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THE EFFECT OF INVESTMENT INCENTIVES AND EXPORT CREDITS ON COUNTRY EXPORT: THE CASE OF TURKEY

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Abstract

Increasing export in developing countries like Turkey is equal to escalate economic force and public welfare. In this context, developing countries enforce various export promoting legislation and make efforts to enhance export of country. Some of these efforts include export credits provided by banks and export-oriented investment incentives, as well as direct export incentives by government. In this study, effects of export credits provided by banks and investment incentives on country's export was analyzed by ARDL (Autoregressive Distributed Lag) approach which is one of the time series analysis. According to ARDL, the boundary test results show that there is a co-integration relationship between variables. The 1% escalation in export credits causes 0.82% increase in exports approximately. Similarly, it is revealed that 1% increase in investments incentives causes 0.077% uptick in exports. Error correction term estimated in the study based on ARDL model was found negative and significant as expected.

Keywords: Investment Incentives, Export Credits, Country Exports, Export, ARDL.

YATIRIM TEŞVİKLERİ VE İHRACAT KREDİLERİLERİNİN ÜLKE İHRACATINA ETKİSİ: TÜRKİYE ÖRNEĞİ

Öz

Türkiye gibi gelişmekte olan ülkelerde ihracatı artırmak ekonomik gücü ve halkın refahını artırmaya eşittir. Bu bağlamda, gelişmekte olan ülkeler ülke ihracatını artırmak adına çeşitli teşvikler oluşturarak çabalar harcarlar. Bu çabalar doğrudan devlet tarafından sağlanan ihracat teşvikleri olabileceği gibi bazıları da bankalar tarafından sağlanan ihracat kredileri ve ihracata yönelik yatırım teşvikleridir. Bu çalışmada, zaman serisi analizlerinden birisi olan ARDL (Autoregressive Distributed Lag) yaklaşımı kullanılarak bankalar tarafından sağlanan ihracat kredileri ve yatırım teşviklerinin ülke ihracatı üzerindeki etkisi analiz edilmiştir. ARDL yaklaşımına göre sınır testli sonuçları değişkenler arasında eşbütünleşme olduğu görülmektedir. İhracat kredilerindeki % 1'lik artışın, ihracatta yaklaşık % 0,82 artışa neden olduğu görülmektedir. Benzer şekilde, yatırım teşviklerindeki % 1'lik artışın ihracatta % 0,077 oranında yükselişe neden olduğu ortaya çıkarılmıştır. ARDL modeline dayanan çalışmada tahmin edilen hata düzeltme terimi, beklendiği gibi negatif ve anlamlı bulunmuştur.

Anahtar Kelimeler: Yatırım Teşvikleri, İhracat Kredileri, Ülke İhracatı, İhracat, ARDL.

I. Introduction

Relation between financial conditions, trade credits and trade is reprinted after sharp fall of trade in 2008 global crisis. Decline in international trade has led a downtrend in export demand bringing effects on GDP levels. Financing trade in crisis periods can strengthen link between financial sector and real economy. Role of export credits and export oriented investment incentives rise as the need of finance uncovers in crisis periods. The size of total official export credits worldwide is not available but according to EIU (Economist Intelligence Unit) estimations, total lending amounts of global trade finance is 60.9 billion USD for three developed countries (France, Germany and UK) in 2013 (WTO, 2017). According to RIS data, it is estimated that 40% of global trade was supported by bank intermediate trade finance from 2009-2011 including export credit insurance, pre-export finance, supplier credits and L/C. In Turkey, 11% of exports are supported by L/C and documentary collections in 2012.

Developing countries find themselves in the middle of a great competition in existing international trade markets. Since Turkey is a developing country in terms of its economic position, government has to constitute a sustainable trade structure within this competition. However, nowadays stabilizing the balance in international trade is a goal that is aimed to be achieved by enhancing exports. Escalating export is one of the economic targets of all countries, not only developing countries. In this sense, it is possible to see export encouraging activities in all countries. It can be argued that competition in international trade turned into an incentive policy competition (Gunes & Ugur, 2007: 22). In Turkey, the Ministry of Economy continuously announces, implements and develops incentives.

