Czech University of Life Science Prague

Faculty of Economics and Management

Department of Economics

Diploma Thesis

The Relationship between the Foreign Exchange Rate and Foreign Trade in Turkey

Author: Damla Col

Supervisor: Assoc. Prof. Ing. Mansoor Maitah, Ph.D

et Ph.D

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Bc. Damla Çol

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Relationship Between Foreign Exchange Rate on Foreign Trade in Turkey

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Objectives of thesis

The exchange rate was considered as a factor affecting foreign trade, which has been the subject of research into the effects of Turkey's foreign trade. Therefore, this study aims to determine the impact of the exchange rate of foreign trade in Turkey.

Methodology

Methodology based on: An empirical study covering the years 2008-2018 was made by taking into account the real exchange rate, export, import and real GDP variables. For this study; Time series analysis is based on the method. Granger causality test, Johansen co-integration test, VAR analysis, multiple linear regression analysis were performed. Model validation tests, VEC error correction model and effect-response analysis were also included

The proposed extent of the thesis

40- 60 pages

Keywords

Foreign Trade, Foreign exchange rate, Turkey,Time series analysis

Recommended information sources

Cetintas Ahmed and Ozturk Gurkan, 2014, 'A Gravity Approach on Turkey's Foreign Trade', ISBN number:
      9783639496499

Estimation and classification of reserves of crude oil, natural gas and condensate [elektronický zdroj].
      Richardson, Tex.: Society of Petroleum Engineers, 2001

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The Diploma Thesis Supervisor

prof. Ing. Mansoor Maitah, Ph.D. et Ph.D.

Supervising department

Department of Economics

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prof. Ing. Miroslav Svatoš, CSc.

Head of department

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Ing. Martin Pelikán, Ph.D.

Dean

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Declaration

I declare that all the informations and results presented in this thesis as my original work and using only listed resources and literature. As the author, grants to the Czech University of Life Science Prague permission to distribute copies for this university or other institute of learning.

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Damla Col

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Souhrn

Vědecké studie o vztazích v oblasti zahraničního obchodu jsou velmi důležité v posledních letech, kdy se ekonomiky země vzájemně propojily s globalizací na celém světě. Stávající teorie a politiky zahraničního obchodu se proto nadále mění a uplatňují.

Pokud jde o koncept, který formuje ekonomiku, jako je vývoz, dovoz a rovnováha zahraničního obchodu, došlo ke změnám v metodách. Proto nestačí vyjádřit vývoz a dovoz pouze z hlediska příjmů ze zboží a služeb. V této diplomové práci se zabýváme nedostatky zaměřenými na šetření týkající se dovozu a vývozu činností zahraničního obchodu v turecké ekonomice. V teoretické části; jako metoda jsou zahrnuta koncepční vysvětlení a srovnání zahraničního obchodu a směnných kurzů. V této práci je analyzován vztah mezi údaji za roky 2009–2018 a směnným kurzem a podílem dovozu, na který se vztahuje vývoz. Tento vztah byl testován metodou Johansenovy kointegrace. Kromě toho bylo analyzováno, že stacionáře vybraných proměnných metodami Augmented Dickey Fuller a Phillips Perron.

Výsledkem bylo prokázáno, že mezi proměnnými stanovenými jako výsledek kointegračního testu provedeného v souladu s ekonometrickými testy existuje kointegrační vztah.

Klíčová slova: Zahraniční obchod, směnný kurz, dovoz, vývoz, podíl dovozu zahrnutý do exportu, Johansenův kointegrační test.

The Relationship Between the Foreign Exchange Rate and Foreign Trade in Turkey

Summary

The scientific studies on foreign trade relations are very important in recent years, when the economies of the country have become interdependent with globalization all over the world. Therefore, the existing of the foreign trade theories and policies continue to change and to apply.

In terms of concept that shape the economy such as exports, imports and balance of foreign trade, there have been changes in methods. Accordingly, it is no sufficient to express the exports and imports only in terms of income from goods and services. In this thesis, whilst aiming deficiencies related to an investigation on the import and exports of foreign trade activities in Turkey's economy is considered. In the theoretical section; as a method, the conceptual explanations and comparisons about foreign trade and foreign exchange rates are included. In this thesis, the relationship between the years 2009-2018 data and the exchange rate and the proportion of import covered by exports are analysed. This relationship has been tested by Johansen Co-integration method. In addition, it has been analysed that stationaries of selected variables by the Augmented Dickey Fuller and Phillips Perron methods.

A result, it has been proved that there is a co-integration relationship between the variables determined as a result of the co-integration test conducted in accordance with econometric tests.

Key Words: Foreign Trade, foreign Exchange Rate, Import, Export, Proportion of Import covered by Export, Johansen Co-integration Test.

Content

1. Introduction

The foreign trade has increased it is impact on the world with globalization. In particular, the changes in the exchange rates, which is one of the most important factors affecting to foreign trade in terms of a country with a major manufacturing powers such as Turkey attract the attention.

In recent decades, especially, after 2008, with effect of the global financial crises, the excessive fluctuations in exchange rates have had an impact in the foreign trade balance of all countries. Therefore, the effects of changes in foreign exchange rates which are accepted as a factor affecting on foreign trade have been the subject of research. The effect of these changes on foreign trade has been a matter a curiosity. The exchange rate policies are determined to eliminate imbalances in foreign trade and increase competition in underdeveloped and developing countries. There is associated with factors affecting directly or indirectly that Turkey has a foreign trade potential in the developing world. For this reason, it was a matter of debate about how the exchange rate affects to foreign trade. Because, the determination of the exchange rate volatility on foreign trade gives the dimension of the countries' foreign trade vulnerability to exchange rate. The import and export, which are the most important elements of foreign trade, these can affect the economic dynamics of the countries both positively and negatively. At this point, it is very important to use of foreign currency as an instrument by countries that export and import with each other in explaining this interaction. This interaction affects both the national currency and the foreign currency. According to this assignment, this thesis focuses on both the elements of foreign exchange rates and foreign trade theories in which these elements interact.

As a result, it has been tried to show the functioning of the foreign trade in Turkey and the efficiency of the Central Bank of Republic of the Turkey. This theoretical knowledge that will help us to understand the relationship between the foreign exchange rate and foreign trade of Turkey and as results of statistical analysis conducted after obtaining the necessary data and results were obtained.

