ECONOMETRIC ANALYSIS OF THE IMPACT TO THE GDP (*GROSS DOMESTIC PRODUCT*) OF THE NON-OIL SECTOR IN AZERBAIJAN'S ECONOMY

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ABSTRACT

In this paper we establish a linear relation using multiple linear regression model between the gross domestic product (GDP) by industry, agriculture, forestry and fishing, construction, transport. Drinking determinasiya source model is used to check whether there were adequate. Then the value of the model is verified. F-Fischer and the statistical distribution of the prices found in comparison to the actual price. Mathematical calculations were used batch STATISTICA program.
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1. INTRODUCTION

The rich resources of oil and gas revenues from the non-oil sectors in directing the development of other economic sectors will be highlighted. In recent years, the growth of non-oil sector also could be seen as a consequence of the policy of diversification of energy resources. GDP growth in 2011 was due to the non-oil sector. The center of gravity of economic development and GDP growth, but also by the volume of investments in the non-oil sector exceeded. In 2011 GDP growth at 0.1% vs. 9.4% in the non-oil sector. Last year, the non-oil sector GDP growth of 4.2%, net of tax impact of 0.4%. Non-oil GDP increased by 9.4%. The contribution of the increase has been different in different areas. Thus, the increase in non-oil sector's share of the construction sector, 3.6%, 1% of the share of non-oil sector, the share of agriculture - 0.7%, communication services amounted to 0.5%.

The last 8 years, the volume of gross domestic product increased by 3 times to 2 times the volume of the GDP in the coming year the main goal. The oil and gas sector's share of GDP will remain stable in the coming years, while the non-oil sectors of the center of gravity directly fall on the rise for some time, economic growth in these sections reveal. Note that the last eight years, the non-oil sector in Azerbaijan increased by 2.2 times. The growth of the economy and industry, agriculture, tourism, information and communication technologies in the areas of growth in non-oil and gas sector's growth in the next 10 years than in the previous decade would be a condition (Aliyev 2002).

Azerbaijan's non-oil sector development, agriculture, tourism, information and communication technology, the processing industry is considered to be the main priority areas. International financial institutions in these areas tend to emphasize the importance of agriculture and tourism. Thus, 44 percent of the employed population works in the agricultural sector. For this reason, successive government programs aimed at the development of agriculture in the country, reforms and attraction of new technologies being implemented. According to the figures contained in the report of the Council of Ministers in 2003, compared with 34 percent in 2011. The increase was registered in the production of agricultural products. Over the past three years, the total output of the agriculture growth rate by an average of 2.5 percent. At present, production of non-oil products, including electrical machinery and equipment and parts, chemical products, construction materials, made up textile articles and so on., are exported to various regions.

The chemical industry plays an important role in the development of one of the sectors of economy. Create conditions for the development of agriculture in the production of mineral fertilizers. The chemical industry helps to meet the needs of different things, expands the chemical-technological methods.

Modern chemical technology, as opposed to the processing of raw materials, machinery, chemicals, minerals (apatite, phosphorite, potassium salt, salt, sulfur, etc.), mineral fuels, especially oil, gas and coal, wood and plant, animal raw materials, air, water and so on. into valuable industrial products. Technical progress as the invention of new raw materials are expensive and scarce raw materials are replaced by cheaper raw materials, raw materials are used in the complex. For example, waste processing and production of a new product is purchased. The chemical industry is made up of several areas:

1) Mining chemicals (mineral raw materials extraction);

2) The main chemical (salt, acid, mineral fertilizers);

3) Organic synthesis chemistry (hydrocarbon raw material, semi-finished products);

4) The chemistry of polymers (plastics, rubber, various fiber purchase);

5) Processing of polymer materials (tire, polyethylene preparation).

