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THE RELATIONSHIP BETWEEN GROWTH AND EXPORTS: WHAT IF THE IMPACT IS NEGATIVE? EVIDENCE FROM TURKEY

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ABSTRACT

Purpose- The effect of economic growth on exports in Turkey and the direction of the relationship have been determined. The data were obtained from the World Bank data system and TUIK (Turkish Official Statistics Institute, 2021 data were obtained from here) and annual data for the period 1961-2021 were used. Analyzed with Auto Regressive Distrubuted Lag Models (ARDL) bounds test approach and Toda&Yamamoto Causality Test.

Methodology- The data set was created using annual data and analyzed in this way. Then Vector Autoregressive Model-VAR was created. Then, Toma&Yamamoto causality test and ARDL were applied. In addition, Breusch-Godfrey Autocorrelation LM Test, Breusch-Pagan-Godfrey Heteroskedasticity Test, unit root test, normality test and CUSUM tests were applied to verify the accuracy of the output.

Findings- It is concluded that there is a long-term relationship between the ARDL Bounds test approach and the variables where economic growth affects exports negatively in the long run, and a 1% increase in economic growth causes a decrease of 1.18 million dollars in exports in Turkey. The error correction term, which is calculated export in the long run, shows that the imbalances that may occur in the short run are corrected in the long run. According to the results of Toda-Yamamoto causality analysis, a causal relationship was found from Growth to Export.

Conclusion- The aim of this article is to find the causal relationship between Growth and Export in Turkey in the widest possible range and with the most up-to-date data and to reveal the extent of the causal relationship between them. As a result, although there is a causal relationship from Growth to Exports, this relationship is negative in the long run. This result has not been included in the Turkish literature before.

Keywords: Economic growth, exports, VAR, Toda&Yamamoto, causality, ARDL
JEL Codes: B41, F14, F43

1. INTRODUCTION CONCEPTUAL FRAMEWORK

The relationship between exports and economic growth is one of the important topics of discussion in the theoretical and applied economics literature. This situation can be explained by the role played by exports in the historical experiences of the economies that are now called developed. The effect of exports on economic growth is also known in the development literature as export-oriented growth. Export-oriented growth is an export-oriented development strategy and is used as a synonym for free trade or openness (Sannassee et al., 2014). In this context, export-oriented growth is one of the biggest instruments for the integration of countries into world markets (Mandel & Müller, 1974).

The phenomenon of globalization has significantly increased the foreign trade potential between countries by shortening the distances between world economies. In particular, this phenomenon has contributed significantly to the increase in economic growth by increasing the opportunities for trade in developing countries. The effect of foreign trade on growth has started to be discussed with the classical macroeconomic thought system, and the debate is still up-to-date today when Neo-Liberal economic policies are valid (Acet et al., 2016).

Theories from the classical growth theory to date have explained growth with different variables. However, among all these variables, wages, interest rates, savings level, human and physical capital, technological development, and natural resources emerge as determinants of growth (Rebelo, 1991). In addition to all these variables, it has been reflected in the literature as an undeniable fact that export is one of the most effective factors in the growth of a country.

It is seen that the relationship between economic growth and exports is among the topics that are frequently discussed in the Turkish economic literature. In the literature, there are different studies for Turkey that both support and reject each other. Simdi and Seker (2018) examined the 1998-2016 period and found a long-term relationship between exports and growth, and found that they were affected by both national and international crises. Yurdakul and Aydin (2018), in their study with both nominal and real values, concluded that the import-led growth hypothesis is valid in nominal terms and the export-led growth hypothesis is valid in real terms for the 2003-2016 period. Ozcan and Ozcelebi (2013), on the other hand, found evidence for the export-led growth hypothesis in their study, in which they examined the relationships between exports, imports, industrial production index and real exchange rate for the 2005-2011 period. In their study, Saglam and Egeli (2015) argued that for the period 1999-2013, the relationship was bidirectional in the short term and from the direction of growth only in the long term. On the other hand, Temiz (2010), in his study covering the period 1965-2009, argued that there is no relationship in the short run, and that there is a relationship between real exports and growth in the long run.

