

**RELATIONSHIP BETWEEN INFLATION AND FOREIGN TRADE:  
AN ECONOMETRIC ANALYSIS WITH STRUCTURAL BREAK  
BETWEEN THE EU-28 COUNTRIES AND TURKEY\***

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**ENFLASYON VE DIŐ TİCARET İLİŐKİŐİ: TÜRKİYE İLE AB-28 ÜLKELERİ  
ARASINDA YAPISAL KIRILMALI EKONOMETRİK BİR ANALİZ**

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**Abstract**

*Inflation, which indicates the continuous increase in the general level of prices, affects many macroeconomic indicators, especially foreign trade. Inflation is an important variable that affects production costs. Therefore, the aim of the study is to reveal the relationship between inflation and foreign trade. In the study, the relationship between foreign trade and inflation was analyzed using structural break time series method based on the monthly data obtained from models covering the period 2005: 01 to 2017:12 between Turkey and the EU 28. In the analyzes, the cointegration relationship with structural breaks is found between exports and inflation. However, there isn't any cointegration relationship between imports and inflation. Moreover, there is a two-way causality relationship between exports and inflation. On the other hand, there is a one-way causality relationship from imports to inflation. There is no causality relationship from inflation to imports. Based on the findings of the study policy proposals were made related to the process of the EU full membership of Turkey.*

**Keywords:** Foreign Trade, European Union, Inflation, Time-Series

**Öz**

*Fiyatlar genel seviyesindeki sürekli artışı ifade eden enflasyon, bařta dıő ticaret olmak üzere birçok makroekonomik göstergeyi etkilemektedir. Enflasyon üretim maliyetlerini etkileyen önemli bir deęiřkendir. Bu nedenle alıřmanın amacı enflasyon ile dıő ticaret arasındaki iliřkiyi ortaya koymaktır. alıřmada, Türkiye-AB 28 arasında 2005: 01 ile 2017: 12 dönemlerini kapsayan aylık verilerle kurulan modeller üzerinden enflasyon ile dıő ticaret arasındaki iliřki yapısall kırılmall zaman serisi yöntemleri ile analiz edilmektedir. Analizlerde yapısall kırılmalarla birlikte ihracat ile enflasyon arasında eőbüttüme iliřkisi bulunmuřtur. Fakat ithalat ile enflasyon arasında herhangi bir iliřki görülmemiřtir. Ayrıca, ihracat ile enflasyon arasında ift yönlü nedensellik iliřkisi bulunurken, ithalattan enflasyona doęru ise tek yönlü nedensellik iliřkisi vardır. İhracat ile ithalat arasında ise herhangi bir nedensellik iliřkisi bulunmamaktadır. alıřma sonunda bulgulara dayanılarak, Türkiye'nin AB'ye tam üyelik süreciyle ilgili politika önermeleri yapılmıřtır.*

**Anahtar Kelimeler:** Dıő Ticaret, Avrupa Birlięi, Enflasyon, Zaman-serileri

\* This paper is an improved version of the paper presented at the International Congress On Political, Economic and Social Studies/ ICPESS Venice/Italy 2018.

## 1. INTRODUCTION

Since it was founded, Turkey has been an active member of international organizations such as OECD and NATO to reach the level of contemporary civilizations. To that end, she made a partnership application on 31 July 1959 to the European Economic Community which was established in 1958 after world wars (EU Ministry, 2018). Important steps have been taken during the nomination process, which has continued for many years up until today. The most important condition in the EU full membership process is the provision of economic criteria. The EU want certain standards in various macro-economic variables such as interest rates, the budget deficit and debt ratios to be met and wants Turkey to reduce inflation to the EU standards (Gerber, 2007: 330-332). Although inflation has achieved significant success in recent years and has been reduced to single-digit figures, inflation has once again risen in the last few years due to seasonal factors and cyclical policies.

This instability in inflation rates affects many variables such as foreign trade, interest rates, unemployment and economic growth. Foreign trade, which will be mainly emphasized in the study, is a strategic variable for the development of the country's economy and the solution of many economic problems. Foreign trade is made up of import and export items. Foreign trade deficit or surplus depends on the change in import and export figures. The changes in foreign trade balance affect foreign exchange rates, current deficit, inflation, budget balance... and so on. It also determines the global competitive power of the country in international markets. For this reason, the success of the country in the foreign trade policy is an indication that the country is a global power in numerous fields. As far as Turkey is concerned, as a country that has had foreign trade deficit for many years, the other macroeconomic variables, especially inflation, have been adversely affected by this.

In this study, the relationship between inflation and foreign trade, the two most important indicators for national economy, is tested by econometric analysis on Turkey's economy. In this context, these two variables are examined theoretically and conceptually first and then the literature was reviewed about the relevant models. At the end of the study, the relationship between foreign trade and inflation was tested by econometric analyses including structural breaks and policy proposals were made based on the findings. The monthly data used in the analysis covered 2005: 01 to 2017: 12- period and imports and exports figures between the EU-28 countries and Turkey have been used as foreign trade variables. Due to the data limitation of the countries included in the sample, this date range was preferred. With the policies developed based on the results of cointegration and causality tests, the study is expected to make an important contribution to the literature towards ensuring the economic criteria that Turkey is expected to meet in the EU full membership process.