The premise of the principles in the diverse sources of raw materials in mining, chemicals, basic chemical products (mineral fertilizers and various acids) in the demand for transportation is difficult to accommodate their enterprises profitable. In addition, the potash fertilizer plants are inclined to raw material sources. Polymer chemistry and a lot of heat and electricity, water and requires special raw materials, so this is the area of oil products, coal kokslasdırılması, cheap fuel and energy, which is abundant water resources are leaning districts. Diversity and wide distribution of raw materials in the chemical industry extends the capability of its placement. The prevalence of various chemical raw materials, oil and gas, mining and chemicals, iodine-bromine water, oil and gas and non-ferrous metallurgical industry waste, creates conditions for the development of a diversified chemical industry. Among the areas of heavy industry and chemical industry on the volume of production engineering and the energy industry ranks third after (Bayulgen 2010).

One of the non-oil sectors of the construction materials industry. Building materials industry is comprised of three main areas, this mineral-building materials (sand, gravel, different stone, marble) removal, masonry materials (cement, lime, gypsum) production, building and structures of different wall materials, products and structures include the preparation. Basic construction materials industry of the Republic of cement products, various sizes of reinforced concrete structures and panels, cubic stone, brick, glass, slate, absestsement pipes, heat - insulating, polymers and others applies. Moreover, in recent years, linoleum, light filler mineral construction materials, marble, travertine, decorative materials, such as cast iron and iron plumbing products are produced. Building materials industry in the first place, according to the composition of the production of reinforced concrete structures and parts, second place in the cement industry, and the third involves the extraction of natural wall stones and a variety of raw materials.

At present, the world has established trade relations with many foreign countries. Bilateral trade exchange volume, range, and demand for the goods in terms of the strategic importance of relations with Iran, Turkey and emerged with the Britannia.

In addition to the export products of cotton fiber, non-ferrous metals, chemical products, refrigerators and steamers, oil equipment, air conditioners and consumer goods (www.statgov.az).

2. THE MATHEMATICAL FORMULATION OF THE PROBLEM

The first mathematical analysis of economic issues to meet Steels are the variables $x_{i1}, x_{i2}, ..., x_{im}$ and $\hat{y}_i$, where $\hat{y}_i$ is of interest to us, mainly to explain the $x_{i1}, x_{i2}, ..., x_{im}$ or $\hat{y}_i$ variable to monitor changes during the change crosses. The study of independence between two or more variables are available for the various issues. This type of regression analysis is used to resolve the issues. Forecasting and management issues, taking into account the currently applied regression analysis and extensive. Variable Regression numerous external factors which explain the purpose of the analysis is to identify the dependencies. In this case it was found by the method of least squares regression coefficients. This expression can write as follows Lihovido 1999 :

$$\hat{y}_i = \alpha_0 + \alpha_1 x_{i1} + \alpha_2 x_{i2} + ... + \alpha_m x_{im} + \varepsilon_i \ , \quad i = 1,2,...,n \ , \quad (2.1)$$

wherey_i–the dependent variable or predict, $x_{i1}, x_{i2}, ..., x_{im}$ says variables and key variable, explanatory variable, control and predictive variables. ε_i -is called changes in the random error, or a random part. $\alpha_0, \alpha_1, \alpha_2, ...\alpha_m$ parameters of the regression coefficients and their prices can be defined in different ways (Lihovido 1999; Samilova & ark. 2015) .

Considering the above model called multiple linear regression model and this econometric model reflects the relationship between the variables. Multiple regression analysis $x_{i1}, x_{i2}, ..., x_{im}$ more in contrast to all the factors affecting the cost-effective approach to yi.. ε -that factors which are not included in the model, at the same time as the factors within or planned based unobservable. It is clear that in the formula where the functional relationship between the variables available.

According to the principle of generalized method of least squares estimator of the unknown parameter, we find that the minimum prices of equation:

$$S(\alpha_0, \alpha_1, \alpha_2, ..., \alpha_m) = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2 \to \min \ .$$

It is known that a necessary condition for ekstremumu function, extreme point of the transformation of the derivatives to zero. That is,

$$\begin{cases} \dfrac{\partial S}{\partial \alpha_0} = 0 \\ \dfrac{\partial S}{\partial \alpha_1} = 0 \\ .... \\ \dfrac{\partial S}{\partial \alpha_m} = 0 \end{cases} \tag{2.2}$$

