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Climate policy of oil and gas companies in the Russian Federation

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ABSTRACT

Oil and gas companies are facing a critical challenge as the world increasingly shifts towards clean energy transitions. Fossil fuels drive the companies' near-term returns, but failure to address growing calls to reduce greenhouse gas emissions could threaten their long-term social acceptability and profitability. In the current realities of financial technology development, it is necessary to move from traditional ways of financing companies' activities to more transparent, fast and efficient ones with positive environmental considerations. The article reveals the distinctive features of the climate policy of the oil and gas business of the Russian Federation, in particular, the realities of the development of this industry in the face of foreign economic shocks in the form of sanctions as well as how to keep the damage to the environment to a minimum. The oil and gas business and companies in this industry are significant not only within the country but also on the international market as participants in export-import, finance, investment, political and other types of relations. The availability of such fuel and energy resources within the country allows it to be in a certain degree in high positions on the world market, since companies in the industry accumulate a significant amount of capital in their foreign trade and foreign economic activities and, to a certain extent, ensure the movement of foreign currency within the framework of their trade and economic relations. The authors of the article calculated an economic and mathematical model based on the structural-dynamic and coefficient analysis, that allows determining the feasibility of forming a new digital tool for the devising constructive Climate Policy for oil and gas projects financing. In the course of the analysis, based on Russian quarterly data for 2015-2018, the connection between the level of overdue debt on oil companies loans and the development indicators of the Russian oil and gas business was determined. The main conclusions presented in the article can be used in scientific and practical activities to develop financial and credit technologies as well as Climate Policy used in the oil and gas business.

Keywords: Climate policy, Greenhouse gas, Oil and gas business, Sources of financing, Level of overdue debt, Economic and mathematical modelling.

INTRODUCTION

The oil and gas industry now needs to make clear what clean energy transitions mean for it – and what it can do to accelerate clean energy transitions**.** The sources of financing used by oil and gas companies for their projects allow them operating efficiently. The effect of ecological bookkeeping and revealing a hierarchical execution with specific reference to oil and gas organizations working in the Niger Delta Region of Nigeria was analyzed. The investigation was directed utilizing the Pearson's item second relationship co-effective (Bassey *et al.* 2013). Strategy measures in which thoughts of carbon hazard have been at the focal point of contradictions between restricting backing alliances testing or guarding the norm of Norwegian oil asset administration were dissected (Bang & Lahn 2020).

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Board information estimating the strength of state strategy from 2007 to 2014 out of four zones: inexhaustible portfolio guidelines, dispersed age, energy effectiveness, and severance charges on oil and gas extraction were gathered and broke down (Trachtman 2020). Petroleum gas has been advanced as a "connect" fuel toward a low-carbon future by offering close term outflows decreases at lower cost. Existing writing is uncertain on the momentary discharges advantages of more plentiful flammable gas. The enduring idea of petroleum gas foundation additionally takes steps to secure outflows levels well above longer-term targets (Woollacott 2020). The year of 2014 was marked by sanctions against oil and gas companies, and a number of international projects were also closed, in particular, the rapid fall in oil prices due to the "shale revolution" in the United States happened. This aspect was associated with the growth of supply in the world oil market and the demand for fuel and energy resources that did not keep up with it. US oil and gas companies, namely those engaged in shale oil production, have reduced their dependence on external fundraising by the end of 2018 (Fig. 1).

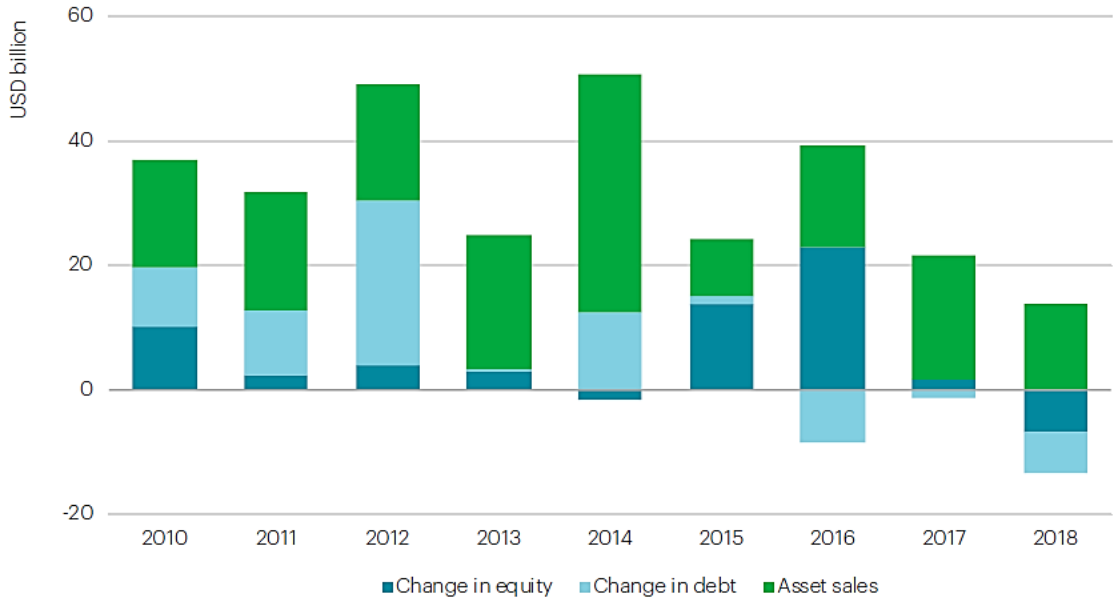

Fig. 1. US E & P independents indicative source of finance (https://www.iea.org)
Note: Includes data on 48 US E&P independent companies.
Source: IEA analysis with calculations based on company filings & Bloomberg (2019), Bloomberg Terminal.

