.969475	Mean dependent var	32.11367	
Adjusted R²	0.9,69,152	Standard deviation dependent variable	9.3,22,195	
Standard error of regression	1.6,37,305	Akaike info criterion	3.8,39,481	
Sum squared residual	506.6648	Schwarz criterion	3.8,90,380	
Log likelihood	−365.5902	Hannan-Quinn criter	3.8,60,096	
F-statistic	3001.356	Durbin-Watson stat	1.7,08,203	
P (F-statistic)	0.0,00,000			
Inverted AR Roots	1.03			

Estimated AR process is non-stationary

Because of large volumes of oil export and large volumes of import of consumer goods, it is possible to assume that inflation too considerably influences the currency rate. Therefore we will add the additional Inflation variable. We take the internal from the February 2002 to January 2016 (Table 3).

The model has improved (Table 2), the equation in general is significant because P (F-statistic) is equal 0.0,00,000, that is the hypothesis of insignificance of the equation is rejected. All variables are significant because P (t-statistic) is equal 0.000, that is all hypotheses of insignificance of independent variables is rejected. The standard mistake has decreased about 1.58 rubles that is a good indicator for this model. Sharp jumps of a remaining balance since August, 2014 (Graph 1) are not explained.

For the solution of this task we will enter a dummy variable which is connected with policy, namely accession of the Republic of Crimea and Sevastopol to the Russian Federation and the subsequent sanctions of the USA and the European Union (Table 4).

The model has improved, the equation in general is significant because P (F-statistic) is equal 0.0,00,000, that is the hypothesis of insignificance of the equation is rejected. All variables are significant because P (t-statistic) does not exceed a one-percentage significance value, that is all hypotheses of insignificance of independent variables is rejected. The standard mistake has decreased about 1.41 rubles that is a good indicator for this model.

The complete idea of interrelations between the currency rate of dollar to ruble, Brent brand oil prices, inflation, economic sanctions of the USA and countries of Western Europe and change of key interest rate of the Central Bank has been gained. The currency rate of ruble strongly depends on Brent brand oil prices. The interrelation with a foreign policy factor - sanctions of the USA and the European Union is also revealed.

There is a close interrelation between the currency rate of dollar to ruble and oil prices. The regression model has accurately shown this interrelation. Oil prices of the Brent oil is the dominating

Table 2: Auto correlated correlogram

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.927	0.927	168.59	0.000
		2	0.850	−0.068	311.12	0.000
		3	0.787	0.057	433.88	0.000
		4	0.735	0.034	541.32	0.000
		5	0.682	−0.024	634.51	0.000
		6	0.629	−0.024	714.23	0.000
		7	0.594	0.099	785.59	0.000
		8	0.561	−0.010	849.70	0.000
		9	0.533	0.030	907.87	0.000
		10	0.509	0.022	961.08	0.000
		11	0.466	−0.139	1006.0	0.000
		12	0.408	−0.125	1040.7	0.000
		13	0.325	−0.222	1062.8	0.000
		14	0.272	0.147	1078.3	0.000
		15	0.234	0.034	1089.9	0.000

Graph 1: Regression set of a remaining balance of model
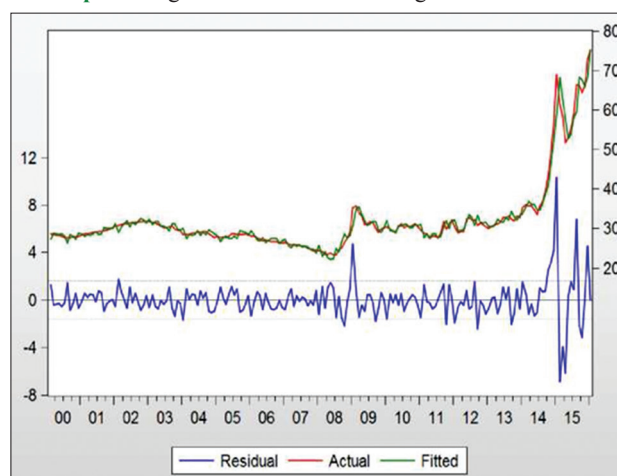
Source: It is constituted by the authors according to the Central Bank and Goskomstat

factor in a currency exchange rate formation mechanism of ruble, at least, in the long term.

3.2. Exchange Rate and Other Variables

Besides, exchange rate depends on the inflation and percent rate of the Central Bank because Russia is a large exporter of raw

Table 3: Influence of oil price and inflation on ruble exchange rate

Dependent variable: USDRUR method: Least squares. Sample (adjusted): 2002M02 2016M01 included observations: 192 after adjustments convergence achieved after 6 iterations				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
BRENT	−0.0,97,533	0.0,17,906	−5.4,49,756	0.0000
Inflation	0.7,22,982	0.1,94,139	3.7,23,092	0.0003
C	29.33,374	4.763-299	6.2,74,799	0.0000
AR (1)	1.0,31,939	0.0,12,777	30.76,484	0.0000
R^2	0.9,71,570	Mean dependent var		32.11,367
Adjusted R^2	0.9,71,116	Standard deviation dependent var		9.3,22,195
Standard error of regression	1.5,34,329	Akaike info criterion		3.7,73,313
Sum squared residual	471.3986	Schwarz criterion		3,8,46,677
Log likelihood	−358.7660	Hannan-Quinn criter		3.8,06,293
F-statistic	2141.567	Durbin-Watson stat		1.3,14,535
P (F-statistic)	0.0,00,000			
Inverted AR roots	1.03			

