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Causality Relationship between Import, Export and Exim Bank Loans: Turkish Economy

Yüksel Akay Ünvan and Ulviyya Nahmatli

Abstract

Export promotion tools aim to increase exports and support the entrepreneur in reaching new foreign markets. The positive impact of incentives, especially on financial issues, on exports both before and after shipment is undeniable. Founded in 1987, Turkish Exim bank is Turkey's official export credit institution. By observing macro-economic balances, Exim bank ensures that exporters, export-oriented production manufacturers and entrepreneurs operating abroad are supported by credit, guarantee and insurance programs to increase their competitiveness. The study aims to examine the causal relationship between imports, exports and Exim bank loans in the Turkish economy. In the study, stationarity with the extended Dickey-Fuller unit root test, long-term relationship with the Johansen co-integration test, and then causality with the Granger test were investigated. The causality relationship was analyzed using import, export and Eximbank loans data for the periods 2003–2020.

Keywords: exports, exim bank loans, ADF test, causality test

1. Introduction

For developing countries to reach the level of developed countries and to catch the level to compete with them, more than one condition must be met. The most important of these conditions is the industrialization strategies that developing countries will implement. With the decisions of January 24, 1980, which were a turning point in terms of redesigning the Turkish economy, the export-based industrialization strategy was started to be implemented by targeting export-based growth instead of the import substitution strategy implemented since the 1960s, and some institutions were created to eliminate the problems that will be encountered at the implementation stage of these decisions ([1], p. 22).

To increase the competitiveness of exporters in foreign markets, Turkish Exim bank provides export financing in Turkey with credit, guarantee and insurance programs under international rules and principles ([2], p. 180).

In developing countries, Exim bank loans are provided by organizations that support the Central Bank of the Republic of Turkey (CBRT) and non-profit exports. Commercial banks, private equity export credit insurance companies and factoring companies are the only organizations that support finance, as the main purpose is profit.

In developed countries, the necessary financing for exports is usually provided by the commercial banking system. Export financing organizations, on the other

hand, support the export sector and banks with insurance and guarantee programs, only performs the function of providing a risk-free environment.

1.1 Import

Imports are the value of foreign goods and services bought by a country's households, firms, government agencies, and other organizations in a given period.

1.2 Exports

Exports are goods and services that are produced in one country and sold to buyers in another. Exports, along with imports, make up international trade.

1.3 Eximbank loan

Eximbank loans are lines of credit made available by Export Credit Bank of Turkey (Exim bank) to enhance exports. This credit is made available during the pre-export stage against a written pledge by the exporter to export Turkish-origin goods and services as stipulated by Exim bank. It provides a price advantage over other export loans offered by banks.

2. Literature review

In the Literature view, a summary of information was given about research that examines the relationship between exports, financial development and economic growth in Turkey in the context of causality.

Dodaro [3], examined the relationship between economic growth and exports with the Granger Causality test by using variables between 1967 and 1986 periods. The study found a one-sided causal relationship from economic growth to exports.

Bahmani and Domac [4] examined the relationship between economic growth and exports, with the Co-Integration test by using variables between 1923 and 1990 periods. As a result of the research, it is found that there is a decidedly causal relationship between economic growth and exports.

Tuncer [5], examined the causal relationship between exports, imports, investments and Gross domestic product (GDP) with the method Toda and Yamamoto by using variables between 1980Q1 and 2000Q3 periods. As a result of the study, a one-sided causality relationship has been found from economic growth to exports.

Şimşek [6], tested the export-based growth hypothesis with Error Correction Model, Co-Integration Test and Causality tests by using variables between 1960 and 2002 periods. As a result of the study, the one-sided causality relationship has been found from economic growth to exports.

Erdogan [7], examined the relationship between economic growth and exports, with Co-Integration and Causality tests by using variables between 1923 and 2004 periods. As a result of the study, the long-term double-sided causal relationship between economic growth and exports was found at the level of 10% significance.

Taştan [8], examined the interaction and causal relationships between export, industrial production and import variables, with Co-Integration and Causality tests by using variables between 1985Q1 and 2009Q3 periods. As a result of the study, a one-sided causality relationship has been found from economic growth to exports.