As can be seen from above, although the relationship between export and growth has been the subject of many studies until today, different results have been obtained in different studies. Since both variables contain different components, these differences should be considered natural. For example, while the GDP values, which are the basis for the calculation of growth, consist of the sum of the added values, the export figures include the values of some imported goods in addition to the share of domestic production. If most of the exports consist of imported goods, it would be an incomplete evaluation to talk about the export-led growth phenomenon (Takım, 2010).

The causality relationship between exports and economic growth in an open economy has been established in four different ways (Taştan, 2010):

The first is the hypothesis that expresses a unidirectional causality relationship between exports and growth. In the "ELG-Export-Related Growth" hypothesis, it is thought that exports are a part of income and have a positive effect on economic growth indirectly, in addition to the multiplier effect. As a result of the increase in exports, resources will be shifted from inefficient non-trading sectors to the export sector, and efficient use of resources will lead to productivity gains and economic growth. The increase in exports will increase productivity by creating pressure through international competition, leading to the search for new technologies, intensification of research and development, more effective management techniques and entrepreneurial activities, learning by doing and the development of skills. As a result, economic growth will increase (Berg & Lewer, 2007). In addition, the increase in exports will contribute to economic growth by increasing the import capacity and facilitating the import of capital and intermediate goods, especially needed in the production of industrial goods.

The second hypothesis is the hypothesis that predicts a causal relationship between economic growth and exports. In this hypothesis, also called "Growth-Oriented Exports", it is thought that economic growth facilitates the adoption of new technologies, leads to productivity gains, and ultimately increases the country's exports by gaining a comparative advantage in international markets (Giles & Williams, 2010).

The third hypothesis is that there is a two-way causality relationship between economic growth and exports. While an increase in exports leads to economic growth, higher income levels can also lead to increased trade, leading to bilateral interactions. Finally, there may not be a causal relationship between economic growth and exports (Taştan, 2010).

Apart from the approaches mentioned above, there are almost no different approaches. Apart from these approaches, which we can say gathered under the general heading according to the results of the studies in the literature, our research results say something completely different.

This study was prepared to investigate the causality relationship between export and growth using annual data sets for the years 1961-2021 in Turkey and to decide whether this causality relationship is positive or negative. In the analyzed period, whether there is a causal relationship between export and growth variables in Turkey and if there is a causal relationship, the direction of this causality has been determined. Thus, this causality relationship will be determined in the widest possible range and with the most up-to-date data and will be brought to the literature. In addition, long- and short-term relationships between variables were determined with the help of ARDL Bounds Test and error correction models. In line with the results, a result that has not been seen before in the literature has emerged.

There are studies in which causality tests and cointegration tests have been applied many times before. The results of these studies confirm the above approaches. The literature review section will not be within the scope of our research, as this result is a first in Turkey and this is the first time it has been reached in this way, although similar methods have been followed, as it has been said before.

In the second part, econometric methods and analysis results are given. In the last section, there is a comment section on the findings of the outcome analysis. In addition, all models in this study were determined according to the Schwarz Information Criteria and will not be consistently specified in further testing.

