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INFLUENCE OF THE CONSTRUCTION SECTOR ON THE GROSS DOMESTIC PRODUCT OF THE OIL AND GAS INDUSTRY

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Introduction. The oil and gas sector, which forms the basis of the economy of countries rich in oil and gas reserves, is one of the most dynamically developing segments of heavy industry. This sector is organically developing at a rapid pace, mainly due to the development of the construction of oil and gas facilities. The development of the oil and gas industry is mainly due to the leading position of hydrocarbons in the commodity sector of international trade. Being one of the main valuable components of the country's natural resource base, oil and gas reserves are not only fuel but also the basis of the mining industry [1]. That is why the oil and gas industry has a fundamentally significant impact on the development of many areas of the country's economy, including the non-oil sector. The oil and gas industry, which is the main source of energy in the world, is one of the most important factors influencing economic growth in the global economy. This sector's development determines the industry's development, which is considered an effective and competitive segment in the international arena [5]. The current state of development of the oil and gas industry in the Republic of Azerbaijan creates great opportunities for the further development of the entire infrastructure of the country. Since Azerbaijan plays an important role in the international oil and gas market, every year it develops the construction of oil and gas facilities, ensuring the rapid development of the industry. As the demand for hydrocarbon reserves in international trade increases, the profit from their export provides ample opportunities for creating a modern electric power industry, organic chemistry, metallurgy, road, and social infrastructure. Thanks to the oil and gas industry, the Republic of Azerbaijan has become an attractive center for many investment resources. In this regard, the demand for the construction of oil and gas complex facilities, as well as their constant modernization, is developing with increasing dynamics [3].

1. Investments directed to the main capital for construction in the oil and gas sector of the Republic of Azerbaijan

To achieve a sustainable competitive advantage in modern conditions, every company must successfully implement strategically important investment projects and programs aimed at satisfying the needs and requests of consumers, effectively using and developing the company's strengths, and at the same time improving its activities [6; 8]. Increasing the investment attractiveness of the fuel and energy complex and activating the investment activity of the state and companies that form modern infrastructure and business competitiveness in the studied area, adequate to the requirements of society and the economy, require new approaches. From this point of view, research and development of mechanisms that increase the efficiency of investment policy in Azerbaijan's oil and gas sector of the economy of Azerbaijan are of great importance. The graph below shows the amount of investments aimed at construction and installation works, including the capital for construction and installation works in the oil and gas complex [7].