## 2. THEORETICAL AND CONCEPTUAL FRAMEWORK

The European Union is a real, political and economic project that has become a long-term goal of government policies of nation states. The main goal is to form a United States of Europe, a unity that acts in common policies (political-economic-military, etc ...) and struggles for common interests in the global world and getting one-step closer to these goals since its foundation. However, global competition and the world conjuncture in recent years are preventing or delaying the realization of this goal. Both the global crises and the global terrorist attacks have shown that the union cannot cooperate in many issues.

It can be said that the bases of this great project in which the economies and states that were destroyed after the world wars came together with the establishment of a new world order goes way back. The dream of being united monetary and legally of European nations as well as scholars, which was also expressed in Dante's book Monarchy and in the Paris United States of Europe Conference has been nearly accomplished with European Union (Telli, 2015: 179). This major project first completed its first enlargement process in 1973 with the participation of the UK, Ireland and Denmark. Finally, with the inclusion of Bosnia and Herzegovina it has accomplished a structure of a large organization with 29 members.

**Table 1.** Expansion Process of EU

First Expansion - 1973	England, Denmark, Ireland
Second Expansion -1981	Greece
Third Expansion - 1986	Spain - Portugal
Fourth Expansion - 1995	Austria, Finland, Sweden
Fifth Expansion - 2004	Hungary, Poland, Czech Republic, Slovakia, Slovenia, Latvia, Lithuania, Estonia, Malta, Greek Cypriot Administration
Sixth Expansion - 2007	Romania, Bulgaria
Seventh Expansion - 2013	Croatia
Eight Expansion - 2016	Bosnia and Herzegovina

**Source:** Ministry for EU Affairs, 2016

Turkey's relations with the European Union began in 1959 after the establishment of the EEC. EEC Council of Ministers has accepted the application of Turkey on July 31, 1959, and a partnership regime was created by the Ankara Agreement, signed on 12 September 1963 until the membership conditions have been fully met. The Ankara Agreement, which entered into force on December 1, 1964, is a framework agreement in essence (Gökdere, 1991: 143). The transition period began when Additional Protocol entered into force on 1 January 1973 (Ökmen and Canan, 2009: 141).

Throughout the process of membership to EU, what has been expected from Turkey is to meet the economic criteria in which foreign trade and inflation are the most important factors. Since 1960's there has been a chronic inflation period in the process of the transition to a planned economy in Turkey. This basic problem could be seen in the closed economy policies based on import substitution until the 1980s, but after 1980's it emerged with international crises and occasional stagnation (Arı, 2001: 73). Inflation is generally known as the increase in the prices of goods and services, or a decrease in purchasing power, namely, the cost of living. The most comprehensive definition of inflation is provided by the Central Bank and it is as follows: the continuous increase in the general level of prices. Another definition is a decrease in the purchasing power of money. In other words, inflation means buying fewer goods or services in time with the same income (McConnell, Brue, Flynn, 2009: 28).

According to Turkey's inflation report, inflation seems to have emerged with World War II and became an important macroeconomic problem appearing constantly in the following periods. 1960s is the beginning of the planned economy period and since then the inflationary crisis (Şahin, 2016: 78) was reduced to single digit in the 2000s for the first time; however, it has again risen recently. There have been several policies as to fight inflation. (Emsen et al., 2012: 26). Some of these are; 24 January Decrees (1980), Inflation Fighting Program (1998), Transition to A Strong Economy Program (2001). The main goal of all programs is to increase supply by encouraging production and to weaken the demand structure by putting pressure on revenue.

Together with the decrease in the global inflation since 1990s, the rate of foreign trade deficit has increased in the markets. During those periods Central Bank was given an independence for institutional regulations and certain strategies were established such as fixed exchange rate and inflation targeting (Araç, 2013: 27). Inflation affects not only macro-economic variables but also foreign trade. The important criterion to evaluate the role of the foreign trade in the national economy is to examine the ratio of exports and imports or foreign trade rate to Gross Domestic Product (GDP).

The concept of export consists of a process of exporting a product abroad under defined rules in accordance with the Export Regulation published in the Official Gazette. Imports is defined as the whole of goods taken from another country. The foreign trade between two countries one of which has a high level of inflation while the other has low rate of inflation becomes unbalanced. The fact that the prices

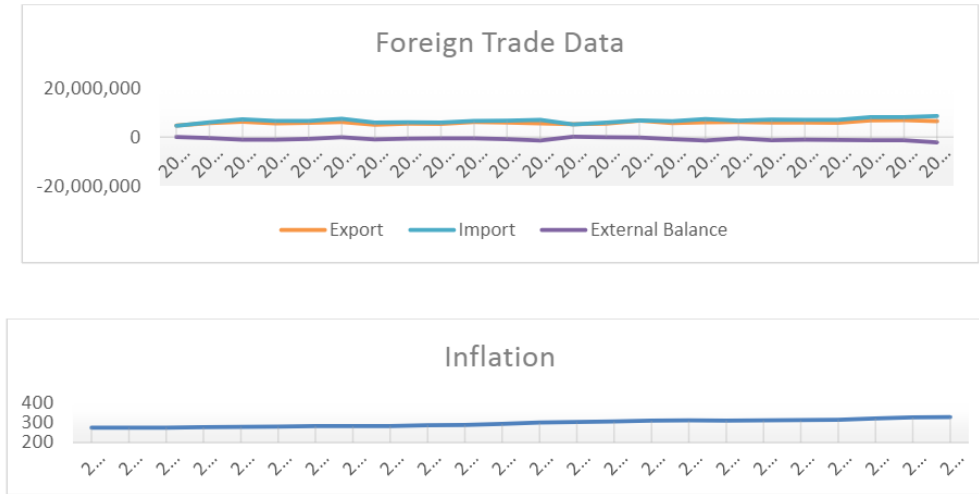
of imported products do not change, and the prices increase within the country causes speculative profit and blocks exports (Onay, 2015: 78).

