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A STUDY OF THE DEPENDENCE OF THE GROWTH RATES OF THE REGIONAL ECONOMY ON THE DEGREE OF DIVERSIFICATION USING CORRELATION-REGRESSION ANALYSIS

Abstract. The raw orientation of the economy of Kazakhstan not only hampers the provision of long-term economic growth, but also makes the country dependent on changes in world prices. The conducted researches showed that only diversification can provide a departure from the dominance of the raw material branches of the economy, as well as the growth of the competitiveness of the country's economy due to the increase in the share of products with high added value and high technology products in GDP. A thorough analysis was carried out to select the direction of diversification. The investigated statistical indicators allowed to obtain useful information on the opportunities for diversification and to compile a description of these prospects by standard indicators. Selected indicators were reflected in the form of a series of distributions using the method of ranking, as well as after calculating the median, arithmetic mean, mode, etc. the full characteristics of the presented indicators were given. Comparison of several methods of carrying out empirical studies once again proved that the obtained conclusions depend on the selected performance indicators. The conducted researches also have proved that the raw orientation of the economy of Kazakhstan does not give competitive advantages, it gives only comparative advantages. The presence of a non-diversified economy, i. based on the development of a single commodity sector does not yet prove the underdevelopment and lack of dynamics, since in our case a significant growth rate is guaranteed by developing the fuel and energy complex and all related industries, while a high degree of economic diversification does not prove that development economy will be large-scale.

Key words: diversification, statistical analysis, the Herfindahl-Hirschman index, regression coefficient, correlation coefficient, coefficient of determination.

The structure of the modern world economy and globalization makes new competitive demands for all its participants. For Kazakhstan, it is necessary to realize the realities and challenges of global production, where first developed countries and transnational corporations, pursuing their goals, are struggling for resources in order to maintain a dominant position in the world production chain. This leads to the current situation, where developed countries have technology, and countries rich in raw materials remain in the role of catch-up.

Unlike the western countries, Kazakhstan has entered the post-industrial transformation way much later, which requires the need to ensure modernization at an accelerated pace, allowing to reduce or overcome the existing gap between the level of development of Kazakhstan and the most advanced countries in the technological world [1].

In this connection, there is a question of structural reorganization, changes in the direction of industrial and investment policy, all that includes a multifaceted process of diversification.

To choose the right direction of diversification, a thorough analysis is necessary. Studying of separate statistical indicators allows to receive the helpful information about them and to make their description by standard indicators. At the same time, the studied set of indicators can be reflected in the form of a series of distribution by the method of ranking, giving a complete description of the given population, calculating the indices of the mode, medians, arithmetic mean, etc. [2].

The first stage in this statistical analysis concerns the identification of the so-called correlation, or correlation dependence. Correlation is considered as a sign indicating the interrelation of many numerical sequences.

In the process of finding the correlation dependence, the probable relationship of one investigated quantity x with another investigated value y is often determined. In this case, the indicators are represented by two numerical sequences, between which the presence of a statistical relationship must be established [3].

Thus, this type of analysis allows one to draw a conclusion about the strength of the relationship between pairs of indicators x and y, and regression analysis allows one to predict one variable (y) based on the other (x). In other words, in this case an attempt was made to identify the cause-effect relationship between the analyzed indicators [4].

The correlation coefficient makes it possible to give a qualitative and quantitative estimate of the tightness of the connection between the two studied factors X and Y. Its representation can have the following form (Table 1):

Table 1 - Qualitative assessment of tightness of communication

Coefficient of pair correlation	Strength of communication
Untill 0,2	Virtually absent
0,2-0,39	Weak
0,4-0,69	Average (moderate)
0,7-0,89	Strong (tight)
0,9-1	Very strong (tight)

Calculate the correlation coefficient and use the "Data analysis" package to obtain the regression equation.