Considering the sources of funding for these companies, one can identify specific time periods (Table 1) (https://oilindustryinsight.com).

Table 1. Time periods for financing the activities of the US oil and gas companies.

Period	Characteristics
2010-2014	The need to use external sources for financing: debt obligations and proceeds from the sale of non-core assets, bank syndicated renewable loans secured by oil and gas reserves
2015-2016	Credit organizations stopped lending to companies in the US industry due to the collapse in prices on the world market, a decrease in asset sales by 70% and the need to attract more expensive capital
2017	Asset sales are again the main source of financing

In 2018, free cash flow reached almost 90 billion USD, which has not happened since 2008. During the 2014-2018 period, large companies maintained a high level of dividends compared to other industries, distributing, on average about 50 billion USD per year to shareholders. In addition to the above, it is noted that in 2018, the financial condition of oil and gas companies tended to improve noticeably (Fig. 2). The USA, as the country that became the founder of the "shale revolution", has a different model of financing the production of shale oil from the classic one (https://www.iea.org). The industry in the country itself is characterized by negative free cash flow because the constant expectations of market participants in the growth of production and cost optimization caused continuous overspending in the sector. At the same time, the US shale industry is dominated by small and medium-

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sized independent producers, which is radically different from the model of the Russian Federation, where the major of the oil and gas business are vertically integrated oil companies (VIOC). Russian companies in the oil and gas sector do not have competitive R&D financing as an investment in innovation. An important aspect of foreign experience in financing innovative projects in the economy's oil and gas sector is the use of venture funds (Shell Technology Ventures, BP Ventures, Chevron Technology Ventures etc.) (Bagautdinova *et al*. 2017).

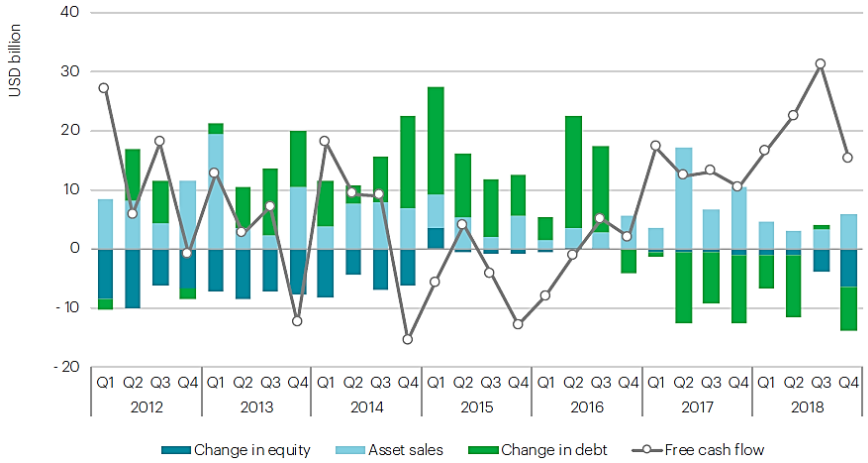

Fig. 2. Majors indicative source of finance and free cash flow.

Note: Free cash flow is cash from operating activities, less capital expenditure. It excludes the change in working capital.
Source: IEA analysis with calculations based on company filings & Bloomberg (2019), Bloomberg Terminal.

In addition to the significant amount of government support in the US oil and gas industry, one of the unique components is the lack of dominance of national oil companies, as can be seen in several OPEC countries (Bulatova *et al.* 2016; Jahanifar *et al.* 2018; Karim *et al.* 2020). When comparing groups of companies such as Russian VIOCs, US shale companies, and multinational VIOCs in terms of weighted average interest rates (Fig. 3), one can notice that the interest rate of Russian VIOCs is close to the interest rates of shale companies. However, taking into account the development of their foreign trade and foreign economic activities, the scale of the company itself, Russian vertically integrated oil companies should have lower interest rates and a longer period of financing compared to the other two groups.