2. METHOD

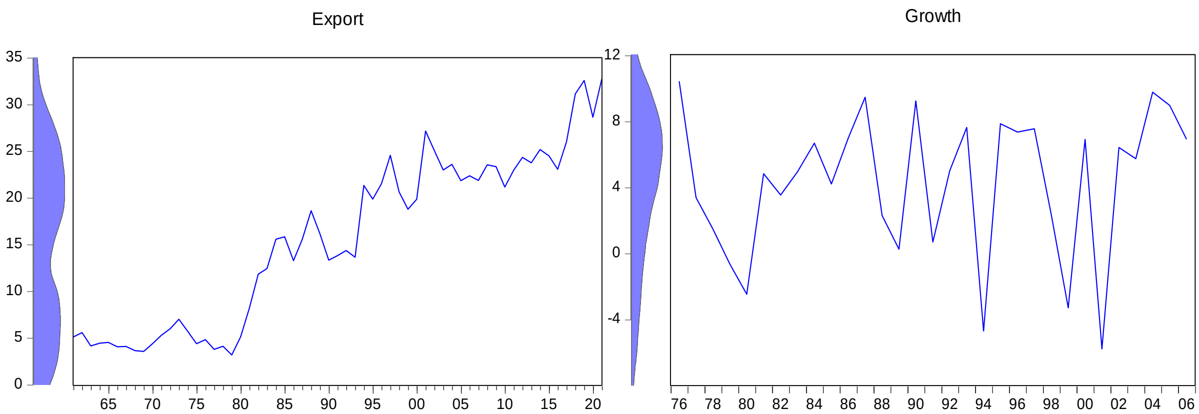
2.1. Datasets

In this study, the relationship between Export and Economic Growth in Turkey was investigated using annual data for the period 1961-2021. In the study, the variables Growth representing economic growth and Export representing export were used. Data for "GDP growth (annual %)" and "Exports of goods and services (current US$)" are from the World Bank Databank for 1961 to 2020. The year 2021 was withdrawn from TUIK. The stationarity of the series is disrupted by the trend and seasonal element with different wave intensity. For this reason, the logarithms of the observation values must be taken to make the series stationary. With this transformation, the wave intensity of the seasonal effect becomes constant and the invariance of the variance is ensured. Then the differences need to be taken if necessary. These operations, in turn, ensure that the series is freed from the influence of the trend and seasonal factors, that is, the series is freed from the elements that disrupt the stagnation (Box & Jenkins, 1970). Therefore, the logarithms of the series are taken. All data have been obtained from the official database of the "World Bank" and "TUIK (Turkish Official Statistics Institute". Table 1 and below contain descriptions of the Export and Growth variables in the model and some descriptive statistics:

Table 1: Disclosures and Descriptive Statistics

	Export	Growth	Descriptions
Mean	15.60325	4.761497	Export: Real export figures (Million USD)
Median	15.86072	5.043508	
Maximum	32.76394	11.21282	
Minimum	3.218027	-5.750.007	
Std. Dev.	9.023335	3.948139	Growth: Economic growth rates compared to the previous year (%)
Skewness	0.008443	-0.714147	
Kurtosis	1.681580	3.276675	
Jarque-Bera	4.418732	5.379622	
Probability	0.109770	0.067894	TUIK (Turkish Official Statistics Institute, 2021 data were obtained from here)
Sum	951.7982	290.4513	
Sum Sq. Dev.	4885.235	935.2681	
Observations	61	61	

Figure 1: Graphs of Variables



Note: Plot, Raw Data, Kernel Density, Growth: Real Economic Growth Figures, Export: Export real values (Million Dollars), 1961-2021 period.

2.2. ADF Unit Root Test and Results

The stationarity tests of the series are carried out through unit root tests. Stationarity refers to the situation where the mean, variance, and covariance of a series do not change over time (Gujarati & Porter, 2009). In this study, the stationarity test of Export and Growth variables was determined by the Augmented Dickey&Fuller (Dickey & Fuller, 1979, 1981). Stability test results are demonstrated in the Table 2 below:

Table 2: ADF Test Results

Variable	Lag Length	ADF t-value	Test critical values			MacKinnon (1996) one-sided p-values
			1%	5%	10%	
Growth	*I(0)*	-7.59780*	-3.544.063	-2.910.860	-259.309	0.0000
Export	*I(0)*	0.039625*	-3.548.208	-2.912.631	-259.402	0.9581
Growth	*I(1)*	-8.644941*	-3.548.208	-2.912.631	-2.594.027	0.0000
Export	*I(1)*	-7.28098*	-354.820	-2.912.631	-259.402	0.0000

* The lag length of the ADF test was determined according to Schwarz Information Criteria.