Tıraşoğlu [9], examined whether the export-based growth hypothesis is valid in Turkey or not, with Co-Integration and Causality tests by using variables between

1998Q1–2011Q3 periods. As a result of the study, there is a long-term one-sided causal relationship between exports and economic growth.

Korkmaz [10], examined the relationship between economic growth and exports, with Co-Integration and Causality tests by using variables between 1998: Q1–2013:Q3 periods. As a result of the study, a one-sided causality relationship has been found from exports to economic growth.

Pentecost and Kar [11], examined the relationship between economic growth and exports, with Co-Integration and Causality tests by using variables between 1963 and 1995 periods. As a result of the research, there is a one-sided causal relationship from economic growth to financial development.

Al-Yousif [12], studied the causal relationship between financial development and economic growth for 30 developing countries, with both Time Series and Panel Data Analysis tests, by using variables between 1970 and 1999 periods. As a result of the study, there is a double-sided relationship between economic growth and financial development.

Ceylan and Durkaya [13], examined the causal relationship between domestic credit volume and economic growth, by taking advantage of Gross domestic product (GDP) and total loans that private banks use domestically by using variables between 1998 and 2008 periods. As a result of the research, there is a one-sided causality relationship from economic growth to loans.

3. Econometric analysis

3.1 Data set

In this study, the data set used were between 2003 and 2019 periods. The source of the data used in the study was taken from the Central Bank of the Republic of Turkey (TCMB) and the official website of the bank Exim bank. This data was created with three different variables which are listed in **Table 1**. All analyses and tests were performed on these variables by using the EViews11 program.

3.2 Augmented Dickey-Fuller (ADF) unit root test

To obtain econometrically significant relationships between series in time series analysis, it is essential that the analyzed series must be stationary. Unit root tests are usually used to test whether the series has a stationary structure or not. The most commonly used of these tests is the unit root test performed by Dickey-Fuller [14], which assumes that the error term is independent and uniformly distributed. If a time series is stationary, its variance, average, and covariance (with various delays) are the same, no matter when it is measured ([15], p. 757).

Variable	Code
Import	Central Bank of the Republic of Turkey, Balance Of Payments Analytical Presentation (6.manual), A.2
Export	Central Bank of the Republic of Turkey, Balance Of Payments Analytical Presentation (6.manual), A.1
Exim bank loans	https://www.eximbank.gov.tr

Table 1.
Data set.

Let Y_t be any time series, the stationary of a series depends on the following conditions:

$$E(Y_t) = \mu \quad (1)$$

$$\text{Var}(Y_t) = E(Y_t - \mu)^2 = \sigma^2 \quad (2)$$

$$\gamma_k = E[(Y_t - \mu)(Y_{t-k} - \mu)] \quad (3)$$

The relationship between this period value of Series Y_t and the value it has in the last period, is as in Eq. (4):

$$Y_t = \rho Y_{t-1} + \varepsilon_t \quad (4)$$

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + \varepsilon_t \quad (5)$$

$$\Delta Y_t = (\rho - 1)Y_{t-1} + \varepsilon_t \quad (6)$$

$$\Delta Y_t = \gamma Y_{t-1} + \varepsilon_t \quad (7)$$

If $\rho = 1$ or $\gamma = 0$ is found in this equation, there is a unit root problem. If $\rho = 1$, the relationship will be as in Eq. (8):

$$Y_t = Y_{t-1} + \varepsilon_t \quad (8)$$

This means that the impact of the shock that the series was subjected in the previous period remains in the system as it was. If $\rho < 1$, it means that the initial effect of shocks in the past continues and that this effect will disappear over time.

The main regression patterns used in the Dickey-Fuller test are:

$$\Delta Y_t = \gamma Y_{t-1} + \varepsilon_t \quad (9)$$

$$\Delta Y_t = \beta_{0+} \gamma Y_{t-1} + \varepsilon_t \quad (10)$$

$$\Delta Y_t = \beta_{0+} \beta_i t + \gamma Y_{t-1} + \varepsilon_t \quad (11)$$

Eq. (9), shows a structure with no fixed term and no trend effect. Eq. (10) shows a structure with a fixed term and no trend term, and Eq. (11) shows a structure with a fixed term and no trend effect.