Export is a substantial economic activity to implement. In addition to providing various supports and incentives for companies existing in Turkey to participate exports, incentives are also procured for new investors. It is also possible to use export the guaranteed investment credits additively export credits within the country's banking system for conditions when financial incentives are not sufficient. All these incentives and credits are being put on the market in order to facilitate the carrying out of economic activities that will contribute to export and economy of the country.

Some theories consider that in order to compete properly in global markets, firms must take their position in target countries by integrating these countries with the transfer of their ownership-specific assets in knowledge, technology, management, organization or marketing structures (Blomström et. al, 2003: 41). Firms with that capabilities could have several advantages in the phase of building up an investment-based organizations such as

manufacturing facilities, joint ventures, franchising and licensing etc. Certainly, these kind of investments are called foreign direct investments (FDI) which every country would appreciate to have. In this sense, the situation of firms having these advantages and countries seeking to bring them into domestic interests, makes FDI's more valuable. From this point forth, to attract the FDI's, countries develop some policies like "investment incentives".

The aim of this study is to analyze, dynamic interactions plus short and long-term relationships between investment incentives, export credits and country exports. For this purpose, model and data set used to investigate the correlation are explained after literature review. Results related to VAR test used in determining short and long term relationships between variables are examined before conclusion.

II. Literature Review

With globalization, rapid vanishing of economic, commercial and technological borders between the countries have brought the issue of capital transfer to the world's agenda. Capital transfers in the form of short-term portfolio investments and foreign direct investments are very important for countries with insufficient national savings levels. Countries in developing period tries to attract especially foreign direct investments (FDI), taking into account their medium and long term gains. FDI generally refers to the international investments made by a resident in a country to establish a long-term relationship in another country (IMF, 1993: 86). These types of investments are not only transfer of capital but also transfer of undertaking, technology, risk allocation and organization therefore they are not considered as financing of the establishment and equipment only (Mucuk and Demirsel, 2009: 366). On the other hand, domestic investments are also as important as FDI's because of their financing role in manufacturing industry. When some issues like investments are so important, they become really hard to gain. Accordingly, most countries need to attract investors to obtain investments with benefits. The issue that brings our work to investment incentives is precisely because of this point.

Countries are known to give many incentives under the name of investment incentives, R&D incentives and various periodical supports to private sector (Karakurt, 2010: 147). These incentives can cover various areas such as tax deduction or exemption, land acquisition, customs facilities, tax returns. As it can be seen that the most fundamental aspect of these incentives is direct or indirect funding of private sector by public sector aids. In this context, the concept of incentives can be described as financial or non-financial aids and supports to economic activities that are desired to be developed more than others (Ciloglu,

1997: 1). Investment incentives are all supports given to investors and given to preferential areas by government in order to increase investment volume. The Turkish Ministry of Economy explained aims of investment incentives as follows (Ekonomi Bakanlığı, 2017: 4).

“To direct savings to high value-added investments, to increase production and employment, to increase international competitiveness and to encourage strategic investment with large scale investments, to increase international direct investments, to reduce regional development disparities, to encourage investment in clustering and environmental protection”

Investment incentives are highly important for country's economy in terms of their objectives. Especially the provision of foreign direct investments is seen as a strong factor for the development of economic power (Temiz & Gokmen, 2009). It is found that foreign direct investment provided has a positive effect on export of countries also found that presence of foreign investors on markets enables domestic investors to focus more on exportation (Ruane & Sutherland, 2005). Prasanna (2010) found that foreign direct investments inflow effects significantly and positively export of a country. Same study suggests that export-encouraging government policies should be implemented together with investment incentives. In addition, it is shown that higher export volume is expected to be reached in the long run in consequence of implemented policies.