1) To assess the tightness of the relationship between the factors under study, we calculate the coefficients of pair correlation using the statistical function "CORREL" (Table 2):

Table 2 - Coefficient of pair correlation

Coefficients	2014 г.	2015 г.	2016 г.	2017 г.
correlation coefficient	-0,65	0,33	-0,67	0,39
coefficient of determination	41,66	11,04	44,43	15,31

2) Since the value of the correlation coefficient in 2016 is the largest, it makes sense for the forecast to use the 2016 data.

3) Calculate the correlation coefficient and construct a pairwise linear regression model for the dependence of growth rates on the diversification index using Regression mode of the Data Analysis tool.

4) In the "Tools" menu, select "Data Analysis" tool "Regression".

5) Fill it with the initial data of 2016.

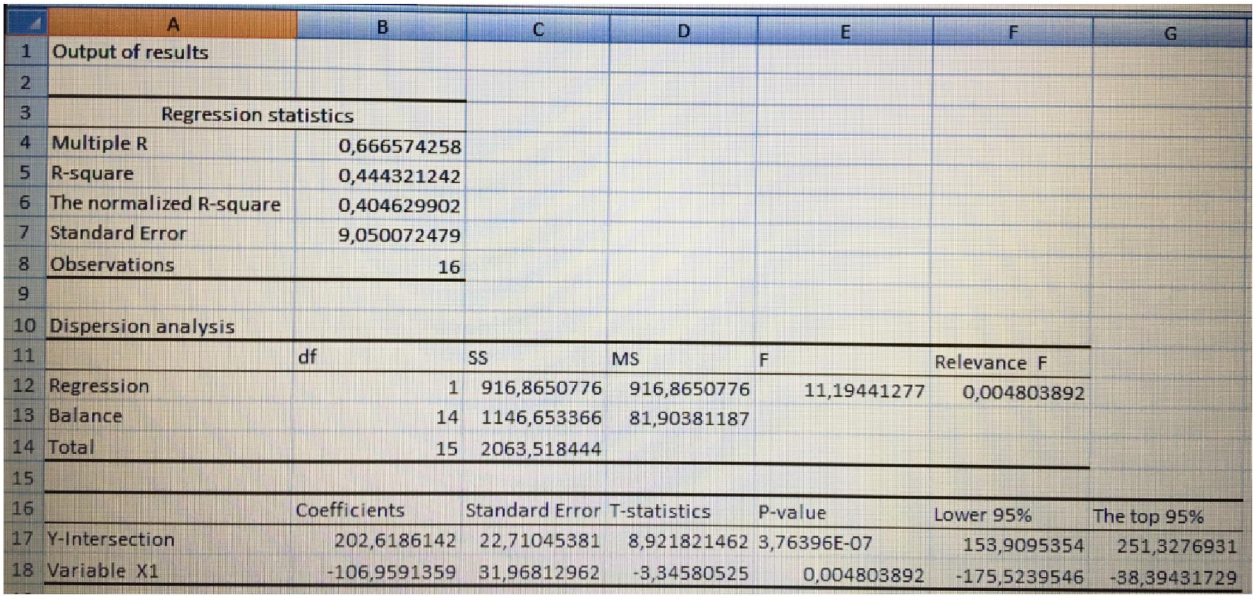
6) The results of the "Regression" tool will be displayed on a new sheet as shown in Figure 1.

7) The correlation coefficient was 0.67. This indicates a close relationship between the factors studied.

8) The change in the growth rate by 44% is explained by the change in the index of diversification, the remaining 56% is the influence of unaccounted factors.

9) Based on the "Conclusion of the results" the equation of pair regression takes the form: Y = 202.62-106.96 * X. The value of the regression coefficient indicates an inverse relationship (-106.96).

10) We will evaluate the quality of the chosen regression equation using the mean error of approximation. To do this, we first calculate the theoretical growth rates (Vx) from the regression equation found (Table 3) [5,6].