In case of correlation between error terms, the extended Dickey-Fuller (ADF) unit root test was developed again by Augmented Dickey-Fuller [16] by including the delayed values of the dependent variable in the model. The proposed models for this test are shown in the following equations:

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=2}^{\rho} \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad (12)$$

$$\Delta Y_t = \beta_{0+} \gamma Y_{t-1} + \sum_{i=2}^{\rho} \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad (13)$$

$$\Delta Y_t = \beta_{0+} \beta_i t + \gamma Y_{t-1} + \sum_{i=2}^{\rho} \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad (14)$$

Eq. (12) shows the structure in which there is no fixed term and no trend effect. Eq. (13) shows the structure in which there is only a fixed term, and Eq. (14) shows the structure in which both the fixed term and the trend effect are observed.

The stationary test is first performed at the level value. If stationary is not achieved in the level value, the first difference of the Y_t series will be taken. If the

$\Delta Y_t = Y_t - Y_{t-1}$ series becomes stationary, it is denoted by I(1) and the series becomes stationary in the first difference. If stationarity cannot be achieved in the first difference of the series, the second difference will be taken. The process of taking the difference of the series continues until it becomes stationary.

In Eqs. (4) and (7), the $H_0: \gamma=0$ (the series aren't stationary) hypothesis in the unit root test was found by Dickey Fuller [14] and tested with the τ (tau) statistic. If the error term is correlated in the Y_t series, the extended Dickey Fuller (ADF) test is preferred, and the H_0 hypothesis is rejected if the critical values of MacKinnon [17], correspond to the absolute value of the statistics τ (tau), are greater than τ . ([15], p. 757).

If the ADF test statistic value is more negative than the MacKinnon [17] critical values at various significance levels, it is decided that there is a unit root in the series; in other words, the series are not stationary. In this study, the stability of the series was analyzed using the extended Dickey-Fuller (ADF) unit Root Test.

As we can see in **Table 2**, Import variables were found stationary in the intercept model in the first difference I(1), Export variables were found stationary in non-intercept and trendless model in the first difference I(1); while Eximbank loans variables were found stationary in intercept model in the second difference I(2).

3.3 Johansen cointegration test

To test whether non-stationary series converge to equilibrium over a long period, the cointegration test examines whether there is a long-term relationship between the series or not. But since this test does not provide information about the direction of the relationship, causality tests are used to determine the direction of the relationship. There are two Tests in Johansen's cointegration analysis. These are trace and max.

Trace hypothesis test $H_0: r \leq r_0$, $H_1: r \geq r_0 + 1$.

Max hypothesis test $H_0: r = r_0$, $H_1: r = r_0 + 1$.

If $r = 0$ there is not cointegration vector.

The series were analyzed using the Johansen cointegration test and the results were shown in **Table 3**. In **Table 3**, the $r = 0$ hypothesis, shows that there is no cointegration relationship between the variables; the $r \geq 1$ hypothesis, is an alternative hypothesis which shows that there is at least one cointegration relationship; the

Variables	Test for unit root in	Include in test equation	Lag Length	ADF
Import	I(1)	Intercept	p = 0	-4.061237
Export	I(1)	None	p = 0	-3.196258
Eximbank loans	I(2)	Intercept	p = 1	-4.417361

Table 2.
ADF unit root test.

Hypothesis		Trace statistic		Max-Eigen statistic	
H ₀	H ₁	Statistic	Critical value	Statistic	Critical value
r = 0	r ≥ 0	76.02502	29.79707	66.68893	21.13162
r = 1	r ≥ 2	9.336092	15.49471	8.804522	14.26460

Table 3.
Johansen cointegration test results.

$r \geq 2$ hypothesis is an alternative hypothesis that shows that there are at least two cointegration relations:

According to the Johansen test output, both the Trace test statistic value and the Maximum Eigen test statistic value were greater than the table critical value of 5%. Therefore, the zero hypothesis of $r = 0$ can be rejected for both test values. In other words, Export, Gross domestic product (GDP), and Loan variables are cointegrated.