Temiz & Gokmen (2009) used monthly data from Turkey between 1991-2008 and employed Vector Auto Regression (VAR) model to analyze relationship between foreign direct investments and country export. The unit root tests, Granger causality test and Johansen co-integration tests were applied on time series to examine dynamic relationship between exports and foreign direct investments. As a result, it is revealed that there is a long-run equilibrium relationship between variables and an ordinary causality relation.

The relationship between investment and exports, which has been examined and confirmed by academicians (see, Ruane & Sutherland, 2005; Prasanna, 2010; Temiz & Gokmen, 2009) has led idea of investigating whether incentives for investments in our work are influential on exports.

Another fundamental factor when it comes to export development is issue of financing which is generated during production and marketing sessions of exported goods. Funding and financing export process can be achieved by obtaining export credits from banks (Seymen, 1995: 195). Also as a financial reality which is known by every related person; credits arise when buyers postpone payment of goods and services sold. In this sense export credits could arise when foreign buyers postpone their liabilities as a forward sale. It is possible to examine export credits in three groups as short, medium and long term according to the dates. Generally, short-term (up

to two years' maturity) credits are used for raw materials and consumable goods, medium-term (2-5 years maturity) loans are used for durable goods and capital goods, and long-term credits (more than five years maturity) are used for heavy capital goods (Togan, 1992: 73). Since it is essential to handle export credits, the first institution that comes to mind in Turkey is Turkish Export Credit Bank (EXIMBANK). However, it is important to remember that other private or public sector banks or Presidency of Institution to Development and Support for SME's (KOSGEB) exist with the intent of financing exportation.

In a study investigating relationship between export credits and country exports, EXIMBANK loans have been found to finance 21% Turkey's exportation (Ozturk et. al., 2007). Gunes & Ugur (2007) conducted a study on use of export credits in companies and have explained that EXIMBANK credits are not as well-known as they must. Also the study claims that there may be increases in exports of country if necessary encouragement is made. In another study, it was argued that export credits were inadequate and interest rates were at high levels for enterprises, and it was estimated that if necessary regulations were made, export participation of firms would increase (Ozdemir, 2004).

It is seen that studies related to export credits are made at firm level in Turkey. It is known that export credits mainly aim to increase total export volume of country by facilitating export of companies (Kuhn et. al., 1995). Dijk (2002) found that factors related to cost, especially those that are dependent on suppliers, affect countries' exports. It is known that emerging countries rely heavily on their suppliers for exportation according to the World Trade Organization. As mentioned before, export credits provided in production and marketing sessions may help to reduce costs and that export-oriented activities might be facilitated and exportation might be augmented.

Auboin and Engemen (2014) made a benchmark analyze between countries to see if export credits were affecting country exports. Data from guaranteed export credits and export between 2005-2011 years are taken quarterly to measure the relationship between export credits and exports of countries. The study revealed that an addition of 1% for the export credits will cause 0.4% uptick in exports.

An analysis of correlation between German exports and guaranteed export credits led to the conclusion that any increase in export was directly relevant to export credits as a result of analyzes made by using the German Export Credit Agency (HERMES) data (Felbermayr & Yalcin, 2013).

Beltramello et. al. (2002) argued that exports of countries are influenced by geographical location, sectoral distribution and national policies, but the most effectives come

from national policies. In this context, both investment incentives and export credits are related with national policies as known, idea of measuring the effects of export credits on export of country is emerged.

III. Materials and Methods

A. Data Set

Effects of investment incentives and export credits provided by banks on export were investigated in this study. Monthly data including period 2002:12 – 2016:12 were used in the study. By taking natural logarithms of variables used in the study, it is aimed to remove problem of heterogeneity which is likely to occur in time series. Table 1 shows abbreviations used in the study and sources obtained.

