THE EFFECTS OF EXCHANGE RATE DYNAMICS

ON TRADE BALANCE IN TURKISH ECONOMY

Master's Thesis

Zübeyir Can KANSEL

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MASTER'S THESIS

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Graduate School of Social Sciences

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ÖZET

TÜRKİYE EKONOMİSİNDE DÖVİZ KURU DİNAMİKLERİNİN TİCARET DENGESİ ÜZERİNDEKİ ETKİLERİ

Zübeyir Can KANSEL

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Bu çalışma, Türkiye ekonomisinde dalgalı döviz kuruna geçiş sonrası döviz kurundaki değişimlerin ve dalgalanmaların dış ticaret dengesi üzerindeki etkilerini araştırmaktadır. Bu amaçla dört ayrı model geliştirilmiştir. Bu modeller 2003-2018 arası dönem için çeyreklik ve aylık veriler kullanılarak ARDL yöntemi ile tahmin edilmektedir. Araştırmanın temel çıkış noktası Türkiye ekonomisinde J-Eğrisi teorisinin geçerliliğini incelemektir. Çalışmada kullanılan temel modelin analiz sonuçlarına göre Türkiye ekonomisinde ilgili dönemde dış ticaret dengesinde J-Eğrisi etkisi ortaya çıkmamaktadır. Buna göre döviz kurundaki değişimlerin dış ticaret dengesi üzerindeki etkisi sınırlıdır. Bunun temel nedeni ise Türkiye ekonomisinde yurtiçine ve yurtdışına yönelik üretimde yüksek oranda ithal ara malı ve girdi kullanılmasıdır. Bu durumu analiz etmek için tahmin edilen ikinci modelin sonuçları da bunu doğrulamaktadır.

Çalışmada ayrıca döviz kurundaki dalgalanmaların dış ticaret dengesi üzerindeki etkileri de araştırılmaktadır. Bu amaçla tahmin edilen model sonuçları döviz kurundaki dalgalanmanın kısa vadede pozitif, uzun vadede ise negatif etkiye sahip olduğunu göstermektedir. Ayrıca üretimdeki değişmelerin dış ticaret dengesi üzerinde negatif etkisi bulunmuştur.

Modeller yardımıyla elde edilen sonuçlar Türkiye ekonomisinin üretim ile ilgili temel yapısal sorununun ithal ara malı ve girdi kullanımı olduğunu göstermektedir. Bu nedenle dış ticaret dengesi üzerinde döviz kurunun etkisi teorik beklentilerden farklı gerçekleşmektedir. Çalışmanın ulaştığı temel politika sonucu üretimde yerli ara malı ve girdi kullanımının artırılarak dış ticaret dengesinin iyileştirileceği yönündedir.

Anahtar Sözcükler: Dış Ticaret Dengesi, J-Eğrisi, Reel Efektif Döviz Kuru, ARDL modeli

ABSTRACT

THE EFFECTS OF EXCHANGE RATE DYNAMICS ON TRADE BALANCE IN TURKISH ECONOMY

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Supervisor: Asst. Prof. Dr. Bilgin BARİ

This study researches the effects of changes and volatility in the exchange rate on the trade balance after the transition to the floating exchange rate in the Turkish economy. For this purpose, four different models have been developed. These models are estimated by the ARDL method by using quarterly and monthly data from 2003 through 2018. The starting point of the research is to examine the validity of the J-Curve theory in the Turkish economy. According to the results of the analysis of the main model used in the study, there is no J-Curve effect on the trade balance in the related period. The results state that the effect of changes in exchange rates on the foreign trade balance is limited. The main reason for that is the high usage of imported intermediate goods and inputs in production. The results of the second model estimated confirm this situation.

The study also investigates the effects of exchange rate fluctuations on the trade balance. For this purpose, estimated model results show that the exchange rate fluctuation has a positive effect in the short term and a negative effect in the long term. Moreover, the changes in production harm the trade balance.

The results of analysis show that the fundamental structural problem of Turkey's economy is the usage of imported intermediate goods and inputs. Therefore, the effect of the exchange rate on trade balance differs from theoretical expectations. The main policy result of the study is that foreign trade balance might be improved by increasing the usage of domestic intermediate goods and inputs in production.

Keywords: Trade Balance, J-Curve, Real Effective Exchange Rate, ARDL model

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26.08.2019

STATEMENT OF COMPLIANCE WITH ETHICAL PRINCIPLES AND RULES

I hereby truthfully declare that this thesis is an original work prepared by me; that I have behaved in accordance with the scientific ethical principles and rules throughout the stages of preparation, data collection, analysis and presentation of my work; that I have cited the sources of all the data and information that could be obtained within the scope of this study, and included these sources in the references section; and that this study has been scanned for plagiarism with "scientific plagiarism detection program" used by Anadolu University, and that "it does not have any plagiarism" whatsoever. I also declare that, if a case contrary to my declaration is detected in my work at any time, I hereby express my consent to all the ethical and legal consequences that are involved.

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LIST OF SYMBOLS AND ABBREVIATIONS

α : Coefficient of equation

β : Coefficient of equation and cointegration vectors

Δ : Difference of the relevant variable

δ : Coefficient of equation and constant term

ε : Error term

η : Coefficient of equation and error term

γ : Coefficient of equation

λ : Estimated value of the characteristic unit roots

μ : Coefficient of equation

φ : Coefficient of equation

σ : Coefficient of equation

θ : Coefficient of equation

U : Error term

ADF : Augmented Dickey Fuller

AIC : Akaike Information Criterion

ARDL : Autoregressive Distributed Lag

CPI : Consumer Price Index

CUSUM : Cumulative Sum

CUSUMSQ : Cumulative Sum Squared

DUM : Dummy Variable

ECM : Error Correction Model

EXP : Export

GARCH : Generalised Autoregressive Conditional Heteroscedasticity

GBTT : Gross Barter Terms of Trade

GDP : Gross Domestic Product

HQ : Hannan-Quin Information Criterion

IMF : International Monetary Fund

IMP : Import

ITT : Income Terms of Trade

MPI : Manufacturing Production Index

NBTT : Net Barter Terms of Trade

PP : Phillips-Perron

REER/RER : Real Effective Exchange Rate

SC : Schwarz Information Criterion

SFTT : Single Factoral Terms of Trade

TB : Trade Balance

TL : Turkish Lira

VECM : Vector Error Correction Model

VOL : Real Effective Exchange Rate Volatility

1. INTRODUCTION

The diversity of needs has led people and countries to establish exchange relationships with each other. Countries trade among each other for various reasons. Foreign trade is divided into two parts: Import and export. Communities market what they produce and import what they don’t have advantage on producing. The concepts of export and import, are two important determinants of a national economy. The main factor in the realization of imports and exports are the exchange rates. In other words, it shows the price of the currency of one country in terms of the other countries’ currency, where the trade is performed accordingly. In addition, the exchange rate also affects overall macroeconomic stability in an economy.

We discuss the stability in the Turkish economy. In Turkish economy, fixed exchange rate regime was applied until 1980. The Turkish Lira was devaluated periodically to eliminate the negative effects of foreign trade deficits on foreign exchange reserves. The flexible exchange rate regime was implemented due to export growth targets in Turkey among 1981 to 1988. Therefore, TL depreciated and the exchange rate appreciated. Besides, the creeping anchor on the current account deficit and inflation, the external conjuncture and fiscal policies also had an impact between the years 1989 to 2000. After the November 2000 and February 2001 crises, the most appropriate exchange rate regime for the Turkish economy has become the most urgent plan. As a result, the Letter of Intent-LOI was signed with the International Monetary Fund (IMF). As it was the most important issue in the letter; a floating exchange rate regime was adopted instead of a fixed exchange rate regime.

The foreign trade balance affects by certain macroeconomic and financial factors. Many types of research and studies have been carried out to investigate the determinants of the balance of foreign trade and to examine the factors affecting it. In this study, the real effective exchange rate, the home country's gross domestic product, the gross domestic product of the major trade partners of the home country and some other important macroeconomic and financial factors are considered among the main determinants of the trade balance.

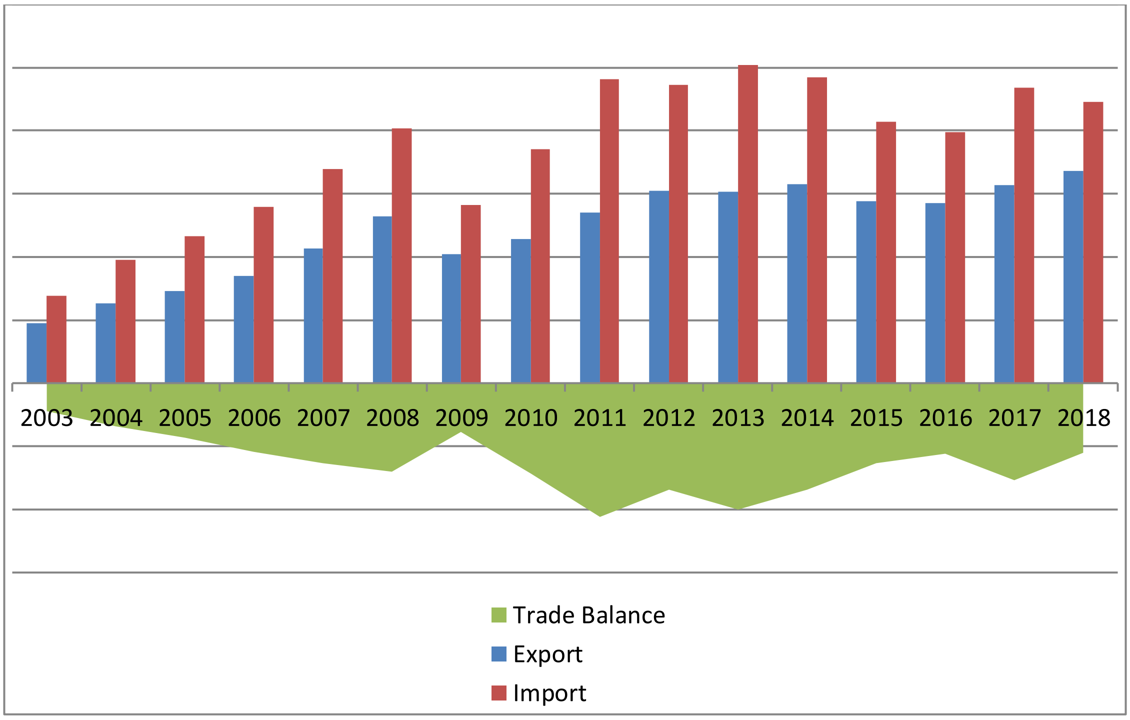

Figure 1.1: *Trade balance of Turkey, 2003-2018*

Source: *IMF database, 2019*

In the figure (1.1), we can easily understand Turkey's foreign trade balance from 2003 to 2018; the foreign trade deficit decreases when exchange rates rise and the exchange rates decrease when the foreign trade deficit increases. This condition is also seen in crisis times. When the exchange rates are evaluated, the export goods of the country become more attractive to foreigners because they import the goods cheaper. During this period, the country's imports also decrease because the prices of imported goods increase. In other words, the foreign trade deficit of a country decreases with the decrease in imports and the increase in exports. It is just the other way around when the country's domestic currency gains value.

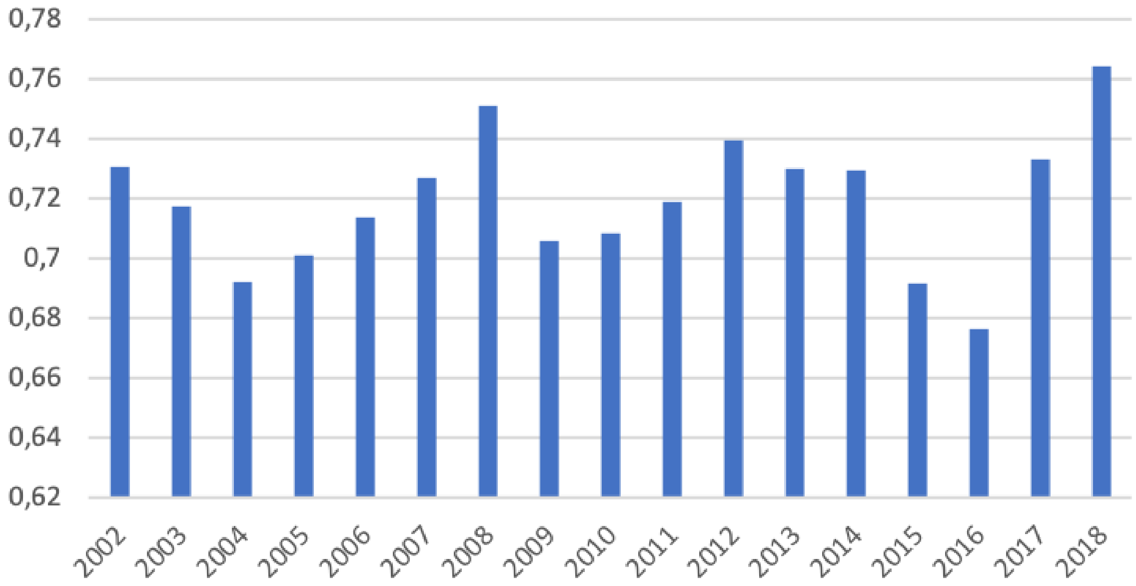

Figure 1.2: *Ratio of Imported Intermadiate Goods to Total Import 2002-2018*

Source: *Central Bank of the Republic of Turkey, 2019*

Another matter that affects the trade balance is the share of intermediate goods in total imports for the Turkish economy. It is showed in figure (1.2). The high proportion of imported goods in a country's exports indicates that the Turkish economy lacks intermediate goods, investment goods and technology, and human capital. Therefore, Turkey increases its exports by importing intermediate goods, raw materials and human capital. Imports are increased during periods of economic growth. So, import and export transactions may be interrelated. This study also examines how trade balance reacts to this situation.

1.1. Research Question and Purpose

Foreign trade deficits have great importance because they emerge as a result of change in exchange rates. Trade balance problems affect multiple macroeconomic variables within the economic system. Especially for developing countries, it is very important to keep the foreign trade balance under control because the balance in trade reflects not only the countries’ trade among each other, but also it is an indicator that reflects the reputation of the countries’ financial terms.

Emerging economies should reduce their trade deficits in order to have a balanced and sustainable economic growth. This study examines the exchange rate and foreign trade in Turkey. We investigate the effects of exchange rate changes on the trade balance. That is, it considers how imports and exports are affected by the exchange rate in a given period.

When the Turkish economy switched to a floating exchange rate system, exchange rates affected the trade balance. Thus, we studied the impact on Turkish economy case. At the same time, we investigate the J-Curve effect and effect of volatility of exchange rates on the foreign trade balance.

This study estimates four different models. In the first model, we have examined the factors affecting to Turkey's trade balance and the J-Curve phenomenon. The second model studies which factors are affect imports of Turkey. In these models quarterly data are used for the period of 2003 to 2018. In the third model, research shows how the volatility in real effective exchange rate affects the trade balance. The last model examines which factors affect imports. In the last two models, monthly data is employed. All models are estimated by Autoregressive Distributed Lag Model (ARDL). In addıtion, volatility is estimated by utilizing the Generalised Autoregressive Conditional Heteroscedasticity (GARCH) in the third model.

1.2. Contribution of the Study

Several studies investigate the effect of exchange rates on the trade balance both in the world and the Turkish economy. This study differs from others because we calculate the foreign GDP as a weighted index comprising the major trading partners with a trading volume of Turkish economy.

2. THEORITICAL BACKGROUND

A comprehensive survey of a theory is the first step to understand our analysis. Besides, this chapter will review the fundamental theories that affect the trade balance.

2.1.Trade Balance

In general, the trade balance is defined as the difference between the exported goods and imported goods of a country in a certain time period. The trade balance measures the flow of exports and imports in a particular time.

In a given country, if the export is greater than import, the country has a trade surplus or positive trade balance. On the other hand, if the import is greater than export, it means that the country has a trade deficit or a negative trade balance.

The main factor which affects the trade balance is the exchange rate. The country's import and export volumes change with the changes in exchange rate. It shows how the trade balance is affected by the exchange rate when the country is in a state of devaluation. There are many studies about how to trade balance is affected by this situation in the literature. According to many economists, devaluation has different effects on a country's trade balance in the long-run and short-run.

2.1.1. The nominal effective exchange rate

The nominal exchange rate is the price of a currency in other currency. While the nominal exchange rate expresses the relative ratio of the two country's currencies, the nominal effective exchange rate index is used to determine the relative ratio of a country's currency against the currencies of its trade partners.

The nominal effective exchange rate (NEER) shows the effect of the currencies of countries that have a significant share in a country’s foreign trade and it makes up a currency basket consisting of the domestic currency weighted average value. Weights in a currency basket are determined by using bilateral trading.

$$NEER_t = \prod_{i=1}^{N} S(i)_t^{w^{(i)}}$$

(2.1)

Where NEER is the nominal effective exchange rate of on economy under the study, which is in turn the geometrically weighted average of $S(i)_t$, the nominal bilateral exchange rate between the country and its trading partner *i*, $w^{(i)}$is the trading partner (*i*)'s weight, and N is the trading partners number considered (Darvas, 2012).

2.1.2. The real effective exchange rate

The real exchange rate is taken into account rather than the nominal exchange rate as it is free of inflation. The real exchange rate is a factor affecting the consumption and resource allocation among the goods subject to trade (Dornbusch and Kuenzler, 1993).

$$E = e\frac{P^f}{P^d}$$

(2.2)

The real exchange rate is obtained by correcting the nominal exchange rate with the relative price level of the two countries as expressed above. In equation (2.2), E denotes the real exchange rate; the nominal exchange rate (e) is multiplied ratio of foreign price level (P^f) to domestic price level (P^d).

The real effective exchange rate (REER) is obtained by eliminating the relative price effects in the nominal effective exchange rate.

$$REER_t = \frac{NEER_t\,.CPI_t^d}{CPI_t^f}$$

(2.3)

where the REER is the real effective exchange rate, the NEER is the nominal effective exchange rate. CPI_t^d is the consumer price index of the home country. $CPI_t^f = \prod_{i=1}^{N} CPI(i)_t^{w^{(i)}}$ is the geometrically weighted average of CPI indices of trading partners. $CPI(i)$ is the trading partner i's consumer price index. $w^{(i)}$ is the weight of trading partner *i*, and the number of trading partners considered is called N (Darvas, 2012).

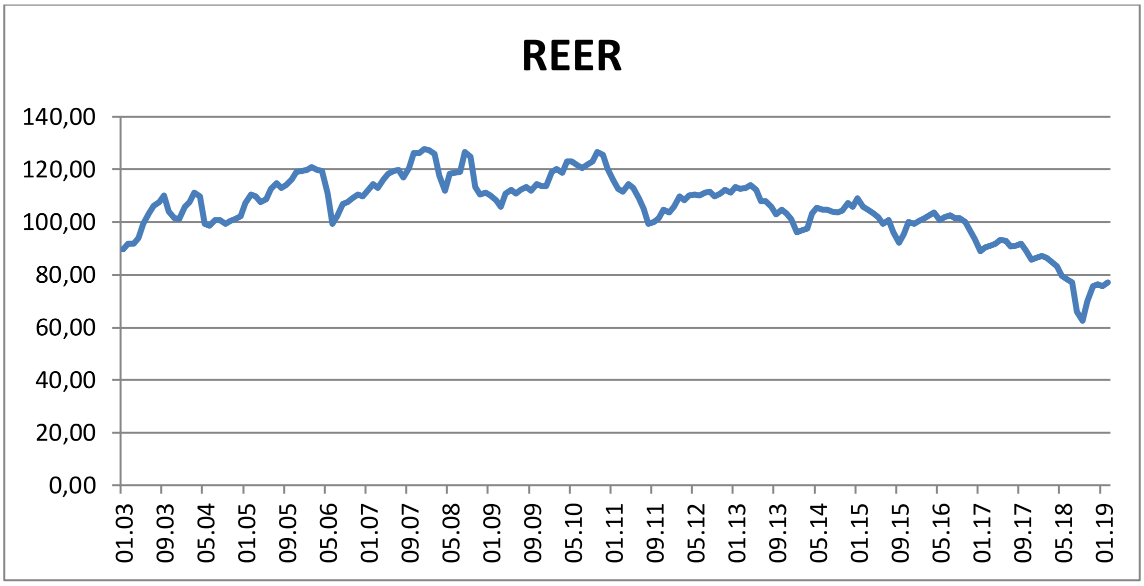

Figure 2.1: *Turkey's real effective exchange rate, 2003 M1-2019 M2*

Source: *Central Bank of the Republic of Turkey, 2019*

Figure (2.1) shows us the real effective exchange rate based on TL. The increase in the real effective exchange rate shows that the TL appreciated compared to the currencies of the major trading partners. Excessive appreciation of TL affects trade balance negatively. It's meaning that Turkey's exports are expensive in foreign markets. Another reason for the negative impact of the trade balance is that imports increase because import goods are cheaper to domestic consumers. Decreasing the value of the real effective exchange rate constitutes the opposite of increasing the value of the real effective exchange rate.

2.2. Terms of Trade

The economy is one of the main areas influenced by globalization. The global economy is mainly affected by trade. With the development of foreign trade, countries are more connected to each other. In other words, the development of a country is related to its share in international trade. One of the macroeconomic values of a country's international competitiveness is its terms of trade. The development of the terms of trade will positively affect the international competitiveness of the country.

The term of trade is used as a measure in determining the income of the countries from foreign trade in international economic relations.

The term of trade is a tool that shows comparative price changes. Let's say that a country produces a single commodity and sells it to the world in dollars (P^d) domestic (local) currency. Suppose the rest of the world produce another commodity and sell it in dollars. Then, we call it (P^f) foreign currency. When a home country exports its production, it will earn (P^d) per unit. In imports, each unit will pay (P^f) for import goods. The P^d/P^f occurred and, it is known as terms of trade ratio (Barro, 2008).

2.2.1. Net barter terms of trade (NBTT)

In international economics literature, the most common form of terms of trade is the net barter terms of trade. Net barter terms of trade index is calculated as the ratio of the export unit value indexes to the import unit value indexes. The term of trade is the ratio of the export price index to the import price index and this is known as the net barter terms of trade. The point to pay attention here is that, in calculating the price index, the goods that will enter the index should cover a large part of the export and import. This ratio is multiplied by the hundred to express as a percentage.

$$NBTT = \frac{P_x}{P_m}$$

(2.4)

In the above formula (2.4), N is the net barter terms of trade (NBTT), P_x is export prices index, and P_m is import prices index.

If the increase in import prices is less than export prices or if the export prices are stable and import prices increase, it means that trade conditions have turned against the country. In fact, adversely affecting the exchange rate of the country worsens the terms of trade. This means that in order to get the same level of imports, a country needs to export more than the current export. On the other hand, the increase in the terms of trade of the country means that the development of foreign trade to the detriment of the country increases the welfare of the country. It should be noted that foreign trade in a country contributes to the increase in the level of welfare (Freeman, 1971).

