CANKAYA UNIVERSITY
DEPARTMENT OF ECONOMICS
THE GRADUATE SCHOOL OF SOCIAL SCIENCES

ASYMMETRIC EFFECT OF REAL EXCHANGE RATE ON THE TRADE BALANCES OF TURKISH MANUFACTURING, MINING AND AGRICULTURE

İPEK KARAKAN

JANUARY 2020

Title of the thesis: **Asymmetric Effect of Real Exchange Rate on The Trade Balances of Turkish Manufacturing, Mining and Agriculture**

Submitted by: **İpek KARAKAN**

Approval by the Graduate School of Social Sciences

Prof. Dr. Mehmet YAZICI

Director

I certify that this thesis satisfies all the requirement as thesis for the degree of Master of Science.

Prof. Dr. Nadir ÖCAL

Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality, as a thesis for the degree of Master of Science in Financial Economics.

Prof. Dr. Mehmet YAZICI

Supervisor

Examination Date: 07.02.2020

Examination Committee Members:

Prof. Dr. Mehmet YAZICI	Cankaya Univ.	
Prof. Dr. Ergun DOĞAN	Cankaya Univ.	
Doç. Dr. Süleyman AÇIKALIN	Hitit Univ.	

STATEMENT OF NONPLAGIARISM

I hereby declare that all statements in this statement has been obtained and presented in accordance with academic rules and ethical conducts. I also declare that, as required by these rules and conducts, I have fully cited and referenced all material and results that are not original to this work.

Name, Last Name: : **İpek KARAKAN**
Signature :
Date : 24.02.2020

ABSTRACT

ASYMMETRIC EFFECT OF REAL EXCHANGE RATE ON THE TRADE BALANCES OF TURKISH MANUFACTURING, MINING AND AGRICULTURE

KARAKAN, İpek
Master's Thesis
M.Sc., Department of Financial Economics

Supervisor: Prof. Dr. Mehmet YAZICI
January 2020, 133 pages

The objective of this research is to find the effects of real exchange rate on the trade balances of Turkish manufacturing, mining and agriculture sectors, and the sum of these 3 sectors. The study investigates short-term and long-term effects of real exchange rate on these trade balances using linear and non-linear autoregressive distributed lag methods (ARDL and NARDL methods) based on quarterly data for 2002-2018 period (17 years x 4 periods= 68 quarterly basis data for each sector). According to findings, the real exchange rate has no short-run effect in any of trade balances in linear case. It has significant short-run effect only on trade balances for manufacturing and agriculture in non-linear case. As for long-run effect, in linear case it has significant effect only on manufacturing trade balance and overall trade balance. In non-linear case, the real exchange rate has significant long-run effect on all four trade balances. Based on the findings, in manufacturing and agriculture sectors, j-curve effect is also observed.

Keywords: Asymmetric Effect, Exchange Rate, Trade Balance, Manufacturing, Mining, Symmetric Effect, Agriculture.

ÖZET

REEL DÖVİZ KURUNUN TÜRKİYE'DEKİ İMALAT, MADENCİLİK VE TARIM SEKTÖRLERİNİN DIŞ TİCARET DENGESİ ÜZERİNDEKİ ASİMETRİK ETKİSİ

KARAKAN, İpek
Yüksek Lisans Tezi
Finansal Ekonomi Anabilim Dalı

Danışman: Prof. Dr. Mehmet YAZICI
Ocak 2020, 133 sayfa

Bu araştırmanın amacı reel döviz kurunun Türk imalat, madencilik ve tarım sektörleri ve bu 3 sektörün toplam ticaret dengeleri üzerindeki etkisini bulmaktır. Çalışma, 2002-2018 dönemi (17 yıl x 4 dönem = her sektör için 68 çeyrek dönem veri) üç aylık verilerine dayalı olarak doğrusal ve doğrusal olmayan otoregresif dağıtılmış gecikme yöntemleri (ARDL ve NARDL yöntemleri) kullanarak reel döviz kurunun bu ticaret dengeleri üzerindeki kısa ve uzun vadeli etkilerini araştırmaktadır. Bulgulara göre, reel döviz kurunun lineer durumda herhangi bir ticaret dengesi üzerinde kısa vadeli bir etkisi bulunmamaktadır. Lineer olmayan durumda sadece imalat ve tarım için ticaret dengeleri üzerinde kısa vadeli anlamlı bir etkisi bulunmaktadır. Uzun vadeli etkiye gelince, lineer durumda sadece imalat ticaret dengesi ve üç sektörün toplam ticaret dengesi üzerinde anlamlı bir etkisi vardır. Lineer olmayan durumda, reel döviz kuru, dört ticaret dengesinin tamamında uzun vadeli anlamlı bir etkiye sahiptir. Bulgulara dayanarak, imalat ve tarım sektörlerinde j-eğrisi etkisi de gözlenmiştir.

Anahtar Kelimeler: Asimetrik Etki, Döviz Kuru, Dış Ticaret Dengesi, İmalat, Madencilik, Simetrik Etki, Tarım.

ACKNOWLEDGEMENT

I would like to thank to my respectful supervisor Prof. Dr. Mehmet YAZICI for his great efforts in trying to explaining/clarifying the conflicts in my mind especially during this study's application part such as determining the variables, collecting the data, selecting the models, etc. He was always very kind in sharing his valuable time for explaining the things I had difficulty in understanding regarding to my thesis.

Furthermore, I also thank to valuable jury members and my all valuable teachers who have illuminated me with their depth knowledge in my graduate education.

Lastly, I'm also grateful to my parents and friends with whom I had difficulty in sharing time during trying to complete my thesis.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

ADF	Augmented Dickey-Fuller
GDP	Gross Domestic Product
CBRT	Central Bank of the Republic of Turkey
OECD	Organisation for Economic Co-operation and Development
TL	Turkish Liras
TurkStat	Turkish Statistical Institute
USA	United States of America
USD	United States Dollar

CHAPTER I

INTRODUCTION

In this chapter, objective, importance, scope, assumptions and limitations of the research will be given.

1.1. Objective of the Research

The objective of this research is to find the symmetric and asymmetric effects of real exchange rate on the trade balances of Turkish manufacturing, mining and agriculture sectors as well as the trade balance of the sum of these three sectors (overall 3 sectors) in the short and long terms.

More specifically, the hypothesis of the research is that there is a symmetric and asymmetric effect of Real Exchange Rate (RER) on the trade balances of Turkish manufacturing, mining and agriculture sectors and overall 3 sectors in the short and long terms.

As stated in the study of Bahmani-Oskooee & Fariditavana (2015: 1), the exchange rate affects the trade balance. Specifically, if the exchange rate depreciates, it increases the export and decreases the imports, thus appreciates the foreign trade balance, and that appreciation of the exchange rate does the opposite. However, the previous studies assumed that the appreciation or depreciation of exchange rate is thought to be symmetric on the trade balance. However, this effect may be asymmetric, and the asymmetric effect of exchange rate on trade balance has been recently started to be studied (Bahmani-Oskooee & Fariditavana; 2015; Aksu, Başar, Eren and Bozma, 2017; Bahmani-Oskooee & Kanitpong, 2017; Kolcu & Yamak, 2017; Karaoğlu, 2018; Benli, 2019).

There are some studies (Dinçer, 2005; Tanrıöver and Yamak, 2012; Benlialper, 2013; Boz, 2013; Aral, 2015; Aksu, Başar, Eren and Bozma, 2017; Demirgil, Yıldırım and Karcı, 2017; Kolcu and Yamak, 2017; Karaoğlu, 2018; Benli, 2019) searching for the asymmetric effect of exchange rate on Turkey. However, our subject has not been studied anywhere. These studies are in the literature review part.

1.2. Scope of the Research

The study covers to investigate short and long-term symmetric and asymmetric effects of real exchange rate on the trade balances of Turkish manufacturing, mining and agriculture sectors, and on the sum of these 3 sectors between 2002-2018 in a 17-year period in quarterly bases data as 17 years x 4 periods= 68 quarterly basis data for each sector.

1.3. Assumptions and Limitations

- The application of the study is limited to the second order data obtained from secondary sources and these data are assumed to be accurate.
- Data on country weights are limited to 46 countries which are available in the OECD database and are fully accessible and assumed to be accurate.
- Country weights are limited to the arithmetic average technique.
- Investigation of the impact of real exchange rate on foreign trade balance is limited to 3 sectors which are Manufacturing, Mining, Agriculture and the sum of these 3 sectors.
- The variables used to determine the effect of real exchange rate on foreign trade balance in the research are limited to the variables TB: Trade Balance, Y: Domestic income, YW: World income and RER: Real Exchange Rate.
- The rate of (export/import)*100 is assumed to represent TB: Trade Balance correctly.
- Y: Domestic variable income real GDP's of Turkey's most accurate is assumed to be expressed.
- YWCA: World income in Turkey is limited to the real GDP of 46 countries according to the weighted sectoral bilateral trade and it is assumed that these data are correct.
- In the analysis, it has been assumed that the indexed to the arithmetic average of the 4 quarters of 2003, logarithms were taken on the log e base and the use

of seasonally adjusted data would yield the best results in observing the investigated effects.

1.4. Organization of the Report

In the first chapter of the research where the Introduction has been introduced, the objective, scope, assumptions and limitations of the research, and organization of the report have been given. In the second chapter, where the literature review has been presented, the previous researches about asymmetric effect of exchange rate on Turkish economy, the literature about symmetric and asymmetric effects of real exchange rate, the literature about impact of real exchange rate on Turkish economy, and the literature about relations between real exchange rate and trade balances have been studied. In the third chapter, the overviews of Turkish manufacturing, mining and agriculture sectors and real exchange rate in Turkey, the notions of asymmetric effect and real exchange rate have been studied. In the fourth chapter where the data and methodology has been presented, description and plots of the data, empirical methodology have been studied. In the fifth chapter where the empirical results have been presented, the unit root, the estimation of ARDL and NARDL models, the specified models, the bound testing, the error correction model and the long-run coefficients, the diagnostic tests, and the interpretation of results have been studied. Finally, in the sixth chapter, summary and conclusion have been presented.

CHAPTER II

LITERATURE REVIEW

In this chapter where the literature review has been presented, the literature about symmetric and asymmetric effects of real exchange rate, and the impact of real exchange rate on Turkish economy have been studied.

2.1. Previous Researches about Asymmetric Effect of Exchange Rate on Turkish Economy

In Kolcu and Yamak's (2017) study, asymmetric effect of exchange rate changes on foreign trade prices in Turkey, especially in whether the exchange rate change has a symmetrical or asymmetric effect on import and export prices in the short and long term, were examined. Linear ARDL was used for symmetric effect and non-linear ARDL (NARDL) model was used for asymmetric effect. According to the results of ARDL and NARDL bounds tests, long-term effect of exchange rate on both import and export prices was determined. In the NARDL model, Wald test results regarding the symmetry in long and the short term showed that the effect of exchange rate changes on import prices was symmetric in both the long and the short term, and the effect on export prices was symmetric in long term and asymmetric in the short term. In the short term, positive exchange rate changes have an effect on export prices, while negative exchange rate changes have no effect.

In the study of Aksu, Başar, Eren and Bozma (2017), the asymmetric effect of the exchange rate on the foreign trade balance in Turkey was investigated using the NARDL method developed by Shin, Yu and Greenwood-Nimmo (2011), based on the ARDL bounds test developed by Pesaran, Shin and Smith (2001). In determination of cointegration relationship between series in NARDL model, Augmented Dickey-Fuller (ADF) unit root test proposed by Dickey and Fuller (1981) was used in stationarity analysis of series, and Lumsdaine-Papell (1997) unit root test, which considers structural breaks. In the research, the estimations are made by using real exchange rate according to domestic manufacturing prices, the import and export figures, and import/export ratio in the measurement of trade balance between 2003 and 2015, and by taking the natural logarithm of series. According to the results obtained in the study; the symmetric effect of real exchange rate on trade balance in the long term, and asymmetrical effect in the short term have been found. On the other hand, it was found that the new balance appears to occur after about 20 months as a result of the positive and negative shock which will occur by using the asymmetric cumulative multiplier mechanism. According to this, Turkey J - curve hypothesis was found to be valid in the period examined.

In the study of Demirgil, Yıldırım and Karcı (2017), asymmetric volatility in the currency exchange rate of EURO/TL was aimed to be modelled. In this study, EURO Buying Prices from January 1999 to April 2017 were used, and volatility series were obtained with 100 * log (EURO / EURO (-1)) conversion, and GARCH coefficients were obtained in order to take the values around 1 for convenience in interpretation, the ARCH effect was tested with the ARCH-LM test in the appropriate ARIMA model. In this study, of asymmetric conditional variable variance models, EGARCH, TGARCH, PGARCH models were compared. When the models were compared, it was found that EGARCH had the highest explanatory power and as a result, the volatility in the purchase prices of EURO / TL changed asymmetrically over time.

In Aral's (2015) study, the relationship between the exchange rate and foreign trade (export-import ratio) between the years 1992-2013 in Turkey has been tested with Johansen's cointegration method, the stability of variables was analysed with Augmented Dickey Fuller and Phillips Perron methods. As a result, it was found that there was a cointegration relationship between the variables, but no analysis was conducted on the basis of asymmetric effect or sector in the study.

In Tanrıöver and Yamak's (2012) research, possible asymmetric effects of monetary shocks on the real production level for Turkish economy have been tested. The money supply, Real Gross Domestic Product, Consumer Price Index, share of budget deficit in GDP, exchange rate and 3-month deposit interest rate were used in the test for possible effect. Three hypotheses in which the asymmetric effect was tested revealed that positive monetary shocks had a positive and statistically significant effect while negative monetary shocks had a negative but statistically insignificant effect. In this sense, the dominant view in the literature on the asymmetric effect of monetary shocks is supported. However, the presence of this asymmetric effect is not because the positive shocks are ineffective and the negative shocks are effective. On the contrary, it was due to the fact that positive shocks had a significant effect but negative shocks had an insignificant effect on real production level.

In Benli's (2019) study, asymmetric effect of exchange rates on exports has been examined on the basis of exports to the US from Turkey, with US Dollar / TRY exchange rates, especially in the presence of a non-linear pattern between mutual exports to the US from Turkey. The NARDL model that enables simultaneous testing of decomposition of short and long term nonlinear as well as positive and partial sum of exchange rate, that also provides an opportunity to measure the response of exports to asymmetric dynamic factors of positive and negative changes, that used by Shin et al. (2011) was used as a model. As a result, according to NARDL estimation model, it was found that exchange rate fluctuations had a nonlinear effect on exports.

In Boz'un (2013) study, the asymmetric effect of exchange rate on the prices of inflation targets between the years 2002-2012 term in Turkey was investigated by using the non-cointegrated NARDL model of Carlo who assumes that optimal prices are determined by an increase in total unit costs. As a data set in the research, monthly consumer price index, the industrial production index and monthly log value of the nominal exchange rate between 2002-2012, were used. According to the Wald test after the asymmetric NARDL estimation, exchange rate was found to have asymmetric effects in both short and long term on Turkish economy.

In Dinçer's (2005) research, the asymmetric effects of foreign exchange rate on consumer durables, private durable, public consumption, private investment, public investment, exports, imports, prices, interest rates, interbank interest rates in Turkey were examined. However, it was seen that this study differs from our research due to the fact that it was limited in the data, as well as the effect of real exchange rate on trade balances of manufacturing, mining and agriculture sectors in Turkey was not investigated.

In the research conducted by Karaoğlu (2018), it was aimed to determine whether the transition effect of the exchange rate is asymmetric and linear on the consumer and manufacturer prices in Turkey. In this study, nonlinear time series models (TR and STR models) and the monthly data between January 2014 and July

2018 were used. The study differs from our study as it examined the asymmetric effect of exchange rate on manufacturer and consumer prices.

In the study of Benlialper (2013), the determinants of inflation were investigated and VAR model was used by using data between 2002 and 2008, and it was found that the changes in international commodity prices and exchange rates were the main determinants of inflation. This study differs from our study as it examined the asymmetric effect of exchange rate on inflation.

In the literature, apart from the above studies, there is an important research (Yazıcı, 2008) in terms of that it investigated the effect of real exchange rate on the trade balances of Turkish manufacturing, mining and agriculture in the short and long terms, despite the fact that the asymmetric affect was not examined as well as the current data after 2005 was not included. In Yazıcı's (2008) study, the effect of exchange rate on the trade balance of agriculture, manufacturing and mining in Turkey, using 3-month data from between the years of 1986-1998, and trade balance model used in the study of Bahmani-Oskooee (1985). In the study, it was found that the depreciation of the local currency first improved, then worsened and then improved the trade balance in each of the three sectors, that the long-term or overall response did not differ between sectors although the trade balance showed similar responses to exchange rate changes in the short term, that both manufacturing and mining trade balance improved in the long term, and as a result of the deterioration in local currency, the agricultural trade balance was also deteriorated.

Another important study in addition to the above ones is the one carried out by Atılgan (2011) in order to examine the impact on the real exchange rate of the foreign trade balance in Turkey by using quarterly data and by analysing the data between 1992-2010 period through the ARDL bounds testing approach method. In the related study, it is determined that the direction of the relationship with Granger causality test was as GDP → finance and capital account → Real exchange rate → Foreign Trade Balance, and accordingly the real exchange rate did not have a direct effect on the foreign trade balance but GDP affected the real exchange rate by affecting the finance and capital account, thus real exchange rate affected the foreign trade balance. In the study, it was seen that positive changes in the financial and capital account was adding value into the national currency (TL – Turkish Liras), and that the appreciation of the national currency also increased the foreign trade deficit in Turkey.

There are also many studies about the impact of exchange rate on different variables in Turkish economy. The most important ones amongst these studies are about the effect of real effective exchange rate on the textile and garment sector (Gülşen, 2015), on the foreign trade balance (Gedik, 2014), the effect of sectoral real exchange rate on the firm performance (Kızıl, 2012), on the ISE 100 index (Savaş, 2010), on the stock market (Ulaş, 2010), the effect of the exchange rate on exports (Taşar, 2011; Güngör, 2018), on foreign trade and economic growth (Başkesen, 2018), on domestic prices (transition effect, Tüzün, 2008), on prices (nonlinear and asymmetric effect, Karaoğlu, 2018), on prices (with VAR analysis) (Hoşafçı, 2011), on the unemployment (Kılıçaslan, 2007) and the reflection effect of exchange rate (Yetiz, 2015). In these studies, asymmetric effect of real exchange rate or its effect on the foreign trade balance of agriculture, manufacturing and mining sectors have not been examined thus they differ from our research topic.

Finally, there are also studies examining asymmetric effects of monetary policy shocks in Turkey. For example, Arıkan's (2013) study is completely different from our study, as it examines the asymmetric effect of oil prices on macroeconomic indicators in Turkey. Although the exchange rate is mentioned in Oltulular's (2015) study, it is different from our research topic as the essence of the study was based on the asymmetric effect of the monetary policy shocks on the output and price level, rather than the impact of the exchange rate, only the subjects that the monetary policy shocks affect the exchange rate and the exchange rate affects the consumption were briefly mentioned. In the study of Morgül (2013), similar to that of Oltulular's (2015) study, the asymmetric effect of monetary policy shocks on output and price level was investigated. However, in the study, other macroeconomic variables such as industrial production index, consumer price index, gross domestic product, overnight interest, money stock and nominal government expenditure were also considered as well as the exchange rate (US dollars). In the mentioned study, expansionary and contractionary monetary policy shocks are analysed within the VAR model and Least Squares method is used to investigate the asymmetric effects. Shared analysis results considering open economy and nominal government expenditures show that while monetary policies are an effective tool in the fight against inflation, they are not effective in reviving the economy. Consequently, while monetary policy is not an effective means of struggle during the recession period, fiscal policies are more effective than monetary policy in revitalizing the economy. This study also differs from our research topic. Other studies

(Ergeç, 2007; Tanrıöver, 2008; Bilman, 2008; Çankaya, 2015; Biçici, 2015; Karataş, 2018; Kaplan, 2019) that have investigated the asymmetric effects of monetary policy shocks in Turkey, also differs from our study topic as they are not dealt directly with the effect of the exchange rate.

Exchange rate is an important variable for foreign trade balance. Its symmetric effect on trade balance have been well studied but its asymmetric effect is being recently studied. Some studies (Dinçer, 2005; Tanrıöver and Yamak, 2012; Benlialper, 2013; Boz, 2013; Aral, 2015; Aksu, Başar, Eren and Bozma, 2017; Demirgil, Yıldırım and Karcı, 2017; Kolcu and Yamak, 2017; Karaoğlu, 2018; Benli, 2019) has been done on Turkey but our subject has not been studied till now.

Other studies examining the exchange rate effect asymmetrically are examined in Section 2.3.

2.2. Literature about Symmetric Effect of Real Exchange Rate

In economic theory, it is accepted that changes in exchange rates affect the general level of domestic prices directly and indirectly through two channels. As the prices of both imported raw materials and intermediate goods and finished goods will change with the change in the exchange rate, this change will be reflected directly to domestic prices through production or sales prices. Indirect channel is expressed as total demand channel. Any increase in the exchange rate will cause the domestic goods to become cheaper for foreign consumers and consequently increase of exports and total demand and thus increase of domestic prices. However, the duration and degree of exchange rate’s effect on the general level of domestic prices may vary depending on the competitiveness level of countries, the structural characteristics of goods subject to foreign trade, the magnitude of the exchange rate change and the exchange rate regime applied in the economy. Occasionally, small scale changes in exchange rates are not reflected in the prices depending on the pricing strategies of the firms, resulting in a low transition effect. Similarly, in flexible exchange rate regimes, the degree and speed of exchange rate’s effect on the general level of domestic prices are slower and lower than in fixed exchange rate regimes. Determining the degree of exchange rate effect is of great importance in forecasting inflation and determining the monetary policies to be implemented (Kolcu & Yamak, 2017: 645).

The empirical literature on exchange rates' effects on general level of domestic prices began with the study of Dornbusch (1985), followed by several studies. In most of the empirical studies on this issue, it is assumed that exchange rate changes have a symmetrical effect. For example, Athukorala and Menon (1994) found that there was a lack of pass-through effect in Japan's export structure in their studies using Japanese data for the period 1980-1992. Bailliu and Fujii (2004), using the data set of 11 countries covering the period 1977- 2001, determined that low inflation reduces exchange rate's effect on general level of prices. Choudhri and Hakura (2006) found a positive and significant relationship between inflation rate and exchange rate's effect on general level of domestic prices as a result of their analysis of 71 countries from 1979-2000 period. Korhonen and Watchel (2006) concluded that the exchange rate movements had a significant effect on prices as a result of the econometric analysis they conducted on the Commonwealth of Independent States (CIS) during the period 1999-2004. Yoshida (2010) determined that the export prices between ports are related to the fluctuations in exchange rates as a result of the panel data analysis conducted in the Japanese economy for the period 1988-2005. Frankel, Parsley and Wei (2012) in their study using data from 76 countries during the period 1990-2001 found that the exchange rate's effect on import prices in developed countries is not complete.

As mentioned above, most of the empirical researches for the effect of changes in exchange rates are based on the assumption that the effect is symmetrical (Kolcu and Yamak, 2017: 645). In the symmetrical relationship, the absolute effect of the change in exchange rate is assumed to be the same (Aksu et al., 2017: 479). Basically, the symmetrical effect of the exchange rate means that the improvement in the exchange rate (the increase in the value of the national currency in abroad) will lead to a simultaneous increase, while the deterioration in the exchange rate (the loss of the value of the national currency in abroad) will lead to a simultaneous decline, i.e. it will show a positive relationship (Saha, 2017: 3). In the case of the foreign trade balance, the symmetrical effect of the exchange rate on the foreign trade balance means that an increase in the foreign exchange rate (depreciation of local currency) increases the export and decreases the imports, thus improving the foreign trade balance, and that a decrease in the foreign exchange rate (appreciation of local currency) decreases the exports and increases the imports, thus distorting the foreign trade balance (Bahmani-Oskooee & Fariditavana, 2015: 1).

In Kolcu and Yamak's (2017) study, whether the exchange rate change has a symmetrical or asymmetric effect on import and export prices in the short and long term, were examined. Linear ARDL was used for symmetric effect and non-linear ARDL (NARDL) model was used for asymmetric effect. According to the results of ARDL and NARDL bounds tests, long-term effect of exchange rate on both import and export prices was determined. In the NARDL model, Wald test results regarding the symmetry in long and the short term showed that the effect of exchange rate changes on import prices was symmetric in both the long and the short term, and the effect on export prices was symmetric in long term and asymmetric in the short term. In the short term, positive exchange rate changes have an effect on export prices, while negative exchange rate changes have no effect.

In Saha's (2017) study, being carried out on 24 developed and developing countries during the period between 1973 and 2015, to determine whether the effect of changes in nominal effective exchange rate on the trade balance of Asian countries is symmetric or asymmetric, where the border test approach was used for cointegration in order to examine the short and long term dynamics between stock prices and exchange rates, by taking the macroeconomic variables such as Consumer Price Index, Industrial Production Index and nominal money supply, which are known to have an impact on stock prices as monthly data, into account, it was determined that nearly all variables had short-term symmetric effects, whereas only a few cases had symmetrical effects in the long-term, when considering the linear model in which all variables are assumed to have symmetrical effects in the multivariate model. However, in the related study, when the nonlinear ARDL approach of Shin et al. (2014) was used, it was determined that the effect of exchange rate changes on stock prices was asymmetric in both short and long term; the short-term asymmetric effect was seen in many countries and sectors composing the sample, the long-term asymmetric effect was observed to be specific to the country and sector, it was seen in only a few countries and sectors.

In the research of Bahmani-Oskooee and Fariditavana (2014), being conducted to determine whether the fall in foreign exchange prices and/or the rise has a symmetrical effect on the foreign trade balance (S model), where quarterly data of 11 OECD countries between 1973-I and 2013-II were used, and where the effects of the depreciation and appreciation in the exchange rate would be accepted as symmetrical when three S-Curves were generated using the three equations of the exchange rate for each country (REER, REER+t and REER-t) within the framework of equations where

REER is decomposed into partial sums, in case that two curves associated with partial sums show the same pattern, the country-specific results show that exchange rate movements did not have a symmetrical effect, as well as the effect of the depreciation in the exchange rate on the foreign trade balance was different from the effect of the appreciation in the exchange rate on the foreign trade balance, i.e. the effect is asymmetrical.

In the study of Bahmani-Oskooee and Kanitpong (2017) being conducted to determine whether the effect of changes in the exchange rate on the foreign trade balance was symmetric or asymmetric, where data from seven Asian countries, and the nonlinear ARDL approach were used, the country-specific findings showed that the exchange rate had short and long term asymmetric effects on foreign trade balance in many Asian countries.

2.3. Literature about Asymmetric Effect of Real Exchange Rate

Although the most of the empirical studies conducted on the effect of exchange rates in the literature have made the assumption that exchange rate changes had a symmetrical effect, this assumption is not valid in many cases (Kolcu and Yamak, 2017: 645). The fact that the effect of the fall in exchange rate and the increase in exchange rate may not be the same in recent period (Aksu et al., 2017: 479) supports this argument. In addition, the structure of the market in which importers or exporters are located, in other words, whether the firms are fully competitive or monopolistic, the factors such as menu costs, transit costs, price rigidity, quantity constraints and market share, may cause the transition effect to be asymmetrical, that is, may cause the prices to react differently to exchange rate changes (Kolcu and Yamak, 2017: 645). According to Saha (2017: 3), the asymmetric effect of the exchange rate may be different in size and direction, mainly due to the internal dynamics and reactions in countries with different levels of development or in different sectors of a country. According to Kolcu and Yamak (2017: 645), the real exchange rate asymmetry may have a different effect not only in direction and magnitude but also in terms of duration. In addition, the asymmetric effect may occur only in the short or long term, but it is possible that such an effect may occur in both periods (Kolcu and Yamak, 2017: 645).

As mentioned above, although the literature is generally based on the assumption of symmetry, there are also empirical studies that are made to eliminate the assumption of symmetry and/or form the basis or prove the assumption of asymmetry. For example, Marston (1990), using the 1980-1987 data for the Japanese economy, concluded that the appreciations had a greater effect than the depreciations, and thus the effect of the exchange rate was asymmetrical. Pollard and Coughlin (2004) examined the effect of exchange rates on import prices for 30 industries in the United States. The results showed that in more than half of the industries, the companies react asymmetrically to the appreciation and depreciation in the exchange rates. Likewise, it was shown that most firms react differently to small and large changes in exchange rates. Yang (2007), using the data set covering the period of 1982-2002 in the US economy tested the asymmetry of the effect of exchange rate on domestic prices. As a result of the study, when the dollar depreciates, it has been observed that the effect of exchange rate on domestic prices appreciated in some industries and depreciated in others. Bussiere (2007) investigated whether the export and import prices in G7 countries react symmetrically and linearly to exchange rate changes. The findings obtained in the study using data from the period 1980-2006 revealed that non-linear relations and asymmetries should not be ignored in the cases of transition effect of exchange rate. In Saha's (2017) study, being carried out on 24 developed and developing countries during the period between 1973 and 2015, to determine whether the effect of changes in nominal effective exchange rate on the trade balance of Asian countries is symmetric or asymmetric, when the nonlinear ARDL approach of Shin et al. (2014) was used, it was found that the effect of exchange rate changes on stock prices was asymmetric in both short and long term; the short-term asymmetric effect was seen in many countries and sectors composing the sample, the long-term asymmetric effect was observed to be specific to the country and sector, it was seen in only a few countries and sectors. In the study of Liu and Tu (2011), using daily data between 2001-2007 to examine whether the relationship between stock price index, exchange rate and foreign capital in Taiwan is asymmetric, they found that excessive buying and foreign capital influenced by foreign exchange rates affected the changes in exchange rate and stock price index asymmetrically (negative returns were returned faster than positive returns). In the study of Delatte and Lopez-Villavicencio (2012) who investigated the asymmetric effect of exchange rate changes on prices in the short and long term in four major developed countries, where the data from Germany, Japan, UK and USA economies during 1980-2009 period were used, the results showed that prices reacted differently to the value increases and decreases in the long run. Especially, it is determined that the transition effect of foreign exchange rate changes is higher in depreciations. In the research of Bahmani-Oskooee and Fariditavana (2014), being conducted to determine whether the fall in foreign exchange prices and/or the rise has a symmetrical effect on the foreign trade balance (S model), the country-specific results show that exchange rate movements did not have a symmetrical effect, as well as the effect of the depreciation in the exchange rate on the foreign trade balance was different from the effect of the appreciation in the exchange rate on the foreign trade balance, i.e. the effect is asymmetrical. They stated that these asymmetric effects may be due to the different expectations and reactions of investors in exchange rate depreciations and appreciations.

2.4. Literature about Impact of Real Exchange Rate on Turkish Economy

There are many studies examining the effect of real exchange rate on the Turkish economy within the framework of numerous macroeconomic variables/factors/prices, especially foreign trade balance and domestic prices. Some of these studies will be summarized below.

Yapraklı (2010), used the border test approach in his study where the factors affecting Turkey's foreign trade deficit for the 2001-2009 period were examined with monthly data. According to the findings, it is seen that the real effective exchange rate index affects the foreign trade deficit positively in the short and long term. However, it was concluded that the finding was statistically insignificant.

In another study conducted by Yavuz, Güriş and Kıran (2009), the Marshall-Lerner condition of validity for Turkey was tested by using the ARDL bounds test and quarterly data for the period from 1988 to 2007. According to the results of the study, the Marshall-Lerner condition does not seem applicable to Turkey, but the presence of the J-curve in the short term after the devaluation is determined.

In another study conducted by Vergil and Erdoğan (2009), the existence of long-term relationship between the variables was investigated by ARDL cointegration test analysis by using quarterly data in 1989-2005 period and it was observed that cointegration relationship was found between variables. As a result, it has been demonstrated that Turkey could close the foreign trade deficit with the devaluation, but the devaluation negatively affected the foreign trade balance in the short term.

In another study conducted by Peker (2008), the effect of real exchange rate on the balance of foreign trade in Turkey were examined by using the quarterly data between 1992 to 2006 period. According to the findings of the study, a 1% change in the exchange rate in the long term negatively affects the balance of foreign trade in Turkey. The findings obtained from this study, revealed that the Marshall-Lerner condition was not supported in long term for Turkey. According to the same study, the short-term effects of exchange rate volatility on trade balance are negative as in the long run. As a result, in contrary to popular belief, it was found that using devaluation to eliminate foreign trade deficit is not a rational choice.

In Keskin's (2008) study, the relationship between real exchange rate and foreign trade is examined in the context of the trade of investment goods, consumer goods and intermediate goods, with Turkey's three most important trading partner, the US, Germany and Italy. In this study, it was expected that the increase in real exchange rate would improve the foreign trade balance. However, according to the results of the study contrary to expectations, it was not possible to talk about the impact of J-curve for Turkey regarding to the trade of these goods with these 3 countries.

In Hepaktan's study (2008), the validity of the Marshall-Lerner condition is tested in Turkey by using fragmented cointegration analysis and quarterly data between 1980-2008 period. According to the results of the study, it was determined that the Marshall-Lerner condition is not applicable to Turkey in the long term. Accordingly, according to the findings of this study, the success of devaluation implementations is a matter of debate.

In another study conducted by Erdem, Tuğcu and Nuhoğlu (2007), the long and short-term effects have been studied in the context of bilateral trade of industrial products between Turkey and Germany by using annual data between the 1969-2007 period. In this study, ARDL model was used and 38 industrial branches were examined. Accordingly, in the long run, the J curve effect was observed in 9 industrial branches. In the short term, the J curve effect was determined in 16 industrial branches. According to the results of the study, 9 industry branches where J curve effect was seen in the long term, in other words, where the depreciation of the Turkish Lira had a positive effect on the foreign trade balance, was a group of durable consumer goods.

In the study conducted by Yamak and Korkmaz (2005) using the data between 1995-Q1 and 2004-Q4 periods, it was revealed that the balance relation between real exchange rate and foreign trade was based on movements in foreign trade of capital goods. Accordingly, the real depreciation of TL affects the foreign trade balance positively by reducing the foreign trade deficit of capital goods. However, according to the same study, the depreciation in the foreign trade deficit of capital goods also means a depreciation in economic growth.

In another study conducted by Karagöz and Doğan (2005) with monthly data between January 1995 and June 2004, cointegration and multiple regression analyzes were performed. According to the findings, there is no long-term causal relationship from real exchange rate to foreign trade variables, but the devaluation effect is significant in the short term. Accordingly, the devaluations in Turkey increase the exports in the short term and enhance the foreign trade balance, but then foreign trade deficits increase again in the long term.

In Akbostancı's (2004) study, where the validity of J-curve was tested in short and long terms for Turkey by using quarterly date in 1987-2000 period, J-curve has been found to be valid in the long term for Turkey as envisaged. However, according to the study, there was no evidence of deterioration in the foreign trade balance after devaluation as in the J-curve hypothesis in the short term. As a result, J-curve hypothesis was found to be valid for Turkey in the long term but invalid in the short term.

Terzi ve Zengin (1999) have examined the dynamic relationships between exchange rate, total and sectoral foreign trade variables, and the role of exchange rate policy in achieving trade balanceby using monthly data in 1989-1996 period. According to the findings, no significant relationship was found between exchange rate and foreign trade balance

Considering the above-mentioned studies on the relationship between real exchange rate and the foreign trade balance in Turkey, there are different findings determining that the increase in foreign exchange rate, i.e. the depreciation of the national currency had a positive effect on the foreign trade balance in the long term, that there was no long-term relationship between the two, that the devaluation first improved, then worsened and then improved Turkey’s foreign trade balance (Yazıcı, 2008), that Turkey J-curve was invalid for the service sector in Turkey (Yazıcı, 2009), that J-curve hypothesis is valid for Turkey in the long term but invalid in the short term, the presence of J-curve was determined in the short term after the realization of devaluation (Yavuz, Güriş & Kıran, 2009), that the devaluation could reduce Turkey's foreign trade deficit in the long term but negatively affected it in the short term, that is j curve was valid for Turkey (Vergil ve Erdoğan, 2009), that the devaluation negatively affects the foreign trade balance in the short and long term (Peker, 2008), that j-curve effect for Turkey in the trade of investment goods, consumer goods and intermediate goods with the US, Germany and Italy (Keskin, 2008),that the Marshall-Lerner condition was not applicable to Turkey in the long term; accordingly, the devaluation implementations has negative effects on foreign trade balance in the long term for Turkey (Hepaktan, 2008), that J curve effect was seen in durable goods in the long term regarding to the bilateral trade of industrial products between Turkey and Germany (Erdem, Tuğcu and Nuhoğlu, 2007), that the real depreciation of TL had a positive effect on the foreign trade balance by reducing the foreign trade deficit of capital goods (Yamak and Korkmaz, 2005), that the devaluation effect was significant in the short term, although there was no long-term causal relationship from real exchange rate to foreign trade variables; accordingly, the devaluations in Turkey increased the exports in the short term and enhanced the foreign trade balance, but then foreign trade deficits increased again in the long term (Karagöz and Doğan, 2005), that a relation was found between real exchange rate and foreign trade balance in the short and long-term, but this relationship was not significant (Yapraklı, 2010) or that there was no significant relationship between these two (Terzi and Zengin, 1999). Therefore, there is no general consensus in the current literature regarding the relationship between the exchange rate and foreign trade balance for Turkey.

Considering the aforementioned studies examining the impact on the overall level of domestic prices and exchange rate changes in Turkish economy, it is mostly seen that the exchange rate impact on domestic prices in Turkey are high in terms of size and speed compared to emerging economies, that this effect decreased or disappeared in the short term and after long term and free floating exchange rate regime, that this effect was not linear, that the fluctuations in the exchange rate between the years of 2002-2014 in Turkey during the course of consumer and producer price index had been quite effective, however, this effect seems to diminish gradually. These studies are summarized below:

In the study of Erdem and Yamak, being conducted with the data from 2003-2014 period for Turkish economy, it was concluded that the pass-through effect of exchange rate on the general level of prices was not linear.

Özdamar (2015) investigated the impact of the exchange rate on domestic prices in Turkish economy for the 2006-2015 period. The results showed that the exchange rate effect on domestic producer prices was low in the long run.

Bayat, Özcan ve Taş (2015) have studied the exchange rate impact on the overall level of domestic prices in Turkish economy by using data from the 2003-2013 period with causality tests. The findings showed that the exchange rate does not affect the overall level of the domestic prices in Turkey.