Table 1. Variables and Descriptions

Variable	Abbreviations	Description and Data Range	Data Source
Investment Incentives (Million Turkish Lira)	linvinc	Amounts paid as investment incentives (December 2002-December 2016)	The Turkish Ministry of Economy
Export Credits (Million Turkish Lira)	lexpcredit	Amounts used as export credits (December 2002-December 2016)	Banking Regulation and Supervision Agency (BRSA) Turkey
Export (Million Turkish Lira)	lexport	Turkey's Export Amount (December 2002-December 2016)	Turkish Statistical Institute (TSI)

Compiled by authors.

Using logarithmic forms of variables in the study is expressed as follows:

$$\ln \text{lexport}_t = \beta_0 + \beta_1 \ln \text{lexpcredit}_t + \beta_2 \ln \text{linvinc}_t + \epsilon_t \quad (1)$$

B. Econometric Model

It is aimed to investigate short and long-term relationship between investment incentives given to enterprises plus export credits and exports of the country. For this purpose, it is essential to determine stationarity of series before going on to build a model in the analysis of time series. Stability -the average of a time series and its variance- does not vary over time. The stability of time series is a crucial condition for future forecasts. The most important reason for this is that if analysis is done with a non-stationary time series then revealed results might only cover period taken. However, main target of analysis is to identify relationship between series and generalize them (Gujarati, 2016: 320).

A stationary series follows a fluctuating course around a fixed average, and these series tends to return to average. Therefore, variance of the series will not change with time and will show there is an end as a result (Cilyavuz, 2015: 283).

Non-stationary time series can be stabilized by appropriate methods and used in econometric applications. Because, when analyzed with non-stationary time series, problem of false regression can be encountered, which causes non-related series to appear to be related to each other (Ozata & Esen, 2010: 27).

Stability of a time series is mainly investigated in three ways: graphical analysis, corelogram and unit root tests. In this study, stationarity of series was examined by unit root tests.

C. Unit Root Tests

Stationarity of series in the study was examined by unit root tests of ADF (Extended Dickey-Fuller), PP (Phillips-Perron) and KPSS (Kwiatkowski, Phillips, Schmint and Shin).

Unit root test results for series are given in Table 2.

Table 2. Unit Root Test Results

Variables	ADF	PP	KPSS	
linvinc	-1.0325(0.7409)	- 4.5459(0.0002)	1.486985 1% level 5% level 10% level	0.739000 0.463000 0.347000
lexpcredit	-0.8716(0.7952)	- 0.872513(0.7949)	1.612991 1% level 5% level 10% level	0.739000 0.463000 0.347000
lexport	-0.6246(0.8606)	- 1.029017(0.7424)	1.612214 1% level 5% level 10% level	0.739000 0.463000 0.347000
First Differences				
dlinvinc	-7.1775(0.0000)	- 49.2658(0.0000)	0.315735 1% level 5% level 10% level	0.739000 0.463000 0.347000
dlexpcredit	-11.665(0.0000)	- 11.60785(0.0000)	0.055651 1% level 5% level 10% level	0.739000 0.463000 0.347000
dlexport	-4.4185(0.0004)	- 69.66256(0.0001)	0.161331 1% level 5% level 10% level	0.739000 0.463000 0.347000

When Table 2 is examined, it is seen that variables of investment incentives are stable at the first differences of all except PP test result. However, these inconsistencies between tests also indicate a trend. For this reason, it is aimed to determine whether there is any

breakpoint at any time by applying structural breakdown unit root tests to series. Results of unit root tests made for this purpose are given in Table 3.

Table 3. Unit Root Test Regarding Structural Breakdown

Variable	ADF	
linvinc	-10,316	
	1% level	-5,711
	5% level	-5,155
	10% level	-4,860
lexpcredit	-3,869	
	1% level	-5,711
	5% level	-5,155
	10% level	-4,860
lexport	-10,527	
	1% level	-5,711
	5% level	-5,155
	10% level	-4,860

When examined Table 3, it is confronted that only export credits have unit root and other variables do not include unit root from variables of structural breakdown unit root test.