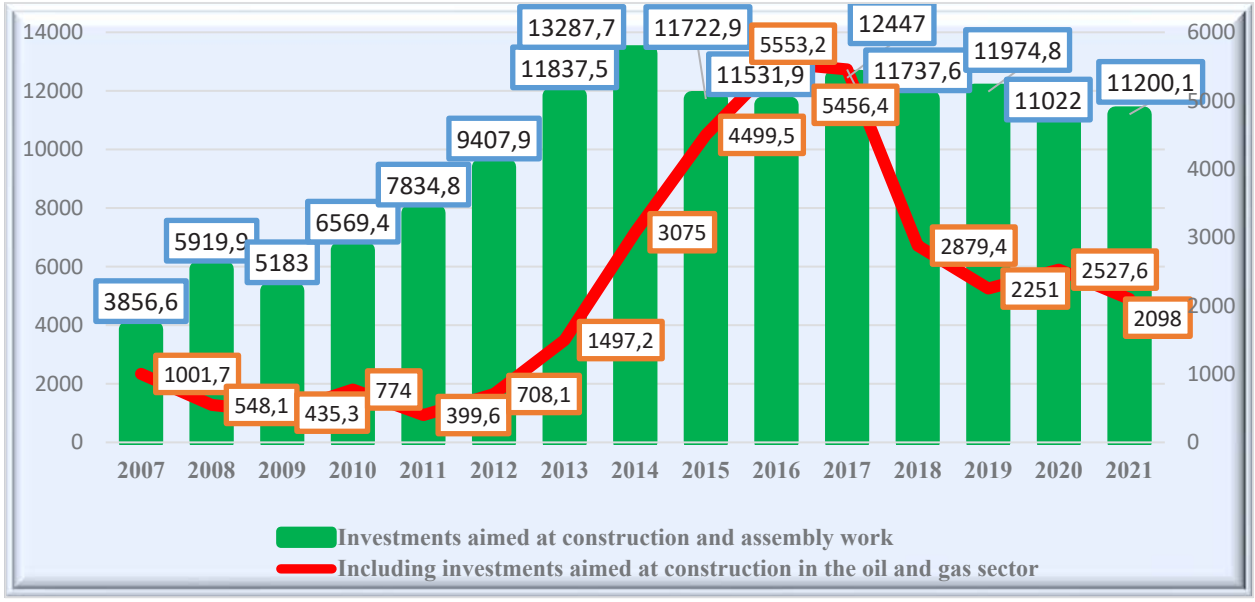

Figure 1.1. Investments aimed at construction and installation work in the Republic of Azerbaijan in 2007–2021, million manats

Source: Calculated and compiled by the author based on information (7)

As can be seen from the graph, during 2009–2014. the volume of investments aimed at construction works developed with increasing dynamics. The volume of investments in the main capital in the oil and gas sector decreased in 2007–2009. and increased in 2010. In 2011, the volume of investments decreased to 399.6 million manats. In 2011–2016, investments in this sector developed with increasing dynamics. In 2016, due to the sharp drop in oil prices on the world market and the COVID-19 pandemic, investments in fixed capital in 2016–2019 developed in a downward trend.

It should be noted that the specific weight of investments aimed at construction and installation works in the oil and gas sector also decreased during the period under study. This can be seen more clearly from the graph below [7].

As can be seen from the graph, the share of the oil and gas sector in construction and installation works on investments in fixed assets in the Republic of Azerbaijan in 2005 was 60%, and in 2011 it decreased to 5.1%. In 2011–2016, it increased to 48.2%. In subsequent periods, for 2016–2021, it decreased to 18.7%.

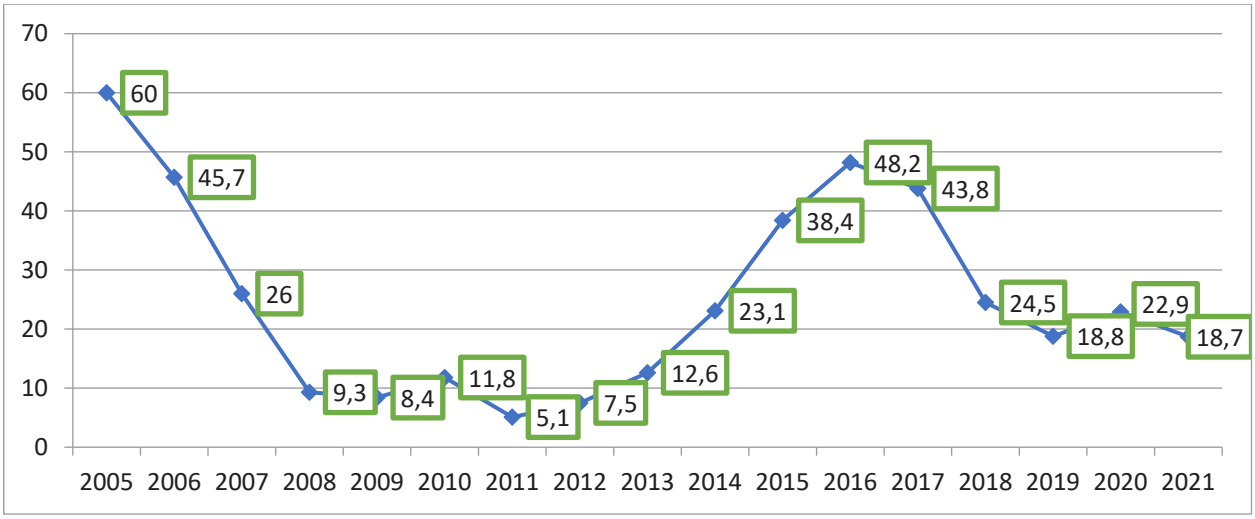

Figure 1.2. The share of the oil and gas sector in construction and installation works by investments in fixed capital in the Republic of Azerbaijan, in %

Source: Calculated and compiled by the author based on information [7]

In the Republic of Azerbaijan, investment in construction and installation works in the oil and gas sector directly affected oil and gas production and had a positive impact on increasing revenues in this sector. This can be seen more clearly in the graph below.