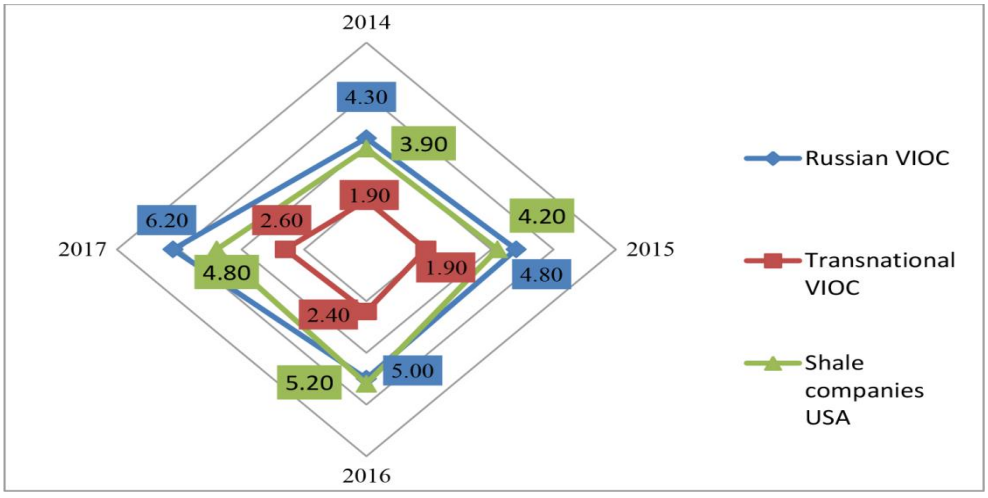

Fig. 3. The weighted average interest rate for groups of oil and gas companies in 2014-2017, % (https://ogjrussia.com).

At the same time, Russian VIOCs are characterized by a significant share of short-term financing (Fig. 4), with the inability to invest in the development of the company, especially under the existing tax regime, the high cost

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of debt capital, restrictions on attracting external forms of financing for its activities, which also limits the potential for opening new fields.

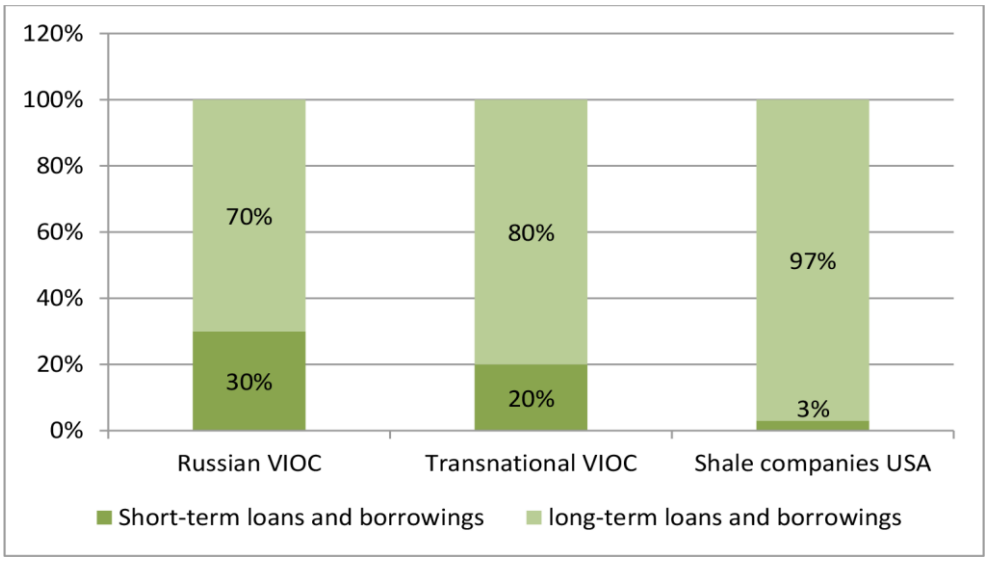

Fig. 4. Ratio of specific short-term and long-term loans by a group of companies, %.

Russian oil and gas companies are characterized by less significant investment in R&D compared to foreign companies in this industry. Effective promotion of investment in R&D is determined by the clusters and technology parks creation, technology centres, positive experience abroad of which is also being adopted by the Russian oil and gas complex. Gazprom Neft, one of Russia's vertically integrated oil and gas companies, is implementing digital projects as part of its R&D activities. 2018 was one of the most successful years for Russian oil and gas companies in their history. A strange combination of high oil prices and a weak ruble against the background of high export duties caused a rapid increase in their financial indicators and, as a result, their capitalization. Also, the ongoing "trade wars", combined, have had an impact on the performance of Russian oil and gas companies. These aspects are confirmed by a coefficient analysis (Figs. 5-7) of the performance indicators of oil and gas VIOCs in the Russian Federation.

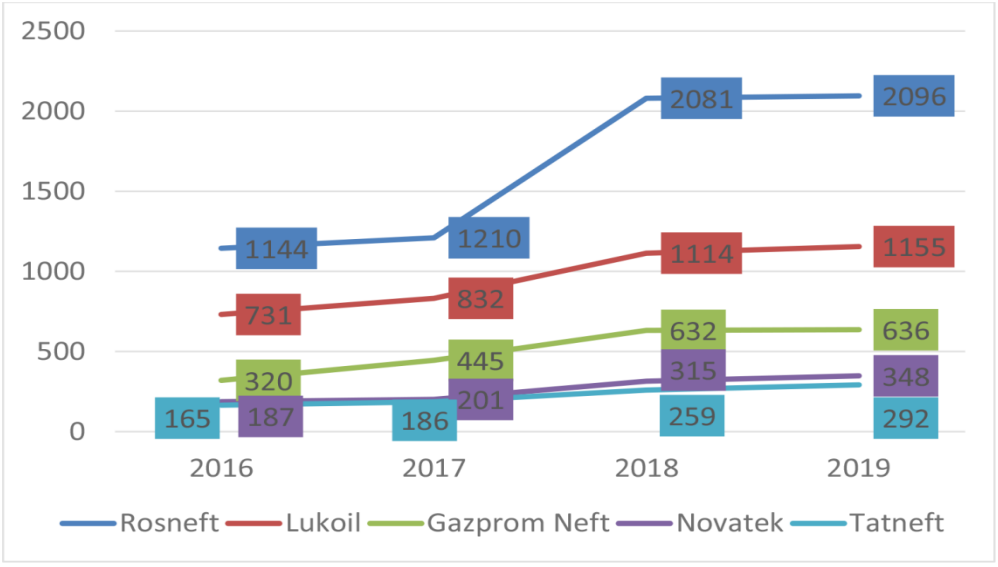

Fig. 5. EBITDA of oil and gas companies in the Russian Federation in dynamics, billion rub (https://ogjrussia.com).