According to ADF, PP and KPSS test results in Table 2 and Table 3, it is seen that there is a discrepancy between results when test results are considered and some series are $I(0)$ while some series are $I(1)$. In such a case, it is necessary to apply ARDL (Autoregressive Distributed Lag Model) approach in order to measure co-integration relationship between variables. In time series analysis, it is appropriate to apply the ARDL approach to measurement of co-integration relation if some series stationary at the level and some series stationary at the first differences. Because, in co-integration tests developed by Engle and Granger (1987) and Johansen and Juselius (1990), variables must be equivalently equidistant.

D. ARDL Model

ARDL model is based on a standard least squares method with lagged values of dependent and independent variables. Unlike standard co-integration tests developed by Engle and Granger (1987) and Johansen and Juselius (1990), ARDL model does not require a unit root test beforehand. It is not essential to classify casual variables as $I(1)$ and $I(0)$ (Sharifi & Renani, 2008: 4). Main advantage of ARDL model is that co-integration test can be performed and meaningful results can be obtained even though variables are $I(1)$ or $I(0)$ (Esen et al., 2012: 257). However, the fact that ARDL model is applicable to small samples also demonstrates another advantage of this model (Paul, 2014: 2). However, the biggest limitation of this model, developed by Peseran et al. (1996), is that the model cannot be applied when

variables are integrated at the second level and at a larger scale (Caglayan, 2006: 427). The equation to be applied in ARDL co-integration test is shown below.

$$\Delta \text{lexport}_t = \delta_0 + \sum_{i=1}^l \zeta_i \cdot \Delta \text{lexport}_{t-i} + \sum_{i=0}^m \theta_i \Delta \text{lexpcredit}_{t-i} + \sum_{i=0}^n \omega_i \Delta \text{linvinc}_{t-i} + \varphi_1 \cdot \text{lexport}_{t-1} + \varphi_2 \cdot \text{lexpcredit}_{t-1} + \varphi_3 \cdot \text{linvinc}_{t-1} + \eta_t \quad (2)$$

Export variable in equation shows export amount, export credit variable shows the amount of export credits and invinc variable shows the amount of investments incentives given. Δ sign signifies the first differences

$$H_0: \varphi_1 = \varphi_2 = \varphi_3 = 0$$

$$H_1: \varphi_1 \neq \varphi_2 \neq \varphi_3 \neq 0$$

Hypotheses above are tested in the ARDL model obtained as result of the equation 2. If results obtained are greater than F value developed by Peseran et al. (2001) H_0 hypothesis will be rejected and it will be concluded that there is a long-run relationship between variables. If it is small, H_0 will not be rejected and it will be reached as a result that there is no co-integration between variables.

The ARDL model, which examines long-run relationship between variables, is shown in equation 3.

$$\text{lexport}_t = \gamma_0 + \sum_{i=1}^k \partial_{1i} \text{lexport}_{t-i} + \sum_{i=0}^p \mu_{1i} \text{lexpcredit}_{t-i} + \sum_{i=0}^q \theta_{1i} \text{linvinc}_{t-i} + \varepsilon_{1t} \quad (3)$$

The short term relationship between variables is based on the error correction model based on the ARDL model.

$$\Delta \text{lexport}_t = \alpha_0 + \sum_{i=1}^g \partial_{2i} \Delta \text{lexport}_{t-i} + \sum_{i=0}^h \mu_{2i} \Delta \text{lexpcredit}_{t-i} + \sum_{i=0}^u \theta_{2i} \Delta \text{linvinc}_{t-i} + \theta \text{ect}_{t-1} + \varepsilon_{2t} \quad (4)$$

In equation 4, ect_{t-1} error correction is added, unlike equation 3. This coefficient is a one-term lagged value of residuals obtained from equation 3, and the coefficient indicates how much of an imbalance that will occur in the short-term will rise in the long run. It is expected that sign of the coefficient of this variable is negative and meaningful (Esen et al., 2012: 258).