Simplifying the system of equations in (2.2) will be reduce thesimplifying following system of equations:

$$\begin{cases} n \cdot \alpha_0 + \alpha_1 \sum_{i=1}^{n} x_{i1} + \alpha_2 \sum_{i=1}^{n} x_{i2} + ... + \alpha_m \sum_{i=1}^{n} x_{im} = \sum_{i=1}^{n} y_i \\ \alpha_0 \sum_{i=1}^{n} x_{i1} + \alpha_1 \sum_{i=1}^{n} x_{i1}^2 + \alpha_2 \sum_{i=1}^{n} x_{i1} x_{i2} + ... + \alpha_m \sum_{i=1}^{n} x_{i1} x_{im} = \sum_{i=1}^{n} x_{i1} y_i \\ \alpha_0 \sum_{i=1}^{n} x_{i2} + \alpha_1 \sum_{i=1}^{n} x_{i1} x_{i2} + \alpha_2 \sum_{i=1}^{n} x_{i2}^2 + ... + \alpha_m \sum_{i=1}^{n} x_{i2} x_{im} = \sum_{i=1}^{n} x_{i2} y_i \\ ------------------------------------ \\ \alpha_0 \sum_{i=1}^{n} x_{im} + \alpha_1 \sum_{i=1}^{n} x_{i1} x_{im} + \alpha_2 \sum_{i=1}^{n} x_{i2} x_{im} + ... + \alpha_m \sum_{i=1}^{n} x_{1m}^2 = \sum_{i=1}^{n} x_{im} y_i \ . \end{cases} \tag{2.3}$$

Therefore to solvethe system of linear equations (2.3)and the prices $\alpha_0, \alpha_1, \alpha_2, ..., \alpha_m$ parameters and ifputting in place of multiple linear regression equation(2.1), the variable y_i from $x_{i1}, x_{i2}, ..., x_{im}$ dependence on the specific shape of the line would be found.

Let's assume that the gross domestic product ($\hat{y}$) and between industrial (x_{i1}), agriculture, forestry and fishing (x_{i2}), construction (x_{i3}) and transport and communication(x_{i4}) are linear dependence. If we take $m = 4$ in (2.1), then we can write

$$\hat{y}_i = \alpha_0 + \alpha_1 x_{i1} + \alpha_2 x_{i2} + \alpha_3 x_{i3} + \alpha_4 x_{i4} + \varepsilon_i, \quad i = 1,2.,,,.16. \quad (2.5)$$

For the years 2000-2015 in the non-oil sector of the economy - industry, agriculture, forestry and fishing, construction, transport and communications, the net effect of taxes to GDP (in%) are reflected in the following table:

Table 2.1. By sectors of the economy, gross domestic product, the actual prices (Samilova & ark 2015)

Year	Sum (%)	Industrial (%)	Agriculture, Forestry and Fishing (%)	Construction (%)	Transport and Communication (%)
2000	76,8	36,0	16,1	6,5	12,0
2001	76,2	37,6	14,8	5,8	10,1
2002	77,9	37,4	14,0	8,7	9,8
2003	78,6	37,3	12,4	11,2	10,0
2004	78,5	38,3	11,0	12,5	9,5
2005	82,5	49,5	9,1	9,0	7,3
2006	84,3	57,4	7,1	7,7	6,6
2007	86,7	59,7	6,7	6,4	7,3
2008	84,7	58,7	5,6	7,0	6,7
2009	79,0	49,2	6,1	7,2	8,6
2010	79,5	51,7	5,5	8,1	7,4
2011	79,5	53,8	5,1	8,0	6,7
2012	77,4	49,4	5,1	10,1	6,6
2013	75,2	45,4	5,4	11,6	6,1
2014	72,7	41,0	5,3	12,6	6,3
2015	68,0	34,0	6,2	12,1	7,4