The favourable state of the oil and gas business of the Russian Federation according to the results of 2018 actualizes the definition of a retrospective aspect in relation to the most popular instruments for financing activities used in

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the context of external economic shocks emergence in the form of sanctions. Thus, relevance is defined. Under the imposed sanctions, oil and gas companies were barred from the possibility of obtaining foreign sources of financing, in particular, the possibility of acquiring the necessary imported components.

In addition to project-based syndicated lending and the use of state support in financing large oil and gas projects, Russian realities demonstrate a significant share of borrowing in the industry (according to statistics from the Bank of Russia website) and more than 30% of the oil and gas production companies in the Russian bond market (Bulatova *et al.* 2019).

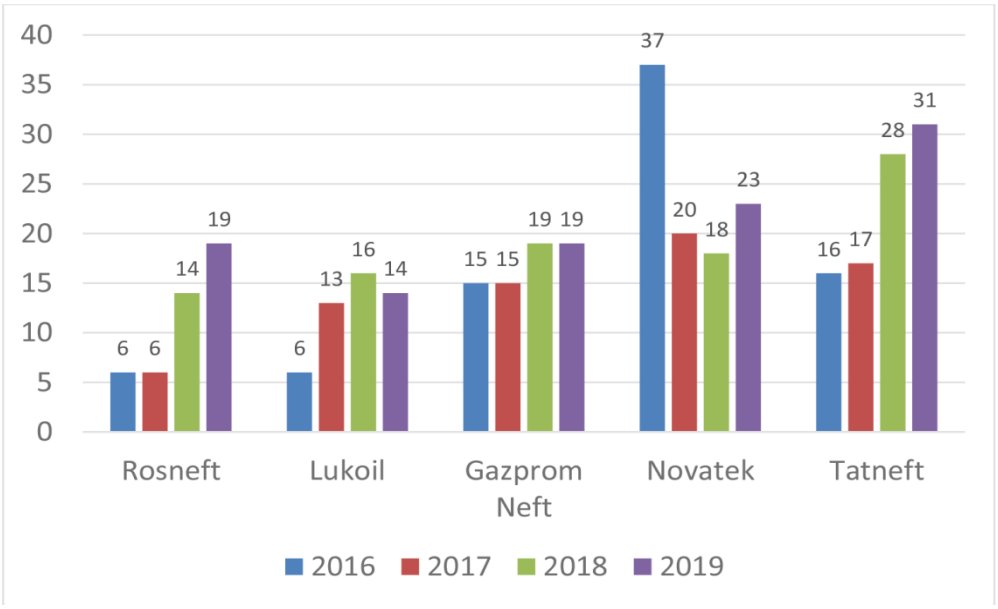

Fig. 6. ROE indicator of oil and gas companies in the Russian Federation in dynamics, % (https://ogjrussia.com).

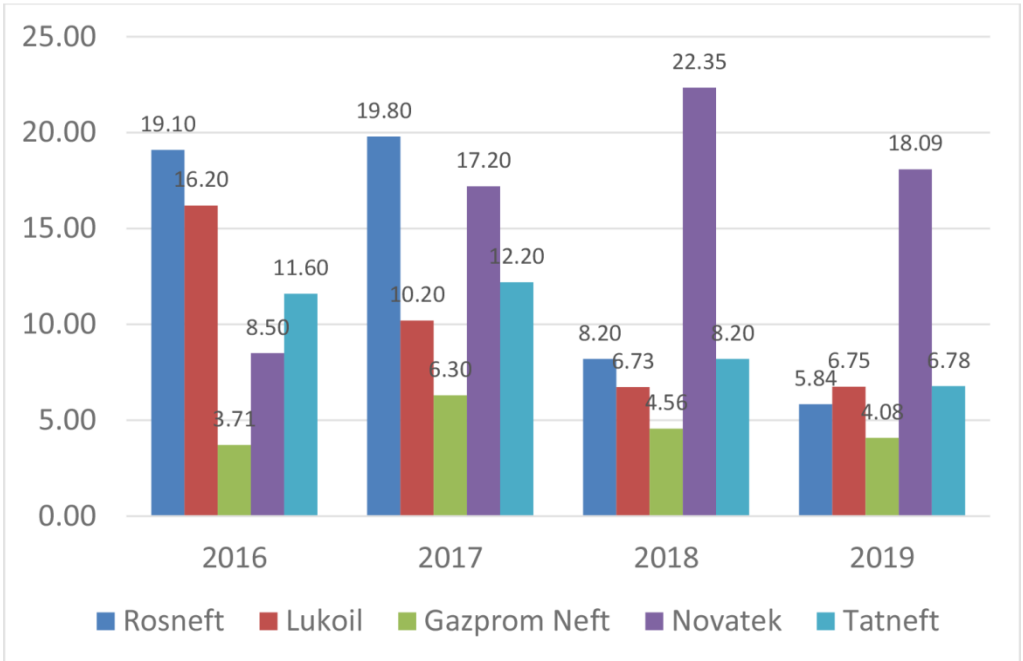

Fig. 7. P/E indicator of oil and gas companies in the Russian Federation in dynamics (https://ogjrussia.com).