1.1. Objectives

The main purpose of this study is to determine the effects of exchange rate changes on foreign trade of Turkey and it is based on the basic concepts of foreign exchange rate and foreign trade. It is important to compare the data for export, imports and balance of foreign trade to make analyses the exchange rates to use that the currencies related with USD Dollar and Turkish Lira. The time period determined for research has been used monthly data from the first month of 2009 until the end of 2018. The reason for choosing the monthly data is that long-term effects of statistical analysis can be observed. The reason for choosing these currencies, which are the USD/TL, is that the American Dollar has a strong effect on the Turkish lira. In the practical section, it is also aim to investigate of the general framework of import-export and proportion of import covered by export in long term foreign trade efficiency of Turkey.

At the same time, it has been targeted to consider the intervention of government or the Central Bank of the Republic of Turkey, especially after the 2008 financial global crisis till years of the 2018.

1.2. Methodology

In this study, there were used three different variables to modelling the approach. These variables are import, export and proportion of import covered by export (PICE). Additionally, the reason for choosing these three variables is determine the effect of the exchange rate on foreign trade without including any effect. There are various studies about the effect of the foreign exchange rate on the foreign trade. However, this study is separating than the other because of the chosen different variables. The time period examined in this study as ten years, which is the between the years 2009 and 2018. The reason for working with monthly data is to see the effect of unit change in each month. The data were used monthly for the export-import and USD dollar variables which are obtained from official website of Central Bank of the Republic of Turkey (CBRT) of Electronic Data Distribution System (EDDS) between the years 2009-2018. In addition, the another time series used which is the average of exchange rate (EXCH),it was formed by taking the arithmetic average of monthly buying and selling rate of USD dollar as obtained from the (CBRT-EDDS). I used the Augmented Dickey Fuller test (ADF) and Johansen co-integration test, Vector Error Correction Model (VEC), Vector auto-regression Model (VAR).

2. Theoretical Part

In the first stage, the theoretical part is divided into two different part to figure out the approaches. The first part covers the foreign exchange rate theory to understand and to implement with analytical part. In second part is examine the importance of foreign trade and relating the some approaches of foreign trade and regulations and interventions of the government and Central Bank. Thus, it is quite important to understand this theory in order to better analyse the practical part in the light of the information obtained from the theoretical part.

2.1. Foreign Exchange Rate

The countries have to use own respective currencies to be effective in foreign trade. It refers to the price or exchange rate of a foreign currency in national currency. This price figure out in free market economies where the foreign exchange supply and demand are meet at the same point. At this point, it is also useful to define these two concept. The supply of money is total amount of money that is active in the economy in certain period. The demand of money is the amount of money that individuals and institutions would like to keep with them.

- **Direct Quotation**

Exchange rate quotations are encountered in two different ways. These are referred to as direct quotation and indirect quotation. Direct exchange rate (quote): Shows the value of the unit price of a foreign currency against the national currency. Direct method for quotation expressed in terms of domestic currency. In other words, this method is preferred whenever the domestic currency is to be exchanged for foreign currency. At the same time increase the value of the national currency, it requires less amount of changing the national park. However, the decrease in the value of the national currency will require a large amount of national currency to be exchanged.

- **Indirect Quotation**

The indirect Quotation is the method of defining the exchange rate as the amount of foreign currency, which is a unit of national currency. (MacDonald, 2007)

2.1.1 Nominal Exchange Rate

The nominal exchange rate refers to the value of foreign currencies against to the national currency. In the calculation of the nominal exchange rate, the increase or decrease in the value of the national currency is taken into account and the inflation rate is not taken into account when expressing the nominal exchange rate. In terms of the fact that the nominal exchange rate reflects the results obtained in international markets, it creates a more determinant effect by separating the inflation rates from the nominal exchange rate. At this point, the nominal and real exchange rate separation is made.

2.1.2 Real Exchange Rate

The real exchange rate is the value calculated according to the purchasing power of the domestic currency against foreign currency. Especially the most important point, it is an indicator used for competitiveness in a country's foreign trade.

The most important issue to be considered in the calculations regarding the Real Exchange Rate is the country currency in which the underlying exchange rate is expressed.

In case;

$$RER = (e.P*)/P$$

Where;

e= Nominal Dollar-Lira Exchange Rate

P* = Average Price of the good in Lira area (in Turkey)

P= Average Price of the good in the US.

REr= Real Exchange Rate

With the increase in the Real Exchange Rate, the national currency suffers from depreciation, which indicates that overseas goods are more expensive than domestic goods. With this increase in the exchange rate, people cause the consumption or spending directions to move domestically. This increase in Real Exchange Rate is expressed as the real depreciation of money, while the decline in exchange rate is called real appreciation. When there is real depreciation in a country, relative prices increase. In this way, domestic goods become more attractive for consumers as the goods produced domestically will become cheaper than goods produced abroad. Accordingly, with the decrease in local prices, foreign consumers will buy more goods from the national market. This will increase the export. In other words, with the

effect of real depreciation, the tendency of domestic consumers to buy goods from foreign countries will decrease. In short, the amount of export from the country will decrease and net export will be positively affected as an effect. Contrary to the above, if the real appreciation occurs, the relative prices will decrease. Therefore, with the decrease in the relative prices, the goods produced domestically will become more expensive than the goods produced abroad. Depending on this situation, an increase in imports will occur (James & Marsh 2012).

2.1.3 Purchasing Power Parity

The Purchasing Power Parity (PPP) theory reveals that the exchange rate between the currencies of the two countries is the ratio of the prices measured in their own currency of these two countries. In more concrete terms, the price of a good or service means that it is equal all over the world when it is converted into a common currency. In order to pinpoint the purchasing power, these two countries must cover most of the goods and services produced worldwide.

Purchasing Power Parity theory is basically based on a single price law. However, the point that separates the two approaches is that the Purchasing power parity theory is the form of the single price law that has been converted into foreign exchange market analysis. It should be noted that the purchasing power parity does not always require price equality because the inflation rates of each country will differ and there will also be volatility in exchange rates. Purchasing power parity is expressed in two ways as absolute and relative approach.

- **Absolute Purchasing Power Parity**

The absolute purchasing power parity, the purchasing power of any national currency should be the same in all countries considered in the country's economy and in a foreign economy, after the currency exchange rate is converted into foreign currency. In addition, the same goods and services must exist in two different countries. In short, countries are required to have equal purchasing power.

Absolute Purchasing Power Parity is obtained by extending the single price law to more than one commodity in the foreign trade area. the situation in the commodity markets differs from the capital markets.

The Law of One Price; However, in order for the single price law to be valid, goods and services must be traded, there are no trade and arbitrage barriers between countries, there are no transportation costs, the goods subject to trade must have the same qualities with each other, so that the transaction costs are minimised and competitive arbitration is We are forced to force the same goods to be sold for the same price expressed in a certain currency between.