Ergin (2015) examined the relationship between exchange rate and inflation from 2005 to 2014 periods in Turkey. As a result of the estimation of the model used in the study, the effect of exchange rate changes on consumer prices was found to be strong at first but weakened afterwards.

In Gündoğdu's (2013) study which was conducted to examine the exchange rate impact on the general level of domestic prices in Turkey, the results of the analysis made by using the vector error correction model and with the data of 2003-2012 period revealed that the fluctuations in exchange rates were highly effective in consumer and producer price indices and the effect was gradually reduced during the period examined.

Kara and Öğünç (2012) studied the effects of exchange rate and import values on the core consumer price with different models for the 2002-2011 period in Turkish economy, and concluded that the exchange rate effect was around 15 percent on average for both variables over a one-year period. Moreover, the results showed that the relationship between exchange rate and consumer prices continued to decline.

Arat (2003) examined the effect of exchange rate on the general level of domestic prices by using monthly data of 1994-2002 period and taking into account the exchange rate regime changes with the help of consecutive vector autoregression analysis. According to the results of the model estimated, it was found that the effect of the exchange rate in Turkey was higher than the ones in the developed economies, and this effect was reduced after the transition to a free-floating exchange rate regime.

Leigh and Rossi (2002) examined the effect of exchange rate changes on domestic prices by using the vector autoregressive model and data from 1994-2002 period. The findings showed that the transition effect lasted for one year but most of the effect occurred in the first four months. It has also revealed that the effect of exchange rate on wholesale prices was greater than the ones on consumer prices, and that the size and speed of the effect of the exchange rate on the overall level of the domestic prices was greater in Turkey compared to the other developing countries.

There are also many studies about the impact of exchange rate on different variables in Turkish economy. The most important ones amongst these studies are about the effect of real effective exchange rate on the textile and garment sector (Gülşen, 2015), on the foreign trade balance (Gedik, 2014), the effect of sectoral real exchange rate on the firm performance (Kızıl, 2012), on the ISE 100 index (Savaş, 2010), on the stock market (Ulaş, 2010), the effect of the exchange rate on exports (Taşar, 2011; Güngör, 2018), on foreign trade and economic growth (Başkesen, 2018), on domestic prices (transition effect, Tüzün, 2008), on prices (nonlinear and asymmetric effect, Karaoğlu, 2018), on prices (with VAR analysis) (Hoşafçı, 2011), on the unemployment (Kılıçaslan, 2007) and the reflection effect of exchange rate (Yetiz, 2015).

2.5. Literature about Relations Between Real Exchange Rate and Trade Balances

Although there are many empirical studies examining the relationship between real exchange rates and foreign trade balance, there is no general consensus on the relationship between variables. Particularly in developing countries, the threats posed by the fluctuations in foreign trade balance on economic stability ensure that the relationship between exchange rates and foreign trade balance remains up to date (Aksu et al., 2017: 479).

Gervais, Schembri and Suchanek (2016) used the data of 1975-2008 period for developing economies. In the study, the effect of exchange rate adjustments on the foreign trade deficit was examined and it was stated that positive effects occurred in the foreign trade deficit when the adjustment took place.

In the study of Bahmani-Oskooee and Xu (2013) on the effects of the depreciation of the currency on the foreign trade balance, where instead of total trade data, annual bilateral trade data between Mexico and its largest trading partner, USA, covering the years 1989-2008 are used, the correlation coefficients between past and future values of foreign trade balance and current exchange rate were estimated with annual data. In the study, it was found that the S-Curve Hypothesis was not supported when total trade data was used, whereas the S-Curve structure was found in 90 out of

223 industries when bilateral trade data was separated by goods. According to these findings, it has been suggested that the real depreciation of the Mexican currency Peso against the US Dollar will bring positive results for the foreign trade balance of these 90 industries in the future. In other words, the foreign depreciation of the national currency improves the foreign trade balance.

In the study of Bahmani-Oskooee and Zhang (2013), which was conducted to investigate the effect of exchange rate changes on the trade balance separated by goods between the UK and China for 47 different sectors covered by the trade relationship between the two countries by using annual data covering the period 1978-2010, estimation was made with error correction model, and it was observed that the trade balances of 38 of 47 sectors were affected by exchange rate changes in the short term and the exchange rate had a J-curve effect on the foreign trade balance of 12 sectors. In the related study, in the long run, it is seen that the foreign currency depreciation of the Chinese currency in 7 industries, which corresponds to 6% of the total trade, has positive effects on the foreign trade balance. In the four largest sectors, it was determined that the foreign currency depreciation did not have a long-term effect on the foreign trade balance.

In the study of Kodongo and Ojah (2013), where an intertemporal causality relationship between real exchange rate and foreign trade balance was analysed through Panel VAR techniques by using annual data covering the period 1993-2009 in 9 major African countries, the findings support the classical trade balance theory, that is, the net effect of the external depreciation in the domestic currency is an improvement in the country's balance of payments position in the short term. Accordingly, in general, it's seen that the depreciation of the national currency had a positive effect on the foreign trade balance of the country.

In the study of Cheung and Sengupta (2013), which analysed the annual data covering the period 2000-2010 in order to examine the effect of real effective exchange rate on exports, it was determined that the stable increase in real effective exchange rate (external depreciation of the national currency) had a strong and significant positive effect on exports.

Aziz (2012) investigated the effects of exchange rate policy in the short and long term in order to examine the effects of real devaluation on foreign trade balance for Bangladesh, by using annual data between 1976 and 2009, and multivariate cointegration, error correction model and effect response functions for non-stationary data. According to the findings, it was determined that the trade balance of Bangladesh was significantly and positively dependent on real exchange rate in short and long term, and J-Curve effect was realized for Bangladesh. Accordingly, it is seen that the depreciation of the national currency has a positive effect on the export and foreign trade balance in the short and long term.

Lin (1997), in his study on the USA for the period 1973-1994, found that there is a two-way relationship between the real exchange rate and trade balance.

In Arize's (1994) study on nine Asian countries for the period 1973-1991, it was concluded that the devaluation of the seven countries included in the model positively affected the foreign trade balance in the long term.

Spitäller (1980), in his study on ten developed countries with 1973-I and 1978-IV monthly data, found that the change in exchange rate had an effect on the foreign trade balance.

The studies investigating the effect of the real exchange rate on Turkey's foreign trade balance are included in Section 2.3. Other studies on the symmetric and asymmetric effects of the real exchange rate on foreign trade are given in Sections 2.1 and 2.2. Therefore, here it can be only said that no general consensus in the literature regarding the relationship between the trade balance and the exchange rate for Turkey. In addition, it should be noted that studies conducted in other countries, both in the above and in the previous chapters, show that there are more studies which determine that the real exchange rate depreciation (national currency depreciation) has a positive effect on the export and foreign trade balance in the short and long term.

On the other hand, it is seen that the studies examining the relationship between exchange rate and foreign trade balance are mostly conducted with total trade volume (sum of import and export values) and with annual data, that is, mostly not on sectoral basis.

CHAPTER III

OVERVIEWS OF TURKISH MANUFACTURING, MINING AND AGRICULTURE SECTORS AND REAL EXCHANGE RATE

In this chapter, the overviews of Turkish manufacturing, mining and agriculture sectors and real exchange rate, the relations between real exchange rate and trade balances, the notion of asymmetric effect and real exchange rate have been studied.

3.1. Overviews of Turkish Manufacturing, Mining and Agriculture Sectors

3.1.1. An Overview of Turkish Manufacturing Sector

Within the framework of many dynamic externalities for rapid productivity growth, increasing returns to scale, technological development and the economy in general that the manufacturing industry has created, it is seen as the engine of growth in the economy and it is of primary importance in emerging economies such as Turkey. Without denying the importance of numerous factors affecting the development process, strengthening the manufacturing industry and increasing their competitive potential are considered as the main starting point in the context of countries' catching sustainable growth (Doğruel, 2008: 21). Especially since the manufacturing industry is the sector in which the goods subject to foreign trade are produced, it is seen as the one most affected by the global developments (Yaman-Songur, 2019: 60).

For this purpose, in this section, the production index, its share in GDP, foreign trade (import, export, foreign trade volume, foreign trade balance [sectoral export minus import] and the import coverage ratio of sectoral exports) of manufacturing industry which is seen as a pioneer of the industry's growth in Turkey, will be emphasized particularly between the years 1999-2018.

Following the liberalization policies in the economy after 1980, the Turkish manufacturing industry, which developed after the crisis of 1994, depreciated in parallel with the general decline in the economy and especially in 1998 and this negative situation was reflected in the share of the manufacturing industry in GDP. The crisis in 2001 accelerated the decline in the sector. In fact, the manufacturing industry sector contracted by 7.5 percent in the 2001 crisis. In this regard, in Table 3.1 based on the data extracted from Turkish Statistical Institute (TurkStat) for the 1999-2018 period, the value of manufacturing sector and its share in GDP in Turkey are shown below:

Table 3.1 Turkey's Manufacturing Value and It's Share in GDP (1999-2018) (TURKSTAT, 2019b)

Years	Gross domestic product (purchaser's price) of Manufacturing				Total Gross domestic product (purchaser's price)	
	Value (x1000 TL)	Share (%)	Annual Change (%)	Value (1999=100.0)	Value (x1000 TL)	Value (1999=100.0)
1999	21,511,387	20.1	34.1	100.0	107,164,345	100.0
2000	32,007,671	18.8	48.8	148.8	170,666,715	159.3
2001	43,574,901	17.8	36.1	202.6	245,428,760	229.0
2002	60,769,389	16.9	39.5	282.5	359,358,871	335.3
2003	80,126,179	17.1	31.9	372.5	468,015,146	436.7
2004	97,766,996	16.9	22.0	454.5	577,023,497	538.4
2005	113,914,562	16.9	16.5	529.6	673,702,943	628.7
2006	134,751,723	17.1	18.3	626.4	789,227,555	736.5
2007	148,131,166	16.8	9.9	688.6	880,460,879	821.6
2008	162,031,748	16.3	9.4	753.2	994,782,858	928.3
2009	151,436,401	15.2	-6.5	704.0	999,191,848	932.4
2010	175,176,723	15.1	15.7	814.3	1,160,013,978	1,082.5
2011	229,817,774	16.5	31.2	1,068.4	1,394,477,166	1,301.3
2012	249,250,916	15.9	8.5	1,158.7	1,569,672,115	1,464.7
2013	293,884,254	16.2	17.9	1,366.2	1,809,713,087	1,688.7
2014	343,304,828	16.8	16.8	1,595.9	2,044,465,876	1,907.8
2015	390,796,400	16.7	13.8	1,816.7	2,338,647,494	2,182.3
2016	432,979,604	16.6	10.8	2,012.8	2,608,525,749	2,434.1
2017	547,178,973	17.6	26.4	2,543.7	3,110,650,155	2,902.7
2018	709,374,936	19.0	29.6	3,297.7	3,724,387,936	3,475.4

According to Table 3.1, Turkey's manufacturing industry can be grouped under two periods between the years 1999 to 2018 in terms of GDP. Between 1999 and 2010, the share of manufacturing industry in GDP depreciated from 20.1% to 15.1% gradually until 2010. Between the years of 2011-2018, which is the second period, it showed a recovery tendency and reached 19.0% share in GDP with the rapid increases especially in 2017 and 2018. Consequently, manufacturing industry size, which ranged from 15.1% to 20.1% in GDP over the last 20 years, has an average share of 17.0% of GDP. This is seen more clearly in Figure 3.1.

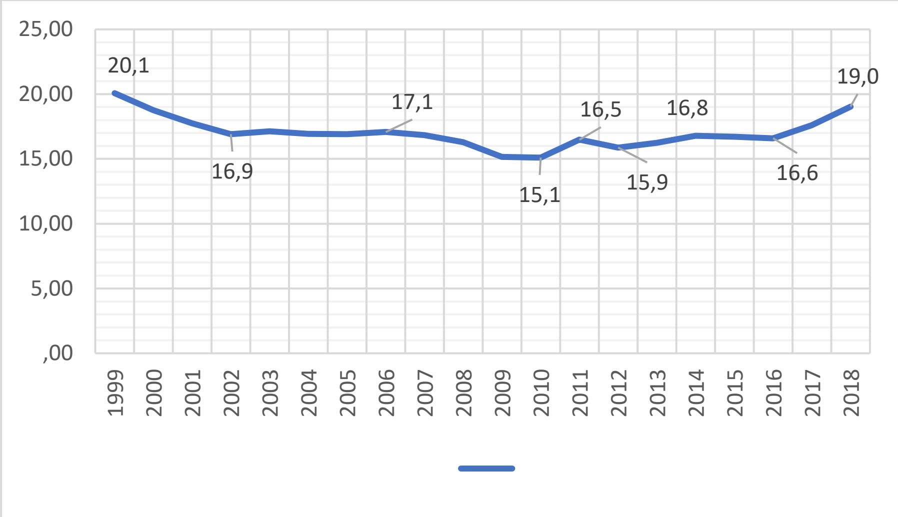

Figure 3.1 Turkey’s Manufacturing Industry’s Share in GDP (1999-2018) (TURKSTAT, 2019b)

Although there has been a slight depreciation in the share of manufacturing industry in GDP between 1999 and 2018, the value of the manufacturing industry, which was TL 21.5 billion in 1999, increased by 20.2% annually on average and reached TL 709.4 billion in 2018. The sector has grown approximately 33 times in size in the last 20 years. This is more clearly seen in Table 3.1 and Figure 3.2 where YoY change of Turkey's manufacturing GDP and total GDP were compared.

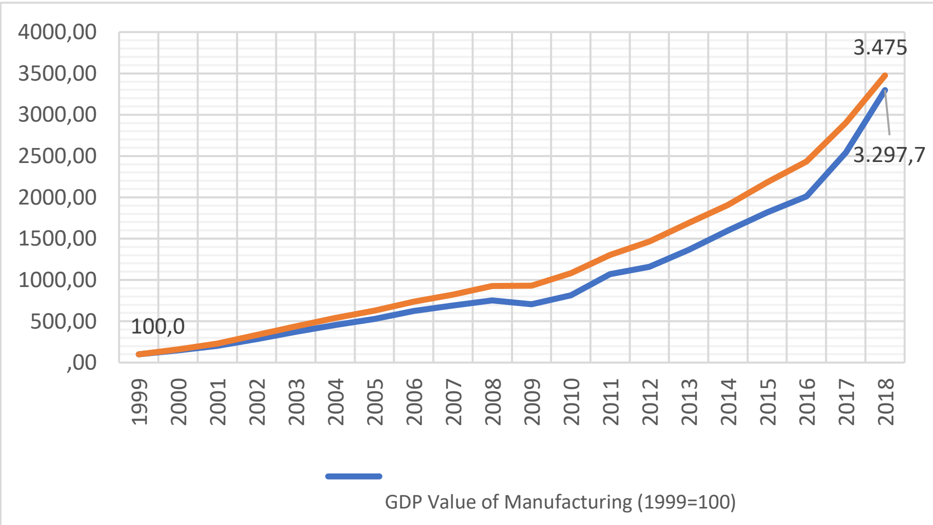

Figure 3.2 Comparison of Turkey's Manufacturing Industry Value Index and Total Annual Value Index of GDP (1999-2018, 1999=100.0) (TURKSTAT, 2019b)

It's seen that the growth in the last 20 years in Turkey's manufacturing industry shows a positive correlation with GDP growth (approximately 35 times growth) (Table 3.1 and Figure 3.2).

In the TURKSTAT data, the foreign trade of the manufacturing industry is classified as D-Manufacturing under the headings of Export by Economic Activities (TURKSTAT, 2019e) and Imports by Economic Activities (ISIC, Rev.3) (TURKSTAT, 2019f) under the International standard industry classification (ISIC, Rev.3). Accordingly, TURKSTAT (2019e, f) according to economic activities according to export and import data; the general outlook of the manufacturing industry foreign trade in the last 20 years between 1999 and 2018 is given in Table 3.2, the export and import values of manufacturing industry are given in Figure 3.3, the manufacturing trade foreign trade balance (manufacturing industry exports - manufacturing industry agricultural import difference) is given in Figure 3.4, and the ratio of manufacturing industry exports to imports is given in Figure 3.5.

Table 3.2 Turkey's Manufacturing Industry Foreign Trade Values (1999-2018, x1000 USD) (TURKSTAT, 2019e, f)

Years	Manufacturing Export (Exp) (x 1000 USD)	Manufacturing Import (Imp) (x 1000 USD)	Manufacturing Foreign Trade Volume, Exp+Imp (x 1000 USD)	Manufacturing Foreign Trade Balance, Exp-Imp (x 1000 USD)	Rate of Exports Meeting Imports for Manufacturing, Exp/Imp (%)
1999	23,957,813	33,935,827	57,893,639	-9,978,014	70.6%
2000	25,517,540	44,200,242	69,717,782	-18,682,701	57.7%
2001	28,826,014	32,686,102	61,512,116	-3,860,087	88.2%
2002	33,701,646	41,383,030	75,084,676	-7,681,384	81.4%
2003	44,378,429	55,689,766	100,068,195	-11,311,336	79.7%
2004	59,579,116	80,447,302	140,026,418	-20,868,186	74.1%
2005	68,813,408	94,208,255	163,021,663	-25,394,847	73.0%
2006	80,246,109	110,378,826	190,624,935	-30,132,717	72.7%
2007	101,081,873	133,938,136	235,020,008	-32,856,263	75.5%
2008	125,187,659	150,252,335	275,439,994	-25,064,676	83.3%
2009	95,449,246	111,030,525	206,479,771	-15,581,278	86.0%
2010	105,466,686	145,366,975	250,833,661	-39,900,288	72.6%
2011	125,962,537	183,930,287	309,892,823	-57,967,750	68.5%
2012	143,193,911	176,235,027	319,428,937	-33,041,116	81.3%
2013	141,358,199	196,822,807	338,181,006	-55,464,609	71.8%
2014	147,059,418	187,742,215	334,801,633	-40,682,796	78.3%
2015	134,389,890	166,821,237	301,211,128	-32,431,347	80.6%
2016	133,595,801	167,243,395	300,839,196	-33,647,593	79.9%
2017	147,138,203	190,748,102	337,886,305	-43,609,899	77.1%
2018	157,705,154	175,979,178	333,684,332	-18,274,024	89.6%

As seen in Table 3.2 and Figure 3.3, the foreign trade of Turkey's manufacturing industry gives deficit every year in the last 20-year period. However, in this period, this deficit appreciates due to the growth of exports by 10.4% on average and imports by 9.0% on average, which means that sectoral exports grow faster than imports. Thus, the ratio of exports to imports in the manufacturing industry reached 78.6% on average in the last 10 years (2009-2018), whereas it was 75.6% between 1999 and 2008.

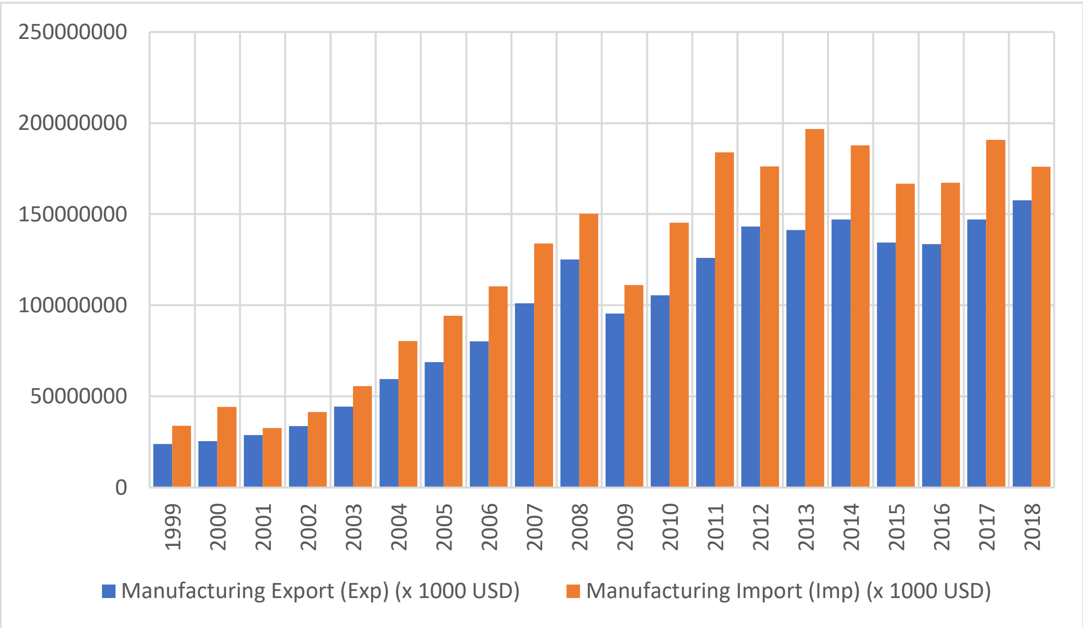

Figure 3.3 Turkey's Manufacturing Industry Value of Exports and Imports (1999-2018, x1000 USD) (TURKSTAT, 2019e, f)

The foreign trade deficit of the sector is 556 billion USD in the last 20 years, with an average of 27.8 billion USD per year. In 2018, the total annual exports realized in the sector were 157.7 billion USD, the total annual imports were 176 billion USD, the total annual trade volume was 333.7 billion USD, the annual sectoral foreign trade deficit was 18.3 billion USD and the ratio of sectoral exports to imports was 89.6% (Table 3.2, Figures 3.3, 3.4 and 3.5).

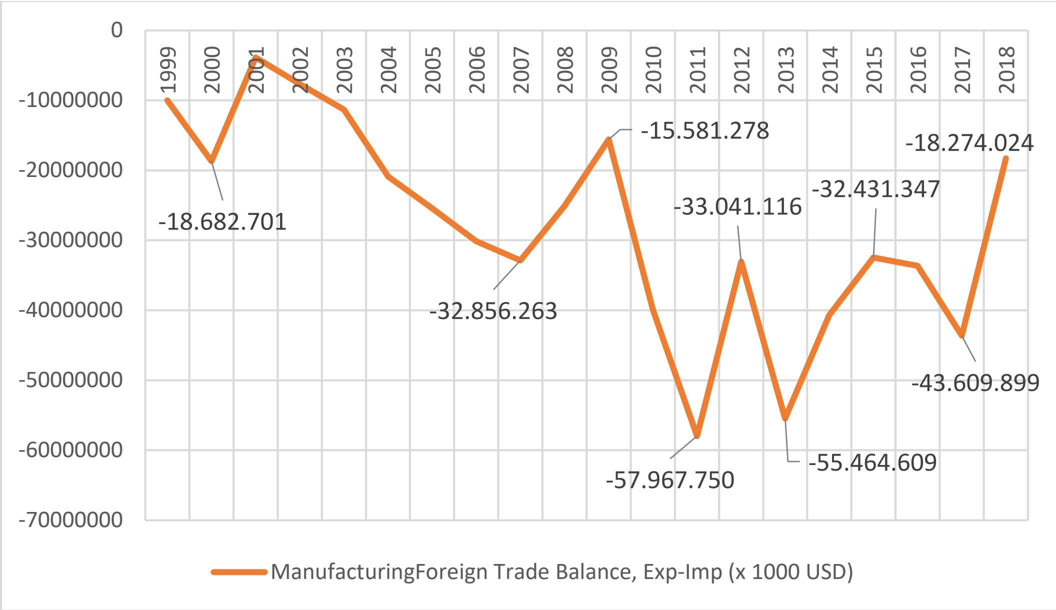

Figure 3.4 Turkey's Manufacturing Industry's Foreign Trade Balance (1999-2018, x1000 USD) (TURKSTAT, 2019e, f)

In the last 20 years (1999-2018), the ratio of exports to imports in Turkey's manufacturing industry is in extremely low value, such as an annual average 77.1%. If the sector maintains its performance in the last 10 years (exports grow faster than imports), it will take 70-75 years to close the foreign trade deficit.

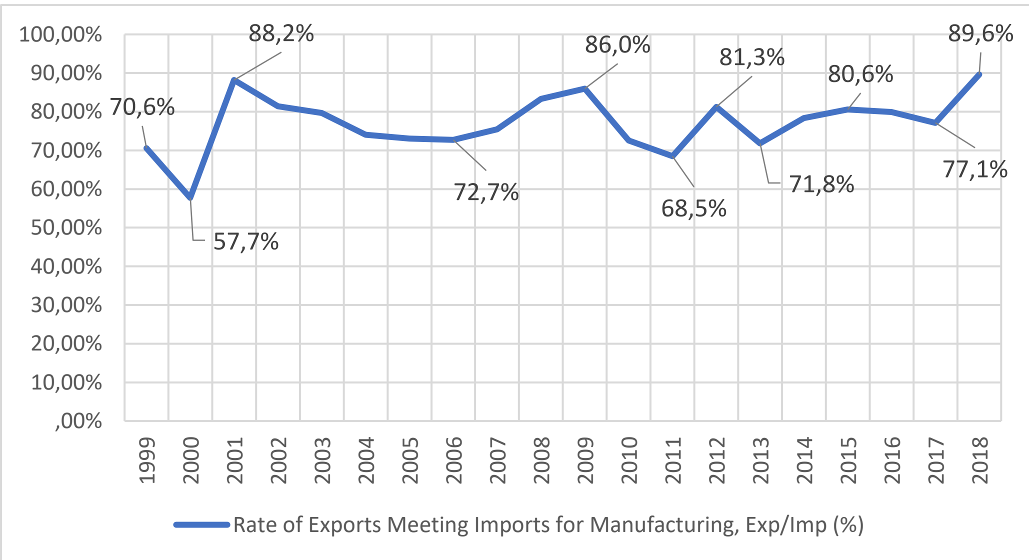

Figure 3.5 The Ratio of Exports to Imports in Turkey's Manufacturing Industry (%) (TURKSTAT, 2019e, f)

Turkey's manufacturing industry production index for the 1999-2018 period are shown in Table 3.3 and Figure 3.6:

Table 3.3 Industrial Production Index for Manufacturing Sector in Turkey (2015=100) (TURKSTAT, 2019a)

Years	**Turkey Manufacturing Production Index (2015=100)**	**Years**	**Turkey Manufacturing Production Index (2015=100)**
1999	41.3	**2009**	61.3 ↓
2000	43.8	**2010**	69.4
2001	40.0 ↓	**2011**	80.1
2002	43.8	**2012**	83.5
2003	47.6	**2013**	89.0
2004	52.3	**2014**	94.2
2005	59.6	**2015**	100.0
2006	64.0	**2016**	103.4
2007	68.5	**2017**	112.8
2008	68.1 ↓	**2018**	114.0

As can be seen in Table 3.3 and Figure 3.6, it is seen that the manufacturing industry production index has increased steadily over the years between 1999-2018 except for 2001 (9.5% decline due to the 2001 crisis), 2008 and 2009 (0.6% decline in 2008 and 11.0% decline in 2009 due to the 2008 crisis) In the index, which was taken as 100 units in 2015, the manufacturing industry production index, which was 41.3 units in 1999, increased to 114 units in 2018 and achieved an average annual growth rate of 5.5% between 1999 and 2018.

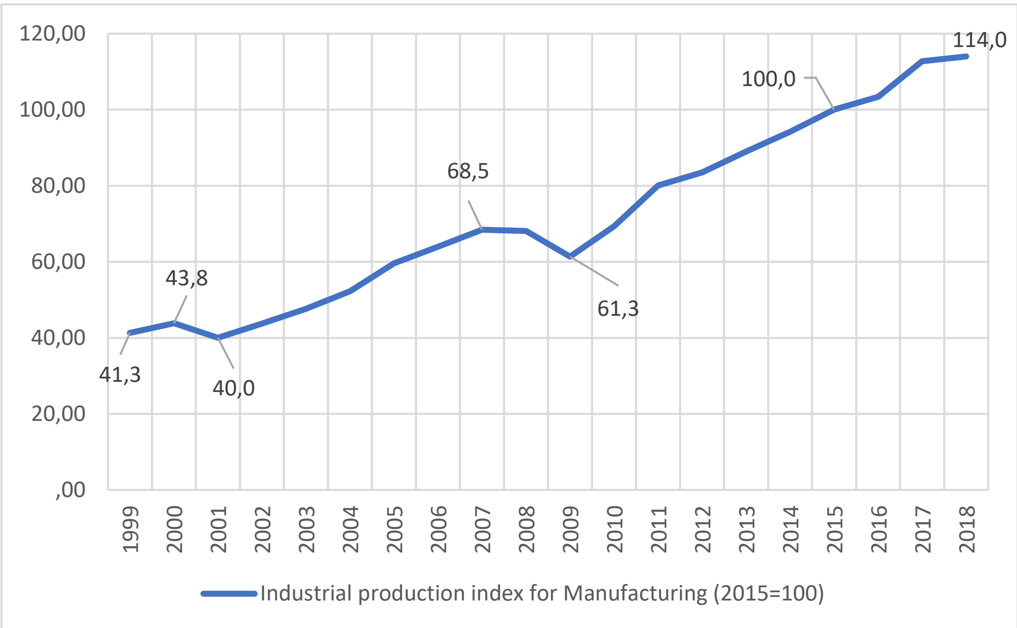

Figure 3.6 Industrial Production Index for Manufacturing Sector in Turkey (1999-2018, 2015=100) (TURKSTAT, 2019a)

3.1.2. An Overview of Turkish Mining Sector

The production in mining sector, which is 10 billion/ton per year globally, represents an economic volume of around USD 1.5 trillion. 10% of this production capacity is distributed as metallic mines, 15% as industrial raw materials and 75% as energy raw materials. The size of the demand in the world market and the domestic production volume are the main factors determining on exports from the mining sector in Turkey. Developments in global markets have an impact on the export of metallic ores. Today, the favorable economic conjuncture in the world markets provides important development opportunities for Turkish mining (Ankara Chamber of Industry, 2017: 9).

Turkey's mining sector GDP share has consistently changed between 0.8-1.1% in the last 20 years (1999-2018). The mining (mining and quarrying) sector GDP values and their share in total GDP for 1999-2018 period are shown in Table 3.4.

Table 3.4 Turkey's Mining Industry GDP Value and It's Share in Total GDP (1999-2018) (TURKSTAT, 2019b)

	Gross domestic product (purchaser's price) of Mining and quarrying				**Total Gross domestic product (purchaser's price)**	
Years	**Value (x1000 TL)**	**Share (%)**	**Annual Change (%)**	**Value (1999=100.0)**	**Value (x1000 TL)**	**Value (1999=100.0)**
1999	889,996	0.8	33.6	100.0	107,164,345	100.0
2000	1,509,771	0.9	69.6	169.6	170,666,715	159.3
2001	2,127,239	0.9	40.9	239.0	245,428,760	229.0
2002	2,948,079	0.8	38.6	331.2	359,358,871	335.3
2003	4,062,878	0.9	37.8	456.5	468,015,146	436.7
2004	5,166,285	0.9	27.2	580.5	577,023,497	538.4
2005	6,530,982	1.0	26.4	733.8	673,702,943	628.7
2006	7,520,121	1.0	15.1	845.0	789,227,555	736.5
2007	8,664,515	1.0	15.2	973.5	880,460,879	821.6
2008	10,824,975	1.1	24.9	1,216.3	994,782,858	928.3
2009	11,182,853	1.1	3.3	1,256.5	999,191,848	932.4
2010	12,593,603	1.1	12.6	1,415.0	1,160,013,978	1,082.5
2011	15,653,910	1.1	24.3	1,758.9	1,394,477,166	1,301.3
2012	17,117,464	1.1	9.3	1,923.3	1,569,672,115	1,464.7
2013	19,419,988	1.1	13.5	2,182.0	1,809,713,087	1,688.7
2014	19,409,824	0.9	-0.1	2,180.9	2,044,465,876	1,907.8
2015	19,255,080	0.8	-0.8	2,163.5	2,338,647,494	2,182.3
2016	21,369,179	0.8	11.0	2,401.0	2,608,525,749	2,434.1
2017	27,863,066	0.9	30.4	3,130.7	3,110,650,155	2,902.7
2018	37,267,858	1.0	33.8	4,187.4	3,724,387,936	3,475.4

The annual GDP share of mining sector (mining and quarrying) is shown in Figure 3.7.

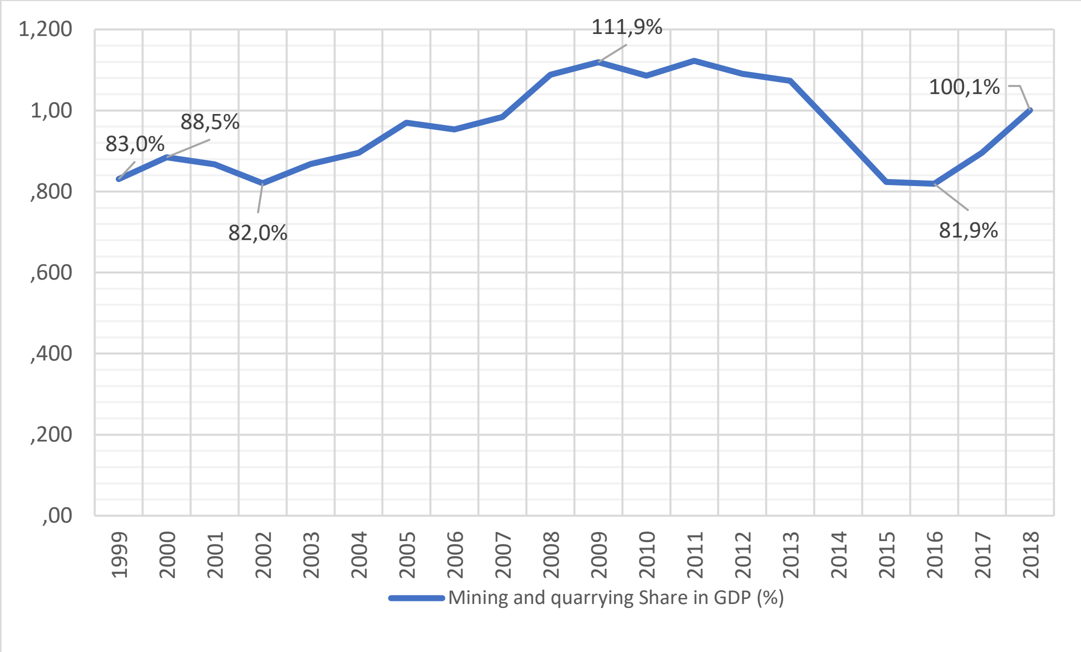

Figure 3.7 The Annual GDP Share of Mining Sector in Turkey (1999-2018) (TURKSTAT, 2019b)

Annual changes of Turkey's mining sector GDP and total GDP which were accepted as 100 units in 1999, are compared in Figure 3.8:

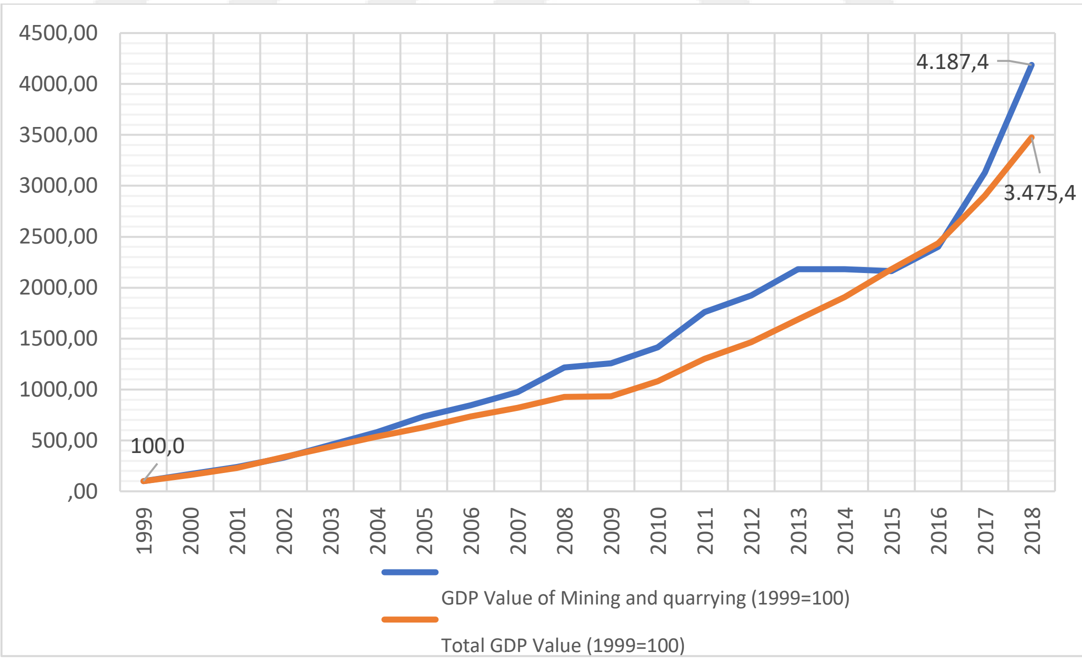

Figure 3.8 The Comparison of Value Index of Mining Sector and Total GDP Value Index of Turkey (1999-2018, 1999=100.0) (TURKSTAT, 2019b)

As can be seen in Table 3.4, Figures 3.7 and 3.8, the value of the mining sector, which was 890 million TL in 1999, increased by 20.2% on average and reached 37.3

billion TL by the end of 2018. In the same period, the share of mining sector in GDP increased from 0.8% to 1.0% and reached a size of 42 times in the last 20 years. It is pleasing that the growth in the mining sector is higher than the growth in GDP, when considering that the total GDP of Turkey increased about 35 times in the same period.

This positive picture is also observed in the production index in the same period. Turkey's mining and quarrying production index is shown in Table 3.5 and Figure 3.9 for the 1999-2018 period:

Table 3.5 Turkey's Mining and Quarrying Production Index (2015=100) (TURKSTAT, 2019a)

Years	Turkey's mining and quarrying production index (2015=100)	Years	Turkey's mining and quarrying production index (2015=100)
1999	74.6	**2009**	84.1 ↓
2000	72.5 ↓	**2010**	85.9
2001	66.6 ↓	**2011**	99.0
2002	61.1 ↓	**2012**	100.8
2003	59.1 ↓	**2013**	100.9
2004	61.5	**2014**	98.2 ↓
2005	67.4	**2015**	100.0
2006	72.5	**2016**	99.4 ↓
2007	78.4	**2017**	110.6
2008	84.9	**2018**	113.8

As can be seen in Table 3.5 and Figure 3.9, it is seen that the general trend in the mining and quarrying production index is in the direction of increase between 1999 and 2018, except for the years of 2000-2003, 2009, 2014 and 2016. In the index, where the year 2015 was taken as 100 units, the mining and quarrying production index, which was 74.6 units in 1999, declined to 59.1 unit, respectively by 2.9, 8.8, 9.0 and 3.4 percent decline. However, during the 5 years period between 2004 and 2008, it showed a rapid recovery and reached an annual average of 84.9 units in 2008. After a flat trend in 2009 and 2010, the index rose to 99 units on average annually in 2011 with a sharp increase of 15.2%. Following a flat trend of 98.2-100.9 between 2012 and 2016, it increased to 110.6 units in 2017 with a sharp increase of 11.3% and to an average of 113.8 units in 2018.

