

Test Analysis of the Relationship Between GDP and Energy Exports in Azerbaijan

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Abstract: The relationship between foreign trade and economic growth is one of the most important research fields of economics. As a result of globalization, it is stated that there is a relationship between the increase in trade volume between countries and the development level and economic growth potential of the countries. The expectation that the increase in exports in developing countries will increase economic growth affects the preference of liberal policies rather than protectionist policies. The Export-Based Growth Hypothesis (IBD), which states that exports affect economic growth positively, was investigated by linear causality tests. While some findings reveal the existence of a causality between export and growth, some other findings reveal that there is no causal relationship between export and growth.

In this study, the relationship between Azerbaijan's GDP, exports and electricity exports was tested by regression analysis. According to the results obtained as a result of the analysis, a significant relationship has been reached between the GDP of Azerbaijan and its exports. In other words, there is a significant relationship between the growth of the country and its exports. However, while electricity exports are subject to analysis, it is concluded that there is no causality between electricity exports and growth within the framework of the Export-Based Growth Hypothesis.

Keywords: GDP, Export, Import, Electric, Regression, Growth

1. Introduction

Growth, which is one of the indispensable concepts of economic analysis, states that it is in the production sector as the most important indicator of the country's well-being and is also measured because it is within the GNP or its members. Can examine the structure of the economy, its development and the welfare of the people for the growth studies of the countries.

The importance of the foreign currency required for economic growth and development was understood, and it was believed that exports should be given great importance to increase foreign currency revenues with the idea that the healthiest foreign currency entry would be provided through exports.

States also trade in order to close their current account deficits and balance foreign payments. Export, which is a branch of foreign trade, reveals its importance here. Here, it shows its own importance that exports will increase the

country's revenues and that it will affect the growth of the country.

Researches related to the Azerbaijani economy, especially foreign trade, are conducted from time to time. In studies carried out in Azerbaijan as in every country, the importance of exports is emphasized in terms of opening up to foreign trade.

The country has gained rapid growth after regaining its independence. In general, oil and petroleum products have an important place in export revenues. Whether in the petroleum industry or in the non-petroleum industry, export quantities and varieties are increasing every year. Energy exports have an important place among the products exported by this country. In the study, energy export was not addressed in general and emphasis was made to emphasize more specific electrical energy. It was tried to determine the place of electrical energy in the country's exports. It has been tried to analyze whether there is an effect of electrical energy on GDP increase.

2. Literature Review

Team (2010), the relationship between Turkey's export growth study tested the Granger causality analysis and export increase to the conclusion that support the increase in growth ulaşmıştır. 1975-2008 using the data for Turkey, applying error correction model and Granger causality test, the GDP of the increase in exports It was researched whether or not it supported, it was concluded that the increase in exports did not lead to an increase in GDP.

Korkmaz and Develi (2012) studies, energy consumption affects the development levels of the countries, but also shows that it has an important place in determining the international policies of the countries. For this reason, they stated that the use of energy resources and the increase in energy demand is one of the factors contributing to economic growth.

School and Montfort (2007), using annual data covered the period from 1970 to 2003 and in Turkey in the work they perform some have examined the existence of co-integration and causality relationship between energy consumption and GDP. As a result of the study, it was determined that there is a co-integration relationship between energy consumption and GDP and that energy consumption of GDP has a one-way effect.

Karagöl and Serel (2017), the relationship between export and GDP for the 1955-2002 period in Turkey were examined using cointegration method. Using the error correction method and causality tests, the direction of the relationship between exports and GNP has been determined. From the test results, it has been observed that there is a unilateral causality for export from GNP.

Narayan and Singh (2007) examined the relationship between electricity consumption and GDP in their research for the period 1971-2002 under the Fiji Islands. As a result of the research, the existence of a one-way causality and co-integration relationship has been observed in the direction of GDP from electricity consumption.

In the study of Korkmaz (2016), the relationship between energy consumption (net electricity consumption and oil consumption) and economic growth (GDP) was tested using the Granger causality test using data from 1970-2014. Granger causality test analysis results showed that

there is one-way causality from oil consumption to net electricity consumption and net electricity consumption to GDP.