Thus, the one price law,

$$(Pi = E.Pi^*)$$

Pi= domestic currency prices of commodity

Pi* = foreign currency prices of commodity

i= good and services

E= exchange rate

To expand this equation to Absolute PPP;

$$(E = P / P^*)$$

Absolute PPP makes adjustments to equalize the exchange rate of the price level and it argues that the real exchange rate is valid. (Mazur, 2008).

- **Comparative Purchasing Power Parity**

In relative purchasing power parity, relative changes of price index and exchange rates are taken into account. It also means the balance between the price difference between the two countries and the change in the nominal exchange rate. It is based on real exchange rates to express the real competitiveness of countries. At the same time, an increase in the domestic price level depending on the local currency exchange rates should be increased in parallel with the foreign price level. According to this approach, the percentage of one-unit change in the exchange rate is equal to the difference between the domestic inflation rate and the foreign inflation rate. As it can be understood from here, it is stated that the exchange rate can balance the inflation differences between the two countries in a certain period of time.

The relative PPP formula is below:

$$E_t/E_{t-1} = (P_d{}_t /P_{t-1}) / (P_f^*{}_t / P_f^*{}_{t-1})$$

E_t= the real exchange rate in period t,

E_{t-1}= the real exchange rate in previous period from t period,

$P_d{}_t$= domestic inflation rate in t period,

$P_d{}_{t-1}$=the previous domestic inflation rate in t period,

$P_f^*{}_t$= Foreign inflation rate in t period,

$P_f^*{}_{t-1}$= the previous foreign inflation rate in t period.

When we look at the variables in this equation, the change in rates (decreases and increases) depends on the inflation rates between countries. According to this equation, when the domestic inflation rate is higher than the foreign inflation rate, the exchange rate is expected to increase as much. In parallel, when the domestic inflation rate is lower than the foreign inflation rate, a decrease in the exchange rate will be observed.

According to the relative purchasing power parity, the real exchange rate will remain constant whenever the real exchange rate in equilibrium level. It is mean that there will be internal and external balance in foreign trade.

As we stated in the theory of purchasing power parity, deviations from the balance level may occur in exchange rates due to the existence of non-traded goods and services, trade constraints, structural changes, incomplete competition, measurement errors, tastes and preferences, expectations, speculations and technological changes. These deviations cause internal and external imbalances and these factors are ignored in relative PPP.

In a country where the inflation rate is high, if the exchange rates do not increase at the desired rate, this country will have difficulty in competing with other countries in terms of export of goods and services. This situation will affect the prices of imported goods and foreign goods will become cheaper than domestic goods. Accordingly, the foreign trade deficit will increase in the high inflation country (Bekaert & Hodrik, 2017).

2.2 Foreign Exchange Rate Regimes

The exchange rate regime, policy makers cannot directly observe occurred as a reaction against macroeconomic factors. These macroeconomic factors enable price levels to decrease and increase. At this point, exchange rates are in a position to automatically balance. With the targeted exchange rate targets, countries aim to avoid costly macroeconomic returns or risks.

According to the Bretton Woods system, the US dollar was accepted as the basic currency, but it was established on the system of variable exchange rates. When this system contracted in early 1960, the Bretton Woods system was replaced by a variable exchange rate system that could be traded between large currencies. However, for the remaining currencies, no solution to the suitable exchange rate regime has been found. In the early 1990s, fixed exchange rate regimes were supported as a solution to minimize the high inflation levels of many developing countries. However, as an alternative to the fixed exchange rate regime, which has been seen as insufficient to overcome the global financial crises causing uncertainty in all world markets, the advantages of flexible exchange rate regimes are concentrated (Evans, 2011).

2.2.1. Fixed Exchange Regimes

The system in which the exchange rate is announced by monetary authorities (policy practitioners) is called the "Fixed Exchange Rate System". This type of exchange system was applied between 1945 and 1971 throughout the world, until the collapse of the Bretton Woods system. The basis of the fixed exchange rate is based on the condition that a country's central bank adjusts its money supply to ensure that the exchange rate is determined by the rate at which the exchange rate is in balance. The governments agree to buy or sell money in a fixed exchange rate regime at a predetermined rate and amount. This predetermined rate can be fixed to a foreign currency. In cases where capital movements are intense worldwide and in an economy model where investors are assumed to be similar to all world markets, the fixed exchange rate will definitely be considered functionally equivalent to a currency board.

It is realised by the Central Bank's intervention in the foreign exchange market as a buyer and seller to ensure the stability of exchange rates in the fixed exchange rate system. In order for the Central Bank to intervene, it must have sufficient gold and foreign currency stocks. To illustrate this case, when the exchange rates start to increase, the Central Bank sells foreign currency to fix the exchange rates, and in the opposite case, when the exchange rates begin to decrease, the Central Bank draws foreign currency from the market and keeps the exchange rates constant. However, in order to keep the Central Bank's exchange rates at the desired level,

regular deficit of the balance of payments should be prevented. With this attitude of the central bank, it is aimed to protect the foreign exchange reserves at hand. Thus, the Central Bank will prefer to switch to the exchange control system instead of the freedom to buy and sell foreign currency.

Advantages

---In a country where a fixed exchange rate is applied, the prices of the goods that are the subject of the trade can be estimated approximately and foreign trade becomes more attractive.

---As volatility will be almost minimal if the fixed exchange rate regime is applied, constant uncertainty and exchange rate risk will encourage long-term capital flows.

---Currency fluctuations and speculative activities are minimal in the fixed exchange rate regime. Because the fixed exchange rate has a strong effect on the national currency, and thus speculations do not affect the exchange rate.

Disadvantages

Monetary authorities lose their dependence on the functions of monetary policy to maintain exchange rate stability.

- In the fixed exchange rate regime, exchange rate stability can only be applied to achieve national economic stability. However, this will not encourage foreign trade (Walter, 2018).