Turkey is prominent with her foreign trade deficits. Especially due to lack of resources and wrongful foreign trade policies almost every year the rate of imports is higher than the rate of exports. In the recent years, the country has been cited as foreign-dependent because of this deficit. As well as being a serious economic problem, the foreign trade deficit is the the reason for problems such as the current account deficit. When theoretical approaches are taken into consideration, it is suggested that the countries that are in the process of industrialization uses the strategy of import-substitution industrialization. However, it has been claimed that these countries later turn towards export-oriented industrialization (Seyidođlu, 2007: 514).

The world economy entered a rapid globalization process after 1950. In this process, the natural borders between the countries have been lifted and the countries have become closer to trade. This rapprochement is reflected in the foreign trade of the countries and the exports between the countries have increased. Turkey, although lagging behind in this process, with the economic decisions taken on 24 January 1980 switched to exportation policy in foreign competition to keep up with changes around the world. Law No. 32 issued in 1989, membership of the World Trade Organization in 1995, and the Customs Union signed in 1996 accelerated this process. With such international expansion policies exportation and importation has both increased significantly (Balçılar et al. 2013: 469). Turkey's increasing exports is due to increase of export capability and international competitiveness of domestic firms as well as the country's macroeconomic stability.

The studies show that there are different theoretical relations between foreign trade and inflation. Keynesian Demand Function has formulated that exports increase total demand and imports decrease total demand. Accordingly, the increase in exports in open-ended economies will increase domestic demand and therefore total demand. Increasing aggregate demand will lead to an increase in the general level of domestic prices, ie inflation. The increase in imports, on the other hand, will cause some of the national income to infiltrate abroad, thus reducing total demand and lowering inflation (Göçer and Gerege, 2016: 28).

**Figure 1.** Inflation and Foreign Trade Data



**Source:** TSI and CBTR

Similarly, figure 1 shows the relationship between inflation and external balance monthly. As inflation data, CPI figures were taken and 2003 = 100 base years were used. In addition, the import and export data of the EU-28 countries, which constitute the sampling part of the analysis in the study, were used.

### 3. LITERATURE REVIEW

Theoretical and empirical studies that address the relationship between inflation and foreign trade seem to have failed to provide a consensus. While some studies argue that foreign trade is inflationary, especially in terms of imports, some other studies suggest that international specialization and scale economies may reduce costs and thus international trade will have an anti-inflationist effect (Güneş and Konur, 2013: 8). In addition, the studies in this field do not always yield the same results due to seasonal, country-based differences and different methods of analysis. The national and international studies on the subject show that;

Lane (1997) argues that as the opening rate increases, the inflation rates will decrease because the openness will make the Phillips curve more upright. Ball (2006) noted that globalization, defined as an increase in international trade, will reduce inflation by lowering import prices and by increasing imports of inexpensive goods. According to his study, increasing globalization, along with deregulation and privatization, will reduce inflation by increasing competition within the country, preventing the rise in inflation by lowering the production costs of cheap intermediate goods, especially imported from Asian countries. According to Evans (2007), with open economy, foreign consumers tolerate the pressure of inflation on the consumption tax, and the terms of trade and real wage support increasing inflation. For this reason, the emphasis is on balance inflation will be at a higher level as the openness increases. In a panel data model of eight Caribbean countries over a thirty-year period, Thomas (2012) found a positive relationship between openness and inflation and reached the conclusion that international trade made these countries vulnerable to external shocks, leading to instability. Martinez and Iyer (2014) examined the correlation between inflation and foreign trade in nine Soviet bloc countries for the period 1996-2010. Eight of these countries had negative correlations, but the coefficients were not significant in the four out of these eight countries. One of the countries, on the other hand, had a positive and significant coefficient estimate.

Unless the openness increases, inflation will be high. Afshan and Batul (2014) tested the relationship between exchange rate, inflation and foreign trade series with the help of time series analysis method for Pakistan and India. The aim of this study was to determine short and long-term relationships between variables. Results showed that the large changes in the exchange rate affected the inflation rate seriously in Pakistan. In addition, Pakistan was negatively affected by the fact that it could not compete against the high inflation-induced world market.

In studies conducted in Turkey, there has not been a consensus about the relationship between inflation and foreign trade. Bayraktutan and Armstrong (2003), using annual data from 1980 to 2000 period, has analyzed the relationship between imports and inflation of Turkey. The study employed causality and cointegration tests. It was revealed that the increase in inflation negatively affected the import volume. Sekmen (2007) has analyzed Turkey in the 1950-2003 period with the annual data of the Least Squares method. The result of the study was that the openness diminished its ability of monetary policy to increase production while it increased its effect on inflation. Taşçı et al. (2009) investigated the relationship between openness and inflation by using panel data estimation method. In the study, annual data covering the period of 1980-2006 were used. According to the findings; in Argentina, Brazil, Bolivia, Chile, Colombia, Costa Rica, Mexico, Paraguay, Peru, Uruguay and Turkey openness has a positive impact on inflation. Ülke and Ergun (2011), examined the relationship between imports and inflation in Turkey using monthly data for the period 1995-2010. In the study, Granger causality and cointegration analysis were applied and it was revealed that there is a short-term and long-term cointegration relation between inflation and imports. There is also a one-way Granger causality towards inflation. Güneş and Konur (2013) pointed out that increases in prices of imported intermediate goods in open markets can create inflationary effects due to increasing production costs. They examined the relationship between Turkey's degree of openness and inflation during 2000-2011 period using quarterly data. As a result of the study of Cointegration and Vector Error Correction Model, they found that outward openness and inflation are cointegrated and there is a two-way causality relationship between them. Mercan and Göçer (2014) conducted panel data analysis for Central Asian countries using data from 1990-2010 for Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. It was revealed that if these countries increase their openness by 100%, the inflation rates