Kapusuzoğlu and Land (2010), for the 1975-2006 period, electricity consumption and causality relationship between long-term relationship between gross domestic product in Turkey were examined using econometric models. As a result of the first cointegration analysis conducted in the study, a long-term relationship was found between electricity consumption and gross domestic product. As a result of the Granger causality analysis conducted in line with the Vektor error correction model, it was determined that there is a one-way causality relationship between electricity consumption and gross domestic product. According to findings obtained, the consumption of electricity in the long term the quantity of product gross domestic economic growth process in Turkey is an important variable influencing in a positive direction and therefore also to avoid the disruptions that may occur in the economic growth process suffering long term in my electricity and used in electricity production It is stated that the timely supply of primary energy sources without any disruption is important for the stability of the economic production and consumption process.

Altınay, Karagöl and Özkivrak (2005) showed that GDP grew by an average of 4.4% annually in the 1980-2000 period, while electricity consumption increased by an average of 8.1% annually during the same period. While the per capita electricity consumption was 459 Kw-hour in 1980, this amount was 1457 Kw-hour in 2000 and this value turned out to be low compared to the amount of electricity consumption in OECD countries.

Karagöl and Altınay (2005), covered the period from 1950 to 2000 in Turkey, have examined the causal relationship between electricity consumption and GDP. As a result of the study, a one-way relationship was determined from electricity consumption to GDP.

Erdogan and Gurbuz (2014), Working with annual data between 1970 to 2009 period in Turkey, is to examine the relationship between energy consumption and economic growth through structural break models. The result showed that there may be at least one causality relationship between the cointegration series. As a result of the Granger causality analysis, one-way causality relationship has been found from Real Gross Domestic Product to capital, energy consumption

to capital, export to Real Gross Domestic Product, export to energy consumption and again from export to capital. No causal relationship was found between growth.

Aytac's (2017) research on the relationship between exports and economic growth in Turkey was examined in the 2001-2016 period. The causality relationship between the GDP variable, which represents economic growth, and the export variable, has been tested with the Granger causality test based on the VAR model. Structural breaks in series related to these variables were determined by Zivot-Andrews unit root test. As a result of the analysis, a one-way causality relationship from economic growth to export was determined. Therefore, the relationship between economic growth and exports in the analyzed period gave a result supporting the "Growth Based Export" hypothesis.

Yoo (2005) in his study, investigated the short and long-term causality relationship between electricity price and GDP in Korea within the period of 1970-2002. In the study, in which cointegration and error correction models were applied, a two-way causality relationship was found between electricity price and GDP.

3. Method

Regression analysis is carried out in order to determine the relationship between two or more variables that have a cause-effect relationship and to make predictions or predictions about that subject.

It is a statistical analysis used to convert the relationship between a criterion variable and one or more estimation variables into a numerical value. Regression analysis mainly aims to determine the quality of the relationship between the variables. It is possible to talk about simple regression if one variable is used as the prediction variable, and multiple regression analysis if two or more variables are used as prediction variables. Regression models with one dependent variable and more than one independent variable are known as multivariate regression analysis.

The aim is to determine the contribution of each prediction variable to the total change in the criterion variable and thus to estimate the criterion value based on the value of the linear combination of the prediction variables.

Regression analysis allows to make predictions about unknown future events from known findings. Regression develops a prediction equation by using the relationship between the dependent and independent variable (s) and the concept of linear curve. After determining the relationship between variables, the score of the dependent variable can be estimated when the score of the independent variable is known.

Dependent Variable (y) is the variable described or predicted in the regression model. This variable is assumed to be related to the independent variable. Independent Variable (x) is the explanatory variable in the regression model; used to estimate the value of the dependent variable.

Table 1. 1994-2018 Azerbaijan GDP, Export and Electricity Export Data (Dollar)

Years	GDP (Million)	Export (Million)	Electricity Export (Million)
1994	1629300	652.734,00	5.768,1
1995	2415200	637.199,00	22.408,8
1996	3180800	631.245,50	15.791,8
1997	3960700	781.309,70	22.951,2
1998	4446400	606.150,50	24.907,5
1999	4583700	929.663,60	25.986,1
2000	5272800	1.745.220,00	19.342,2
2001	5707700	2.314.206,40	4.463,6
2002	6235900	2.167.400,00	18.926,7
2003	7276000	2.590.377,50	11.265,3
2004	8680400	3.615.449,80	4.654,8
2005	13238700	4.347.151,20	20.756,9
2006	20983000	6.372.165,00	18.973,8
2007	33050300	6.058.222,30	9.666,6
2008	48852500	47.756.040,20	27.357,0
2009	44297000	14.701.358,80	27.939,0
2010	52909300	21.360.210,20	15.263,7
2011	65951600	26.570.898,30	40.073,0
2012	69683900	23.907.983,70	24.756,3
2013	74164400	23.975.416,80	24.849,0
2014	75234700	21.828.608,90	31.261,4
2015	52996800	12.729.138,50	17.225,8
2016	37862800	13.457.592,10	28.344,5
2017	40867900	15.319.977,10	50.969,0
2018	46939600	19.458.632,50	65.627,7

The general form of the linear regression model when k is the independent variable and N is observed

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki} + \epsilon_i \text{ dir. (1)}$$

Linear regression model when sample size is n

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki} + \epsilon_i \text{ (2)}$$

it is written as.