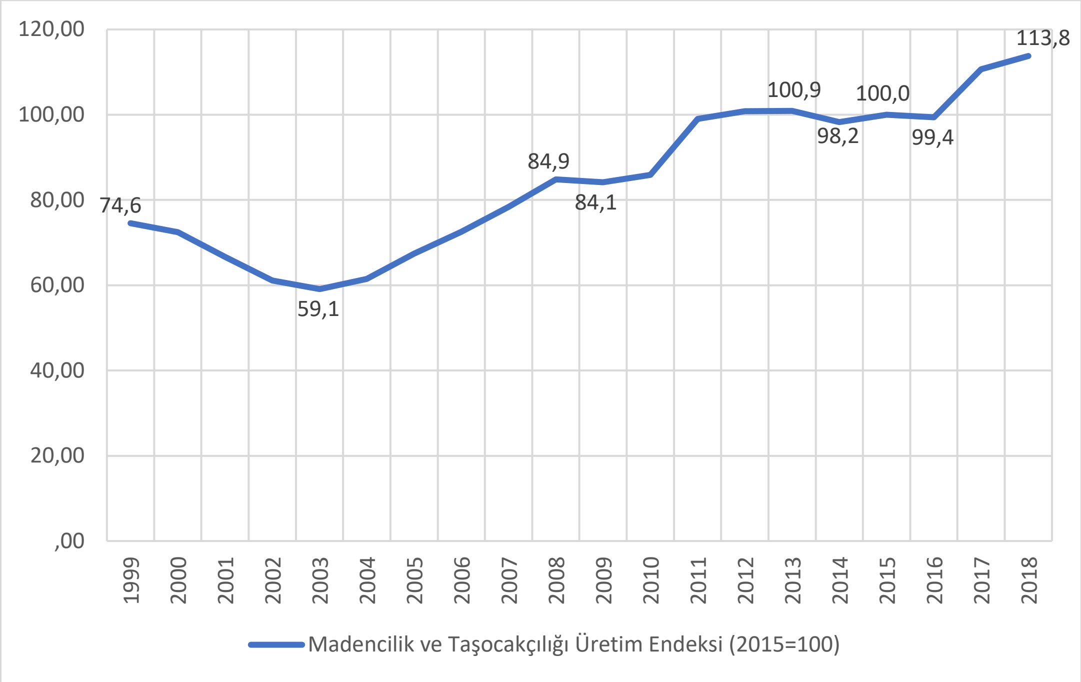

Figure 3.9 Turkey's Mining and Quarrying Production Index (1999-2018, 2015=100) (TURKSTAT, 2019a)

The mining and quarrying production index annually grew by 2.2% on average between 1999 and 2018 (Table 3.5 and Figure 3.9).

In the TURKSTAT data, the foreign trade of the mining industry is classified as "C-Mining and quarrying" under the headings of Export by Economic Activities (TURKSTAT, 2019e) and Imports by Economic Activities (ISIC, Rev.3) (TURKSTAT, 2019f) under the International standard industry classification (ISIC, Rev.3). In this frame, with respect to economic activities according to export and import data of TURKSTAT (2019e, f); Overview of mining trade foreign trade in the last 20 years between 1999 and 2018 is shown in Table 3.6, the mining export and import values are shown in Figure 3.10, the mining foreign trade balance (exports minus import in mining sector) is shown in Figure 3.11, the ratio of exports to imports in mining sector is shown in Figure 3.12.

Table 3.6 Turkey's Mining Industry (mining and quarrying) Foreign Trade Values (1999-2018, x1000 USD) (TURKSTAT, 2019c, d)

Years	**Mining and quarrying Export (Exp) (x 1000 USD)**	**Mining and quarrying Import (Imp) (x 1000 USD)**	**Mining and quarrying Foreign Trade Volume, Exp+Imp (x 1000 USD)**	**Mining and quarrying Foreign Trade Balance, Exp-Imp (x 1000 USD)**	**Rate of Exports Meeting Imports for Mining and quarrying, Exp/Imp (%)**
1999	384,989	4,245,738	4,630,726	-3,860,749	9.1%
2000	400,269	7,096,767	7,497,036	-6,696,499	5.6%
2001	348,652	6,576,826	6,925,478	-6,228,174	5.3%
2002	387,193	7,192,305	7,579,498	-6,805,112	5.4%
2003	469,089	9,020,508	9,489,597	-8,551,418	5.2%
2004	649,237	10,980,937	11,630,175	-10,331,700	5.9%
2005	810,241	16,321,199	17,131,441	-15,510,958	5.0%
2006	1,146,326	22,033,762	23,180,088	-20,887,436	5.2%
2007	1,660,895	25,314,075	26,974,969	-23,653,180	6.6%
2008	2,155,150	35,649,704	37,804,854	-33,494,554	6.0%
2009	1,682,915	20,624,650	22,307,565	-18,941,734	8.2%
2010	2,687,124	25,932,549	28,619,673	-23,245,426	10.4%
2011	2,805,449	37,331,370	40,136,819	-34,525,921	7.5%
2012	3,160,765	42,246,825	45,407,590	-39,086,059	7.5%
2013	3,879,449	38,205,124	42,084,573	-34,325,675	10.2%
2014	3,406,108	37,126,090	40,532,198	-33,719,982	9.2%
2015	2,798,896	27,608,840	30,407,735	-24,809,944	10.1%
2016	2,676,815	19,008,899	21,685,714	-16,332,084	14.1%
2017	3,509,311	26,078,566	29,587,878	-22,569,255	13.5%
2018	3,399,632	28,967,959	32,367,591	-25,568,326	11.7%

As can be seen in Table 3.6 and Figure 3.10, Turkey's mining sector foreign trade has continued to give foreign trade deficit every year for the last 20 years. However, in this period, this deficit appreciates as exports grow by 12.1% on average and imports grow by 10.6% on average, which means that sectoral exports grow faster than imports. Thus, the ratio of exports to imports in the mining industry reached 10.2% on average in the last 10 years (2009-2018), whereas it was 5.9% between 1999 and 2008.

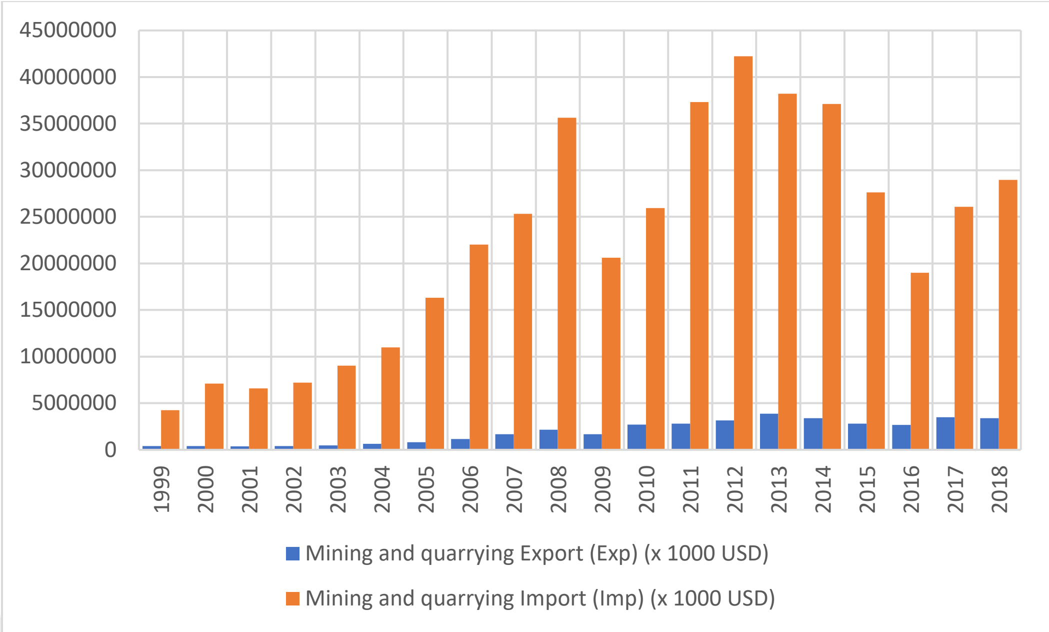

Figure 3.10 Turkey's Mining Industry Exports and Imports Values (1999-2018, x1000 USD) (TURKSTAT, 2019e, f)

Total foreign trade deficit of the sector is 409 billion USD in the last 20 years, with an average of 20.5 billion USD per year. In 2018, the total annual exports in the sector were 3.4 billion USD, the total annual imports were 29 billion USD, the total annual trade volume was 32.4 billion USD, the sectoral foreign trade deficit was 25.6 billion USD and the ratio of sectoral exports to imports was 11.7% (Table 3.6, Figure 3.10, 3.11 and 3.12).

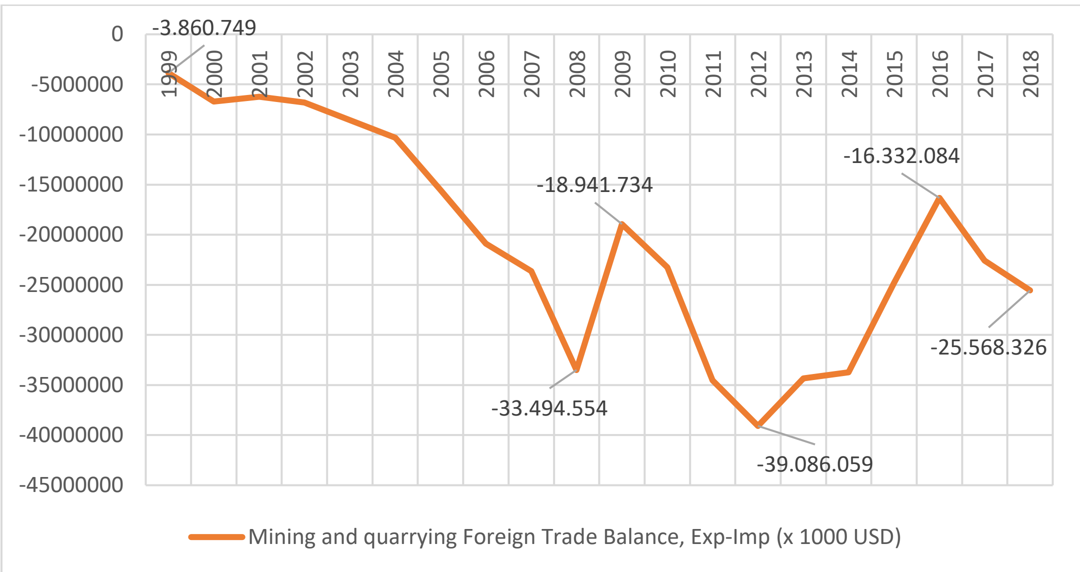

Figure 3.11 Turkey's Mining Industry Foreign Trade Balance (1999-2018, x1000 USD) (TURKSTAT, 2019e, f)

In the last 20 years (1999-2018), the ratio of exports to imports in the mining sector is quite low as 8.1% on average annually. This is a clear indication of the high level of dependence on imports in the mining sector.

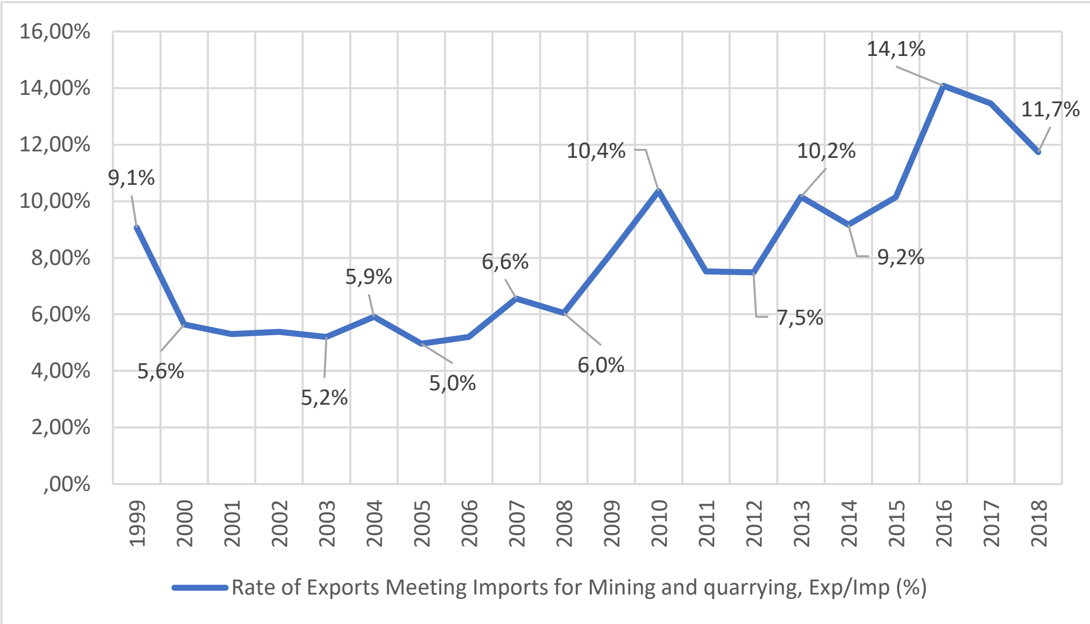

Figure 3.12 The Ratio of Exports to Imports in Turkey's Mining Sector (%) (TURKSTAT, 2019e, f)

3.1.3. An Overview of Turkish Agriculture Sector

In the last two decades, exports and imports of agri-food and other sectors have grown at close proportions in Turkey. The export success of the sector, which cannot benefit from the freedom of trade in which non-agricultural and non-food sectors benefit, is promising for the future. While increasing the exports of fruits, vegetables and hard shellfish, which are traditional export products, the sector managed to increase the exports of processed food industry products, albeit with small steps. The sector, formerly known as ”agriculture", is now considered as "agriculture-food", and the sector, similar to other sectors, with the support of a corporate network that transcends national boundaries, it has gained the appearance of supplying goods and products to the world market and increasing the internationalization of trade. This change affects farmers, manufacturers, marketers, retailers, consumers, and governments that interfere with the flow of goods and products (Turkish Exporters Assembly, 2017: 16). However, in the last 20 years (1999-2018), the share of agriculture, forestry and fishery products in GDP has depreciated to almost half its value. Turkey's agricultural (agriculture, forestry and fishing) share of GDP and total GDP values are shown in Table 3.7 for the 1999-2018 period:

Table 3.7 Turkey's Agriculture Industry GDP Value and It’s Share in Total GDP (1999-2018) (TURKSTAT, 2019b)

Years	Gross domestic product (purchaser's price) of Agriculture. forestry and fishing				Total Gross domestic product (purchaser's price)	
	Value (x1000 TL)	**Share (%)**	**Annual Change (%)**	**Value (1999=100.0)**	**Value (x1000 TL)**	**Value (1999=100.0)**
1999	11,229,013	10.5	25.4	100.0	107,164,345	100.0
2000	17,205,761	10.1	53.2	153.2	170,666,715	159.3
2001	21,729,848	8.9	26.3	193.5	245,428,760	229.0
2002	36,901,720	10.3	69.8	328.6	359,358,871	335.3
2003	46,249,933	9.9	25.3	411.9	468,015,146	436.7
2004	54,365,145	9.4	17.5	484.1	577,023,497	538.4
2005	62,349,598	9.3	14.7	555.3	673,702,943	628.7
2006	64,415,593	8.2	3.3	573.7	789,227,555	736.5
2007	66,197,107	7.5	2.8	589.5	880,460,879	821.6
2008	74,451,345	7.5	12.5	663.0	994,782,858	928.3
2009	81,234,274	8.1	9.1	723.4	999,191,848	932.4
2010	104,703,635	9.0	28.9	932.4	1,160,013,978	1,082.5
2011	114,838,169	8.2	9.7	1,022.7	1,394,477,166	1,301.3
2012	121,692,893	7.8	6.0	1,083.7	1,569,672,115	1,464.7
2013	121,709,079	6.7	0.0	1,083.9	1,809,713,087	1,688.7
2014	134,724,745	6.6	10.7	1,199.8	2,044,465,876	1,907.8
2015	161,447,917	6.9	19.8	1,437.8	2,338,647,494	2,182.3
2016	161,304,618	6.2	-0.1	1,436.5	2,608,525,749	2,434.1
2017	189,193,521	6.1	17.3	1,684.9	3,110,650,155	2,902.7
2018	216,666,387	5.8	14.5	1,929.5	3,724,387,936	3,475.4

The annual GDP share of agriculture sector (agriculture, forestry and fishing) is shown in Figure 3.13.

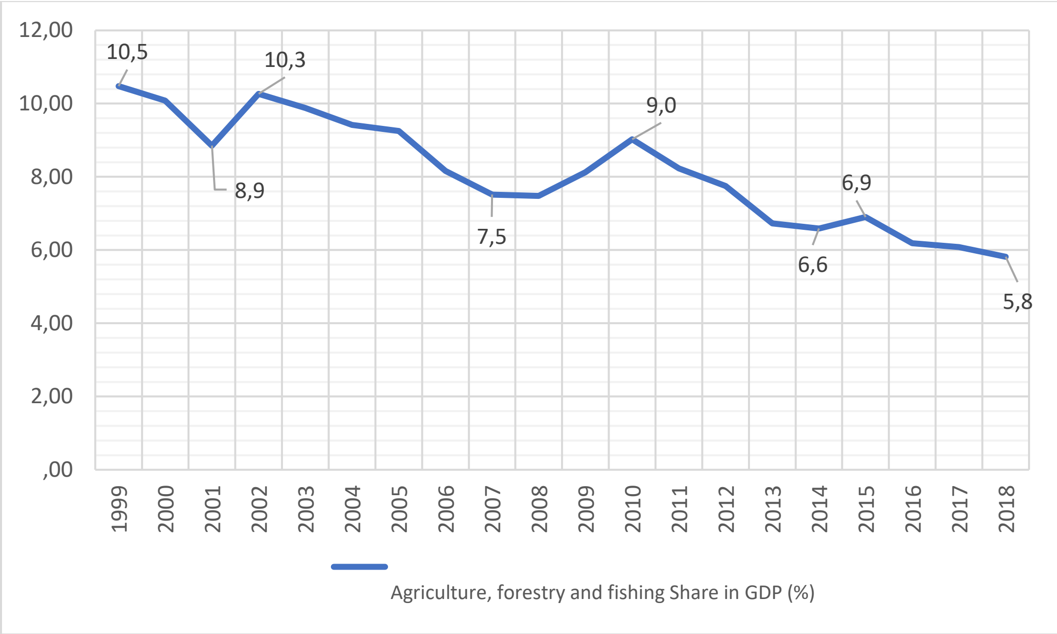

Figure 3.13 The Annual GDP Share of Agriculture Sector in Turkey (1999-2018) (TURKSTAT, 2019b)

Annual changes of Turkey's agricultural (agriculture, forestry and fishing) GDP and total GDP which were accepted as 100 units in 1999, are compared in Figure 3.14:

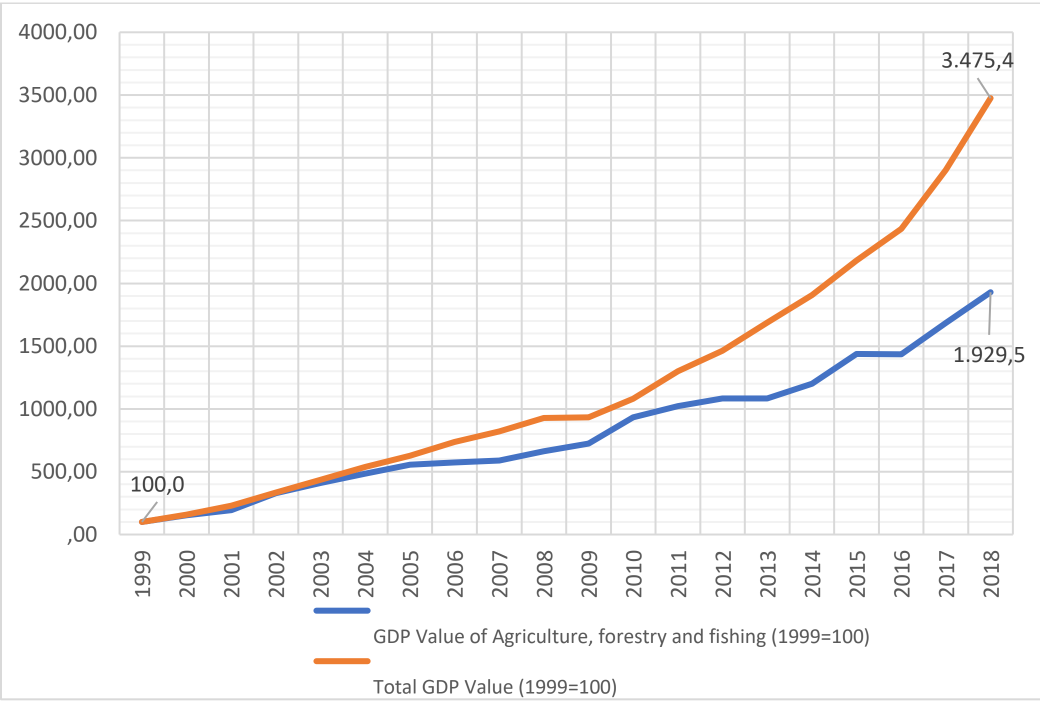

Figure 3.14 The Comparison of Value Index of Agriculture Sector and Total GDP Value of Turkey (1999-2018, 1999=100.0) (TURKSTAT, 2019b)

As can be seen in Table 3.7, Figures 3.12 and 3.14, the value of the agricultural sector (agriculture, forestry and fisheries), which was 11.3 billion TL in 1999, reached 216.7 billion TL by the end of 2018 with an average annual growth of 16.9%. However, within the same period, the share of the agricultural sector in GDP depreciated from 10.5% to 5.8%, and the sectoral growth in the last 20 years was approximately 19 times. It is seen that the growth in the agricultural sector is considerably lower than the growth in GDP when considering that the total GDP of Turkey showed about 35 times increase in the same period.

Table 3.8 Turkey's Agricultural Foreign Trade Values (1999-2018, x1000 USD) (TURKSTAT, 2019c, d)

Years	**Agricultural (Agriculture, Livestock and Food) Export (Exp) (x 1000 USD)**	**Agricultural (Agriculture, Livestock and Food) Import (Imp) (x 1000 USD)**	**Agricultural (Agriculture, Livestock and Food) Foreign Trade Volume, Exp+Imp (x 1000 USD)**	**Agricultural (Agriculture, Livestock and Food) Foreign Trade Balance, Exp-Imp (x 1000 USD)**	**Rate of Exports Meeting Imports for Agricultural Foreign Trade, Exp/Imp (%)**
1999	4,173,826	2,123,955	6,297,781	2,049,871	196.5%
2000	3,619,410	2,218,476	5,837,886	1,400,934	163.1%
2001	4,071,067	1,552,191	5,623,258	2,518,876	262.3%
2002	3,752,287	2,005,928	5,758,215	1,746,359	187.1%
2003	4,845,490	2,915,364	7,760,854	1,930,126	166.2%
2004	6,009,052	3,237,507	9,246,559	2,771,545	185.6%
2005	7,828,200	3,463,429	11,291,629	4,364,771	226.0%
2006	8,048,473	3,685,216	11,733,689	4,363,257	218.4%
2007	9,142,120	5,393,251	14,535,371	3,748,869	169.5%
2008	10,840,207	8,759,545	19,599,752	2,080,662	123.8%
2009	10,701,175	6,354,649	17,055,824	4,346,526	168.4%
2010	12,040,472	7,682,821	19,723,293	4,357,651	156.7%
2011	14,427,478	10,961,497	25,388,975	3,465,981	131.6%
2012	15,251,006	10,733,968	25,984,974	4,517,038	142.1%
2013	16,977,197	11,200,161	28,177,358	5,777,036	151.6%
2014	17,994,845	12,418,338	30,413,183	5,576,507	144.9%
2015	16,788,925	11,242,924	28,031,849	5,546,001	149.3%
2016	16,249,144	11,037,855	27,286,999	5,211,289	147.2%
2017	16,908,662	12,666,085	29,574,747	4,242,577	133.5%
2018	17,673,078	12,844,670	30,517,748	4,828,408	137.6%

This negative picture turns into a positive picture in the foreign trade of the agriculture sector, which is obtained by gathering agriculture, animal husbandry and food products under the agriculture sector, especially with the positive effect of the food sector. According to the 2018 Budget Presentation Report of the Ministry of Food, Agriculture and Livestock, among the 99 foreign trade chapters in TURKSTAT's foreign trade data according to chapters, the first 24 chapters are related to agriculture, animal husbandry and food and constitute agricultural foreign trade data (Fakıbaba. 2017: 13). In this frame, according to TURKSTAT (2019c, d) chapters on export and import data, the general outlook of agricultural foreign trade in the last 20 years between 1999 and 2018 is given in Table 3.8, the agricultural export and import values are given in Figure 3.15, the agricultural foreign trade balance (agricultural export minus agricultural import) is given in Figure 3.16, and the ratio of exports to imports in agriculture sector is given in Figure 3.17.

Turkey's agricultural (agriculture, livestock and food) sector, as will be seen in the Table 3.8 and Figure 3.15, has a trade surplus every year without exception in the 20-year period. However, in this period, this surplus increases in a decreasing rate with the growth of exports by 7.9% on average and imports by 9.9% on average, which means that sectoral imports grow faster than exports. Thus, the ratio of exports to imports in the agriculture sector decreased to 146.3% on average in the last 20 years (1999-2018), whereas it was 196.5% in 1999.

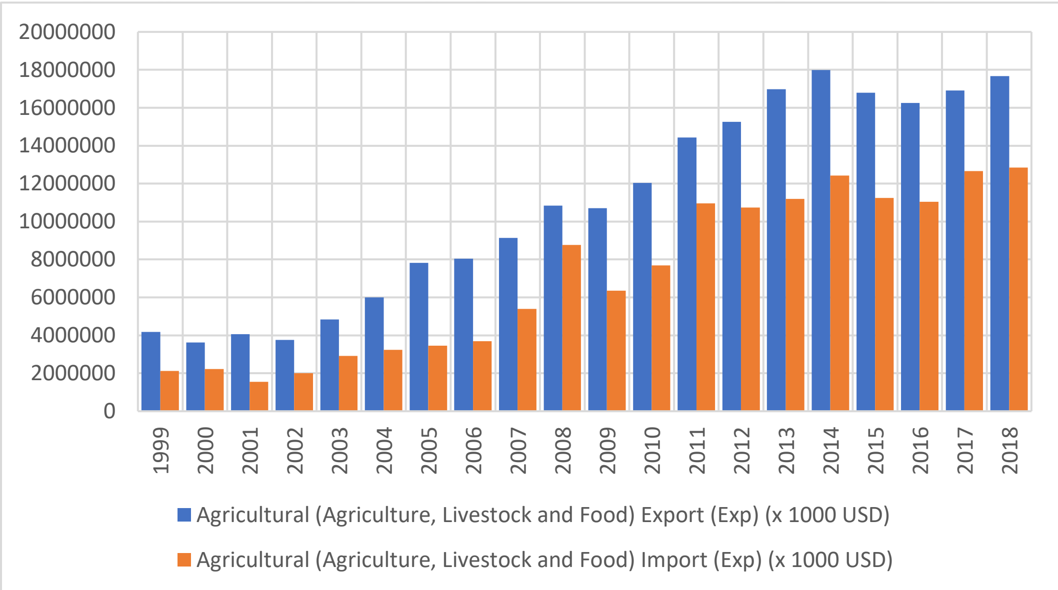

Figure 3.15 Turkey's Agriculture Sector Exports and Imports Values (1999-2018, x1000 USD) (TURKSTAT, 2019c, d)

In the last 20 years (1999-2018), the ratio of exports to imports in the agricultural sector is quite high as 168.1% on average annually. This is a clear indication of the high level of exports in the agricultural sector, especially with the positive effect of the food sector.

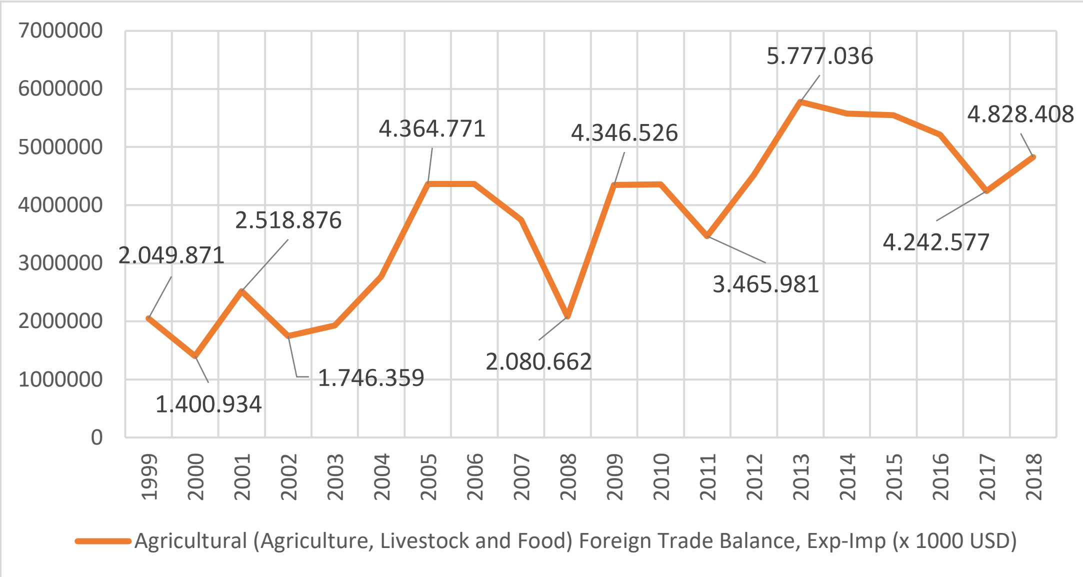

Figure 3.16 Turkey's Agricultural Trade Balance (1999-2018, x1000 USD) (TURKSTAT, 2019c, d)

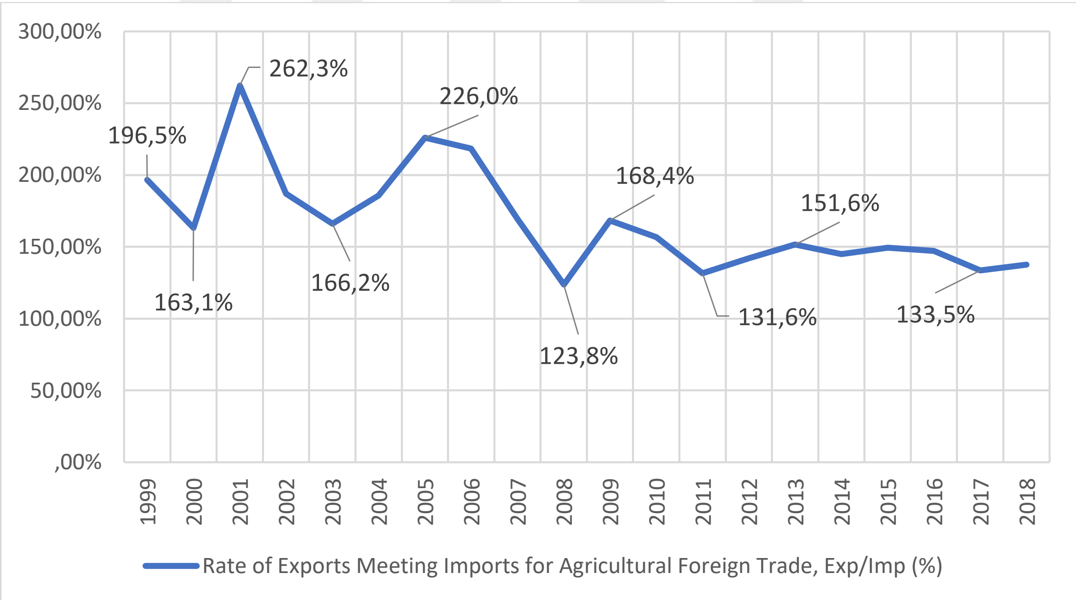

Figure 3.17 Ratio of Exports to Imports in Turkey's Agriculture Sector (%) (TURKSTAT, 2019c, d)

3.2. An Overview of Real Exchange Rate in Turkey

Exchange rate policies are all measures taken by governments in order to ensure the balance of payments in international trade. In the implementation of exchange rate policy, the effects of exchange rate policies are based on real exchange rate. The real exchange rate is the exchange rate at which the prices are determined in the trade of goods and services realized by the two countries and it is an important factor especially in analyzing the changes in the foreign trade balance in open economies (Atılgan, 2011: iii). However, as previously examined and as mentioned in the studies (Terzi and Zengin, 1999; Yapraklı, 2010; Karagöz and Doğan, 2005; Yamak and Korkmaz, 2005; Erdem, Tuğcu and Nuhoğlu, 2007; Hepaktan, 2008; Keskin, 2008; Peker, 2008; Vergil and Erdoğan, 2009; Yavuz, Güriş and Kıran, 2009; Yazıcı, 2008, 2009) investigating the relationship between the trade balance and the exchange rate for Turkey, there is no general consensus in the literature as to whether the changes in the real exchange rate have an impact on the foreign trade balance, the direction of this effect, whether short and/or long-term effects are seen, and whether the j-curve effect is valid for Turkey. In this regard, there is a necessity of conducting researches on the impact of the exchange rate on foreign trade in Turkey, and re-addressing it in sectoral and in systematic with current data.

In this context, real exchange rate (ReR) in Turkey in the last 20 years (between 1999-2008), in PPI-based three-month period, with domestic prices is shown in Table 3.9 and Figure 3.17. Here ReR is defined as the ratio of the value of Turkish goods divided by the value of US goods. Given this definition, an increase in ReR represents an appreciation of Turkish Liras (TL) while a decrease in ReR means a depreciation of TL. When ReR decreases (thus TL depreciates), the Turkish goods becomes cheaper compared to US goods and this makes easier to export Turkish goods thus leads an increase in exports and decrease in imports so that this improves the foreign trade balance. In the opposite case, i.e. when ReR increases (thus TL appreciates), the Turkish goods becomes more expensive compared to US goods and this makes more difficult to export Turkish goods thus leads a decrease in exports and increase in imports so that this worsens the foreign trade balance.

Table 3.9 Real Effective Exchange Rate in Turkey (1999-2018, D-PPI Based, 2003=100, Quarterly) (CBRT, 2019)

Period	ReR	Period	ReR	Period	ReR	Period	ReR
1999-Q1	95.52	**2004-Q1**	112.48	**2009-Q1**	100.70	**2014-Q1**	94.07
1999-Q2	95.48	**2004-Q2**	99.92	**2009-Q2**	106.34	**2014-Q2**	98.96
1999-Q3	97.54	**2004-Q3**	98.44	**2009-Q3**	107.10	**2014-Q3**	100.29
1999-Q4	99.05	**2004-Q4**	100.83	**2009-Q4**	105.21	**2014-Q4**	102.62
2000-Q1	102.50	**2005-Q1**	107.75	**2010-Q1**	110.56	**2015-Q1**	101.78
2000-Q2	101.70	**2005-Q2**	111.42	**2010-Q2**	114.36	**2015-Q2**	97.71
2000-Q3	105.46	**2005-Q3**	113.69	**2010-Q3**	115.71	**2015-Q3**	93.23
2000-Q4	110.91	**2005-Q4**	112.33	**2010-Q4**	111.64	**2015-Q4**	97.66
2001-Q1	86.49	**2006-Q1**	113.26	**2011-Q1**	105.75	**2016-Q1**	99.84
2001-Q2	84.59	**2006-Q2**	97.88	**2011-Q2**	102.20	**2016-Q2**	98.70
2001-Q3	75.15	**2006-Q3**	104.43	**2011-Q3**	96.43	**2016-Q3**	97.68
2001-Q4	88.92	**2006-Q4**	103.66	**2011-Q4**	98.27	**2016-Q4**	90.97
2002-Q1	104.53	**2007-Q1**	106.54	**2012-Q1**	101.70	**2017-Q1**	89.31
2002-Q2	89.75	**2007-Q2**	111.95	**2012-Q2**	103.86	**2017-Q2**	91.90
2002-Q3	86.82	**2007-Q3**	114.65	**2012-Q3**	102.74	**2017-Q3**	89.80
2002-Q4	94.17	**2007-Q4**	115.65	**2012-Q4**	103.89	**2017-Q4**	84.28
2003-Q1	93.57	**2008-Q1**	108.73	**2013-Q1**	104.29	**2018-Q1**	84.31
2003-Q2	103.45	**2008-Q2**	112.22	**2013-Q2**	101.84	**2018-Q2**	79.51
2003-Q3	108.57	**2008-Q3**	115.51	**2013-Q3**	96.43	**2018-Q3**	70.04
2003-Q4	99.15	**2008-Q4**	102.60	**2013-Q4**	95.16	**2018-Q4**	82.77

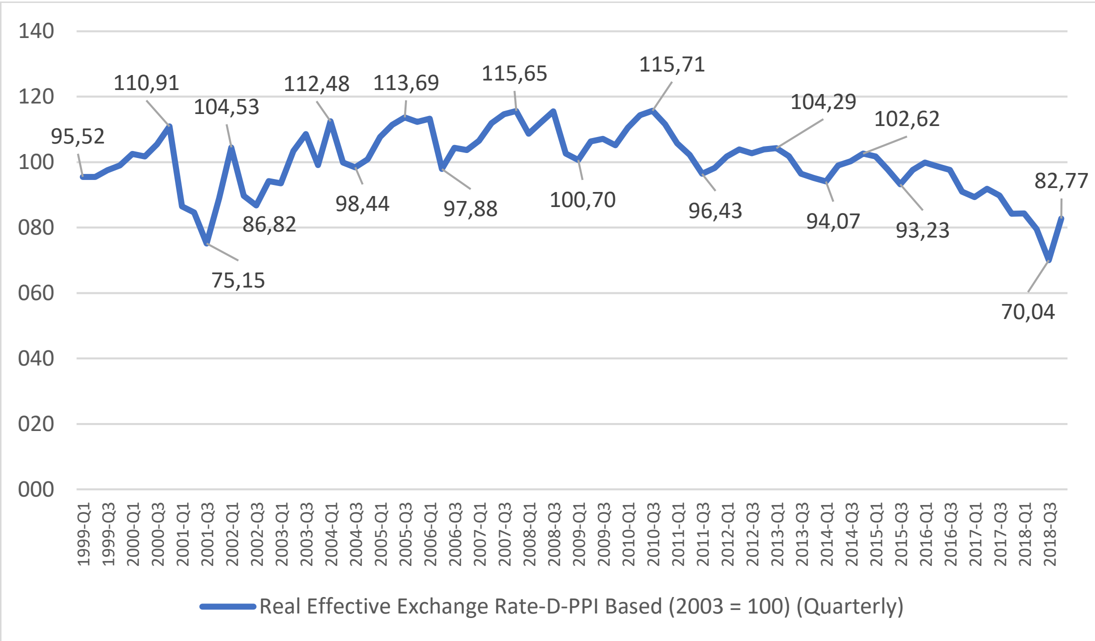

Figure 3.18 Real Effective Exchange Rate in Turkey (1999-2018, D-PPI Based, 2003=100, Quarterly) (CBRT, 2019)

According to Table 3.9 and Figure 3.18; at the end of the first quarter of 1999 (1999-Q1), the real effective exchange rate based on PPI at domestic prices (2003 = 100) increased from 95.52 to 110.91 in the last quarter of 2000 (2000-Q4). However, it quickly dropped to 75.15 in the next 3 quarters (at the end of 2001-Q3). In the following two quarters (at the end of 2002-Q1), it recovered to 104.53, and reached 115.71 at the end of 2010-Q3 with gradual increases over the following 8 years. Real effective exchange rates depreciated to 70.04 by the end of 2018-Q3 with gradual descents for the next 8 years starting from the last quarter of 2010. In the last quarter of 2018, the real effective exchange rate appreciated to 82.77, and if this trend continues, it can be expected to reach a value between 95-110 in 2 years.