The ARDL model for variables was estimated in the study. According to the Akaike Information criterion, ARDL (2,3,2) model has been estimated for a long-run relationship. As a result of estimation, at first, it is necessary to check with the preliminary tests whether the model carries any problems in terms of stochastic or deterministic. Preliminary tests for the model are shown in Table 4. There is no autocorrelation and heteroscedasticity problem in the

model estimated according to the test results. Functional form of the model is correctly determined, and residual obtained from the error terms also shows a normal distribution.

Table 4. Pretest Results

	Test Statistic	P-Value
Autocorrelation	F_Statistic = 2.143	0.1207
Functional Form	F_Statistic= 2.088002	0.1505
Normality	$X^2_{(2)} = 3.6240$	0.163323
Heteroscedasticity	Obs*R-square= 14.23007	0.1144

* Autocorrelation was tested with LM test, Functional form is tested with RESET test, Normality is tested with the Jarque-Bera test. Variable Variance test was obtained by regressing the squares of residuals over the squares of the explanatory variables.

Table 5 shows the result of the ARDL boundary test to test whether there is any co-integration among the variables in the model.

Table 5. ARDL Boundary Test

Date: 02/13/17 Time: 01:33 Sample: 2003M02 2016M12 Included observations: 167 Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	9.157172	2
Critical Values for Boundary's		
Critical Values	I0 Boundary	I1 Boundary
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

According to the ARDL boundary test results, there seems to be a co-integration relation between the variables. After this step, long term coefficients must be calculated.

Table 6. Long Term Coefficients -Estimate Results

Long Term Coefficients			
Variable	Coefficients	t-Value	Possibility
LINVINC	0.077343	1.781020	0.0769*
LEXPCREDIT	0.822034	14.191958	0.0000**

Table 6 shows that both of variables have positive effect on exports. There is a 1% significance co-integration between export credits and export, while a 10% long term co-

integrating relationship between investment incentives and exports have been determined. The coefficient of both of variables is positive. The 1% increase in export credits will enhance the export amount by approximately 0.82%. Similarly, a 1% increase in investment incentives will uptick exports by approximately 0.077%.

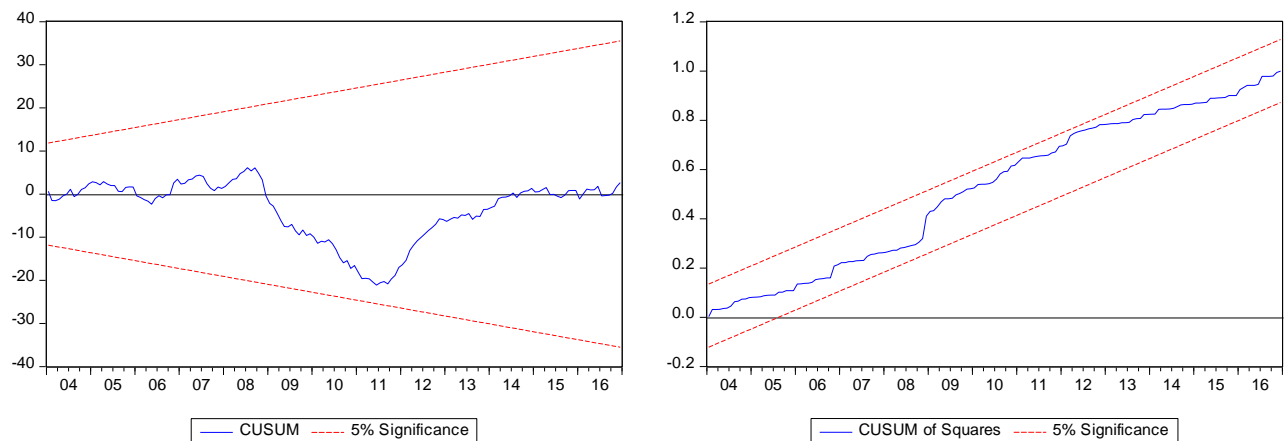
The short term co-integration relationship based on error correction model is shown in table 7.