	A	B	C	D	E	F	G
1	Output of results						
2							
3	Regression statistics						
4	Multiple R	0,666574258					
5	R-square	0,444321242					
6	The normalized R-square	0,404629902					
7	Standard Error	9,050072479					
8	Observations	16					
9							
10	Dispersion analysis						
11		df	SS	MS	F	Relevance F	
12	Regression	1	916,8650776	916,8650776	11,19441277	0,004803892	
13	Balance	14	1146,653366	81,90381187			
14	Total	15	2063,518444				
15							
16		Coefficients	Standard Error	T-statistics	P-value	Lower 95%	The top 95%
17	Y-Intersection	202,6186142	22,71045381	8,921821462	3,76396E-07	153,9095354	251,3276931
18	Variable X1	-106,9591359	31,96812962	-3,34580525	0,004803892	-175,5239546	-38,39431729

Picture 1 - Results of the "Regression" tool

Table 3 - Theoretical value of growth rates

2016			
Rates of growth, У	The Herfindahl-Hirschman Index (the diversification index), X	Uther	A, approximation error
117,56	0,79	118,1216	0,48
128,36	0,7	127,748	0,48
122,99	0,8	117,052	4,83
145,74	0,64	134,1656	7,94
111,18	0,76	121,3304	9,13
121,89	0,76	121,3304	0,46
133,81	0,65	133,096	0,53
127,85	0,65	133,096	4,10
125,68	0,8	117,052	6,87
137,15	0,6	138,444	0,94
144,84	0,55	143,792	0,72
145,68	0,7	127,748	12,31
125,78	0,75	122,4	2,69
119,55	0,72	125,6088	5,07
113,9	0,74	123,4696	8,40
110,23	0,7	127,748	15,89
Average error of approximation			**5,05**

11) As mentioned above, the model is considered qualitatively selected if the value of the average error of approximation does not exceed 8-10% [7,8].

The dependence of the growth rates (Y) on the index of diversification (X) on the example of the Herfindahl-Hirschman index is characterized as inverse, close. That is, an increase (decrease) in the index of diversification leads to a decrease (increase) in the growth rates. Variations in the growth rate of 44% are

due to the variation in the diversification index, the remaining 56% is the impact of any other random and unaccounted factors. The pairwise linear regression model of the form Y = 202.62-106.96 * X is qualitatively matched to the initial data and can be used for forecasting.

If you look at the graphs, the value of the adjusted determination coefficient is approximately at the same level, so you can choose a linear function, because it is the most qualitative forecast.

The value of the coefficient of determination in both cases is 0.44 (44%).

The value of the regression coefficient is negative, which indicates the presence of an inverse relationship between the factors under investigation, namely between growth rates and the level of economic diversification.

Let's try to give an economic explanation for the data obtained because of the correlation-regression analysis, when an inverse relationship is traced between such factors as the growth rate of the economy and the level of diversification.

Today, we can say with confidence that oil is the dominant position in the Kazakh economy, as an energy resource that generates a large revenue for the state.

The oil and gas complex are not just an industry branch, it is one of the main components of our country's independence, its economic security and domestic political stability.

The development of oil and gas projects directly and through tax revenues to the budget makes it possible to increase the pace and volume of the implementation of social programs, including the ecological rehabilitation of many territories.

So, it is impossible to overestimate the political and social role of the development of the oil and gas industry. Oilmen provide a significant part of the national gross product, budget revenues and foreign exchange earnings to the country. Oil and gas projects have become a catalyst for investment activity in Kazakhstan.

The latest data from the Statistics Agency of the Republic of Kazakhstan for three quarters of 2017 show that the industry in the gross regional product for Kazakhstan was KZT3,309.5 billion, which is the highest indicator from all other industries, even though in 2016 this the same period the industry amounted to 4 014.9 billion tenge [9].

Thus, the economy of Kazakhstan is almost based on the extraction of minerals, that is, it has a very raw-material orientation. At the same time, the availability of natural resources does not give the country competitive advantages, it gives only comparative advantages. In the world, the most developed countries are those that do not have natural resources.

Consequently, it can be concluded that the presence of one developed commodity sector in the economy does not indicate a low level of growth rates, since in our case high rates of economic growth are provided by the development of the fuel and energy complex and related industries, and vice versa, high degree of diversification, is not evidence of a high rate of economic growth.

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