2.2.2. Floating Exchange Rate

In the flexible exchange rate system, the exchange rate is determined in the market to equalize the foreign exchange supply and demand. In this case, the central bank, which is the national monetary authority, is not expected to intervene in the imbalances in foreign exchange supply and demand. According to this system, if the foreign exchange demand (import) is more than the foreign exchange supply (export), the exchange rate will increase as the balance of external payments will open. Accordingly, there will be an increase in exports due to the increasing exchange rate, so the balance of external payments will naturally reach the level of balance. Another important factor includes the effects of changes in prices on exports and imports. That is; If the prices exceed the determined competition level, the excess foreign exchange demand will bring the prices down to the equilibrium level. In parallel with this, if the prices fall below the competition level, the excess foreign currency demanded from the amount obtained will push the prices up to the equilibrium level. In this system, there will be no need for the central

bank to intervene in prices and it will keep the reserve need to a minimum. According to this system, the smallest increases and decreases in exchange rates and foreign trade balance can be achieved in the economy, while changes in exports and imports can significantly affect exchange rates. Due to the volatility in exchange rates, uncertainty and risk environment will occur in the markets where the value of the national currency will increase and decrease against the value of foreign currencies. As foreign exchange rates are unstable, it will cause foreign investments to withdraw and adversely affect capital movements (James &Marsh, 2012).

- **Crawling Pegs**

In the Crawling (floating) peg system, the exchange rates are changed at a predetermined amount of frequency and at clearly adjusted intervals until the balance reaches the exchange rate. The main goal here is to minimise sudden deviations that may occur. At the same time, the exchange rate is adjusted slowly. Thus, it is aimed to reduce uncertainty in exchange rates, to reduce inflation, and at the same time to reduce the intervention effect of the central bank against the pressure on the exchange rate. This system imposes restrictions on monetary policy. Since the exchange rate is fixed at a certain parity, no adjustment can be made using the monetary policy. In short, it appears that this system caused excessive valuation of the real exchange rate in economies with high inflation and fixed exchange rates, resulting in decreased competition in foreign trade.

- **Target-Crawling Bands**

According to this system, unlike the creeping parity system, the currency is allowed to fluctuate in a present range. Target tapes are in the form of horizontal bands, where the nominal value of money does not change, or cross bands, where the nominal value of money is periodically adjusted. Here, the exchange rate does not move in one direction, it is fixed with a small degree of fluctuation around the set target. This creates a restriction requirement in monetary policy depending on the exchange rate fluctuation rate. To put it more clearly, a very narrow band does not allow adjustments and monetary policy implementation, while a very broad band allows a limited degree of monetary policy (Sarno & Taylor, 2012).

- **Currency Board**

Currency board is a system that allows exchange of a determined national currency against a foreign currency at a fixed exchange rate when a strict commitment is applied. In this system, reserve money is of great importance. This means that; the national currency is indexed at a

fixed exchange rate. The money board generally holds low-risk, interest-bearing bonds as reserves. One of the most important features is full convertibility; it refers to the conversion of the national currency to reserve money without any limitation on fixed parity. This system does not guarantee the convertibility of deposits in banks. In this system, the Central Bank prints the country money only if foreign currency entry is provided. In addition, the functions of the Central Bank become insignificant and banks become more effective. In addition, the exchange rate gained stability, limiting financial policies and nominal exchange rates losing their flexibility. The money board does not have the ability to use monetary policy; money supply is determined only by market forces and balance of payments (MacDonald, 2007).

- **Dollarization**

Dollarization refers to the use of a foreign currency, rather than the local currency, within the borders of a country. If there is a substitution between a national currency and a foreign currency in the country, this indicates that the fixed exchange rate regime has been applied. At the same time, the decisive currency here is the US dollar, although some European countries use Euro as the foreign currency. We can show the unavoidable excessive inflation and an economic structure that cannot progress accordingly, among the main factors that push the countries into dollarization. For this reason, dollarization may seem to be an alternative solution for countries in a sense. There are three different types of dollarization. These; unofficial dollarization, partial dollarization and full dollarization. With informal dollarization, it is desired to prevent excessive inflation through the domestic currency. Here, domestic banks allow the acceptance of deposits in foreign currency. This means that when citizens of the country convert their money into foreign currency, they do not need to send it abroad. According to another type, partial dollarization; In a country with high inflation rates, the economic authorities direct the value of the national currency to financial assets in foreign currency in order to protect it from inflation. Here, although the bank deposits of foreign countries are in the foreground, the national currency maintains its effectiveness due to reasons such as payment of taxes. In other words, the national central bank and the banks of foreign countries compete, which forces the central bank of the country to be more disciplined. Finally, full dollarization is when a country completely removes its official currency from the market and uses the currency of the selected foreign country. In this way, excess volatility in the exchange rate can be eliminated. However, a very risky process will occur with the end of the country's use of the national currency.

2.3. Foreign Exchange Market Mechanism

The foreign exchange market, in other words (FX or FOREX), is the market where exchange rates are determined. The exchange rate market mechanism states that the global currency and all currencies are linked, and the price of one currency is determined relative to the other. The exchange rate is the relative price of two different currencies.

Foreign exchange market; It consists of trading among large banks, central banks, money speculators, multinational corporations, governments and other financial markets and commercial institutions and is therefore considered the largest market in the world. One of the biggest features that distinguishes foreign exchange markets from other financial markets; The companies operate to facilitate daily transactions in the market and to avoid long-term risks. Companies trade in foreign currency to facilitate the necessary business transactions, to avoid market risk and to minimise long-term investment needs.

In the foreign exchange market, the currency is exchanged for one currency against another and the value of the currency traded is dealt with. It necessitates the conversion of different currencies, thanks to the capital flow between countries, especially with foreign trade.

Since the transactions in the foreign exchange market are not carried out in a single institution, it is a decentralised market where all dealer quotes cannot be observed. Accordingly, different prices can be realised simultaneously in the market and a reliable data source is not available. In addition, actors active in the market are responsible for trade volume and commercial and investment banks assume this responsibility. Another important detail is; in foreign exchange markets, the market is open 24 hours a day, and is very common in the world in terms of trade volume. However; the foreign exchange market is among the most efficient markets. FX markets are available in all countries and the most important FX markets are London, New York, Paris, Zurich, Frankfurt, Singapore, Hong Kong and Tokyo. London is the biggest (Schwartz, 2001).

2.3.1. Activities in Foreign Exchange Market

Since the foreign exchange market is defined as the OTC (over-the-counter) market, there is no physical environment in which participants will meet to realise their agreements. Therefore, currency buying and selling is an arrangement between banks and intermediaries operating in a telecommunication and interconnected financial centre such as telephone and satellite communication network SWIFT. The contribution of various foreign exchange transactions

organized markets (spot, forward, future, options and swap) is very important to make easier that foreign trade.

- **Spot Rate**

The exchange rate is the fastest way to change currencies. The spot trading is the transaction where the foreign exchange buying and selling takes place two days after the communication date.

- **Forward Rate**

As the main features of futures contracts; it is not standardised, based on classical futures contracts, transactions are carried out in the OTC market, and regulated by considering special conditions for buyers and sellers.