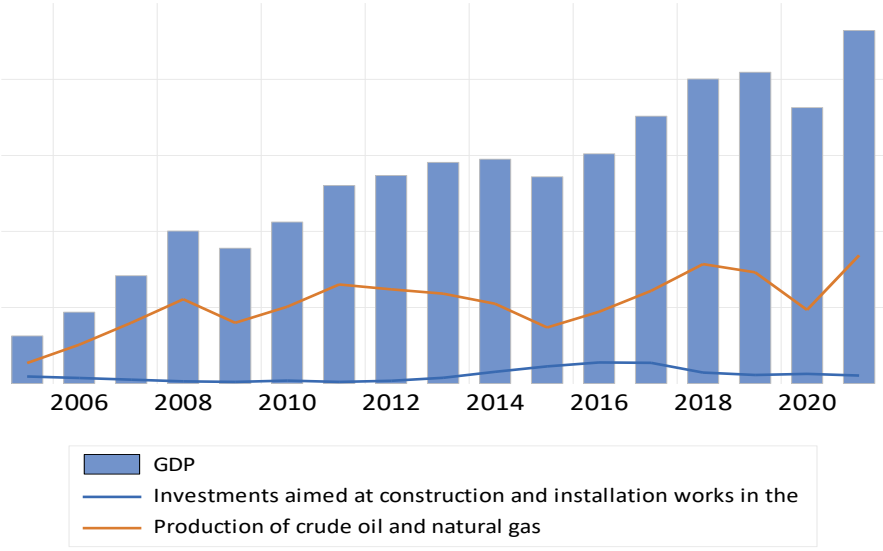

Figure 1.3. Dynamics of fixed capital investments, oil and gas production, and GDP in the years 2005–2021 for construction and installation works in the Republic of Azerbaijan, in million manats

Source: Calculated and compiled by the author based on information (7)

As can be seen from the graph, the change of the investments directed to the fixed capital for construction and installation works in the Republic of Azerbaijan and the income obtained from oil and gas production for the years 2005–2021 caused the GDP to change according to the same dynamics. From this point of view, it is important to determine the dependence between these indicators.

2. Assessment of the impact of investments aimed at construction and assembly works and revenues from the oil and gas sector on GDP in the Republic of Azerbaijan

Table 2.1

Regression analysis of the relationship between investments aimed at construction and installation works in the oil and gas sector of the Republic of Azerbaijan, and income from the oil and gas sector and GDP

Dependent Variable: Y Method: Least Squares Date: 11/15/22 Time: 00:16 Sample: 2005 2021 Included observations: 17				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
X2	5.137005	1.176938	4.364720	0.0006
X1	2.594138	0.268089	9.676390	0.0000
C	-11872.11	6403.531	-1.853994	0.0849
R-squared	0.891764	Mean dependent var		53789.51
Adjusted R-squared	0.876301	S.D. dependent var		22294.69
S.E. of regression	7841.230	Akaike info criterion		20.93096
Sum squared resid	8.61E+08	Schwarz criterion		21.07800
Log likelihood	-174.9132	Hannan-Quinn criter.		20.94558
F-statistic	57.67324	Durbin-Watson stat		1.116906
Prob(F-statistic)	0.000000			

Source: The EViews-12 application was developed by the author based on the software package

To carry out regression analysis of the dependence between investments aimed at construction and installation works in the oil and gas sector of the Republic of Azerbaijan, income from oil production and gas sector and GDP for the years 2005–2021, ready-made packages of mathematical programs are used, including EViews, MatLab, MS Excel, MathCad. Using the software complex EViews-12, based on the statistical data reflected in graph 1.3, we get the following result [2; 3].

