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Influence of the Main Economic Factors on the Diesel Fuel Pricing

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Abstract
The article considers the features of diesel fuel pricing and studies the correlation level between the price of diesel fuel in Russia, its gross domestic product, the price of oil and the volume of diesel fuel production. As a result, it concludes, that according to the correlation matrix, all regressors effect the price of diesel fuel, i.e. real GDP, the price of oil and the volume of diesel fuel production correlate with the price of diesel fuel. The existence of a correlation between regressors is also noted.

Key-words: World Market, Diesel Fuel, Pricing, Oil, Oil Industry, Refineries, Oil Refining Industry, World Market of Diesel Fuel, World Economy.

1. Introduction

Currently, a large share of the income of the Russian Federation depends on the volume of diesel fuel sold and its price on the world market. Therefore, the study of the principles of diesel fuel pricing makes it possible to increase the volume of tax receipts from the export of diesel fuel.

2. Materials and methods

In order to identify the pricing principles in the global diesel fuel market, it is necessary to analyze the international practice of cost identification and price setting. In global practice, the price of diesel fuel consists of several parts: [1]

1. oil production, storage and transportation costs.
2. processing, diesel fuel extraction costs.
3. Cost of delivery to gas stations, gas stations marketing costs.

4. Operating costs of gas stations and competition between nearby gas stations.

5. Taxes and excise duties.

Further, the cost factors influencing particular components of the final cost of diesel fuel are analyzed in more details. Petroleum products prices are determined by global supply and demand. Global economic conditions promote an increased demand for petroleum products. In order to understand the fundamentals of the price setting on the global diesel fuel market, one should first pay attention on the following aspect - the price of oil products in the international and regional markets depends on the oil stock prices, and is also subject to stock exchange quotations. In this regard, the author considers it appropriate to describe the current oil price setting mechanism. [2] The global oil market has been constantly changing under the influence of many factors, the diversity of its internal structure has expanded. Accordingly, the price setting mechanism has also changed. This aspect is monitored by the development of the formula for determining the key prices for petroleum products.

At the moment, in the oil market, pricing depends on the exchange pricing structure. Market competition is not perfect because the Organization of Petroleum Exporting Countries (OPEC) countries continue to have significant influence. This organization is the global supply regulator. The OPEC countries produce about 40% of the world's oil. OPEC can influence the pricing rules, adjust production plans in order to increase or decrease world oil prices. Depending on the policy of the cartel, the world prices movements for oil and, consequently, for diesel fuel change. [3]

Prices used in the exchange of goods (transfer) continue to be used by vertically integrated oil organizations in order to reduce their own tax payments in the oil production region.

Today, there are several global platforms on the basis of which hydrocarbon raw materials are traded. Major: London ICE Futures Europe (Intercontinental Exchange Futures Europe) and New York NYMEX.

For convenience of trade, depending on the content of alkane groups, the following oil grades are distinguished: Brent Crude, West Texas Intermediate, Urals, Dubai Crude, Kuwait Export Crude, Iran Heavy and Basra Light.

Currently, about 70 thousand futures contracts on the Brent blend alone are concluded on the Futures Europe exchange every day. This figure is equivalent to the global daily oil production. Final settlement of oil futures transactions is in cash. [4]

All actual oil supply transactions account for only one percent of total international oil trade. Experts note that this leads to the fact that the laws and principles of pricing are now divorced from

the physical volumes of supplies. This situation is also typical in the copper and nickel markets. Despite the fact that there is strong volatility in the oil market, today the exporting countries are able to meet the emerging needs of the world economy and oil prices are changing quite rapidly. Thus, the role of exchanges in energy pricing is assessed ambiguously. Economists are confident that it was exchange speculations that led to the high oil price in 2011-2014.

To objectively determine the dynamics and level of world prices for petroleum products, use:

- reference prices. These include the pricing of real trade transactions. According to the results of trading each day, information agencies Platts, Argus Media publish data. They represent indicative transaction prices and refer to specific transactions. The actual cost may be indicated taking into account discounts or surcharges, but they are set based on reference.

- stock quotes are indicators of actual prices. Exchange transactions for real deliveries are concluded on them. In conditions of low market liquidity, changes in quotations do not reflect actual trends in price changes. This is directly related to speculation. Daily exchange quotes are significantly influenced by trading in futures and other derivatives, prices for them are formed under the influence of the mood of the main market players.