If we get $m = 4$ and $n = 16$ in(2.3),then linear algebraic equations system is as follows:

$$\begin{cases} 16\alpha_0 + \alpha_1 \sum_{i=1}^{16} x_{i1} + \alpha_2 \sum_{i=1}^{16} x_{i2} + \alpha_3 \sum_{i=1}^{16} x_{i3} + \alpha_4 \sum_{i=1}^{16} x_{i4} = \sum_{i=1}^{16} y_i, \\ \alpha_0 \sum_{i=1}^{16} x_{i1} + \alpha_1 \sum_{i=1}^{16} x_{i1}^2 + \alpha_2 \sum_{i=1}^{16} x_{i1}x_{i2} + \alpha_3 \sum_{i=1}^{16} x_{i1}x_{i3} + \alpha_4 \sum_{i=1}^{16} x_{i1}x_{i4} = \sum_{i=1}^{16} x_{i1}y_i, \\ \alpha_0 \sum_{i=1}^{16} x_{i2} + \alpha_1 \sum_{i=1}^{16} x_{i1} \cdot x_{i2} + \alpha_2 \sum_{i=1}^{16} x_{i2}^2 + \alpha_3 \sum_{i=1}^{16} x_{i2}x_{i3} + \alpha_4 \sum_{i=1}^{16} x_{i2}x_{i4} = \sum_{i=1}^{16} x_{i2}y_i, \\ \alpha_0 \sum_{i=1}^{16} x_{i3} + \alpha_1 \sum_{i=1}^{16} x_{i1}x_{i3} + \alpha_2 \sum_{i=1}^{16} x_{i2}x_{i3} + \alpha_3 \sum_{i=1}^{16} x_{i3}^2 + \alpha_4 \sum_{i=1}^{16} x_{i3}x_{i4} = \sum_{i=1}^{16} x_{i3}y_i, \\ \alpha_0 \sum_{i=1}^{16} x_{i4} + \alpha_1 \sum_{i=1}^{16} x_{i1}x_{i4} + \alpha_2 \sum_{i=1}^{16} x_{i2}x_{i4} + \alpha_3 \sum_{i=1}^{16} x_{i3}x_{i4} + \alpha_4 \sum_{i=1}^{16} x_{i4}^2 = \sum_{i=1}^{16} x_{i4}y_i. \end{cases}$$

Each side of the equations of the system dividing to 16, then equations of the systems is simples.

$$\begin{cases} \alpha_0 + \alpha_1 \overline{x_1} + \alpha_2 \overline{x_2} + \alpha_3 \overline{x_3} + \alpha_4 \overline{x_4} = \overline{y}, \\ \alpha_0 \overline{x_1} + \alpha_1 \overline{x_1^2} + \alpha_2 \cdot \overline{x_1 x_2} + \alpha_3 \cdot \overline{x_1 x_3} + \alpha_4 \overline{x_1 x_4} = \overline{y x_1}, \\ \alpha_0 \overline{x_2} + \alpha_1 \overline{x_1 x_2} + \alpha_2 \overline{x_2^2} + \alpha_3 \overline{x_2 x_3} + \alpha_4 \overline{x_2 x_4} = \overline{y x_2}, \\ \alpha_0 \overline{x_3} + \alpha_1 \overline{x_1 x_3} + \alpha_2 \overline{x_2 x_3} + \alpha_3 \overline{x_3^2} + \alpha_4 \overline{x_3 x_4} = \overline{y x_3}, \\ \alpha_0 \overline{x_4} + \alpha_1 \overline{x_1 x_4} + \alpha_2 \overline{x_2 x_4} + \alpha_3 \overline{x_3 x_4} + \alpha_4 \overline{x_4^2} = \overline{y x_4}, \end{cases} \quad (2.4)$$

By substituting of the explanatory and understandable variables into (2.4)which obtained from Table 2.2, we can write

$$\begin{cases} \alpha_0 + 46 \cdot \alpha_1 + 8{,}5 \cdot \alpha_2 + 9 \cdot \alpha_3 + 8 \cdot \alpha_4 = 78{,}6 \\ 46 \cdot \alpha_0 + 2190{,}5 \cdot \alpha_1 + 369{,}6 \cdot \alpha_2 + 407 \cdot \alpha_3 + 360{,}2 \cdot \alpha_4 = 3647{,}3 \\ 8{,}5 \cdot \alpha_0 + 369{,}6 \cdot \alpha_1 + 85{,}9 \cdot \alpha_2 + 74{,}5 \cdot \alpha_3 + 73{,}8 \cdot \alpha_4 = 664{,}4, \\ 9 \cdot \alpha_0 + 407 \cdot \alpha_1 + 74{,}5 \cdot \alpha_2 + 86{,}7 \cdot \alpha_3 + 71{,}5 \cdot \alpha_4 = 703{,}8, \\ 8 \cdot \alpha_0 + 360{,}2 \cdot \alpha_1 + 73{,}8 \cdot \alpha_2 + 71{,}5 \cdot \alpha_3 + 67{,}3 \cdot \alpha_4 = 629{,}8. \end{cases} \quad (2.5)$$