3.3. The Notions of Asymmetric Effect and Real Exchange Rate

In the context of economic literature, asymmetric effect can be defined as that an increase and/or a decrease in one economic variable shows different effects asynchronous, in short and/or long terms in terms of direction, size and duration over another economic variable depending on the internal dynamics and reactions in countries with different levels of development or in different sectors of a country (Aksu et al., 2017: 479; Kolcu and Yamak, 2017: 645; Saha, 2017: 3).

The exchange rate is the ratio of exchange between one unit of national currency and foreign currency. It provides a connection between national economy and world economy. Exchange rate is formed at the level where total foreign exchange demand and total foreign exchange supply are equalized. When a change in market demand or market supply occurs, exchange rates change as a reaction to this (Seyidoğlu, 2003: 298).

There are two types of exchange rates, nominal and real. The nominal exchange rate is defined as the relative price of the two countries' currency. The nominal exchange rate represents the relative price of the two currencies as a monetary concept. When it is said that 1 TL equals 1 USD, it means the nominal exchange rate is mentioned. On the other hand, the real exchange rate is the rate calculated by comparing the sales prices of the same goods or groups of goods at the nominal exchange rate between the currencies of the two countries, and shows the realistic rate of nominal exchange rate. In other words, the real exchange rate is the exchange rate calculated to take into account the inflation differences between countries. In order to precisely calculate the real exchange rate, the goods or goods on which the comparison is based must be produced with the same standard in both countries. The real exchange rate which is commonly used in measuring international competition is calculated as follows (Kaplan, 2009: 3):

$$\text{ReR} = p/(\text{e} \times p^{*}) \quad \text{(Equation 3.1)}$$

where;

ReR: Reel Exchange Rate

p: Domestic price (Price of the relevant product in local currency in the country of comparison)

p*: Overseas price (Price of the respective product in the base country)

e: Nominal exchange rate (Current exchange rate)

The nominal exchange rate reflects the relative price of the two countries' currency, while the real exchange rate reflects the relative price of the goods in the two countries. In other words, the real exchange rate indicates the rate at which one country's goods are traded with another country's goods (Parasız, 1999: 316). Here ReR is defined as the ratio of the value of Turkish goods divided by the value of US goods. Given this definition, an increase in ReR represents an appreciation of Turkish Liras (TL) while a decrease in ReR means a depreciation of TL.

In terms of the effect of exchange rate, the main causes of asymmetric effect are the structure of the market in which importer or exporter companies take place, in other words, whether the firms are fully competitive or monopolistic, the factors such as menu costs, transit costs, price rigidity, quantity constraints and market share (Kolcu and Yamak, 2017: 645).

CHAPTER IV

DATA AND METHODOLOGY

In this chapter where the data and methodology has been presented, the description and plots of the data, the empirical methodology, the stationarity and unit root test have been studied.

4.1. Description of the Data

In our research, where it is aimed to find the symmetric and asymmetric effects of real exchange rate on the trade balances of Turkish manufacturing, mining and agriculture sectors as well as the trade balance of the sum of these three sectors in the short and long terms, there are mainly 4 variables which are:

TB: Trade Balance

RER: Real Exchange Rate

Y: Real Domestic Income

YW: Real World Income

TB is the dependent variable as the rest are independent.

TB is taken as sectoral. Thus, we get the following variables for TB:

"TB_{mnf}", Foreign Trade Balance of Turkey's Manufacturing Sector

"TB_{mng}", Foreign Trade Balance of Turkey's Mining Sector

"TB_{agc}", Foreign Trade Balance of Turkey's Agriculture Sector

"TB_{all}", Foreign Trade Balance of Turkey's Manufacturing, Mining and Agriculture Sectors (sum of three sectors).

YW is also taken as sectoral. Thus, we get the following variables for YW:

"YW_{mnf}", Real World Income for Manufacturing Sector

"YW_{mng}", Real World Income for Mining Sector

"YW_{agc}", Real World Income for Agriculture Sector

"YW_{all}", Real World Income for Manufacturing, Mining and Agriculture Sectors (sum of three sectors).

In this frame, we collected dataset for 10 variables which are (1) TB_{mnf}, (2) TB_{mng}, (3) TB_{agc}, (4) TB_{all}, (5) RER, (6) Y, (7) YW_{mnf}, (8) YW_{mng}, (9) YW_{agc} and (10) YW_{all} as described above.

Table 4.1 Variables and Their Sources

Main Variable	**All Variables (inc. sectoral ones)**	**Dependent / Independent**	**Sources**
TB: Trade Balance	"TBmnf", Foreign Trade Balance of Turkey's Manufacturing Sector (Export/Import) (2003=100, quarterly) "TBmng", Foreign Trade Balance of Turkey's Mining Sector (Export/Import) (2003=100, quarterly) "TBagc", Foreign Trade Balance of Turkey's Agriculture Sector (Export/Import) (2003=100, quarterly) "TBall", Foreign Trade Balance of Turkey's Manufacturing, Mining and Agriculture Sectors (Export/Import) (2003=100, quarterly)	Dependent	(TurkStat, 2019).
RER: Real Exchange Rate	"RER"="$p/(e \times p^{*})$", Real Effective Exchange Rate based on Domestic CPI (2003=100, quarterly)	Independent	(CBRT, 2019).
Y: Real Domestic Income	"Y" Real GDP of Turkey (as Real Domestic Income) (2003=100, quarterly)	Independent	(OECD, 2019).
YW: Real World Income	"YWmnf", Real World Income for Manufacturing (2003=100, quarterly) "YWmng", Real World Income for Mining (2003=100, quarterly) "YWagc", Real World Income for Agriculture (2003=100, quarterly) "YWall", Real World Income for Manufacturing, Mining and Agriculture (sum of 3 sectors) (2003=100, quarterly)	Independent	(OECD, 2019; TurkStat, 2019).

The dataset includes 68 quarter data for 17 years from 2002 to 2018 including these years, i.e. 2002-I:2018-IV, for these above mentioned 10 variables.

In the research, secondary data is used. They are collected through three main sources which are Turkish Statistical Institute (TurkStat), Central Bank of the Republic of Turkey (CBRT) and Organisation for Economic Co-operation and Development (OECD). The variables and their sources are listed in Table 4.1.

4.1.1. Trade Balances (Dependent)

The data for trade balances which are (1) TB_{mnf}, (2) TB_{mng}, (3) TB_{agc}, (4) TB_{all} are taken as the ratio of Export/Import then multiplied by 100. Turkey's agriculture, mining, manufacturing trade data was obtained in TurkStat website[1].

Since this dynamic inquiry part of TurkStat allows data acquisition for a maximum of 5 years at a time, the data was taken for all countries separately for 2002-2003, 2004-2008, 2009-2013, 2014-2018 and then merged. These data were prepared for the period of 2002-I: 2018-IV for the sectoral basis and for 68 quarters (i.e. including 17 years). Finally, the data in each sector was calculated as export / import (percent) for each quarter and multiplied by 100.

Each quarter data in the dataset was indexed to 2003 by dividing the average of the four quarters of 2003 (2003=100.00). After indexing to 2003, Log in e base (Ln) conversion of all data was performed and all data were seasonally adjusted before analysis.

4.1.2. Real Exchange Rate (Independent)

The Real Exchange Rate dataset was created from the CBRT's https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket/collapse_2/5868/DataGroup/turkish/bie_rktufey/#collapse_2 address on a monthly basis and averaged quarterly. Since the monthly exchange rates are indexed in 2003, the 2003 average of the quarter-based ones gives exactly 100,00. Therefore, there is no need to make a separate calculation for indexing data for 2003 (2003 = 100.00) by dividing the data for each quarter by the average of 4 quarters of 2003.

After indexing to 2003, Log in e base (Ln) conversion of all data was performed and all data were seasonally adjusted before analysis.

[1] Steps we follow to access to this data are explained in Appendix 2.

In our study, a decrease in RER variable means a depreciation of local currency (Turkish Liras) against USD. This will lead an increase in export value, a decrease in import value, so an improvement in trade balance (TB = export/import*100) value (Bahmani-Oskooee & Fariditavana, 2015: 1). Thus, we expect increase on the trade balance value by a decrease in RER value (negative correlation). In case of j-curve effect, we expect to see a positive RER-TB correlation in short-term, then negative correlation in long term. This j-curve effect may be observed in symmetric (at the same time, simultaneously, synchronously, similar in attitude/change rate) and/or asymmetric (different and/or asynchronous in terms of direction, size and duration in short and/or long terms) effect. Therefore, any positive correlation (symmetric or asymmetric) of RER-TB in short term, then any negative correlation (symmetric or asymmetric) of RER-TB in long term will be assumed as j-curve effect.

Regarding to RER-TB relation, the j-curve pairs of effects will be as follows:

- Positive symmetric effect in short-term + negative symmetric effect in long-term= j-curve effect
- Positive symmetric effect in short-term + negative asymmetric effect in long-term= j-curve effect
- Positive asymmetric effect in short-term + negative symmetric effect in long-term= j-curve effect
- Positive asymmetric effect in short-term + negative asymmetric effect in long-term= j-curve effect

That is (no matter the effect is symmetric or asymmetric);

Positive effect in short-term + negative effect in long-term= j-curve effect.

4.1.3. Real Domestic Income (Independent)

Real GDP of Turkey is taken as Real Domestic Income. Turkey's real GDP data was obtained in OECD website[2].

Each quarter data in the dataset was indexed to 2003 by dividing the average of the four quarters of 2003 (2003=100.00). After indexing to 2003, Log in e base (Ln)

[2] Steps we follow to access to this data are explained in Appendix C.

conversion of all data was performed and all data were seasonally adjusted before analysis.

4.1.4. Real World Incomes (Independent)

The data for Real World Income which are (7) YW_{mnf}, (8) YW_{mng}, (9) YW_{agc} and (10) YW_{all} were taken in both sectoral basis and country weighted. Bilateral trade size with Turkey (imports + exports) of 46 countries in the OECD's database[3] were used in the calculation of country weightings (arithmetic weightings).

The real world income is calculated as the sum of weighted average of real GDPs of 46 countries, 15 of which are amongst the Top 20 countries in export, 16 of which are amongst the Top 20 countries in import, 21 of which are amongst 26 countries in the Top 20 countries in both export and import of Turkey between 2002-I:2018-IV where the country weights are the share of each country in the sectorial total trade (export+import) and 3 sectors' total trade (export+import) of Turkey in quarterly basis]. The reason to include these 46 countries into dataset is that the only the data of these countries could be collected/extracted in complete.

The shares of each of these 46 countries in Turkey's total trade in order of importance are 1) Germany: 0.1515; 2) Russian Federation: 0.1142; 3) Italy: 0.0835; 4) United States: 0.0710; 5) France: 0.0653; 6) United Kingdom: 0.0635; 7) Spain: 0.0445; 8) Switzerland: 0.0310; 9) Netherlands: 0.0269; 10) Korea. Rep.: 0.0262; 11) Romania: 0.0242; 12) Belgium: 0.0239; 13) India: 0.0225; 14) Poland: 0.0202; 15) Bulgaria: 0.0186; 16) Japan: 0.0186; 17) Israel: 0.0180; 18) Saudi Arabia: 0.0179; 19) Greece: 0.0164; 20) Sweden: 0.0130; 21) Austria: 0.0114; 22) Czech Republic: 0.0109; 23) Brazil: 0.0096; 24) South Africa: 0.0090 ; 25) Hungary: 0.0090; 26) Canada: 0.0079; 27) Indonesia: 0.0077; 28) Denmark: 0.0071; 29) Finland: 0.0065; 30) Ireland: 0.0063; 31) Australia: 0.0055; 32) Norway: 0.0054; 33) Portugal: 0.0053; 34) Slovak Republic: 0.0052; 35) Slovenia: 0.0044; 36) Mexico: 0.0039; 37) Colombia: 0.0036; 38) Argentina: 0.0024; 39) Chile: 0.0023; 40) Lithuania: 0.0017;

[3] Steps we follow to access to this data are explained in Appendix D.

41) Luxembourg: 0.0011; 42) Estonia: 0.0009; 43) Latvia: 0.0008; 44) New Zealand: 0.0006; 45) Costa Rica: 0.0004; 46) Iceland: 0.0002 (totally 1.0000).

Country weightings of these 46 countries having trade with Turkey, in agriculture, mining, manufacturing sectors was calculated in quarterly based. Bilateral foreign trade data were obtained in TurkStat web site[4].

Since this dynamic inquiry part of TurkStat allows data acquisition for a maximum of 5 years at a time, the data was taken for all countries separately for 2002-2003, 2004-2008, 2009-2013, 2014-2018 and then merged. These data were prepared for the period of 2002-I: 2018-IV for the sectoral basis and for 68 quarters (i.e. including 17 years). Among these data, 46 countries were organized on a sectoral basis to cover the 2002-I: 2018-IV periods. Finally, these 46 countries were weighted on a quarterly basis. In sectoral based weighting, the size of each country's foreign trade with the sectoral Turkey was divided by the size of the total foreign trade of Turkey with these 46 countries.

In the weighting for the sum of three sectors, the size of each country's total foreign trade in the sum of these 3 sectors with Turkey was divided by the size of the total foreign trade of Turkey with these 46 countries in the sum of these 3 sectors. In order to check the accuracy of the data, it was also checked that the sum of the weightings for each quarter gave 1.00 on a quarterly basis.

These 46 countries represent 67.4% of the average total trade volume of Turkey's agricultural sector, 46.1% of the total mining sector trade volume, 70.1% of the total manufacturing industry trade volume, and 67.7% of the total trade volume in 3 sectors in 17 years between 2002-I and 2018-IV (68 quarters).

Each quarter data in the dataset was indexed to 2003 by dividing the average of the four quarters of 2003 (2003=100.00). After indexing to 2003, Log in e base (Ln) conversion of all data was performed and all data were seasonally adjusted before analysis.

In general, the logarithm conversion of the data minimizes the problem of heteroscedasticity. Log transformation also helps to prevent series correlation. In

[4] Steps we follow to access to this data are explained in Appendix E.

addition, log transformation allows the data to be formatted as flexible, which facilitates coefficient interpretation.

The variables' descriptive statistics such as definitions, mean, median, max.-min., standard deviation, skewness, kurtosis, Jarque-Bera, probability, sum, sum sq. dev. are given in Table 4.2:

Table 4.2 The Descriptive Statistics of All Variables

	LRER_SA	**LTBMNF_SA**	**LTBMNG_SA**	**LTBAGC_SA**	**LTBALL_SA**	**LY_SA**	**LYWMNF_SA**	**LYWMNG_SA**	**LYWAGC_SA**	**LYWALL_SA**
Mean	4.65	4.57	5.01	4.37	4.57	5.00	4.69	4.85	4.57	4.69
Median	4.66	4.57	4.97	4.34	4.57	4.96	4.67	4.88	4.56	4.67
Maximum	4.86	4.92	5.64	5.10	4.89	5.43	4.93	5.06	4.83	4.90
Minimum	4.23	4.39	4.44	3.90	4.37	4.51	4.57	4.45	4.26	4.57
Std. Dev.	0.12	0.09	0.35	0.24	0.09	0.26	0.10	0.15	0.12	0.09
Skewness	-1.09	1.21	0.19	0.54	0.79	-0.02	0.69	-0.86	0.15	0.52
Kurtosis	4.74	6.20	1.76	3.00	5.38	1.91	2.42	3.20	3.06	2.15
Jarque-Bera	21.97	45.64	4.77	3.30	23.12	3.38	6.36	8.46	0.28	5.10
Probability	0.000	0.000	0.092	0.192	0.000	0.185	0.042	0.015	0.871	0.078
Sum	316.26	311.09	340.57	297.42	310.58	340.11	318.85	329.84	310.58	318.84
Sum Sq. Dev.	0.94	0.55	8.40	3.95	0.50	4.67	0.65	1.43	0.92	0.58
Observations*	68	68	68	68	68	68	68	68	68	68

* 68 quarterly data between 2002-I:2018-IV (4 quarterly data in a year x 17 years = 68).
LRER_SA: Seasonally adjusted real exchange rate with log conversion
LTBMNF_SA: Seasonally adjusted manufacturing trade foreign trade balance
LTBMNG_SA: Seasonally adjusted mining trade foreign trade balance
LTBAGC_SA: Seasonally adjusted agricultural trade foreign trade balance with log conversion
LTBALL_SA: Seasonally adjusted all 3 sectors foreign trade balance with log conversion
LY_SA: Seasonally adjusted domestic income with log conversion
LYWMNF_SA: Seasonally adjusted manufacturing world income with log conversion
LYWMNG_SA: Seasonally adjusted mining world income with log conversion
LYWAGC_SA: Seasonally adjusted agricultural world income with log conversion
LYWALL_SA: All seasonally adjusted all 3 sectors world income with log conversion

The dataset of all variables which were seasonally adjusted and log e (Ln) conversion has been performed, is given in Appendix 1.

4.2. Plots of the Data

Variable-based graphs of the data used in the analysis are given in Figure 4.1-4.10. All variables are 2003 indexed, Ln (Log e) converted and seasonally adjusted.

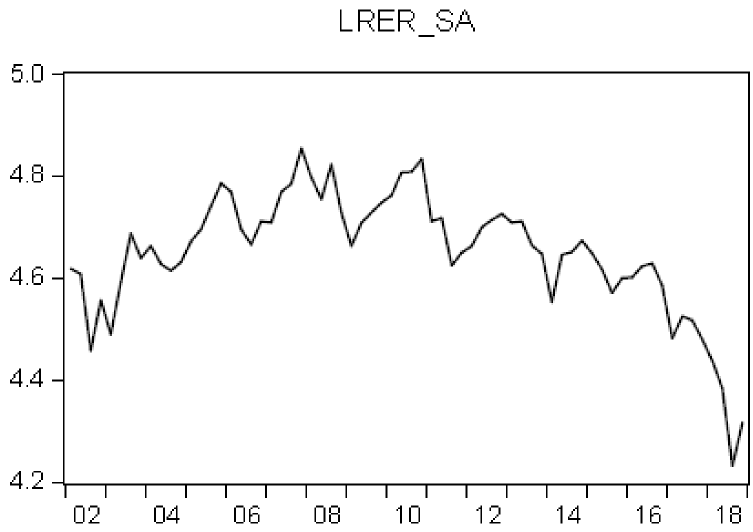

Figure 4.1 Plots of LRER_SA data

In Figure 4.1, the real exchange rate shows two different trends: an appreciation from 2002-III to 2007-IV, then a depreciation till 2018-III. It is observed that the trend from 2002-III to 2018-I is similar in terms of appreciation and depreciation and it has the lowest values of the last 17 years (68 quarters) in all quarters of 2018. This indicates an increase of approximately 8 years (31-32 quarters) and a decline of approximately 8 years (31-32 quarters) (Figure 4.1).

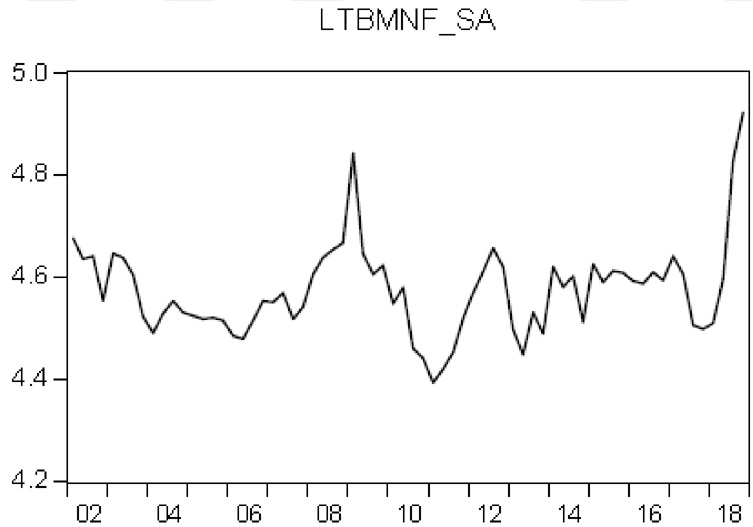

Figure 4.2 Plots of LTBMNF_SA data

Figure 4.2 shows that manufacturing foreign trade balance (LTBMNF_SA) shows similar trends in 2002-I: 2009-I period and 2009-I: 2018-IV period. In both periods, the foreign trade balance of manufacturing appreciated first and then depreciated. The amount of appreciation is higher than the amount of depreciation. Therefore, it can be said that the general trend direction is upward (Figure 4.2).

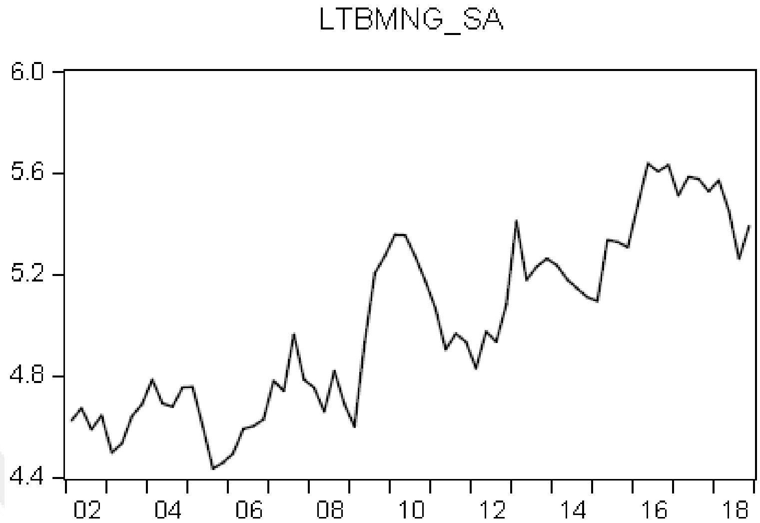

Figure 4.3 Plots of LTBMNG_SA data

Looking at Figure 4.3, the mining foreign trade balance (LTBMNG_SA) shows a steady upward trend (Figure 4.3).

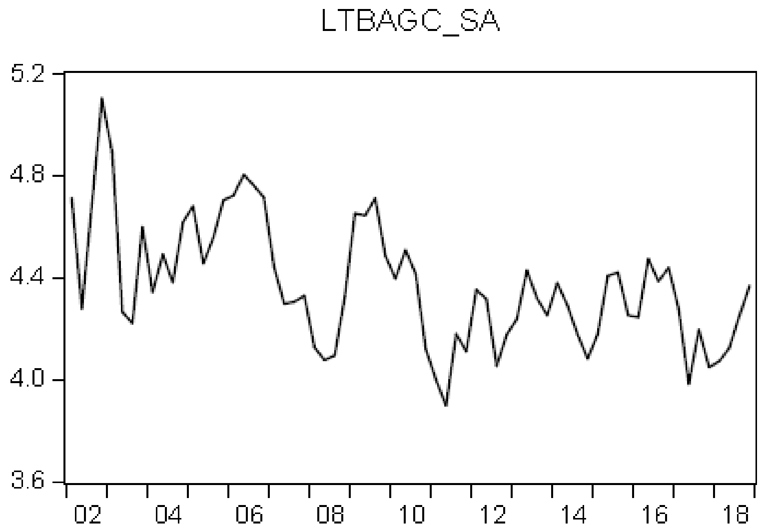

Figure 4.4 Plots of LTBAGC_SA data

Figure 4.4 shows that the agricultural trade balance (LTBAGC_SA) shows a steady downward trend. However, since the descent trend is above the upper (resistance) line, it can be thought that it may enter an upward trend (Figure 4.4).

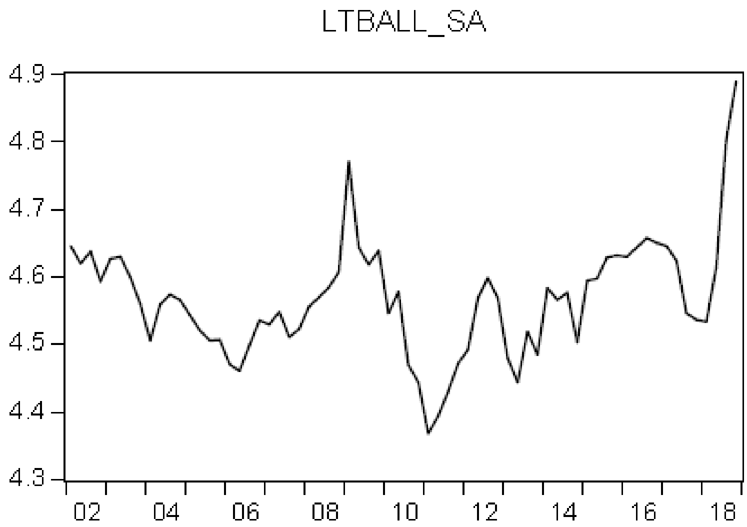

Figure 4.5 Plots of LTBALL_SA data

When looking at Figure 4.5, it seems that the overall trade balance (LTBALL_SA) of manufacturing, mining and agriculture sectors is quite similar to the trend of manufacturing trade balance (LTBMNF_SA) in Figure 4.2. The reason for this is that the share of the foreign trade volume of manufacturing industry within the sum of these 3 sectors is as high as 87.37%. In other words, it is natural that the trade balance trend of the manufacturing industry and the overall trade balance of these three sectors are very similar. Accordingly, total trade balance of 3 sectors (LTBALL_SA) shows similar trends in 2002-I:2009-I period and 2009-I:2018-IV period. In both periods, overall trade balance of the 3 sectors appreciated firstly and then depreciated. The amount of appreciation is higher than the amount of depreciation. Therefore, it can be said that the general trend direction is upward (Figure 4.5).

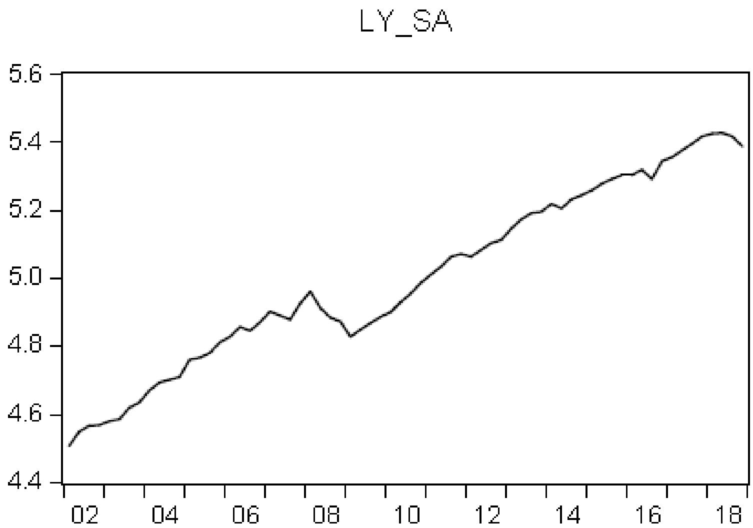

Figure 4.6 Plots of LY_SA data

When looking at Figure 4.6, Turkey's domestic income (in real terms of GDP) (LY_SA) shows a steady upward trend. However, in the 2008-I:2009-I period and in the 2018-II:2018-IV period, small decreases of 4 and 2 quarters were observed, respectively (Figure 4.6).

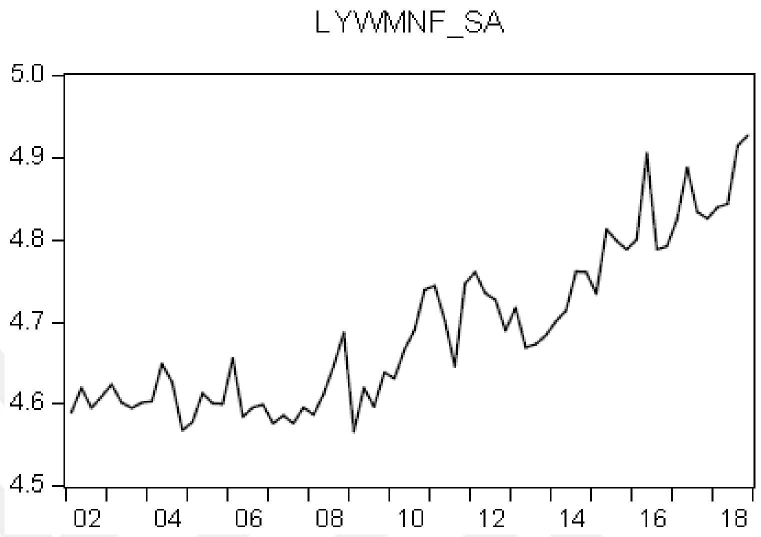

Figure 4.7 Plots of LYWMNF_SA data

When looking at Figure 4.7, it is seen that manufacturing industry world income (LYWMNF_SA) showed a flat trend between 2002-2009 and then showed an upward trend (Figure 4.7).

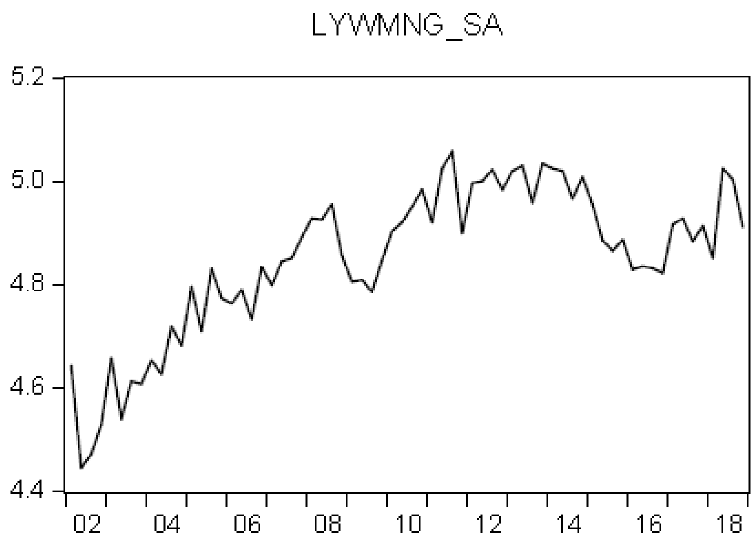

Figure 4.8 Plots of LYWMNG_SA data

When looking at Figure 4.8, the mining world income (LYWMNG_SA) showed an upward trend up to 2011-III, a flat trend up to 2014-II, a decline up to 2016-IV, and then a generally regular upward trend (Figure 4.8).

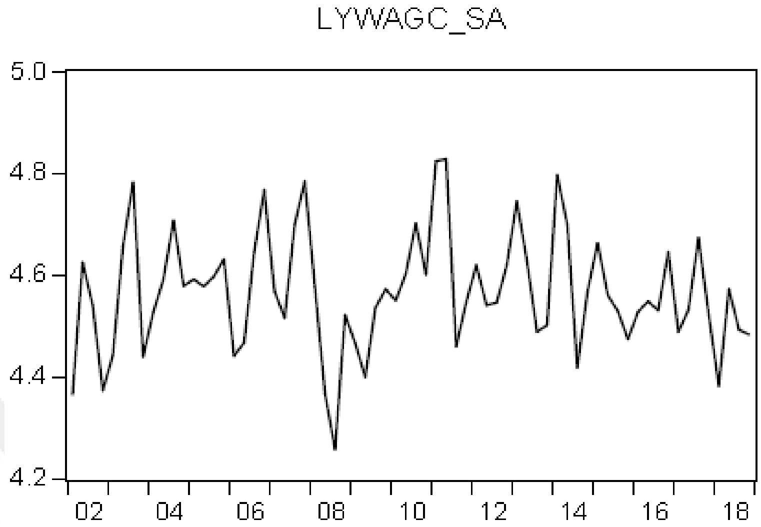

Figure 4.9 Plots of LYWAGC_SA data

When looking at Figure 4.9, the trend of agricultural world income (LYWAGC_SA) is mostly up and down but generally horizontal, ranging from 4.4 to 4.8. On the other hand, it can also be interpreted as an increase up to the first quarters of 2011 and then a decrease (Figure 4.9).

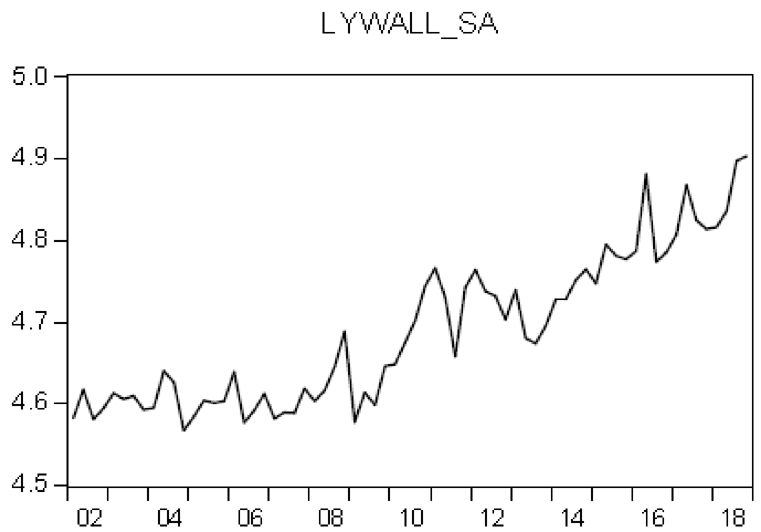

Figure 4.10 Plots of LYWALL_SA data

Looking at Figure 4.10, the overall world income (LYWALL_SA) of the manufacturing, mining and agriculture sectors is quite similar to the manufacturing industry world income (LYWMNF_SA) trend in Figure 4.7. The reason for this is that the world income of the manufacturing industry constitutes a large part of the total world income of these 3 sectors. In other words, it is natural that the total world income trends of manufacturing and 3 sectors are very similar. Accordingly, the overall world income of the 3 sectors (LYWALL_SA) showed a horizontal trend between 2002 and 2009, followed by an upward trend (Figure 4.10).

4.3. Empirical Methodology

Not long ago, the linear approach to Auto Regressive Distributed Lag (ARDL) has been modified to introduce a nonlinear version taking the same approach, which is often used to evaluate some external variables' asymmetric effects on the dependent variable (Bahmani-Oskooee & Kanitpong, 2017).

In this study, the Linear ARDL and Nonlinear ARDL (NARDL) will be used as the estimation method analysis of the data in the short and long terms.

In this section, some empirical concepts such as Cointegration, ARDL, Nonlinearity, Asymmetry, NARDL, J-curve, the Long and Short-Run ARDL and NARDL models, the stationarity and the unit root test will be discussed.

4.3.1. Cointegration, Stationarity, ARDL, Unit Root Test, Nonlinearity, Asymmetry and NARDL

Time series data are frequently used in economic analyzes where long term relationships are investigated through econometric methods. The common feature of most time series is that they have trends. Until recently, in most econometric studies using time series data, the series were assumed to be stationary. This assumption causes autocorrelation and even false regression in models. In addition, in the models estimated with the assumption that the series are stationary, standard t and other statistics will give misleading results. As a result of all these negativities, econometric studies conducted in recent years have generally focused on the analysis of time series. Alternative estimation methods and hypothesis testing methods have been developed, especially for non-stationary series (Çil-Yavuz, 2011: 139-140). These studies that

Engle-Granger (1987) pioneered in this field, were continued by Johansen (1991), Phillips (1991), Phillips and Hansen (1990). Stability and cointegration analyzes are generally followed in these models using time series (Çil-Yavuz, 2011: 140).

Cointegration is a technique developed to investigate the long-term correlation between non-stationary time series (Açıkalın & Başcı, 2016: 567). The cointegration analysis used in the determination of long-term relationships is closely related to the stability characteristics of the series. Phillips and Loretan (1991) suggested that other methods, such as the distributed delayed autoregressive model (ARDL), could be used in the determination of long-term relationships in addition to Engle-Granger cointegration analysis. Pesaran and Shin (1995-1998) reconsidered the traditional Distributed Delayed Autoregressive Model (ARDL) approach for the analysis of long-term relationships of variables when the trend was stationary and demonstrated that the ARDL model could be used in cointegration analysis (Çil-Yavuz, 2011: 140).