will also increase by 64%. Kızılgöl and İpek (2015), examined the relationship between trade openness and inflation. In the study, annual data for the period 1992: 1-2013: 3 were used and ARDL bounds testing methods were applied. Results showed that foreign trade openness and inflation have a cointegration relation and variables such as openness affect inflation positively in both long-run and short-run. Göçer and Gerede (2016), examined 1992-2014 period using the changing unit root test and causality analysis, revealed that the increase in export and imports in Turkey increased inflation.

Theoretical and empirical studies that address the relationship between inflation and foreign trade seem to have failed to provide a consensus. While some studies argue that foreign trade is inflationary, especially in terms of imports, some other studies suggest that international specialization and scale economies may reduce costs and thus international trade will have an anti-inflationist effect (Güneş and Konur, 2013: 8). In addition, the studies in this field do not always yield the same results due to seasonal, country-based differences and different methods of analysis. The national and international studies on the subject show that;

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In the next part of the study, the above-mentioned conceptual framework and literature review will take place together with the analysis of econometric tests. In this context, firstly, econometric model analysis is introduced in the methodology section, followed by related tests and the findings.

#### 4. METHODOLOGY

The methodology which was employed to examine the effect of the relationship between inflation rates and foreign trade on Turkey's economy can be expressed as follows. Firstly, the data set was introduced, and a hypothesized model was established. At the beginning of the analysis, stationarity analyzes were performed. As unit root tests, the most commonly used ADF and PP tests and Lee-Strazicich tests, which allows structural breaks, were used. Following the stationarity tests, to determine the long-term relationship between the variables the Engle-Granger Cointegration Test and Hatemi-J Cointegration tests were used. To determine the causality relationship between variables, Toda-Yamamoto Causality test was used, and the results were compared and interpreted.

Economic fluctuations are very common in the global world. These fluctuations cause significant breaks in many variables. The periods of fractures should be interpreted correctly. Therefore, in econometric analysis, the dates of breaks should be determined. For this reason, tests that allow structural breakage were preferred in the study.

##### 4.1. Data Set and the Econometric Model

The relationship between foreign trade and inflation were examined by analyzing the monthly data covering the 2005: 1-2017: 12 periods. Inflation data was obtained from the database of Central Bank of the Republic of Turkey (CBRT) electronic data distribution system (EDDS). Based on CPI, the series were based on 2003 = 100. The import and export data that occur during the relevant period between the EU-28 countries and Turkey was formed by compiling the data of Turkish Statistical Institute (TSI) and was used as the foreign trade data.

To test the established hypotheses two model estimates were made within the framework of the analyzes. In the first model, export (X) was taken as a dependent variable and import (M) was taken as a dependent variable in the second model. Inflation (INF) was used as an independent variable in both models. Logarithms of the variables used in the analyzes were taken and models in a seasonally adjusted manner were set. The reason for the logarithmic transformation is the ease with which logarithms are

taken on a particular tabular basis to reduce the variance and interpret the results of the analysis. Omitting the logarithms of the series does not cause any loss of information in the data, but it reduces the autocorrelation problem, and increases the normal distribution of the series (Dirican and Canoz, 2017: 383). The established models can be expressed as;

$$X_t = \beta_0 + \beta_1 INF_{t1} + \epsilon_{t1} \quad (1)$$

$$M_t = \beta_0 + \beta_2 INF_{t2} + \epsilon_{t2} \quad (2)$$

In the analyzes, foreign trade and inflation figures were obtained from the relevant periods in terms of data set harmonization, obtained from EDDS and TSI. While the data used in the analyzes can be expressed as a secondary source, the fact that they were obtained from the databases of official sources such as the CBRT and TSI increases the reliability.

#### 4.2. Results of Unit Root Test

In econometric time series analysis, unit root tests, which do not consider structural breaks, were interpreted before examining cointegration and causality relations. In econometric analysis, unit root tests are made to avoid false regression problems. In the analyzes, the series which are unit rooted are not stationary. If non-stationary time series do not have a cointegration relationship, it would be wrong to mention the existence of a meaningful relationship between these variables (Harris and Sollis, 2003: 41). If the series are unit rooted, there is a false regression problem, and even if the R2 and t values are significant, the economic interpretations will be meaningless (Sevuktekin and ınar, 2014:324).

Augmented Dickey-Fuller (1981) and Philips-Perron (1988) tests were applied for the stationarity of the series in the study. The Augmented Dickey-Fuller (ADF) test was constructed by adding the delayed values of the variable to the Dickey-Fuller test. The ADF test aims to eliminate the problem of correlation in error terms (Wojciech and Derek, 1999: 101). The model used for this test is as follows;

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_t - 1 + \alpha_i \sum_{i=1}^m \Delta Y_{t-i} + \epsilon_t \quad (3)$$

The first difference of the variable that is tested for  $\Delta Y_t$  stagnation in the model is the t-trend variable  $\Delta Y_{t-i}$ , which is a delayed difference term. The model was added a delayed difference term to ensure that the error term is consecutively independent (Gujareti, 1999: 720). In the model, Akaike and Schwarz information criteria can be used as the lag length. In the ADF unit root test, it is basically tested whether the number of  $\delta$  is equal to zero. In the ADF unit root test, the null hypothesis states that the unit root, i.e., the series is not stationary, and the alternative hypothesis is that the unit root is absent, i.e., the series are stationary.