It is more convenient to use the model that provides a curvilinear relationship between the independent variable and the dependent variable to ensure that the values that the dependent variable can take is between 0-1.

$$E(y_i) = \frac{\pi_i \exp(\beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki})}{1 + \exp(\beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki})}$$

In the study, to measure the strength of the relationship between variables, values greater than 0.05 or less than three were used. The fact that the value received is greater than 0.05 indicates that the relationship between them is weak, that is, the independent variable does not affect the dependent variable.

In the study, the relationship between GDP, export and export of electrical energy is measured in the years after Azerbaijan Republic gained its independence again. Annual data were used to form the dataset. The data set covers the years 2006-2018. The data were obtained from the Azerbaijan State Statistical Committee. In the analysis, the natural logarithm of the data of all variables was used.

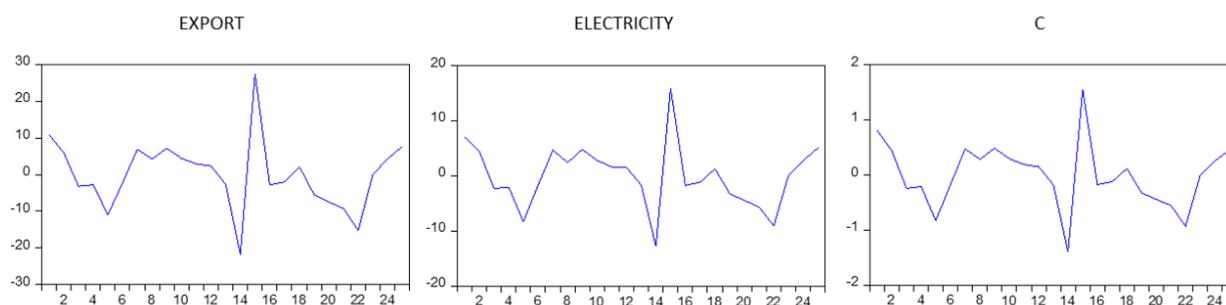
The independent variable of the econometric model is exports and electrical energy exports. In our study, GDP was considered as the dependent variable. Regression analysis was used with the help of the data obtained in the study.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGEXPORT	0.817235	0.048752	16.76319	0.0000
LOGELECTRICITY	0.167936	0.106238	1.580748	0.1282
C	2.313946	1.002184	2.308903	0.0307

Other charts and descriptive statistics of the variables are included in the charts below. As can be seen from the graphs, all three data statuses of Azerbaijan show an unstable change over the

years. When we examine the last years, a positive increase is recorded. All data used in the study are expressed in dollars.

Figure 1. Gradients of the Objective Function



In the study, Extended Dickey-Fuller stationarity test was performed to determine whether the series had a structure before proceeding to the analysis. Generalized (Augmented) DickeyFuller (ADF) Test hypotheses developed by Dickey-Fuller (1979) are known as follows:

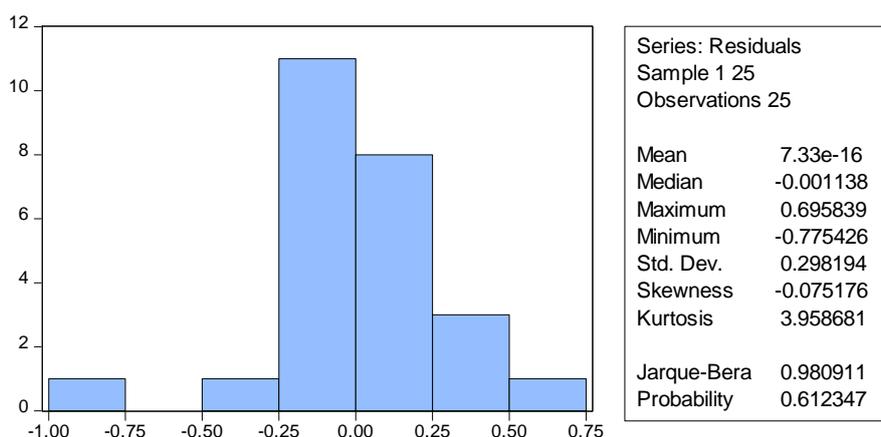
- H0: The series is not stationary. (It contains a unit root.)
- H1: The series is stationary. (The unit does not contain roots.)