According to the ADF unit root test, the null hypothesis demonstrates that the series contains a unit root and is not stationary. The alternative hypothesis states that the series does not contain a unit root, so it is stationary. According to the ADF test results (Table 2), the fact that the absolute value of the test statistics in the Table 2 is greater than the critical value indicates that the series does not contain a unit root, that is, it is stationary. Since the test statistic value is greater than the absolute critical value in both variables, Export is stationary at the first difference and without taking the Growth difference.

2.3. Toda&Yamamoto Causality Test

In order to apply this test, the Vector Autoregressive Model (VAR) must be established and the delay length (*K*) must be determined. Then, the highest degree of integration *dmax* is added to the lag length *K*. Knowing these two values allows the model to be estimated correctly, preventing data loss and allowing more successful results at the level. The test model is as follows:

$$Growth_t = \vartheta + \sum_{i=1}^{K+dmax} a_{1i}\, Growth_{t-1} + \sum_{i=1}^{K+dmax} a_{2i}\, Export_{t-1} + \mu_{1t} \quad (1)$$

$$Export_t = \vartheta + \sum_{i=1}^{K+dmax} \beta_{1i}\, Export_{t-1} + \sum_{i=1}^{K+dmax} \beta_{2i}\, Growth_{t-1} + \mu_{1t} \quad (2)$$

The hypotheses for the equation denoted as (1) are:

H_0 : Export is not Granger cause of Growth

H_1 : Export is Granger cause of Growth

The hypotheses for the equation denoted as (2) are:

H_0 : Growth is not Granger cause of Export

H_1 : Growth is Granger cause of Export

2.3.1. Toda-Yamamoto Causality Test Results

With the traditional Granger (1969) Causality Test, the causality relationship between the variables is possible if the series are stationary and contain a cointegration relationship (Granger, 1969). With the Toda-Yamamoto causality test, it is not taken into account whether the series are stationary or whether they have a cointegration relationship. Since in the Toda-Yamamoto causality test, the same level of stationarity or cointegration of the series does not prevent the validity of the test, it is an advantage of this test that it prevents data loss if the series are made stationary by taking the difference as in the Granger causality test (Toda & Yamamoto, 1995: 225-250). The point to be considered in this test is that the maximum degree of integration (*dmax*) of the variables should not be greater than the appropriate lag number (*K*) of the model.

In order to apply the Toda-Yamamoto test, first of all, the VAR model must be established and the appropriate lag length must be determined. The Table 3 below contains the results for determining the appropriate lag length.

Table 3: VAR Lag Length Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	35.781.878	NA	1306.261	12.85067	12.92300	12.87871
1	28.172.760	144.0297	99.52781	10.27599	**10.4929***	10.36012
2	27.870.027	5.514073	103.1231	10.31072	10.67239	10.45094
3	26.981.783	15.54426	86.76698	10.13635	10.64269	10.33266
4	26.082.342	15.0977*	72.8095*	9.95797*	10.60899	10.2103*
5	25.851.184	3.715030	77.70131	10.01828	10.81395	10.32676

Note: LR: Likelihood Rate Test Statistics; FPE: Final Prediction-Error Criteria; AIC: Akaike Information Criteria; SIC: Schwarz Information Criteria; HQ: Hannan-Quinn Information Criteria.

According to the results in the Table 3, the lag number of the model is 1 according to the SC (Schwarz Information Criterion) criterion. It is 4 according to FPE (Final Prediction Error) and LR (Sequential Modified LR Test Statistic), AIC (Akaike Information Criterion) and HQ (Hannan-Quinn Information Criterion) criteria. In this study, the appropriate lag length (*K*) has been determined as the SC (Schwarz Information Criterion) criterion, which includes more information criteria and is a method frequently used in practice. (*K*=1).

Previously, the presence of unit root was tested with the ADF test method and the longest delay was found to be "1". In order to test for causality with the Toda and Yamamoto method, *dmax* was determined as the degree of the series with the longest delay. In this case, *dmax* is taken as = 1.