As a result, we have 4 unknown 5 equations linear algebraic equations system. Ready to find the unknown parameters to use STATISTICA package program.

3. THE USAGE OF THE STATISTICA PACKAGE IN THE REGRESSION AND CORRELATION RELATIONSHIPS

In the form (2.5) of the system of linear algebraic equations to find the unknown parameters, the value of statistical package program must perform the following sequence. At the same time, marked in Table 3.1 will be reflected in the results of multivariate regression model (Samilova & ark 2015).

Table 3.1. Multiple regression model

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Multiple Regression Results: Spreadsheet1

 Multiple Regression Results

Dependent: Var1              Multiple R = ,99035721     F = 140,5344
                                    R?= ,98080741    df =    4,11
No. of cases: 16             adjusted R?= ,97382828     p = ,000000
             Standard error of estimate: ,749510614
Intercept: 13,160992497  Std.Error: 5,131187  t(   11) = 2,5649  p = ,0263

           x1 beta=1,72            x2 beta=,784            x3 beta=,458
           x4 beta=,358

(significant betas are highlighted)
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Thus we can write $\alpha_0 = 13{,}16$, $\alpha_1 = 1{,}72$, $\alpha_2 = 0{,}784$, $\alpha_3 = 0{,}458$ and $\alpha_4 = 0{,}358$ from Table 3.1.The unknown parameters price (2.5), taking into account we obtain

$$\hat{y}_i = 13{,}16 + 1{,}72x_{i1} + 0{,}784x_{i2} + 0{,}458x_{i3} + 0{,}358x_{i4} + \varepsilon_i,\ i = 1,2,...,16. \quad (3.1)$$

(3.1) multiple regression model shows that the gross domestic product ($\hat{y}$), a 1% increase, industrial products (x_{i1}) 172%, agriculture, forestry and fishery products (x_{i2}) 78.4%, construction material (x_{i3}) 45.8% transport and communication products (x_{i4}) 35.8% increases. That appear from Table 3.1, the ratio is determination $R^2 = 0{,}98080741$. Determination price ratio shows that the model is highly accurate and original adequate. Established by using a linear regression model to examine the distribution of important from distribution F-Fischer:

$$F = \frac{R^2}{1-R^2} \cdot \frac{n-m-1}{m} > F_{\alpha,k_1,k_2}$$

The table on the left side of inequality that they include the cost of the statistical distribution of the F-Fischer. $\alpha = 0{,}05$ and $k_1 = 3$, $k_2 = 13$ then $F_{\alpha,k_1,k_2} = 3{,}410534$. From Table (3.1) it can be seen that $F = 140{,}5344$. In this case,we have $F = 140{,}5344$ $> 3{,}4105 = F_{\alpha,k_1,k_2}$ and therefore the linear regression model is 5 % of important.

4. CONCLUSION

Using multiple linear regression model, the gross domestic product by industry, agriculture, forestry and fishing, construction, transport and communication is established between the linear dependence. Established unknown parameters of the model are found. Found in prices is the economic interpretation. Established multiple linear regression model shows that the gross domestic product 1vahid increases, industrial products 172 single, agriculture, forestry and fishery products 78.4 units to 45.8 units of construction materials, transport and communications products unit increased 35.8.

Determination ratio of the original model is used to check whether there were adequate. As a result, 98% of the original model has been found to be adequate.
Then the significance of the model is checked. F-Fischer and the statistical distribution of the price found is compared to the actual price. Established multivariate linear regression model, the 5% significance emerges.

Mathematical calculations have been used during the program STATISTICA package. The statistical software package to use, and prevents the loss of time, but also leads to a lack of large errors.