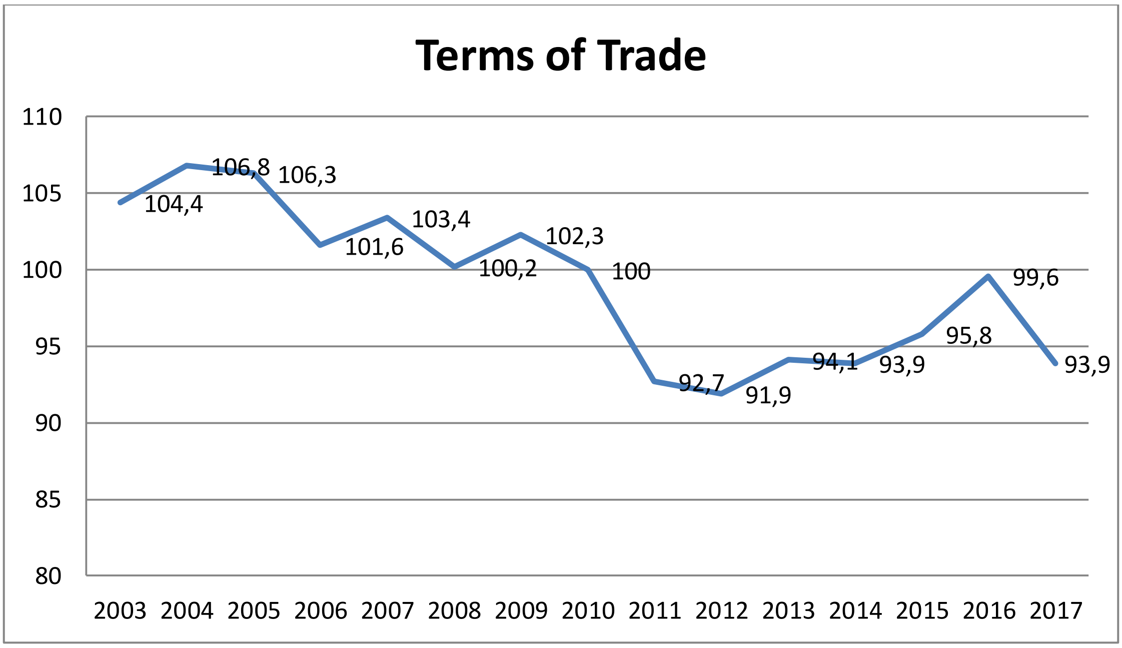

Figure 2.2: *Turkey's terms of trade, 2003-2017*

Source: *OECD database, 2019*

2.2.2. Gross barter terms of trade (GBTT)

The gross exchange between the physical exports of the country and its physical imports refers to the gross barter terms of trade. In other words, while the net barter term of trade is evaluated only financially, the gross barter terms of trade also address the import and export volume index.

$$GBTT = \frac{Q_m}{Q_x} \tag{2.5}$$

In the equation (2.5), the GBTT implies that the gross barter terms of trade. Q_m is the import quantity index and Q_x is the export quantity index. The ratio in the gross barter terms of trade shows how much imports are made in return for one unit of export. An increase in the gross barter terms of trade indicates that more imports are made in return for a certain volume of exports when we compare to the previous year or base year. Therefore, the growth rate is favorable and shrinkage is a negative development.

Any change in the volume of imports may be due not only to the importation of goods but also changing in the capital inflows which is entering and leaving the country (Findlay, 1989).

2.2.3. Income terms of trade

It can be shown that the income terms of trade also take into account the volume of foreign trade as the reason of the fact that the income terms for trade are different from the net barter terms of trade. The income terms of trade (ITT) is obtained by multiplying net barter terms of trade and export volume index (Q_x).

$$ITT = \frac{P_x}{P_m} \times Q_x$$

(2.6)

In the equation (2.6), ITT is the income terms of trade, P_x is export prices index, and P_m is import prices index.

Income terms of trade indicate the country's export-based import capacity. There is an inverse relationship between the net barter terms of trade and the income terms of trade. In other words, a situation that is against the net barter terms of trade and its favor for income terms of trade. When we consider economic development, income terms may be more efficient than net barter terms of trade (Karluk, 2013).

2.2.4. Single factoral terms of trade

Single factor terms of trade (SFTT) are obtained by multiplying the net barter terms of trade by the productivity index in the export sector. The reason for this tool is that net barter terms of trade do not reflect the increase in productivity in the export sector.

$$SFTT = \frac{P_x}{P_m} \times V_X$$

(2.7)

In the equation (2.7), *SFTT* is the single factoral terms of trade (SFTT), P_x Is export prices index, P_m is import prices index, and V_x is productivity index of export sector.

It is very difficult to calculate productivity improvement in practice. A single factorial term of trade is a good tool for demonstrating the earnings arising from foreign trade. An increase in the net barter terms of trade can be overcome by the increase in productivity in the export sector.

With the changing supply and demand over time, the country's offer curves will also change. An improvement in terms of trade means that the nation obtains more from the exports than it pays for its imports (Barro, 2008).

The terms of trade are influenced by different factors in the short and long term. According to Meier, trade policy, changes in foreign currency, unilateral transfer payments and conjectural fluctuations determine the terms of trade in the short-run. In the long run, changes in the production and consumption structure of the economy play a role in the development. The terms of trade depends on the quantity and income elasticity of import demand on the one hand, and on the quantity and income elasticity of external demand on the other hand. Improvement in terms of trade means rising export prices. This accelerates the foreign capital flow towards the country. If a negative development is observed in terms of foreign trade, this situation leads to a decrease in the purchasing power of the country from foreign economies by requiring the prices of export goods to decrease.

2.2.5. Singer-Prebisch Hypothesis

The idea that Hans Singer and Raul Prebisch argued for the first time and their terms of trade developed in the long run against primary products usually such as raw materials and agricultural products are called the “Singer - Prebisch Hypothesis”.

The basis of the Singer-Prebisch hypothesis is that the terms of trade are in favor of the industrialized countries against the developing countries. It exports agricultural products in the long term. It refers to the transfer of a part of the national product to industrialized countries from developing countries.

Singer and Prebisch's view is mentioned that "In the period from the second half of the nineteenth century from the Second World War, there has been a downward trend in the price of a primitive substance compared to the prices of industrial products. On average, the export of a certain primitive substance can only buy 60 percent at the end of this period of the beginning of the term" (Nafziger, 2006).

In the Singer and Prebisch Hypothesis, a number of factors related to supply, demand effects and structural elasticity of economies are emphasized as a reason for the trade terms to turn against the underdeveloped countries. Demand and supply-related factors are examined as factors affecting external demand and domestic supply.

Supply factors are;

The factors are related to supply are mainly technological advances in the industrial sector. Therefore, technological advances have higher efficiency than primary production. The productivity growth is achieved in the industrial sector in developed countries. However the distribution of productivity increases in developing countries from primary production.

According to economists such as Prebisch, Singer and Myrdal, the terms of trade in developing countries tend to deteriorate over time. This causes productivity increases in the developed countries. Also it reverts to higher income or wages for the country workers, while productivity increases in developing countries which are reflected in lower product prices. In developing countries, the productivity increases in the country which is an exporter of the product. It reduces the prices and, increases the real income of the other country that imports of the product (Salvatore, 2012).

Secondly, trade unions and other monopoly organizations in developed countries and it transforms yield increases to wage increases and profits. It should also prevent the prices from falling.

Demand factors are;

One of the factors related to demand is that the income elasticity of demand in food products is smaller than that of industrial products. The income of individuals increases according to the Engel Law. The share of expenditures on food products in aggregate expenditures will decrease, while the share of expenditures on industrial products increases. In this case, as the income increases in developing countries, the demand for imported goods will increase at a faster rate than the demand for export goods. In developed countries, as the income increases, the rate of increase in demand for food products which is the export product of developing countries will slow down.

One of the factors related to demand is to increase the use of synthetic products instead of raw materials by saving the raw materials of technical advances. There is an effect on the way of decreasing exports of developing countries. It causes the terms of trade to develop against developing countries.

Foodstuffs have an important share in exports of developing countries. According to Engel's law, as income increases, the expenditure on food items decreases and the expenditures on industrial goods increase. Thus, the result of the increase in income in the developing countries, imports have increased faster than the demand for export goods. Also, the terms of trade show that improvement against the developing countries. The transformation of artificial raw materials and wastes produced with the development of technology. In addition, it reduces the demand for raw materials and causes prices to fall. This situation limits the export potential of developing countries to a great extent.

Factors related to structural elasticity of economies;

The supply elasticity of agricultural products and raw materials is lower than that of industrial products. The total amount of supply in the primary production sectors is largely dependent on natural conditions. However, as the supply of industrial products is reduced and increased according to market conditions, the supply of these products is more elastic than that of agricultural products (Karluk, 2013).

2.3. Balance of Payments

The general outline of the balance of payments established many years ago and were developed by many economists over time; The balance of payments should be maintained in a healthy manner as a country's economic relations with other countries are recorded and accounted for by a system and they direct their economies through the results of this system.

Accounts of the balance of payments always summarize the country's trade with the outside of the world so, it records all transactions that cross the country's borders. The basic approach is as an account of all payments which are coming into the home country from foreigners and going out from the home to foreigners. On the other hand, the balance of payments is generally a systematic accounting of payments between natives of a country and foreigners within a year. The balance of payments' explanation is a statistical account that systematically abstract that the economic transactions of an economy with the rest of the world for a specific period (International Monetary Fund, 1993).

The balance of payments shows the status of the country's external economic and financial relations within a certain period. The balance or imbalance of a country's foreign payments shows the improvement or deterioration in the international solvency of that country. So, this shows the country's economic reputation. The basic economic variables related to the balance of payments are national income and population level, development rate, exchange rates, inflation rate, income distribution, employment and external debts.

According to the traditional theory, there is a close relationship between the value of a country's currency and its trade flows. Currencies of the countries that give foreign trade surplus appreciates in the foreign exchange market and the value of the countries that give trade balance deficit is depreciates.

The balance of payments describes a systematic record of the transactions of the country during a certain period. Also, it is showing the results of all the economic operations that they have done with individual people of foreign countries. The balance of payments is the concept of flow.

When we look at the accounting of the balance of payments; we must follow the value which flows in and out of the country. In addition, it gives them a positive sign for inflows and a negative sign for the outflows: When we look at the credit item, it indicates the payments to be made by foreigners to the country. The debt item shows the payments to be made by the country to foreigners (Pugel, 2007).

In other words, the balance of payments accounts of the country shows both the payments to be made by the country and the payments to be paid to the country by foreigners. Payments are indicated to receive with a positive sign in the accounting system. The outward payments are indicated in the balance of payments with a negative sign and are shown in the debit item. Whichever transaction item that is resulted in a receipt from foreigners is entered as a credit and is given a positive sign (Krugman, 2009).

Each international economic transaction, the transfer of the goods and services concerned to one of the countries, and has the right to demand the other funds. There are such dualities in most of the international economic and financial transactions. Because of this duality, the balance of payments account is kept according to the double-entry accounting system. Following the duality of this system, a debtor is registered to the debtor's side of the relevant account and another account is registered to the creditor. Another payee transaction is the first recorded in the creditor section of the related account and then in the debtor's part of another account. Therefore, saving the same transaction to the reverse sides of two separating accounts are results to their equalization. In other words, as a feature of the double-entry accounting system, the sum of the credit side of the balance of payments is always equal to the sum of the debtor's side (Pugel, 2007).

Economic transactions that are arising from trade between countries should be established within a certain order and system. Operations should be classified according to common characteristics by creating this order. These classifications are called account groups. These account groups provide great benefits for the creation and use of the balance of payments. Also, these accounts are major broad categories of items that are defined as the three main parts of a country’s balance of payments. These are the current account, the capital account, and official international reserves.

2.3.1. The current account

The current account balance is described below:

$$\text{Current Account} = \text{Export}^{G,S,IPR,UT} - \text{Import}^{G,S,IPR,UT} \quad \textbf{(2.8)}$$

where the (G) is goods, (S) is services, (IPR) is the income payments and receipts, and (UT) is unilateral transfers.

The most important sub-item of the balance of payments is the current account. The goods and services are exported and imported by the country that is recorded under this account. Current account is also divided into sub-groups. These are the major export and import groups of most countries, which have traded in goods. However, trade in goods is the most obvious indicator of the country's situation. For example, the productivity levels of the goods with technological status show long-term development. Exports of the goods to the country bring foreign exchange. It is recorded in the creditor item. Imports of the goods are recorded in the debtor item. The balance between the total of the goods exports and the total of the goods import is called the balance of trade. Another sub-item is the service item. Imports of the country's service and export of the country’s service payments are recorded in the current account. In the services, we can show which items are including such as foreign tourism, international transportation, banking, and insurance, etc.

Intra-factor income and expenses are explained that domestic foreign capital companies' profits from the activities of the foreign companies transferred abroad. Also, long-term and short-term foreign financial investments made to the country as outlays or interests paid to foreign debts are included in this item.

Another sub-item is one-sided transfers. It covers transactions which made in the form of donations and grants among these countries. One-sided operations are called for these transactions because no payment is required.

Mc Connell, Brue, and Flynn (2009) explained that countries’ exports have a positive sign because they are credit and generate in flows of money towards the country. A country’s imports have a negative (-) sign because they are debts and they cause out flows of money out of the country.

When the country's imports exceed its exports, this causes a current account deficit. Another case, the country gives the current account surplus; export is more than import (Krugman, 2009). An income payment shows the money and earned by foreign residents on their investments in the domestic country. Income receipts are showed to earn the money by domestic residents on their investments abroad.

A current account is an important factor since it shows the direction and size of international borrowing. If the country has a current account deficit, it shows that it uses more output than the country produces and borrows from abroad. If there is a surplus in the current account, it shows that this country consumes less of what it produces and lends the surplus to the foreign countries. Intertemporal consumption of the country is determined by international borrowing and lending (Krugman, 2009).

2.3.2. The capital and financial account

In balance of payments, capital and financial accounts are evaluated separately in some sources. However, the capital account and the financial account will be combined and explained in this study.

When increases in the capital assets of foreigners in the country, this causes foreign currency inflow to the country, so it is classified as a creditor transaction and recorded in the creditor part of the balance of payments. The capital outflow from the country means that an increase in the foreign capital assets of residents, foreign exchange outflow from the country is recorded in the debitor part of the balance of payments. In this respect, the capital and financial account show only the amount of capital entering and exiting the country.

Interest income and profits are achieved in the long term. Therefore, the export of capital is a debtor. The increase is negative on the market and the decrease creates a positive result. With this feature, the account is the opposite of the currents in the goods and services account, capital inflows to the country to earn foreign currency and give the residents of the country the right to an external claim by the export of goods from the country. Imports of the goods and the capital may result in foreign currency outflows or borrowings from foreigners. Balance of payments to the net balance of total payer and debtor transactions called capital balance. The debit of this balance indicates that the country's total portfolio and direct investments in other countries have increased, whereas in the opposite case, the debts of the external world have increased.Transactions in the capital account are divided into two according to their maturities:

- Long term capital account; In general, international capital transactions for more than one year are in this account.

- Short term capital account; Private and official international capital flows with a maturity of less than one year are included in this account. The maturity is usually 30, 60 or 90 days.

An increase in the revenues of economic units can result in more savings, thus increasing national and international investment can have the movement of international capital. The rise in interest rates in a country may increase the rates of economic agents turning to interest-bearing investments in this country. Productivity growth in countries may attract international investments. The change of tax rates in countries may be effective in shifting capital or attracting foreign capital to their own countries. Or, the negative situation of the government reduces the capital inflow to these countries (Meade, 1951).

2.3.3. Official international reserves

International payment instruments issued by the Central Bank to be used when necessary are called official reserves. It is the account where the changes in the country's international official reserves are recorded as a result of the Central Bank's interventions in the foreign exchange market (Krugman, 2009).

The central bank of a country's economy is the institution responsible for managing the money supply. Official international reserves are foreign asset sources which are held by central banks for any external threats or problems. One of the tasks of the central bank under this subject is to buy or sell international reserves to influence the macroeconomic conditions of their economies. This is called formal exchange intervention. In other words, it is to inject money into the economy or withdraw money from circulation.

The negative balance of payments, such as a deficit statement, could be a sign of a crisis. This is because of the decline in the country's international reserve assets. That is owed to the foreign exchange authorities.

When a country's revenues from abroad exceed its expenses, the Central Bank raises reserves by buying foreign currency from the market. Otherwise, the Central Bank decreases reserves by selling foreign exchange to the market. Central interventions vary according to the exchange rate system.

2.3.4. The statistical discrepancy

The Statistical Discrepancy account is a balancing account that equalizes the current and capital accounts to official reserves account. Since the balance of payments is kept according to the double-entry system, the total debt and the total credit must be equal to each other.

In other words, in practice, this equation cannot be ensured spontaneously because of some factors such as errors, missing, delay and forgetting. Therefore, balance sheet is not exactly equal. Here, the only item used to compensate for this difference is called the statistical differences account (Salvatore, 2012).

2.4. Approaches About The Relationship Between Exchange Rates and Trade Balance

This section relates with the Bickerdike-Robinson-Metzler (BRM) model, which examines the elasticity approach to analyze the relationship between exchange rates and trade balance. Then, the absorption and monetary approaches regulate the elasticity approach and they are examined.

2.4.1. BRM model, Marshall Lerner condition and elasticity approach

The BRM model reveals the relationship between exchange rate and trade balance. This model examines the substitution effects of relative price changes, which is caused by devaluation in consumption and production (Dornbusch, 1975).

The rise in the exchange rates of a country creates an effect that decreases imports by raising the price of foreign goods in terms of the national currency, decreasing the prices of goods in foreign currency and encouraging exports. However, the elasticity of the demand for imports and exports of the country can only help to foreign trade balance. The criterion developed for this is called the Marshall Lerner condition.

The effect of devaluation on imports varies depending on price elasticity(e_M) of import demand. The price elasticity of the import demand measures the percentage change in imports caused by the one percent increase in the real exchange rate. In addition to this, foreign demand for domestic goods increases as a result of devaluation. The cause is that the goods produced in the home country are cheaper than goods produced in abroad. The positive effect of devaluation on exports depends on price elasticity(e_X) of export demand. The price elasticity of the export demand shows an increase in the real exchange rate and it is resulted in a percentage increase in exports. In this case, one percent increases in the real exchange rate as a result of devaluation decreases imports by percentage (e_M-1) and increases exports by percentage (e_X). The effect of devaluation on net exports (e_X+ e_M-1) depends on this term. In other words, if there is a devaluation to increase net exports, the price elasticity of the import demand and the price elasticity of the export demand should be greater than the sum of the price elasticity. This is the validity of the Marshall Lerner condition (Krugman, 2009). In other words, if the price elasticity of the export and import demand is greater than the price elasticity, the net export will improve and, the Marshall Lerner condition is provided (Bahmani-Oskooeea and Niroomand, 1998).

$$(e_X + e_M - 1) \tag{2.9}$$

The Marshall Lerner condition provides a critical value that is required for the rise in exchange rates to affect the balance of payments positively. To eliminate the external imbalance, the sum of the demand elasticity should be greater than 1. The smaller is the elasticity, the greater should be the exchange rate which changes required to achieve the external balance. Or, a certain improvement in the size of the elasticity can be achieved with smaller exchange rates.

Even if the elasticity condition is realized, the balance of payments deficit of the country grows enormously; it is not possible to close this gap with the depreciation of the national currency. Because, if the share of the foreign trade deficit is low or the deficit is due to other balance items in the balance of payments deficit of a country, the effect of the Marshall Lerner requirement may not be effective.

On the other hand, the rise in the exchange rate, such as the devaluation situation, will worsen the country's trading conditions. The Marshall Lerner requirement must be met to improve the trade after the deterioration. Otherwise, inflation occurs.

2.4.1.1. J-Curve

The reduction of the value for the national currency by government is expressed as devaluation. As a result of devaluation, the foreign trade balance first deteriorates and then tends to improve. Over time, the devaluation has a similar effect to the letter (J) on the country's foreign trade balance. This is called the J-Curve because the changes in the foreign trade of the country as a result of devaluation are similar to the "J" shape. This effect depends on short-term elasticity which is less than 1. Devaluation makes exports attractive in terms of price. However, production must be increased to export. If the short-term elasticity is not following the Marshall Lerner condition, the J-Curve occurs. In the long term, it affects the trade balance positively.

Short-term elasticity in the economy is low to compare with long-term elasticity. Because after the devaluation, exports do not increase or imports do not decrease because the foreign trade transactions are linked to pre-made contracts. On the other hand, it is impossible to expect consumers to change their habits in the short term. Besides, importers expect their prices to increase further in the short term. This will be worsening the trade balance in the short term. Exporters also postpone their exports, and they are hoping that exchange rates will increase further.

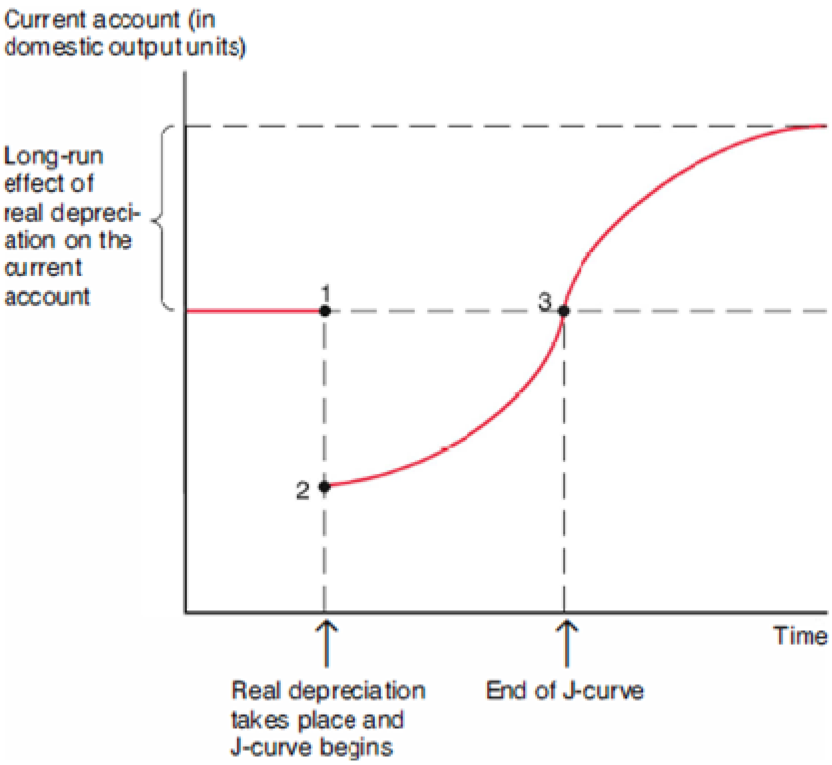

Figure 2.3 *The J-curve phenomenon (Krugman, 2009)*

In the figure (2.3) above, after the real currency depreciation trade balance sharply move from point 1 to point 2. The effect of devaluation in the figure (2.3) above, it starts from point 2. The trade balance develops until Point 2 to point 3. Empirical results indicate that this development took one year and then current accounts continue to improve (Krugman, 2009).

2.4.2. Absorption approach

Absorption approach analyzes the economy in terms of aggregate expenditures, particularly in exchange rate changes in direct effects on relative prices, income, and absorption, and ultimately on the trade balance. Absorption approach investigates the impact of expenditures on the foreign trade balance. As a country decreases absorption and increases its production, the trade balance improves.

With the presence of devaluation, the effect of substitute goods comes out and it is meaning that the demand passes from foreign goods to domestic goods. It increases the absorption of products. Production increases as an absorption and investments increase from another angle. There is an income impact that increases absorption. The final effect of the devaluation on the trade balance depends on the combined substitution and revenue impact.

On the other hand, according to the absorption approach, the total income of a country can be found by adding the net difference between imports and exports after the consumption and investment expenditures are collected. Absorption is the sum of the consumption expenditures and investment expenditures on national and imported goods and services. The external balance effects of devaluation in the absorption approach are explained by the changes in national income (Alexander, 1952).

It should be noted that the rise in real national income will increase the expenditures to some extent. However, as some of the revenue growth will be saved, the increase in domestic expenditure is smaller than the increase in domestic income.

Simultaneously, in a situation where the economy is at full employment, devaluation is not effective in terms of providing external balance. Because the increase in demand directed to the competitor companies to export and importation will spread to the whole economy through the replicating mechanism but will not increase the total domestic production. The increase in demand caused by the expansion of expenditures will be covered by imports from abroad instead. In other words, the balance of domestic production is against the country and will be further deteriorated.

2.4.3. Monetary approach

The monetary approach states that the imbalance in the balance of payments is a monetary phenomenon. It tries to explain the deficit or surplus in the balance of payments with the demand and supply of money.