The Philips-Perron (PP) test, modeled to ensure that the residuals of the Dickey-Fuller test track the  $\epsilon_t$  white noise process, adds a correction factor instead of delaying the model dependent variable to account for autocorrelation between residuals. The model used in this test is as follows (Eren et al., 2016: 282);

$$Z_\alpha = T(\phi_1 - 1) - CF \quad (4)$$

The CF in the model expresses the correction factor. Thanks to this correction factor, it is aimed to eliminate the influence of the deviation caused by the fact that error terms do not have normal distribution. The results of ADF and PP unit root test are shown in Table 3 below.

$$Z_\alpha = T(\phi_1 - 1) - CF \quad (5)$$

**Table 3.** Results of the ADF and PP Unit Root Tests

Level	Variables	ADF		PP	
Constant	LX	-2.51(13)	-3.87(5)		
		[0.1138]	[0.0028]**		
	LM	-2.38(12)	-4.23(1)		
		[0.1489]	[0.0008]*		
	LINF	0.19(14)	0.67(32)		
		[0.9713]	[0.9912]		
Constant+Trend	LX	-3.73(13)	-6.13(6)		
		[0.0230]**	[0.0000]*		
	LM	-3.41(13)	-5.41(4)		
		[0.0533]**	[0.0001]*		
	LINF	-4.32(1)	-3.07(13)		
		[0.0038]**	[0.1171]		

Note: \*, \*\* and \*\*\* values shows relevance respectively on the level of %1, %5 and %10. Values in parenthesis shows the proper time lag length of kernel "Barlettkernel" method for PP, Akaike statistic information criterion for ADF and bandwidth "Newey West bandwidth" method. When the time lag length is zero, it shows Dickey-Fuller test. Values in square brackets show possibility values.

According to the results in Table 3, when ADF and PP test statistical values of fixed and trending models are compared in terms of absolute values, it was noted that the three variables were sometimes stationary in the PP, sometimes in the ADF test, and some of them were unitrooted. However, when the differences of the first three variables are taken, it is seen that fixed and trending models become stationary. Having all three variables stationary at I (1) means that there will be no problem for analysis of cointegration and causality.

Time series can be stationary around different deterministic trends at different times. These differences can be caused by structural breaks occurring in constant terms and / or slopes. These breaks may be caused by wars, natural disasters, peace, policy changes, terrorist attacks and economic crises. If unit root analyzes are made without considering these structural breaks, it can give erroneous results causing unstationary results for stationary series (Yıldırım et al., 2013:83). Lee and Strazicich (2003) developed a unit root test to investigate the existence of two structural breaks in the series. Model A investigates the existence of two structural breaks in the mean of the series and Model C investigates the existence of two structural breaks in the mean and the trend of the series. If the absolute value of the test statistic obtained is greater than the critical values, the structural break unit root hypothesis is rejected. If the test statistic is low, it is not rejected. Equations (3) and (4) include equations related to Model A and Model C, respectively.

Model A

$$\Delta y_t = K + \phi y_{t-1} + \beta t + \theta_1 DU1_t + \theta_1 DU2_t + \sum_{j=1}^k dj \Delta y_{t-j} + \varepsilon_t \quad (6)$$

Model C

$$\Delta y_t = K + \phi y_{t-1} + \beta t + \theta_1 DU1_t + \theta_2 DU2_t + \theta_2 DU2_t + \gamma DT_t + \sum_{j=1}^k dj \Delta y_{t-j} + \varepsilon_t \quad (7)$$

Here,  $\Delta$  represents first difference operator,  $\varepsilon_t$ ,  $\sigma^2$  is white noised with variance term and  $t = 1, \dots, T$  shows the time.  $\Delta y_{t-j}$  means that the error term is white noisy and is not consecutive dependent.  $DU_t$  is the dummy variable. The null hypothesis of Model A indicates that the series is not stationary with one break and the alternative hypothesis indicates that the series is stationary with only

one break. On the other hand, the null hypothesis of Model C indicates that there is no stationarity with a single break at the level of the series and the slope, while the alternative hypothesis indicates that the series is stationary with level and slope breaks.

**Table 4.** Results of the Lee-Strazicich Unit Root Test

Variables	Model A			Model C		
	Min. t stat.	Break 1	Break 2	Min. t stat	Break 1	Break 2
<b>LX</b>	-7.59(9)*	2008:08	2010:09	-7.59(9)*	2008:08	2010:09
<b>LM</b>	-5,09(10)*	2008:08	2011:03	-5.09 (10)	2008:08	2011:03
<b>LINF</b>	-6.00(6)*	2008:07	2015:12	-0.00(6)**	2008:07	2015:12
<b>Critical Values</b>	<b>Critical Values of Model A</b>			<b>Critical Values of Model C</b>		
	-4,545(%1)			-6,16 (%1)		
	-3,842(%5)			-5.59 (%5)		
	-3,504(%10)			-5.27 (%10)		

Note: Values in parenthesis show delay number selected by Akaike Information Criterion. \*, \*\* and \*\*\* values shows relevance respectively on the level of%1, %5 and %10. Critical values are taken from Lee-Strazicich (2003:1084) article.