With the ARDL bounds test, it is possible to test the cointegration, the derivation of the error correction model and the long-term coefficients. In this case, firstly, whether there is a cointegration between the variables, i.e. a long-term equilibrium, can be predicted by the Error Correction Model (ECM) (Beyai, 2018: 30). According to Aksu et al. (2017: 482), in order to determine the cointegration relationship between the series in ARDL model, the series should be stationary at I (0) and I (1) levels. After determining whether all variables are I(0) or I(1), bounds test approach is applied to cointegration analysis. If any of the variables is in the second order, that is to say I(2), the ARDL method will make no sense (Beyai, 2018: 30-31). On the other hand, Kolcu and Yamak (2017: 648) stated that although the ARDL model allows to investigate the cointegration relationship between the variables regardless of their stationarity levels, the degree of integration of the series should not be greater than 1. In this case, Extended Dickey-Fuller unit root test proposed by Dickey and Fuller (1981) is widely used in the determination of the integrated grades of the series or in the stationary analysis of the series (Aksu et al., 2017: 482). Dickey and Fuller (1981) proposed the following two hypotheses (Beyai, 2018: 31):

H_0: There is a unit root.

H_1: There is no unit root.

The fact that the first difference statistics of the series is smaller than the t-statistic values means that the series are stationary at I(1) level.

Nonlinearity can be defined as a relationship that cannot be explained by the linear combination of variable inputs. In this case, it appears that the result obtained is disproportionate to the changes in the inputs (Jones & Nesmith, 2007: 2).

In the context of economic literature, asymmetry can be defined as that the different and/or asynchronous relation in short and/or long terms in terms of direction, size and duration between economic variables (Aksu et al., 2017: 479; Kolcu and Yamak, 2017: 645; Saha, 2017: 3).

The linear ARDL model makes the assumption of symmetric effect, and therefore can only be used to explain the symmetric aspect of the relationship between variables. Nonlinear ARDL (NARDL) model is used to explain the non-linear (asymmetric) aspect of the relationship (Kolcu & Yamak, 2017: 648). Therefore, there is a very close relationship between linearity and ARDL (thus symmetry), between nonlinearity and NARDL (thus asymmetry). As the short- and long-term ARDL and NARDL models will be discussed in Section 4.3.3, they have been briefly discussed here.

4.3.2. J-Curve

The real economic activity level of a country, the real economic activity level in the rest of the world and the real exchange rate influence the foreign trade balance of that country. Basically, the economic growth of the country will lead to more imports and naturally deteriorate the foreign trade balance. On the other hand, the economic growth of other countries will enable the country to export more and thus improve the trade balance. The depreciation or devaluation of the national currency will also have a positive impact on the foreign trade balance by increasing exports and reducing imports. However, none of these effects occur immediately. In other words, if the country's foreign trade balance deteriorates and the national currency remains low, it is seen that the adjustment delays will continue to deteriorate the foreign trade balance and the foreign trade balance will begin to improve only after the adjustment delays occur (Bahmani-Oskooee & Fariditavana, 2015: 1). In other words, since the external depreciation of the national currency shows a downward effect for a short time and then an upward effect in the long run right after the moment of impact on foreign trade balance, a curve resembling the letter j is formed, and this is called the J curve effect (Bahmani-Oskooee, M. & Ratha, 2004: 1377; Bahmani-Oskooee, &

Hegerty, 2010: 580). Stephen P. Magee introduced the J curve effect conceptually for the first time in 1973 and described it as the opposite effect in the short term (Magee, 1973: 308). However, empirical testing of curve J was conducted by Bahmani-Oskooee in 1985 (Bahmani-Oskooee, 1985).

4.3.3. Models

In order to determine the models to be used in the study, many studies investigating the short and/or long-term symmetric and/or asymmetric effects and using the ARDL and/or NARDL method were examined. Of these, the 12 studies considered most relevant were identified, and the models and variables used in these studies are given in Table 4.3:

Table 4.3 Examined Studies for Selecting the Model

	Source	**Employed Model**
1	Bahmani-Oskooee and Zhang (2013)	$\mathrm{Ln}(\frac{X_i}{M_i})_t = a + b\mathrm{Ln}Y_t^{\mathrm{UK}} + c\mathrm{Ln}Y_t^{\mathrm{C}} + d\mathrm{Ln}REX_t + \varepsilon_t$ Xi: UK's commodity exports to China Mi: UK's commodity imports from China YUK: British income YC: Chinese income REX: Real exchange rate
2	Bahmani-Oskooee (1985)	$TB_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 YW_t + \alpha_3 M_t + \alpha_4 MW_t + \sum_{i=0}^{n} \beta_i (E/P)_{t-i} + u_t.$ E/P: Effective Exchange Rate-D-CPI Based, Real, Indexed TB: Foreign Trade Balance (Value derived from exports minus imports), Indexed Y: GDP, Indexed YW: World Income, Real, Indexed M: Domestic high-powered money, Real, Indexed MW: World high-powered money, Real, Indexed
3	Bahmani-Oskooee and Xu (2013)	In the study, the model is not explicitly given, but it is stated that the following two variables were used in the model. $(\frac{X_i - M_i}{GDP_{US}})_{t+k}$ ve $(\frac{P_{MEX}}{P_{US}.E})_t$ Xi: US exports of commodity to Mexico Mi: US imports of commodity from Mexico GDPus: US Gross Domestic Product Pmex/Pus.E = Real exchange rate between two countries

4	Kodongo and Ojah (2013),	$$RER_{it} = \alpha_0 + \sum_{j=1}^{L} \alpha_j RER_{i,t-j} + \sum_{j=1}^{L} \delta_j FLOW_{i,t-j} + f_{RER,i} + u_{it}$$ $$FLOW_{it} = \beta_0 + \sum_{j=1}^{L} \beta_j FLOW_{i,t-j} + \sum_{j=1}^{L} \gamma_j RER_{i,t-j} + f_{FLOW,i} + v_{it}$$ RER: Real Exchange Rate FLOW: Net Foreign Direct Investment and Net Portfolio Flow (separately evaluated)
5	Aziz (2012)	$$lnB_t = \beta_0 + \beta_1 lnRER_t + \beta_2 lnY_t + \beta_3 lnY_t^* + \varepsilon_t$$ lnBt = lnXt-lnMt or ln (Xt / Mt): Foreign Trade Balance (logarithm is taken on the basis of e. Foreign trade balance is taken as the ratio of exports to imports). lnRERt: Real Effective Exchange Rate (logarithm based on e) lnYt: Industrial Production Index (For Bangladesh, and logarithm based on e) lnYt*: Weighted Average of Real GDP (For countries involved in foreign trade of Bangladesh, and logarithm fbased on e)
6	Arize (1994)	$$TB_t = \alpha + \lambda rer_t + \varepsilon_t$$ TBt: Foreign Trade Balance (The ratio of exports to imports, exports/imports) Rert: Real exchange rate
7	Spitäller (1980)	$$TB(i) = X[1 - \dot{E}X/100 + \dot{X}V(i)_{\dot{E}X}] - M[1 - \dot{E}M/100 + \dot{M}V(i)_{\dot{E}M}]$$ TB: Foreign Trade Balance (in USD) X: Export Value (in USD) M: Import Value (in USD) E*: Weighted Effective Exchange Rate XV(i)EX: Cumulative proportional change of export unit values in response to exchange rate change MV(i)EM: Cumulative proportional change of import unit values in response to exchange rate change
8	Bahmani-Oskooee and Fariditavana (2014)	$$\rho_k = \frac{\sum (REER_t - \overline{REER})(TB_{t+k} - \overline{TB})}{\sqrt{\sum (REER_t - \overline{REER})^2 (TB_{t+k} - \overline{TB})^2}}$$ TB = (M – X)/GDP REERt: Instantaneous Value of Real Effective Exchange Rate R (EE)̅R: Average Value of Real Effective Exchange Rates Throughout the Sample Period TB̅: Average Value of Foreign Trade Balance Throughout the Sample Period TB: Foreign Trade Balance M: Total Imports X: Total export GDP: Gross Domestic Product
9	Aksu, Başar, Eren and Bozma (2017)	$\Delta cd_t = \alpha_0 + ucd_{t-1} + \theta^+ rkur_{t-1}^+ + \theta^- rkur_{t-1}^- + \sum_{i=1}^{p-1} \varphi_i \Delta cd_{t-i} + \sum_{i=0}^{q-1} \pi_i^- \Delta rkur_{t-i}^- + \sum_{i=0}^{q-1} \pi_i^+ \Delta rkur_{t-i}^+ + \varepsilon_t$ †† $\Delta cd_t = \alpha_0 + ucd_{t-1} + \theta^+ rkur_{t-1}^+ + \theta^- rkur_{t-1}^- + \sum_{i=1}^{p-1} \varphi_i \Delta cd_{t-i} + \sum_{i=0}^{q-1} \pi_i \Delta rkur_{t-i} + \varepsilon_t$ $\Delta cd_t = \alpha_0 + ucd_{t-1} + \theta\ rkur_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta cd_{t-i} + \sum_{i=0}^{q-1} \pi_i^- \Delta rkur_{t-i}^- + \sum_{i=0}^{q-1} \pi_i^+ \Delta rkur_{t-i}^+ + \varepsilon_t$ $\Delta cd_t = \alpha_0 + ucd_{t-1} + \theta\ rkur_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta cd_{t-i} + \sum_{i=0}^{q-1} \pi_i \Delta rkur_{t-i} + \varepsilon_t$ cd: Trade Balance (export/import ratio) rkur: Real Exchange Rate (taken as Domestic Producer Prices)

10	Aral (2015)	Regression model $İİKO = \alpha\ DK + u$ $İİKO = \frac{İhracat}{İthalat}$ İİKO: Ratio of Exports Covering Imports (Export/Import ratio) DK: Exchange Rate (average exchange rate used)
11	Dinçer (2005)	Model for the asymmetric effect of exchange rate shocks on exports: $d\log(x) = c(1) + c(2)*s1 + c(3)*s2 + c(4)*s3 + c(5)*d\log(x(-1)) + c(6)*d\log(x(-2)) + c(7)*d\log(x(-4)) + c(8)*d\log(1 + px(-2)/p^*(-2)) + c(9)*d\log(1 + px(-4)/p^*(-4)) + c(10)*d\log(y^*(-2)) + c(11)*d\log(y^*(-3)) + c(12)*d\log(ip(-3)) + c(13)*dum1 + c(14)*dum2 + c(15)*dum3$ x: Total exports (Indexed, from SIS expenditures, taken from GNP data). y*: GDP of OECD countries (Indexed). p*: OECD countries GNP deflator (Indexed). Px: Export prices index (Indexed). Ip: Private fixed capital investments (Indexed, from SIS expenditures, taken from GNP data). s1, s2, s3: Quarterly dummy variables used to eliminate seasonal effects Other dummy variables: Dummy variable taken the value of 1 in 1994:1 and 1994:3, and taken the value of 1 in other periods, and used to control the 1994 crisis; Dummy variable used to control the effects of terrorist attacks on September 11, 2001, taking value 1 in 2001:4; Dummy variable used to eliminate the shock of liberation, and taken the value of 1 in 1989:1 and zero in other periods; Dummy variable used to control the Russian crisis, and taken the value of 1 in 1998:2 and zero in other periods.
12	Yazıcı (2008).	$TB_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 YW_t + \alpha_3 M_t + \alpha_4 MW_t + \sum_{i=0}^{n} \beta_i (E/P)_{t-i} + u_t$ E/P: Effective Exchange Rate-D-CPI Based, Real, Indexed TB: Foreign Trade Balance (Value derived from imports from exports), Indexed Y: GDP, Indexed YW: World Income, Real, Indexed M: Domestic high-powered money, Real, Indexed MW: World high-powered money, Real, Indexed

According to Table 4.3;

In Bahmani-Oskooee and Zhang's (2013) study, the effect of exchange rate change on trade balance and the existence of J-curve (examined within the scope of trade between England and China) is studied. The foreign trade deficit was taken as the ratio of exports to imports (the ratio of exports to imports, export/import). Ln (log e) values of all the variables in the model are taken.

In Bahmani-Oskooee's (1985) study, the effect of exchange rate change on trade balance and the existence of J-curve (Examined for Greece, India, Korea and

Thailand) is studied. The foreign trade deficit was taken as the difference between exports and imports (the value obtained by subtracting imports from exports). All data is indexed to a specific date.

In Bahmani-Oskooee and Xu’s (2013) study, the effect of exchange rate on foreign trade balance and the existence of S-curve (examined for bilateral trade balance between Mexico and USA) is studied. The foreign trade deficit was taken as the share of the exports-imports difference (exports minus imports) in GDP. The nominal values of all variables were used.

In Kodongo and Ojah’s (2013) study, the temporal causality relationship between real exchange rate and foreign trade balance (Examined for 9 major African countries by Panel VAR analysis) is studied. Although the foreign trade deficit is not directly in the model, it is reported that the deterioration in the local currency value has a curative effect on the foreign trade deficit based on foreign trade flows.

In Aziz’s (2012) study, the short and long-term effect of real exchange rate on foreign trade balance and existence of J-curve (examined for Bangledesh) is investigated. The foreign trade deficit was taken as the ratio of exports to imports (export / import). Ln (loge) values of all the variables in the model are taken. Quarterly data were used. The model used was developed similar to the models used by Rose (1991) and Singh (2002).

In Arize’s (1994) study, the long-term relationship between real effective exchange rate and trade balance (examined for 9 African countries) is investigated. The foreign trade deficit was taken as the ratio of exports to imports (export/import).

In Spitäller’s (1980) study, the short-term effects of exchange rate change for trade and trade balance (examined in developed countries) is investigated. The foreign trade deficit was taken in a complex way, as seen in the equation given in the model in Table 4.3.

In Bahmani-Oskooee and Fariditavana’s (2014) study, whether the fall and/or increase in foreign exchange prices has a symmetrical effect on the foreign trade balance (S model) (examined for 11 OECD countries) is examined. The foreign trade deficit was taken as the share of the imports-exports difference (imports minus exports) in GDP.

In Aksu, Başar, Eren and Bozma’s (2017) study, the symmetrical and asymmetrical effects of the real exchange rate on trade balance in Turkey (Linear ARDL and Nonlinear ARDL are used) are examined. The foreign trade deficit was taken as the ratio of imports to exports (import/export). Natural logarithm of all values used in the model is taken.

In Aral’s (2015) study, the relationship between the exchange rate and foreign trade (export/import ratio) in Turkey (The cointegration relationship was tested by Johansen's cointegration method, and the stationarity of variables was analyzed by Augmented Dickey Fuller and Phillips Perron methods) is examined. The foreign trade deficit was taken as the ratio of exports to imports (export/import). The average effective exchange rate is used instead of the real effective exchange rate.

In Dinçer’s (2005) study, asymmetric effects on the exchange rate of durable goods, private durable consumption, public consumption, private investment, public investment, exports, imports, prices, interest rates, interbank interest rates in Turkey are investigated. The relationship between exchange rate and foreign trade deficit has not been examined. The exchange rate was not used as a direct variable in the model. However, the asymmetric effect of exchange rate shocks on individual imports and exports was examined. In export and import models, the first order differences of the logarithms of each of the variables were used.

In Yazıcı’s (2008) study, the effects of the real exchange rate changes on the trade balance of Turkey's manufacturing, mining and agriculture in short and long term are investigated. Asymmetric effect has not been examined, 3 months (quarterly) data between 1986-1998 has been used, the trade balance model is employed that Bahmani-Oskooee (1985) used.

In the context of all the studies examined above, it was thought that the model used in the study of Bahmani-Oskooee and Zhang (2013), developed by Bahmani-Oskooee and Wang (2008) on commodity basis was appropriate. However, since just the bilateral trade between England and China is examined in the relevant model, it is decided to use Y (domestic income, Turkey's GDP) instead of Yuk, while the YW (World Income) instead of Yc as it was in the model used by Bahmani-Oskooee (1985). The model in this form is very similar to the model developed by Aziz (2012) who stated that he developed this model similar to the models Rose (1991) and Singh (2002) used. In Aziz's study Bangladesh's Industrial Production Index is used as domestic income (Y). However, in our study, Turkey's GDP (indexed) has been taken as domestic income (Y) as Bahmani-Oskooee (1985) and Yazıcı (2008) did. Aziz (2012) took the Weighted Average of Real GDP as the world income (YW) for the countries involved in Bangladesh's foreign trade, which is the same in our study as well as in the studies of Bahmani-Oskooee (1985) and Yazıcı (2008). In the study of Bahmani-Oskooee (1985), for the foreign trade balance (TB), the export minus import value (the value found by subtracting the exports from imports) was used, whereas in the study of Bahmani-Oskooee and Zhang (2013), the ratio of exports to imports (export/import) was used. In many other studies, the use of export/import ratio for TB has been proposed. We did not consider it appropriate to take the foreign trade balance as the difference between import and export. Because, when taken in this way, the foreign trade balance will increase regularly in the long term due to inflation and population increase. This may lead to a trend observation, creating false relationships or the loss of a relationship that is expected to be observed. However, when the ratio of exports to imports is used, there will be no such effect as the foreign trade deficit caused by the increase in both imports and exports over time. Therefore, we thought that it would be appropriate to use the ratio of exports to imports (export / import) for TB as in the studies of Bahmani-Oskooee and Zhang (2013), Aziz (2012) and Aral (2015). It was decided to index the real values of all variables to 2003, then take logarithms on the base of e (Ln values), to use them as such in the model, and to seasonally adjust the data before the analysis.

Consequently, the following models (in Chapters 4.3.3.1 and 4.3.3.2) have been decided to be used for our study in order to investigate the short- and long-term symmetric and asymmetric effect. The model we chose to use in our study is very similar to the model of Aksu, Başar, Eren and Bozma (2017). However, in terms of the variables used, our model is similar to the ones used in the studies of Aziz (2012) and Bahmani-Oskooee and Zhang (2013).

4.3.3.1. Linear Model

The long-term linear model used in our study is as follows in Equation 4.1:

$$\mathrm{Ln}TB_t = c_1 + c_2\mathrm{Ln}Y_t + c_3\mathrm{Ln}YW_t + c_4\mathrm{Ln}RER_t + \varepsilon_t \tag{4.1}$$

The short term linear error correction model is given in Equation 4.2:

$$\Delta\mathrm{Ln}TB_t = \alpha_0 + \sum_{i=1}^{n1}\alpha_{1,i}\Delta\mathrm{Ln}TB_{t-i} + \sum_{i=0}^{n2}\alpha_{2,i}\Delta\mathrm{Ln}Y_{t-i} + \sum_{i=0}^{n3}\alpha_{3,i}\Delta\mathrm{Ln}YW_{t-i} + \sum_{i=0}^{n4}\alpha_{4,i}\Delta\mathrm{Ln}RER_{t-i} + \beta_1\mathrm{Ln}TB_{t-1} + \beta_2\mathrm{Ln}Y_{t-1} + \beta_3\mathrm{Ln}YW_{t-1} + \beta_4\mathrm{Ln}RER_{t-1} + u_t \tag{4.2}$$

where;
TB: Trade Balance (export/import)
Y: Domestic income
YW: World income
RER: Reel Exchange Rate

4.3.3.2. Non-Linear Model

The long-term non-linear model used in our study is as follows in Equation 4.3:

$$\text{Ln}TB_t = c_1 + c_2\text{Ln}Y_t + c_3\text{Ln}YW_t + c_{41}\text{Ln}RER_t^+ + c_{42}\text{Ln}RER_t^- + \varepsilon_t \qquad (4.3)$$

The short-term non-linear error correction model is given in Equation 4.4:

$$\begin{aligned}\Delta\text{Ln}TB_t = \alpha_0 &+ \textstyle\sum_{i=1}^{n1} \alpha_{1,i}\Delta\text{Ln}TB_{t-i} + \sum_{i=0}^{n2} \alpha_{2,i}\Delta\text{Ln}Y_{t-i} + \\ &\textstyle\sum_{i=0}^{n3} \alpha_{3,i}\Delta\text{Ln}YW_{t-i} + \sum_{i=0}^{n4} \alpha_{41,i}\Delta\text{Ln}RER_{t-i}^+ + \\ &\textstyle\sum_{i=0}^{n5} \alpha_{42,i}\Delta\text{Ln}RER_{t-i}^- + \beta_1\text{Ln}TB_{t-1} + \beta_2\text{Ln}Y_{t-1} + \beta_3\text{Ln}YW_{t-1} + \\ &\beta_4\text{Ln}RER_{t-1}^+ + \beta_5\text{Ln}RER_{t-1}^- + u_t \qquad (4.4)\end{aligned}$$

where;
TB: Trade Balance (export/import)
Y: Domestic income
YW: World income
RER: Reel Exchange Rate
RER$^+$: Positive shocks of Reel Exchange Rate = POS
RER$^-$: Negative shocks of Reel Exchange Rate = NEG

Here, RER$^+$ and *RER*$^-$ are constructed as follows:

$$\text{POS} = \text{Ln}RER_t^+ = \textstyle\sum_{j=1}^{t} \Delta\text{Ln}RER_j^+ = \sum_{j=1}^{t} \max(\Delta\text{Ln}RER_j, 0) \qquad (4.5a)$$

$$\text{NEG} = \text{Ln}RER_t^- = \textstyle\sum_{j=1}^{t} \Delta\text{Ln}RER_j^- = \sum_{j=1}^{t} \min(\Delta\text{Ln}RER_j, 0) \qquad (4.5b)$$

CHAPTER V

EMPRICAL RESULTS

In this chapter where the empirical results have been presented, the unit root, the estimation of ARDL and NARDL models of the specified model, the stability condition, the bound testing, the error correction model and the long-run coefficients, and the interpretation of results have been presented.

5.1. Unit Root

The ADF stationarity and unit root tests performed on the series were performed with both constant (Table 5.1), and constant and trend (Table 5.2).

Table 5.1 ADF Test with Intercept Only

variables	level	1st difference	%1 critical value	%5 critical value	integrating order
LRER_SA	-1.00	-9.27	-3.53	-2.91	I(1)
LTBAGC_SA	-1.31	-5.12	-3.55	-2.91	I(1)
LTBMNG_SA	-1.41	-5.59	-3.53	-2.91	I(1)
LTBALL_SA	-2.40	-7.52	-3.53	-2.91	I(1)
LTBMNF_SA	-3.08	-8.01	-3.53	-2.91	I(1)
LY_SA	-1.44	-7.00	-3.53	-2.91	I(1)
LYWAGC_SA	-3.82	-12.10	-3.53	-2.91	I(1)
LYWALL_SA	0.59	-7.65	-3.54	-2.91	I(1)
LYWMNF_SA	-4.25	-7.81	-4.10	-3.48	I(1)
LYWMNG_SA	-2.49	-12.92	-3.53	-2.91	I(1)

The fact that the first difference statistics of the series is smaller than the t-statistic values shows that all series are stationary at I(1) level (Table 5.1 and Table 5.2).

Table 5.2 ADF Test with Intercept and Trend

variables	level	1st difference	%1 critical value	%5 critical value	integrating order
LRER_SA	-0.29	-6.74	-4.11	-3.48	I(1)
LTBAGC_SA	-4.72	-5.10	-4.11	-3.48	I(1)
LTBMNG_SA	-4.08	-5.59	-4.11	-3.48	I(1)
LTBALL_SA	-2.62	-7.71	-4.11	-3.48	I(1)
LTBMNF_SA	-3.17	-8.17	-4.11	-3.48	I(1)
LY_SA	-2.01	-7.02	-4.10	-3.48	I(1)
LYWAGC_SA	-3.80	-12.04	-4.11	-3.48	I(1)
LYWALL_SA	-4.25	-7.81	-4.10	-3.48	I(1)
LYWMNF_SA	0.75	-7.25	-3.54	-2.91	I(1)
LYWMNG_SA	-2.16	-13.03	-4.10	-3.48	I(1)

5.2. Estimation of ARDL and NARDL Models

For the estimation of the ARDL and NARDL Models, it is necessary to determine the optimal lags first for models in (4.2) and (4.4). Optimum lags have been determined by Akaike Information Criteria, so that the best models have the following lags.

Table 5.3 Selected Models

Model Name	Selected Model
Manufacturing Trade Balance for **Linear** Model	ARDL(3, 4, 3, 0)
Mining Trade Balance for **Linear** Model	ARDL(1, 2, 0, 0)
Agriculture Trade Balance for **Linear** Model	ARDL(2, 0, 2, 3)
All 3 Sectors Trade Balance for **Linear** Model	ARDL(3, 4, 3, 0)
Manufacturing Trade Balance for **Non-Linear** Model	NARDL(3, 4, 3, 1, 4)
Mining Trade Balance for **Non-Linear** Model	NARDL(4, 3, 2, 0, 0)
Agriculture Trade Balance for **Non-Linear** Model	NARDL(2, 0, 4, 4, 4)
All 3 Sectors Trade Balance for **Non-Linear** Model	NARDL(3, 4, 3, 0, 0)

Estimation output from Eviews (Version 11) for manufacturing sector is presented in the Appendix F.

5.3. Specified Models

The coefficient estimates for LRER in the specified models for linear and non-linear models for manufacturing, mining, agriculture and overall 3 sectors are given in Table 5.4-5.5.

Table 5.4 The Coefficient Estimates for LRER in the Specified Linear Models

Eq Name:	ardl1	ardl2	ardl3	ardl4
Method:	ARDL	ARDL	ARDL	ARDL
Dep. Var:	LTBMNF_SA	LTBMNG_SA	LTBAGC_SA	LTBALL_SA
LRER_SA	-0.395581	0.355063	-0.241209	-0.385974
	(0.0765)**	(0.1622)*	-0.404	(0.0596)**
	[-5.1702]**	[2.1896]*	[-0.5971]	[-6.4713]**
C	7.06412	-0.65451	7.023232	5.6597
	(1.0548)**	-0.7669	(1.9648)**	(0.9011)**
	[6.6969]**	[-0.8535]	[3.5745]**	[6.2806]**
LRER_SA(-1)			0.309043	
			-0.4644	
			[0.6654]	
LRER_SA(-2)			-0.688584	
			-0.5009	
			[-1.3748]	
LRER_SA(-3)			0.542479	
			-0.3952	
			[1.3726]	
Observations:	64	66	65	64
R-squared:	0.817	0.9133	0.6515	0.8623
F-statistic:	17.1725	103.5218	10.0949	24.0882
Prob(F-stat):	0	0	0	0

( ): indicated standard error values.
[ ]: indicates t-statistics values

Table 5.5 The Coefficient Estimates for LRER in the Specified Non-Linear Models

Eq Name:	nardl1	nardl2	nardl3	nardl4
Method:	ARDL	ARDL	ARDL	ARDL
Dep. Var:	LTBMNF_SA	LTBMNG_SA	LTBAGC_SA	LTBALL_SA
LRER_SA_POS	0.0772	1.186593	-0.583009	-0.395493
	-0.3008	(0.2712)**	-0.9241	(0.0651)**
	[0.2567]	[4.3750]**	[-0.6309]	[-6.0764]**
LRER_SA_POS(-1)	-0.49734		-0.563819	
	-0.2792		-1.2268	
	[-1.7813]		[-0.4596]	
LRER_SA_NEG	-0.583134	-0.004617	0.023559	-0.363613
	(0.2023)**	-0.1911	-0.6172	(0.0838)**
	[-2.8825]**	[-0.0242]	[0.0382]	[-4.3386]**
LRER_SA_NEG(-1)	0.349866		1.342351	
	-0.2971		-0.9154	
	[1.1777]		[1.4665]	
LRER_SA_NEG(-2)	0.109471		-2.21787	
	-0.2808		(0.9395)*	
	[0.3899]		[-2.3608]*	
LRER_SA_NEG(-3)	-0.092883		2.41892	

	-0.2713		(0.9684)*	
	[-0.3424]		[2.4979]*	
LRER_SA_NEG(-4)	-0.319681		-1.47422	
	-0.1961		(0.6915)*	
	[-1.6303]		[-2.1319]*	
C	6.811667	9.209498	9.302433	3.53217
	(1.4781)**	(1.8529)**	(2.1971)**	(1.1419)**
	[4.6084]**	[4.9703]**	[4.2339]**	[3.0932]**
LRER_SA_POS(-2)			0.202126	
			-1.1328	
			[0.1784]	
LRER_SA_POS(-3)			-1.33267	
			-1.1304	
			[-1.1789]	
LRER_SA_POS(-4)			1.821681	
			(0.8039)*	
			[2.2661]*	
Observations:	63	64	63	64
R-squared:	0.8516	0.9413	0.7232	0.8627
F-statistic:	12.9861	61.6527	6.387	21.9965
Prob(F-stat):	0	0	0	0

( ): indicated standard error values.
[ ]: indicates t-statistics values

5.4. Bound Testing

The bound testing and critical value for selected ARDL models are given in Tables 5.6.

Table 5.6 Bound Testing Results

F-statistic	F-statistic	I(0)	I(1)	Result
F(D(LTBMNF_SA))	16.40283	2.79	3.67	Co-integration
F(D(LTBMNG_SA))	3.235727	2.37	3.2	Co-integration[1]
F(D(LTBAGC_SA))	5.644320	2.79	3.67	Co-integration
F(D(LTBALL_SA))	15.70525	2.79	3.67	Co-integration
F(LTBMNF_SA)	9.543056	2.56	3.49	Co-integration
F(LTBMNG_SA)	6.283757	2.56	3.49	Co-integration
F(LTBAGC_SA)	5.890127	2.56	3.49	Co-integration
F(LTBALL_SA)	12.88887	2.56	3.49	Co-integration

[1] for %10 significance. The others are for %5 significance.

As discussed in Section 4.3.1, cointegration is a technique developed to investigate the long-term correlation between non-stationary time series (Açıkalın & Başçı, 2016: 567). With the ARDL bounds test, it is possible to test the cointegration, (Beyai, 2018: 30). In bound testing, the hypothesis are as follows:

If F-statistic > I(1), there is co-integration.

If F-statistic < I(0), there is no co-integration.

If I(0) < F-statistic < I(1), no clear conclusion.

As seen in Table 5.6, except for the linear model for mining, F-statistic value is greater than I(1) in 5% significance in all models. This means that there is cointegration among variables. However, in the linear model for mining, F-statistic value is greater than I(1) in 10% significance [3.235727 > 3.2; 10% sign. I(1)]. Therefore, we can say that there is cointegration which means that there is long-term equilibrium amongst the variables in all models. Cointegration in the linear model for mining is also confirmed by the sign and significance of error correction term CointEq(-1) in the Table 5.8.

5.5. Error Correction Model and the Long-Run Coefficients

Error Correction Model (ECM) and long run coefficients for selected models are given in Tables 5.7-5.14.

Table 5.7 ECM Model and Long Run Coefficients for Linear Model: Manufacturing

ARDL Cointegrating And Long Run Form Dependent Variable: D(LTBMNF SA) Selected Model: ARDL(3, 4, 3, 0) Case 2: Restricted Constant and No Trend Sample: 2002Q1 2018Q4 Included observations: 64				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTBMNF SA(-1))	0.157615	0.09282	1.69806	0.0957
D(LTBMNF SA(-2))	0.274919	0.097178	2.829016	0.0067
D(LY SA)	-1.06981	0.290398	-3.683944	0.0006
D(LY SA(-1))	-0.896364	0.32037	-2.797899	0.0073
D(LY SA(-2))	-1.159563	0.305392	-3.796964	0.0004
D(LY SA(-3))	-1.443712	0.314748	-4.586886	0.0000
D(LYWMNF SA)	0.183404	0.143536	1.277758	0.2072
D(LYWMNF SA(-1))	0.467616	0.158931	2.942252	0.0049
D(LYWMNF SA(-2))	0.434257	0.15178	2.861099	0.0061
CointEq(-1)	-0.842769	0.089547	-9.411445	0
CointEq = LTBMNF SA - (0.0490*LY SA -0.3842*LYWMNF SA -0.4694*LRER_SA + 8.3820)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY SA	0.048960	0.076379	0.641009	0.5244
LYWMNF SA	-0.384158	0.267934	-1.433779	0.1579
LRER SA	-0.469383	0.119279	-3.935154	0.0003
C	8.382036	1.406175	5.960876	0.0000

Table 5.8 ECM Model and Long Run Coefficients for Linear Model: Mining

ARDL Cointegrating And Long Run Form Dependent Variable: D(LTBMNG_SA) Selected Model: ARDL(1, 2, 0, 0) Case 2: Restricted Constant and No Trend Sample: 2002Q1 2018Q4 Included observations: 66				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LY SA)	1.159261	0.594484	1.950029	0.0559
D(LY SA(-1))	-1.730794	0.590577	-2.930683	0.0048
CointEq(-1)	-0.194963	0.046907	-4.15638	0.0001
CointEq = LTBMNG SA - (2.4880*LY SA -2.5623*LYWMNG SA + 1.8212*LRER_SA - 3.3571)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY SA	2.487998	0.728665	3.414463	0.0012
LYWMNG SA	-2.562285	1.311657	-1.953472	0.0555
LRER SA	1.821179	1.112840	1.636515	0.1071
C	-3.357091	4.129470	-0.812959	0.4195

Table 5.9 ECM Model and Long Run Coefficients for Linear Model: Agriculture

ARDL Cointegrating And Long Run Form Dependent Variable: D(LTBAGC SA) Selected Model: ARDL(2, 0, 2, 3) Case 2: Restricted Constant and No Trend Sample: 2002Q1 2018Q4 Included observations: 65				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTBAGC SA(-1))	0.291913	0.115183	2.534336	0.0142
D(LYWAGC SA)	-0.259377	0.138856	-1.867954	0.0672
D(LYWAGC SA(-1))	0.458651	0.14367	3.192385	0.0024
D(LRER SA)	-0.241209	0.353842	-0.681686	0.4984
D(LRER SA(-1))	0.146105	0.352831	0.414095	0.6804
D(LRER SA(-2))	-0.542479	0.349759	-1.551009	0.1267
CointEq(-1)	-0.574569	0.10436	-5.505641	0.0000
CointEq = LTBAGC SA - (-0.5479*LY SA -0.9794*LYWAGC SA -0.1362*LRER_SA + 12.2235)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY SA	-0.547946	0.162259	-3.376975	0.0014
LYWAGC SA	-0.979394	0.547115	-1.790104	0.0790
LRER SA	-0.136226	0.405950	-0.335573	0.7385
C	12.22347	2.917199	4.190141	0.0001

Table 5.10 ECM Model and Long Run Coefficients for Linear Model: All 3 Sectors

ARDL Cointegrating And Long Run Form Dependent Variable: D(LTBALL SA) Selected Model: ARDL(3, 4, 3, 0) Case 2: Restricted Constant and No Trend Sample: 2002Q1 2018Q4 Included observations: 64				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTBALL SA(-1))	0.003689	0.087807	0.042014	0.9667
D(LTBALL SA(-2))	0.20583	0.095567	2.153766	0.0361
D(LY SA)	-0.724901	0.238799	-3.035613	0.0038
D(LY SA(-1))	-0.68049	0.254981	-2.668786	0.0102
D(LY SA(-2))	-0.800608	0.244775	-3.270796	0.0019
D(LY SA(-3))	-0.987325	0.252974	-3.902865	0.0003
D(LYWALL SA)	0.1442	0.130807	1.102389	0.2756
D(LYWALL SA(-1))	0.419406	0.14028	2.989786	0.0043
D(LYWALL SA(-2))	0.472148	0.137346	3.437651	0.0012
CointEq(-1)	-0.584943	0.063518	-9.209144	0.0000
CointEq = LTBALL SA - (0.0843*LY SA -0.5101*LYWALL SA -0.6598*LRER_SA + 9.6756)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY SA	0.084349	0.097625	0.864016	0.3917
LYWALL SA	-0.510067	0.333958	-1.527339	0.1330
LRER SA	-0.659848	0.126930	-5.198524	0.0000
C	9.675647	1.604081	6.031893	0.0000

Table 5.11 ECM Model and Long Run Coefficients for Non-Linear Model: Manufacturing

ARDL Cointegrating And Long Run Form				
Dependent Variable: D(LTBMNF_SA), Selected Model: NARDL(3, 4, 3, 1, 4), Case 2: Restricted Constant and No Trend Sample: 2002Q1 2018Q4.				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTBMNF_SA(-1))	0.250792	0.115092	2.179049	0.0349
D(LTBMNF_SA(-2))	0.355851	0.103518	3.437588	0.0013
D(LY_SA)	-1.21343	0.308423	-3.93431	0.0003
D(LY_SA(-1))	-0.83998	0.322489	-2.60466	0.0126
D(LY_SA(-2))	-1.30512	0.346423	-3.76742	0.0005
D(LY_SA(-3))	-1.52119	0.312841	-4.8625	0.0000
D(LYWMNF_SA)	0.107676	0.138349	0.778293	0.4407
D(LYWMNF_SA(-1))	0.494792	0.157342	3.144692	0.0030
D(LYWMNF_SA(-2))	0.459578	0.153484	2.994312	0.0045
D(LRER_SA_POS)	0.0772	0.227771	0.338938	0.7363
D(LRER_SA_NEG)	-0.58313	0.160026	-3.644	0.0007
D(LRER_SA_NEG(-1))	0.303094	0.189508	1.599369	0.1171
D(LRER_SA_NEG(-2))	0.412564	0.184937	2.230836	0.0310
D(LRER_SA_NEG(-3))	0.319681	0.162101	1.972107	0.0551
CointEq(-1)	-0.94463	0.118157	-7.99477	0.0000
CointEq = LTBMNF_SA - (-0.0779*LY_SA -0.4805*LYWMNF_SA -0.4448*LRER_SA_POS -0.5678*LRER_SA_NEG + 7.2109)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY_SA	-0.077925	0.136863	-0.569365	0.5721
LYWMNF_SA	-0.480541	0.257772	-1.864211	0.0691
LRER_SA_POS	-0.444765	0.117758	-3.776929	0.0005
LRER_SA_NEG	-0.567799	0.149767	-3.79121	0.0005
C	7.210909	1.316458	5.477506	0

Table 5.12 ECM Model and Long Run Coefficients for Non-Linear Model: Mining

ARDL Cointegrating And Long Run Form				
Dependent Variable: D(LTBMNG_SA), Selected Model: NARDL(4, 3, 2, 0, 0), Case 2: Restricted Constant and No Trend Sample: 2002Q1 2018Q4, Included observations: 64				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTBMNG_SA(-1))	0.248373	0.106305	2.336415	0.0235
D(LTBMNG_SA(-2))	0.10261	0.097653	1.050762	0.2984
D(LTBMNG_SA(-3))	0.227955	0.098703	2.309493	0.0251
D(LY_SA)	1.028166	0.552615	1.860547	0.0687
D(LY_SA(-1))	-0.38711	0.602846	-0.64214	0.5237
D(LY_SA(-2))	1.560869	0.586297	2.662252	0.0104
D(LYWMNG_SA)	-0.45422	0.212878	-2.13372	0.0378
D(LYWMNG_SA(-1))	0.539126	0.245839	2.193001	0.0330
CointEq(-1)	-0.61628	0.095696	-6.43994	0.0000
EC = LTBMNG_SA - (-0.7104*LY_SA -1.6503*LYWMNG_SA + 1.9254*LRER_SA_POS - 0.0075*LRER_SA_NEG + 14.9438)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY_SA	-0.710351	0.405246	-1.752886	0.0858
LYWMNG_SA	-1.650335	0.404292	-4.082035	0.0002
LRER_SA_POS	1.925426	0.439369	4.382256	0.0001
LRER_SA_NEG	-0.007492	0.309675	-0.024193	0.9808
C	14.9438	2.665872	5.605597	0.0000

Table 5.13 ECM Model and Long Run Coefficients for Non-Linear Model: Agriculture

ARDL Cointegrating And Long Run Form, Dependent Variable: D(LTBAGC_SA), Selected Model: NARDL(2, 0, 4, 4, 4), Case 2: Restricted Constant and No Trend Sample: 2002Q1 2018Q4, Included observations: 63				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTBAGC_SA(-1))	0.405431	0.129183	3.138417	0.0030
D(LYWAGC_SA)	-0.15963	0.186043	-0.85805	0.3955
D(LYWAGC_SA(-1))	1.253055	0.376118	3.331549	0.0018
D(LYWAGC_SA(-2))	0.559163	0.271671	2.05824	0.0455
D(LYWAGC_SA(-3))	0.420774	0.215727	1.950487	0.0575
D(LRER_SA_POS)	-0.58301	0.924056	-0.63092	0.5314
D(LRER_SA_POS(-1))	-0.69114	0.891006	-0.77568	0.4421
D(LRER_SA_POS(-2))	-0.48901	0.866353	-0.56445	0.5753
D(LRER_SA_POS(-3))	-1.82168	0.803894	-2.26607	0.0284
D(LRER_SA_NEG)	0.023559	0.61723	0.038168	0.9697
D(LRER_SA_NEG(-1))	1.27317	0.682713	1.864869	0.0689
D(LRER_SA_NEG(-2))	-0.9447	0.725395	-1.30233	0.1996
D(LRER_SA_NEG(-3))	1.47422	0.691505	2.131902	0.0386
CointEq(-1)	-0.778191	0.138357	-5.624536	0.0000
CointEq = LTBAGC_SA - (0.3923*LY_SA -1.9352*LYWAGC_SA -0.5856*LRER_SA_POS + 0.1192*LRER_SA_NEG + 11.9539)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY_SA	0.392275	0.57527	0.681897	0.4989
LYWAGC_SA	-1.935233	0.477305	-4.054499	0.0002
LRER_SA_POS	-0.585577	0.321686	-1.820339	0.0755
LRER_SA_NEG	0.119173	0.449133	0.265341	0.792
C	11.95391	2.581595	4.630437	0.0000

Table 5.14 ECM Model and Long Run Coefficients for Non-Linear Model: All 3 Sectors

ARDL Cointegrating And Long Run Form, Dependent Variable: D(LTBALL_SA), Selected Model: NARDL(3, 4, 3, 0, 0), Case 2: Restricted Constant and No Trend, Sample: 2002Q1 2018Q4, Included observations: 64				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTBALL_SA(-1))	0.003634	0.10928	0.033252	0.9736
D(LTBALL_SA(-2))	0.201994	0.11015	1.83381	0.0728
D(LY_SA)	-0.71941	0.284408	-2.52948	0.0147
D(LY_SA(-1))	-0.71413	0.305821	-2.33512	0.0237
D(LY_SA(-2))	-0.8381	0.290851	-2.88154	0.0059
D(LY_SA(-3))	-1.03253	0.303331	-3.40396	0.0013
D(LYWALL_SA)	0.166127	0.159669	1.040449	0.3032
D(LYWALL_SA(-1))	0.405677	0.188331	2.154064	0.0362
D(LYWALL_SA(-2))	0.462164	0.165968	2.784659	0.0076
CointEq(-1)	-0.586356	0.091416	-6.414178	0.0000
CointEq = LTBALL_SA - (0.1397*LY_SA -0.4305*LYWALL_SA -0.6745*LRER_SA_POS - 0.6201*LRER_SA_NEG + 6.0239)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY_SA	0.139676	0.176049	0.793392	0.4314
LYWALL_SA	-0.430534	0.390869	-1.101478	0.2761
LRER_SA_POS	-0.674492	0.13466	-5.008854	0
LRER_SA_NEG	-0.620124	0.161431	-3.841404	0.0004
C	6.023935	1.924578	3.130004	0.0029

The results obtained from cointegration analysis and bounds test estimations should be tested, and diagnostic tests such as serial correlation (autocorrelation test), heteroscedasticity test, normality test and Ramsey test should be performed. The results for these tests are presented in the following section.