In the monetary approach, the balance of payments problem is mainly related to the monetary variables. Money is a stock; it is not a flow. The stock relationship between money supply and demand is considered to be the main determinant of the balance of payment movements in monetary approach (Vane and Thompson, 1992).

A monetary imbalance causes deficits or surpluses in the balance of payments. If there is a deficit in the balance of payments for any reason in the country, the reason is that either there is a large amount of money supply within the country or an excess demand from domestic country to abroad. However, if the balance of payments deficit persists, the excessive expansion of the money supply inside of the country. The monetary approach recognizes that real factors can create an imbalance in the balance of payments. The imbalance in external payments has an impact on net foreign assets, and it is causing monetary base and thus fluctuations in money supply (Johnson, 1977).

According to Monetarists, devaluation increases the demand for money by raising the price of goods within the country. If this demand is not met with internal emissions, individuals can export goods and services abroad or sell foreign bonds, and foreign currency funds are entered from abroad. As a result, the money demand has been met by the central bank, increasing the volume of emissions based on them (money supply and demand balance is equalized) and the balance of payments is provided. According to the monetarist view, the provision of external balance is the result of eliminating the imbalance between money supply and demand (Heffernan and Sinclair, 1990).

2.5. Foreign Trade Theories

2.5.1. Absolute Advantage

Adam Smith explains the benefits of free trade and international specialization with the theory of absolute advantages. Accordingly, when we consider the two countries and one of them compared to the other, which goods are produced at a lower cost, should be specialized in the production of those goods. Also, they should import other goods with high costs when exporting their production at a low cost. However, the concept of cost here includes only the labor as a production factor which is thought to be homogeneous.

2.5.2. Comperative Advantage

Adam Smith's theory of absolute advantage has an important place in the theory of foreign trade. It is not entirely possible to explain international specialization with absolute advantages. What will happen if a country produces all the goods at a much cheaper rate than the other? The answer to this question was given by David Ricardo in the theory of comparative advantage. David Ricardo showed that although one country has the absolute disadvantage of a commodity. In other words, it does not have an absolute advantage in the production of these goods. There can still be trade between countries and both countries can profit from this trade. According to this theory, if the country has the absolute disadvantage in the production of both goods this country should export the goods with fewer disadvantages. That means that it has a comparative advantage in the production and export of these goods. The country will stop the production of goods with more disadvantages and they will import these goods. In summary, comparative advantage is the theory that the country should produce a relatively higher yield (lower cost). It should be specialized in this product and, it should import relatively expensive products from other countries.

3. EMPIRICAL ANALYSIS

This chapter starts with the definition of the standard "two country" imperfect substitute's model, in which imported and exported goods cannot be completely substituted by domestic goods. Hence, finite elasticities for supply and demand will be estimated. $Import_d$, which is the domestic imports demanded as quantity indicated byequation (3.1). $Import_d^*$, which is the imports demanded quantity by the rest of the world, is indicated by equation (3.2):

$$Import_d = f_d(Y, P_m, P), \frac{\partial Import_d}{\partial Y} > 0, \frac{\partial Import_d}{\partial P_m} < 0, \frac{\partial Import_d}{\partial P} > 0 \quad \textbf{(3.1)}$$

$$Import_d^* = f_d^*(Ye^*, P_m^*, P^*), \frac{\partial Import_d^*}{\partial Y^*} > 0, \frac{\partial Import_d^*}{\partial P_m^*} < 0, \frac{\partial Import_d^*}{\partial P^*} > 0 \quad \textbf{(3.2)}$$

In the equations (3.1) and (3.2); Y is the real income of home country, Y^* represents the real income of rest of the world, e represents the exchange rate. P_m represents the domestic currency price of paid by domestic importers. P is the total price level of the home country. P_m^* denotes the foreign currency price of paid by domestic importers. P^* is the rest of the world's aggregate price level. The real incomes and overall price levels have positive correlations with the volume of imported goods while the relative prices have a negative effect.

The income level in the importing region, the prices of imported goods and the prices of local substitutes constitute the demand function.

Generally, the homogeneity of demand function is assumed in such models. Therefore, the assumption of homogeneity is expressed by dividing the explanatory variables by P:

$$Import_d = f_d(Y_r, RP_m), \frac{\partial Import_d}{\partial Y_r} > 0, \frac{\partial Import_d}{\partial RP_m} < 0; Y_r = \frac{Y}{P}, \ RP_m = \frac{P_m}{P} \quad \textbf{(3.3)}$$

$$Import_d^* = f_d^*(Y_r{}^*, RP_m^*), \frac{\partial Import_d}{\partial Y_r^*} > 0, \frac{\partial Import_d}{\partial RP_m^*} < 0; Y_r^* = \frac{Y^*}{P^*}, RP_m^* = \frac{P_m^*}{P^*} \quad \textbf{(3.4)}$$

Relative import price is equal to the foreign currency price of foreign exports adjusted for the exchange rate. It can show as;

$$Relative\ Price_m = RP_m = \frac{P_m}{P} = \frac{eP_x^*}{P} = \frac{eP^*}{P}\frac{P_x^*}{P^*} = Q\frac{P_x^*}{P^*} = Qp_x^*$$

(3.5)

where the p_x^* denotes real foreign currency price of exports,

$Q = \frac{eP^*}{P}$,

(3.6)

where Q represents the real exchange rate and defined as an increase leading to the depreciation of the local currency.

The supply function for the rest of the world export and domestic export supply to the rest of the world are shown as above

$$Export_s = f_s(P_x, P)$$

(3.7)

$$Export_s^* = f_s(P_x^*, P^*)$$

(3.8)

where P_x is the currency received by domestic exporters calculated in the domestic currency and vice versa.

We determine the supply and demand conditions for the equilibrium in (3.9) and (3.10).

$$Import_d = Export_s^* e$$

(3.9)

$$Import_d^* = Export_s$$

(3.10)

Therefore, we define the trade balance as:

$$Trade\ Balance = TB = p_x Import_d^* - Qp_x^* Import_d$$

(3.11)

TB can be expressed as the "partial reduced form":

$$TB = f(Y_r, Y_r^*, Q), \frac{\partial TB}{\partial Y_r} < 0, \frac{\partial TB}{\partial Y_r^*} > 0, \frac{\partial TB}{\partial Q} > 0$$

(3.12)

In (3.12), the real exchange rate and the real income of the rest of the world have positive correlations with trade balance. Meanwhile domestic real income has a negative correlation (Stucka, 2004).

3.1. Literature Review

3.1.1. Literature review on trade balance

Bahmani-Oskooee and Goswami (2003) study the effects of real depreciation of the Yen in short-term and long-term with the J curve effect in the trade relations between Japan and 9 trade partners (USA, Australia, Canada, France, Germany, Italy, Netherlands, Switzerland and UK). The model is estimated by using the ARDL approach with the quarterly data for this period 1973: 1 - 1998: 4. According to the results, Japan has a J Curve effect in the trade relations between Germany and Italy. In the long term, it has a positive relationship between Japan and Canada, the UK and the United States.

Bahmani-Oskooee and Ratha (2004) explain the existence of the J Curve effect in trade relations between the main trading partners and the US. They estimate ARDL mode using quarterly data period from 1975:1 to 2000:2. According to their findings, there has not effect of J Curve.

Narayan (2006) analyzes the relationship between China's balance of trade and its exchange rate vis-a-vis the USA dollar. The study estimates the ARDL model using monthly data period from November 1979 to September 2002. According to the result, China's balance of trade and real exchange rate vis-a-vis the USA is co-integrated, is implying that a devaluation of the real exchange rate China's balance of trade improves.

Bahmani-Oskooee, Economidou and Goswami (2006) verify the bilateral J-curve phenomenon among the UK and her twenty major trading partner (Australia, Austria, Canada, Denmark, Finland, France, Germany, Greece, India, Ireland, Italy, Japan, Netherlands, Norway, Singapore, S. Africa, Spain, Sweden, Switzerland and USA). The research uses the ARDL model with quarterly data over the period 1973:1 – 2001:3. The long-term result shows that only in six countries (Australia, Austria, Greece, South Africa, Singapore and Spain) have significant relations between exchange rate and the trade balance, while two countries (Canada and the United States) support the J-curve effect.

Duasa (2007) present the short-term and long-term relationship between Malaysia's trade balance and exchange rate. The study is estimated by using cointegration test, VEC, ARDL and VAR models with annual data period from 1974 to

2003. Accordingly, it is states that the exchange rate policy in this country is not much effect on the trade balances.

Bahmani-Oskooee and Wang (2008) state the short and long-term effects of the real exchange rate on the trade balance of industries and the existence of the J Curve effect for 88 industrial products between the U.S. and China. They etimate by using the Engel-Granger co-integration test and ARDL model using annual data from 1978 to 2002. The result of analysis shows the existence of the J Curve effect for 22 industrial products. The long-term effect of the real exchange rate in the foreign trade balance of the industry can be found to be positive.

Bahmani-Oskooee and Bolhasani (2008) reveal the existence of J Curve effect for 152 industrial products in trade relations between Canada and United States. The analysis evaluates with the co-integration test and VEC model and they use the yearly data of 1962-2004 period. As a result of the analysis, it is determined that the short-term effects of devaluation for the 50% of the industrial products turns into positive effects on the trade balance in the long term. In addition, two-thirds of the industrial products involves in the analysis which is showed that the J-Curve effect exists.

Bahmani-Oskooee and Mitra (2009) document the existence of the J-curve effect for 38 industrial products in India's bilateral trade with the US. They estimate with the co-integration test and VEC model using annual data from 1962 to 2006 period. The result shows that there is a J Curve effect for 8 industrial products.

Bahmani-Oskooee and Hegerty (2009) examine the short and long-term effects and the presence of the J-Curve effect of real exchange rate fluctuations for 117 industrial products in the trade relations between Japan and the United States. They estimate with the co-integration test and ARDL model and they use the annual data from 1973 to 2006 period. In the long term, the real exchange rate can be found to have a positive effect for 41 industrial products.

Harvey (2013) analyses the exchange rate sensitivity in the Philippines and the existence of J-curve phenomenon with 15 trading partners. The analysis estimates the ARDL bounds testing approach with quarterly data over the period from1973 to 2011. As a result of the analysis, researcher finds that support J-curve effect in Australia, Saudi Arabia, and Thailand and short-run deterioration combine with long-run improvement in the trade balance between Philippines and China.

Bahmani-Oskooee and Xu (2013) research into the existence of the J-Curve effect in the foreign trade balance of 73 industries in trade relations between Japan and China. The analysis estimates the VEC model using annual data over the period from1978 to 2008. As a result of the analysis, it is determined that there is J curve effect on the foreign trade balance of 24 industries.

Kyophilavong, Shahbaz and Uddin (2013) make a research about the the existence of J-curve phenomenon in Laos economy. The analysis is estimated that the ARDL bounds testing approach and they use quarterly data over the period from 1993 to 2010. As a result of the analysis, the findings show that the J-curve effect occurs in case of Laos. In the short-term, real depreciation has inverse impact on Lao's balance of trade. The long-term balance of trade is identified by domestic income.

Wijeweera and Dollery (2013) analyse the J curve effect on Australia's trade in goods and services sectors. The analysis is estimated by ARDL to co-integration and error correction model using quarterly data over the period from1988 to 2011. As a result of the analysis, some conditions support to the J-curve effect.

Bahmani-Oskooee, Harvey and Hegerty (2014) present the empirical effectiveness of the J-Curve for each of the 92 industries that commodity trade between Brazil and U.S. The analysis estimates by the ARDL to co-integration and error-correction model and they use annual data for the period of 1971 - 2010. As a result of the analysis, they find the phenomenon in 31 industries that will benefit from currency depreciation, which phenomenon is the short-run deterioration combined with the long-run improvement (J-Curve phenomenon) on the trade balance.

Ziramba and Chifamba (2014) study the behavior of South Africa’s trade balance following a depreciation of currency. The analysis is estimated the ARDL bounds testing approach to co-integration and error correction model using annual data for the period of 1975 - 2011. As a result of the analysis, the real effective exchange rate has a negative affect in long-term on the balance of trade.

Bahmani-Oskooee and Zhang (2014) provide the J-Curve effect in the commodity trade between Korea and rest of the world. The analysis is estimated using by the bounds testing approach to co-integration and error-correction model using annual data over the period 1971 to 2011. The result of analysis shows that the J-Curve effects in 58 industries. However, the long run favorable effects of devaluation are evidenced only in 26 industries which mostly they are small.

Bahmani-Oskooee and Fariditavana (2015) explain the short and long-term effects of currency depreciation in trade balance and the J-curve effect for trade relations among U.S. and her six trade partner. The analysis estimates the nonlinear ARDL model using quarterly data over the period 1971 to 2013. The result of analysis shows the J-curve effect support in five trade partner. Non-linear approach shows us that in most cases the effects of exchange rate changes are asymmetric.

Yeshineh (2016) researches the short-run and long-run relationships of trade balance in Ethiopia. The analysis is estimated using the ARDL approach of co-integration and error correction model using annual data for the period 1970 to 2011. The result shows that exchange rate depreciation is positively related to the balance of trade in the long-term and short-term. The results shows strong evidence that exchange rate play a faint role in determining the behavior for balance of trade in Ethiopia. Balance of budget, income and money supply has a strongest impact on balance of trade.

Nusair (2017) reveal the J-curve phenomenon for 16 European transition economies (Bulgaria, Croatia, Czech Republic, Macedonia, Hungary, Poland, Romania, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Armenia, Georgia, Russia, and Ukraine). The analysis estimates the linear and nonlinear ARDL model using quarterly data over the period 1994 to 2015. The result of the analysis shows that when the linear ARDL model is used, they do not find evidence for the J-curve phenomenon. Besides, when the nonlinear ARDL model is used, they find support for the J-curve phenomenon for Armenia, Bulgaria, Croatia, Hungary, Georgia, Poland, Romania, Russia, Slovakia, Slovenia, the Czech Republic, and Ukraine.

Akbostancı (2004) studies the short and long-term effects of currency depreciation in trade balance and the J-curve effect for Turkish economy. The analysis is estimated by using error correction model and uses quarterly data over the period 1987 to 2000. The result of this analysis, the improvement of the trade balance in response to a real depreciation emerges in the long-run, results do not exactly support the J-curve hypothesis in the short-run.

Halıcıoğlu (2008) examines the presence of the J-Curve effect on Turkey's foreign trade balance in the short and long-terms. The analysis estimates ARDL model and Granger causality test and use quarterly data over the period 1980: 1 to 2005:4. According to the findings, the J curve effect in Turkey's foreign trade balance has been determined in the short term. Moreover, Granger causality test shows that the real effective exchange rate has an effect on the trade balance in the short and long term.

Çelik and Kaya (2010) investigate Turkey's trade relations and the existence of the J-Curve effect on trade balance with France, Germany, Netherlands, Italy, Japan, the UK, and the US. The analysis uses co-integration test. In the article they employ quarterly data over the period 1985:1 to 2006:4. The result of the analysis, Turkish economy has reverse J-Curve affect trade relations with Germany and the United States.

Yazıcı (2010) examines the presence of the J-Curve effect in the service sector in Turkey. The study estimates distributed lag coefficients using quarterly data over the period 1986:1 to 1998:3. The analysis reveals that the devaluation has worsened the trade balance in the short term and improved it in the long term. Accordingly, in the service sector in Turkey has reached conclusion about the existence of the J-Curve effect.

Nazlioglu and Erdem (2011) explore the role of exchange rate on bilateral trade balance on Turkey's fresh fruits and vegetables with 14 trading partners (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, The Netherlands, Portugal, Spain, Sweden, and United Kingdom) in the European Union. The study is estimated by the method of ARDL and employs quarterly data over the period 1995:1 to 2007:2. As a result of the study, there is an evidence of the J-curve effect in 2 cases (Belgium and France) in the short run. In the long run, the exchange rate has a positive impact on the trade balance in 7 out of 14 cases (Belgium, Denmark, France, Greece, Italy, Sweden, and the United Kingdom).

Okay, Baytar and Saridoğan (2012) analyze the current account of the real effective exchange rate effect on the balance of Turkey's economy. The study is estimated by using the VEC model and they employ monthly data over the period 2003:1 to 2010:12. As a consequence of the analysis, the real effective exchange rate negatively affects the current account balance in the long term. Furthermore, according to the impulse response function is determined that there excicts a J-Curve effect on Turkey's economy.

Cambazoğlu and Karaalp (2012) examine the trends in Turkey's terms of trade over the thirty years. The analysis estimates using Vector Auto-Regression (VAR) model using monthly data over the period from 1982 to 2011. The result of the investigation finds that the Prebisch-Singer thesis is not valid for Turkey and they find that Turkish exports are affected by imports, which indicates the import dependency of Turkish exports.

Bal ve Demiral (2012) mention the short and long term relationship between Turkey and Germany, with bilateral trade in the real trade balance with the euro exchange rate. The analysis uses the co-integration test and the VEC model. They employ the monthly data from 2001:1 to 2012:9 periods. The conclusion states that the J-Curve effect occurs for trade between Turkey and Germany.

Ari and Cergibozan (2017) review the determinants of the trade balance in the Turkish economy. The study is using the Vector Error Correction model. They apply quarterly data over the period 1987:1 to 2015:2. The outcome of the study shows that an increase in the real effective exchange rate improves the balance of trade in the long-run, while it does not affect the trade balance in the short-run. Besides, an increase in domestic and foreign income has negative effects on the trade balance. The results document that the J-Curve effect does not occur in the Turkish economy.

3.1.2. Literature review on volatility

Arize, Osang, and Slottje (2000) present the empirical impact of real exchange-rate volatility on the export flows for 13 less developed countries (LDC's) over the quarterly period 1973-1996. The analysis employs Johansen cointegration approach. The result shows that the exchange rate volatility negatively affect exports both in the long and short terms.

Singh (2004) reviews exchange rate volatility on the trade balance of India. They estimate the Error Correction and GARCH models. They use quarterly data over the period from 1975:2 to 1996:3. The result of the analysis shows that variables in the model move together in the long-run. There is no evidence for the existence of a J-curve effect on the trade balance. The study finds the presence of insignificant ARCH but significant GARCH effects in the exchange rate. But this exchange rate volatility does not have a significant effect on the trade balance in India.

Hwaug and Lee (2005) report the relationship between exchange rate volatility and trade flow in England. In the analysis, they use the GARCH model with monthly data over the period 1990:6 to 2000:2. The result of the analysis shows that exchange rate volatility has little effect on exports but has a positive effect on imports.

Wang and Barrett (2007) reveal Taiwan's exports to the United States for the effect of the risk arising from the volatility in a real exchange rate on exports. The study estimates multivariate GARCH-M estimator with corrections for leptokurtic errors. They use monthly data over the period 1989 to 1998. As a conclusion of the study, they find that real exchange rate risk has no significant effect on many sectors. However, agricultural trade level is affected by real exchange rate volatility.

Bahmani- Oskooee, Ardalani, and Bolhasani (2010) investigate the positive and negative effects of exchange rate volatility on trade flows for 66 American industries that trade with the rest of the world. The analysis estimates error-correction model with monthly data from 1991:1 to 2007:12. As a result of the research, trade flows are not affected by GARCH-based volatility of the real effective exchange rate of the dollar.

Bakhromov (2011) examine the effect of exchange rate volatility on international trade in Uzbekistan. The analyze estimated by the Johansen cointegration test with quarterly data for 1999:1 to 2009:4. As a result of the study, the real exchange rate volatility has an important effect on the exports and imports of Uzbekistan. The results find that an increase in the real exchange rate volatility has a substantial negative effect on exports and imports in the long-term.

Chipili (2013) document the impact of exchange rate volatility on trade flows in Zambia. The study estimated by the Johansen cointegration test with monthly over the period 1980 to 2008. It finds that stability in the exchange rate is important for the sustainability of the trade growth because the persistence in exchange rate volatility may affect the re-allocation of resources to the non- tradable sector.

Bahmani-Oskooee and Hegerty (2015) review the effects of exchange rate volatility on industrial trade for 36 separate export and import industries between the US and Egypt. The study estimates employing both Cointegration analysis and Error-Correction model with quarterly data over the period 1994 to 2007. As a conclusion of the study, they find that there is evidence for long-run relationships in some import and export industries.

Sani, Hassan, and Azam (2016) verify the effect of exchange rate volatility on the output of Nigeria, Ghana, Gambia, the Sierra Leones, and Liberia. The analysis uses Co-integration test and Error Correction model with data over the period 1991 to 2014. As a conclusion of the research, exchange rate volatility has a substantial effect on outputs of all the countries, while there is a negative effect on the output of the countries except for Liberia.

Aftab, Syed, and Katper (2017) investigate the exchange-rate volatility and bilateral industry trade relationship between Malaysia and Thailand. They use Generalized Autoregressive Conditional Heteroskedasticity (GARCH) and Autoregressive Distributed Lag (ARDL) model with monthly data over the period 2000-2013. The result of the anlyzes, the effect of exchange rate volatility on trade is limited in a number of sectors. Morover, the exchange rate volatility has a negative effect on large industries like instruments and equipment.

Asteriou, Masatci, and Pilbeam (2016) analyze the effect of exchange rate volatility on international trade flows for Mexico, Indonesia, Nigeria, and Turkey. They estimate the GARCH and ARDL model using monthly data for the period of 1995:01 - 2012:12. As a result of the research, there is no relationship between exchange rate volatility and international trade flows except for Turkey in the long-run. Besides, a substantial effect between volatility and import/export demand is found for Indonesia and Mexico for the short-run. Moreover, there is no causality between volatility and import/export demand for Turkey, while there is unidirectional causality from export demand to volatility in Nigeria.

3.2. Autoregressive Distributed Lags (ARDL) model

Long-term analyzes are required to understand how variables affect each other in the economy.The variables we use for these analyzes are non-stationary and follow the trends. However, the variables must be stationary due to the basic principles of the time series. We consider a more recent econometric approach ARDL (Autoregressive Distributed Lags) model to set up our model regardless of the stationarity of the variables.

The ARDL model includes both lags of independent variables and the dependent variable. In its general form, with p lags of y and q lags of x, an ARDL (p, q) model can be written as (Hill*et al.*, 2011) below:

$$y_t = \delta + \theta_1 y_{t-1} + \cdots + \theta_p y_{t-p} + \delta_0 x_t + \delta_1 x_{t-1} + \cdots + \delta_q x_{t-q} + v_t \tag{3.13}$$

The ARDL bounds testing approach was developed by Pesaran et al. (2001). ARDL model is used to determine the long-term relationships between variables. Thus this approach is able to test the existence of the co-integration relationship between the series with different degrees of stationarity. In other words, the main advantage of the ARDL bounds test is that it can be applied regardless of whether the variables included in the analysis are I (0) or I (1). Another advantage of this model is that it uses the unrestricted error correction model (UECM) and can provide statistically more reliable results than classical co-integration tests.Narayan and Smyth (2005) mentioned that "The UECM is likely to have better statistical properties than the two-step Engle–Granger method because, unlike the Engle–Granger method, the UECM does not push the short-run dynamics into the residual terms."The applicability of ARDL model to small sampling studies is more reliable than that of Engle-Granger and Johansen co-integration tests. Basically this model helps to catch long and short term causality relations (Pesaran et al., 2001; Narayan and Smyth, 2005).

The ARDL boundary test approach consists of three phases. In the first stage, the long-term relationship between the variables included in the analysis is tested. In case of co-integration relationship between these variables, long and short term elasticity are obtained in the following stages respectively. In the first stage of the ARDL boundary test approach, UECM is created. The value "p" in the model refers to the appropriate lag length. The appropriate lag length is determined by considering the Schwartz Bayesian Criterion (SBC) and Akaike Information Criteria (AIC) for the long-term ARDL model. After the determining lag length in ARDL boundary test approach, the existence of co-integration relationship between variables. The secound step is taken by rejecting the basic hypothesis as a result of the F test. In the following section, this model is estimated by the ordinary least squares technique. In the third and final phase, the ARDL model is estimated for the short-term relationship between the variables. The error correction term variable in the model is the previous value of the residual series obtained from the long-term ARDL model. The coefficient for this variable shows how long the imbalance in the short term can be corrected in the long term (Narayan and Narayan, 2005).