When the Lee-Strazicich unit root test results that allow two structural breaks were examined, it was seen that only the import series was not stationary in Model C. However, since test statistic values of both the model A and the model C were greater than the critical value of 1% significance level, the series were stationary with structural breaks. In the import variant model C, the unit seems to be rooted, but the model A is stationary at 1% level. In addition, the inflation variant is stationary at 1% significance level in model A, while it stands at 5% significance level in model C.

In the periods 2008: 07-2008: 08 - 2010: 09-2011: 03 - 2015: 12 - significant changes and crisis took place in Turkey and the world socio-economic structure together with political conjuncture. Two major events took place between July 2008 and August 2008 and were discussed for a long time in Turkey's agenda. The first one was the closure case of ruling party AKP and the second one was the Ergenekon case which was seen as one of the political breaking points in the history of Republic of Turkey. These two major cases were followed by markets and foreign capital, causing significant breaks in macro-economic indicators. In August 2010, level of inflation fell in Eurozone and the economy was at its most reliable status. In addition, credit rating agencies' positive reports about Turkey's economy and record-breaking growth forecasts can be interpreted as signs of a positive break. As of March 2011 the per capita income in Turkey exceeded the threshold of 10 thousand dollars. On the world agenda there was the earthquake and tsunami seen as one of the five biggest disasters in Japan and in the last century. Finally, in December 2015, the main agenda of the foreign exchange market was the FED meetings and interest rate increase. Turkey, on the other hand, was busy with the terrorist attacks causing the death of Tahir Elçi, head of Diyarbakir Bar Association.

### 4.3. Engle-Granger Cointegration Test

Cointegration tests are used to determine whether two or more variables move together in the long run. The long-run relationship between variables has largely been tested using Johansen-Juselius (1992) and Engle-Granger (1987) techniques, after ensuring the same order of integration of the series (Barisik and Demirciođlu, 2006: 76). In this study the Engle-Granger cointegration test was used. It was followed by the Hatemi-J Cointegration test, which allows structural breaks, and comparative policy recommendations were made between the two tests.

The Engle-Granger test is based on residuals. As is known, in the first stage of the Engle-Granger test, a regression is established between two variables that are stationary in the first order (Yılancı, 2009: 208):

$$Y_t = \alpha_0 + \alpha_1 \alpha_1 + u_t \quad (8)$$

In the second stage of the analysis, the error was predicted by the Least Squares Method and an autoregressive model was obtained with the residuals obtained from this regression to determine the stationarity of the remains.

$$\Delta u_t = \Delta p + u_{t-1} + e_t \quad (9)$$

Here, if  $\rho = 0$ , the residuals contain unit root, so there is no cointegration relation between the two variables. Since the  $u_t$  series are not observable but are estimated values obtained from the regression equation, the critical values obtained by Engle-Granger (1987) with simulations are used instead of the ADF critical values to test the stationarity of the remains.

**Table 5.** Engle-Granger Co-Integration Test

	ADF Test Statistics	Engle-Granger Cointegration Test Critical Values		
		1%	5%	10%
<b>Model 1</b>	0.23	4.00	3.37	3.02
<b>Model 2</b>	0.03			

In the study, the relationship between foreign trade and inflation was analyzed through two models as mentioned above. In the first model, inflation and exports were analyzed, while in the second one inflation and imports were analyzed. As can be seen in both models, the test statistic obtained from the ADF stationarity test was smaller than the critical values obtained by simulations of Engle-Granger by 1% -5% - 10%. For this reason, it can be concluded that there was no long-term relationship between foreign trade and inflation, both linear and non-linear.

#### 4.4. Hatemi-J Cointegration Test

The Engle-Granger cointegration analysis was followed by the Hatemi-J Cointegration Test allowing structural break. Hatemi-J (2008) conducted the cointegration test developed by Gregory and Hansen (1996) for the presence of single structural break in the cointegration test, allowing two structural breaks. Hatemi-J expressed the effect of two structural breaks on both the peg and the slope, considering the equation number 9 below (Eren and Aydın, 2016:221);

$$y_t = \alpha_0 + \alpha_1 D_{1t} + \alpha_2 D_{2t} + \beta'_0 X_t + \beta'_1 D_{1t} X_t + \beta'_2 D_{2t} X_t + u_t \quad (10)$$

While  $\alpha_1$  represented the first structural change,  $\alpha_2$  represented the change in the constant term due to the second structural break,  $\alpha_0$  was the constant term before structural changes;  $\beta_0$  represented the slope parameter before the structural changes,  $\beta_1$  represented the effect created by the first structural change on the slope, and  $\beta_2$  represented the effect caused by the second structural change.  $y_t$  was the dependent variable, and  $x_t$  was the independent variable vector. In the model, if  $t > [n\tau_1]$ ,  $D_{1t} = 1$ , if not 0; were dummy variables defined as if  $t > [n\tau_2]$ ,  $D_{2t} = 1$  and 0 otherwise. The terms  $\tau_1$  and  $\tau_2$  refer to unknown indicators whose values range from 0 to 1 and which represented structural break times (Hatemi-J, 2008: 499). The ADF \*, Zt and Za test statistics are used to test the basic hypothesis that there is no cointegration relationship between variables in the Hatemi-J test (Yılancı and Öztürk: 2010: 267).