The level of overdue debt (Fig. 8), expressed in relation of the mining industry overdue loans to the total volume of loans issued, shows significant volatility and a sharp increase by the end of 2015, which can be more described by the impact of sanctions processes on the activities of companies and the need to reorient financial resources for

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activities from foreign loans to national ones. At the same time, it should be noted that during the period of significant sanctions development, companies could repay previously received loans.
In particular, bond issuance, along with lending, is the most common source of financing for oil and gas companies in Russia.

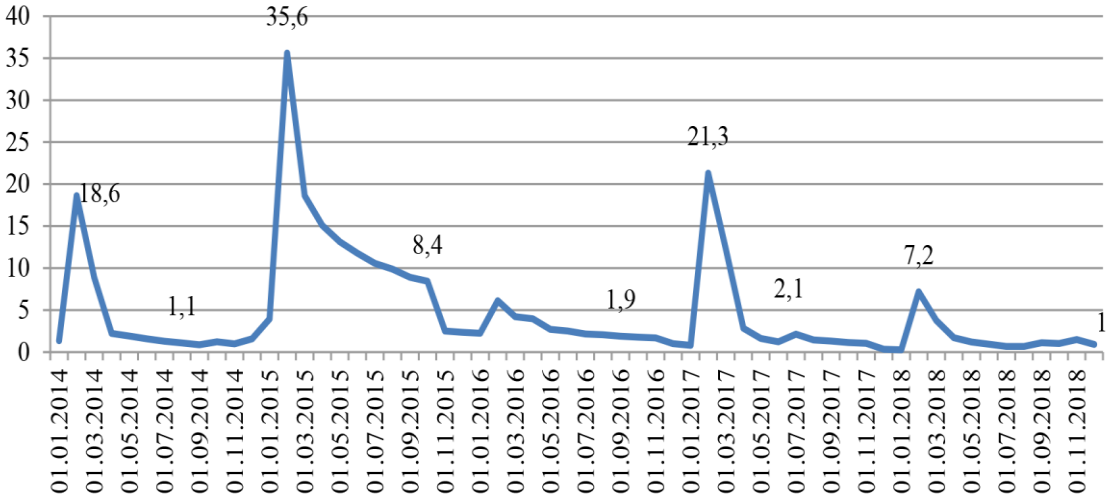

Fig. 8. The level of overdue debt on loans to the mining industry (including oil and gas companies), %.

MATERIALS AND METHODS

In this article, the authors' applied methods of structural and dynamic analysis, tabulation, graphical analysis, abstraction, hypothesis setting, correlation, regression modelling, verification for approximation, heteroscedasticity, the autocorrelation of residuals, prediction, coefficient analysis, construction of a graphical model of token issuance, in particular, methods of scientific knowledge. To determine the feasibility of forming a new tool for financing oil and gas business projects, the authors put hypotheses, the confirmation of which justifies the need for further analysis. Hypothesis 1: level of overdue debt in the total volume of lending to Russian economy companies in the oil and gas sector will remain at the same level by 2021 compared to the data at the beginning of 2018, or will increase by10-15%. Hypothesis 2: if certain adverse aspects occur during the verification of hypothesis 1, an additional test of interest in the oil and gas industry of the Russian Federation is performed by determining the positive trend of the Moscow Exchange MOEXOG industry index. There are sixteen observation points for the simulation – the period from 2015 to 2018 by quarter. Factors defined for all stages of modelling in the number of 22 are presented in Table 2. The average values of each of the factors in the quarterly range were determined.
After determining the spectrum of factors that can affect the Y object understudy, a correlation matrix is constructed, that demonstrates the degree of influence of each of the factors on Y. Initially, the number of factors is determined, the correlation with which is more than 0.5 modulo - X1, X2, X5, X8, X11, X13 and X18. Next, the multicollinearity between the selected factors is determined, which should be less than 0.7 to include the factor in other modelling. Provided that, between the factors, multipotentiality is more significant than 0.7, the factor with the greatest correlation with Y is selected for further modelling.

RESULTS AND DISCUSSION

As a result of the correlation analysis, factors such as X8, X13 and X18 were selected. However, the econometric theory also allows one to accept factors for modelling that logically affect the object under study, avoiding the results of correlation analysis. Based on this, to conduct regression modelling, X16 is added to the selected factors, which logically could have an effect on the level of overdue debt. Regression modelling considering the selected factors X8, X13, X16 and X18 (Table 3) showed that, despite a sufficient level of determination coefficient (0.9295), the significance of the model according to the Fisher test, the Student's test on the significance of the coefficients of the regression equation showed that the coefficient at X8 is not statistically significant, based on which repeated regression modelling was performed, but without the X8 factor.