3.2.1. The Error Correction model

In this method defined a dynamic relationship between variables I (0), which involve a cointegrating relationship known as the short-term error correction model. The error correction model (ECM) is a consistent method for combining long and short term effects. We derive the short-term dynamic parameter from the error correction model (ECM) estimate, which is related to the long-term estimate.

The most appropriate step in determining the ARDL model is the short-term dynamics. In order to determine the short term dynamics, it is necessary to determine the parameters of error correction model. Conditional error correction model including short term dynamics;

$$\Delta Y_t = \delta + \beta e_{t-1} + \sum_{i=1}^{p} \theta \Delta Y_{t-1} + \sum_{i=0}^{q} \delta_1 \Delta X_{t-i} + u_t$$

(3.14)

In order to test whether there is a cointegration relationship between the variables or not, the unrestricted error correction model of the models is used to investigate the relationships between the related variables should be established. When setting up unrestricted error correction models, the missing number of appropriate lag numbers used in the respective ARDL model is used as the appropriate number of lag for the first difference series of each variable in each model.

The "e_{t-1}" in the equation is a term lag of the error term derived from the long-term equation, and this variable is called the error correction term. For the error correction model to succeed, the coefficient of error correction term must be negative. In addition, this coefficient should be statistically significant. As a result, a negative error correction term indicates how long it will take to correct the deviation in the long-term relationship between variables.

3.3.Model, Data Description and Source

3.3.1. Econometric model estimation

3.3.1.1. J-Curve effect

Empirical Equation for Trade Balance:

$$TB_t = \alpha + \beta_1.REER_t + \beta_2.GDP_t^h + \beta_3 GDP_t^f + U_t$$

(3.15)

TB=Trade Balance
$REER$= Real Effective Exchange Rate
GDP_t^{h}= Domestic Output
GDP_t^f= Foreign Output

ARDL Model for Trade Balance:

$$\Delta TB_t = \alpha + \sum_{i=1}^{\rho_1}(\beta_{1,i}.\Delta TB_{t-i}) + \sum_{j=0}^{\rho_2}(\beta_{2,j}.\Delta REER_{t-j}) + \sum_{k=0}^{\rho_3}(\beta_{3,j}.\Delta GDP_{t-k}^h) + \sum_{l=0}^{\rho_4}(\beta_{4,l}\Delta GDP_{t-l}^f) + \lambda_1.TB_{t-1} + \lambda_2 REER_{t-1} + \lambda_3.GDP_{t-1}^h + \lambda_4.GDP_{t-1}^f + u_t$$

(3.16)

3.3.1.2. Effects of exchange rate volatility

In this model, we add the volatility variable to the main model. We use the volatility of real effective exchange rate. Because the real effective exchange rate volatility is not directly observable, we employ the GARCH (1, 1) model to obtain volatility series. After the estimation of GARCH model, conditional variance series are used for the volatility.

Empirical Model for Trade Balance:

$$TB_t = \alpha + \beta_1 MPI_t + \beta_2 REER_t + \beta_3 VOL_t + u_t$$

(3.17)

TB=Trade Balance

$REER$= Real Effective Exchange Rate

MPI= Manufacturing Production Index

VOL= Volatility of Real Effective Exchange Rate

ARDL Model:

$$\Delta TB_t = \alpha + \sum_{i=1}^{\rho_1}\left(\beta_{1,i}\Delta TB_{t-i}\right) + \sum_{J=0}^{\rho_2}\left(\beta_{2,j}\Delta GDP_t\right) + \sum_{k=0}^{\rho_3}\left(\beta_{3,k}\Delta REER_t\right) + \sum_{l=0}^{\rho_4}\left(\beta_{4,l}\Delta VOL_t\right) + \lambda_1.TB_{t-1} + \lambda_2.GDP_{t-1} + \lambda_3.REER_{t-1} + \lambda_4 VOL_{t-1} + u_t \quad \textbf{(3.18)}$$

Measuring Exchange Rate Volatility with GARCH Model:

Mean equation:

$$Y_t = \alpha + \beta^{\iota}x_t + \mu_t$$
$$\mu_t \sim iid\ \ N(0, VOL_t) \quad \textbf{(3.19)}$$

Variance equation:

$$VOL_t = \gamma_0 + \sum_{J=1}^{\rho}\theta_j u_{t-j}^2 \quad \textbf{(3.20)}$$

GARCH (1,1) model:

$$VOL_t = \theta_0 + \gamma_1 VOL_{t-1} + \gamma_2 u_{t-1}^2 \quad \textbf{(3.21)}$$
$$\theta_0 > 0, \gamma_1 > 0, \gamma_2 > 0\ and\ \ \gamma_1 +\ \gamma_2 < 1$$

It is that the next period forecast of the variance is a combination of last period squared return and last period forecast.

VOL_t is variance or current period volatility, VOL_{t-1} is previous year residual variance or volatility.

3.3.2. Data description and data sources

While creating our models, we used two different series as monthly and quarterly. We created our first and second models using quarter series and, we created our third and fourth models by using monthly series. Quarterly series cover dates between 2003Q1-2018Q4, while monthly series cover dates between 2003M01-2018M12.

Table 3.1 *Definitions and Sources of Variables*

TB	**Trade Balance**	**The ratio of Turkey's export value to import value.**	**Federal Reserve Bank of St. Louis**
REER	**Real Effective Exchange Rate**	**The weighted geometric average of the prices in Turkey relative to the prices of its 45 trade partners.**	**Federal Reserve Bank of St. Louis**
GDP^h	**Gross Domestic Production for Home Country**	**Turkey's real gross domestic product index.**	**Federal Reserve Bank of St. Louis**
GDP^f	**Gross Domestic Production for Foreign Countries**	**The sum of real GDP indices of 23 trading partners after each of index is multiplied by their respective percentage of volume in trading with Turkey (USA, UK, Japan, Germany, Italy, France, Greece, Spain, Switzerland, Poland, Sweden, Belgium, Netherland, Czech Republic, Austria, Hungary, Romania, Bulgaria, China, Russia, India, Korea, and Israel).**	**Federal Reserve Bank of St. Louis and Central Bank of the Republic of Turkey**
MPI	**Manufacturing Production Index**	**Turkey's industrial production**	**Federal Reserve Bank of St. Louis**
EXP	**Export**	**Export value of Turkey**	**Federal Reserve Bank of St. Louis**
IMP	**Import**	**Import value of Turkey**	**Federal Reserve Bank of St. Louis**
VOL	**Volatility in REER**	**It is derived by using Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model.**	
DUM	**Dummy**	**2008M08-2009M02**	
DUM5	**Dummy5**	**2018M03-2018M08**	

3.4. Estimation Results

3.4.1. Estimation of model 1

Table (3.2) presents descriptive statistics of series used in model 1.

Table 3.2. *Descriptive Statistics of Variable Series for Model 1*

	LNTB	**LNRER**	**LNGDPF**	**LNGDPH**
Mean	**-0.412244**	**4.650815**	**4.719379**	**4.351220**
Median	**-0.426094**	**4.670130**	**4.700726**	**4.321899**
Maximum	**-0.099500**	**4.849840**	**5.020745**	**4.748520**
Minimum	**-0.604647**	**4.134686**	**4.422449**	**3.904379**
Std. Dev.	**0.089276**	**0.125246**	**0.179971**	**0.245044**
Skewness	**0.806411**	**-1.467853**	**-0.013703**	**0.025465**
Kurtosis	**5.006999**	**6.533359**	**1.666241**	**1.856891**
Jarque-Bera	**17.67797**	**56.27465**	**4.745769**	**3.491442**
Probability	**0.000145**	**0.000000**	**0.093211**	**0.174519**
Sum	**-26.38362**	**297.6521**	**302.0403**	**278.4781**
Sum Sq. Dev.	**0.502126**	**0.988251**	**2.040533**	**3.782949**
Observations	**64**	**64**	**64**	**64**

Figure (3.1) shows the graphs of the variables used in the study. According to the figure, foreign GDP and domestic GDP follow an upward trend depending on the economic growth process. The trade balance fluctuates depending on the real effective exchange rate.

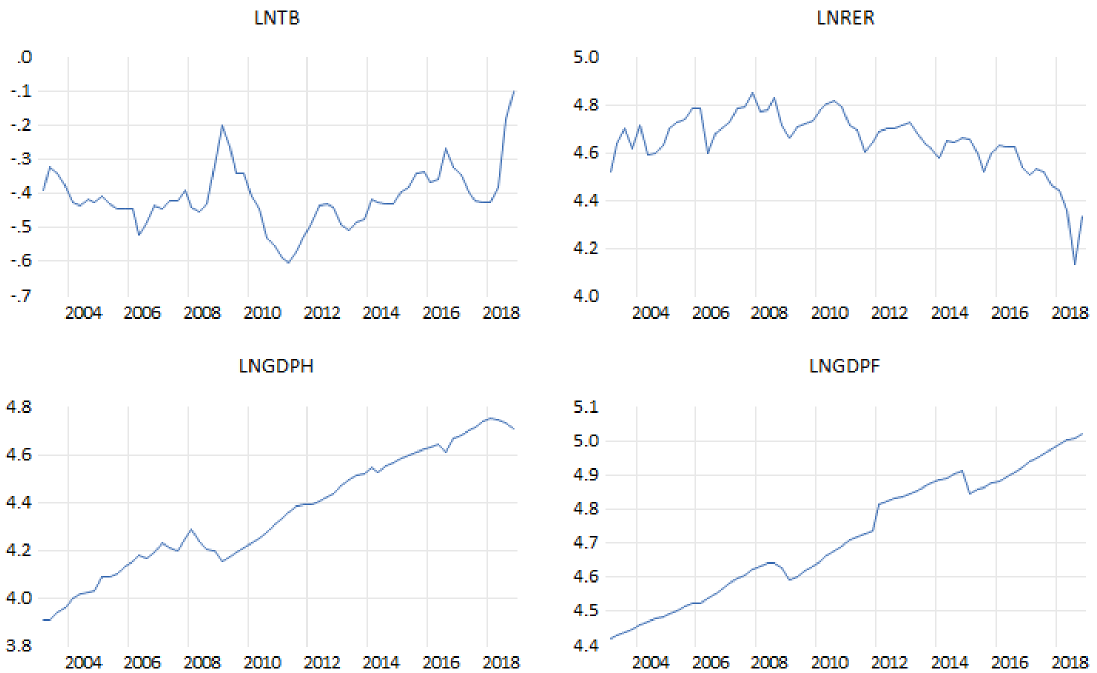

Figure 3.1. *Graph of Series Level for Model 1*

First of all before starting the analysis we employ some unit root tests to ensure that the variables are not integrated into I(2). These tests are Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP). The results of the tests are reported in table (3.3) and table (3.4).

All variables are converted into logarithmic form and "Δ" shows their first difference.

Table (3.3) and table (3.4) shows LNGDPF, LNGDPH, LNRER and LNTB variables are stationary in the first-difference, the order of integration of LNGDPF, LNGDPH, LNRER and LNTB are I(1).

Table 3.3. *Augmented Dickey-Fuller (ADF) test for Model 1*

Augmented Dickey-Fuller (ADF) Test

	t-statistic	**Prob.**	**%1**	**%5**	**%10**
Δ LNGDPF	**-7.071924*** **	**0.0000**	**-4.113017**	**-3.483970**	**-3.170071**
Δ LNGDPH	**-6.760955*** **	**0.0000**	**-4.113017**	**-3.483970**	**-3.170071**
Δ LNRER	**-4.692241*** **	**0.0021**	**-4.137279**	**-3.495295**	**-3.176618**
Δ LNTB	**-5.551309*** **	**0.0001**	**-4.113017**	**-3.483970**	**-3.170071**
Note: ***, ** and * are shows significance level respectively 1%, 5% and 10%.					

Table 3.4. *Phillips-Perron (PP) test for Model 1.*

Phillips-Perron (PP) Test

	t-statistic	Prob.	%1	%5	%10
Δ LNGDPF	**-7.071924*** **	**0.0000**	**-4.113017**	**-3.483970**	**-3.170071**
Δ LNGDPH	**-6.737547*** **	**0.0000**	**-4.113017**	**-3.483970**	**-3.170071**
Δ LNRER	**-11.36251*** **	**0.0000**	**-4.113017**	**-3.483970**	**-3.170071**
Δ LNTB	**-5.531480*** **	**0.0001**	**-4.113017**	**-3.483970**	**-3.170071**
Note: ***, ** and * are shows significance level respectively 1%, 5%, and 10%.					

We also use unit root test with break. The table (3.5) presents that break point date of variables. From the table (3.5) all variables are statistically significant in the first-difference I(1). According to the test results LNGDPF's break point date is 2015Q1, LNGDPH's break point date is 2009Q1, LNRER's break point date is 2006Q2 and LNTB's break point date is 2016Q3.

Table 3.5 *Break Point test for Model 1*

Unit Root with Break Test

	t-statistic	Prob.	%1	%5	%10	Break Date:
Δ LNGDPF	**-8.523373**	**< 0.01**	**-5.719131**	**-5.175710**	**-4.893950**	**2015Q1**
Δ LNGDPH	**-8.345409**	**< 0.01**	**-5.719131**	**-5.175710**	**-4.893950**	**2009Q1**
Δ LNRER	**-9.691467**	**< 0.01**	**-5.719131**	**-5.175710**	**-4.893950**	**2006Q2**
Δ LNTB	**-6.878123**	**< 0.01**	**-5.719131**	**-5.175710**	**-4.893950**	**2016Q3**

Table 3.6 *F-Bounds test statistic for Model 1*

F-Bounds Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	**14.33828**	**10%**	**2.37**	**3.2**
k	**3**	**5%**	**2.79**	**3.67**
		2.5%	**3.15**	**4.08**
		1%	**3.65**	**4.66**

In (3.6) we calculated F-statistic value (14.33828) is greater than the 10%, 5%, %2.5 and 1% significance levels. So, the null hypothesis is rejected. It is found that there is a co-integration relationship between the variables. Therefore, it is possible to state that there is a long-term relationship among the LNTB, LNRER, LNGDPH and LNGDPF.

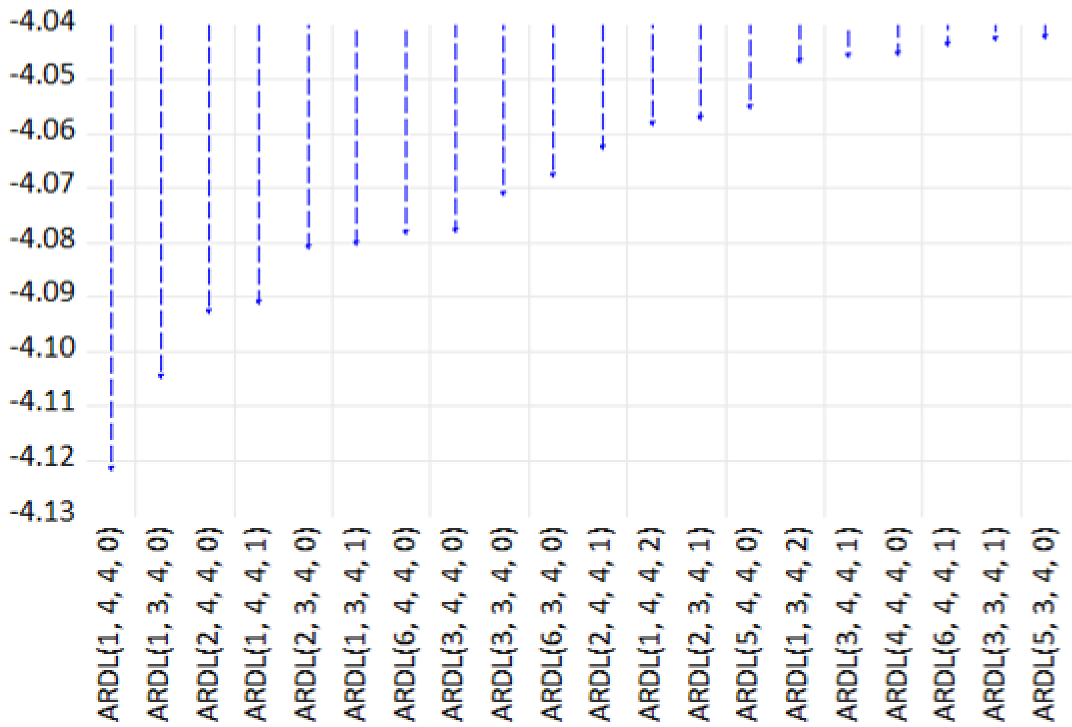

Figure 3.2. *Model selection criteria (AIC) for Model 1*

Figure (3.2) shows the optimal model of ARDL for the Akaike Information Criteria. The first step of the ARDL model is the determination of the appropriate lag length. At this stage, variables are tested with different lag combinations and the model that gives the lowest value according to the information criteria is selected as the appropriate model. In this study, the optimal lag length was determined as 4 considering the minimum (AIC) value.

We estimated ARDL model and we used Akaike Information Criteria for optimal lag length. The model's maximum lag order is 4. ARDL (1, 4, 4, 0) is shown the optimal lag length select based on (AIC). ARDL model explains the co-integration relationship between variables.

Table 3.7 *Autoregressive Distributed Lags (ARDL) model estimation for Model 1*

Dependent Variable: LNTB				
Sample (adjusted): 2004Q 2018Q4				
Included observations: 60 after adjustments				
Maximum dependent lags: 4 (Automatic selection)				
Model selection method: Akaike Information Criteria (AIC)				
Dynamic regressors (4 lags, automatic): LNRER LNGDPH LNGDPF				
Fixed regressors: C				
Number of models evalulated: 500				
Selected Model: ARDL(1, 4, 4, 0)				
HAC standard errors & covariance (Prewhitening with lags=3 from AIC Maxlags=3, Bartlett kernel, Newey-West fixed bandwidth=4.0000)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
LNTB(-1)	**0.430037***	**0.058755**	**7.319183**	**0.0000**
LNRER	**-0.146183***	**0.076154**	**-1.919573**	**0.0610**
LNRER(-1)	**-0.062564****	**0.029703**	**-2.106325**	**0.0405**
LNRER(-2)	**0.026420**	**0.116265**	**0.227244**	**0.8212**
LNRER(-3)	**-0.114210**	**0.079584**	**-1.435078**	**0.1579**
LNRER(-4)	**-0.121575****	**0.059931**	**-2.028580**	**0.0482**
LNGDPH	**-0.928500*****	**0.139525**	**-6.654708**	**0.0000**
LNGDPH(-1)	**-0.269015**	**0.164767**	**-1.632698**	**0.1092**
LNGDPH(-2)	**0.030138**	**0.148404**	**0.203083**	**0.8399**
LNGDPH(-3)	**0.655353*****	**0.144028**	**4.550181**	**0.0000**
LNGDPH(-4)	**0.635530*****	**0.130795**	**4.858964**	**0.0000**
LNGDPF	**-0.231300****	**0.090627**	**-2.552227**	**0.0140**
C	**2.327733*****	**0.252178**	**9.230528**	**0.0000**

R-squared	**0.925527**	**Mean dependent var**	**-0.415820**
Adjusted R-squared	**0.906512**	**S.D. dependent var**	**0.090837**
S.E. of regression	**0.027774**	**Akaike info criterion**	**-4.140293**
Sum squared resid	**0.036256**	**Schwarz criterion**	**-3.962797**
Log likelihood	**137.2088**	**Hannan-Quinn criter.**	**-3.962797**
F-statistic	**48.67486**	**Durbin-Watson stat**	**1.737171**
Prob.	**0.000000**		

Equation (3.22) shows the estimation results of ARDL model equation:

$$\begin{aligned} LNTB_t = {} & 0.430036613912LNTB_{t-1} - 0.146182815567LNRER_t \\ & - 0.0625639746472LNRER_{t-1} + 0.026420491378LNRER_{t-2} \\ & - 0.114209848709LNRER_{t-3} - 0.121575142399LNRER_{t-4} \\ & - 0.928499809299LNGDPH_t - 0.269014760999LNGDPH_{t-1} \\ & + 0.0301384760866LNGDPH_{t-2} + 0.655352954206LNGDPH_{t-3} \\ & + 0.635529706051LNGDPH_{t-4} - 0.23130007423LNGDPF_t \\ & + 2.32773316116 \end{aligned} \quad \textbf{(3.22)}$$

In the table (3.7), LNTB is dependent variable and LNRER, LNGDPH and LNGDPF are independent variables. Our model accounts for approximately 90% of trade balance performance. The real effective exchange rate, gross domestic product for Turkey and gross domestic product for foreigners are explained 90% of Turkey's trade balance.

When we look at the long-term effects, the trades balance increases 0.43% when one quarter lag of the trade balance increases by 1%, which is significant at 10%, 5% and 1% significance level. The real effective exchange rate increases by 1%, the trade balance reduces by 0.14%, which is significant at a 10% significance level. The one-quarter lag of the real effective exchange rate increases by 1%, the trade balance reduces by 0.06%, which is significant at 10% and 5% significance levels. The four-quarter lag of the real effective exchange rate increases by 1%, the trade balance reduces by 0.12%, which is significant at 10% and 5 % significance levels. When home GDP increases by 1%, the trade balance reduces by 0.92%, which is significant at 10%, 5% and 1% significance levels. The third quarter lag of home GDP increases by 1%, the trade balance increases by 0.65%, which is significant at 10%, 5% and 1% significance levels. The fourth quarter lag of home GDP increases by 1%, the trade balance increases by 0.63 %, which is significant at 10%, 5% and 1% significance levels.

According to the results of the ARDL model, domestic income has a significant effect on trade balance when compared to other variables. The effect of domestic income on the trade balance is changing from negative to positive over time. The effect of the real effective exchange rate on the trade balance starts from negative and becomes negative over time. This means that the J-Curve does not occur. In other words, the effect of the real effective exchange rate on trade balance does not turn into positive over time. The foreign GDP has no long-term impact.

Table 3.8 *Diagnostic Results for Model 1*

	F-statistic	Prob.
Serial Correlation	**0.893199**	**0.4763**
Heteroskedasticity	**2.180515**	**0.0287**

Table (3.8) provides the diagnostic test results of the estimated ARDL (1, 4, 4, 0) model. Accordingly, in the predicted model, there is no serial correlation problem. Because, model calculating by the Newey-West HAC Consistent Covariance, the damage caused by estimating the variances made by the heterogeneity in the model can be eliminated with White's Heterostic-consistent variance estimates.

CUSUM and CUSUMSQ graphs are used to determine whether the estimated ARDL model has structural break of variables, using the squares of reversible error terms and thus investigating the structural break of variables.