**Table 6.** Results of the Hatemi-J Co-integration Test (LX – LINF)

ADF*		Zt		Za	
Test Statistic	Breaking Period	Test Statistic	Breaking Period	Test Statistic	Breaking Period
-11.30 (0)*	2008:10 2009:11	-11.48*	2008:10 2009:09	-143.28*	2008:10 2009:09
Critical Values		Critical Values		Critical Values	
%1	%5	%1	%5	%1	%5
-6.503	-6.015	-6.503	-6.015	-90.794	-76.003

Note: Critical values are taken from Table of Hatemi-J (2008). The value in parentheses indicates the delay length. The delay length of model is calculated to be 13 according to the Schwert (1989) formula.

According to Hatemi-J structural break cointegration test results, as shown in Table 6, the ADF test statistic was greater than Hatemi-J (2008) critical values at the 1% significance level. For this reason, it was concluded that the hypothesis that there was no long-run cointegration between export data (LX) and inflation (LINF) were rejected, ie the variables included in the analysis were cointegrated with two structural breaks.

The day the break occurred was October 2008 when Turkey experienced terrorist attacks. In the attack on the Aktütün police station in Hakkari's Şemdinli district 17, in the attack on the police station in Diyarbakır, 5 security officers lost their lives. In addition, specified date was one of the most critical phases of the history of law in Turkey due to the Ergenekon case. The detentions of journalists, soldiers, politicians and academicians within the scope of the case in October have been a major agenda item.

November 2009 was another historic time that a break took place. There were three major events in that period, one of them being the "democratic solution" process. Another important event in the world and Turkey was swine flu. The vaccine against swine flu has been discussed for a long time. Finally, it corresponds to a period where Turkey made important decisions regarding the Ergenekon case, one the most important cases in the history of law.

**Table 7.** Results of the Hatemi-J Co-integration Test (LM – LINF)

ADF*		Zt		Za	
Test Statistic	Breaking Period	Test Statistic	Breaking Period	Test Statistic	Breaking Period
-5.18 (13)	2006:11 2008:10	-9.63*	2008:09 2009:01	-116.61*	2008:09 2009:01
Critical Values		Critical Values		Critical Values	
%1	%5	%1	%5	%1	%5
-6.503	-6.015	-6.503	-6.015	-90.794	-76.003

Note: Critical values are taken from Table of Hatemi-J (2008). The value in parentheses indicates the delay length. The delay length of model is calculated to be 13 according to the Schwert (1989) formula.

According to Hatemi-J structural break cointegration test results between import (LM) and inflation (LINF) variables; as seen in Table 7, the ADF test statistic appears to be smaller than the Hatemi-J (2008) critical value at the 1% significance level. This leads to the conclusion that the hypothesis that there is no long-run cointegration between import data (LM) and inflation (LINF) must be accepted, ie the variables involved in the analysis are not cointegrated to the two structural breaks.

#### 4.5. Toda-Yamamoto Causality Test

In econometric causality analyzes, the values of the set time series data in the following years are obtained by being influenced by the past values of the annual data of its own or another variable. The study investigated the relationship between inflation rates and foreign trade and Toda-Yamamoto (1995) test, which was frequently used in the new generation econometric analysis, tried to determine the causality relationship.

In the Granger causality analysis, has the condition that the variables in question should be cointegrated making the analysis dependent. In the causality test by delayed VAR method developed by Toda and Yamamoto, the cointegration relation between the series is not important and it is sufficient to know the model correctly and the maximum degree of integration of the variables in the model (Kızılgöl and Baykal, 2008: 356). According to Toda and Yamamoto (1995), although the series are not stationary, the VAR model in which the level values of the series are included can be estimated and the standard Wald test can be applied. In this method, for the Granger causality test, the VAR model is estimated from  $[k + (dmax)]$  and the Wald test is applied to the first  $k$  of the coefficient matrix. Toda and Yamamoto (1995) have shown that this test has a  $k$ -degree of freedom and an asymptotic  $2\chi$  distribution, regardless of whether the corresponding series is stationary cointegrated or stationary around the trend. Here;  $k$  is the approximate delay length of the estimated VAR model, and  $dmax$  is the maximum degree of integration of the variables in the model. Thus, the first step of the method is the determination of the degree of integration of the variables in the system, and the second step is the estimation of the system. Accordingly, the success of the method depends on the correct determination of the system's delay length ( $k$ ) and the integration degree of the series ( $dmax$ ). An important feature of this method, proposed by Toda and Yamamoto, is that there is no need for potentially prone pre-tests used to determine unit root and cointegration properties. Thus, the risk associated with misuse of the degree of integration of the series by using the relevant method is minimized (Yavuz, 2006: 169).

The causality relationship between inflation rates which is an independent variable and import and export - dependent variables- were examined by the Toda-Yamamoto test. In the Toda-Yamamoto test, the degree of integration needs to be calculated before starting the analysis. In the ADF and PP unit root tests all variables were found to be stationary at I (1) level. Therefore,  $dmax=1$ .