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Table 2. Input parameters for modelling the level of overdue debt on loans of Russian oil and gas companies (https://minenergo.gov.ru; https://www.cbr.ru; https://www.minfin.ru; http://www.cbr.ru).

	Variables	Data type	Source
Y	**Overdue debt level**	**%**	**Bank of Russia**
X1	Average crude oil production (including gas condensate)	thousand tons	Federal statistics service
X2	Quantity of exported crude oil	million tons	Federal statistics service
X3	Exported crude oil value	million dollars	Federal statistics service
X4	Average export prices (crude oil)	USD per barrel	Federal statistics service
X5	Quantity of exported petroleum products	million tons	Federal statistics service
X6	Cost of exported petroleum products	million dollars	Federal statistics service
X7	Average export prices (petroleum products)	USD per barrel	Federal statistics service
X8	Natural gas quantity - exported	billion cubic meters	Federal statistics service
X9	Exported natural gas value	million dollars	Federal statistics service
X10	Average export prices (natural gas)	dollars per thousand cubic meters	Federal statistics service
X11	Quantity of liquefied natural gas - exported	billion cubic meters	Federal statistics service
X12	Exported liquefied natural gas value	million dollars	Federal statistics service
X13	Average export prices (liquefied natural gas)	dollars per thousand cubic meters	Federal statistics service
X14	Average value of the Bank of Russia's key rate	%	Bank of Russia
X15	Average Brent oil price	dollars per barrel	Federal statistics service
X16	Average URALS oil price	dollars per barrel	Federal statistics service
X17	Average value of oil and gas budget revenues	billion rubles	Federal statistics service
X18	Average value of outstanding loans	million rubles	Bank of Russia
X19	Average value of the Chinese Yuan exchange rate	for 10 units	Bank of Russia
X20	Average value of the us dollar exchange rate	per unit	Bank of Russia
X21	Average value of the Euro exchange rate	per unit	Bank of Russia
X22	Average value of Brent crude oil futures	USD	Bank of Russia

Table 3. Regression modelling without X8 factor.

Regression statistics	
Multiple R	0,958203
R-square	0,918154
Normalized R-square	0,897692
Standard error	1,198304
Observations	16

The R-square (coefficient of determination) shows that the investigated Y object is 91.82% dependent on the values of the selected factors: X13, X18 and X16

Analysis of variance

	df	SS	MS	F	F Value
Regression	3	193,300178	64,43339	44,87217179	8,5E-07
The remainder	12	17,2311854	1,435932		
Total	15	210,531364			

The excess of the calculated value of the Fisher criterion over the table indicates the statistical significance of the entire model

	Coefficients	Standard error	t-statystics
Y intersection	3,985038	2,03316888	1,960014
X13	0,025423	0,00980326	2,593329
X18	-1,1E-05	2,0731E-06	-5,0865
X16	0,096784	0,041889	2,310482

Student's criterion on the coefficients significance of the regression equation (tabular value of the criterion = 2.16037) demonstrates the statistical significance of all the coefficients modulo.

Despite a small change in the determination coefficient, a regression model with three factors remains statistically significant according to the Fisher test and the Student's test (coefficients of the regression equation). The equation revealed during regression modelling has the following form (Formula 1):

$$Y = 3{,}985038 + 0{,}025423 \times X13 + 0{,}096784 \times X16 - 0{,}000011 * X18 \quad \textbf{(1)}$$

Regression modelling also allowed generating the value of the object Y understudy if it was influenced only by selected factors, as well as the difference between the actual and regression value of the overdue debt level (balances), which are checked for the balances autocorrelation, approximation errors, and homoscedasticity. The

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approximation error was higher than 8% (27.70%) - a satisfactory value since it falls in the range of 20-50%. There is no residues autocorrelation since k=8 falls within the range according to the table values in k1 = 4 k2 = 14. The excess of the table value t over the observed one indicates the residues homoscedasticity (meets the prerequisites of the least square method).

Based on the calculations performed and a small sample (less than 40), it is advisable to check for residues autocorrelation using the series method. "Rows" are formed with the same characters on the remainder, i.e. the characters that follow one another are formed in brackets in the so-called rows. As a result, these "series" turned out to be k = 8. Next, the number of positive deviations n1 = 9, the total number of negative deviations n2 = 7 is determined. Referring to the table of rows number critical values to determine the presence of autocorrelation at α=0.05, it is determined that k1 = 4, k2 = 14 and it is concluded that there is no residues autocorrelation since the number of rows is included in this range. The average approximation error is the average deviation of the calculated values from the actual values, determined by Formula 2, the arithmetic mean of relative errors:

$$\overline{A} = \frac{1}{n} \cdot \sum \left| \frac{y - \hat{y}_x}{y} \right| \cdot 100\% \quad \textbf{(2)}$$

The analysis showed a satisfactory value of the approximation error - 27.70%, which indicates that there is a non-linear dependence of the parameters under consideration. The Spearman rank correlation test was used to determine heteroscedasticity. When using this test, it is assumed that the variance of the deviations will either increase or decrease with increasing values of X. Therefore, for the regression constructed by the least-squares method, the absolute values of the deviations |ei| and xi values will be correlated. The coefficient of rank correlation is determined by Formula 3:

$$r_{x,e} = 1 - 6 \cdot \frac{\sum d_i^2}{n\left(n^2 - 1\right)} \quad \textbf{(3)}$$

where: di – the difference between the ranks xi and |ei|, n – number of observations.