In the study, the length of the delay was taken as 4.

The basic assumptions regarding the error term of the simple regression we have established regarding the mentioned variables are as follows:

- Normality Assumption: This assumption states that error terms should have distribution. In this study, Jarque-Bera Normality test was used. The result of the test is as follows:

Figure 2. Jarque-Bera Normality Test results



As seen from Figure 1, since $p > 0.05$, error terms have normal distribution. That is, the assumption of normality is provided.

- ii. Zero Average Assumption: It is clearly seen from Figure 1 that the mean of the errors is equal to zero.
- iii. Autocorrelation Assumption: One of the main assumptions of the classical linear regression model is that there is no relationship between error terms. The relationship between error terms reveals

the presence of autocorrelation (Ünver-Gamgam, 1996: 345). Since our data is annual, it will be enough to look at the autocorrelation test for the second difference. In this study, Breusch-Godfrey test was applied and the following results were obtained.

Table 2. Breusch-Godfrey Serial Correlation LM Test results

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.012508	Prob. F(2,20)	0.9876
Obs*R-squared	0.031231	Prob. Chi-Square(2)	0.9845

From Table 2, it seems that the error terms of our model have no autocorrelation problems (H_0 is accepted since the probe is > 0.05). This means that there is no relationship between one of the error terms.

- iv. Fixed Variance Assumption: Regression model's error terms must have fixed variances. Otherwise, it is said to have variance problem. For this, hetetostasticity test is applied. In this study, Breusch-Pagan-Godfrey test was applied.

Table 3. Breusch-Pagan-Godfrey Hetetostasticity Test results

F-statistic	0.826428	Prob. F(2,22)	0.4507
Obs*R-squared	1.746995	Prob. Chi-Square(2)	0.4175
Scaled explained SS	2.001360	Prob. Chi-Square(2)	0.3676

It is seen that the tests applied above provide the basic assumptions about the error term of the simple regression model we have established regarding the variables. The Ramsey Reset test

was used to test whether the installed model was defective.

The Ramsey Reset Test proposed a general method used to detect the presence of model

building errors. Although there is no linear relationship between the variables, the variable y is treated as if it is a linear function of the variable x ,

and the model is constructed by the researcher. The test results obtained in the study are as follows.

Table 4. Ramsey-Reset Test results

	Value	Df	Probability
t-statistic	1.713268	21	0.1014
F-statistic	2.935286	(1, 21)	0.1014
Likelihood ratio	3.270784	1	0.0705

According to Table 4, since $p > 0.05$, there is no error in model building. The established regression model is suitable for our variables.

According to the data obtained as a result of the analysis, there is a linear relationship between our exports and GDP. In other words, the increase in our export rates causes an increase in GDP. The other variable of analysis, electrical energy, shows the opposite result. In other words, whether the country's electricity exports increase or not has no effect on the country's GDP, and hence its growth.

Conclusions

One of the most important issues of the economy is the relationship between exports and economic growth. The political and economic developments of the countries also have a significant impact on their foreign trade. The expectation that the increase in exports in developing countries will increase economic growth also affects the abandonment of protectionist policies and the preference of liberal policies instead. Whether exports affect economic growth in a boosting manner has been investigated by the Export-Based Growth Hypothesis (IBD) tests. According to the information obtained from the test results, some findings reveal the existence of a causality between export and growth, while other findings reveal that there is no causality between export and growth.

In this study, the relations between Azerbaijan's GDP, exports and electricity exports are tested. Regression analysis was used while making the analysis. According to the results obtained, there is a significant relationship between the GDP and exports of Azerbaijan. In other words, there is a significant relationship between the growth of the country and its exports. In other words, in this country, there is a causality between export and growth within the framework

of Export-Based Growth Hypothesis. According to the results of the analysis, there is no significant relationship between GDP and electrical energy exports. While using the data related to the analysis, it is considered that the country is a young country and the data set published accordingly is small.

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