For example, in the United States, the largest element in the retail price of diesel fuel is the cost of produced oil, which is 58% of the diesel fuel price. Therefore, their oil cost curves are practically similar to each other. [5]

In Russia, the market prices for diesel fuel are formed under the influence of the dynamics and level indicators of world quotations, which play the role of a price benchmark. In world practice, prices for motor fuels and oil prices are linked. Their change almost immediately leads to a jump in fuel prices. Therefore, when oil prices dropped sharply in the first half of 2008, the cost of diesel and gasoline fuel fell in all world markets. However, prices on the Russian market declined more slowly during this period than on the American, European and Asian markets. [6]

Refining costs are one of the factors influencing the cost of diesel fuel, while this factor depends on the level of technology used to obtain diesel fuel. For example, refining depth affects relatively the cost of diesel fuel produced. This indicator cannot be changed in a short period of time, but when carrying out modernization at a refinery, production costs can reduce the cost of diesel fuel production. [7]

Another feature in pricing is the impact on the price of the local market of the volume of diesel fuel exports to the world market.

For example, in Russia, since 2013, the Russian Ministry of Finance has carried out a “Tax Maneuver”, which has many different tasks, but the main one was the reduction of export duties on oil, that is, alignment with the duty rates for dark and light oil products. The tax on the extraction of minerals was additionally increased. At the time of the signing of the law on the completion of this reform, a situation developed when there was a sharp rise in prices. This growth was driven by a number of factors. The main one was the lack of profit by oil companies from the increase in oil prices, and, consequently, on diesel fuel, and the growth of the dollar against the Russian ruble, as a result of which oil companies began to export most of the diesel fuel and there was a shortage of diesel fuel in the domestic market. Therefore, in order to somehow reduce the cost of selling fuel on the Russian market, an agreement was temporarily concluded to freeze prices for diesel fuel. During the application of which the introduction of a damping mechanism was discussed.

The introduction of the last phase of the tax maneuver, effective January 1, 2019, resulted in a reduction in export duty exemptions (also previously known as an implied subsidy) on petroleum products, compared to the previous tax regime. After meetings with representatives from the oil and gas industry, the Russian Government decided to compensate for this change by introducing an excise tax on oil, which is a reverse (negative) tax paid by the Russian Government to domestic refineries in order to continue to stimulate the oil refining industry, since the current export duty subsidy on oil products is valid until 2024.

In accordance with the amendments to the Tax Code of the Russian Federation in 2018, a damping mechanism was introduced, which will be applied in calculating the reverse excise tax and will allow controlling retail prices for petroleum products in Russia. [8]

This mechanism is necessary to compensate for the difference between domestic and export prices. Its essence lies in the fact that when fuel is supplied to the domestic market, the difference between prices is returned to the enterprise. If the export price is higher than the base price, then the difference is paid to the enterprise by the state. The mechanism can also work in the opposite direction. [9]

3. Results and discussion

The author especially noted the influence of the local currency rate in relation to the US dollar. For a long time, oil products are sold on world exchanges for US dollars, in contrast to the

local market, where oil products are sold for the national currency. Due to the fact that the price of diesel fuel and the exchange rate are not stable, oil exporters are exposed to the risk of high volatility of the national currency. [10]

The seasonality of diesel fuel sales strongly affects its final cost. [11] For example, in the pre-winter and winter seasons, diesel fuel is purchased in large volumes to heat various premises. In spring, prices also jump, as many agricultural enterprises purchase fuel for sowing. [12]

In addition, the author, within the framework of a more detailed study of the pricing of diesel fuel, conducted a study of the influence on the price of fuel of such factors as: GDP in current prices, the price of oil and the volume of diesel fuel production. For this, an economic and mathematical model was built. Using this model, the work investigated the influence of three main factors that affect the price of diesel fuel in the Russian Federation.

Based on the data from Table 1, a correlation matrix was built, thereby determining the degree of correlation dependence (Table 2).

Table 1. Annual data on the price of diesel fuel, exports of goods and services, GDP at current prices Oil price, diesel fuel production in the Russian Federation for the period from 2007 to 2017

	Regressand Y	Regressor X1	Regressor X2	Regressor X3
Year	Diesel fuel price per 1 ton, rub.	GDP in current prices, billion rubles	Oil price per ton, rub.	Diesel fuel production in Russia, million tons
2007	17498,3275	33247,5	8095,2575	66,3
2008	23137,85	41276,8	7422,4925	68,9
2009	18934,3625	38807,2	8095,2575	67,3
2010	20398,0725	46308,5	7975,45	70
2011	26867,05083	60282,5	8213,220833	70,2
2012	30496,49917	68163,9	9245,211667	69,3
2013	33294,80667	73133,9	12044,66167	71,5
2014	35051,65833	79199,7	13699,2625	76,9
2015	37208,14167	83387,2	15794,95833	75,9
2016	37459,42083	86010,2	15597,17833	76,2
2017	42238,2675	92089,3	18577,85083	76,8