3.4 Granger causality test

The Granger causality test examines the relationship between series based on estimating past and present values. According to Granger, if past information about X_t helps to obtain estimates. On the other hand, if Y_t 's past values allow X_t to be estimated, the Y_t series is the granger cause of X_t . If X_t causes Y_t and Y_t causes X_t , there is a bilateral causality relationship. An error correction model is used to determine the direction of the causality relationship, if the series is co-integrated. But if the series is not co-integrated, standard Granger or Sims tests are used to determine the direction of the causality relationship ([18], pp. 213–228).

3.4.1 Determination of appropriate lag length

Accurate determination of the number of lag lengths in the Granger causality test is very important for the application to give healthy results, because this test is sensitive to the number of lag lengths. To find the appropriate lag length numbers for the Granger causality test, the Vector autoregression (VAR) model is estimated. Here a generic VAR model is estimated primarily to determine the appropriate number of lag length. Then, the number of lag length, will be determined by Akaike information criteria and by the LM test.

For the VAR model, the appropriate lag length was obtained by LogL (Log-We), LR (sequential modified LR test statistic), FPE (Final prediction error), AIC (Akaike information criterion), SC (Schwarz information criterion) and HQ (Hannan-Quinn information criterion) criteria. The model with the largest LogL and LR values and the smallest FPE, AIC, SC and HQ values were selected to determine the appropriate lag length criteria.

As seen from **Table 4**, Sequentially modified LR test statistic (LR); Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) appropriate lag length as 1. According to this information, the lag length will be 1.

In **Figure 1** it is presented the Var(1) model which provides the stationary condition:

Since the auto-regressive characteristic roots are all in the unit circle, the model VAR(1) which is used in the study, provided the stationary condition. Subsequently, appropriate delay numbers for the Granger causality test were performed

Lag	LogL	LR	FPE	AiC	SC	HQ
0	−853.9328	0	6.65e+42	107.1166	107.2615	107.1240
1	−820.4059	50.29035*	3.20e+41*	104.0507*	104.6302*	104.0804*
2	−816.0730	4.874522	6.71e+41	104.6341	105.6481	104.6861

*Values shows that the appropriate number of lag lengths according to the relevant criterion.

Table 4.
Determination of appropriate lag length.