Based on the results obtained from the Eviews application software package, the regression equation will be as follows:

Estimation Command:

==========

LS Y X2 X1 C

Estimation Equation:

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Y = C(1)*X2 + C(2)*X1 + C(3)

Substituted Coefficients:

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Y = 5.13700502564*X2 + 2.59413823158*X1 – 11872.1076996 (1)

$y = 2{,}594x_1 + 5{,}137x_2 - 11872{,}11$ R^2 **=0,876, DW=1,117**

t (9,68) (4,36) (-1,85)

According to the Eviews-12 application software package, between the Y coefficient representing GDP, the X1 coefficient representing oil and gas sector revenues, and the X2 coefficients representing the volume of investments directed to construction and installation works in the oil and gas sector in the Republic of Azerbaijan, there is a high correlation, expressed by the model $y = 5{,}137x_2 + 2{,}594x_2 - 11872{,}11$.

As you can see, the standard errors of the coefficients according to the t-statistics are significantly smaller than the coefficients themselves. In addition, the t-statistics for the free threshold is greater than unity. This characterizes the statistical significance of the coefficients in the model. That is, the model is statistically significant.

Based on this determined relationship equation, it can be concluded that one unit increase of the factor (X1), which represents the income of the oil and gas sector in the Republic of Azerbaijan, leads to an increase of 2.59 units of GDP, directed to the construction and installation works of the oil and gas sector in the Republic of Azerbaijan. One unit increase in the factor (X2) representing the volume of investments leads to an increase in the volume of GDP by 5,137 units.

As you can see, the model (1) is significant according to the table (1.2.1), obtained on the basis of the EViews application package. This significance is explained primarily by the fact that the coefficients of the explanatory variables X are less than the standard errors of the coefficients of the free limit C.

Since it is important to check the adequacy of the created model, this adequacy can be determined using the F-Fisher test as one of the traditional methods. To check the statistical significance of the model (1), which expresses the equation of multiple regression in general, the F-Fisher criterion should be compared with the value of $F_{cədvəl}\,(\mathrm{a;\,m;\,n-m-1})$ [3, p. 315]. According to table 2.1, in which the results of the work of the program complex Eviews-12 are presented, F-statistics (Fisher's criterion) = 57.67.

If you set the table value F in EXCEL according to the formula qiymətini $F_{tab}\left(\mathrm{a;m;n-m-1}\right)=\mathrm{F}$,

$$F_{tab.}\left(\mathrm{a;m;n-m-1}\right)=\mathrm{F}\left(0{,}05;2;14\right)=3.74$$

When comparing Fisher's F-criterion with the value of $F_{tab.}\left(\mathrm{a;m;n-m-1}\right)$, it is clear that F-criterion > Ftable (57.67>3.74). This means that the regression equation as a whole is statistically significant [3, p. 191]. This means the adequacy of the established model (1).

A conclusion about the presence or absence of autocorrelation in the model can be made on the basis of Darbon-Watson statistics in table 2.1, obtained according to the package of application programs Eviews-12. As you can see from the table, it is equal to DW=1.117. In this case, Darbon-Watson critical points for 2 explanatory variables (m=2) and n=17 observations at the level of significance α=0.05 will be as follows [2, p. 321].

$$d_l = 1{,}015, d_u = 1{,}536$$

since $d_l = 1{,}015 < \mathrm{DW} = 1{,}117 < d_u = 1{,}536$ the conclusion that there is autocorrelation is not determined [2; 4]. This means that the regression equation as a whole is statistically significant and the constructed model $y = 2{,}594x_1 + 5{,}137x_2 - 11872{,}11$ is adequate.

The graph of the dynamic change of GDP, taking into account investments aimed at construction and installation works in the oil and gas sector of the Republic of Azerbaijan for 2005–2021, and income from the oil and gas sector was obtained as follows.