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Table 2. Correlation matrix

	Y	X1	X2	X3
Y	1	0,988221466	0,923546879	0,913146606
X1	0,988221466	1	0,908557596	0,919149424
X2	0,923546879	0,908557596	1	0,916936
X3	0,913146606	0,919149424	0,916936	1

According to the correlation matrix, all regressors effect the price of diesel fuel, that is, GDP at current prices, the price of oil and the volume of diesel fuel production are correlated with the price of diesel fuel. This is how the presence of a correlation relationship between regressors was noted. This dependence indicates the presence of multicollenarity.

After constructing the correlation matrix, the author created a multivariate regression model, where the price of diesel fuel per 1 ton is the regressor, this is the variable Y.

$Y = b0 + b1 \cdot X1 + b2 \cdot X2 + b3 \cdot X3$

The author has built a multivariate regression model in which the dependent variable is Y the price of diesel fuel per 1 ton. Then the coefficients of the regression equation were determined. The numerical results of calculating multiple regression are presented in (Table 3).

Table 3. Regression statistics

Regression statistics	
Multiple R	0,990358641
R-square	0,980810238
Adjusted R Square	0,972586054
Standard error	1401,83447
Observations	11

ANNOVA					
	df	SS	MS	F	*Significance F*
Regression	3	703083509,9	234361170	119,2592813	2,26204E-06
Residual	7	13755979,18	1965139,882		
Total	10	716839489,1			

	Coefficients	*Standard error*	*t-stat*	*P-Value*
Y-intersection	11737,71	19772,71897	0,593631492	0,571434172
Variable X 1	0,36	0,059039142	6,04735929	0,000517313
Variable X 2	0,37	0,307405294	1,219751872	0,262056119
Variable X 3	-131,65	326,1219556	-0,403689059	0,698488815

	Lower 95%	*Upper 95%*	*Lower 95%*	*Upper 95%*
Y-intersection	-35017,34212	58492,75946	-35017,34212	58492,75946
Variable X 1	0,217425517	0,496636292	0,217425517	0,496636292
Variable X 2	-0,351939831	1,101856198	-0,351939831	1,101856198
Variable X 3	-902,8077505	639,5040198	-902,8077505	639,5040198

Residual output

Observation	*Predicteed Y*	*Residuals*
1	17914,96276	-416,6352629
2	20187,13025	2950,71975
3	19768,29753	-833,9350254
4	22046,11868	-1648,046184
5	27098,09205	-231,0412127
6	30417,41501	79,08415467
7	32951,90546	342,9012018
8	35027,05651	24,60182448
9	37439,58543	-231,4437665
10	38262,41238	-802,9915454
11	41471,48143	766,7860657

As follows from the data obtained using the least squares method, the resulting multivariate model will look like:

$$Y = 11737{,}78 + 0{,}36 \cdot X1 + 0{,}37 \cdot X2 - 131{,}65X3 \qquad (1.1)$$

(t) (0,594) (6,047) (1,219) (-0,403)

The dependence of the price of diesel fuel (Y) on GDP in current prices (X1), the price of oil (X2) and the volume of production of diesel fuel (X3) expresses equation (1.1). Equation coefficients show the quantitative impact of each factor on the effective indicator, while others remain unchanged. In our case, the price of 1 ton of diesel fuel increases by 0.36 units. with an increase in GDP in current prices by 1 unit. when the oil price and diesel fuel production volume remain unchanged; the price of 1 ton of diesel fuel increases by 0.37 units. with an increase in the price of oil by 1 unit. with constant GDP indicators in current prices and diesel fuel production; the price of 1 ton of diesel fuel is reduced by 131.65 units. with an increase in the production of diesel fuel by 1 unit. with constant oil prices and GDP at current prices.

The value of the Student's criterion corresponding to the confidence level $\gamma = 0,95$ and the number of degrees of freedom $v = n - m - 1 = 7$; $t_{кр.} = t_{0,025;7} = 2,365$.

Comparing the calculated t-statistics of the coefficients of the equation with the table value, we conclude that all the coefficients of the regression equation will be statistically significant. Determination coefficient R2 = 0.98081. Adjusted for the loss of degrees of freedom, multiple determination coefficient AR2 = 0.97258; Fisher's criterion F = 119.259;

The significance level of the model is p <0.00001; According to Fisher's criterion, this model is adequate. Since the significance level of the model is less than 0.00001, the residuals were checked for autocorrelation. For this, the value of the Durbin-Watson statistic was found, which is equal to DW = 2.3160. Intermediate calculations are indicated in Table 4.