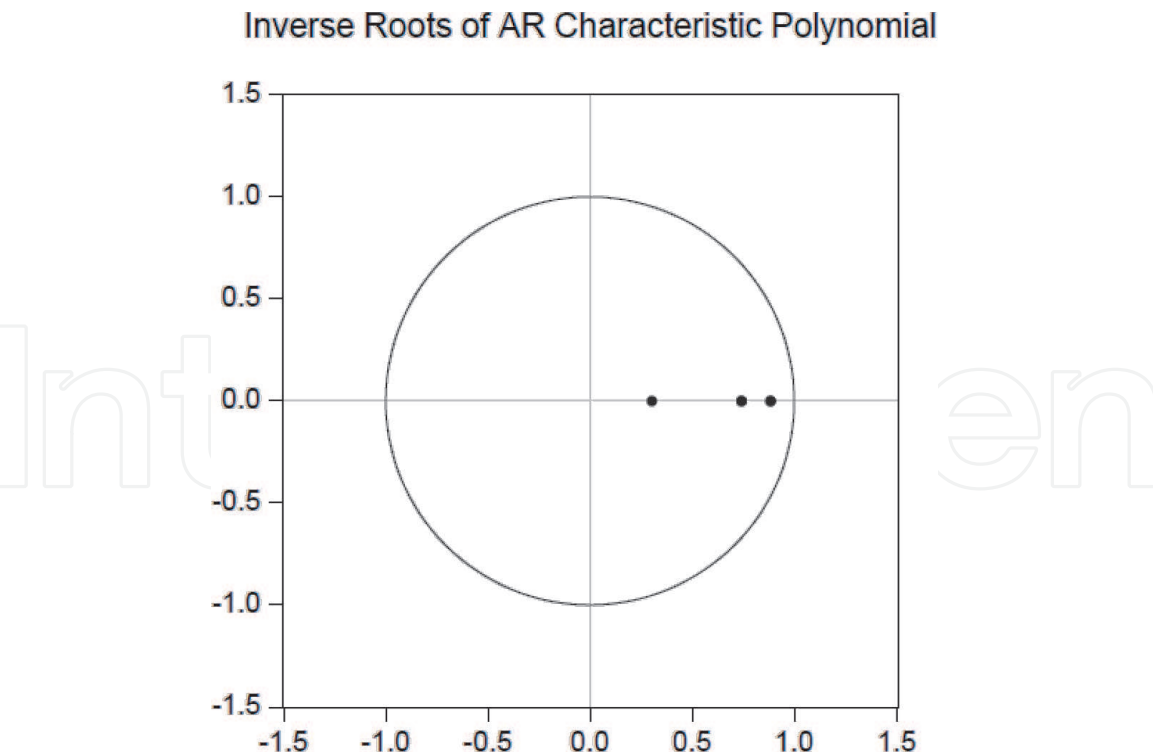


Figure 1.
Stationarity analysis.

H ₀ Hypothesis	Chi-sq.	Probability	Result
Eximbank→Export	1.331500	0.2485	Rejected
Import→Export	2.497195	0.1140	Rejected
Export→Exim bank	0.762369	0.3826	Rejected
Import→Eximbank	2.986957	0.0839	Rejected
Eximbank→Import	0.000609	0.9803	Rejected
Export→Import	0.017613	0.8944	Rejected

Table 5.
Granger causality test results.

by autocorrelation LM tests, it was determined that there was no autocorrelation and the series was stationary.

The series were analyzed using the Granger causality test, as we can see from **Table 5**; there is no causal relationship between Eximbank to Export variables ($\rho = 0.2485 > 0.05$), Import to Export variables ($\rho = 0.1140 > 0.05$), Export and Eximbank variables($\rho = 0.3826 > 0.05$), Import to Eximbank variables ($\rho = 0.0839 > 0.05$), Eximbank to Import($\rho = 0.98035 > 0.05$), Export to Import ($\rho = 0.8944 > 05$).

According to the results which are shown in **Table 5**, it was determined that there is no causal relationship between Eximbank loans, Import and Export variables at 1 and 5% significance levels.

4. Conclusion

To decipher the causal relationship between import, export and Eximbank loan variables in the Turkish economy, three different variables were used in the study.

All variables used in the study are time series, because they depend on time, so the stationarity of the variables was tested by the ADF test. As a result of the test, stationarity was achieved by taking first-order differences in import and export variables and second-order differences in eximbank loans variables. To test whether non-stationary series converge to equilibrium over a long period or not, the series were analyzed by using the Johansen cointegration test and the results revealed that Export, GDP, and Loan variables were cointegrated. Then the series were analyzed using the Granger causality test, and according to the results, it was determined that there was no causal relationship between Eximbank loans, Import and Export variables at 1 and 5% significance levels.

When we look at the literature review, a summary of information was given about research that examines the relationship between exports, financial development and economic growth in Turkey in the context of causality. From the study of Ceylan and Durkaya [13], there was found one-sided causality relationship from economic growth to loans. From the study of Dodaro [3], Bahmani and Domac [4], Tuncer [5], Şimşek [6] and Taştan [8] it was found a causal relationship from economic growth to exports. Erdogan [7] found causality relationship between economic growth and exports at the level of 10% significance. Tıraşoğlu [9] and Korkmaz [10], found a causal relationship between export and economic growth. Pentecost, Kar [11] and Al-Yousif [12] found causal relationships from economic growth to financial development. But in this study, it was determined that there were no causal relationship between Eximbank loans, Import and Export variables at 1 and 5% significance levels.

Turkey's export target in 2023, is to set at 500 billion USD. Looking at the export figures at the end of 2015, Turkey must increase exports by an average of 16.5% each year to reach the 2023 target. To achieve this increase, it is necessary to ensure the high growth of the economy, accelerate R&D investments, diversify exports, reach new markets, and provide the necessary regulations and facilities for exporting companies to compete with exporters in other countries.


Eximbank loans provide a price advantage over other export loans offered by banks. It has a strong financial structure. Because of this financial structure, it supports exports at a high rate. To achieve the export potential that the country has, also in international markets, it should implement new and effective credit/insurance programs under international treaties and the restrictions of the institutions to which it is affiliated.

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