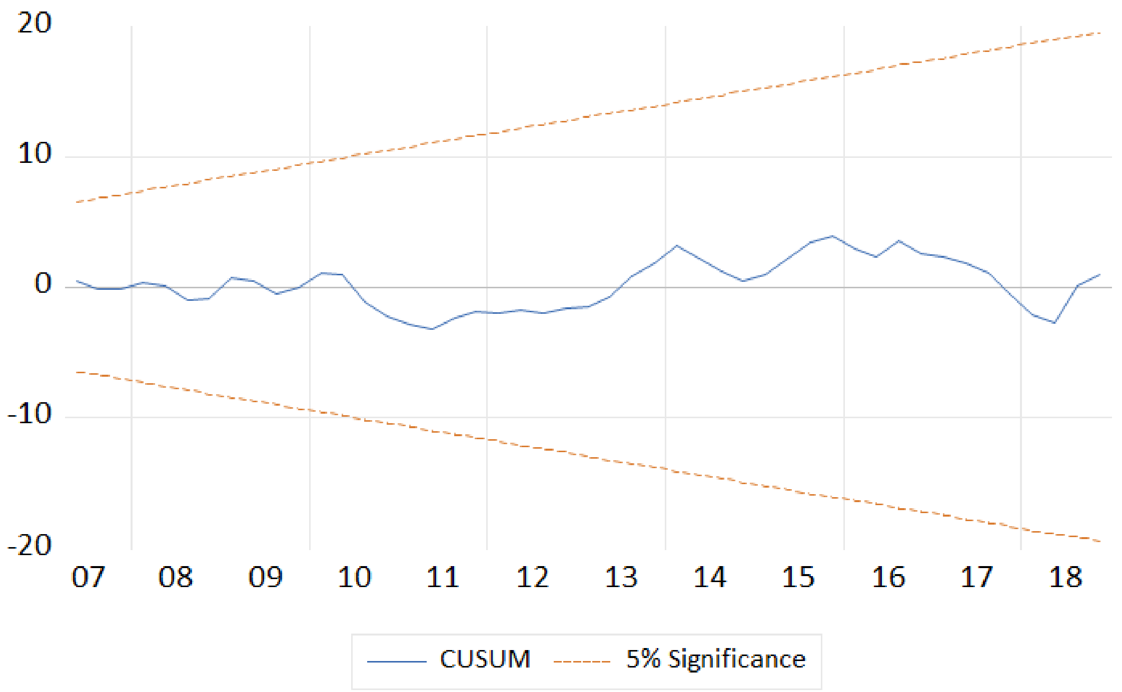

Figure 3.3 *Graph of Cumulative Sum for Model 1*

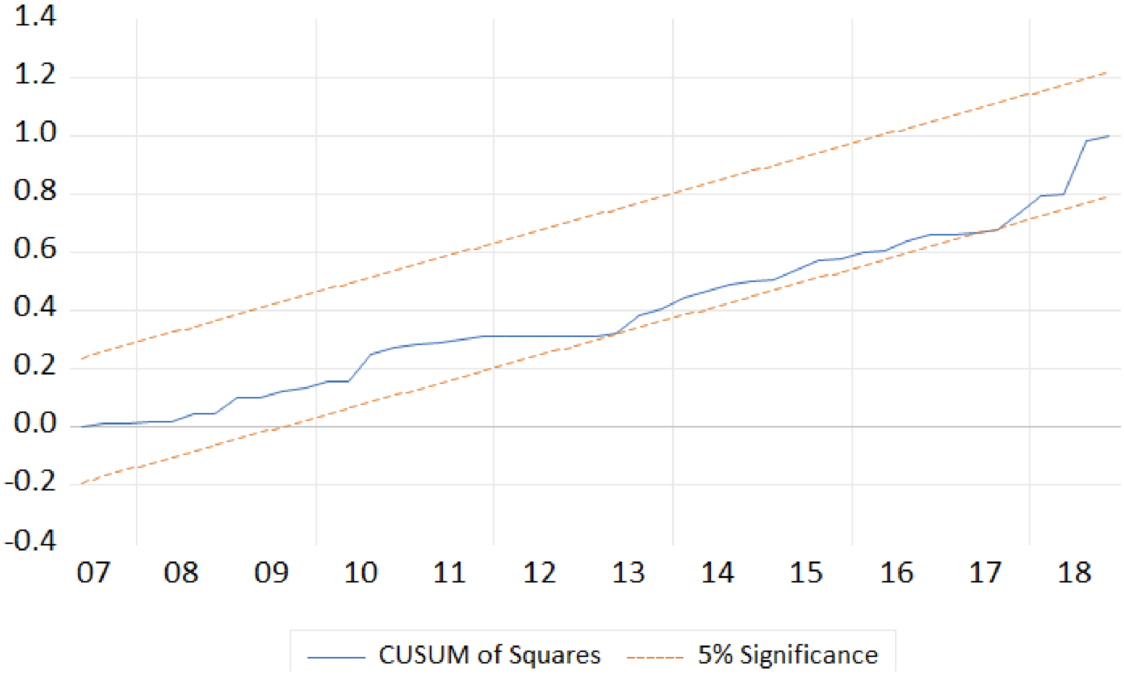

Figure 3.4 *Graph of Cumulative sum of Squares for Model 1*

If the CUSUM and CUSUMSQ statistics remain within critical bounds at a 5% significance level, the null hypothesis that the coefficient in the ARDL model is stable will be accepted. If the CUSUM plots are out of bounds, the null hypothesis, defending the stability of the coefficients, will have to be rejected.

When the CUSUM and CUSUMSQ graphs are examined, it shows that there is no structural break in the series.

Table 3.9 *Error Correction Model for Model 1*

ARDL Error Correction Regression				
Dependent Variable: D(LNTB)				
Selected Model: ARDL(1, 4, 4, 0)				
Case 2: Restricted Constant and No Trend				
Sample: 2003Q1 2018Q4				
Included observations: 60				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Δ LNRER	**-0.146183*** **	**0.053568**	**-2.728942**	**0.0089**
Δ LNRER(-1)	**0.209364*** **	**0.077697**	**2.694624**	**0.0097**
Δ LNRER(-2)	**0.235785*** **	**0.073210**	**3.220646**	**0.0023**
Δ LNRER(-3)	**0.121575***	**0.070137**	**1.733388**	**0.0896**
Δ LNGDPH	**-0.928500*** **	**0.166627**	**-5.572312**	**0.0000**
Δ LNGDPH(-1)	**-1.321021*** **	**0.196958**	**-6.707124**	**0.0000**
Δ LNGDPH(-2)	**-1.290883*** **	**0.214653**	**-6.013821**	**0.0000**
Δ LNGDPH(-3)	**-0.635530*** **	**0.215353**	**-2.951103**	**0.0049**
CointEq(-1)*	**-0.569963*** **	**0.064622**	**-8.820022**	**0.0000**

R-squared	**0.758423**	**Mean dependent var**	**0.004641**
Adjusted R-squared	**0.720529**	**S.D. dependent var**	**0.050435**
S.E. of regression	**0.026663**	**Akaike info criterion**	**-4.273626**
Sum squared resid	**0.036256**	**Schwarz criterion**	**-3.959475**
Log likelihood	**137.2088**	**Hannan-Quinn criter.**	**-4.150744**
Durbin-Watson stat	**1.737171**		

Note: *, ** and * are shows significance level respectively 1%, 5%, and 10%.**

Equation (3.23) shows co-integrating equation.

$$\Delta LNTB = -0.569963386083[LNTB_{t-1} - (-0.73357570LNRER_{t-1} + 0.21669211LNGDPH_{t-1} - 0.40581567LNGDPF + 4.08400472)]$$

(3.23)

Equation (3.24) shows error-correction equation.

$$EC_{t-1} = LNTB_{t-1} - \left(-0.73357570LNRER_{t-1} + 0.21669211LNGDPH_{t-1)} - 0.40581567LNGDPF + 4.08400472\right)$$

(3.24)

Table (3.9) shows the estimate of short-run coefficients of the ARDL model. In the short-run, Turkey's real income lagged 1 quarter, 2 quarter and 3 quarter have negative and significant impacts on Turkey's trade balance and real effective exchange rate lagged 1 quarter, 2 quarter and 3 quarter have positive and significant impacts on Turkey's trade balance.

The error correction term has negative sign and statistically significant. It means that the deviations from the balance are eliminated in the long term. The estimated value of this coefficient is -0.569963, this shows the speed of adjustment from short-run towards long-run. The speed of adjustment after one period is 56.9%.

When we look at the effects in the short term, all variables except the third quarter lag of the real effective exchange rate are statistically significant at 10%, 5% and 1%. The third quarter lag of the real effective exchange rate is significant at 10% level.

In the short run, a 1% increase in the real effective exchange rate reduces the trade balance by 0.14%. The first-quarter lag of the real effective exchange rate increases by 1%, the trade balance increase by 0.20%. The second-quarter lag of the real effective exchange rate increases by %1, the trade balance increase by 0.23%. The third-quarter lag of the real effective exchange rate increases by 1%, the trade balance increase by 0.12%. When home GDP increases by 1%, the trade balance reduces by 0.92%. The first quarter lag of home GDP increases by 1%, the trade balance reduces by 1.32%. The second quarter lag of home GDP increases by 1%, the trade balance reduces by 1.29%.The third quarter lag of home GDP increases by 1%; the trade balance reduces by 0.63%.

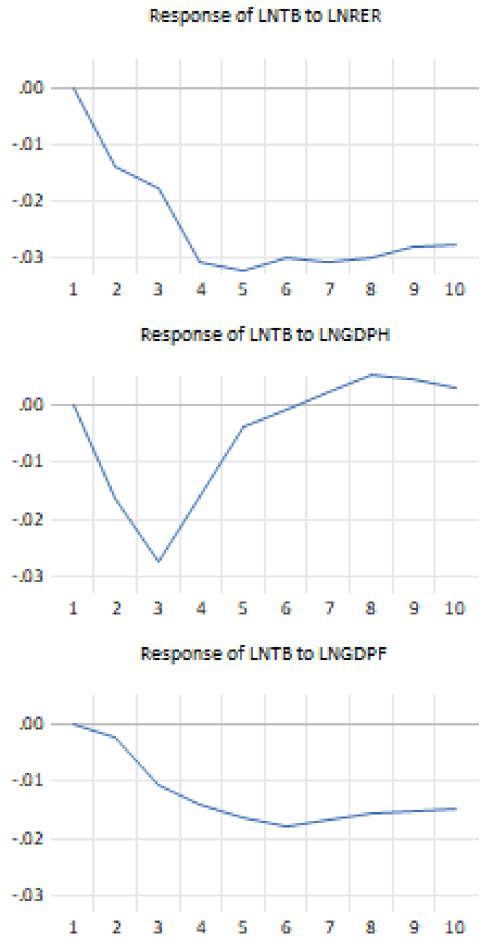

Figure 3.5 *Impulse-Response Graphs for Model 1*

Since all variables are stationary in I(1), we have also estimated the Vector Error Correction Model (VECM) model. Therefore, we examined the impulse-response functions.

Figure (3.5) shows that when one standard deviation shock applied real effective exchange rate, home GDP and foreign GDP how to effects trade balance.

Table (3.10) presents the lag lengths calculated for the VAR model according to the specified information criteria. According to the results presented in Table 3.10, it is determined that the lag length which makes FPE, AIC, SC and HQ information criteria minimum lag length is 1.

Table 3.10 *Determination of Lag Length for Model 1*

Lag	LogL	LR	FPE	AIC	SC	HQ
1	491.6601	NA	8.85e-13*	-16.40207*	-15.83367*	-16.18067*
2	506.3622	25.34840	9.32e-13	-16.35732	-15.22052	-15.91451
3	517.5032	17.67204	1.12e-12	-16.18977	-14.48457	-15.52556
4	528.7686	16.31540	1.37e-12	-16.02650	-13.75291	-15.14089
5	551.9709	30.40299*	1.13e-12	-16.27486	-13.43287	-15.16785
6	562.4927	12.33591	1.50e-12	-16.08596	-12.67557	-14.75754

The figure (3.6) shows that the inverse of AR roots is in the unit circle. It shows the dynamic stability of the model. The fact that the inverse roots of AR are in the unit circle shows that the model is dynamically stable. Therefore, the degree of VAR model to be estimated is 1.

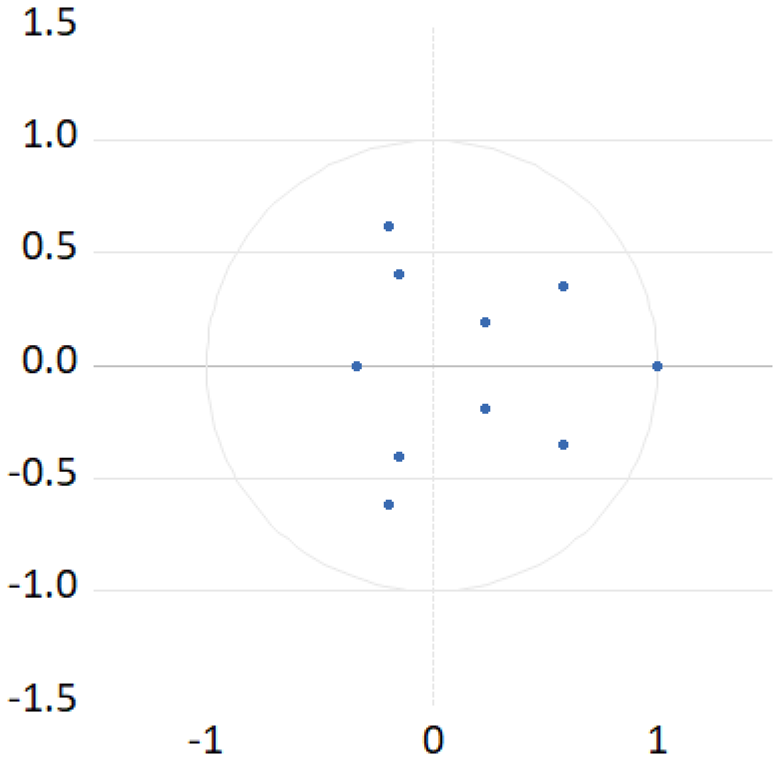

Figure 3.6. *Inverse Roots of AR Characteristic Polynominal for Model 1*

Variance decomposition helps to determine the proportion of variation of the dependent variable explained by each of the explanatory variables. Figure (3.7) shows how much LNRER, LNGDPH and LNGDPF explain the trade balance.

In the long-run, we see that the effect on trade balance is mostly explained by the real effective exchange rate. Home GDP and foreign GDP explain less than the real effective exchange rate.

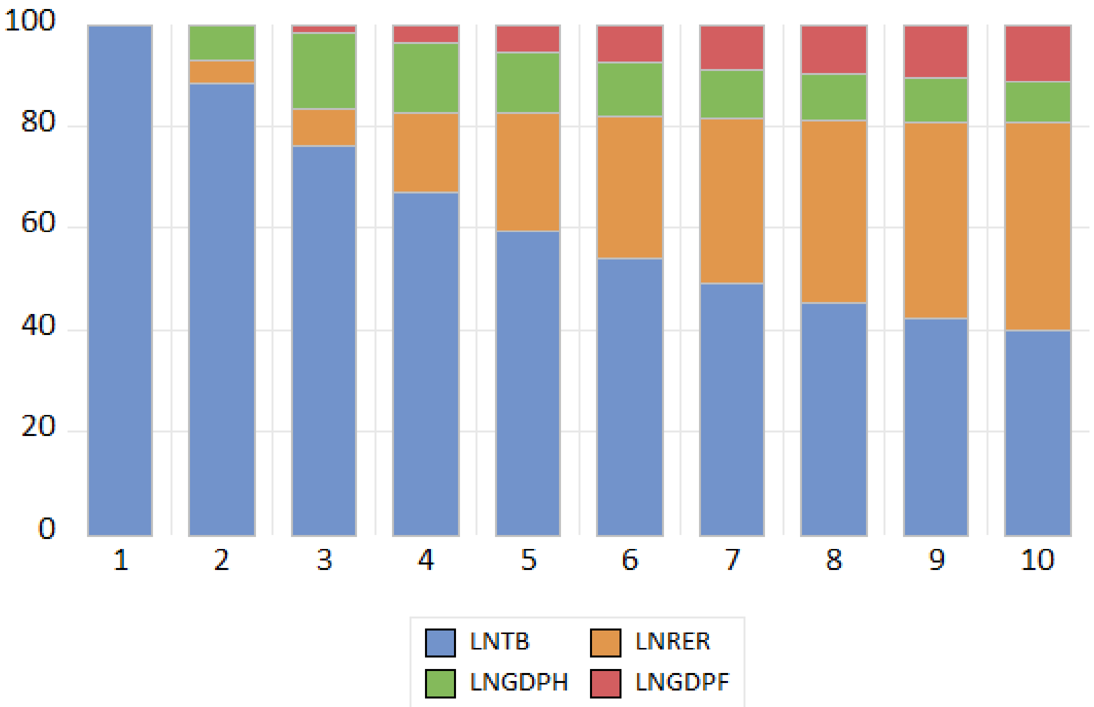

Figure 3.7. *Variance Decomposition of LNTB for Model 1*

In figure (3.8), historical decomposition shows historical fluctuations in time series modeled by the defined structural shocks and which variables affected these shocks.

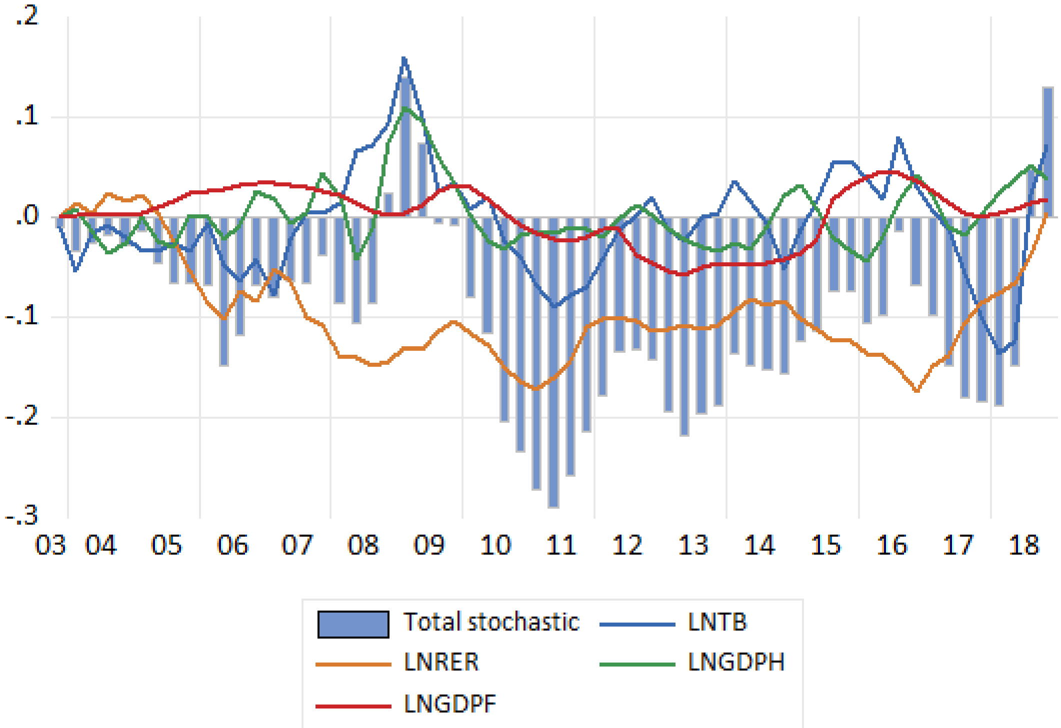

Figure 3.8. *Historical decomposition of LNTB for Model 1*

3.4.2. Estimation of model 2

Figure (3.9) shows the level graphs of the variables used in the model 2. According to the figure import, export, foreign GDP and home GDP variables show an upward trend depending on the economic growth process. The real effective exchange rate is fluctuates.

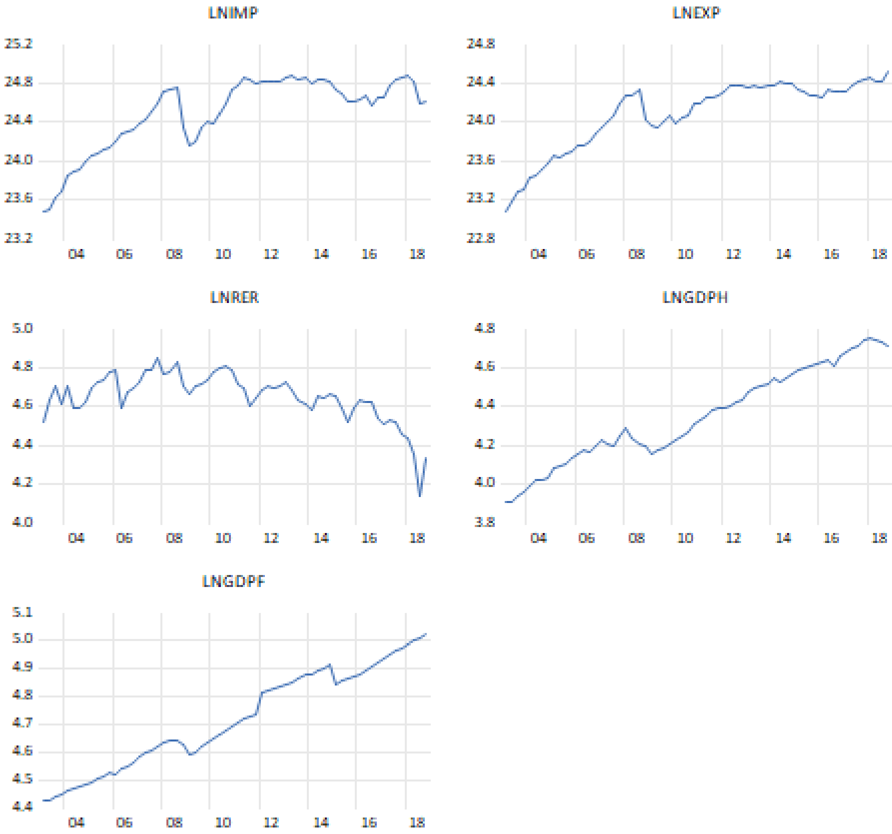

Figure 3.9 *Graph of Series Level for Model 2*

Table (3.11) and (3.12) present LNGDPF, LNGDPH, LNRER, LNEXP and LNIMP are stationary in the first-difference, the order of integration of LNGDPF, LNGDPH, LNRER, LNEXP and LNIMP are I(1).

Table 3.11 *Augmented Dickey-Fuller (ADF) test for Model 2*

Augmented Dickey-Fuller (ADF) Test

	t-statistic	**Prob.**	**%1**	**%5**	**%10**
Δ LNGDPF	**-7.071924*** **	**0.0000**	**-4.113017**	**-3.483970**	**-3.170071**
Δ LNGDPH	**-6.760955*** **	**0.0000**	**-4.113017**	**-3.483970**	**-3.170071**
Δ LNRER	**-4.692241*** **	**0.0021**	**-4.137279**	**-3.495295**	**-3.176618**
Δ LNEXP	**-6.551322*** **	**0.0000**	**-3.540198**	**-2.909206**	**-2.592215**
Δ LNIMP	**-5.463320*** **	**0.0000**	**-3.540198**	**-2.909206**	**-2.592215**
Note: ***, ** and * are shows significance level respectively 1%, 5%, and 10%.					

Table 3.12 *Phillips-Perron (PP) Test for Model 2*

Phillips-Perron (PP) Test

	t-statistic	Prob.	%1	%5	%10
Δ LNGDPF	**-7.071924*****	**0.0000**	**-4.113017**	**-3.483970**	**-3.170071**
Δ LNGDPH	**-6.737547*****	**0.0000**	**-4.113017**	**-3.483970**	**-3.170071**
Δ LNRER	**-11.36251*****	**0.0000**	**-4.113017**	**-3.483970**	**-3.170071**
Δ LNEXP	**-6.522047*****	**0.0000**	**-3.540198**	**-2.909206**	**-2.592215**
Δ LNIMP	**-5.242071*****	**0.0000**	**-3.540198**	**-2.909206**	**-2.592215**
Note: ***, ** and * are shows significance level respectively 1%, 5%, and 10%.					

The table (3.13) presents that unit root with break point of variables. All variables are statistically significant in the first-difference I(1). LNGDPF's break point date is 2015Q1, LNGDPH's break point date is 2009Q1, LNRER's break point date is 2006Q2, LNEXP's break point date is 2008Q4 and LNIMP's break point date is 2008Q4.