Table 4. Results of calculating the value of the Durbin-Watson statistics

Observation	*et2*	*(et-et-1)2*	*et*	*et-1*
1			2950,71975	-416,635
2	8706747,044	11339079,78	-833,9350254	2950,72
3	695447,6267	14323611,77	-1648,046184	-833,935
4	2716056,225	662776,9785	-231,0412127	-1648,05
5	53380,04195	2007903,089	79,08415467	-231,041
6	6254,30352	96177,74347	342,9012018	79,08415
7	117581,2342	69599,43436	24,60182448	342,9012
8	605,2497677	101314,4936	-231,4437665	24,60182
9	53566,21705	65559,34465	-802,9915454	-231,444
10	644795,422	326666,8636	766,7860657	-802,992
11	587960,8706	2464201,748		
Sum:	13582394,23	31456891,25		
	DW=	2,316004874		

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X12	X22	X32	X1*X2*X3	*et2*
1105397135,9	65533194,0	4395,7	17844458088	173584,9423
1703778278,8	55093394,9	4747,2	21109382432	8706747,044
1506000213,5	65533194,0	4529,3	21142592952	695447,6267
2144480987,1	63607802,7	4900,0	25853201838	2716056,225
3633984690,3	67456996,5	4928,0	34756989996	53380,04195
4646314961,7	85473938,8	4802,5	43672134252	6254,30352
5348566611,4	145073874,7	5112,3	62982421127	117581,2342
6272585906,0	187669793,0	5913,6	83434724506	605,2497677
6953423734,8	249480708,8	5760,8	99967678844	53566,21705
7397748095,4	243271972,0	5806,4	1,02224E+11	644795,422
8480435438,0	345136541,6	5898,2	1,31391E+11	587960,8706

From the table of critical Durbin-Watson coefficients, the significant points dL and dU were determined for the 5% significance level. For m = 3 and n = 11: dL = 0.60; dU = 1.93. Since DW> dL (2.316> 0.6), the null hypothesis of the absence of autocorrelation is accepted. Consequently, the model lacks autocorrelation of residuals of random deviations.

To check the significance of the correlation coefficient (Table 5), the observed value was found Tobs= - 0,5303 и tcritical=1,795. Since T <tcritical, therefore, the correlation coefficient is not significant and the model does not have autocorrelation of residuals of random deviations.

Table 5. Checking the significance of the correlation coefficient

	Column 1	*Column 2*
Column 1	1	
Column 2	-0,174073	1

	Observation	
T=	-0,530315	
	Critical	
	1,7958848	

The model was tested for heteroscedasticity by using White's test. The results of the calculation of the test are presented in Table 6. White's test results show the absence of heteroscedasticity, since at 5% significance level Fact. <Ftab. The p-probability of accepting the hypothesis of heteroscedasticity is 0.16, which is greater than 0.05.

Table 6. Results of calculation by White's Test

Summary output

Regression statistics	
Multiple R	0,978380803
R-square	0,957228996
Adjusted R Square	0,786144979
Standard error	1199478,069
Observations	11

ANNOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	8	6,43993E+13	8,04991E+12	5,595081375	0,160417491
Residual	2	2,8775E+12	1,43875E+12		
Total	10	6,72768E+13			

	Coefficients	*Standard error*	*t-stat*	*P-Value*
Y-intersection	-1023435633	486120778,9	-2,105311432	0,169897006
Variable X 1	1191,636558	349,1334011	3,413126771	0,076163553
Variable X 2	-1307,573285	1117,689644	-1,169889416	0,362592116
Variable X 3	-1096,751542	1334,843102	-0,8216333	0,497646374
Variable X 4	29814039,96	13367826,24	2,230283326	0,155472164
Variable X 5	-0,001607454	0,018652271	-0,086180077	0,939174317
Variable X 6	-0,345794742	0,386816831	-0,893949575	0,465681442
Variable X 7	-210153,6607	88301,8934	-2,379945125	0,140323089
Variable X 8	0,001502465	0,001837461	0,81768508	0,499454445

	Lower 95%	*Upper 95%*	*Lower 95%*	*Upper 95%*
Y-intersection	-3115044530	1,07E+09	-3115044530	1068173263
Variable X 1	-310,5632232	2693,836	-310,5632232	2693,836339
Variable X 2	-6116,603684	3501,457	-6116,603684	3501,457113
Variable X 3	-6840,11786	4646,615	-6840,11786	4646,614775
Variable X 4	-27703074,1	87331154	-27703074,1	87331154,03
Variable X 5	-0,0818617	0,078647	-0,0818617	0,078646791
Variable X 6	-2,010133237	1,318544	-2,010133237	1,318543753
Variable X 7	-590086,0434	169778,7	-590086,0434	169778,722
Variable X 8	-0,006403493	0,009408	-0,006403493	0,009408422

Consequently, the constructed regression equation (1.1) is adequate to the experimental data (it has a high coefficient of determination and significant F-statistics, all regression coefficients are statistically significant), can be used for practical purposes, since there is no autocorrelation of residuals of random deviations, there is no multicollinearity.