And then t is determined by the Formula 4:

$$t = \frac{r_{x,e}\sqrt{n-2}}{\sqrt{1 - r_{x,e}^2}} \quad \textbf{(4)}$$

Since, as a result of the analysis, the observed statistic value for the three studied factors is less than the critical value calculated from the table of Student's essential points of distribution, the hypothesis that the correlation coefficient is equal to zero should be accepted as well as the lack of heteroscedasticity.

Thus, the generated model is forecasted, and at the same time, a point forecast of each of the three selected factors is initially carried out and, based on the obtained values, the level of overdue debts is predicted using the previously identified regression equation, indicating the forecast values of each factor for the corresponding period instead of unknown X. Forecasted levels of overdue debt for 2021 are presented in Fig. 9. The forecast of the overdue debt level to Russian oil companies is characterized by a small growth trend with confirmation of the previously set hypothesis. Since despite the confirmation of the first hypothesis, a certain aspect was identified (the value of the approximation error), there is a need to test the second hypothesis on the potential interest in the oil and gas industry of the Russian Federation by determining the trend of the MOEXOG Moscow Exchange industry.

Thus, the second hypothesis is tested in the same way as the first one: correlation and regression analysis, verification of balances, and prediction of the MOEXOG value under the influence of selected factors (Table 4).

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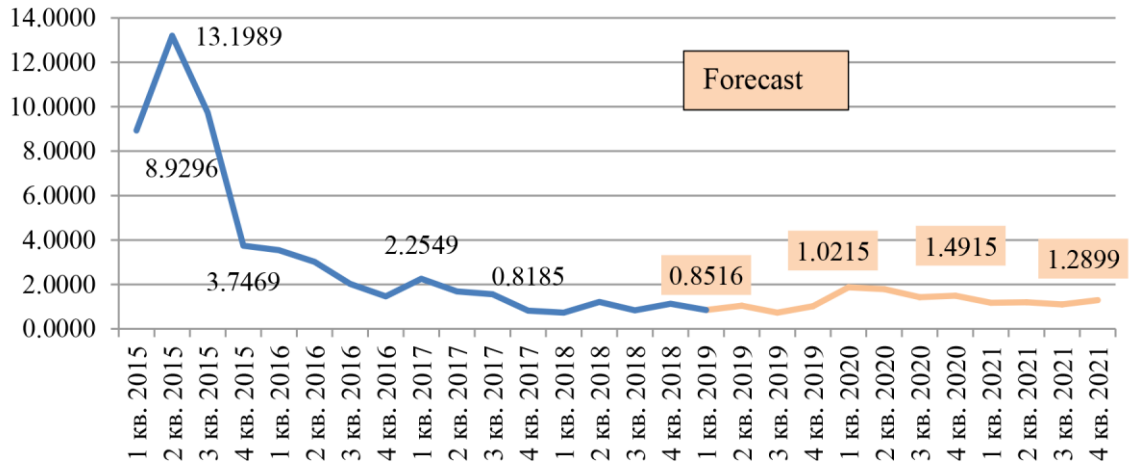

Fig. 9. Forecast of the overdue loans level to oil and gas companies in the Russian Federation by the end of 2021, %.

Table 4. Indicators for conducting MOEXOG modelling (Shaidullin *et al.* 2019).

Variable	Description
Y	MOEXOG - Moscow Exchange index (oil and gas) at the end of the quarter
X1	Average crude oil production (including gas condensate), thousand tons
X2	Average export prices (crude oil), USD per barrel
X3	Average export prices (petroleum products), USD per barrel
X4	Average export prices (natural gas), USD per thousand cubic meters
X5	Average export prices (liquefied natural gas), USD per thousand cubic meters
X6	Average value of Brent crude oil price, dollars per barrel
X7	Average value of the URALS oil price, dollars per barrel
X8	Average value of oil and gas budget revenues, billion rubles
X9	The average value of the Chinese Yuan exchange rate, for 10 units.
X10	Average value of the us dollar exchange rate, per unit
X11	Average value of the Euro exchange rate, per unit
X12	Average value of Brent crude oil futures
X13	Moscow Exchange index, Rel. units at the end of the month (quarter)
X14	RTS index, tn. units at the end of the month (quarter)
X15	Moscow Exchange blue chip index, RUB at the end of the quarter

An approximation error below 8% (2.23%) is an excellent value indicating a favourable model. There is no residues autocorrelation since k = 10 falls within the range according to the table values in k1 = 4 k2 = 14. The excess of the table value t over the observed one indicates the residues homoscedasticity (meets the prerequisites of the least-squares method). As a result, the second hypothesis was confirmed (Fig. 10) and had more positive modelling results, in contrast to the first, which is an additional confirmation of the feasibility of forming a new tool.