**Table 8.** LINF-LX Proper Delay Length Based on the VAR Model Information Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	6.426.091	NA	0.001478	-0.841364	-0.800861	-0.824907
1	6.327.823	1.113.995	7.19E-07	-8.470.031	-8.348.522	-8.420.662
2	6.433.188	2.036.118	6.58E-07	-8.558.363	-8.355848*	-8.476.082
3	6.506.847	1.403.487	6.29E-07	-8.603.847	-8.320.327	-8.488.653
4	6.605.371	1.850.668	5.81E-07	-8.682.934	-8.318.408	-8.534.828
5	6.694.537	1.650.776	5.44E-07	-8.749.375	-8.303.843	-8.568356*
6	6.720.867	4.803.443	5.54E-07	-8.730.902	-8.204.365	-8.516.971
7	6.761.971	7.387.523	5.54E-07	-8.732.393	-8.124.850	-8.485.550
8	6.831.662	12.33729*	5.32E-07*	-8.772517*	-8.083.968	-8.492.761

The log length for the degree of freedom ( $k$ ) was 2 according to the SC information criterion, 8 according to the AIC information criterion, and 5 according to the HQ information criterion. However, since the tests were carried out based on the Schwarz information criterion in the stationarity analysis, the number of delays in the causality test between inflation and exports will be 2. For this reason, there was causality in the framework of VAR model with  $k + dmax = (2 + 1) = 3$ .

**Table 9.** LINF-LM Proper Delay Length Based on the VAR Model Information Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	2.858.590	NA	0.002393	-0.359269	-0.318766	-0.342813
1	6.109.903	1.141.198	9.65E-07	-8.175.545	-8.054.036	-8.126.176
2	6.208.782	1.910.770	8.91E-07	-8.255.111	-8.052.596	-8.172.830
3	6.295.964	1.661.168	8.36E-07	-8.318.870	-8.035.350	-8.203.677
4	6.441.356	2.731.023	7.25E-07	-8.461.292	-8.096767*	-8.313.186
5	6.522.493	1.502.128	6.86E-07	-8.516.883	-8.071.351	-8.335.864
6	6.580.441	1.057.157	6.70E-07	-8.541.137	-8.014.599	-8.327.206
7	6.597.908	3.139.319	6.91E-07	-8.510.686	-7.903.143	-8.263.843
8	6.719.775	21.57373*	6.19e-07*	-8.621317*	-7.932.769	-8.341562*

In the second model, the causality relation between inflation rates and imports was tested. The lag length for the degree of freedom was 4 according to the SC information criterion and 8 according to the AIC and HQ information criterion. However, since the tests are carried out based on the Schwarz information criterion in the stationarity analysis of the study, the number of delays in the causality test between inflation and import will be 4. For this reason, causality was in the framework of VAR model with  $k + d_{max} = (4 + 1) = 5$

**Table 10.** Results of Toda-Yamamoto Causality Analysis

Basic Hypotheses	Lag Length $k=1, d_{max}=1$	F-Statistic	P-Value	Results
LX $\neq$ LINF	3	79.817	0.0464	There is one way Toda and Yamamoto causality relationship at a significance level of 5% from export to inflation.
LINF $\neq$ LX	3	69.952	0.072	There is a one-way Toda and Yamamoto causality relationship at a significance level of 10% from inflation to export.
LM $\neq$ LINF	5	108.394	0.0044	There is one way Toda and Yamamoto causality relation at significance level of 5% from import to inflation.
LINF $\neq$ LM	5	36.530	0.161	There was no Toda and Yamamoto one-way causality relationship from inflation to imports.

Table 10 shows that in the first model the degree of integration between exports and inflation was 3, and that there was a two-way causality relationship between exports and inflation. In the second model (import-inflation), the degree of integration was 5, and in terms of the degree of significance there was only one-way causality relation from imports to inflation; that is, that there was no causality relation from inflation to imports.

## 5. CONCLUSIONS

One of the biggest problems standing in the way of EU membership of Turkey is the prerequisite of economic conditions. And among these conditions the biggest problem is inflation. Inflation, which represents the continuous increase in the general level of prices, essentially requires price stationarity. Inflation leads to unfairness in income distributions in the country in which it exists, but also indirectly affects many macroeconomic variables such as productivity, growth and foreign trade.

In the study, the relationship between inflation and foreign trade was analyzed through two models. Import and export data covering 2005: 01 to 2017: 12-month period between Turkey and EU-

28 countries were used. The results showed that the series were stationary at I (1) level and thus would not be a problem for cointegration and causality analysis. For the analysis of the long-run relationship between the two variables the Engle-Granger and Hatemi-J tests that allowed two structural breaks were used. In the Engle-Granger test, no long-term relationship was found between the variables in neither of the models. However, in the Hatemi-J test, which is a new generation test and allows structural breaks, it was concluded that there was a long term cointegration relation between exports and inflation in 2008: 10 and 2009: 11 periods. However, there was no long-term cointegration relationship between imports and inflation. In the results of the Toda-Yamamoto causality analysis, there was a two-way causality relationship between exports and inflation. It was also concluded that there was one-way causality relation to inflation from imports.

While the results of our study are in line with the studies of Thomas (2012), Afshan ve Batul (2014), Sekmen (2007), Tařçı vd. (2009), Güneř ve Konur (2013), Kızılgöl ve İpek (2015), Göçer and Gerece (2016) and Lane (1997), is contradicts the the results of Ball (2006), Martinez and Iyer (2014), Bayraktutan and Arslan (2003), and Ülke and Ergun (2011).

Two major macroeconomic indicators of Turkey such as inflation and foreign trade shows that the need to develop new policies for improvement. In addition, bilateral relations should be developed to be successful in the full membership negotiations of EU and to have the members of EU as Turkey's biggest partners in foreign trade. Moreover, the existence of a cointegration relationship between exports and inflation can be interpreted as the effect of prices on exports. However, the lack of a cointegration between imports and inflation indicates that inflation is ineffective on imports. Here it is seen that Turkey's demand of the imported goods does not depend on prices. That is, it shows that Turkey's imported goods have become a kind of dependent.

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