5.6. Diagnostic Tests

5.6.1. Serial Correlation

Breusch-Godfrey Serial Correlation LM Test is performed for testing the serial correlation. The hypotheses for serial correlation are as follows:

H_0: There is no autocorrelation.

H_1: There is autocorrelation.

If the probability value is greater than 5%, H_0 is accepted, otherwise, that is if the probability value is less than 5%, H_1 is accepted.

Table 5.15 Autocorrelation Test

		Breusch-Godfrey Serial Correlation LM Test:			
Linear (Symmetric)	**Manufacturing**	F-statistic	1.624.824	Prob. F(4,46)	0.0456
		Obs*R-squared	1.900.734	Prob. Chi-Square(4)	0.0177
	Mining	F-statistic	0.23281	Prob. F(4,55)	0.9187
		Obs*R-squared	1.098.881	Prob. Chi-Square(4)	0.8944
	Agriculture	F-statistic	0.419618	Prob. F(4,50)	0.7937
		Obs*R-squared	2.111.146	Prob. Chi-Square(4)	0.7153
	All 3 Sectors	F-statistic	1.468.152	Prob. F(4,46)	0.2273
		Obs*R-squared	7.245.577	Prob. Chi-Square(4)	0.1235
Non-Linear (Asymmetric)	**Manufacturing**	F-statistic	1.779.174	Prob. F(5,37)	0.5762
		Obs*R-squared	9.722.118	Prob. Chi-Square(5)	0.3111
	Mining	F-statistic	1.762.104	Prob. F(4,45)	0.1749
		Obs*R-squared	4.377.541	Prob. Chi-Square(4)	0.0873
	Agriculture	F-statistic	1.025.927	Prob. F(4,45)	0.1749
		Obs*R-squared	5.861.945	Prob. Chi-Square(4)	0.0873
	All 3 Sectors	F-statistic	1.734.715	Prob. F(4,41)	0.2948
		Obs*R-squared	8.550.189	Prob. Chi-Square(4)	0.1371

The probability values for all models are greater than 5%. Therefore, H_0 is accepted for all models, meaning that there is no autocorrelation problem in the models. In other words, LM test statistics show that the errors in the respective models are not autocorrelated (Table 5.15).

5.6.2. Heteroscedasticity Test

Breusch-Pagan-Godfrey Heteroscedasticity tests are performed for testing the heteroscedasticity. The hypotheses for heteroscedasticity are as follows:

H_0: There is no heteroscedasticity.

H_1: There is heteroscedasticity.

If the probability value is greater than 5%, H_0 is accepted, otherwise, that is if the probability value is less than 5%, H_1 is accepted.

Table 5.16 Heteroscedasticity Test

		Breusch-Pagan-Godfrey Heteroskedasticity Test			
Linear (Symmetric)	**Manufacturing**	F-statistic	1.624824	Prob. F(13,50)	0.1096
		Obs*R-squared	19.00734	Prob. Chi-Square(13)	0.1229
		Scaled explained SS	9.760953	Prob. Chi-Square(13)	0.7134
	Mining	F-statistic	2.006147	Prob. F(6,59)	0.0791
		Obs*R-squared	11.1834	Prob. Chi-Square(6)	0.0829
		Scaled explained SS	12.0784	Prob. Chi-Square(6)	0.0602
	Agriculture	F-statistic	1.514434	Prob. F(10,54)	0.1452
		Obs*R-squared	1.808081	Prob. Chi-Square(10)	0.1545
		Scaled explained SS	8.094105	Prob. Chi-Square(10)	0.8374
	All 3 Sectors	F-statistic	1.662833	Prob. F(13,50)	0.0993
		Obs*R-squared	19.31776	Prob. Chi-Square(13)	0.1136
		Scaled explained SS	9.599723	Prob. Chi-Square(13)	0.7263
Non-Linear (Asymmetric)	**Manufacturing**	F-statistic	1.771279	Prob. F(20,42)	0.0604
		Obs*R-squared	27.65952	Prob. Chi-Square(20)	0.0902
		Scaled explained SS	10.88771	Prob. Chi-Square(20)	0.9276
	Mining	F-statistic	1.577078	Prob. F(13,49)	0.1239
		Obs*R-squared	18.61123	Prob. Chi-Square(13)	0.1357
		Scaled explained SS	11.58171	Prob. Chi-Square(13)	0.5622
	Agriculture	F-statistic	0.667572	Prob. F(13,49)	0.8229
		Obs*R-squared	13.5144	Prob. Chi-Square(13)	0.7602
		Scaled explained SS	4.558703	Prob. Chi-Square(13)	0.9994
	All 3 Sectors	F-statistic	1.693764	Prob. F(17,45)	0.0878
		Obs*R-squared	20.87136	Prob. Chi-Square(17)	0.105
		Scaled explained SS	9.905436	Prob. Chi-Square(17)	0.7691

The probability values for all models are greater than 5%. Therefore, H_0 is accepted for all models, meaning that there is no heterocedasticity problem in the models. In other words, Breusch-Pagan-Godfrey Heteroskedasticity Test statistics show that no heterocedasticity was observed in the models (Table 5.16).

5.6.3. Normality Test

Jarquera-Bera test is performed for testing the normality. The hypotheses for normality are as follows:

H_0: Residuals are normally distributed

H_1: Residuals are not normally distributed

If the probability value is greater than 5%, H_0 is accepted, otherwise, that is if the probability value is less than 5%, H_1 is accepted.

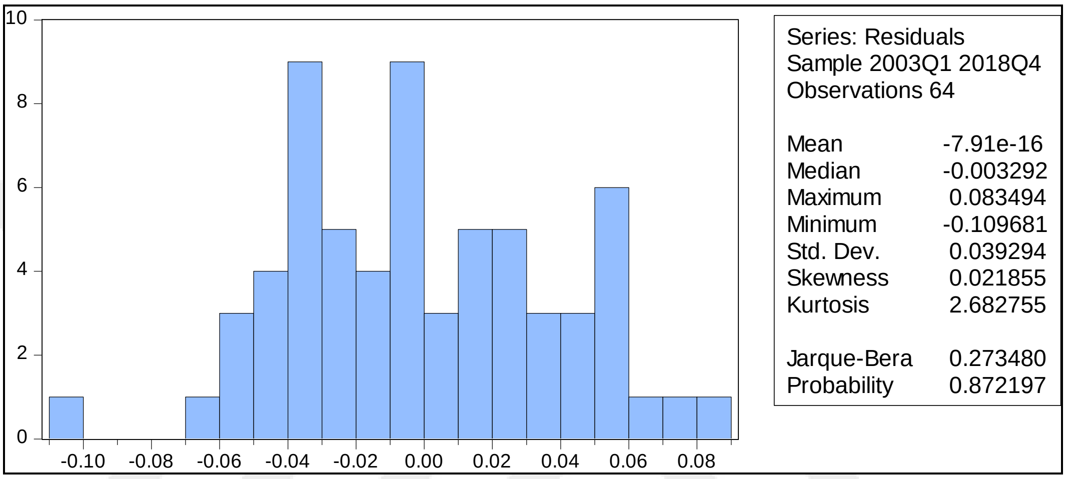

Figure 5.1 Normality Test for Linear Model for Manufacturing

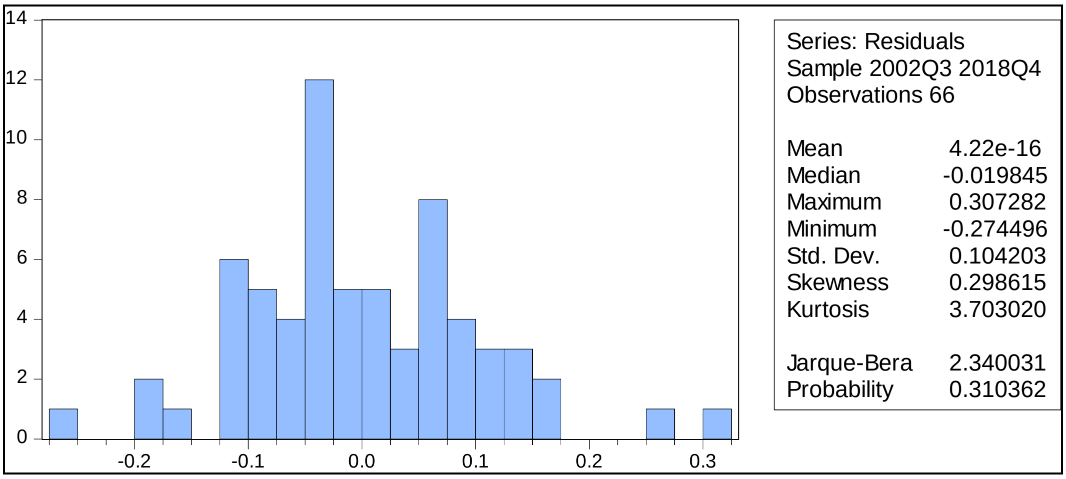

Figure 5.2 Normality Test for Linear Model for Mining

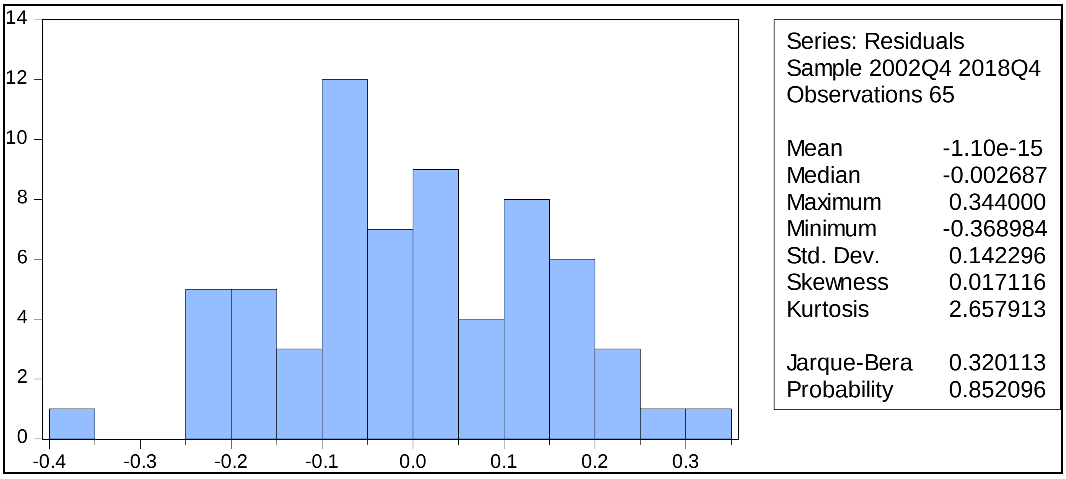

Figure 5.3 Normality Test for Linear Model for Agriculture

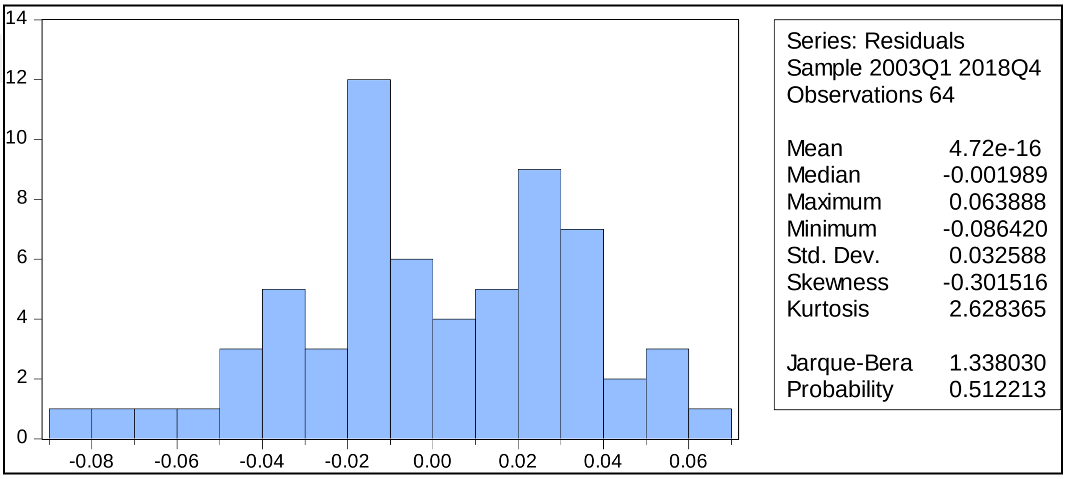

Figure 5.4 Normality Test for Linear Model for All 3 Sectors

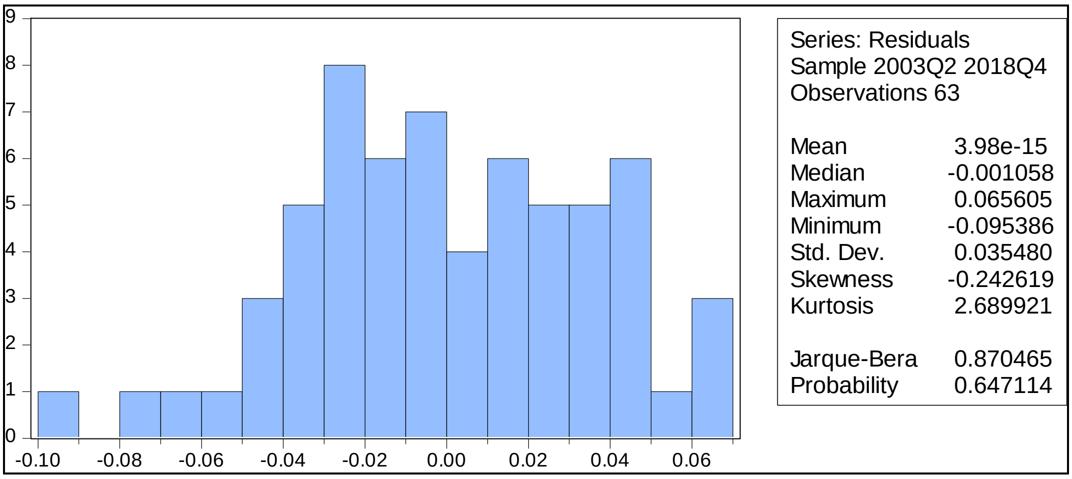

Figure 5.5 Normality Test for Non-Linear Model for Manufacturing

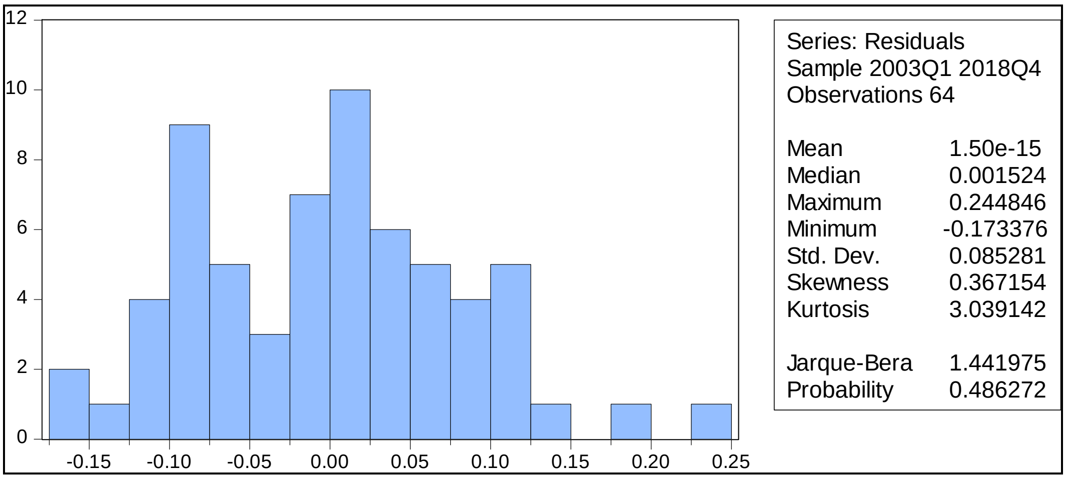

Figure 5.6 Normality Test for Non-Linear Model for Mining

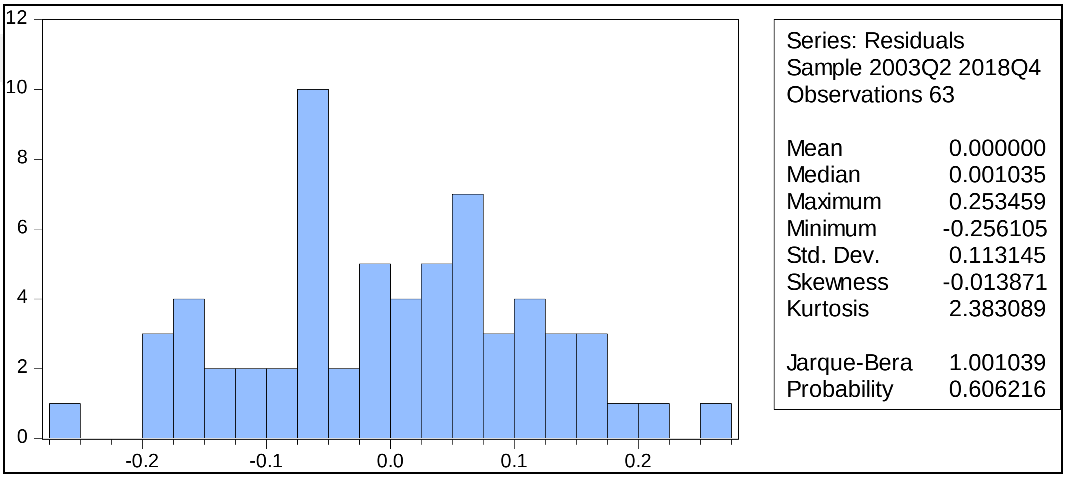

Figure 5.7 Normality Test for Non-Linear Model for Agriculture

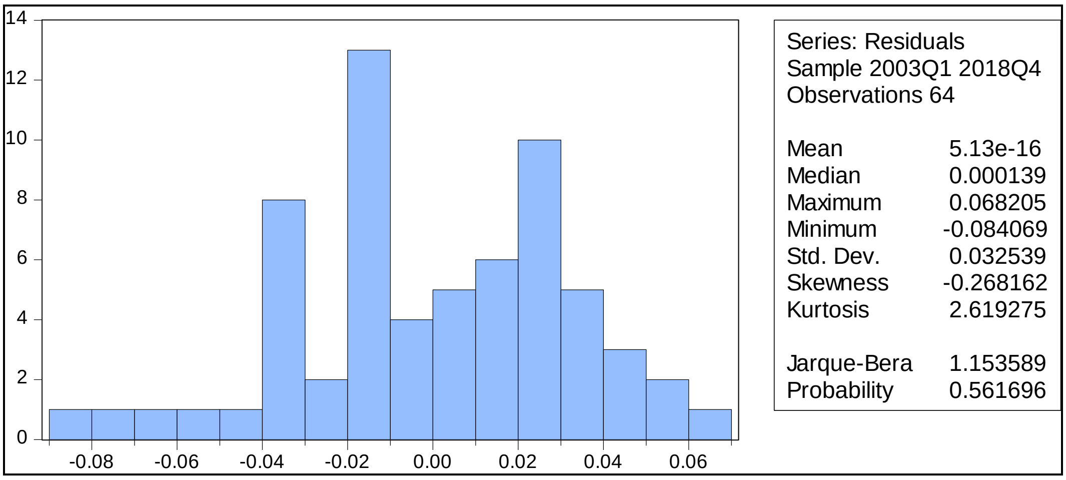

Figure 5.8 Normality Test for Non-Linear Model for All 3 Sectors

The probability values for all models are greater than 5%. Therefore, H_0 is accepted for all models, meaning that residuals are normally distributed. In other words, the model errors correspond to normal distribution (Figures 5.1-5.8).

5.6.4. Ramsey Test

Ramsey RESET test is performed for testing the misspecification. The hypotheses for misspecification are as follows:

H_0: Model is not misspecified

H_1: Model is misspecified

If the probability value is greater than 5%, H_0 is accepted, otherwise, that is if the probability value is less than 5%, H_1 is accepted.

Table 5.17 Ramsey RESET Test for Linear Models

Equation: ARDL1 (Manufacturing)	Specification: LTBMNG_SA LTBMNG_SA(-1) LY_SA LY_SA(-1) LY_SA(-2) LY_SA(-3) LY_SA(-4) LY_SA(-5) LYWMNG_SA LRER_SA C			
	Omitted Variables: Squares of fitted values			
		Value	df	Probability
	t-statistic	0,780112	49	0,4391
	F-statistic	0,608574	(1, 49)	0,4391
	F-test summary:			
		Sum of Sq.	df	Mean Squares
	Test SSR	0,001193	1	0,001193
	Restricted SSR	0,097274	50	0,001945
	Unrestricted SSR	0,09608	49	0,001961
Equation: ARDL2 (Mining)	Specification: LTBMNG_SA LTBMNG_SA(-1) LY_SA LY_SA(-1) LY_SA(-2) LYWMNG_SA LRER_SA C			
	Omitted Variables: Squares of fitted values			
		Value	df	Probability
	t-statistic	1.815672	52	0.0752
	F-statistic	3.296665	(1, 52)	0.0752
	F-test summary:			
		Sum of Sq.	df	Mean Squares
	Test SSR	0.028695	1	0.028695
	Restricted SSR	0.481312	53	0.009081
	Unrestricted SSR	0.452618	52	0.008704
Equation: ARDL3 (Agriculture)	Specification: LTBAGC_SA LTBAGC_SA(-1) LTBAGC_SA(-2) LY_SA LYWAGC_SA LYWAGC_SA(-1) LYWAGC_SA(-2) LRER_SA LRER_SA(-1) LRER_SA(-2) LRER_SA(-3) C			
	Omitted Variables: Squares of fitted values			
		Value	df	Probability
	t-statistic	0,791966	53	0,4319
	F-statistic	0,627211	(1, 53)	0,4319
	F-test summary:			
		Sum of Sq.	df	Mean Squares
	Test SSR	0,015156	1	0,015156
	Restricted SSR	1,29588	54	0,023998

	Unrestricted SSR	1,280723	53	0,024165
Equation: ARDL4 (All 3 Sectors)	Specification: LTBALL_SA LTBALL_SA(-1) LTBALL_SA(-2) LTBALL_SA(-3) LY_SA LY_SA(-1) LY_SA(-2) LY_SA(-3) LY_SA(-4) LYWALL_SA LYWALL_SA(-1) LYWALL_SA(-2) LYWALL_SA(-3) LRER_SA C			
	Omitted Variables: Squares of fitted values			
		Value	df	Probability
	t-statistic	0,50002	49	0,6193
	F-statistic	0,25002	(1, 49)	0,6193
	F-test summary:			
		Sum of Sq.	df	Mean Squares
	Test SSR	0,00034	1	0,00034
	Restricted SSR	0,066903	50	0,001338
	Unrestricted SSR	0,066564	49	0,001358

Table 5.18 Ramsey RESET Test for Non-Linear Models

Equation: NARDL1 (Manufacturing)	Specification: LTBMNF_SA LTBMNF_SA(-1) LTBMNF_SA(-2) LTBMNF_SA(-3) LY_SA LY_SA(-1) LY_SA(-2) LY_SA(-3) LY_SA(-4) LYWMNF_SA LYWMNF_SA(-1) LYWMNF_SA(-2) LYWMNF_SA(-3) LRER_SA_POS LRER_SA_POS(-1) LRER_SA_NEG LRER_SA_NEG(-1) LRER_SA_NEG(-2) LRER_SA_NEG(-3) LRER_SA_NEG(-4) C			
	Omitted Variables: Squares of fitted values			
		Value	df	Probability
	t-statistic	0,996889	42	0,3245
	F-statistic	0,993788	(1, 42)	0,3245
	F-test summary:			
		Sum of Sq.	df	Mean Squares
	Test SSR	0,001804	1	0,001804
	Restricted SSR	0,078048	43	0,001815
	Unrestricted SSR	0,076244	42	0,001815
Equation: NARDL2 (Mining)	Specification: LTBMNG_SA LTBMNG_SA(-1) LTBMNG_SA(-2) LTBMNG_SA(-3) LTBMNG_SA(-4) LY_SA LY_SA(-1) LY_SA(-2) LY_SA(-3) LYWMNG_SA LYWMNG_SA(-1) LYWMNG_SA(-2) LRER_SA_POS LRER_SA_NEG C			
	Omitted Variables: Squares of fitted values			
		Value	df	Probability
	t-statistic	0.909337	49	0.3676
	F-statistic	0.826895	(1, 49)	0.3676
	F-test summary:			
		Sum of Sq.	df	Mean Squares
	Test SSR	0.007604	1	0.007604
	Restricted SSR	0.458192	50	0.009164
	Unrestricted SSR	0.450589	49	0.009196
Equation: NARDL3 (Agriculture)	Specification: LTBAGC_SA LTBAGC_SA(-1) LTBAGC_SA(-2) LY_SA LYWAGC_SA LYWAGC_SA(-1) LYWAGC_SA(-2) LYWAGC_SA(-3) LYWAGC_SA(-4) LRER_SA_POS LRER_SA_POS(-1) LRER_SA_POS(-2) LRER_SA_POS(-3) LRER_SA_POS(-4) LRER_SA_NEG LRER_SA_NEG(-1) LRER_SA_NEG(-2) LRER_SA_NEG(-3) LRER_SA_NEG(-4) C			
	Omitted Variables: Squares of fitted values			
		Value	df	Probability
	t-statistic	1,238657	43	0,2222
	F-statistic	1,534272	(1, 43)	0,2222
	F-test summary:			

		Sum of Sq.	df	Mean Squares
	Test SSR	0,027345	1	0,027345
	Restricted SSR	0,793717	44	0,018039
	Unrestricted SSR	0,766372	43	0,017823
Equation: NARDL4 (All 3 Sectors)	Specification: LTBALL_SA LTBALL_SA(-1) LTBALL_SA(-2) LTBALL_SA(-3) LY_SA LY_SA(-1) LY_SA(-2) LY_SA(-3) LY_SA(-4) LYWALL_SA LYWALL_SA(-1) LYWALL_SA(-2) LYWALL_SA(-3) LRER_SA_POS LRER_SA_NEG C			
	Omitted Variables: Squares of fitted values			
		Value	df	Probability
	t-statistic	0,657678	48	0,5139
	F-statistic	0,43254	(1, 48)	0,5139
	F-test summary:			
		Sum of Sq.	df	Mean Squares
	Test SSR	0,000596	1	0,000596
	Restricted SSR	0,066703	49	0,001361
	Unrestricted SSR	0,066108	48	0,001377

According to the reset test that tests for the presence of specification errors in the models, the probability values for all models are greater than 5%. Therefore, H_0 is accepted for all models, meaning that there is no specification error in the models. In other words, the models are not misspecified (Tables 5.17-5.18).

5.6.5. Stability Condition

In order to fully trust the results of the models, it is necessary to check whether the models are stable. Model stability control can be performed by two techniques, such as the Cumulative Sum test (CUSUM) and the Cumulative Sum of Square test (CUSUMQ). CUSUM helps to check for a systematic change in regression coefficients. CUSUMQ allows to determine whether there is a sudden change in regression coefficients (Peseran, 1997). The hypotheses for both tests are:

H_0: All regression coefficients in the model are stable.

H_1: All regression coefficients in the model are not stable.

If the blue line in the graph is between red dashed lines, H_0 is accepted, ie all coefficients in the model are considered stable. However, if the blue line goes beyond the area between the two red lines, H_0 is rejected (therefore H_1 is accepted) (Beyai, 2018: 43).

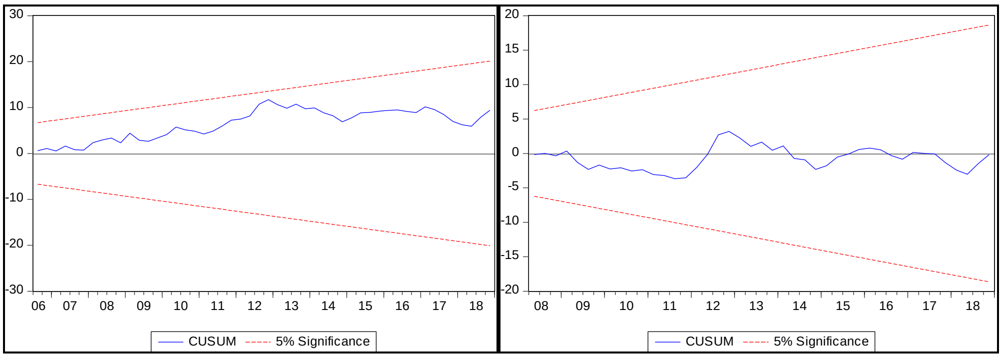

Figure 5.9 CUSUM Test for Linear (left) and Non-Linear (right) Models for Manufacturing

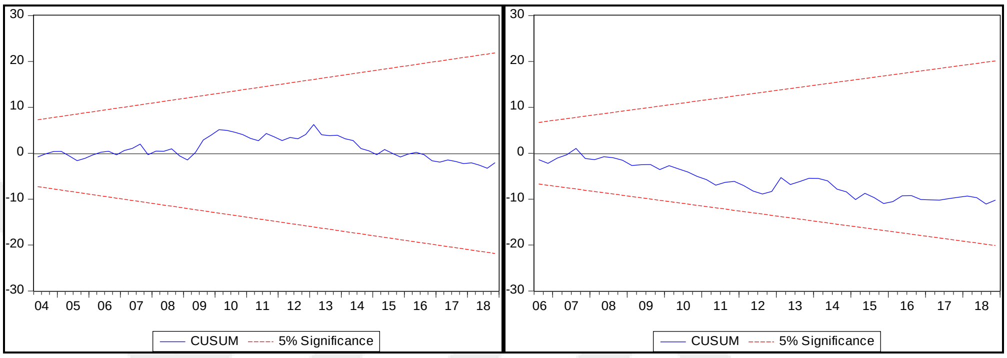

Figure 5.10 CUSUM Test for Linear (left) and Non-Linear (right) Models for Mining

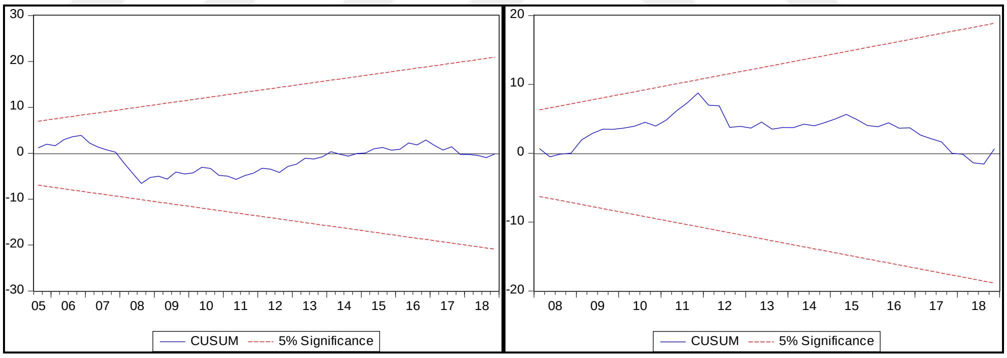

Figure 5.11 CUSUM Test for Linear (left) and Non-Linear (right) Models for Agriculture

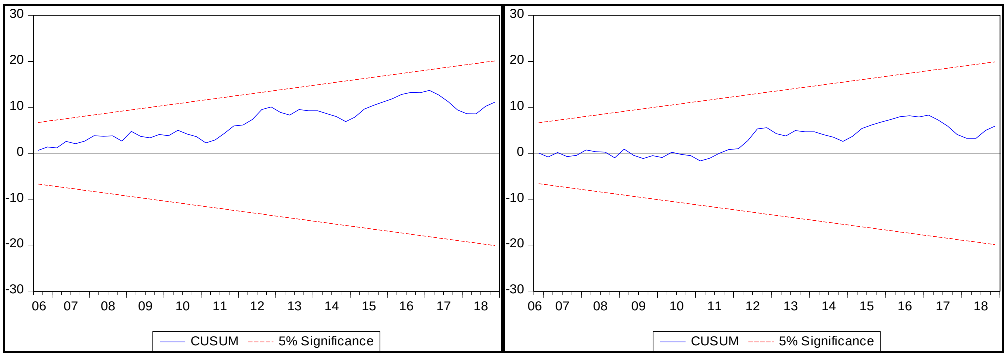

Figure 5.12 CUSUM Test for Linear (left) and Non-Linear (right) Models for All 3 Sectors

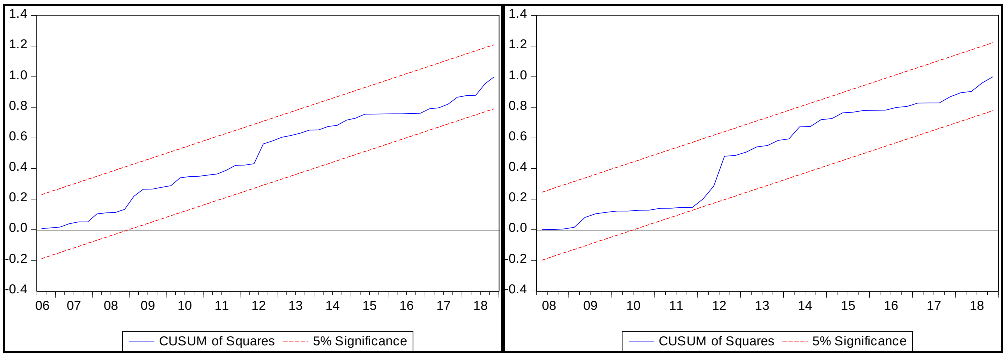

Figure 5.13 CUSUMQ Test for Linear (left) and Non-Linear (right) Models for Manufacturing

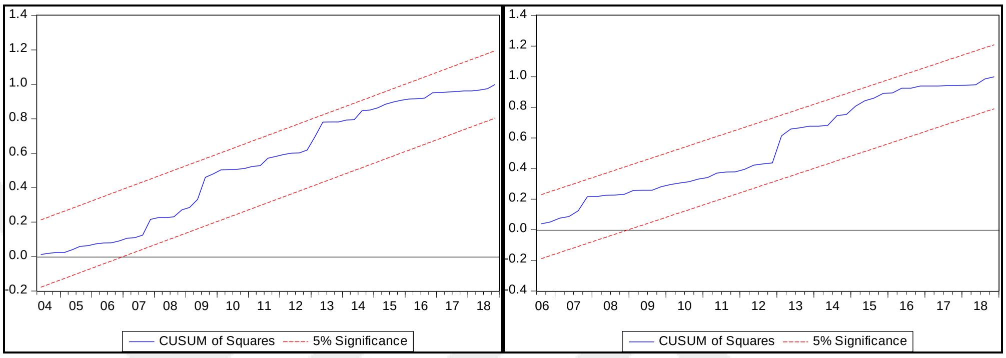

Figure 5.14 CUSUMQ Test for Linear (left) and Non-Linear (right) Models for Mining

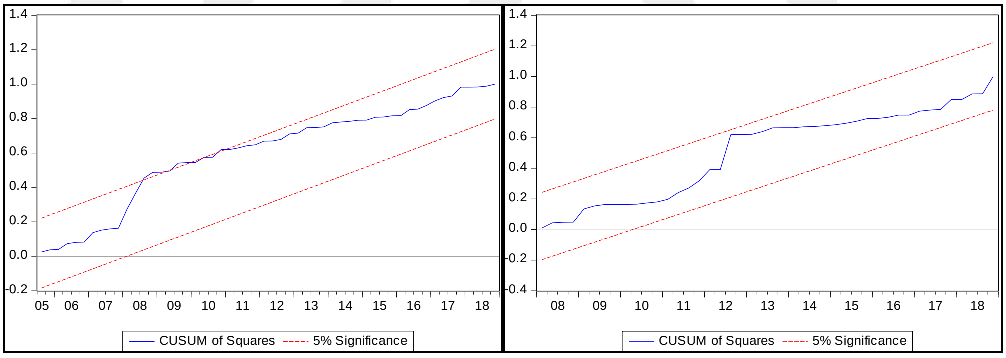

Figure 5.15 CUSUMQ Test for Linear (left) and Non-Linear (right) Models for Agriculture

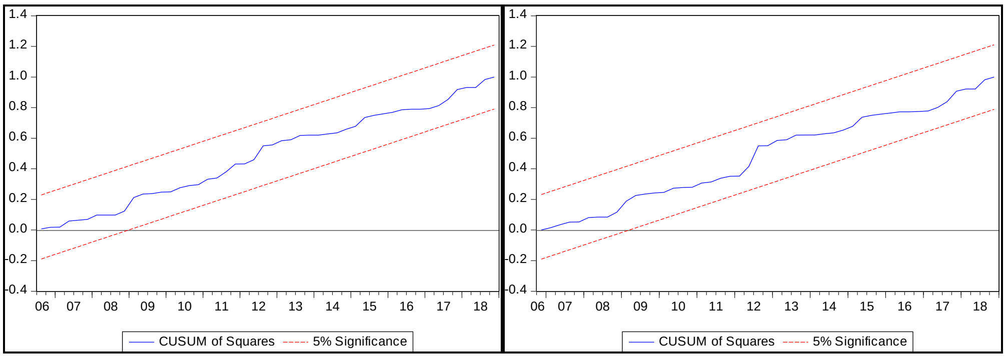

Figure 5.16 CUSUMQ Test for Linear (left) and Non-Linear (right) Models for All 3 Sectors

According to the CUSUM tests (Figures 5.9-12) and CUSUMQ tests (Figures 5.13-16), all blue lines are between red dashed lines. Therefore, H_0 is accepted for all models, meaning that all regression coefficients in the models are stable. In other words, according to CUSUM and CUSUMQ tests of model errors, it is observed that the model errors are consistent with the condition of stability (Figures 5.9-5.16).