Table 7. ARDL (2,3,2) Error Correction Model Results

Variable	Coefficient	Std. Err.	t-Value	Possibility
D(LEXPORT(-1))	-0.303292	0.070795	-4.284080	0.0000
D(LINVINC)	0.025105	0.013013	1.929252	0.0555
D(LINVINC(-1))	-0.027875	0.014519	-1.919980	0.0567
D(LINVINC(-2))	-0.033255	0.013036	-2.550924	0.0117
D(LEXPREDIT)	0.214566	0.186482	1.150597	0.2517
D(LEXPREDIT(-1))	0.812961	0.198752	4.090330	0.0001
C	0.241118	0.046059	5.234946	0.0000
ECT(-1)	-0.426377	0.080833	-5.274819	0.0000
ECT = LEXPORT - (0.0773*LINVINC + 0.8220*LEXPREDIT)				

When we look at Table 7, we can say that investment incentives are significant on export at level of 10% significance of lagged value of one's own and one period, and at the level of 5% significance of lagged values of two terms. However, there is a negative relationship between lagged values of investment incentives and exports. While there is no short-term effect of export credits on exports, one-time lagged value appears to be significant at 1% significance level. It is seen that lagged value of exports itself has a significant effect on the 1% significance level but effect is negative. The sign of the error correction term is negative and meaningful as expected. Table shows that the effect of a shock in the model will restabilize in the first year by 42.63%.

Finally, in order to test the stability of the model, CUSUM (Cumulative sum of recursive residuals) and CUSUM-of-Square (Cumulative sum of squares of recursive residuals) tests were performed. Test results are shown in Figure 1. When Figure 1 is examined, it is seen that residuals of the model are within the boundary, parameters of the model are significant and there is not any structural change.

Figure 1. CUSUM and CUSUM of Square Tests

IV. CONCLUSIONS

Analyzing the relationship between export credits, investment incentives and country exports is vital for determining details of export support policies to be implemented. In this study, long run relationship between investment incentives that are thought to affect exports of the country and export credits have been analyzed with monthly data between 2002-2016 by ARDL model. According to the result of bound test obtained from the model, it is determined that there is a long-term positive relationship between investment incentives and export credits and country exports. In this case, it can be said that increasing export credits and investment incentives will cause growth in the country exports. These results show some similarities to previous researches about the relationship between export credits and country export (see: Auboin and Engemen, 2014; Felbermayr and Yalçın, 2013; Beltramello et. al., 2002). Also since some academicians have already proved the relationship between investment and export (see: Ruane and Sutherland, 2005; Prasanna, 2010; Temiz and Gokmen, 2009), this study will contribute to literature by showing that investment incentives also may positively influence countries export.

As we discussed above; FDI's and domestic investments are important for any country's wealth as well as exports. By implementing policies to ensure investors that they will be supported with strong incentives could attract them to invest in the country. Financing firms' export processes could also encourage firms to export more and other firms to start export-oriented efforts. With conclusion of this study it is proved that giving these incentives and credits would rise export of the country. After all, increasing incentives brings technology, knowledge, advanced facilities in the country and further country wealth would rise as well as exports do.

For developing countries like Turkey, substance of export is well known. This study reveals the positive effects of export credits and investment incentives on country export and shows way to policy makers to enhance exports. In future studies, which may be continuation of this study, if direct export incentives data will be reached then factors affecting export can be addressed. It will also be possible to make comparative analyzes if similar data are available in different countries. Finally, it can be suggested that researchers willing to study in these fields can and must consider gathering more detailed data about governmental incentives to seek more explanatory results. According to whole research process of this study, it is hard to reach vast amount of data about investment incentives and export credits, so that we suggest next studies to use recently emerged time series analyzes like artificial intelligence methods or hybrid models for the purpose of obtaining more accurate predictions.

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