Growth = *I(0)* and Export = *I(1)*

***K*=1**, ***dmax*=1** and 1+1=2 (This means that a Toda&Yamamoto equation with a lag of “2” will be solved.)

Table 4: Toda Yamamoto Causality Test Results

Direction of Causality	Test Statistic	Probability	Result
Growth to Export	7.278.863	0.0263	There is causality from Growth to Export
Export to Growth	1.135.874	0.6003	There is ***no*** causality from Export to Growth

According to the results of the Toda-Yamamoto causality test in Table 4, a one-way causality relationship from Growth to Export was determined

2.4. ARDL Bound Test

Tests such as Engle-Granger and Johansen are frequently used in the literature to test the concept of cointegration, which states that there is a stationary combination of at least two series that are not stationary at their levels. In these cointegration tests, there is an assumption that the series whose cointegration relationship is examined are stationary of the same order. This prerequisite has become a situation that is not required by the boundary test approach to cointegration analysis, which was introduced to the literature by Pesaran (1997) and Pesaran et al. (2001). The advantages of the bounds testing approach are:

- It is possible to apply the bounds test regardless of whether the variables to be used in the model are I(0) or I(1). For this reason, it is not necessary to determine the stationarity levels of the variables before applying the bounds test. However, the critical values in Pesaran et al. (2001) are tabulated according to whether the variables are I(0) or I(1). Therefore, the variables should be tested against the possibility of being I(2).
- Since the unrestricted error correction model is used in the ARDL approach, it has better statistical properties than the Engle-Granger test and gives more reliable results in small samples than the Johansen and Engle-Granger tests (Narayan, 2005). The ARDL bounds test approach basically consists of 3 stages. While testing whether there is a long-term relationship between the relevant variables in the first stage, long-term and short-term elasticities are obtained in the second and third stages, respectively, under the condition of the existence of a cointegration relationship (Narayan & Smyth, 2006). The adaptation of the unlimited error correction model used in the first stage of the test to our study is as follows:

$$\Delta EXPORT = a_0 + \sum_{i=1}^{k} a_{1i}\,\Delta EXPORT_{t-i} + \sum_{i=0}^{k} a_{2i}\,\Delta GROWTH_{t-i} + a_3 EXPORT_{t-1} + a_4 GROWTH_{t-1} + \varepsilon_t \quad (3)$$

Δ in the model (3) shows first-order differences. Bahmani-Oskooee & Goswami (2003) revealed in their study that the F test used for the boundary test is sensitive to the lag length. For this reason, in order to test the existence of the cointegration relationship, first of all, it is necessary to decide on the k value, which shows the lag length of the differential variables used in Model 8. For this purpose, information criteria such as Akaike (AIC) and Schwarz (SIC) are used in the literature.

The diagnostic test results of the ARDL model are given in Table 5:

Table 5: ARDL Model Diagnostic Test Results

Tests	F-Statistics	Prob. Chi-Square
Breusch-Godfrey Autocorrelation LM Test:	2,418173	0,078
Breusch-Pagan-Godfrey Heteroskedasticity Test	2.148.931	0.0639
Normality Test / Jarque-Bera	0,329142	

If the probability value of autocorrelation, varying variance and normality tests is higher than 0.05 significance level, it is stated that there is no autocorrelation, varying variance and normality problem. When Table 5, which includes the diagnostic results of the ARDL model, is examined, it is seen that the probability values are greater than 0.05 in all tests. Therefore, there is no problem of autocorrelation, varying variance and normality. The short-term coefficient relationship between the variables and the long-term relationship depending on the error correction term are estimated by the error correction model in equation (4) based on ARDL:

$$\Delta EXPORT = a_0 + \sum_{i=1}^{k} a_{1i}\,\Delta EXPORT_{t-i} + \sum_{i=0}^{m} a_{2i}\,\Delta GROWTH_{t-i} + \beta CET_{t-1} + \varepsilon_t \quad (4)$$