- **Future rate**

Futures represent a newer version of forward transactions. Here, while sellers are committed to delivering defined assets, such as money or services, at a predetermined date and at a per-established price, buyers are responsible for taking over the assets and making the payment on the day of delivery. Depending on the possibility of the payment not being made, deposit is taken from the buyers and this guarantees the payment. By signing a purchase contract at a predetermined price, the futures buyer and seller may not pay until the delivery date of the goods to the buyer in the future. In addition, the contract defines the terms of delivery and payment is made only when the conditions are met. The organisations that operate here aim to protect themselves from risks and losses arising from price changes (Ong, 2003).

- **Options**

The option is a contract that gives the buyer the right to trade a product at a certain price and at a certain date, where all the terms and needs are clearly stated, that is, the parties are not given any flexibility in applying the rules. Options allow investors to create high-return portfolios to protect themselves against sudden price changes. In case of any uncertainty in prices, the option contract will be put in place to avoid risks. Options are ideal contracts to minimise losses that may occur in sales strategies with this contract that provides convenience to investors. Investors who take the risk of price changes in order to increase profitability in futures contracts may suffer. Since the amount of loss caused by these risks will cause collateral loss, it is decided not to continue the transactions.

- **Swap**

It is process of exchanging cash flows that will create by assets such as swaps, money, foreign currency, and financial instruments. At the same time, a swap transaction is a swap transaction where buyers and sellers minimize credit costs to change the currency or interest. In addition, minimizing the risks caused by excessive fluctuations in price is among the main targets. Swaps, which is similar to spot transactions regarding the advantages it provides, is among other important targets to regulate cash flows by establishing security against financial risks (Schwartz, 2001).

3. Foreign Trade in Historical Stage

The development of foreign trade begins with the industrial revolution that took place in the 19th century and influenced the whole world. This is the period when the world economy creates a new road map. With the new steps in the economy, the industrialisation system in production has started to develop. Accordingly, countries needed to sell surplus products to foreign countries. Thus, this situation has promoted international trade globally. The approach of liberal economic order has also affected the commercial activities of the countries with the approach of "Let them do it, let it pass", the most important name of the 19th century and economy. While expressing the industrial revolution as the beginning of international trade, the economic crises and wars that influenced the world enabled the spread of foreign trade to a wider geography. Especially after the Second World War, which started in 1945, commercial activities increased between the countries. Following this situation, despite the oil shocks that occurred in the 1970's, technological developments occurred and the commercial restrictions and bans applied by the countries decreased. With the establishment of international companies, capitalism has begun to lay the groundwork for itself. The 2008 global financial crisis was another important breaking point affecting foreign trade. Accordingly, a contraction has occurred in the economies of countries and with this contraction, new commercial blocks have been formed. The foreign trade of countries has come a long way with the development of technology and communication networks that provide access to faster information.

3.1. Absolute Advantages Approach

In the late 18th century, written in 1776 by Adam Smith, the causes of foreign trade was explained by the theory of absolute superiority. According to Adam Smith, it is stated that the

welfare levels of countries will increase with the adoption of free trade in economies globally. According to the absolute, advantage theory, if one country produces at lower cost compared to another country, it should concentrate on the goods it produces and while selling these products at a low cost to foreign countries, the goods produced at a high cost should be imported from foreign countries. Thus, a country will have the edge in a sector defined by the other and will obtain commercial gain. In international commercial competition, countries should produce the products they consider advantageous for them, and it is argued that the economic efficiency of the countries will increase. (Gandolfo, 2014).

We will examine the two countries and two different goods to formulate the absolute supremacy theory. These countries; Germany and Turkey, the products are wheat and wine. The figures in the table below represent the amount that a worker can produce in one day.

Table No. 1: Theory of Absolute Advantages

Country	Product 1 -Wheat	Product 2 - Vine
Germany	3	6
Turkey	4	2

When we make a comparison according to absolute superiority theory, looking at the wheat crop, while a worker can produce three products in Germany, a worker can produce four products in Turkey. In this case, the absolute superiority is in Turkey. When we look at the wine products in Germany, a worker can produce false 6 products are capable of producing two products in Turkey. For this reason, Germany has an absolute advantage in wine product.

According to this analysis, the Turkey should specialize in the production of wheat products, Germany should specialize on the wine product. On the other hand, by exchanging products with excess supply, the other product must meet its demands. In more detail about the prices of determined products;

According to above mentioned table, 3 wheat = 6 wine products for Germany, If we go to simplify, 1T = 2G. In other words, the equivalent of a wheat product is 2 vine products. For Turkey, 4 wheat = 2 wine products, if we go simplify, 2T = 1G. This is reflected as 1 vine product in exchange for 2 wheat products (Negishi, 2014).

3.2. Comparative Advantages Approach

Comparative advantage theory was put forward by the English economist David Ricardo in response to the missing (neglected) aspects of the theory of absolute superiority. According to Ricardo, Adam Smith's theory was insufficient in determining the method of foreign trade and claimed that the superiority between the two countries should be determined comparatively. The theory generally overlooks the fact that a country has absolute superiority in the production of both goods. Accordingly, he argues that he will carry out trade transactions in both countries in line with his interests. As a result of this, a decrease in resource waste and an increase in welfare are expected. According to Ricardo, in an environment where the theory of comparative advantage exists, the theory of absolute superiority already exists. The table below will help us understand the comparative superiority theory.

Table No. 2: Theory of Comparative Advantages

Country	Product 1- Wheat	Product 2 - Vine
Turkey	50	25
Germany	20	40

According to the above table, wheat and wine-producing units relative to Turkey wheat cost 50/25 wine, if we simplify the result will be 1W = 0.5V. Turkey, can produce wine product in 1/2 time to produce a unit of wheat products. The relative cost of Germany is 20 wheat / 40 wines, if we simplify the result is 1T = 2G. It happens. Briefly, Germany can produce 2 units of wine as long as it produces one unit of wheat. (Dixit & Norman, 2010).

On the whole comparisons between countries, in Turkey for a wheat product can only receive half the national boundaries of wine products. But when we compare it with Germany, when it gives a wheat product, it buys two wine products. On the contrary, by giving a wine within its borders, it can buy two wheat products while in Germany it can buy half a wheat product in exchange for a wine. In this case, it seems more advantageous to produce wheat and buy wine from Germany. Germany in return for a wheat when buying two wine product, when the wheat in Turkey can only buy half the wine and can buy half the wheat in a wine product with the country's borders, is to buy two wheat products in Turkey. In terms of Germany, wine producing, buying wheat from Turkey show it would be more profitable. These comparisons are based on results in the theory of comparative advantage and should produce wheat products

should specializing on Turkey, Germany should specialize on the product and should produce wine.