5.7. Interpretation of Results

The interpretation of the results will be presented under 2 groups: (1) Short-term and (2) long-term effects of real exchange rate on the trade balances.

5.7.1. Short-term Effects

Short-term effects will be presented under linear and non-linear cases.

5.7.1.1. Short-term Effects in Linear Case

Short-term effects in linear case are interpreted from the first part (Cointegrated Form) of Tables 5.7-5.10.

As seen in Table 5.7, which shows effects on manufacturing trade balance in linear case, the domestic income has negative effects on manufacturing trade balance in short term in 0.01 significance simultaneously with no lag and in delay with 1, 2 and 3 lags. The manufacturing world incomes and with 1 and 2 lags have positive effects on manufacturing trade balance in short term and significant ($p<0.01$). Furthermore, manufacturing trade balance with 1 lag and 2 lags have also positive effects on manufacturing trade balance. In the selected ARDL model (3, 4, 3, 0), optimal lag of exchange rate is 0. Thus, D(LRER SA) does not appear in the error correction estimation. Finally, the value of the ECT [(the coefficient of CointEq(-1)] suggested by ARDL(3, 4, 3, 0) model is -0.8427 and significant ($p<0.01$). This indicates that, approximately 84% of deviation from equilibrium is corrected every quarter period after disequilibrium in the short-run.

As seen in Table 5.8, which shows effects on mining trade balance in linear case, the domestic income has effects on mining trade balance in short term in positive direction simultaneously in 0.10 significance and in positive direction in delay with 1 lag in 0.01 significance. In the selected ARDL model (1, 2, 0, 0), optimal lag of exchange rate is 0. Thus, D(LRER SA) does not appear in the error correction estimation. The value of the ECT suggested by ARDL(1, 2, 0, 0) model is -0.1949 and significant ($p<0.01$). This indicates that, approximately 19% of deviation from equilibrium is corrected every quarter period after disequilibrium in the short-run.

As seen in Table 5.9, which shows effects on agricultural trade balance in linear case, the world income has effects on agricultural trade balance in short term in negative direction simultaneously in 0.10 significance and in positive direction in delay with 1 lag in 0.01 significance. The trade balance with 1 lag has positive effect on agricultural trade balance in short term and significant ($p<0.05$). The real effective exchange rate has no significant short-term effect on agricultural trade balance. Finally, the value of the ECT suggested by ARDL(2, 0, 2, 3) model is -0.5745 and significant ($p<0.01$). This indicates that, approximately 57% of deviation from equilibrium is corrected every quarter period after disequilibrium in the short-run.

As seen in Table 5.10, which shows effects on overall 3 sectors' trade balance in linear case, the domestic income has negative effects on overall 3 sectors' trade balance in short term in 0.01 significance simultaneously with no lag and in delay with 2 and 3 lags and in 0.05 significance in delay with 1 lag. The overall 3 sectors' world incomes with 1 and 2 lags have positive effects on overall 3 sectors' trade balance in short term in 0.01 significance. Furthermore, overall 3 sectors' trade balance with 2 lags has also positive effects on overall 3 sectors' trade balance. In the selected ARDL model (3, 4, 3, 0), optimal lag of exchange rate is 0. Thus D(LRER SA) does not appear in the error correction estimation. Finally, the value of the ECT suggested by ARDL(3, 4, 3, 0) model is -0.5849 and significant ($p<0.01$). This indicates that, approximately 87% of deviation from equilibrium is corrected every quarter period after disequilibrium in the short-run.

5.7.1.2. Short-term Effects in Non-Linear Case

Short-term effects in non-linear case are interpreted from the first part (Cointegrated Form) of Tables 5.11-5.14.

As seen in Table 5.11, which shows effects on manufacturing trade balance in non-linear case, the domestic income has negative effects on manufacturing trade balance in short term in 0.01 significance simultaneously, i.e. with no lag, and in delay with 2 and 3 lags and in 0.05 significance in delay with 1 lag. The manufacturing world incomes and with 1 and 2 lags have positive effects on manufacturing trade balance in short term in 0.01 significance. The manufacturing trade balance with 1 lag and 2 lags have also positive effects on manufacturing trade balance. The negative shocks of real exchange rate have negative effects on manufacturing trade balance in short term in 0.01 significance simultaneously and in delay with 2 lags in 0.05 significance and with 3 lags in 0.10 significance. Finally, the value of the ECT, i.e., the coefficient of CointEq(-1), suggested by ARDL(3, 4, 3, 1, 4) model is -0.9446 and significant. This indicates that, approximately 94% of deviation from equilibrium is corrected every quarter period after disequilibrium in the short-run. Since in our study, the decrease in the exchange rate means depreciation of TL, and depreciation theoretically means an improvement in trade balance, that is increase in TB in our study. However, our findings show there exists both negative and positive effects on trade balance in Turkish manufacturing sector in short term in non-linear case. On the other hand, the theoretical studies indicates that the external depreciation of the national currency may show a downward effect in trade balance for a short time and then an upward (improvement) effect in the long run right after the moment of impact on foreign trade balance, thus a curve resembling the letter j may be formed, and this is called the J curve effect (Bahmani-Oskooee, M. & Ratha, 2004; Bahmani-Oskooee, & Hegerty, 2010). Summarily, as we observed some positive effects of real exchange rate on the manufacturing trade balance in short term, this may be a sign of j-curve effect. Thus, if we also observe any negative effect of real exchange rate on manufacturing trade balance in the long term, we'll evaluate that there is a j-curve effect of real exchange rate on manufacturing trade balance in Turkey. Similarly, as we observed some negative effects of real exchange rate on the manufacturing trade balance in short term, this may be a sign of reverse j-curve effect. Thus, if we also observe any positive effect of real exchange rate on agricultural trade balance in the long term, we'll evaluate that there is a reverse j-curve effect of real exchange rate on agricultural trade balance in Turkey. We will again discuss and finalize this situation later in Chapter VI.

As seen in Table 5.12, which shows effects on mining trade balance in non-linear case, the domestic income has effects on mining trade balance in short term in 0.10 significance in positive direction simultaneously and in 0.05 significance in positive direction in delay with 2 lags. The world income has effects on mining trade balance in short term in negative direction simultaneously and in positive direction in delay with 1 lag both in 0.05 significance. Furthermore, the mining trade balance has also effects on mining trade balance in short term in positive direction with 1 lag and 3 lags in 0.05 significance. In the selected ARDL model (4, 3, 2, 0, 0), optimal lags of positive and negative shocks of exchange rate are 0. Thus, D(LRER SA POS) and D(LRER SA NEG) do not appear in the error correction estimation. Finally, the value of the ECT suggested by ARDL(4, 3, 2, 0, 0) model is -0.6162 in 0.01 significance. This indicates that, approximately 61% of deviation from equilibrium is corrected every quarter period after disequilibrium in the short-run.

As seen in Table 5.13, which shows effects on agricultural trade balance in non-linear case, the agricultural world incomes with 1 lag, 2 lags and 3 lags have positive effects on agricultural trade balance in short term in 0.01, 0.05 and 0.10 significances respectively. The positive shocks of real exchange rate have negative effects on agricultural trade balance in short term in 0.05 significance in delay with 3 lags. The negative shocks of real exchange rate have positive effects on agricultural trade balance in short term in delay with 1 lag in 0.10 significance and with 3 lags in 0.05 significance. Furthermore, the agricultural trade balance has also effects on agricultural trade balance in short term in positive direction with 1 lag in 0.01 significance. Finally, the value of the ECT suggested by ARDL(2, 0, 4, 4, 4) model is -0.7781 and significant ($p<0.01$). This indicates that, approximately 77% of deviation from equilibrium is corrected every quarter period after disequilibrium in the short-run. Since in our study, the decrease in the exchange rate means depreciation of TL, and depreciation theoretically means an improvement in trade balance, that is increase in TB in our study. However, our findings show there exists both negative and positive effects on trade balance in Turkish agriculture sector in short term in non-linear case. On the other hand, the theoretical studies indicates that the external depreciation of the national currency may show a downward effect in trade balance for a short time and then an upward (improvement) effect in the long run right after the moment of impact on foreign trade balance, thus a curve resembling the letter j may be formed, and this is called the J curve effect (Bahmani-Oskooee, M. & Ratha, 2004; Bahmani-Oskooee, & Hegerty, 2010). Summarily, as we observed some positive effects of real exchange rate on the agricultural trade balance in short term, this may be a sign of j-curve effect. Thus, if we also observe any negative effect of real exchange rate on agricultural trade balance in the long term, we’ll evaluate that there is a j-curve effect of real exchange rate on agricultural trade balance in Turkey. Similarly, as we observed some negative effects of real exchange rate on the agricultural trade balance in short term, this may be a sign of reverse j-curve effect. Thus, if we also observe any positive effect of real exchange rate on agricultural trade balance in the long term, we'll evaluate that there is a reverse j-curve effect of real exchange rate on agricultural trade balance in Turkey. We will again discuss and finalize this situation later in Chapter VI.

5.7.2. Long-term Effects

Long-term effects will be presented under linear and non-linear cases.

5.7.2.1. Long-term Effects in Linear Case

Long-term effects in linear case are interpreted from the second part (Long Run Coefficients) of Tables 5.7-5.10.

As seen in Table 5.7, which shows effects on manufacturing trade balance in linear case, the long-term coefficient of domestic income is positive but not significant. The long-term coefficient of manufacturing world income is negative but not significant. The real exchange rate has long-term negative and significant ($p<0.01$) effect on manufacturing trade balance. The coefficient is approximately -0.4693 and significant which means that when exchange rate depreciates by %1, the manufacturing trade balance improves by 0.46 percent. This is theoretically expected.

As seen in Table 5.8, which shows effects on mining trade balance in linear case, the long-term coefficient of domestic income is positive and significant ($p<0.01$). The long-term coefficient of mining world income is negative and significant ($p<0.10$). The long-term coefficient of real exchange rate is positive but not significant ($p=0.1071$).

As seen in Table 5.9, which shows effects on agricultural trade balance in linear case, the long-term coefficient of domestic income is negative and significant ($p<0.01$). The long-term coefficient between agricultural world income and agricultural trade balance is negative and significant ($p<0.10$). The long-term coefficient between real exchange rate agricultural trade balance is negative but not significant ($p=0.7385$).

As seen in Table 5.10, which shows effects on overall 3 sectors' trade balance in linear case, the long-term coefficient of domestic income is positive but not significant. The long-term coefficient of overall 3 sectors' world income is negative but not significant. The real exchange rate has long-term negative effect on overall 3 sectors' trade balance in 0.01 significance. The coefficient is approximately -0.6598 and significant ($p<0.01$) which means that when exchange rate appreciates by %1, the overall 3 sectors' trade balance deteriorates by 0.65 percent. This is theoretically expected.

5.7.2.2. Long-term Effects in Non-Linear Case

Long-term effects in non-linear case are interpreted from the second part (Long Run Coefficients) of Tables 5.11-5.14.

As seen in Table 5.11, which shows effects on manufacturing trade balance in non-linear case, the long-term coefficient of domestic income is negative but not significant. The manufacturing world income has negative effect on manufacturing trade balance in long term in 0.10 significance. Both the positive and negative shocks of real exchange rate have negative effects on manufacturing trade balance in long term in 0.01 significance. The coefficient for positive shocks is approximately -0.4447 and significant which means that when the positive shocks of exchange rate appreciates by %1, the manufacturing trade balance deteriorates by 0.44 percent. Similarly, the coefficient for negative shocks is approximately -0.5677 which means that when the negative shocks of exchange rate depreciates by %1, the manufacturing trade balance improves by 0.56 percent. This is theoretically expected.

As seen in Table 5.12, which shows effects on mining trade balance in non-linear case, the long-term coefficient of domestic income is negative and significant. Similarly, the long-term coefficient of mining world income is negative and significant ($p<0.01$). The positive shocks of real exchange rate have positive effects on mining trade balance in long term in 0.01 significance. The coefficient is approximately +1.9254 and significant which means that when the positive shocks of exchange rate appreciates by %1, the mining trade balance improves by 1.92 percent. Theoretically it is expected that mining trade balance improves as a result of depreciation of TL. However, the findings show the opposite for mining sector. We will discuss this in Chapter VI.

As seen in Table 5.13, which shows effects on agricultural trade balance in non-linear case, the long-term coefficient of domestic income is positive but not significant (p=0.4989). The long-term coefficient of agricultural world income is negative and significant (p<0.01). The positive shocks of real exchange rate have negative effects on agricultural trade balance in long term in 0.10 significance. The coefficient of positive shocks of real exchange rate is approximately -0.5855 and significant (p<0.10) which means that when the positive shocks of exchange rate appreciates by %1, the agricultural trade balance deteriorates by 0.58 percent. This is theoretically expected.

As seen in Table 5.14, which shows effects on overall 3 sectors' trade balance in non-linear case, the long-term coefficient of domestic income is positive but not significant (p=0.4314). The long-term coefficient of overall 3 sectors' world income is negative but not significant (p=0.2761). The positive and negative shocks of real exchange rate have negative effects on overall 3 sectors' trade balance in long term both in 0.01 significance and simultaneously. The coefficient of positive shocks of real exchange rate is approximately -0.6744 and significant (p<0.01) which means that when the positive shocks of exchange rate increase by %1, the overall 3 sectors' trade balance deteriorates by 0.67 percent. The coefficient of negative shocks of real exchange rate is approximately -0.6201 and significant which means that when the negative shocks of exchange rate depreciates by %1, the overall 3 sectors' trade balance improves by 0.62 percent. The findings for LRER SA_POS and LRER SA_NEG are theoretically expected.

CHAPTER VI

SUMMARY AND CONCLUSION

The findings of the research aiming to find the effects of real exchange rate on the trade balances of Turkish manufacturing, mining and agriculture sectors as well as the trade balance of the sum of these three sectors (overall 3 sectors) in the short and long terms in the linear and non-linear cases, are summarized in Tables 6.1-6.4.

Table 6.1 summarizes the significant effects of real exchange rate on foreign trade balances.

Table 6.1 The Summary Table for Significant Effects of Real Exchange Rate on the Trade Balances of Manufacturing, Mining, Agriculture and Overall 3 Sectors in the Short and Long term in Linear and Non-Linear Cases in Turkey

		Short-term				**Long-term**			
		Linear		**Non-Linear**		**Linear**		**Non-Linear**	
		POS	**NEG**	**POS**	**NEG**	**POS**	**NEG**	**POS**	**NEG**
Manufacturing	**RER**	n/a	n/a	n/a	n/a		p<0,01	n/a	n/a
	RER+	n/a	n/a			n/a	n/a		p<0,01
	RER-	n/a	n/a	p<0,05 in (-2), p<0,10 in (-3).	p<0,01	n/a	n/a		p<0,01
Mining	**RER**	n/a	n/a	n/a	n/a			n/a	n/a
	RER+	n/a	n/a			n/a	n/a	p<0,01	
	RER-	n/a	n/a			n/a	n/a		
Agriculture	**RER**			n/a	n/a			n/a	n/a
	RER+	n/a	n/a		p<0,05 in (-3).	n/a	n/a		p<0,10
	RER-	n/a	n/a	p<0,10 in (-1), p<0,05 in (-3).		n/a	n/a		
All 3 Sectors	**RER**	n/a	n/a	n/a	n/a		p<0,01	n/a	n/a
	RER+	n/a	n/a			n/a	n/a		p<0,01
	RER-	n/a	n/a			n/a	n/a		p<0,01

n/a associated with RER in linear case means that D(RER) is not included in the estimation because optimal lag of the RER in ARDL model is zero. (-1): 1-quarter lag; (-2): 2-quarter lag; (-3): 3-quarter lag; (-4): 4-quarter lag; n/a: Not applicable; RER: RER changes; RER+=RER(POS): RER changes in positive direction; RER-=RER(NEG): RER changes in negative direction. Green colours indicate significance.

According to Table 6.1:

- Real exchange rate has significant effects on manufacturing trade balance in delay with 2 lags in $p<0.05$ and with 3 lags in $p<0.10$ significance for RER- in positive direction and with no lag in $p<0.01$ for RER- in negative direction in short term with $p<0.01$ both for RER+ and RER- in long term in non-linear case and with $p<0.01$ for RER in long term in linear case in negative direction. It has “no short-term effect in linear case” or “no positive effect in the long term” on manufacturing trade balance.
- Real exchange rate has significant positive effects on mining trade balance in long term with $p<0.01$ for RER+ in non-linear case.
- Real exchange rate has significant effects in delay with 1 lag in $p<0.10$ and with 3 lags in $p<0.05$ significance for RER- in positive direction and in delay with 3 lags in $p<0.05$ for RER+ in short term with $p<0.10$ for RER+ in long term in negative direction in non-linear case on agriculture trade balance.
- Real exchange rate has significant negative effects on overall 3 sectors’ trade balance with $p<0.01$ both for RER+ and RER- in non-linear case and for RER in linear case in long term. It has no short-term effect or no positive effect on overall 3 sectors’ trade balance.

Table 6.2 summarizes the significant effects of real exchange rate on foreign trade balances.

Table 6.2 The Summary Table for Significant Effects of Real Exchange Rate

	Short-term		Long-term	
	Linear	**Non-Linear**	**Linear**	**Non-Linear**
Manufacturing	NO	YES***	YES***	YES***
Mining	NO	NO	NO	YES***
Agriculture	NO	YES**	NO	YES*
All 3 Sectors	NO	NO	YES***	YES***

YES*: $p<0.10$ = There is significant effect; YES**: $p<0.05$ = There is significant effect; YES***: $p<0.01$ = There is significant effect; Significant effects include any kind of RER changes (RER or RER^+ or RER^-); RER^+=RER(POS); RER^-=RER(NEG); NO: There is no significant effect. Green colours indicate significance.

According to Table 6.2, the real exchange rate has no short-run effect in any of trade balances in linear case. It has significant short-run effect only on trade balances for manufacturing and agriculture in non-linear case. As for long-run effect, in linear case it has significant effect only on manufacturing trade balance and overall trade balance. In non-linear case, the real exchange rate has significant long-run effect on all four trade balances.

Table 6.3 summarizes the direction of significant effects of real exchange rate on foreign trade balances.

Table 6.3 The Summary Table for the Direction of Significant Effects

	Short-term		Long-term	
	Linear	**Non-Linear**	**Linear**	**Non-Linear**
Manufacturing	no effect	NEG***, POS**, POS*	NEG***	NEG***
Mining	no effect	no effect	no effect	POS***
Agriculture	no effect	NEG**, POS**, POS*	no effect	NEG*
All 3 Sectors	no effect	no effect	NEG***	NEG***

*: p<0.10; **: p<0.05; ***: p<0.01; RER: Meaning any kind of RER changes (RER or RER+ or RER-); POS: Effect in the same direction; NEG: Effect in the opposite direction; no effect: no significant effect; Note: All effects in the above table mean the effect of real exchange rate on related trade balance. Red colour indicates insignificance. Green colours indicate significance.

According to Table 6.3, the real exchange rate has both negative and positive effects in the short-term on manufacturing and agriculture trade balances in non-linear case. Except for the positive effect on mining trade balance, the real exchange rate has negative effects in long-term on the trade balances in linear and non-linear cases.

Table 6.4 summarizes the evaluation of j-curve and reverse j-curve effect of real exchange rate on foreign trade balances.

Table 6.4 The Summary Table for the Evaluation of J-Curve and Reverse J-Curve Effect

	Short term		Long term		Short-Long Effect Pairs	EVALUATION Short-Long J-curve	EVALUATION Short-Long Reverse J-curve
RER effect on	**POS**	**NEG**	**POS**	**NEG**		**POS-NEG**	**NEG-POS**
Manufacturing TB	YES	YES		YES	**POS-NEG**, NEG-NEG	**YES**	**NO**
Mining TB			YES		…..-POS	**NO**	**NO**
Agriculture TB	YES	YES		YES	**POS-NEG**, NEG-NEG	**YES**	**NO**
All 3 Sectors TB				YES	…..-NEG	**NO**	**NO**

TB: Trade Balance; YES: There is significant effect; NO: There is NO significant effect; POS: Positive Effect; NEG: Negative Effect; POS-NEG pair means there is a j-curve effect (as the effect is in the same direction [POS] with the change direction of local currency in the short time, while in the opposite direction [NEG] in the short time, causing a j letter in the graph); NEG-POS pair means there is a REVERSE j-curve effect (as the effect is in the opposite direction [NEG] with the change direction of local currency in the short time, while in the same direction [POS] in the long time, causing a reverse j letter in the graph); Decrease in RER means depreciation of local currency (Turkish Liras); Increase in RER means appreciation of local currency (Turkish Liras). Red colour indicates insignificance. Green colour indicates significance.

According to Table 6.4, the directions of short and long-term effects of real exchange rate on the trade balances of manufacturing and agriculture sectors are the same, which is POS-NEG and NEG-NEG. Since the real exchange rate has no significant effect on trade balances of both mining sector and overall 3 sectors, there is no significant short-long effect pairs for these. In other words, the real exchange rate has just effect in long-term on the trade balances of mining sector and overall 3 sectors, which leads to no possibility of observing any j-curve or reverse j-curve. Regarding to the short-term positive and long-term negative effects of real exchange rate on the trade balances of manufacturing and agriculture sectors, that is POS-NEG short-long effect pairs, we can interpret that there is a j-curve effect of real exchange rate on trade balances of manufacturing and agriculture sectors in Turkey. As we observe no NEG-POS short-long effect pair, we can say that there is no reverse j-curve effect on the trade balances of manufacturing, mining, agriculture sectors and overall 3 sectors in Turkey.

Regarding to the j-curve effect of real exchange rate on the trade balance of manufacturing sector, we can say that when the value of real effective exchange rate decreases (here the depreciation of TL and valid for the negative shocks of real exchange rate) the trade balance of manufacturing sector also decreases in short-term in delay with 2 or 3 lags, then increases in long-term. The effect of real exchange rate on the trade balance of manufacturing sector is not limited with j-curve effect. When local currency depreciates, the real exchange rate itself (not positive or negative shocks) has negative effect on the manufacturing trade balance in the long-term, which means that the depreciation of TL leads an improvement on the manufacturing trade balance. Similar situation is valid for the effects of positive shocks of real exchange rate on the manufacturing trade balance in Turkey.

Regarding to the j-curve effect of real exchange rate on the trade balance of agriculture sector, we can say that when local currency depreciates, the trade balance of agriculture sector also decreases in short-term in delay with 1 or 3 lags, then increases for the positive shocks of real exchange rate in long-term. The effect of real exchange rate on the trade balance of agriculture sector is not limited with j-curve effect. When the value of real effective exchange rate increases (here the appreciation of TL and valid for the positive shocks of real exchange rate with 3 lags), it has negative effect on the agriculture trade balance in the short- and long-term, which means that the appreciation of TL leads a deterioration on the agricultural trade balance. No significant effect of real exchange rate itself (not positive or negative shocks) is observed on the agricultural trade balance in Turkish market.

Regarding to the positive effect of real exchange rate on mining trade balance, this effect is limited with the positive shocks of real exchange rate, non-linear case and in long-term. This means that when positive shocks in real exchange rate is observed (here the appreciation of TL), the mining trade balance improves. This may stem from the highly import oriented structure of mining sector in Turkey.

Regarding to the negative effect of real exchange rate on overall 3 sectors' trade balance, this effect is limited in long-term. The positive and negative shocks of real exchange rate have negative effects on overall 3 sectors' trade balance in long-term in non-linear case. The real exchange rate itself (not positive and negative shocks of it) has also negative effects on overall 3 sectors' trade balance in long-term but in linear case. This means that when positive shocks of real exchange rate (means appreciation of TL) is observed, the overall 3 sectors' trade balance deteriorates. Similarly, when negative shocks of real exchange rate (means depreciation of TL) is observed, the overall 3 sectors' trade balance improves. Similarly, when real exchange rate itself (not positive and negative shocks of it) appreciates or depreciates, the overall 3 sectors' trade balance deteriorates or improves respectively. That is, the effect of real exchange rate on the overall 3 sectors' trade balance is always in negative (opposite) direction regardless of the real exchange rate's positive or negative shocks or itself.

REFERENCES

Açıkalın, S., Başcı, E.S. (2016). Cointegration and Causality Relationship Between BIST 100 and BIST Gold Indices. *Yönetim ve Ekonomi: Celal Bayar Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 23* (2), 565-574.

Akbostanci, E. (2004). Dynamics of The Trade Balance: The Turkish J- Curve. *Emerging Markets Finance and Trade, 40* (5), 57-73.

Aksu, H., Başar, S., Eren, M., Bozma, G. (2017). Döviz Kurunun Dış Ticaret Dengesi Üzerindeki Asimetrik Etkisi: Türkiye Örneği. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi, 31* (3), 477-488.

Ankara Chamber of Industry (ASO - Ankara Sanayi Odası) (2017, September 28). *Madencilik Sektör Raporu,* Ankara. Retrieved from http://www.aso.org.tr/wp-content/uploads/2017/09/1.pdf (29 September 2019).

Aral, A. (2015). *Türkiye'de Döviz Kuru ve Dış Ticaret Ilişkisi: 1992 - 2013 Dönemi Eşbütünleşme Analizi.* Adnan Menderes Üniversitesi/Sosyal Bilimler Enstitüsü, Aydın.

Arat, K. (2003). *Türkiye'de Optimum Döviz Kuru Rejimi Seçimi ve Döviz Kurlarından Fiyatlara Geçiş Etkisinin İncelenmesi*, Expertise Thesis, Central Bank of Turkey Republic. Retrieved from http://www3.tcmb.gov.tr/kutuphane/TURKCE/tezler/kursadarat.pdf (4 October 2019).

Arıkan, C. (2013). *Petrol Fiyatlarının Makroekonomik Göstergeler Üzerindeki Asimetrik Etkisi: Türkiye Örneği,* unpublished Master's Thesis, Gazi Üniversitesi/Sosyal Bilimler Enstitüsü, Ankara, Turkey.

Arize, A.C. (1994). Cointegration Test of A Long-Run Relation Between the Real Effective Exchange Rate and The Trade Balance. *International Economic Journal, 8* (3), 1-9. Retrieved from https://www.researchgate.net/profile/Chuck_Arize/publication/24082244_Cointegration_Test_of_a_Long-Run_Relation_Between_the_Real_Effective_Exchange_Rate_and_the_Trade_Balance/links/549f75990cf257a635fe755a/Cointegration-Test-of-a-Long-Run-Relation-

Between-the-Real-Effective-Exchange-Rate-and-the-Trade-Balance.pdf (22 September 2019).

Athukorala, P. & Menon, J. (1994). Pricing to Market Behaviour and Exchange Rate Pass-Through in Japanese Exports. *The Economic Journal, 104* (423), 271-281

Atılgan, Ö. (2011). *Türkiye'de Uygulanan Döviz Kuru Politikaları ve Reel Döviz Kurunun Dış Ticaret Dengesine Etkisi (1992-2010),* unpublished Master’s Thesis, İstanbul Üniversitesi/Sosyal Bilimler Enstitüsü, İstanbul, Turkey.

Aziz, N. (2012). Does a Real Devaluation Improve the Balance of Trade? Empirics from Bangladesh Economy. *The Journal of Developing Areas, 46* (2), 19-41.

Bahmani-Oskooee, M. (1985). Devaluation and the J-curve: some evidence from LDCs. *Review of Economics and Statistics, 67* (3), 500-504.

Bahmani-Oskooee, M. & Fariditavana, H. (2014). Do exchange rate changes have Symmetric Effect on the S-Curve? *Economics Bulletin*, *34,* 164-173.

Bahmani-Oskooee, M., & Fariditavana, H. (2015). Nonlinear ARDL Approach, Asymmetric Effects and the J-Curve. *Journal of Economic Studies, 42* (3), 519–530.

Bahmani-Oskooee, M. & Hegerty, S.W. (2010). The J- and S-Curves: A Survey of the Recent Literature. *Journal of Economic Studies, 37* (6), 580-596.

Bahmani-Oskooee, M., & Kanitpong, T. (2017). Do exchange rate changes have symmetric or asymmetric effects on the trade balances of Asian countries? *Applied Economics*, *49* (46), 4668–4678.

Bahmani-Oskooee, M. & Ratha, A. (2004). The J-Curve: A Literature Review. *Applied Economics, 36* (13), 1377-1398

Bahmani-Oskooee, M. & Xu, J. (2013). The S-Curve Dynamics of U.S.-Mexico Commodity Trade. *Journal of Applied Economics*, *16* (1), 33-48.

Bahmani-Oskooee, M. & Zhang, R. (2013). The J-Curve: Evidence from Commodity Trade Between UK and China. *Applied Economics, 45* (31), 4369-4378.

Bailliu, J., & Fujii, E. (2004). Exchange Rate Pass-Through and the Inflation Environment in Industrialized Countries: An Empirical Investigation. *SSRN Electronic Journal.* Retrieved from https://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID560762_code77874.pdf?abstractid=560762&mirid=1 (29 September 2019).

Başkesen, K. (2018). *Döviz Kurunun, Dış Ticaret ve Ekonomik Büyüme Üzerindeki Etkisi: Türkiye İçin Zaman Serisi Analizi,* unpublished Master's Thesis, Çanakkale Onsekiz Mart Üniversitesi/Sosyal Bilimler Enstitüsü, Çanakkale, Turkey.

Bayat, T., Özcan, B. & Taş, Ş. (2015). Türkiye'de Döviz Kuru Geçiş Etkisinin Asimetrik Nedensellik Testleri ile Analizi. *Eskişehir Osmangazi Üniversitesi İİBF Dergisi, 10* (2), 7-30. Retrieved from https://arastirmax.com/tr/system/files/dergiler/14926/makaleler/10/2/arastirmax-turkiyede-doviz-kuru-gecis-etkisinin-asimetrik-nedensellik-testleri-ile-analizi.pdf (5 October 2019).

Benli, M. (2019). Asymmetric Effect of Exchange Rates on Exports: An Empirical Analysis of Exports from Turkey to the USA. Rasim Yılmaz (Ed.), *Studies on Balkan and Near Eastern Social Sciences* - *Volume 2* içinde (s. 195-204). Berlin: Peter Lang GmbH.

Benlialper, A. (2013). *Asymmetric Exchange Rate Intervention Under Inflation Targeting Regimes: The Case of Turkey, 2002-2008,* Orta Doğu Teknik Üniversitesi/Sosyal Bilimler Enstitüsü, Ankara, Turkey.

Beyai, M. (2018). *The Relationship Between Tourism and Economic Growth: An Empirical Evidence from The Gambia*, unpublished Master's Thesis, Cankaya University/Graduate School of Social Sciences, Ankara, Turkey.

Biçici, K. (2015). *Para Politikası Şoklarının Hâsıla ve Fiyat Düzeyi Üzerindeki Asimetrik Etkileri: Orta Asya ve Balkan Ülkeleri Uygulaması,* unpublished Master's Thesis, Başkent Üniversitesi/Sosyal Bilimler Enstitüsü, Ankara, Turkey.

Bilman, A.S. (2008). *Phillips Eğrisinin Politika Önerisi ve Asimetrik Etkiler: Türkiye Örneği,* unpublished Master's Thesis, Dokuz Eylül Üniversitesi/Sosyal Bilimler Enstitüsü, İzmir, Turkey.

Boz, Ç. (2013). Asymmetric ERPT for the Periods of Implicit-Explicit IT in Turkey. *Scottish Journal of Arts, Social Sciences and Scientific Studies, 9* (2), 3-11.

Bussière M. (2007). *Exchange Rate Pass-through to Trade Prices: The Role of Non-linearities and Asymmetries.* Working Paper Series 822, European Central Bank. Retrieved from https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp822.pdf?5110560281214922cfee9c163c8a47f9 (25 September 2019).

Calvo, G.A., (1983). Staggered Prices in a Utility-Maximizing Framework. *Journal of Monetary Economics, 12* (3), 383-398.

Central Bank of the Republic of Turkey (CBRT) (2019). *Real Effective Exchange Rate (D-PPI Based, 2003=100, Quarterly).* Kurlar-Reel Efektif Döviz Kuru-Yİ-ÜFE Bazlı (2003=100)(Aylık), Gözlem: Orijinal Gözlem, Formül: Düzey, Seri adı: Yİ-ÜFE Bazlı Reel Efektif Döviz Kuru (2003=100), Seçtiklerim: Yİ-ÜFE Bazlı Reel Efektif Döviz Kuru (2003=100) - Düzey, Rapor Seçenekleri Frekans: 3 Aylık, Başlangıç Tarihi: Q1-1999, BitişTarihi: Q4-2018, Ondalık: 2, Tarih Formatı: Yıl-Çeyrek, Ondalık Ayracı: . (nokta), Rapor Oluştur, Excel'e Aktar, İndirme (Excel formatında kaydetmek için indirme butonuna tıklayınız...) Dikey, Artan, İndir. Retrieved from https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket/#collapse_2 (6 October 2016).

Cheung, Y.-W. & and Sengupta, R. (2013, May 20). Impact of Exchange Rate Movements on Exports: An Analysis of Indian Non-Financial Sector Firms. BOFIT Discussion Paper No. 10/2013. *Bank of Finland, BOFIT Institute for Economies in Transition.* Retrieved from SSRN: https://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID2289749_code839764.pdf?abstractid=2289749&mirid=1 (7 October, 2019).

Choudhri, E.U., & Hakura, D.S. (2006). Exchange Rate Pass-Through to Domestic Prices: Does the Inflationary Environment Matter? *Journal of International Money and Finance, 25* (4), 614–639.

Çankaya, M.N. (2015). *Asimetrik Etki Fonksiyonlu M-Tahmin Edicileri: Özellikleri ve Uygulamaları,* unpublished Ph.D.Dissertation, Ankara Üniversitesi/Fen Bilimleri Enstitüsü, Ankara, Turkey.

Çil-Yavuz, N. (2011). Koentegrasyon Analizine Dağıtılmış Gecikmeli Otoregresif Model Yaklaşımı ile Türkiye İthalat-GSMH İlişkisinin İncelenmesi (1983-2001). *İstanbul Üniversitesi İktisat Fakültesi Mecmuası,* 54 (1), 139-152. Retrieved from https://dergipark.org.tr/en/download/article-file/8013 (2 January 2020).