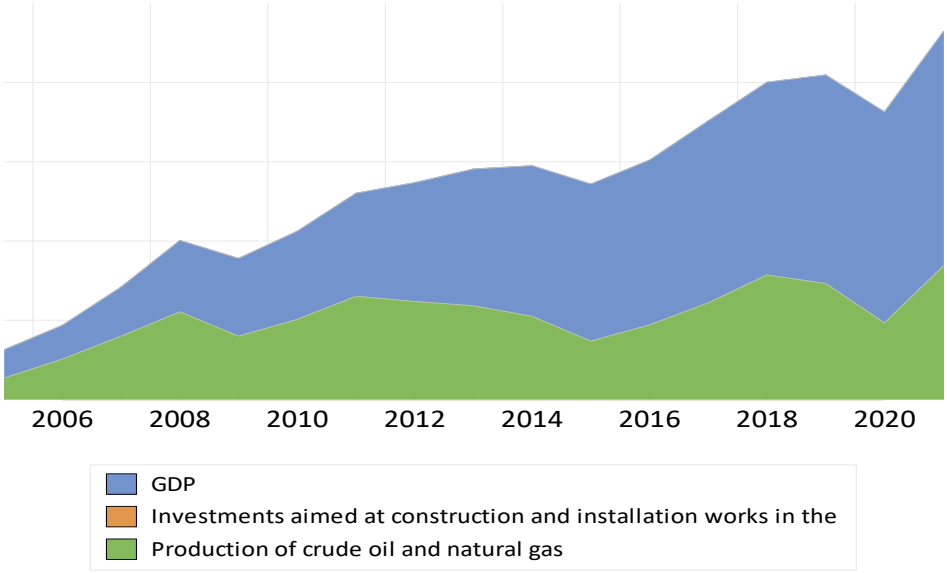

Figure 2.1. Dynamic change of GDP with investments directed to construction and installation works in the oil and gas sector in the Republic of Azerbaijan and income from the oil and gas sector

Source: The Eviews application was developed by the author based on the software package

Based on the regression equation of the built model (1) and the Eviews application software package, the dynamics of the values obtained (Fitted) and actual (Actual) for the studied indicators, as well as the residuals (Residual) between them are given in the graph below [3].

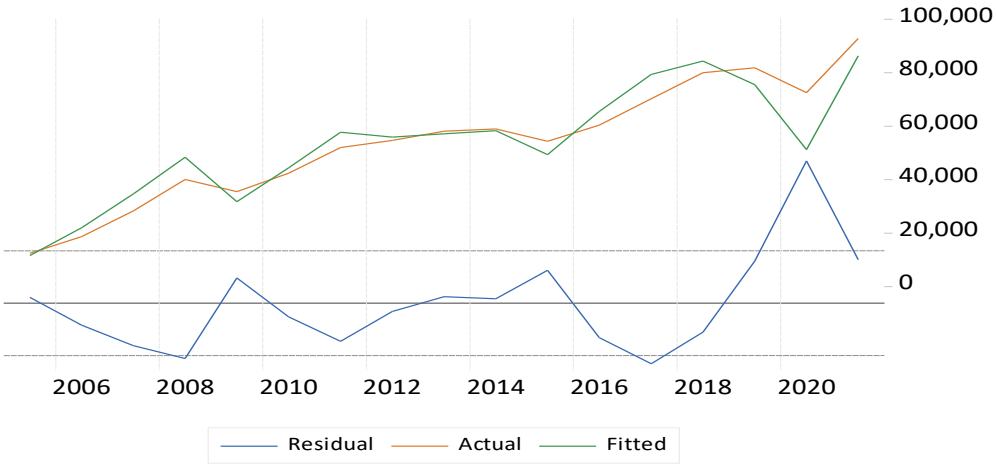

Figure 2.2. The dynamics of the obtained and actual values and the residuals between them by the regression equation

Source: The EViews-12 application was developed by the author based on the software package

The annual values and standard errors of GDP determined from the regression equation obtained from the data of the EViews-12 application software package, as well as a number of characteristics of the use of the equation for forecasting purposes, are presented in the graph below.

Prices, standard errors of GDP of the Republic of Azerbaijan by years, characteristics for forecasting.