3.3. Fiscal Policy

All economic policies implemented in the world are aimed at creating a stable and developed economy and equal income distribution across the country, and one of these policies is fiscal policy. Fiscal policy helps explain the impact of public revenues and expenditures on the economy. Total income and expenditure in a country in a certain period of time determines the total demand level of that country. The state transfers a certain amount of national income to the economy as public expenditures, and withdraws this amount from the economy through public revenues.

With the increase in budget deficit, interest rates will increase and foreign capital inflows will increase. This increase causes the exchange rate to gain value temporarily according to the long-term equilibrium level. In the next stage, even if the budget deficit does not decrease, the budget deficit will return to the equilibrium level due to the decrease in the value and interest rates of the national currency and investors do not prefer securities in national currency. When government spending exceeds total income, domestic interest rates increase with the increase in fund demand in the financial markets. Accordingly, the decrease in the budget deficit will cause domestic interest rates to decrease and the demand for these assets will decrease as the returns of domestic financial assets decrease, but on the other hand it increases the demand for foreign financial assets. This volatility in this demand for financial assets causes the exchange rate to depreciate.

Formulation of the balance condition in fiscal policy in an open economy;

$$(S+T+M= I+G+X)$$

As shown in the above formula, On the left side of the equation these units shows (S) saving, (T) taxes, and (M)import and on the right side of the equation these units refers the (I) investments, (G) public spending and (X) exports (Langdana,2016).

3.4. Monetary Policy

Monetary policy is the consensus and implementation of these decisions, such as the determination of the amount and cost of money to be printed by their central banks in order to achieve macroeconomic goals of the countries. In general terms, countries aim to reach certain targets in line with the monetary policies they implement. These goals include ensuring price

stability, preventing excessive fluctuations in the foreign exchange rate and growth in the country's economy.

In order for the monetary policies implemented by the governments to give positive results, it is obligatory to use monetary policy instruments under the control of the Central Banks, which are the authorities. Here, the task of the central bank ensures that the supply of money is in line with the needs of the country's economy, which are present in the market. Thus, the demand for money increases or decreases according to the money supply. Briefly, Central Banks adjust the needs of the country's economy by affecting money supply, exchange rates and interest rates in order to achieve monetary policy targets.

In the implementation of monetary policy, the central bank acts in two ways. The first is that it uses direct regulatory power. Secondly, it indirectly affects the money market conditions as the institution that issues the central bank money. Monetary instruments used by the Central Bank in monetary policy applications can be expressed directly and indirectly in two ways (Persson &Tabellini, 1994).

3.4.1. Indirect Market Instruments

Indirect instruments are targeted at the central bank balance sheet, using them to influence supply-demand conditions in the market. As indirect vehicles are known as market-based vehicles, the prices of these vehicles are determined by the market. The central bank uses indirect instruments in primary or secondary markets to affect market conditions. Thus, the Central Bank tries to direct the markets by preparing the necessary environment in the markets.

- **Open Market Operations**

Indirect tools; There are three important pillars, including central bank loans or re-discount transactions, reserve requirements and open market transactions.

Open market transactions are expressed as purchases and sales of treasury bills and bonds, as well as some private sector bonds and securities, in order to reduce and increase the amount of money circulating in the central bank. Thus, with these assets purchased by the central bank, money is withdrawn from the market. In addition, open market transactions will affect the interest rate in the market, while the prices of papers purchased by the Central Bank will increase, while interest rates will decrease (Gandolfo, 2014).

- **Reserve Requirements**

Required reserves are a certain ratio of some deposits in the liabilities of the banks in exchange for the deposits they have to keep in the central bank. Within the scope of the reserve requirement, it is an important tool to increase the trust of the depositors, which are two important factors, and to keep the money supply under control. Since the reserve requirement ratio is not a tool that can be changed continuously, it will significantly affect the reserve status of the banking system. Thus, it will be difficult to withdraw the liquidity from the system. Accordingly, it indicates that there may be problems in reaching the goals of monetary policy.

- **Discount Rate**

The discount is the re-discounting of the commercial bonds that have changed hands for a price (discount) by the central bank. With the re discount monetary policy tool, banks' money-making status can be changed in response to the impact of reserves. The change in the re discount policy causes market interest rates to change as well. Since the price of the loan taken from the banks expresses the interest rate in a sense, the change in the interest rates will affect the loan supply and demand of the banks (Negishi, 2014).

3.4.2. Direct Market Instruments

The direct monetary policy instruments are limited by the intervention of the central bank in interest rates and loan amounts. Thus, monetary policy practices are carried out through legal regulations. As direct monetary policy instruments, we can primarily show credit ceilings, control of interest rates, liquidity requirements and mandatory deposits.

- **Credit Ceiling**

The commercial banks can allocate loans for the economic activities they have determined, but these loans may be limited by the central bank. Thus, it is aimed to use the loans for these sectors by keeping credit ceilings high in the sectors determined by commercial banks. Credit ceiling limits are determined according to banks' capital, deposits and existing loans. By this means, policy makers aim to divert their commercial monetary resources towards activities without risk.

- **Liquidity Requirements**

The monetary authority may argue that commercial banks should purchase a certain proportion of funds and bonds they have estimated, and that the central bank should hold cash. At this

point, liquidity requirements do not leave an alternative route to the banks and they are a direct instrument with an application to cover all liabilities (Persson &Tabellini).

3.5. Development of Foreign Trade

Foreign trade; It is the flow of goods produced in one country, services provided and capital out of the country's borders, that is, towards another country. The most distinctive feature of foreign trade is that it shows the effectiveness of international trade based on the common rules determined. We can collect foreign trade as import and export under two main headings. Export plays an important role especially in the growth of developing country economies. With exports, foreign currency flows into the country and accordingly, it means that parameters such as exchange rate stability, an increase in interest rates and a decrease in risks in the economy become important. This will show the country in a strong position in economic and political relations with other countries. In the international arena, they aim to establish foreign trade policies in terms of the decisions they make and the method they apply based on the increase and decrease in the export and import rates of the countries over the years. Many factors affect the foreign trade policies in the world. These factors may include economic sanctions, prohibitions, trade agreements and commercial protectionism (Dormois & Lains, 2005).