4. Conclusion

It is necessary to summarize the pricing patterns in the world market of diesel fuel.

Firstly, it has been proven that the cost of diesel fuel depends on oil prices.

Secondly, it is noted that the most important factor determining the value in the market is the state policy on price formation.

Thirdly, it was noted that the established cost of diesel fuel is influenced by the cost of transporting fuel from processing plants and seasonal factors.

Fourthly, another regularity of pricing is the dependence of the retail price on the wholesale price.

Fifth, it has been proven that the price of diesel fuel increases with the growth of GDP at current prices and with the unchanged oil price and the volume of diesel fuel production; the price of diesel fuel increases with an increase in the price of oil and with the constant GDP at current prices

and the volume of diesel fuel production; the price of diesel fuel decreases with an increase in the production of diesel fuel and when the price of oil and GDP remains unchanged at current prices.

References

Diesel prices, Globalpetrolprices.com, - Available at: http://www.globalpetrolprices.com / diesel_ prices / (Accessed: 24.10.2016).

Degtyareva O.I., *Exchange trade in the fuel and energy complex*: textbook. allowance / O.I. Degtyareva - Moscow: MGIMO, 2011 .- 262 p. What drives crude oil prices, Energy & Financial Markets, Official website of the United States Energy Information Administration, - Access mode: https://www.eia.gov/finance/markets/ supply-opec.cfm (Accessed: 27.10. 2016).

Boselli, M. European refining faces new wave of refinery closures, - Platts. - Access mode: https: //www.theice.com/index (date accessed: 03/01/2017). *Factors affecting diesel prices*, Official website of the United States Energy Information Administration, - Available at:http://www.eia.gov/energyexplained/index.cfm?page=diesel_factors_affecting_prices (Accessed: 20.02.2017)

Farrakhova A.A. *Management of integrated supply chains in the petrochemical industry of polymer and composite materials* // Bulletin of Kazan Technological University. - 2014, No. 5. - P. 216-220.

Khartukov E.M. Energy of Europe in 2018, *before and after. - Science and World*, 2019, - No. 10 (74). - P. 43-80.

Federal Law of November 27, 2018 No. 424-FZ "*On Amendments to Parts One and Two of the Tax Code of the Russian Federation and Certain Legislative Acts of the Russian Federation on Taxes and Fees*" // Ros. gas. - 2018 .- 30 Nov. (No. 270).

Khartukov E.M. Oil market prices: *international and domestic aspects. - Oil of Russia*, 2016. - No. 1. - P. 18-26.

Kholopov A.V. MGIMO (y): *School of Economics* // M .: MGIMO Bulletin. 2014, No. 5 (38). – P. 171-181.

Kholopov A.V. *Oil price and global imbalances* // M .: IA Neftegaz.RU international. 2019, No. 2 (86). - P. 70-75.

Khorokhorin A.E. *Development strategy of modern petrochemical complexes, world experience and opportunities for Russia:* diss. ... Phd .: 08.00.14; scientific. hands. E.A. Telegin; MGIMO. - Moscow, 2018 .- 193 p.

Davydov B.N. Assessment of the influence of the methodology for calculating the cost of oil refining products on the price of petroleum coke // *Problems of Economics and Management of the Oil and Gas Complex.* 2019, No. 11 (179). - P. 23-27.

Davydov I.A. *The main factor in the competitiveness of domestic diesel fuel in the world market*. - Bulletin of the State University of Management, 2016. - No. 7-8. - P. 73-75.

Davydov I.A. The main trends and development prospects of the world diesel fuel market: *the example of the People's Republic of China.* - Bulletin of Samara State Economic University, 2017. - No. 2. - P. 16-19.

Davydov I.A. Features of pricing in the global diesel fuel market. - Bulletin of the State University of Management, 2016. - No. 11. - P. 117-121.

Davydov I.A. Environmental aspect of the development of the world diesel fuel market. - Bulletin of the State University of Management, 2016. - No. 9. - P. 75-77.

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