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Table 2.2.

No	y	x_1	x_2	x_3	x_4	x_1^2	x_1x_2	x_1x_3	x_1x_4	$y.x_1$	x_2^2	x_2x_3	x_2x_4	$y.x_2$	x_3^2	x_3x_4	$y.x_3$	x_4^2	$y.x_4$
1	76,8	36,0	16,1	6,5	12,0	1296,0	579,6	234,0	432,0	2764,8	259,2	104,7	193,2	1236,5	42,3	78,0	499,2	144,0	921,6
2	76,2	37,6	14,8	5,8	10,1	1413,8	556,5	218,1	379,8	2865,1	219,0	85,8	149,5	1127,8	33,6	58,6	442,0	102,0	769,6
3	77,9	37,4	14,0	8,7	9,8	1398,8	523,6	325,4	366,5	2913,5	196,0	121,8	137,2	1090,6	75,7	85,3	677,7	96,0	763,4
4	78,6	37,3	12,4	11,2	10,0	1391,3	462,5	417,8	373,0	2931,8	153,8	138,9	124,0	974,6	125,4	112,0	880,3	100,0	786,0
5	78,5	38,3	11,0	12,5	9,5	1466,9	421,3	478,8	363,9	3006,6	121,0	137,5	104,5	863,5	156,3	118,8	981,3	90,3	745,8
6	82,5	49,5	9,1	9,0	7,3	2450,3	450,5	445,5	361,4	4083,8	82,8	81,9	66,4	750,8	81,0	65,7	742,5	53,3	602,3
7	84,3	57,4	7,1	7,7	6,6	3294,8	407,5	442,0	378,8	4838,8	50,4	54,7	46,9	598,5	59,3	50,8	649,1	43,6	556,4
8	86,7	59,7	6,7	6,4	7,3	3564,1	400,0	382,1	435,8	5176,0	44,9	42,9	48,9	580,9	41,0	46,7	554,9	53,3	632,9
9	84,7	58,7	5,6	7,0	6,7	3445,7	328,7	410,9	393,3	4971,9	31,4	39,2	37,5	474,3	49,0	46,9	592,9	44,9	567,5
10	79,0	49,2	6,1	7,2	8,6	2420,6	300,1	354,2	423,1	3886,8	37,2	43,9	52,5	481,9	51,8	61,9	568,8	74,0	679,4
11	79,5	51,7	5,5	8,1	7,4	2672,9	284,4	418,8	382,6	4110,2	30,3	44,6	40,7	437,3	65,6	59,9	644,0	54,8	588,3
12	79,5	53,8	5,1	8,0	6,7	2894,4	274,4	430,4	360,5	4277,1	26,0	40,8	34,2	405,5	64,0	53,6	636,0	44,9	532,7
13	77,4	49,4	5,1	10,1	6,6	2440,4	251,9	498,9	326,0	3823,6	26,0	51,5	33,7	394,7	102,0	66,7	781,7	43,6	510,8
14	75,2	45,4	5,4	11,6	6,1	2061,2	245,2	526,6	276,9	3414,1	29,2	62,6	32,9	406,1	134,6	70,8	872,3	37,2	458,7
15	72,7	41,0	5,3	12,6	6,3	1681,0	217,3	516,6	258,3	2980,7	28,1	66,8	33,4	385,3	158,8	79,4	916,0	39,7	458,0
16	68,0	34,0	6,2	12,1	7,4	1156,0	210,8	411,4	251,6	2312,0	38,4	75,0	45,9	421,6	146,4	89,5	822,8	54,8	503,2
Sum	1257,5	736,4	135,5	144,5	128,4	35048,0	5914,3	6511,4	5763,5	58356,6	1373,7	1192,5	1181,3	10629,8	1386,7	1144,5	11261,5	1076,2	10076,5
Average	**78,6**	**46,0**	**8,5**	**9,0**	**8,0**	**2190,5**	**369,6**	**407,0**	**360,2**	**3647,3**	**85,9**	**74,5**	**73,8**	**664,4**	**86,7**	**71,5**	**703,8**	**67,3**	**629,8**