3.5.1. The Effect of the Governments on Foreign Trade

Governments target economic policies while determining foreign trade policies. Here, governments have important duties. In particular, they carry out foreign trade policies in many respects according to the social structure, commercial habits, consumption and preferences of the countries, and the most important point here is the effectiveness of the use of foreign trade instruments. Because, governments direct their foreign trade relations with other countries by using these tools. These tools used by the government can restrict, restrict, or, conversely, influence trade. We can show customs tariffs, non-tariff barriers, quotas and taxes as instruments to restrict foreign trade. On the contrary, we can cite export subsidies and value-added tax refunds as an example of governments' tools to support foreign trade. Two important views come to the fore in foreign trade, and the first of these views is free foreign trade. According to this approach, countries will have the potential to reach economic targets more easily. In summary, the liberalisation of international business transactions provides people with better quality and affordable goods and services. According to another aspect of the protectionist approach, unlike the free economic conditions, particularly in emerging economies of the countries of the free economy approach would create distortions and imbalances can be avoided this opinion is expressed that effect. With this protectionist

approach, it is stated that state intervention is effective in protecting the foreign trade balance of the countries, increasing employment and protecting the sectors that make a significant contribution to the economy, and to prevent the economies of industrialisation countries from being negatively affected by international competition (Behera, 2010).

3.5.2. The Function of the Central Bank in Turkey

The Republic of Turkey's central bank has an authorized institution to many issues in terms of duties and responsibilities. In order, for the central bank to effectively enforce these responsibilities and obligations, it is necessary to engage in certain activities. These activities include payment systems, exchange rate policy, managing international reserves, Money-banknote and emission functions, market transactions, monetary policy board and accountability.

- **Money, Banknote and Volume of Emission**

The total amount of money in circulation in an economy is expressed in the term money supply. Economic supplies such as time deposits, demand deposits, funds and securities are included in the money supply. At this point, in order for the Central bank to perform its basic functions, it is necessary to keep the liquidity at the desired level. The central bank implements a policy that runs in parallel between money supply and economic activities, and monitors the monetary base with the sole authority to print money. Monetary base includes open market transactions and money in circulation. Another issue, the emission, means the banknote that is put on the market except for coins. The Central Bank of the Republic of Turkey emission is determined daily needs. Emission volume; It is determined by the cash needs of individuals, banks and public institutions. In this regard, the Central bank keeps the Turkish lira in its treasury as much as the emission volume by following the developments in the money needs (Behera, 2010).

- **System of Payments**

The safe and active operation of payment systems, which are important for central banks to meet their monetary targets, is very important for both the economy and the safety of individuals and organisations. The central bank's role here is to prevent risks from payment systems from affecting financial stability, and to try to implement this system within the framework of legal regulations. The central bank is to ensure that banks, individuals and companies can benefit from the problem by controlling the Electronic Funds Transfer (EFT) system and the Electronic Securities Transfer (EST) system in order to transfer money and securities securely. EFT is a kind of payment system that enables the payments made over the Turkish lira between banks

to be carried out electronically. However, this system is divided into two different branches: the Turkish lira transfer system between banks and the Turkish lira transfer system between individuals. EST system is a payment system that enables the transfer of securities between banks simultaneously in electronic environment (Danila & Islam, 2019).

- **Exchange Rate Policy**

The Central Bank of the Republic of Turkey, has made the transition to a floating exchange rate system in 2001 after the economic crisis. In determining the exchange rate system to be applied to both the government and the Central Bank of the Republic of Turkey are making a joint effort. However, the Central Bank has all duties and powers in determining and implementing the exchange rate policy. Here, monetary policy instruments and targets are taken into account for the implementation of exchange rate policies. The factors that determine the changes in the foreign exchange supply and demand include the monetary and fiscal policies implemented, and international developments. However, the Central Bank; In case of excessive volatility in exchange rates, price stability and imbalance in financial markets, it is obliged to take measures. At the same time, the Central Bank conducts efforts to protect financial stability in response to the possibility of the Turkish lira being overvalued or excessively depreciated.

- **Managing of the International Reserves**

International reserves are the resources managed by the central banks of the countries, used as an international payment instrument and ready to maintain foreign trade balance. Accordingly, the amount of international reserves also affects foreign trade policy. Central bank of the Republic of Turkey, the country's gold and foreign exchange reserves management operations are obliged to carry out, under the regulations. In particular, central bank reserves, the removal of barriers in payment of Turkey's external debt and may use in order to intervene in financial markets to influence the exchange rate provided for inspection (Behera, 2010).

4. Practical Part

In practical part examines the data collecting for the chosen years and then analysing the relations between the variables and interpreting the results of analysis. This part is pretty much important to relate that theoretical understanding to analysis.

4.1. Export in Turkey between the years 2009-2018

Export is the sale goods and services produced within the borders of one country to another country and it is sold for a certain amount of money. The real exchange rates in the orientation of foreign trade and Turkey's foreign trade balance in terms of choosing the appropriate exchange rate policy for the provision is seen as an important factor. According to the interaction between the real exchange rate and exports, a decrease in export rates occurs due to the increase in the real exchange rate. This is mean that the increase in the value of the Turkish lira. The global economic crisis in 2008, has led to significant changes in foreign trade of Turkey. In Turkey experienced a major contraction in demand and consequent contraction in the economy has been realised with the depreciation of the Turkish lira and foreign exchange rate experienced a decline in exports. Turkey tried to ensure the economic stability to increase the export activity and to get rid the negative impact of the crisis.

Table No. 3: Data of Exports in Turkey between the years 2009-2018

Years	Exports (Thousand $) (Value)	Change of Exports (%)
2009	102.142.	-22.6
2010	113.883.	11.5
2011	134.906.	18.5
2012	152.461.	13.5
2013	151.802.	-0.4
2014	157.610.	3.8
2015	143.838.	-8.7
2016	142.529.	-0.9
2017	156.992.	10.1
2018	167.920.	7

Source: Data from Turkish Statistical Institute, TUIK.

The economy in Turkey, the aim elimination of the negative effects of the global economic crisis in 2008, has been realized with the expansion of the export market. In this regard, especially when in the year 2010, Turkey has followed a foreign trade policy to increase the export ratio continuously by taking a share of the new market to stimulate foreign trade. As

seen in the table above, in 2010 following 2009, exports increased by approximately 10 billion dollars and an expansion of 11.5% was experienced. In 2011, exports shifted mostly to Middle Eastern countries instead of the European market.