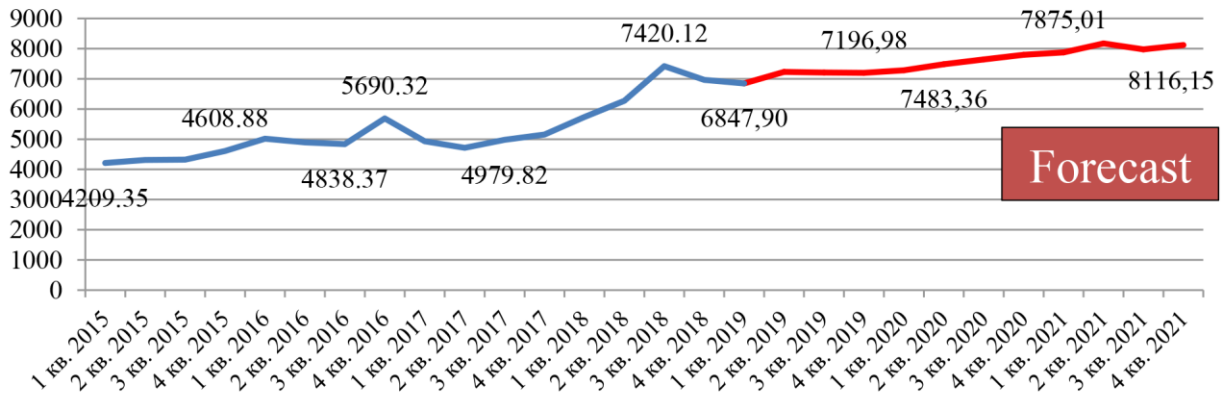

Fig. 10. MOEXOG forecast to the end of 2021, RUB.

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According to the forecast data, the value of the MOEXOG index is expected to grow, which indicates the investment attractiveness of Russian companies in this industry, as well as the favourable financial position of companies in the market as a whole.

FINDINGS AND CONCLUSIONS

Revealing the specifics of financing Russian oil and gas companies, it was noted that this industry is significantly dominated by external sources of financing for operating, in particular, such banking financial and credit technologies as loans and project lending. The Russian oil and gas business practically does not use such an external tool as leasing. The imposed sanctions against oil and gas companies led to the formation of a particular specificity in the financial and credit technologies used by companies in the form of a reorientation from foreign sources of financing to national ones in the form of increasing volumes of loans and a share in the Russian bond market. Two of these tools, in addition to project financing, investment and syndicated lending, are in modern realities the most common financial and credit technologies. However, the increase in lending also led to an increase in the overdue debts level during the period of exacerbation of the imposed sanctions and confirmation of the non-diversification of the tools used by the oil and gas business, which led to the formation of a hypothesis about the overdue debts increase by the end of 2021.

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سیاست (خط مشی) اقلیمی شرکت‌های نفت و گاز در فدراسیون روسیه

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چکیده

شرکت‌های نفت و گاز با چالش مهمی به دلیل روند روز افزون استفاده از انرژی پاک در جهان مواجه هستند. سوخت‌های فسیلی، باعث شده‌اند تا شرکت‌ها به سود و بازدهی کوتاه مدت دست پیدا کنند، با وجود این، شرکت‌ها قادر به کاهش انتشار گازهای گلخانه‌ای که تهدید کننده‌ی سودآوری و مقبولیت اجتماعی بلندمدت آن‌هاست نیستند. در فرایند فعلی توسعه‌ی فناوری مالی، بهتر است تا از شیوه‌های سنتی فعالیت‌های تأمین مالی به شیوه‌های شفاف‌تر، سریع‌تر وکارامد تر با ملاحظات زیست‌محیطی مثبت توجه شود. این مقاله به بررسی ویژگی‌های متمایز سیاست اقلیمی شرکت‌های نفت و گاز فدراسیون روسیه، به خصوص واقعیت‌های مربوط به توسعه‌ی این صنعت در مواجهه با شوک‌های اقتصادی خارجی به شکل تحریم‌ها و نیز شیوه‌ی حداقل سازی آسیب زیست‌محیطی می‌پردازد. شرکت‌های نفت و گاز در این صنعت، نه تنها در کشور بلکه در بازار بین المللی، به‌عنوان بازیگر مهم در عرصه‌ی واردات و صادرات سرمایه گذاری، روابط سیاسی و غیره اهمیت فراوانی دارند. قابلیت دسترسی این منابع انرژی و سوخت در کشور، موجب شده تا در بازار جهانی جایگاه مهمی پیدا کند زیرا شرکت‌ها، حجم عظیمی از سرمایه را در تجارت خارجی و نیز فعالیت‌های اقتصادی خارجی جمع آوری کرده و موجب تضمین جا به جایی ارز در چارچوب روابط تجاری و اقتصادی می‌شوند. در این مقاله، یک مدل اقتصادی و ریاضی را بر اساس تحلیل ضریب و پویایی ساختاری محاسبه شد که به امکان سنجی ایجاد یک ابزار دیجیتال جدید برای طراحی سیاست اقلیمی سازنده برای تأمین مالی شرکت‌های نفت و گاز کمک می‌کند. در طول تحلیل، بر اساس داده‌های سه ماهه‌ی روسیه برای ۲۰۱۵- ۲۰۱۸، ارتباط مالی بین سطح بدهی بر وام شرکت‌های نفت و شاخص‌های توسعه‌ی شرکت‌های نفت و گاز روسیه تعیین شد. نتایج اصلی ارائه شده در این مقاله را می‌توان در فعالیت‌های علمی و عملی برای توسعه‌ی فناوری‌های مالی و اعتباری و سیاست اقلیمی مورد استفاده در کسب و کار های نفت و گاز به کار گرفت.

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