Delatte A-L. & Lopez-Villavicencio, A. (2012). Asymmetric Exchange Rate Pass-through: Evidence from Major Countries. *Journal of Macroeconomics, 34,* 833-844.

Demirgil, H., Yıldırım, S., Karcı, Z. (2017). Türkiye'de Döviz Kuru Oynaklığındaki Asimetrinin Modellenmesi. EYİ 2017 XVIII. Uluslararası Ekonometri Yöneylem Araştırması ve İstatistik Sempozyumu, 5-7 Ekim 2017, Trabzon, Türkiye.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association, 74* (366), 427.

Dickey, D.A., Fuller, W.A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica, 49* (4), 1057-1072.

Dinçer, N.N. (2005). *Döviz Kuru Dalgalanmalarının Asimetrik Etkileri: Türkiye Örneği,* unpublished Master’s Thesis, DPT, Ekonomik Modeller ve Stratejik Araştırmalar Genel Müdürlüğü, Ankara.

Doğruel, S. (2008). *Türkiye Sanayiine Sektörel Bakış*. TÜSİAD, No. Tüsiad-T/2008 -05/466, İstanbul. Retrieved from https://tusiad.org/tr/yayinlar/raporlar/item/download/3492_b67c27a19e3bd1e389a81deb1c0d68d1 (26 September 2019).

Dornbusch, R. (1985). *Exchange Rate and Prices.* NBER, Working Paper Series 1769. Retrieved from https://econpapers.repec.org/scripts/redir.pf?u=http%3A%2F%2Fwww.nber.org%2Fpapers%2Fw1769.pdf;h=repec:nbr:nberwo:1769 (27 September 2019).

Erdem, E., Tuğcu, C.T. & Nuhoğlu, S. (2007). The J-Curve Effect and Turkey-Germany Trade Balance: An Industry Level Data Analysis. *Faculty of Economics and Administrative Sciences,* Kayseri, 1-10.

Erdem, H. F. & Yamak, N. (2016). Döviz Kurunun Fiyatlar Genel Düzeyi Üzerindeki Geçişkenlik Etkisi: Gecikmesi Dağıtılmış Yaklaşım. *Kafkas Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 7* (13) 302-322. Retrieved from https://dergipark.org.tr/download/article-file/738855 (5 October 2019).

Ergeç, E.H. (2007). *Para Politikası Şoklarının Asimetrik Etkileri: Türkiye Ekonomisinde Pozitif ve Negatif Şok Asimetrisi*, unpublished Ph.D.Dissertation, Anadolu Üniversitesi/Sosyal Bilimler Enstitüsü, Eskişehir, Turkey.

Ergin, A. (2015). Döviz Kuru ve Enflasyon Arasındaki Geçiş Etkisi: Türkiye Örneği. *Niğde Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 8* (3), 13-29. Retrieved from https://dergipark.org.tr/download/article-file/185186 (4 October 2019).

Fakıbaba. A.E. (2017. November). 2018 Yılı Bütçe Sunumu Raporu. T.C. Gıda Tarım ve Hayvancılık Bakanlığı. Retrieved from https://www.tarimorman.gov.tr/Belgeler/ButceSunumlari/ButceSunumu_2018.pdf (5 October 2019).

Frankel, J., Parsley, D. & Wei, S-J. (2012). Slow Pass-through Around the World: A New Import for Developing Countries? *Open Economies Review, 23* (2), 213–251. Retrieved from http://www.nber.org/papers/w11199.pdf (1 October 2019).

Gedik, A. (2014). Reel Efektif Döviz Kurunun Dış Ticaret Dengesi Üzerine Etkisi, unpublished Ph.D.Dissertation, Selçuk Üniversitesi/Sosyal Bilimler Enstitüsü, Konya, Turkey.

Gervais, O, Schembri, L, Suchanek, L. (2016). Current Account Dynamics, Real Exchange Rate Adjustment, and the Exchange Rate Regime in Emerging-Market Economies. *Journal of Development Economics, 119*, 86-99.

Gündoğdu, M.K. (2013). *Döviz Kurunun Fiyatlara Geçiş Etkisi: Türkiye Çalışması*. İktisadi Araştırmalar Bölümü, Türkiye İş Bankası. Retrieved from https://docplayer.biz.tr/7958399-Doviz-kurunun-fiyatlara-gecis-etkisi-turkiye-calismasi.html (4 October 2019).

Gülşen, A. (2015). *Reel Efektif Döviz Kurunun Tekstil ve Hazır Giyim Sektörü Üzerine Etkisi: Türkiye Örneği,* unpublished Master's Thesis, Adnan Menderes Üniversitesi/Sosyal Bilimler Enstitüsü, Aydın, Turkey.

Güngör, Ş. (2018). *Türkiye'nin Avrupa Birliği'ne Sektörel Ihracatına Döviz Kurunun Etkisi,* unpublished Master's Thesis, Mersin Üniversitesi/Sosyal Bilimler Enstitüsü, Mersin, Turkey.

Hepaktan, E. (2009). Türkiye'nin Marshall-Lerner Koşuluna İlişkin Parçalı Esbütünleşme Analizi. *Celal Bayar Üniversitesi İ.İ.B.F. Yönetim ve Ekonomi, 16* (1), 40-50.

Hoşafçı, D. (2011). *VAR Analizi ile Döviz Kurunun Fiyatlara Etkisi,* unpublished Master's Thesis, İstanbul Üniversitesi/Sosyal Bilimler Enstitüsü, İstanbul, Turkey.

IHSEViews. (2018, February 21). AutoRegressive Distributed Lag (ARDL) Estimation. Part 3 – Practice (2017, May 16). Retrieved from http://blog.eviews.com/2017/05/autoregressive-distributed-lag-ardl.html (24 January 2020).

Johansen, S. (1988), Statistical Analysis of Cointegrating Vectors. *Journal of Economic Dynamics and Control, 12* (2-3), 231-254.

Jones, B.E., Nesmith, T.D. (2007). Linear Cointegration of Nonlinear Time Series with an Application to Interest Rate Dynamics, Finance and Economics Discussion Series, Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board, Washington, D.C. Retrieved from https://www.federalreserve.gov/pubs/feds/2007/200703/200703pap.pdf (2 January 2020).

Kaplan, H.F. (2019). *Türkiye'de Para Politikası Şoklarının Asimetrik Etkileri*, unpublished Master's Thesis, İnönü Üniversitesi/Sosyal Bilimler Enstitüsü, Malatya, Turkey.

Kaplan, F. (2009). *Türkiye'de Reel Döviz Kurlarındaki Oynaklığın İşsizlik ve Büyüme Oranları Üzerine Etkileri*, unpublished Master's Thesis, Süleyman Demirel Üniversitesi/Sosyal Bilimler Enstitüsü, Isparta, Turkey.

Kara, H. & Öğünç, F. (2012). Döviz Kuru ve İthalat Fiyatlarının Yurt İçi Fiyatlara Etkisi. *İktisat İşletme ve Finans, 27* (317), 9-28. Retrieved from https://www.researchgate.net/profile/Hakan_Kara/publication/238597406_Doviz_kuru_ve_ithalat_fiyatlarinin_yurt_ici_fiyatlara_etkisi/links/542cf5500cf29bbc126cf3da/Doeviz-kuru-ve-ithalat-fiyatlarinin-yurt-ici-fiyatlara-etkisi.pdf (4 October 2019).

Karagöz, M. & Doğan, Ç. (2005). Döviz Kuru Dış Ticaret ilişkisi: Türkiye örneği. *Fırat Üniversitesi Sosyal Bilimler Dergisi, 15* (2), 219-228.

Karataş, A.S. (2018). *Taylor Kuralı: Türkiye Için Asimetrik Etkilerin Testi,* unpublished Master's Thesis, Çukurova Üniversitesi/Sosyal Bilimler Enstitüsü, Adana, Turkey.

Karaoğlu, N. (2018). *Türkiye'de Döviz Kurunun Fiyatlara Doğrusal Olmayan ve Asimetrik Geçiş Etkisi,* unpublished Ph.D.Dissertation, Gazi Üniversitesi/Sosyal Bilimler Enstitüsü, Ankara, Turkey.

Keskin, G. (2008). The Bilateral J-Curve of Turkey for Consumption, Capital and Intermediate Goods. Middle East Technical University, Ankara, 50-57.

Kılıçaslan, N. (2007). *The Effect of Real Exchange Rate on Unemployment in Turkey,* unpublished Master's Thesis, İhsan Doğramacı Bilkent Üniversitesi/Sosyal Bilimler Enstitüsü, Ankara, Turkey.

Kızıl, C. (2012). *Sektörel Reel Döviz Kurunun Firma Performansına Etkisi,* unpublished Master's Thesis, İstanbul Teknik Üniversitesi/Sosyal Bilimler Enstitüsü, İstanbul, Turkey.

Kodongo, O.& Ojah, K. (2013). Real Exchange Rates, Trade Balance and Capital Flows in Africa. *Journal of Economics and Business, 66*, 22-46.

Kolcu, F., Yamak, N. (2017). Türkiyede Döviz Kuru Değişiminin Dış Ticaret Fiyatları Üzerindeki Asimetrik Etkisi. *Akademik Bakış Dergisi,* (64), 644-663.

Korhonen, I., & Wachtel, P. (2006). A Note on Exchange Rate Pass-Through in CIS Countries. *Research in International Business and Finance, 20* (2), 215–226.

Leigh, D. & Rossi, M. (2002). *Exchange Rate Pass-through in Turkey*. IMF Working Paper, 02/204, Washington, DC.: International Monetary Fund. Retrieved from https://www.imf.org/external/pubs/ft/wp/2002/wp02204.pdf (4 October 2019).

Lin, C-A. (1997). The Trade Balance and the Real Exchange Rate: The US Evidence From 1973:3 To 1994:9. *Applied Economics Letters, 4* (8), 517-520.

Liu, H.H. & Tu, T.T. (2011). Mean-Reverting and Asymmetric Volatility Switching Properties of Stock Price Index, Exchange Rate and Foreign Capital in Taiwan. *Asian Economic Journal, 25* (4), 375–395.

Lumsdaine, R.L., Papell, D.H. (1997). Multiple Trend Breaks and the Unit Root Hypothesis. *The Review of Economics and Statistics, 79* (2), 212-218.

Magee, S.P. (1973). Currency Contracts, Pass-Through, and Devaluation. *Brookings Papers on Economic Activity, 1*, 303-325.

Marston, R. (1990). Pricing to Market in Japanese Manufacturing. *Journal of International Economics, 29* (3-4), 217-236.

Morgül, E. (2013). *Genişlemeci ve Daraltıcı Para Politikası Şoklarının Asimetrik Etkileri: 1989-2012 Dönemi Türkiye Örneği,* unpublished Ph.D.Dissertation, Marmara Üniversitesi/Sosyal Bilimler Enstitüsü, İstanbul, Turkey.

Oltulular, S. (2015). *Para Politikası Şoklarının Asimetrik Etkileri ve Iktisadi Doktrinler Açısından Değerlendirilmesi: Ekonometrik Bir Analiz,* unpublished Ph.D.Dissertation, Atatürk Üniversitesi/Sosyal Bilimler Enstitüsü, Erzurum, Turkey.

Özdamar, G. (2015). Türkiye Ekonomisinde Döviz Kuru Geçiş Etkisi: ARDL-Sınır Testi Yaklaşımı Bulguları. *Akdeniz İ.İ.B.F. Dergisi, 32*, 66-97. Retrieved from https://dergipark.org.tr/tr/download/article-file/372858 (5 October 2019).

Parasiz, İ. (1999). *Para Ekonomisi*. Bursa: Ezgi Kitabevi.

Peker, O. (2008). Reel Döviz Kurunun Dış Ticaret Dengesi Üzerindeki Etkileri: Türkiye örneği. *İktisadi ve idari Bilimler Dergisi, 22* (2), 34-42.

Perron, P. (1988). Trends and random walks in econometric time series. *Journal of Economics Dynamics and Control*, *12* (2-3), 297-332.

Pesaran, M. H., Shin, Y., Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics*, *16,* 289-326.

Pollard P.S. & Coughlin C.C. (2004). *Sizematters: Asymmetric Exchange Rate Pass-through at the Industry Level.* Working Paper Series 2003-029C. The Federal Reserve Bank of St. Louis. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.201.4776&rep=rep1&type=pdf (30 September 2019).

Saha, S. (2017). *Do Exchange Rate Changes Have Symmetric or Asymmetric Effects on Stock Prices?* unpublished PhD Thesis, Economics, University of Wisconsin Milwaukee, Wisconsin, USA.

Seyidoğlu, H. (2003). *Uluslararası İktisat, Teori, Politika ve Uygulama*. İstanbul: Güzem Yayınları.

Spitäller, E. (1980). Short-Run Effects of Exchange Rate Changes on Terms of Trade and Trade Balance. *Staff Papers*, *27* (2), 320-348.

Terzi, H. & Zengin, A. (1999). Kur Politikasının Dış Ticaret Dengesini Sağlamadaki Etkinliği: Türkiye Uygulaması. *Ekonomik Yaklaşım, 10* (33), 48-65. Retrieved from https://www.ejmanager.com/fulltextpdf.php?mno=155607 (1 October 2019).

Turkish Exporters Assembly (TİM - Türkiye İhracatçılar Meclisi) (2017) TİM Tarım Raporu 2016. İstanbul: Küçük Mucizeler Yayıncılık ve İletişim Hizmetleri. Retrieved from http://www.tim.org.tr/files/downloads/Raporlar/Tarim_Raporu_2017.pdf (6 October 2019).

Turkish Statistical Institute (TURKSTAT). (2019a). Sanayi Üretim Endeksi (2015=100). Tarihsel Seriler: Sanayi Üretim Endeksi (2015=100): Arındırılmamış Sanayi Üretim Endeksi (2015=100), ham endeksler. (Güncellenme: 31/08/2019). *Türkiye İstatistik Kurumu*. Retrieved from http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=2416 (4 October 2019).

Savaş, İ. (2010). *Euro-Dolar Paritesi ve Reel Döviz Kuru'nun IMKB 100 Endeksi'ne Etkisi*, unpublished Master's Thesis, Uşak Üniversitesi/Sosyal Bilimler Enstitüsü, Uşak, Turkey.

Shin, Y., Yu, B., Greenwood-Nimmo, M. (2014). Modelling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework. *Festschrift in Honor of Peter Schmidt,* 281-314.

Tanriöver, B. (2008). *İktisadi Şoklar ve Asimetrik Etkileri*, unpublished Master's Thesis, Karadeniz Teknik Üniversitesi/Sosyal Bilimler Enstitüsü, Trabzon, Turkey.

Tanrıöver, B., Yamak, N. (2012). Parasal Şokların Asimetrik Etkileri: Teori ve Türkiye Uygulaması. *Ege Akademik Bakış 12* (3), 339-350.

Taşar, İ. (2011). *Emek Verimliliği ve Döviz Kurunun Ihracata Etkisi: Türkiye ve Seçilmiş Ülke Analizleri,* unpublished Master's Thesis, İnönü Üniversitesi/Sosyal Bilimler Enstitüsü, Malatya, Turkey.

Turkish Statistical Institute (TURKSTAT). (2019b). Gayrisafi yurtiçi hasıla. iktisadi faaliyet kollarına (A21) göre cari fiyatlarla (değer. pay. değişim oranı). 1998-2017. Yıllık. *Türkiye İstatistik Kurumu.* Retrieved from http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=2513 (5 October 2019).

Turkish Statistical Institute (TURKSTAT). (2019c). Konularına Göre İstatistikler ›› Dış Ticaret İstatistikleri ›› İstatistiksel Tablolar ve Dinamik Sorgulama ›› İstatistiksel Tablolar ›› Fasıllara Göre Dış Ticaret ›› Fasıllara Göre İhracat. Dönemi: 1996-2019. Aylık (Güncellenme: 31/08/2019). *Türkiye İstatistik Kurumu*. Retrieved from http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=622 (4 October 2019).

Turkish Statistical Institute (TURKSTAT). (2019d). Konularına Göre İstatistikler ›› Dış Ticaret İstatistikleri ›› İstatistiksel Tablolar ve Dinamik Sorgulama ›› İstatistiksel Tablolar ›› Fasıllara Göre Dış Ticaret ›› Fasıllara Göre İthalat. Dönemi: 1996-2019. Aylık (Güncellenme: 31/08/2019)". *Türkiye İstatistik Kurumu.* Retrieved from http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=623 (4 October 2019).

Turkish Statistical Institute (TURKSTAT). (2019e). Ekonomik Faaliyetlere ISIC, Rev.3) Göre Dış Ticaret > Ekonomik Faaliyetlere (ISIC, Rev. 3) Göre İhracat, Dönemi: 1996-2019, Aylık (Güncellenme: 30/09/2019). *Türkiye İstatistik Kurumu*. Retrieved from http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=630 (6 October 2019).

Turkish Statistical Institute (TURKSTAT). (2019f). Ekonomik Faaliyetlere ISIC, Rev.3) Göre Dış Ticaret > Ekonomik Faaliyetlere (ISIC, Rev. 3) Göre İthalat, Dönemi: 1996-2019, Aylık (Güncellenme: 30/09/2019). *Türkiye İstatistik Kurumu*. Retrieved from http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=630 (6 October 2019).

Tüzün, C.Ö. (2007). *Döviz Kurunun Yurtiçi Fiyatlara Geçiş Etkisi: Türkiye Örneği,* unpublished Master's Thesis, Dokuz Eylül Üniversitesi/Sosyal Bilimler Enstitüsü, İzmir, Turkey.

Ulaş, S. (2010). *Enflasyon ve Döviz Kurunun Hisse Senedi Piyasasına Etkileri, İMKB'de Uygulaması,* unpublished Master's Thesis, Selçuk Üniversitesi/Sosyal Bilimler Enstitüsü, Konya, Turkey.

Vergil, H. & Erdoğan S. (2009). Döviz Kuru Dış Ticaret Dengesi ilişkisi: Türkiye örneği. *ZICO Sosyal Bilimler Dergisi, 5* (9), 35-57

Yamak, R. & Korkmaz, Ö. (2005). Reel Döviz Kuru ve Dış Ticaret Dengesi İlişkisi. *İstanbul Üniversitesi Ekonometri ve İstatistik Dergisi, 1* (2), 11-29. Retrieved from https://core.ac.uk/download/pdf/6598738.pdf (2 October 2019).

Yaman-Songur, D. (2019). *Dış Ticaretin Fiyat-Maliyet Eki Üzerine Etkisi: Türkiye İmalat Sanayii İçin Bir Uygulama*, PhD Thesis, Hacettepe Üniversitesi/Sosyal Bilimler Enstitüsü, Ankara, Turkey.

Yang, J. (2007). Is Exchange Rate Pass-through Symmetric? Evidence from US Imports. *Applied Economics, 39* (2), 169-178.

Yapraklı, S. (2010). Türkiye'de Esnek Döviz Kuru Rejimi Altında Dış Açıkların Belirleyicileri: Sınır Testi Yaklaşımı. *Ankara Üniversitesi SBF Dergisi, 65* (4), 141-164. Retrieved from http://dergiler.ankara.edu.tr/dergiler/42/1526/16774.pdf (3 October 2019).

Yavuz, N.Ç., Güriş, B. & Kıran, B. (2010). Reel Döviz Karımın Dış Ticaret Dengesine Etkisi: Türkiye İçin Marshall Lerner Koşulunun Testi. *İstanbul Üniversitesi Iktisat Fakültesi, İktisat İşletme ve Finans*, 70-90.

Yazıcı, M. (2008). The Exchange Rate and the Trade Balances of Turkish Agriculture, Manufacturing and Mining. *Quality & Quantity*, (42), 45-52.

Yazıcı, M. (2009). Is there a J-curve effect in Turkish Services? *Research Note, Çankaya University,* Ankara, 167-172.

Yetiz, F. (2015). *Türkiye'de Döviz Kurunun Yansıma Etkisi,* unpublished Ph.D. Dissertation, Çukurova Üniversitesi/Sosyal Bilimler Enstitüsü, Adana, Turkey.

Yoshida, Y. (2010). New Evidence for Exchange Rate Pass-Through: Disaggregated Trade Data from Local Ports. *International Review of Economics & Finance, 19* (1), 3–12.

APPENDICES

APPENDIX A: Data Used for the Research

	LRER_SA	LTBMNF_SA	LTBMNG_SA	LTBAGC_SA	LTBALL_SA	LY_SA L	LYWMNF_SA	LYMNG_SA	YWAGC_SA	LYWALL_SA
2002Q1	4,6189	4,6762	4,6241	4,7136	4,6458	4,5074	4,5892	4,6427	4,3653	4,5826
2002Q2	4,6089	4,6354	4,6748	4,2807	4,6200	4,5486	4,6197	4,4451	4,6260	4,6166
2002Q3	4,4587	4,6419	4,5913	4,6900	4,6383	4,5660	4,5951	4,4713	4,5415	4,5805
2002Q4	4,5570	4,5550	4,6449	5,1034	4,5932	4,5691	4,6086	4,5294	4,3736	4,5939
2003Q1	4,4911	4,6464	4,4987	4,8947	4,6267	4,5796	4,6231	4,6583	4,4428	4,6130
2003Q2	4,5924	4,6390	4,5358	4,2688	4,6303	4,5861	4,6016	4,5397	4,6575	4,6052
2003Q3	4,6889	4,6042	4,6428	4,2229	4,5996	4,6185	4,5946	4,6135	4,7827	4,6097
2003Q4	4,6406	4,5238	4,6905	4,6011	4,5605	4,6355	4,6014	4,6077	4,4411	4,5921
2004Q1	4,6638	4,4907	4,7865	4,3457	4,5058	4,6710	4,6027	4,6538	4,5267	4,5945
2004Q2	4,6288	4,5291	4,6933	4,4935	4,5589	4,6949	4,6484	4,6260	4,5915	4,6394
2004Q3	4,6144	4,5540	4,6788	4,3817	4,5740	4,7022	4,6258	4,7197	4,7081	4,6255
2004Q4	4,6316	4,5317	4,7541	4,6194	4,5660	4,7105	4,5674	4,6820	4,5796	4,5671
2005Q1	4,6730	4,5244	4,7572	4,6816	4,5433	4,7602	4,5778	4,7974	4,5923	4,5838
2005Q2	4,6963	4,5178	4,5997	4,4577	4,5212	4,7673	4,6126	4,7102	4,5786	4,6034
2005Q3	4,7421	4,5201	4,4355	4,5598	4,5065	4,7813	4,6004	4,8312	4,5977	4,6004
2005Q4	4,7867	4,5153	4,4589	4,7054	4,5074	4,8114	4,5994	4,7749	4,6322	4,6031
2006Q1	4,7699	4,4854	4,4966	4,7242	4,4706	4,8281	4,6551	4,7644	4,4423	4,6391
2006Q2	4,6965	4,4783	4,5930	4,8060	4,4610	4,8583	4,5840	4,7902	4,4676	4,5768
2006Q3	4,6657	4,5152	4,6026	4,7636	4,4991	4,8447	4,5952	4,7334	4,6466	4,5917
2006Q4	4,7118	4,5532	4,6295	4,7157	4,5353	4,8711	4,5986	4,8344	4,7682	4,6120
2007Q1	4,7101	4,5511	4,7823	4,4451	4,5297	4,9022	4,5757	4,7999	4,5697	4,5814
2007Q2	4,7697	4,5686	4,7435	4,3003	4,5481	4,8900	4,5854	4,8452	4,5161	4,5889
2007Q3	4,7861	4,5175	4,9644	4,3082	4,5111	4,8794	4,5755	4,8513	4,7002	4,5880
2007Q4	4,8555	4,5411	4,7865	4,3302	4,5224	4,9260	4,5958	4,8927	4,7853	4,6182
2008Q1	4,7983	4,6061	4,7542	4,1297	4,5561	4,9618	4,5866	4,9289	4,5779	4,6030
2008Q2	4,7553	4,6382	4,6623	4,0779	4,5700	4,9129	4,6119	4,9268	4,3691	4,6158
2008Q3	4,8236	4,6541	4,8199	4,0971	4,5850	4,8852	4,6462	4,9572	4,2577	4,6450
2008Q4	4,7287	4,6676	4,6890	4,3278	4,6077	4,8730	4,6864	4,8576	4,5222	4,6882
2009Q1	4,6641	4,8429	4,6018	4,6536	4,7710	4,8280	4,5659	4,8054	4,4666	4,5775
2009Q2	4,7102	4,6464	4,9356	4,6441	4,6440	4,8504	4,6196	4,8093	4,3995	4,6139
2009Q3	4,7297	4,6064	5,2062	4,7134	4,6184	4,8697	4,5963	4,7863	4,5368	4,5982
2009Q4	4,7491	4,6223	5,2751	4,4890	4,6384	4,8878	4,6379	4,8473	4,5735	4,6453

	LRER_SA	LTBMNF_SA	LTBMNG_SA	LTBAGC_SA	LTBALL_SA	LY_SA L	LYWMNF_SA	LYMNG_SA	YWAGC_SA	LYWALL_SA
2010Q1	4,7631	4,5482	5,3579	4,3991	4,5459	4,9011	4,6307	4,9042	4,5504	4,6480
2010Q2	4,8074	4,5791	5,3563	4,5090	4,5776	4,9297	4,6659	4,9209	4,6036	4,6745
2010Q3	4,8092	4,4608	5,2725	4,4168	4,4696	4,9562	4,6899	4,9520	4,7034	4,7010
2010Q4	4,8348	4,4409	5,1741	4,1216	4,4440	4,9880	4,7392	4,9859	4,6016	4,7438
2011Q1	4,7124	4,3929	5,0676	4,0021	4,3686	5,0099	4,7435	4,9216	4,8253	4,7661
2011Q2	4,7189	4,4191	4,9040	3,9003	4,3937	5,0345	4,7013	5,0262	4,8287	4,7300
2011Q3	4,6253	4,4524	4,9689	4,1807	4,4308	5,0644	4,6454	5,0595	4,4610	4,6578
2011Q4	4,6503	4,5193	4,9371	4,1138	4,4716	5,0720	4,7461	4,9009	4,5478	4,7422
2012Q1	4,6638	4,5696	4,8328	4,3535	4,4922	5,0646	4,7600	4,9967	4,6200	4,7638
2012Q2	4,7007	4,6107	4,9755	4,3162	4,5689	5,0844	4,7352	5,0018	4,5422	4,7374
2012Q3	4,7142	4,6568	4,9362	4,0563	4,5982	5,1038	4,7268	5,0239	4,5463	4,7311
2012Q4	4,7264	4,6205	5,0840	4,1771	4,5689	5,1137	4,6892	4,9837	4,6209	4,7028
2013Q1	4,7089	4,4976	5,4101	4,2382	4,4793	5,1459	4,7164	5,0208	4,7460	4,7390
2013Q2	4,7120	4,4490	5,1805	4,4312	4,4441	5,1748	4,6681	5,0314	4,6278	4,6802
2013Q3	4,6648	4,5317	5,2339	4,3200	4,5192	5,1918	4,6728	4,9598	4,4895	4,6738
2013Q4	4,6478	4,4890	5,2634	4,2553	4,4856	5,1957	4,6834	5,0359	4,5025	4,6950
2014Q1	4,5535	4,6202	5,2393	4,3797	4,5837	5,2187	4,7006	5,0269	4,7979	4,7278
2014Q2	4,6468	4,5816	5,1834	4,2936	4,5660	5,2061	4,7134	5,0213	4,7008	4,7272
2014Q3	4,6516	4,6024	5,1458	4,1796	4,5773	5,2331	4,7611	4,9672	4,4178	4,7514
2014Q4	4,6746	4,5133	5,1120	4,0847	4,5031	5,2445	4,7604	5,0098	4,5684	4,7643
2015Q1	4,6497	4,6262	5,0959	4,1805	4,5944	5,2597	4,7343	4,9556	4,6641	4,7474
2015Q2	4,6180	4,5896	5,3376	4,4082	4,5977	5,2776	4,8124	4,8854	4,5615	4,7949
2015Q3	4,5719	4,6130	5,3301	4,4230	4,6293	5,2929	4,7990	4,8657	4,5304	4,7810
2015Q4	4,6001	4,6079	5,3093	4,2544	4,6319	5,3033	4,7881	4,8870	4,4751	4,7763
2016Q1	4,6016	4,5929	5,4757	4,2469	4,6305	5,3048	4,8008	4,8290	4,5283	4,7864
2016Q2	4,6242	4,5871	5,6400	4,4758	4,6441	5,3190	4,9053	4,8359	4,5501	4,8804
2016Q3	4,6294	4,6093	5,6066	4,3887	4,6572	5,2914	4,7878	4,8325	4,5309	4,7732
2016Q4	4,5858	4,5947	5,6348	4,4403	4,6511	5,3445	4,7922	4,8227	4,6471	4,7845
2017Q1	4,4823	4,6419	5,5121	4,2787	4,6462	5,3561	4,8250	4,9171	4,4896	4,8070
2017Q2	4,5263	4,6059	5,5875	3,9836	4,6242	5,3759	4,8881	4,9293	4,5326	4,8680
2017Q3	4,5177	4,5061	5,5790	4,1965	4,5465	5,3969	4,8337	4,8849	4,6737	4,8240
2017Q4	4,4800	4,4979	5,5305	4,0502	4,5364	5,4174	4,8255	4,9148	4,5217	4,8136
2018Q1	4,4385	4,5104	5,5744	4,0729	4,5332	5,4261	4,8400	4,8516	4,3829	4,8159
2018Q2	4,3839	4,5968	5,4521	4,1268	4,6147	5,4285	4,8442	5,0257	4,5727	4,8360
2018Q3	4,2318	4,8287	5,2637	4,2517	4,8021	5,4182	4,9153	5,0039	4,4933	4,8970
2018Q4	4,3178	4,9237	5,3927	4,3695	4,8898	5,3886	4,9274	4,9127	4,4845	4,9032

APPENDIX B: Access the Data for Trade Balances

Turkey's agriculture, mining, manufacturing trade data was obtained in TurkStat website in the following ways:

- "Product / Product Group-Country", "Product / Product Group", "ISIC-Rev4", from the dynamic inquiry section of TurkStat (https://biruni.tuik.gov.tr/disticaretapp/menu.zul) are selected.
- Then "Next" key is clicked and "3 Month", Year = 2014- 2018, "Level1 (1 digit)", "Bring All", ISIC Rev4 selection: "A-Agriculture, Forestry and Fisheries, B-Mining and Quarrying, C-Manufacturing", Export / Import Selection = "Export, Import" , Value Selection = $ (Dollar), Table Format = Excel options were selected in the new page (https://biruni.tuik.gov.tr/disticaretapp/disticaret.zul?param1=21&param2=0&sitcrev=0&isicrev=0&sayac=5802).
- Finally, the data were taken in USD basis for 3 sectors based on sector by pressing "create report".

APPENDIX C: Access the Data for Turkey’s Real GDP

Turkey's real GDP data was obtained in OECD website in the following ways:

- “National Accounts” was selected by clicking “All Themes” in the “Data by Theme” section at the top left at https://stats.oecd.org/index.aspx?queryid=350#.
- The “GDP-expenditure approach” under the “Quarterly National Accounts” option below was clicked.
- “B1_GE Gross domectic products - expenditure approach” was selected by clicking “Subject” at the top left of the table, “VPVOBARSA - US dollars”, “volume estimates”, “fixed PPPs”, “OECD reference year”, “annual levels”, “seasonally adjusted” were selected by clicking “Measure”.
- “Select date range” is selected by clicking on the “Period & Frequency” option to the right of the “Selection” option by pointing to the “Customize” section at the top left of the table.
- By clicking the “Quarterly” box on the left, From: “2002Q1” and To: “2018Q4” were selected.
- In the top left of the table, “Excel” under “Export” was clicked then “Export to XLS file” button was clicked thus the data set was downloaded with .xls extension.

APPENDIX D: Access the Data for Real World Income

Real World Income data set were obtained in the following ways:

- “National Accounts” was selected by clicking “All Themes” in the “Data by Theme” section at the top left at https://stats.oecd.org/index.aspx?queryid=350#.
- The “GDP-expenditure approach” under the “Quarterly National Accounts” option below was clicked.
- “B1_GE Gross domectic products - expenditure approach” was selected by clicking “Subject” at the top left of the table, “VPVOBARSA - US dollars”, “volume estimates”, “fixed PPPs”, “OECD reference year”, “annual levels”, “seasonally adjusted” were selected by clicking “Measure”.
- “Select date range” is selected by clicking on the “Period & Frequency” option to the right of the “Selection” option by pointing to the “Customize” section at the top left of the table.
- By clicking the “Quarterly” box on the left, From: “2002Q1” and To: “2018Q4” were selected.
- In the top left of the table, “Excel” under “Export” was clicked then “Export to XLS file” button was clicked thus the data set for 46 countries was downloaded with .xls extension.

APPENDIX E: Access the Data for Bilateral Foreign Trade

Bilateral foreign trade data were obtained in TurkStat web site in the following ways:

- "Product / Product Group-Country", "Product / Product Group", "ISIC-Rev4", from the dynamic inquiry section of TurkStat (https://biruni.tuik.gov.tr/disticaretapp/menu.zul) are selected.
- Then "Next" key is clicked and "3 Month", Year = 2014- 2018, "Level1 (1 digit)", "Bring All", ISIC Rev4 selection: "A-Agriculture, Forestry and Fisheries, B-Mining and Quarrying, C-Manufacturing", Export / Import Selection = "Export, Import" , Value Selection = $ (Dollar), Table Format = Excel options were selected in the new page (https://biruni.tuik.gov.tr/disticaretapp/disticaret.zul?param1=21&param2=0 &sitcrev=0&isicrev=0&sayac=5802).
- Finally, the data were taken in USD basis for 3 sectors based on sector by pressing "create report".

APPENDIX F: ARDL and NARDL Estimation Outputs from Eviews (Version 11) for Manufacturing Sector

Equation: ARDL1 Workfile: YENI_VERI::Yeni_veri\

View | Proc | Object | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: D(LTBMNF_SA)
Method: ARDL
Date: 12/23/19 Time: 00:28
Sample (adjusted): 2003Q1 2018Q4
Included observations: 64 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): D(LY_SA) D(LYWMNF_SA)
Fixed regressors: C
Number of models evaluated: 500
Selected Model: ARDL(3, 4, 3, 0)

Variable	Coefficient	Std Error	t-Statistic	Prob."
D(LTBMNF SA(-1))	0.157615	0.09282	1.69806	0.0957
D(LTBMNF SA(-2))	0.274919	0.097178	2.829016	0.0067
D(LY_SA)	-1.06981	0.290398	-3.683944	0.0006
D(LY_SA(-1))	-0.896364	0.32037	-2.797899	0.0073
D(LY_SA(-2))	-1.159563	0.305392	-3.796964	0.0004
D(LY_SA(-3))	-1.443712	0.314748	-4.586886	0.0000
D(LYWMNF_SA)	0.183404	0.143536	1.277758	0.2072
D(LYWMNF_SA(-1))	0.467616	0.158931	2.942252	0.0049
D(LYWMNF_SA(-2))	0.434257	0.15178	2.861099	0.0061
C	-0.842769	0.089547	-9.411445	0.0000

R-squared	0.666604	Mean dependent var	0.005761
Adjusted R-squared	0.611037	S.D. dependent var	0.068053
S.E. of regression	0.042443	Akaike info criterion	-3.338732
Sum squared resid	0.097274	Schwarz criterion	-3.001406
Log likelihood	116.8394	Hannan-Quinn criter.	-3.205842
F-statistic	17.1725	Durbin-Watson stat	1.702155
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection

Equation: NARDL1 Workfile: YENI_VERI::Yeni_veri\

View | Proc | Object | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: D(LTBMNF_SA)
Method: NARDL
Date: 01/11/20 Time: 23:23
Sample (adjusted): 2003Q2 2018Q4
Included observations: 63 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): D(LY_SA) D(LYWMNF_SA) D(LRER_SA_POS) D(LRER_SA_NEG)
Fixed regressors: C
Number of models evaluated: 2500
Selected Model: NARDL(3, 4, 3, 1, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(LTBMNF_SA(-1))	0.250792	0.115092	2.179049	0.0349
D(LTBMNF_SA(-2))	0.355851	0.103518	3.437588	0.0013
D(LY_SA)	-1.21343	0.308423	-3.93431	0.0003
D(LY_SA(-1))	-0.83998	0.322489	-2.60466	0.0126
D(LY_SA(-2))	-1.30512	0.346423	-3.76742	0.0005
D(LY_SA(-3))	-1.52119	0.312841	-4.8625	0.0000
D(LYWMNF_SA)	0.107676	0.138349	0.778293	0.4407
D(LYWMNF_SA(-1))	0.494792	0.157342	3.144692	0.0030
D(LYWMNF_SA(-2))	0.459578	0.153484	2.994312	0.0045
D(LRER_SA_POS)	0.0772	0.227771	0.338938	0.7363
D(LRER_SA_NEG)	-0.58313	0.160026	-3.644	0.0007
D(LRER_SA_NEG(-1))	0.303094	0.189508	1.599369	0.1171
D(LRER_SA_NEG(-2))	0.412564	0.184937	2.230836	0.0310
D(LRER_SA_NEG(-3))	0.319681	0.162101	1.972107	0.0551
C	-0.94463	0.118157	-7.99477	0.0000

R-squared	0.725491	Mean dependent var	0.004402
Adjusted R-squared	0.645426	S.D. dependent var	0.067718
S.E. of regression	0.040324	Akaike info criterion	-3.3795
Sum squared resid	0.078048	Schwarz criterion	-2.86923
Log likelihood	121.4542	Hannan-Quinn triter.	-3.178808
F-statistic	12.9861	Durbin-Watson stat	1.871341
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model

APPENDIX G: Curriculum Vitae

PERSONAL INFORMATION

Surname, Name: KARAKAN, İpek

Nationality: Turkish (T.C)

Date and Place of Birth: Oct 7, 1987 / ANKARA

Marital Status: Single

Phone: +905057927879

E-mail: ipekkarakan@gmail.com

EDUCATION

Degree	Institution	Year of Graduation
Undergraduate	Çankaya University	2009
High School	Ankara Atatürk High School	2005

WORK EXPERIENCE

Year	Place	Enrollment
2011- Working	Türkiye Vakıflar Bankası T.A.O.	Assistant Manager

FOREIGN LANGUAGES

Advanced English, Intermediate French