Table 3.13 *Break Point test for Model for Model 2*

Unit Root with Break Test

	t-statistic	Prob.	%1	%5	%10	Break Date:
Δ LNGDPF	**-8.523373**	**< 0.01**	**-5.719131**	**-5.175710**	**-4.893950**	**2015Q1**
Δ LNGDPH	**-8.345409**	**< 0.01**	**-5.719131**	**-5.175710**	**-4.893950**	**2009Q1**
Δ LNRER	**-9.691467**	**< 0.01**	**-5.719131**	**-5.175710**	**-4.893950**	**2006Q2**
Δ LNEXP	**-9.552148**	**< 0.01**	**-4.949133**	**-4.443649**	**-4.193627**	**2008Q4**
Δ LNIMP	**-7.601691**	**< 0.01**	**-4.949133**	**-4.443649**	**-4.193627**	**2008Q4**

In table (3.14), the calculated F-statistic value (11.58743) is greater than the 10%, 5%, 2.5%, and 1% significance level therefore the null hypothesis is rejected. It has been found that there is a co-integration relationship between the variables. Therefore, it is possible to state that there is a long-term relationship among the variables.

Table 3.14 *F-Bounds test statistic for Model 2*

F-Bounds Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	11.58743	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

We estimated Autoregressive Distributed Lag (ARDL) model and we used Akaike information criteria (AIC) for optimal lag length. ARDL (1, 1, 4, 4, 0).

Table 3.15 *Autoregressive Distributed Lag (ARDL) model estimation for Model 2*

Dependent Variable: LNIMP				
Sample (adjusted): 2003Q1 2018Q4				
Included observations: 60 after adjustments				
Maximum dependent lags: 4 (Automatic selection)				
Model selection method: Akaike Information Criteria (AIC)				
Dynamic regressors (4 lags, automatic): LNEXP LNRER LNGDPH LNGDPF				
Fixed regressors: C				
Number of models evalulated: 2500				
Selected Model: ARDL(1, 1, 4, 4, 0)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
LNIMP(-1)	**0.445780*** **	**0.086938**	**5.127591**	**0.0000**
LNEXP	**0.969955*** **	**0.080046**	**12.11749**	**0.0000**
LNEXP(-1)	**-0.450223*** **	**0.133502**	**-3.372415**	**0.0015**
LNRER	**0.164006** **	**0.070692**	**2.320012**	**0.0249**
LNRER(-1)	**0.062715**	**0.090718**	**0.691313**	**0.4929**
LNRER (-2)	**-0.021044**	**0.095237**	**-0.220969**	**0.8261**
LNRER (-3)	**0.117863**	**0.094798**	**1.243307**	**0.2202**
LNRER (-4)	**0.136232* **	**0.080767**	**1.686735**	**0.0986**
LNGDPH	**0.891730*** **	**0.229151**	**3.891450**	**0.0003**
LNGDPH(-1)	**0.268645**	**0.302351**	**0.888520**	**0.3790**
LNGDPH(-2)	**-0.012278**	**0.292661**	**-0.041952**	**0.9667**
LNGDPH(-3)	**-0.670566** **	**0.294305**	**-2.278475**	**0.0275**
LNGDPH(-4)	**-0.596614** **	**0.242925**	**-2.455960**	**0.0180**
LNGDPF	**0.294403* **	**0.170733**	**1.724352**	**0.0915**
C	**-2.012570*** **	**0.668009**	**-3.012787**	**0.0042**

R-squared	**0.992991**	**Mean dependent var**	**24.55787**
Adjusted R-squared	**0.990810**	**S.D. dependent var**	**0.294805**
S.E. of regression	**0.028261**	**Akaike info criterion**	**-4.082368**
Sum squared resid	**0.035940**	**Schwarz criterion**	**-3.558782**
Log likelihood	**137.4710**	**Hannan-Quinn criter.**	**-3.877565**
F-statistic	**455.3781**	**Durbin-Watson stat**	**1.762790**
Prob.	**0.000000**		

Equation (3.25) presents estimation results of the ARDL model equation.

$$
\begin{aligned}
LNIMP_t = {} & 0.445780LNIMP_{t-1} + 0.969955LNEXP_t - 0.450223LNEXP_{t-1} \\
& + 0.164006LNRER_t + 0.062715LNRER_{t-1} - 0.021044LNRER_{t-2} \\
& + 0.117863LNRER_{t-3} + 0.136232LNRER_{t-4} + 0.891730LNGDPH_t \\
& + 0.268645LNGDPH_{t-1} - 0.012278LNGDPH_{t-2} \\
& - 0.670566LNGDPH_{t-3} - 0.596614LNGDPH_{t-4} \\
& + 0.294403LNGDPF_t - 2.012570
\end{aligned}
$$

(3.25)

In the model, LNIMP is the dependent variable and LNEXP, LNRER, LNGDPH, and LNGDPF are independent variables. Our model accounts for approximately 99% of import's performance.

LNIMP(-1), LNEXP, LNEXP(-1), and LNGDPH variables are statistically significant at 10%, 5% and 1% significance level. LNRER, LNGDPH(-3), and LNGDPH(-4) variables are statistically significant at 10% and 5% significance level. LNRER(-4) and LNGDPF variables are statistically significant at 10% significance level.

In the long-term effects, the first quarter lag of the import increases 1% import increases 0.44%. When the export increase 1% the import increases 0.96%, the first quarter lag of the export increases 1% the import reduces 0.45%. When the real effective exchange rate increase 1% the import increases 0.16%, the fourth quarter lag of the real effective exchange rate increase 1% the import increases 0.13%. When the home gross domestic production increase 1% the import increases 0.89%, the third quarter lag of the home gross domestic production increase 1% the import reduces 0.67%, the fourth quarter lag of the home gross domestic production increase 1% the import reduces 0.59%. When foreign gross domestic production increase 1% the import increase's 0.29%.

According to the result of the model estimation, when Turkey's exports increase, a significant amount of its imports also increases. This shows that our export depends on import.

Table 3.16 *Diagnostic Results for Model 2*

	F-statistic	**Prob.**
Serial Correlation	**0.884163**	**0.4819**
Heteroskedasticity	**1.811161**	**0.0667**

According the diagnostic test results in table (3.16), in the predicted model, serial correlation problem and heteroskedasticity problem are not occured.

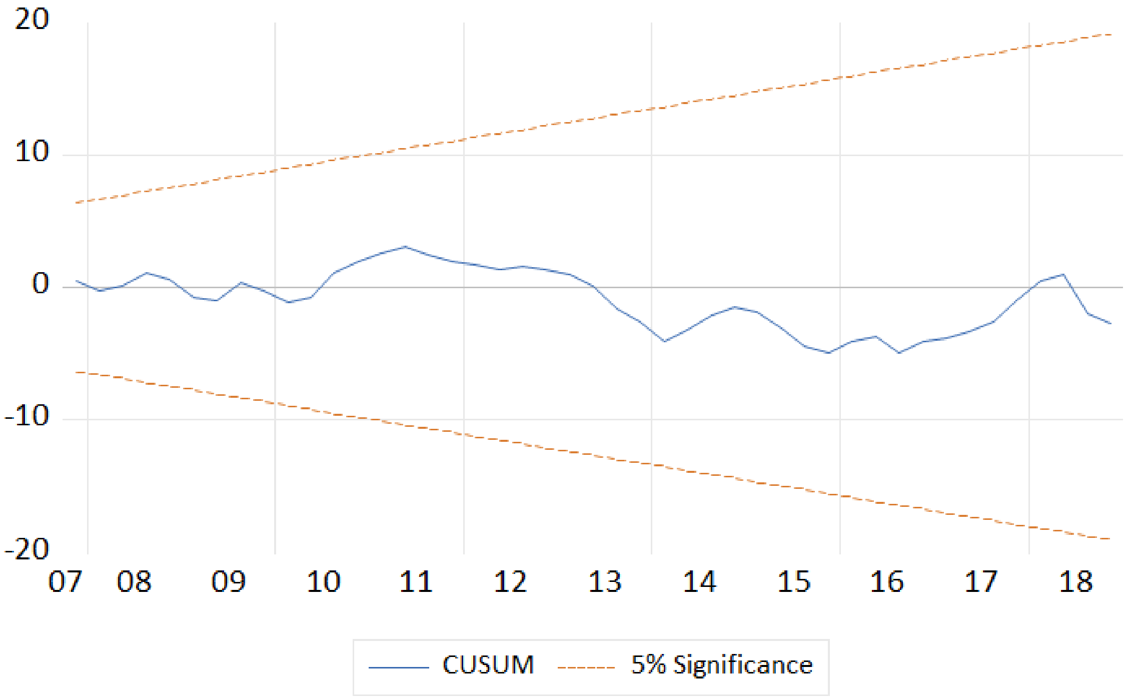

Figure 3.10 *Graph of Cumulative Sum for Model 2*

In the figure (3.10) and (3.11) the CUSUM and CUSUMSQ statistics remain within critical bounds at a 5% significance level, the null hypothesis that the coefficients in the ARDL model is stablity will be accepted.

When the CUSUM and CUSUMSQ graphs are examined, they show that there is no structural break related to the variables used in the analysis. In the long-term coefficients calculated according to ARDL Boundary Test are stable.

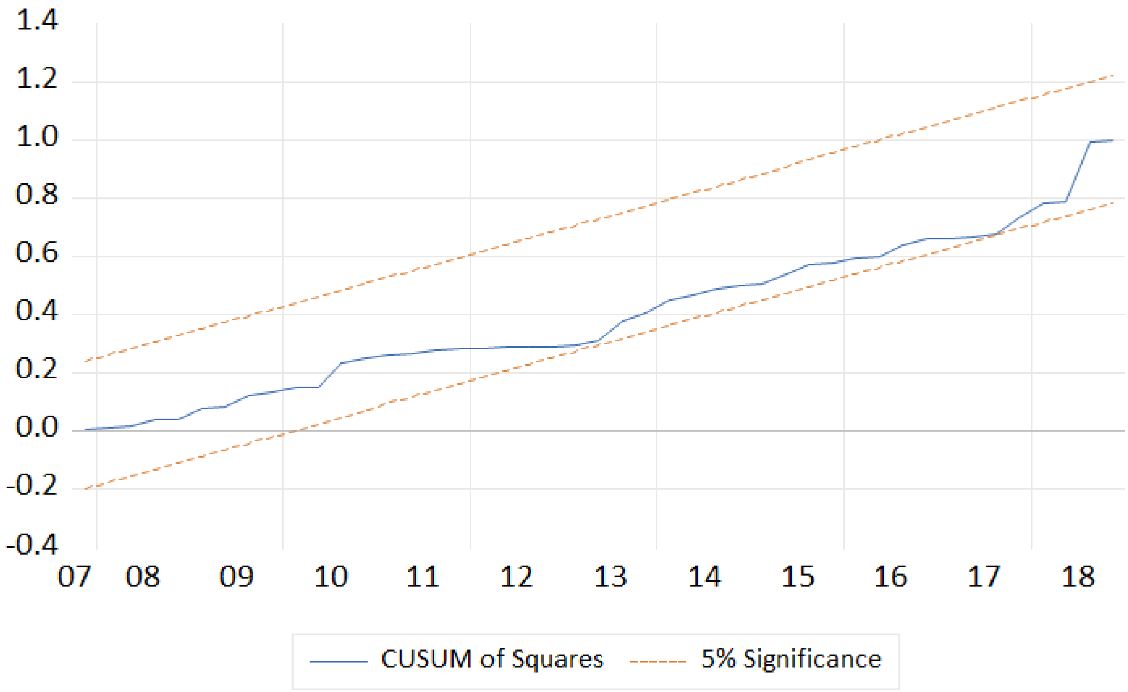

Figure 3.11 *Graph of Cumulative Sum of Square for Model 2*

Table (3.17) presents the estimate results of short-run coefficients of the ARDL model. All independent variables have a statically significant effect on the import.

Table 3.17 *Error Correction Model for Model 2*

ARDL Error Correction Regression				
Dependent Variable: D(LNIMP)				
Selected Model: ARDL(1, 1, 4, 4, 0)				
Case 2: Restricted Constant and No Trend				
Sample: 2003Q1 2018Q4				
Included observations: 60				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Δ LNEXP	**0.969955*** **	**0.072096**	**13.45360**	**0.0000**
Δ LNRER	**0.164006** **	**0.061473**	**2.667955**	**0.0106**
Δ LNRER(-1)	**-0.233051*** **	**0.079838**	**-2.919046**	**0.0055**
Δ LNRER(-2)	**-0.254096*** **	**0.074538**	**-3.408950**	**0.0014**
Δ LNRER(-3)	**-0.136232* **	**0.071190**	**-1.913633**	**0.0620**
Δ LNGDPH	**0.891730*** **	**0.178811**	**4.986995**	**0.0000**
Δ LNGDPH(-1)	**1.279458*** **	**0.195761**	**6.535818**	**0.0000**
Δ LNGDPH(-2)	**1.267180*** **	**0.223308**	**5.674578**	**0.0000**
Δ LNGDPH(-3)	**0.596614*** **	**0.214459**	**2.781945**	**0.0079**
CointEq(-1)*	**-0.554220*** **	**0.063057**	**-8.789171**	**0.0000**

R-squared	**0.925053**	**Mean dependent var**	**0.015767**
Adjusted R-squared	**0.911563**	**S.D. dependent var**	**0.090155**
S.E. of regression	**0.026810**	**Akaike info criterion**	**-4.249035**
Sum squared resid	**0.035940**	**Schwarz criterion**	**-3.899977**
Log likelihood	**137.4710**	**Hannan-Quinn criter.**	**-4.112499**
Durbin-Watson stat	**1.762790**		

Note: *, ** and * are shows significance level respectively 1%, 5% and 10%.**

Equation (3.26) shows co-integrating equation:

$$\Delta LNIMP = -0.554219560293[LNIMP_{t-1} - (0.93777313LNEXP_{t-1} + 0.82958454LNRER_{t-1} - 0.21486539LNGDPH_{t-1} + 0.53120328LNGDPF_t - 3.63135802)] \tag{3.26}$$

Equation (3.27) shows error-correction equation:

$$EC_{t-1} = LNIMP_{t-1} - (0.93777313LNEXP_{t-1} + 0.82958454LNRER_{t-1} - 0.21486539LNGDPH_{t-1} + 0.53120328LNGDPF_t - 3.63135802) \tag{3.27}$$

When we analyze the short-term effects, the exports increase 1% the import increases 0.96%. When the real effective exchange rate increase 1% the import increases 0.16%, the first quarter lag of the real effective exchange rate increase 1% the import reduces 0.23%, the second quarter lag of the real effective exchange rate increase 1% the import reduces 0.25%, the third quarter lag of the real effective exchange rate increase 1% the import reduces 0.13%. When the home gross domestic production increase 1% the import increases 0.89%, the first quarter lag of the home gross domestic production increase %1 the import increases 1.27%, the first quarter lag of the home gross domestic production increase 1% the import increases 1.26%, the third quarter lag of the home gross domestic production increase 1% the import increases 0.59%.

The error correction term has a negative sign and it is statically significant in 10%, 5% and 1% significant level. This means that the deviations from the balance are eliminated in the long term. The estimated value of this coefficient is -0.554220, this shows the speed of adjustment from short-run towards long-run. The speed of adjustment after one period is 55.4%.

3.4.3. Estimation of model 3

Table 3.18 *Descriptive Statistics of Variables for Model 3*

	LNTB	**LNRER**	**LNMPI**	**VOL**
Mean	**-0.412409**	**4.656299**	**4.326364**	**0.015121**
Median	**-0.420371**	**4.677398**	**4.319449**	**0.004194**
Maximum	**-0.003197**	**4.849840**	**4.795791**	**0.296029**
Minimum	**-0.623771**	**4.134686**	**3.784190**	**0.000555**
Std. Dev.	**0.095027**	**0.120915**	**0.272928**	**0.034604**
Skewness	**0.956705**	**-1.312956**	**-0.071586**	**5.395784**
Kurtosis	**5.698180**	**5.777322**	**1.924286**	**37.08253**
Jarque-Bera	**87.53050**	**116.8715**	**9.421264**	**10224.62**
Probability	**0.000000**	**0.000000**	**0.008999**	**0.000000**
Sum	**-79.18254**	**894.0095**	**830.6618**	**2.903174**
Sum Sq. Dev.	**1.724742**	**2.792495**	**14.22749**	**0.228717**
Observations	**192**	**192**	**192**	**192**

Figure (3.12) shows the level graphs of the variables used in the study. According to the figure, manufacturing production index variable shows an upward trend depending on the economic growth process. The trade balance fluctuates depending on the crises.

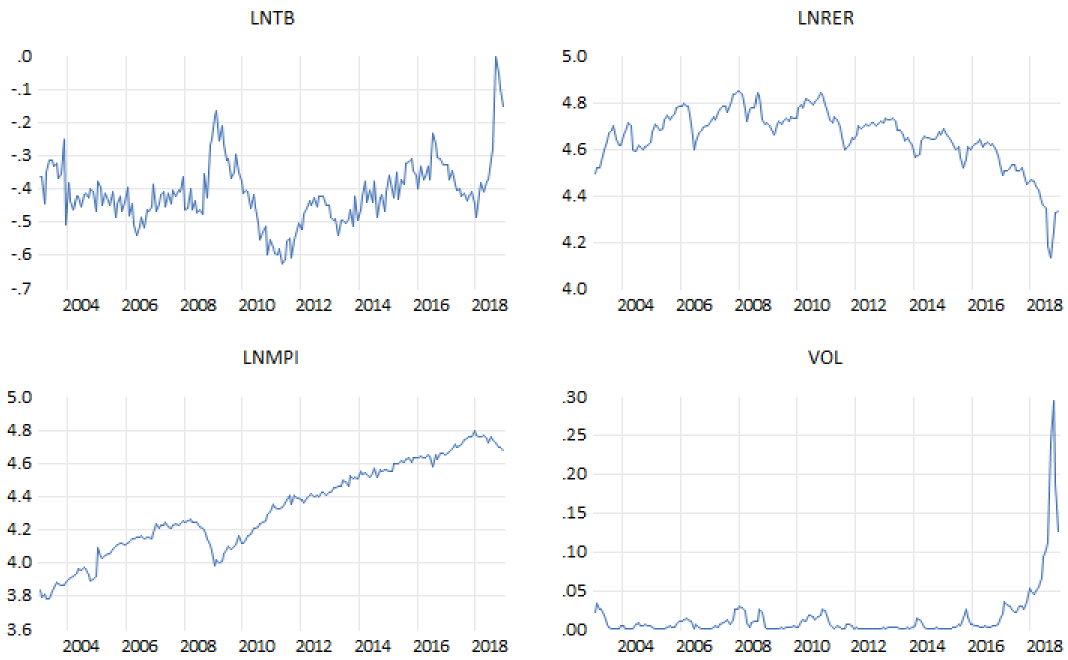

Figure 3.12 *Graph of Series Level for Model 3*

Firstly, unit root tests are used to ensure that the variables are not integrated into I (2) before starting to the analysis. These unit root tests are Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and KPSS Unit Root tests.

Tables (3.19), table (3.20), and table (3.21) present LNMPI, LNRER and LNTB are stationary in the first-difference, the order of integration of LNMPI, LNRER and LNTB are I(1). Variable VOL is stationary in the first-difference in PP and KPSS Unit Root except for ADF.

Table 3.19 *Augmented Dickey-Fuller (ADF) test for Model 3*

Augmented Dickey-Fuller (ADF) Test

	t-statistic	Prob.	%1	%5	%10
Δ VOL	**-1.509127**	**0.8232**	**-4.009271**	**-3.434706**	**-3.141378**
Δ LNMPI	**-16.55161*****	**0.0000**	**-4.007084**	**-3.433651**	**-3.140697**
Δ LNRER	**-7.903475*****	**0.0000**	**-4.007882**	**-3.434036**	**-3.140923**
Δ LNTB	**-20.86033*****	**0.0000**	**-4.007084**	**-3.433651**	**-3.140697**
Note: ***, ** and * are shows significance level respectively 1%, 5% and 10%.					

Table 3.20 *Phillips-Perron (PP) Test for Model 3*

Phillips-Perron (PP) Test

	t-statistic	Prob.	%1	%5	%10
Δ VOL	**-8.784458*****	**0.0000**	**-4.007084**	**-3.433651**	**-3.140697**
Δ LNMPI	**-16.53998*****	**0.0000**	**-4.007084**	**-3.433651**	**-3.140697**
Δ LNRER	**-10.32720*****	**0.0000**	**-4.007084**	**-3.433651**	**-3.140697**
Δ LNTB	**-21.01443*****	**0.0000**	**-4.007084**	**-3.433651**	**-3.140697**
Note: ***, ** and * are shows significance level respectively 1%, 5%, and 10%.					

Table 3.21 *KPSS Unit Root Test for Model 3*

KPSS Unit Root Test

	LM-statistic	%1	%5	%10
Δ VOL	**0.083453**	**0.216000**	**0.146000**	**0.119000**
Δ LNMPI	**0.059282**	**0.216000**	**0.146000**	**0.119000**
Δ LNRER	**0.028156**	**0.216000**	**0.146000**	**0.119000**
Δ LNTB	**0.035970**	**0.216000**	**0.146000**	**0.119000**

Table 3.22 *Break Point test for Model 3*

Unit Root with Break Test

	t-statistic	Prob.	%1	%5	%10	Break Date:
VOL	**-5.153195**	**< 0.01**	**-5.067425**	**-4.524826**	**-4.261048**	**2017M12**
Δ LNMPI	**-18.88539**	**< 0.01**	**-5.719131**	**-5.175710**	**-4.893950**	**2005M01**
Δ LNRER	**-10.95339**	**< 0.01**	**-5.719131**	**-5.175710**	**-4.893950**	**2004M05**
Δ LNTB	**-21.41210**	**< 0.01**	**-5.719131**	**-5.175710**	**-4.893950**	**2018M05**

The table (3.22) presents that break point date with unit root of variables. From the table (3.22) all variables are statistically significant in the first-difference I(1). VOL's break point date is 2017M12, LNMPI's break point date is 2005M01, LNRER's break point date is 2004M05 and LNTB's break point date is 2018M05.

Table 3.23 *F-Bounds test statistic for Model 3*

F-Bounds Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
		Asymptotic: n=1000		
F-statistic	**5.879729**	**10%**	**2.37**	**3.2**
k	**3**	**5%**	**2.79**	**3.67**
		2.5%	**3.15**	**4.08**
		1%	**3.65**	**4.66**

In table (3.23), the calculated F-statistic value (5.879729) is greater than the 10%, 5%, 2.5% and 1% significance levels. So, the null hypothesis is rejected. It is found that there is a co-integration relationship between the variables. Therefore, it is possible to state that there is a long-term relationship among the VOL, LNMPI, LNTB and LNRER.

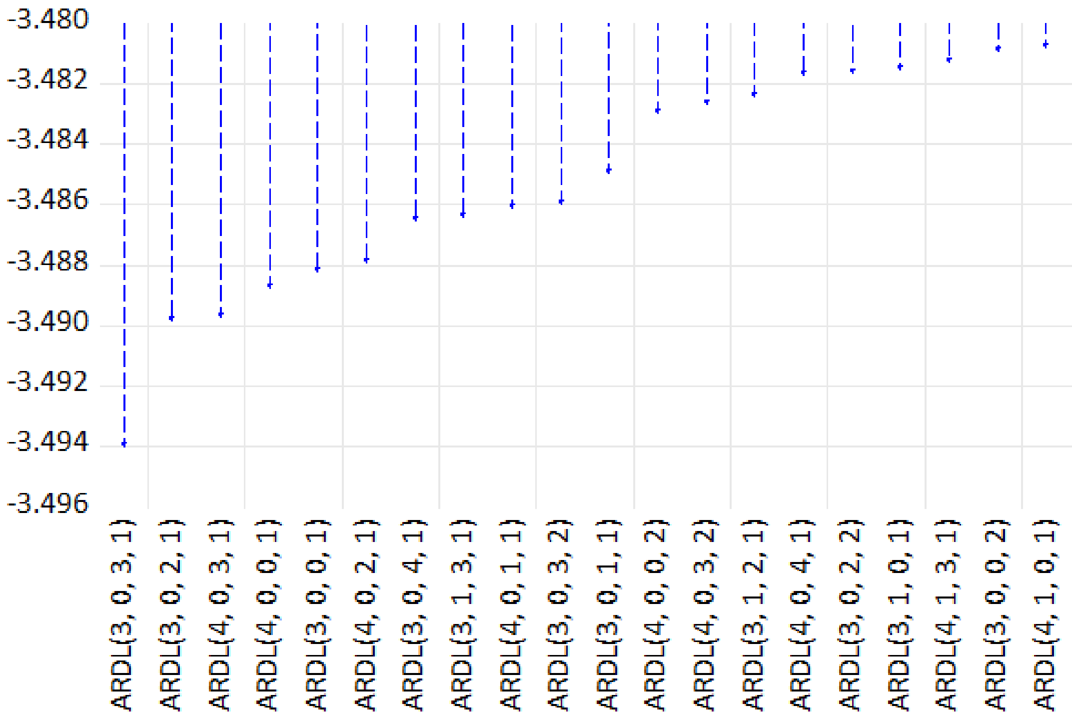

Figure 3.13 *Model selection criteria (AIC) for Model 3*

Figure (3.13) shows the optimal model of ARDL for Akaike Information Criteria. The ARDL model is to determine the appropriate lag length. In this study, the optimal lag length was determined as 4 considering the minimum (AIC) value. Optimal lag length is ARDL (3, 0, 3, 1).