Estimated AR process is non-stationary

Table 4: Influence of oil price, sanctions and inflation on ruble exchange rate

Independent Sanctio variable				
Dependent variable: USD/RUR				
Method: Least squares				
Sample [adjusted]: 2000M2 2016M01				
Included observations: 192 after adjustments				
Convergence achieved after 7 iterations				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
BRENT	−0.0,99,000	0.0,15,132	−6.5,47,050	0.0,000
Inflation	0.7,42,249	0.1,75,291	4.2,34,309	0.0,000
SANCTIO	3.5,03,976	1.3,40,119	2.61,4675	0.0,097
KLUCH STAVKA	−3.4,55,720	1.0,50,653	−3.2,64,262	0.0,013
C	29.52,017	5.4,20,707	5.44,5016	0.0,000
@SEAS (0_	0.7,37,652	0.2,31,555	3.1,85,645	0.0,017
AR (1)	1.0,29,000	0.0,13,020	79.03,407	0.0,000
MA (4)	−0.2,32,624	0.0,00,327	−2.0,95,973	0.0,042
MA (7)	0.1,57,153	0.0,74,570	2.1,07,472	0.0,364
MA (11)	0.2,21,495	0.0,73,312	2.01,0441	0.0,055
R^2	0.9,70,346	Mean dependent variable		32.11,367
Adjusted R^2	0.9,77,275	Standard deviation dependent variable		9.3,22195
Standard error of regression	1.4,05,305	Akaike info criterion		3.569,064
Sum squared residual	359.4205	Schwarz criterion		3.730725
Log likelihood	−332.6301	Hannan-Quinn criter		3.6,37,773
F-statistic	913.6470	Durbin-Watson stat		2.1,00,716
P (F-statistic)	0.0,00,000			

materials, but also the big importer of consumer goods. If there is an increase in the prices in currency, then demand for currency grows together with its rate. Because of large volumes of oil export and large volumes of import of consumer goods, it is possible to assume that inflation too considerably influences the currency rate of ruble. The regression model has confirmed this assumption (Table 4). Inflation in the domestic market leads to devaluation of ruble and respectively leads to hanging of dollar rate to ruble. Dependence of the currency rate on rate of inflation is inherent in the countries with large volumes of international trade in goods, services and the equities.

Due to the international events of the last years the situation in the international geopolitics has changed. In 2014 Ukraine was divided into several parts, the Republic of Crimea and the city of Sevastopol became part of the Russian Federation. As a result

of the USA and the European Union have imposed economic sanctions against Russia that was negatively reflected in national economy. The western financial markets for Russia have been closed, and debt to foreign creditors remained. These credits are nominated in foreign currency, generally in dollars. Respectively demand for dollars in the domestic market from the companies has grown, thus by considerable size from 35 rubles to 65 rubles for dollar. This phenomenon was reflected in regression model (Tables 1-3).

Other important factor influencing the currency rate of ruble is change of key interest rate of Russian Federation Central Bank. Increase of key interest rate of the Central Bank or security yield in rubles will cause increase in demand for Russian ruble and will lead to strengthening of its currency rate. Rather higher key interest rate of the Central Bank will lead to inflow to Russia of the foreign

equity and respectively will increase the offer of foreign currency and will lead to reduction in cost of dollar and, respectively, will cause strengthening of ruble.

The Central Bank of Russia increased an interest rate up to 17% per annum in 2014 and explained this increase with the economic uncertainty caused by the volatility in the international financial markets. The purpose of increase of key interest rate in 2014 is restriction of the inflation caused by the sharp growth of the currency rate and maintenance of financial stability in the market. That is in 2014 increase of key interest rate of the Central Bank was caused by aspiration to slow down inflation rates on import consumer goods. The interrelation between the sharp growth of key interest rate of the Central Bank and the currency rate of dollar to ruble has also been reflected in regression model.

4. CONCLUSION

The influence of various factors on oil prices and the exchange rate relationship may increase or decrease depending on the following conditions.

First, it is the frequency of occurrence of crises and the impact on economic mechanism.

Second, it is the fact that the combination of various factors simultaneously influencing on the situations in economy. Third, it is the duration and strength of the influence of external factors, including the sanctions pressure. Fourth, it is the fluctuations in the market conditions in the various regions of the world and the ability to get a particular market quickly in order to hedge risks.

Today practically any instability in the world and in national economy first of all is reflected by fluctuations of the national currency rate in the financial market. It is demonstrated by modern Russian history. For the 25 year history Russian Federation there were periodical "cataclysms" in economy, such as crises 1992-1993 then a default of 1998, financial crisis of 2008, the European sanctions of 2014 which as a result led to sharp jump of inflation and devaluation of ruble. For this reason studying of the foreign exchange market of Russia, its relationship with oil prices and other variables is a hot topic in modern Russia. The relationship between oil prices, other variables and exchange rate has been tested in the Russian economy. Based on data for the period 2000-2016 the results justify a long-run relationship i.e., cointegration among the considered variables.

The complete idea of interrelations between the currency rate of dollar to ruble, Brent brand oil prices, inflation, economic sanctions of the USA and countries of Western Europe and change of key interest rate of the Central Bank has been gained. The currency rate of ruble strongly depends on Brent brand oil prices. The interrelation with a foreign policy factor - sanctions of the USA and the European Union is also revealed.

The findings of this paper may be used by foreign and domestic investors while taking decisions because all the shocks impact on the economy in short and long term.

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