In equation (4), the sign Δ represents the difference operator, the sign α the constant term, CET the error term coefficient, and εt the error term. The test results of the error correction model based on ARDL are given in Table 6:

Table 6: ARDL Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Probability*
C	2.019.423	0.655662	3079975	0.0033
D(GROWTH)	-0.120082	0.054008	-2223412	0.0306
D(GROWTH(-1))	0.365417	0.071441	5114987	0.0000
D(GROWTH(-2))	0.234595	0.058165	4033251	0.0002
CointEq(-1)*	-0.306431	0.065799	-4657057	0.0000

* All values are significant at the 5% level

If the coefficient value of the error correction term is between 0 and -1, there is a one-way convergence towards the long-term equilibrium value. If the coefficient value is positive or less than -2, it indicates that the equilibrium has been moved away. Finally, if the error correction coefficient value is between -1 and -2, it indicates that the error correction term reaches equilibrium with fluctuations that decrease in size around the long-term equilibrium values (Alam and Quazi, 2003). When Table 6 is examined, the error correction coefficient was found to be approximately -0.3064 and it is significant. Accordingly, in the series, a one-unit deviation in the short term comes to balance in 3.2 years on a yearly basis. In other words, there is a long-term relationship between the variables. These results reveal that economic growth has a negative effect on exports.

Thanks to the error correction model, after the long-term relationship between the variables is found, it will be determined whether there is a cointegration relationship between the variables with the boundary test. H0: β1=0 H1: β1≠0 Here, the null hypothesis, which states that there is no cointegration relationship, is tested against the alternative hypothesis (H1), which states that there is a cointegration relationship. The hypotheses of the cointegration test are written as above. ARDL limit test results are given in Table 7.

Table 7: ARDL Bounds Test Results

	ARDL	F-Statistic
GROWTH	(1,3)	10,63555
Significance level	**Lower Boundary**	**Upper Boundary**
10%	5.765	6,5
5%	6.905	7,735
1%	9.585	10,42

Note: k=1 and Finite Sample: n=60

In Table 7, where the ARDL model boundary test results are shown, the F-Statistics value was calculated as 10.63555. H0 hypothesis is rejected because this value is greater than all upper bound values at 1%, 5%, and 10% significance levels. Therefore, there is a cointegration relationship between the series. This also means that there is a long-run relationship between the variables. The ARDL(k, n) model used for the estimation of the long-term coefficients is included in the equation (5):

$$EXPORT = a_0 + \sum_{i=1}^{k} a_{1i}\, EXPORT_{t-i} + \sum_{i=0}^{k} a_{2i}\, GROWTH_{t-i} + \varepsilon_t \quad (5)$$

In equation (5), the sign α represents the constant term and the sign ε_t the error term. Long-term coefficient results are given in Table 8:

Table 8: ARDL Long-Run and Equality Coefficient Results

Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	2.019.423	0.835708	2.416.421	0.0193*
EXPORT(-1)	-0.306431	0.087981	-3.482.901	0.0010*
GROWTH(-1)	-0.364139	0.129947	-2.802.212	0.0072*
D(GROWTH)	-0.120082	0.062187	-1.930.987	0.0591
D(GROWTH(-1))	0.365417	0.089262	4.093.748	0.0002*
D(GROWTH(-2))	0.234595	0.062942	3.727.146	0.0005*
Levels Equation				
GROWTH	**-1.188.323**	**0.560474**	**-2.120.210**	**0.0389***
EC = EXPORT - (-1.1883*GROWTH)				

* Probability values are significant at the 95% level

The results of the CUSUM Test, which expresses whether the error terms in the series meet the stability condition, are as follows:

Figure 3: CUSUM Test

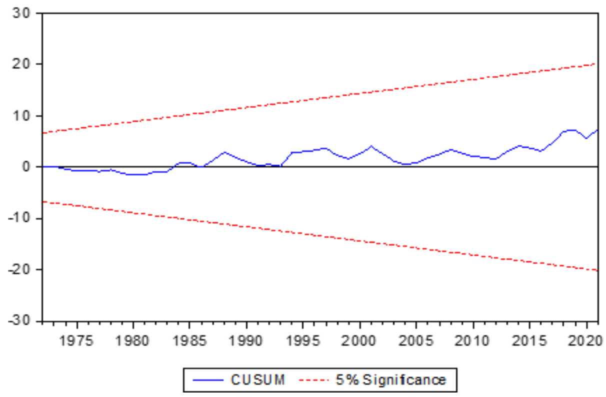
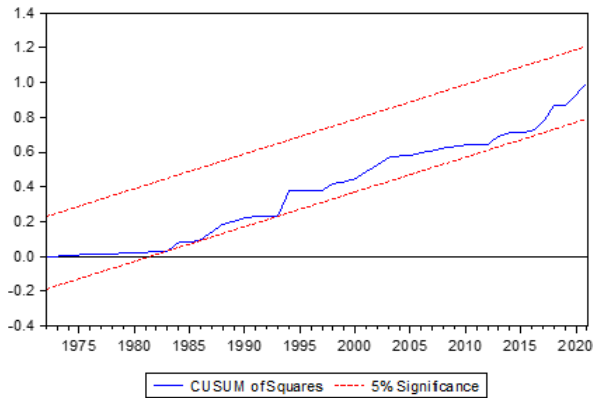


Figure 4: CUSUM Square Test



As it can be seen in the graph where the dashed lines represent the 95% confidence limits and the solid line represents the parameter estimate, it can be said that the stability condition is also met, since the parameter estimate is within the limits. As can be seen from the CUSUM-of-Square test, it can be said that the stability condition is met since the parameter estimation is within the limits, just like in the CUSUM test. In other words, as a result of the CUSUM and CUSUM-of-Square tests, it is seen that the model is stable during the forecast period, that is, there is no structural break.

3. CONCLUSION AND SCOPE FOR FURHER RESEARCH

The aim of this article is to find the causal relationship between Growth and Export in Turkey in the widest possible range and with the most up-to-date data and to reveal the extent of the causal relationship between them. As a result, although there is a causal relationship from Growth to Exports, this relationship is negative in the long run. This result has not been included in the Turkish literature before.

It has been concluded that there is a long-term relationship between the ARDL Bounds test approach and the variables, that economic growth affects exports negatively in the long run, and a 1% increase in economic growth causes a decrease of 1.18 million dollars in exports in Turkey. The error correction term, which is calculated export in the long run, shows that the imbalances that may occur in the short run are corrected in the long run. According to the results of Toda-Yamamoto causality analysis, a causal relationship was found from Growth to Export. Although the causality relationship between growth and exports is the finding of many articles, the conclusion that growth has a negative effect on exports has not been included in the literature before (in studies on Turkey). However, in the literature before, Helpman & Krugman (1985) had an inference on this subject. Sometimes, as a result of the increase in domestic demand for exportable and non-tradable goods, economic growth may increase while exports may decrease (Helpman & Krugman, 1985).

There is not only one factor that affects exports. In this sense, it is useful to remind that all countries are in competition with other world countries. Of course, economic growth alone has an effect on foreign trade instruments, but this effect may have consequences contrary to theory and literature in the long run. To give an example, if the growth in a country does not trigger development and prevent income inequality, the interest in imported goods will decrease and there will be a demand for the domestic market. This causes an increase in the demand in the domestic market (especially in basic goods) in countries that are not very developed technologically and are dependent on foreign countries. If the goods demanded by other countries are melted down in the domestic market, growth will have no effect on exports, and even negative effects will be in question, as can be seen in the result above.

In this study conducted specifically for Turkey, the result may have been different from the others in terms of both the long time interval selected and the method applied. As we mentioned before, the method applied and the time interval are the determining factors of the result.

As further research opportunities, this issue can be explored further and the reasons for this result, especially in Turkey, can be examined in terms of economy and politics.

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