Table 3.24 *Autoregressive Distributed Lags (ARDL) model estimation for Model 3*

Dependent Variable: LNTB				
Sample (adjusted): 2003M04 2018M12				
Included observations: 189 after adjustments				
Maximum dependent lags: 4 (Automatic selection)				
Model selection method: Akaike Information Criteria (AIC)				
Dynamic regressors (4 lags, automatic): LNRER LNMPI VOL				
Fixed regressors: C				
Number of models evalulated: 500				
Selected Model: ARDL(3, 0, 3, 1)				
Note: final equation sample is larger than selection sample				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
LNTB(-1)	**0.305114*** **	**0.068876**	**4.429902**	**0.0000**
LNTB(-2)	**0.382971*** **	**0.069145**	**5.538673**	**0.0000**
LNTB(-3)	**0.158368** **	**0.066362**	**2.386428**	**0.0181**
LNRER	**-0.123626*** **	**0.038645**	**-3.198989**	**0.0016**
LNMPI	**0.031754**	**0.125272**	**0.253481**	**0.8002**
LNMPI(-1)	**-0.323496** **	**0.150113**	**-2.155009**	**0.0325**
LNMPI(-2)	**0.065290**	**0.152331**	**0.428606**	**0.6687**
LNMPI(-3)	**0.209688* **	**0.123011**	**1.704627**	**0.0900**
VOL	**1.245053*** **	**0.227557**	**5.471383**	**0.0000**
VOL(-1)	**-1.022779*** **	**0.225511**	**-4.535379**	**0.0000**
DUM	**0.073322*** **	**0.019239**	**3.811116**	**0.0002**
C	**0.583004*** **	**0.211534**	**2.756082**	**0.0065**

R-squared	**0.828598**	**Mean dependent var**	**-0.412761**
Adjusted R-squared	**0.817946**	**S.D. dependent var**	**0.095622**
S.E. of regression	**0.040800**	**Akaike info criterion**	**-3.498886**
Sum squared resid	**0.294640**	**Schwarz criterion**	**-3.293061**
Log likelihood	**342.6448**	**Hannan-Quinn criter.**	**-3.415502**
F-statistic	**77.78735**	**Durbin-Watson stat**	**2.030430**
Prob.	**0.000000**		

Equation (3.28) presents the estimation results of the ARDL model.

$$LNTB_t = 0.305114 LNTB_{t-1} + 0.382971 LNTB_{t-2} + 0.158368 LNTB_{t-3} - 0.123626 LNRER_t + 0.031754 LNMPI_t - 0.323496 LNMPI_{t-1} + 0.065290 LNMPI_{t-2} + 0.209688 LNMPI_{t-3} + 1.245053 VOL_t - 1.022779 VOL_{t-1} + 0.073322 DUM + 0.583004 \tag{3.28}$$

ARDL model explains co-integration relationship between variables. LNTB is dependent variable and LNRER, LNMPI and VOL are independent variables. In the long-run, our model accounts for approximately 81% of trade balance performance. Real effective exchange rate, manufacturing production index and volatility explain 81% of Turkey's trade balance.

When we look the long-term effects, all variables except LNMPI and LNMPI (-2) are statistically significant. LNMPI (-3) is statically significant in 10% significant level. LNMPI (-1) and LNTB (-3) are statically significant in 10% and 5% significant level and other variables are statically significant in 10%, 5% and, 1% significant level.

In the long-term effects, when first month lag of the trade balance increases by 1% the trade balance increases 0.30%, second month lag of the trade balance increases by 1% the trade balance increases 0.38%, third month lag of the trade balance increases by 1% the trade balance increases 0.15%. When reel effective exchande rate increases by 1% the trade balance reduces 0.12%. When the first month lag of the manufacturing production index increases by 1% the trade balance reduces 0.32%, third month lag of manufacturing production index increases by 1% the trade balance increases 0.20%. When volatility increases by 1% the trade balance increase 1.24%, the first month lag of the volatility increases by 1% the trade balance reduces 1.02%. Since the dummy variable is statistically significant, the structural change in the model is adjusted with the dummy variable.

According to the results, the increase in the real effective exchange rate affects the trade balance negatively. In other words, the appreciation of the domestic currency reduces our exports and increases our imports. The increase in the real effective exchange rate volatility affects the trade balance positively for the first time and then returns to negative.

Table 3.25 *Diagnostic Results for Model 3*

	F-statistic	Prob.
Serial Correlation	**1.192012**	**0.2926**
Heteroskedasticity	**0.843601**	**0.5968**

According the diagnostic test results in table (3.25), in the predicted model, serial correlation and heteroskedasticity problem are not occured.

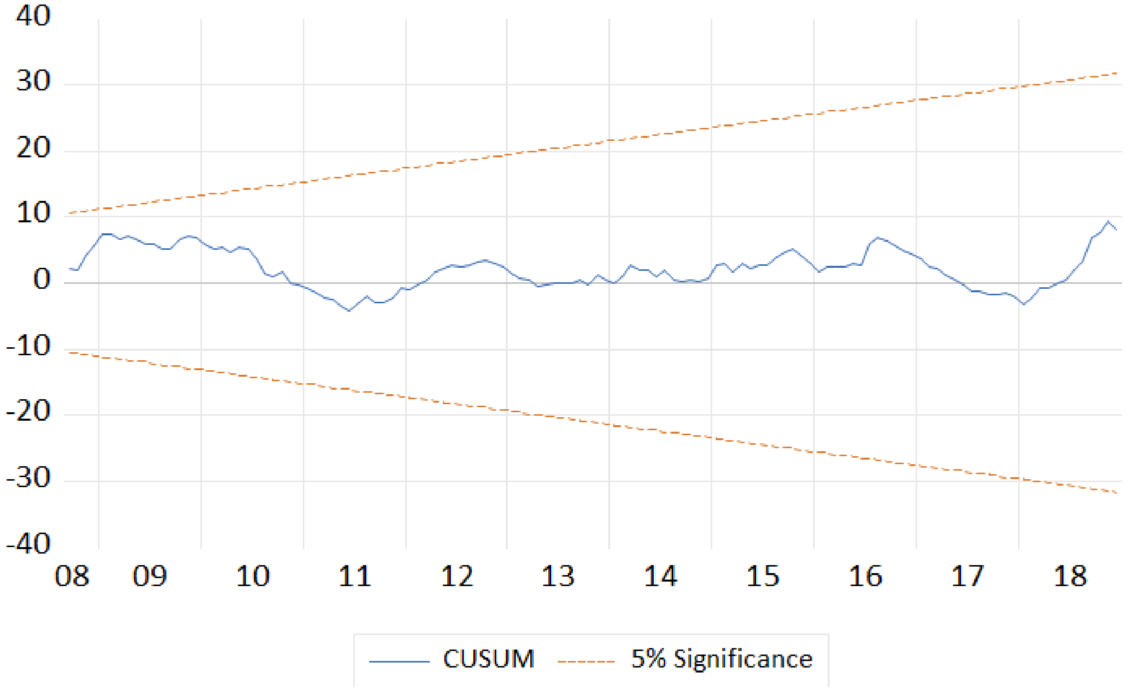

Figure 3.14 *Graph of Cumulative Sum for Model 3*

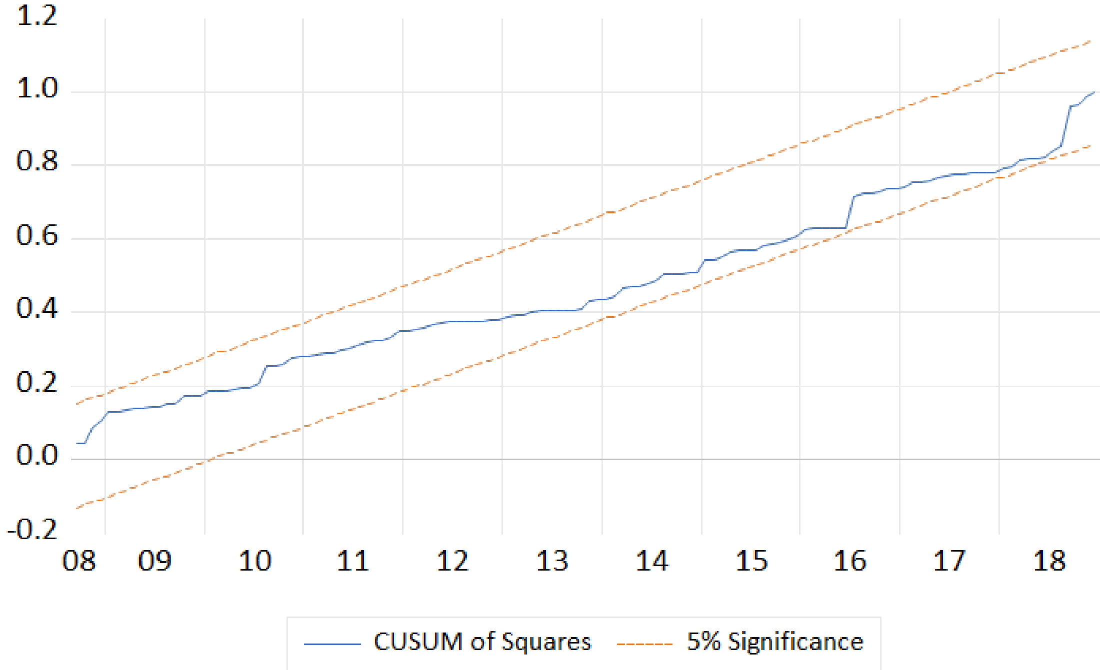

Figure 3.15 *Graph of Cumulative Sum of Square for Model 3*

CUSUM and CUSUMSQ graphs are used to determine whether the estimated ARDL model has structural break of variables. Figure (3.14) and figure (3.15) shows that there is no structural breakage related to the variables used in the analysis.

Table 3.26 *Error Correction Model for Model 3*

ARDL Error Correction Regression				
Dependent Variable: D(LNTB)				
Selected Model: ARDL(3, 0, 3, 1)				
Case 2: Restricted Constant and No Trend				
Sample: 2003M01 2018M12				
Included observations: 189				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Δ LNTB(-1)	**-0.541339*** **	**0.063214**	**-8.563649**	**0.0000**
Δ LNTB(-2)	**-0.158368** **	**0.061661**	**-2.568343**	**0.0110**
Δ LNMPI	**0.031754**	**0.116534**	**0.272488**	**0.7856**
Δ LNMPI(-1)	**-0.274978** **	**0.119398**	**-2.303037**	**0.0224**
Δ LNMPI(-2)	**-0.209688* **	**0.115104**	**-1.821732**	**0.0702**
Δ VOL	**1.245053*** **	**0.210772**	**5.907114**	**0.0000**
DUM	**0.073322*** **	**0.017265**	**4.246762**	**0.0000**
**CointEq(-1)* **	**-0.153547*** **	**0.028004**	**-5.482975**	**0.0000**

R-squared	**0.462219**	**Mean dependent var**	**0.001541**
Adjusted R-squared	**0.441420**	**S.D. dependent var**	**0.053984**
S.E. of regression	**0.040347**	**Akaike info criterion**	**-3.541214**
Sum squared resid	**0.294640**	**Schwarz criterion**	**-3.403998**
Log likelihood	**342.6448**	**Hannan-Quinn criter.**	**-3.485625**
Durbin-Watson stat	**2.030430**		
Note: *, ** and * are shows significance level respectively 1%, 5%, and 10%.**			

Equation (3.29) shows co-integrating equation:

$$\Delta LNTB = -0.153547008931[LNTB_{t-1} - (-0.80513712LNRER_t - 0.10917834LNMPI_{t-1} + 1.44759628VOL_{t-1} + 3.79691120)]$$

(3.29)

Equation (3.30) shows error-correction equation:

$$EC_{t-1} = LNTB_{t-1} - (-0.80513712LNRER_t - 0.10917834LNMPI_{t-1} + 144759628VOL_{t-1} + 3.79691120)$$

(3.30)

In table (3.26), all independent variables have a statically significant effect on the trade balance except for LNMPI. LNMPI (-2) is statically significant in 10% significant level. LNTB (-2) and LNMPI (-1) are statically significant in 10% and 5% significant level. Other variables are statically significant in 10%, 5% and 1% significant level.

In the short run, first month lag of the trade balance increases by 1% the trade balance reduces 0.54%, second month lag of the trade balance increases by 1% the trade balance reduces 0.15%. When the first month lag of the manufacturing production index increases by 1% the trade balance reduces 0.27%, second month lag of manufacturing production index increases by 1% the trade balance reduces 0.20%. When the volatility increases by 1% the trade balance increases 1.24%. In the short-term, the DUM variable is statistically significantly, the structural change in the model is adjusted with the dummy variable.

The error correction term has negative sign and statically significant in 10%, 5% and 1% significant level. This means that the deviations from the balance are eliminated in the long term. The estimated value of this coefficient is -0.153547, this shows the speed of adjustmentfrom short-run towards long-run. The speed of adjustment after one period is 15.3%.

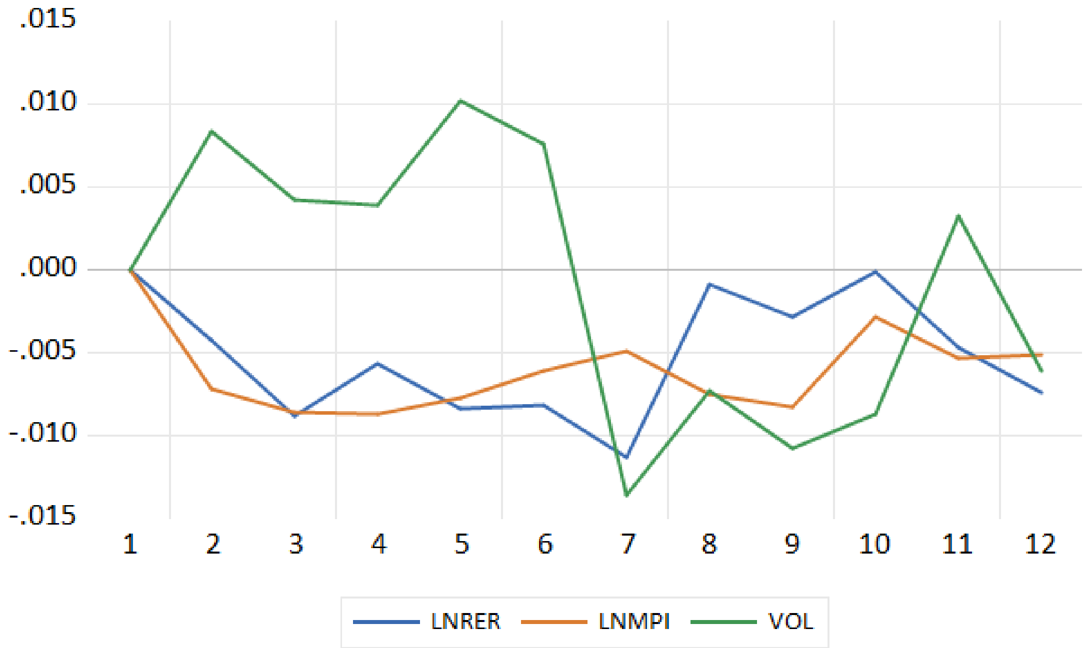

Figure 3.16 *Impulse-Response Graphs for Model 3*

Figure (3.16) shows that when one standard deviation shock applied real effective exchande rate, manufacturing production index and volatility how to effects trade balance.

The impulse-response results show that when a standard deviation shock is applied, the trade balance deteriorates from the first periods and then an improvement occurs. In the volatility case, when applied a standard deviation shock trade balance is affected positively in the first periods and then negatively. Manufacturing production index appears to have a negative impact on trade balance.

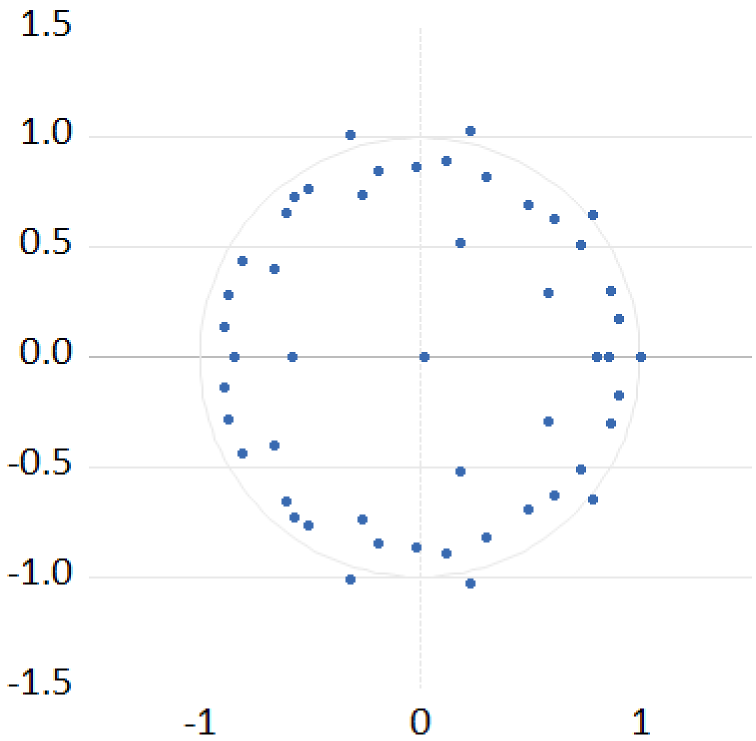

Figure 3.17 *Inverse Roots of AR Characteristic Polynominal for Model 3*

The figure (3.17) shows that the inverse of AR roots is in the unit circle. It shows the dynamic stability of the model. The fact that the inverse roots of AR are in the unit circle shows that the model is dynamically stable but in figure (3.14) have dots out of circle because of using dummy variables in the model.

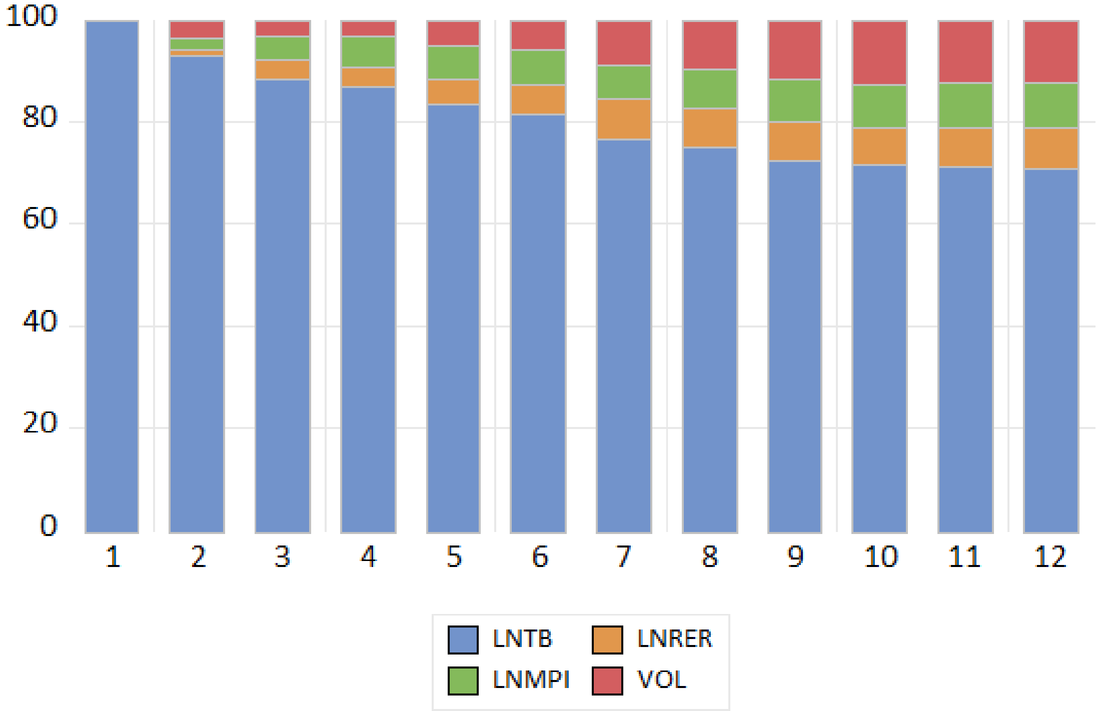

Figure 3.18 *Variance Decomposition of LNTB for Model 3*

Figure (3.18) shows variance decomposition of trade balance. It is helps to determine the proportion of variation of the dependent variable explained by each of the explanatory variables. Thus it shows how much LNRER, LNMPI and VOL explain the trade balance. Trade balance is mostly explained by volatility.

2.3.1. Estimation of model 4

Figure (3.19) shows the level graphs of the variables. According to the figure, impot index, export index and manufacturing production index variables shows an upward trend depending on the economic growth process. The volatility fluctuates depending on the real effective exchange rate variable.

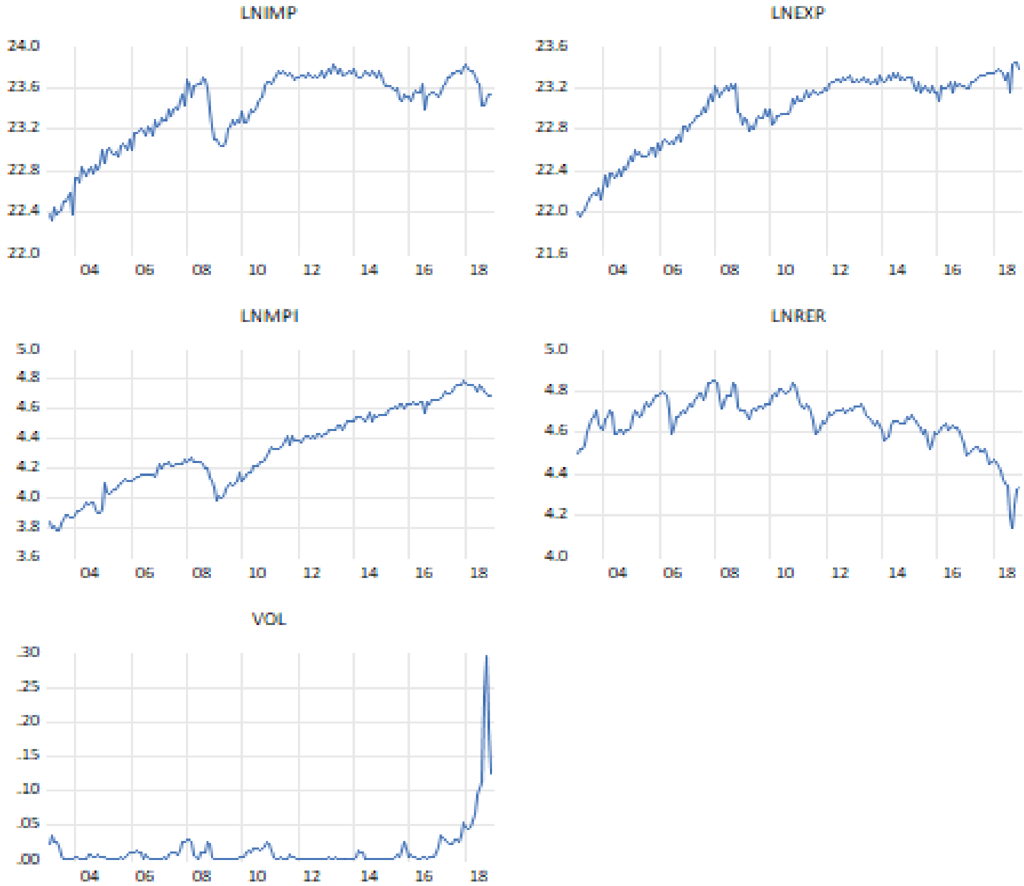

Figure 3.19 *Graph of Series Level for Model 4*

Table (3.27), table (3.28) and table (3.29) present unit root test results. These are ADF, PP and KPSS Unit Root tests. Table (3.27), table (3.28) and table (3.29) present LNMPI, LNRER, LNEXP and LNIMP are stationary in the first-difference, the order of integration of LNMPI, LNRER, LNEXP and LNIMP are I(1). Variable VOL is stationary in the first-difference in PP and KPSS Unit Root except for ADF.