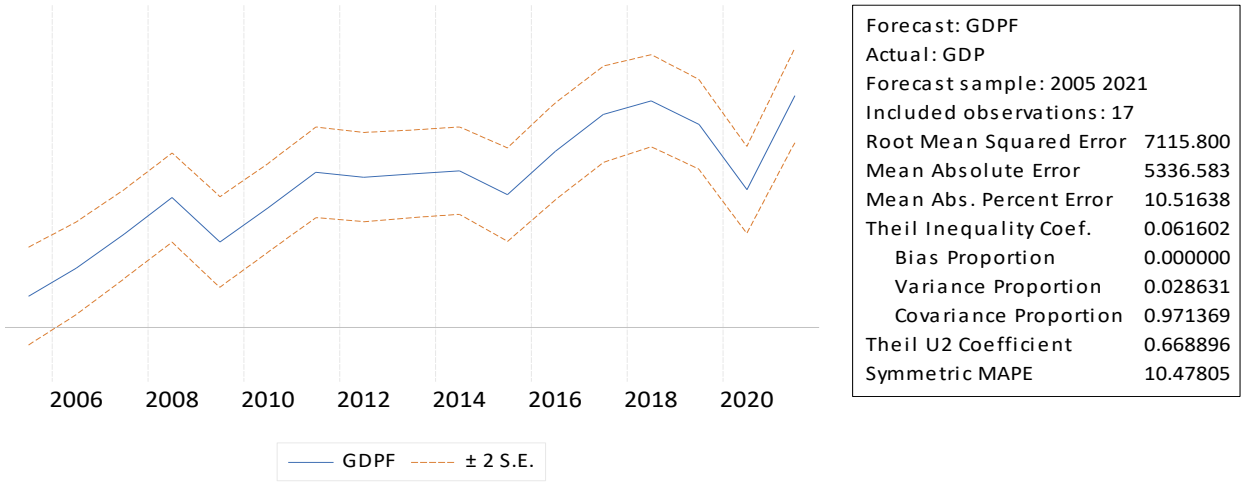

Figure 2.3. Prognostic characteristics of regression equations

Source: The EViews-12 application was developed by the author based on the software package

As you can see, the forecast characteristics of the model are normal, and the forecast values of Azerbaijan's GDP can be determined using the graph.

Jarque-Bera test was carried out as follows to verify the dependence between the investments directed to the construction and installation works in the oil and gas sector in the Republic of Azerbaijan and the dependence between the income from the oil and gas sector and GDP with the normal distribution law.

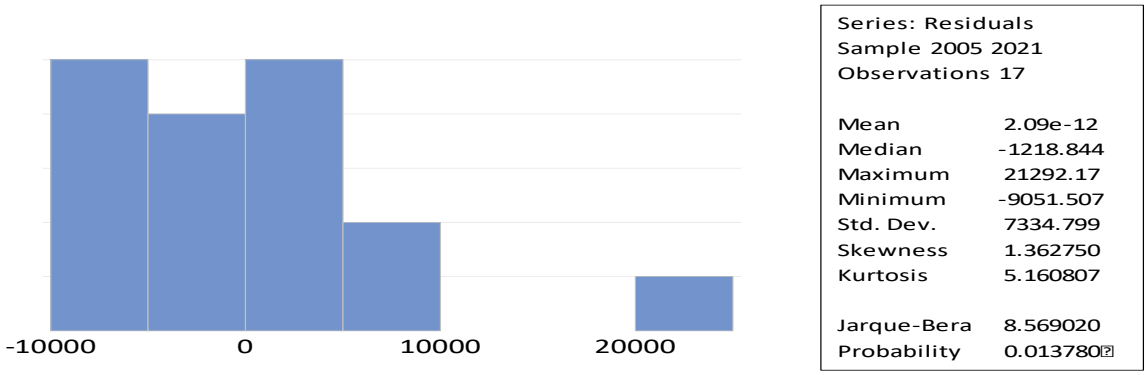

Figure 2.4. Jarque-bera test

Source: The EViews-12 application was developed by the author based on the software package

As can be seen from the graph, the coefficient of asymmetry is not close to zero. This means that the normal distribution is asymmetric. The fact that the coefficient of excess (k = 5.2) is higher than 3 means that it is much higher than the normal distribution. According to Harke-Ber statistics, the results show that GDP with investments aimed at construction and installation works in the oil and gas sector and income from the oil and gas sector in the Republic of Azerbaijan do not correspond to the law of normal distribution.