Table 3.27 *Augmented Dickey-Fuller (ADF) test for Model 4*

Augmented Dickey-Fuller (ADF) Test

	t-statistic	**Prob.**	**%1**	**%5**	**%10**
Δ VOL	**-1.509127**	**0.8232**	**-4.009271**	**-3.434706**	**-3.141378**
Δ LNMPI	**-16.55161*** **	**0.0000**	**-4.007084**	**-3.433651**	**-3.140697**
Δ LNRER	**-7.903475*** **	**0.0000**	**-4.007882**	**-3.434036**	**-3.140923**
Δ LNEXP	**-21.10155*** **	**0.0000**	**-3.464827**	**-2.876595**	**-2.574874**
Δ LNIMP	**-4.007390*** **	**0.0000**	**-3.467205**	**-2.877636**	**-2.575430**
Note: ***, ** and * are shows significance level respectively 1%, 5%, and 10%.					

Table 3.28 *Phillips-Perron (PP) Test for Model 4*

Phillips-Perron (PP) Test

	t-statistic	**Prob.**	**%1**	**%5**	**%10**
Δ VOL	**-8.784458*** **	**0.0000**	**-4.007084**	**-3.433651**	**-3.140697**
Δ LNMPI	**-16.53998*** **	**0.0000**	**-4.007084**	**-3.433651**	**-3.140697**
Δ LNRER	**-10.32720*** **	**0.0000**	**-4.007084**	**-3.433651**	**-3.140697**
Δ LNEXP	**-21.21219*** **	**0.0000**	**-3.464827**	**-2.876595**	**-2.574874**
Δ LNIMP	**-17.24895*** **	**0.0000**	**-3.464827**	**-2.876595**	**-2.574874**
Note: ***, ** and * are shows significance level respectively 1%, 5% and 10%.					

Table 3.29 *KPSS Unit Root Test for Model 4*

KPSS Unit Root Test

	LM-statistic	**%1**	**%5**	**%10**
Δ VOL	**0.083453**	**0.216000**	**0.146000**	**0.119000**
Δ LNMPI	**0.059282**	**0.216000**	**0.146000**	**0.119000**
Δ LNRER	**0.028156**	**0.216000**	**0.146000**	**0.119000**
Δ LNEXP	**0.349942**	**0.739000**	**0.463000**	**0.347000**
Δ LNIMP	**0.378037**	**0.739000**	**0.463000**	**0.347000**

The table (3.30) presents that break point date with unit root of variables. From the table all variables are statistically significant in the first-difference I(1). VOL's break point date is 2017M12, LNMPI's break point date is 2005M01, LNRER's break point date is 2004M05, LNEXP's break point date is 2008M10 and LNIMP's break point date is 2008M12.

Table 3.30 *Break Point test for Model 4*

Unit Root with Break Test

	t-statistic	Prob.	%1	%5	%10	Break Date:
VOL	-5.153195	< 0.01	-5.067425	-4.524826	-4.261048	2017M12
Δ LNMPI	-18.88539	< 0.01	-5.719131	-5.175710	-4.893950	2005M01
Δ LNRER	-10.95339	< 0.01	-5.719131	-5.175710	-4.893950	2004M05
Δ LNEXP	-22.88608	< 0.01	-4.949133	-4.443649	-4.193627	2008M10
Δ LNIMP	-18.19451	< 0.01	-4.949133	-4.443649	-4.193627	2008M12

In (3.31), the calculated F-statistic value (5.071947) is greater than the 10 %, 5 %, 2.5 % and 1 % significance levels. So, the null hypothesis is rejected. It is found that there is a co-integration relationship between the variables.

Table 3.31 *F-Bounds test statistic for Model 4*

F-Bounds Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	5.071947	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Figure (3.20) shows the optimal model of ARDL for Akaike Infotmation Criteria. In this study, the optimal lag length was determined as 4 considering the minimum (AIC) value. Optimal lag length is ARDL(4, 3, 0, 0, 1).

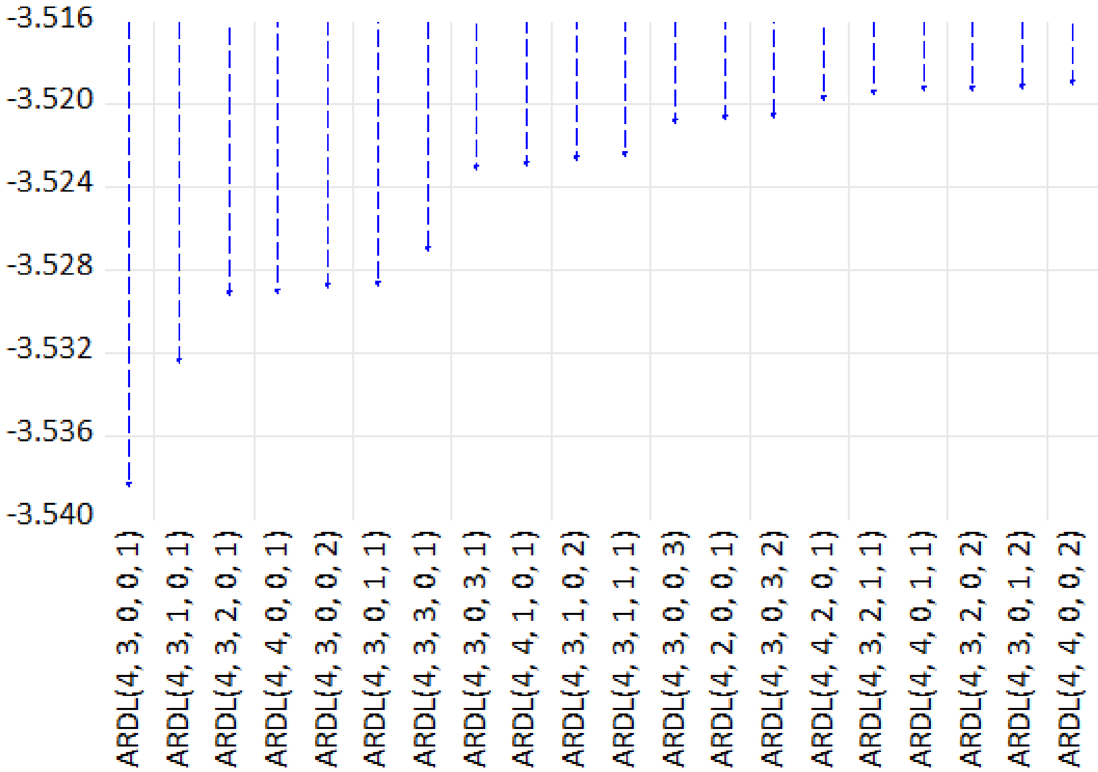

Figure 3.20 *Model selection criteria (AIC) for Model 4*

Table 3.32 *Autoregressive Distributed Lags (ARDL) model estimation for Model 4*

Dependent Variable: LNIMP				
Sample (adjusted): 2003M05 2018M12				
Included observations: 188 after adjustments				
Maximum dependent lags: 4 (Automatic selection)				
Model selection method: Akaike Information Criteria (AIC)				
Dynamic regressors (4 lags, automatic): LNEXP LNMPI LNRER VOL				
Fixed regressors: DUM C				
Number of models evalulated: 2500				
Selected Model: ARDL(4, 3, 0, 0, 1)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
LNIMP(-1)	**0.348714*** **	**0.068807**	**5.068009**	**0.0000**
LNIMP(-2)	**0.373221*** **	**0.074411**	**5.015673**	**0.0000**
LNIMP(-3)	**0.274902*** **	**0.072276**	**3.803525**	**0.0002**
LNIMP(-4)	**-0.165585*** **	**0.047810**	**-3.463371**	**0.0007**
LNEXP	**0.847838*** **	**0.063371**	**13.37903**	**0.0000**
LNEXP(-1)	**-0.195347** **	**0.085940**	**-2.273057**	**0.0242**
LNEXP(-2)	**-0.301755*** **	**0.085709**	**-3.520706**	**0.0005**
LNEXP(-3)	**-0.182352** **	**0.081401**	**-2.240164**	**0.0263**
LNMPI	**0.015267**	**0.037777**	**0.404131**	**0.6866**
LNRER	**0.122581** **	**0.051140**	**2.396966**	**0.0176**
VOL	**-1.027027*** **	**0.238066**	**-4.314044**	**0.0000**
VOL(-1)	**0.834904*** **	**0.235568**	**3.544209**	**0.0005**
DUM	**-0.080831*** **	**0.020290**	**-3.983699**	**0.0001**
C	**-0.555317**	**0.358438**	**-1.549269**	**0.1231**

R-squared	**0.987856**	**Mean dependent var**	**23.41862**
Adjusted R-squared	**0.986948**	**S.D. dependent var**	**0.348371**
S.E. of regression	**0.039799**	**Akaike info criterion**	**-3.538379**
Sum squared resid	**0.275615**	**Schwarz criterion**	**-3.297368**
Log likelihood	**346.6077**	**Hannan-Quinn criter.**	**-3.440730**
F-statistic	**1088.735**	**Durbin-Watson stat**	**2.047547**
Prob.	**0.000000**		

Equation (3.31) shows the ARDL model equation:

$$
\begin{aligned}
LNIMP_t = {} & 0.348714LNIMP_{t-1} + 0.373221LNIMP_{t-2} + 0.274902LNIMP_{t-3} \\
& - 0.165585LNIMP_{t-4} + 0.847838LNEXP_t - 0.195347LNEXP_{t-1} \\
& - 0.301755LNEXP_{t-2} - 0.182352LNEXP_{t-3} + 0.015267LNMPI_t \\
& + 0.122581LNRER_t - 1.027027VOL_t + 0.834904VOL_{t-1} \\
& - 0.080831DUM - 0.555317
\end{aligned}
\tag{3.31}
$$

In the long-run, our model accounts for approximately 98% of import performance. Real effective exchange rate, manufacturing production index, export and volatility explain 98% of Turkey's import.

The results show that the long-term effects, all variables are statistically significant except LNMPI.

In the long-term effects, when first month lag of the import increases by 1% the import increases 0.34%, second month lag of the import increases by 1% the improt increases 0.37%, third month lag of the import increases by 1% the import increases 0.27%, fourth month lag of the import increases by 1% the import reduces 0.16%. When export increases by 1% the import increases 0.84%, first month lag of the export increases by 1% the import reduces 0.19%, second month lag of the export increases by 1% the import reduces 0.30%, third month lag of the export increases by 1% the import reduces 0.18%. When reel effective exchande rate increases by 1% the import increases 0.12%. When volatility increases by 1% the export increase 1.02%, the first month lag of the volatility increases by 1% the export reduces 0.83%. Since the dum variable is statistically significant, the structural change in the model is adjusted with the dummy variable.

According to the results, imports increase when exports increase, which indicates that there is an import-dependent export. When the real effective exchange rate increases, our imports also increase. Imports decrease when real effective exchange rate volatility increases.

Table 3.33 *Diagnostic Results for Model 4*

	F-statistic	Prob.
Serial Correlation	**0.968347**	**0.4813**
Heteroskedasticity	**1.153635**	**0.3178**

According the diagnostic test results in table (3.33), in the predicted model, it has not serial correlation problem and heteroskedasticity problem.

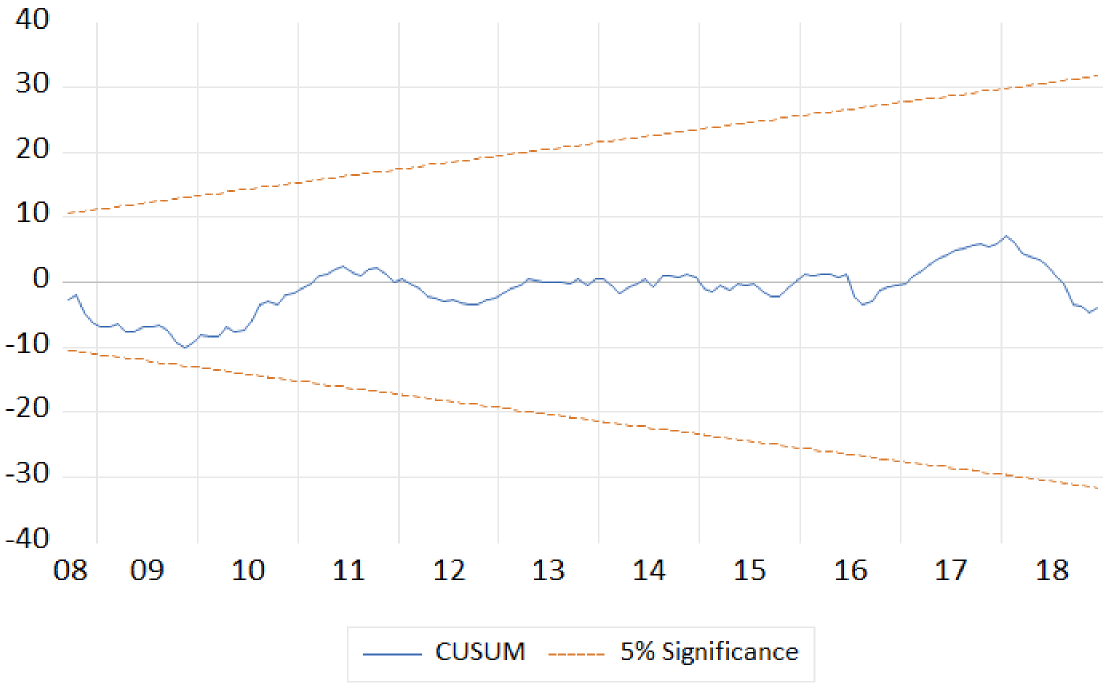

Figure 3.21 *Graph of Cumulative Sum for Model 4*

CUSUM and CUSUMSQ graphs are used to determine whether the estimated ARDL model has structural break of variables.

If the CUSUM and CUSUMSQ statistics remain within critical bounds at a 5% significance level, the H0 hypothesis that the coefficients in the ARDL model is stablity will be accepted. Figure (3.21) and figure (3.22) shows that there is no structural breakage related to the variables used in the analysis.

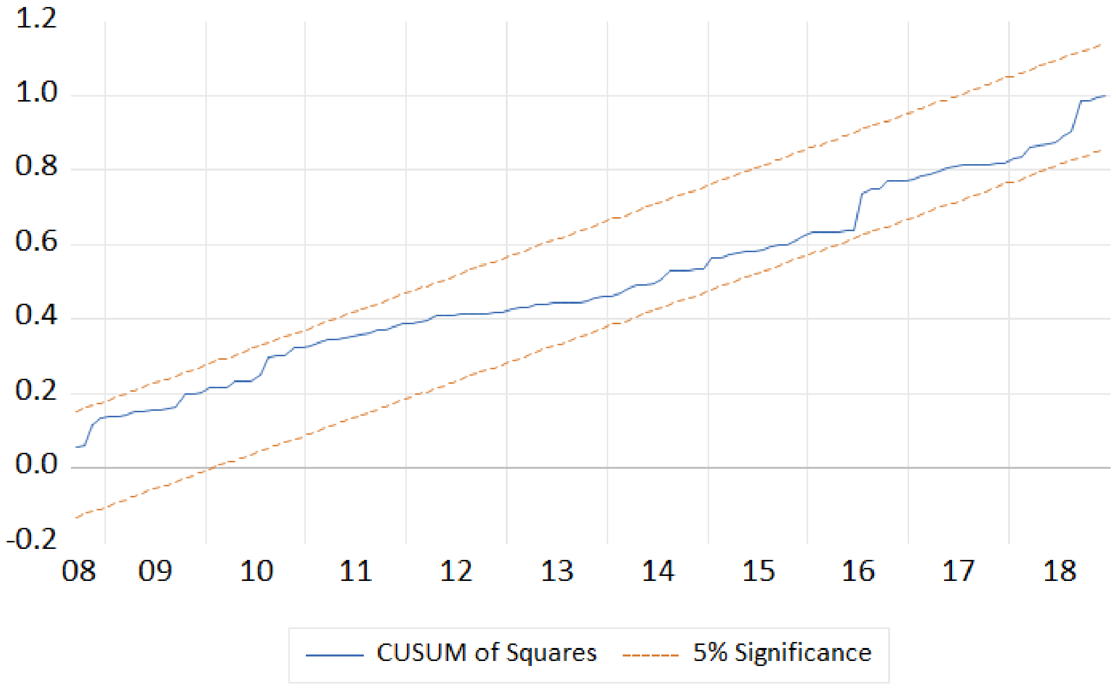

Figure 3.22 *Graph of Cumulative Sum of Square for Model 4*

Table 3.34 *Error Correction Model for Model 4*

ARDL Error Correction Regression				
Dependent Variable: D(LNIMP)				
Selected Model: ARDL(4, 3, 0, 0, 1)				
Case 2: Restricted Constant and No Trend				
Sample: 2003M01 2018M12				
Included observations: 188				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Δ LNIMP(-1)	**-0.482539*** **	**0.062844**	**-7.678396**	**0.0000**
Δ LNIMP(-2)	**-0.109317***	**0.062515**	**-1.748662**	**0.0821**
Δ LNIMP(-3)	**0.165585*** **	**0.043485**	**3.807885**	**0.0002**
Δ LNEXP	**0.847838*** **	**0.055438**	**15.29331**	**0.0000**
Δ LNEXP(-1)	**0.484107*** **	**0.078058**	**6.201872**	**0.0000**
Δ LNEXP(-2)	**0.182352** **	**0.074092**	**2.461159**	**0.0148**
Δ VOL	**-1.027027*** **	**0.219254**	**-4.684193**	**0.0000**
DUM	**-0.080831*** **	**0.017055**	**-4.739481**	**0.0000**
CointEq(-1)*	**-0.168747*** **	**0.030159**	**-5.595190**	**0.0000**

R-squared	**0.695948**	**Mean dependent var**	**0.006203**
Adjusted R-squared	**0.682359**	**S.D. dependent var**	**0.069624**
S.E. of regression	**0.039240**	**Akaike info criterion**	**-3.591571**
Sum squared resid	**0.275615**	**Schwarz criterion**	**-3.436635**
Log likelihood	**346.6077**	**Hannan-Quinn criter.**	**-3.528797**
Durbin-Watson stat	**2.047547**		
Note: *, ** and * are shows significance level respectively 1%, 5% and 10%.**			

Equation (3.32) shows co-integrating equation:

$$\Delta LNIMP = -0.168747442902[LNIMP_{t-1} - (0.99784365LNEXP_{t-1} + 0.09047112LNIMP_t + 0.72641445LNRER_t - 1.13852664VOL_{t-1} - 3.29081866)]$$

(3.32)

Equation (3.33) shows error-correction equation:

$$EC_{t-1} = LNEXP_{t-1} - (1.72149927LNRER_{t-1} + 0.97441652LNMPI_t + 15.28866461VOL_{t-1} + 10.83536551)$$

(3.33)

The error correction model shows short-term co-integration relations of variables in the ARDL model. Table (3.34) presents all independent variables have a statistically significant effect on the import. The model accounts for approximately 68% of import performance.

In the short-term effects, when first month lag of the import increases by 1% the import reduces 0.48%, second month lag of the import increases by 1% the improt reduces 0.10%, third month lag of the import increases by 1% the import increases 0.16%. When export increases by 1% the import increases 0.84%, first month lag of the export increases by 1% the import increases 0.48%, second month lag of the export increases by 1% the import increases 0.18%. When volatility increases by 1% the export reduces 1.02%. Since the dum variable is statistically significant, the structural change in the model is adjusted with the dummy variable.

The error correction term has negative sign and statistically significant in 10%, 5% and 1% significant level. This means that the deviations from the balance are eliminated in the long term. The estimated value of this coefficient is -0.168747, this shows the speed of eliminate from short-run towards long-run. 16.8% shows speed of adjustment after one period.

3. CONCLUSION REMARKS

This thesis aims to examine the validity of the J-Curve hypothesis for Turkey. For this purpose, four different models have been developed. Using these models, the effects of changes and volatility in the real effective exchange rate on the trade flows are analyzed. These models are estimated by the ARDL method by using quarterly and monthly data from 2003 through 2018.

In the first model, determinants of trade balance are examined using quarterly data. We use real effective exchange rate, home GDP, foreign GDP as explanatory variables. For the foreign GDP variable, we build a new weighted index. The sum of real GDP indices of 23 trading partners after each of index is multiplied by their respective percentage of volume in trading with Turkey. The results of the error correction model show that the trade balance has negative relationship with the real effective exchange rate and home GDP in the short-run. The results of the ARDL model show that the trade balance has a negative relationship with the real effective exchange rate, home GDP, and foreign GDP in the long-run.

In the second model, we focus on the import characteristics of the Turkish economy using quarterly data. In the model, export, real effective exchange rate, home GDP, foreign GDP as explanatory variables. The results of the error correction model show that import has a positive relationship with home GDP and exports while it has a positive relationship with real effective exchange rate, and then this relationship turn negative in the short-run. The results of the ARDL model show that import has a positive relationship with export, real effective exchange rate, home GDP and foreign GDP in the long-run.

In the third model, the effect of volatility in the real effective exchange rate is also examined using monthly data. We use volatility in the real effective exchange rate, the real effective exchange rate, and the manufacturing production index as explanatory variables. In this model, we add the volatility variable to the main model. We use the volatility of the real effective exchange rate. Because the real effective exchange rate volatility is not directly observable, we employ the GARCH (1, 1) model to obtain volatility series. After the estimation of GARCH model, conditional variance series are used for the volatility. The results of the error correction model show the trade balance has a negative relationship with its own lag, while it has a positive relationship with the real effective exchange rate volatility. Trade balance has a positive relationship with the manufacturing production index and then it turns to negative in the short-run. The results of the ARDL model show that trade balance has a positive relationship with its own lags while it has a negative relationship with lag of manufacturing production index. The trade balance has a positive relationship with real effective exchange rate volatility, and then returns to negative. Finally, the trade balance has a negative relationship with the real effective exchange rate in the long-run.

In the fourth model, we focus on the import characteristics of the Turkish economy using monthly data. In the model, export, volatility in the real effective exchange rate, real effective exchange rate, and the manufacturing production index as explanatory variables. The results of the error correction model show that there is positive relationship between import and export. Import has a negative relationship with real effective exchange rate volatility in the short-run. The results of the ARDL model show that import has a positive relationship with export and real effective exchange rates. It has a negative relationship with real effective exchange rate volatility in the long-run.

This thesis concludes that the fundamental structural problem of Turkey's economy is the usage of imported intermediate goods and inputs. Therefore, the effect of the exchange rate on trade balance differs from theoretical expectations. The main policy result of the study is that foreign trade balance might be improved by increasing the usage of domestic intermediate goods and inputs in production.

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