As a result of the study, it is possible to determine how much the result factor will change due to causal factors by calculating the elasticity coefficient, which expresses the percentage change in the dependent variable as a result of a 1% change in the independent variable for the linear regression equation. The elasticity coefficient is an indicator of the strength of the connection between the factor and the result, which shows how the value of the result will change if the value of the factor changes by 1 percent. This coefficient is calculated according to the following formula:

$$E = \frac{\propto_i \times \overline{x}_i}{\overline{y}} \quad (2)$$

Here, α_i – are the coefficients of the above relationship equation. $\overline{x}$ – is the calculated average of the explanatory factors for the studied periods, $\overline{y}$ – is the calculated average of the GDP in the Republic of Azer-

baijan for the studied periods. The elasticity coefficients calculated based on those indicators will be as follows according to the established model.

$$E_1 = \frac{\propto_1 \times \overline{x_1}}{\overline{y}} = \frac{2,594 \times 20999,65}{53789,51} = 1,012709$$

$$E_2 = \frac{\propto_2 \times \overline{x_2}}{\overline{y}} = \frac{5,137 \times 2177,459}{53789,51} = 0,207951$$

Calculations show that an increase in income in the oil and gas sector by 1% in the Republic of Azerbaijan leads to an increase in GDP by 1.013%, and an increase in investments aimed at construction and installation works in the oil and gas sector by 1% in the Republic of Azerbaijan leads to an increase in GDP by 0.21 %.

The result. As a result of the research, it was determined that the development of construction in the oil and gas sector is important for turning the country into an attractive investment resource center. According to the data of the Eviews-12 software complex, during the study it was established that there is a high correlation between investments aimed at construction and assembly works in the Republic of Azerbaijan, income from the oil and gas sector and GDP, expressed by the linear regression equation $y = 2,594x_1 + 5,137x_2 - 11872,11$ Based on the study, it was determined that a 1% increase in the revenues of the oil and gas sector in the Republic of Azerbaijan leads to an increase in GDP by 1.013%, as well as a 1% increase in investments aimed at construction and installation works in the Republic of Azerbaijan. The oil and gas sector leads to an increase in GDP by 0.21%.

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Gasimli Murad Bakir, Doctoral Student, Azerbaijan University of Construction and Architecture. **Influence of the construction sector on the gross domestic product of the oil and gas industry.**

The article describes the role of construction development in the oil and gas industry in turning the country into an attractive investment resource center. Here, on the basis of statistical data, the dynamics of the development of investments aimed at construction and installation works, income from the oil and gas sector and GDP in the Republic of Azerbaijan are analyzed and evaluated. In the research work, a correlation-regression analysis of the dependence between investments aimed at construction and installation works in the Republic of Azerbaijan, income from the oil and gas sector and GDP was carried out on the basis of the Eviews-12 software package. On the basis of the research work, it was established that the increase in investments aimed at construction and assembly works in the Republic of Azerbaijan and the increase in income from the oil and gas sector significantly cause the increase in GDP in the Republic of Azerbaijan.

Key words: oil, gas, construction and assembly work, model, correlation, regression, program complex, adequacy.

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Гасимли Мурад Бакір огли, докторант, Азербайджанський університет будівництва та архітектури.
Вплив будівельного сектора на валовий внутрішній продукт нафтогазової галузі.

У статті описується роль розвитку будівництва в нафтогазовій галузі у перетворенні країни на привабливий центр інвестиційних ресурсів. На основі статистичних даних проаналізовано та оцінено динаміку розвитку інвестицій, спрямованих на будівельно-монтажні роботи, доходів від нафтогазового сектора та ВВП в Азербайджанській Республіці. У дослідженні проведено кореляційно-регресійний аналіз залежності між інвестиціями, спрямованими на будівельно-монтажні роботи в Азербайджанській Республіці, доходами від нафтогазового сектора та ВВП на основі програмного пакету Eviews-12. На основі дослідницької роботи було встановлено, що збільшення інвестицій, спрямованих на будівельно-монтажні роботи в Азербайджанській Республіці, та збільшення доходів від нафтогазового сектора, суттєво зумовлюють збільшення ВВП в Азербайджанській Республіці.

Ключові слова: нафта, газ, будівельно-монтажні роботи, модель, кореляція, регресія, програмний комплекс, адекватність.