Graph No. 1: Changes in the Real Effective Exchange Rate and the USD $ unit of Exchange Rate between the years of 2009-2018 in Turkey.
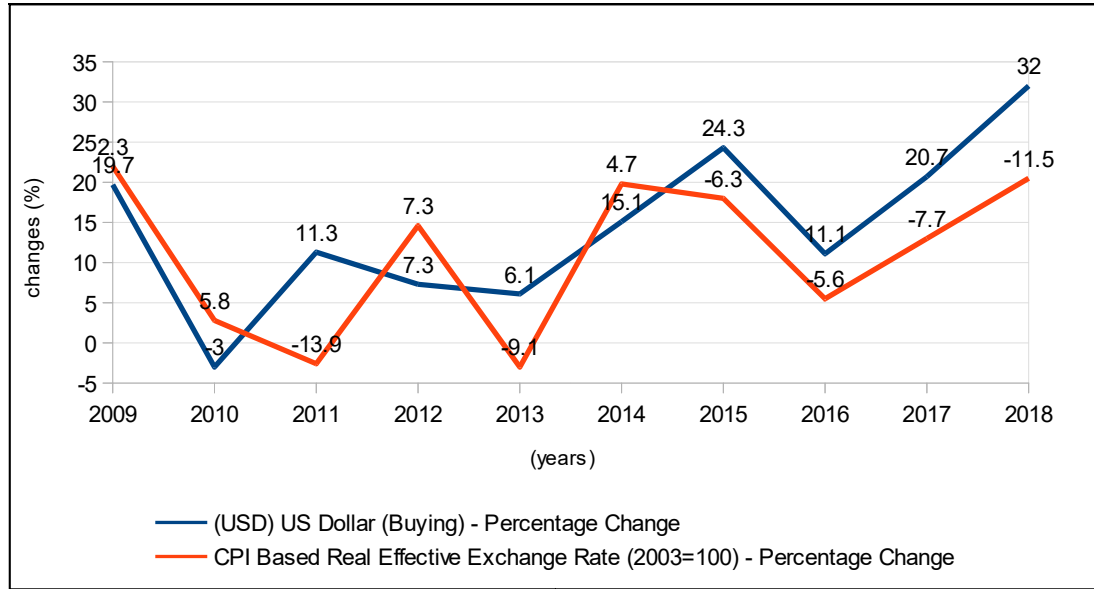
Source: Central Bank of the Republic of Turkey Electronic Data Distribution System (EDDS).

As a result of the exchange rates left to fluctuate after the economic crisis, TL depreciated in real terms. The depreciation of TL by 18% in 2011 increased the competitiveness of the exporter. Accordingly, in 2012, it has increased exports by approximately 30%. In the first half of 2013, with the interest rates of 6.8% and the increase in exchange rates afterwards, it was increased at certain rates in order to keep foreign capital domestically.

 In 2014, the US Federal Reserve (FED) announced that it would implement a contractionary monetary policy instead of the expansionary monetary policy implemented after the 2008 global economic crisis.

Accordingly, the US Dollar started to rise rapidly. The U.S. dollar rose to 6.84 in 2018. The Central Bank of Turkey (CBT) has experienced significant changes in interest rates, the most important monetary policy tool. Republic of Turkey in the period of increased demand for foreign exchange increased and foreign exchange needs of the Central Bank of Turkey, the interest banks are increasing their funding, the country aims to attract more foreign financial capital. In the last quarter of 2018, the CBT raised its lending interest by 9.25%. Despite all

interventions, interest rates were raised to 16.50% in the first half of 2018 in order to stabilize the increasing exchange rate. However, the CBT recently raised its lending rates to 20.75%, due to the insufficiency of all these.

4.2. Import in Turkey between the years 2009-2018

Imports mean that goods and services purchased from a foreign country participate in free movement within the country. According to the relationship between real exchange rate and imports, a decrease in the value of the Turkish lira is expected to affect the decline in imports. Likewise, if the value of the Turkish lira increases, import rates are expected to increase. The impacts of the 2008 economic crisis affected exports as well as imports. Because the share of imports in Turkey's foreign trade is quite high.

Table No. 4: Data of Imports in Turkey between the years 2009-2018.

Years	Imports (Thousand $) (Value)	Change of Exports (%)
2009	140.928.	-30.2
2010	185.544.	31.7
2011	240.841.	29.8
2012	236.545.	-1.8
2013	251.661.	6.4
2014	242.177.	-3.8
2015	207,234,	-14.4
2016	198,618,	-4.2
2017	233,799,	17.7
2018	223,042,	-4.6

Source: Turkish Statistic Institute, TUIK.

According to Table 2, after the 2008 global crisis, the economy contracted in 2009 with a decrease of 30.2% in imports. Central Bank of Turkey Republic; Since the end of 2010, a new monetary policy has been created that can respond to shocks by using modern implementation techniques to reduce the negative effects of the crisis.

In Turkey, the total value of imports showed an improvement with minor modifications between the years 2011-2015. In 2016, Turkey's imports decreased by 4.2 percent and declined to $ 198.6 billion. Thus, total imports decreased by $ 8.6 billion in 2016. The main reasons for this decline are the economic policies implemented and the depreciation in the Turkish lira since

the second half of 2016. According to Chart 1, the real exchange rate declined by 5.6 percent due to the decrease in the Turkish lira in 2016.

4.3. Balance of Foreign Trade in Turkey between the years 2009-2018

Foreign trade balance refers to the situation where a country's export and import rates are equal. Likewise, if total imports are less than total exports, foreign trade surplus occurs.

Table No. 5: Balance of Foreign Trade Data between the years 2009-2018 in Turkey.

Years	Balance of Foreign Trade (Million USD $)	Volume of Foreign Trade (Million USD $)	Proportion of imports covered by Exports (%)
2009	-38,785,	243.071.	72.5
2010	-71.661.	299.427.	61.4
2011	-105.934.	375.748.	56,0
2012	-84.083.	389.006.	64,5
2013	-99.858.	403.463.	60.3
2014	-84.566.	399.787.	65.1
2015	-63.395.	351.073.	69.4
2016	-56.088.	341.147.	71.8
2017	-76.806.	390.792.	67.1
2018	-55.126.	390.967.	75.3

Source: Turkish Statistical Institute, TUIK.

According to Table 5, Turkey's foreign trade deficit in 2011 was 105.9 billion dollars. The foreign trade deficit has decreased from this date until 2017. Despite this, the year of 2017, Turkey's foreign trade deficit stood at 76.8 billion dollars. Accordingly, in 2018, Turkey economy has experienced a serious contraction by 28%.

As the reason for this contraction in the economy, the increase in export rates and the decrease in import rates can be shown. Concretely, the ratio of exports to imports increased from 67.1% in 2017 to 75.3% in 2018.

Graph No. 2: The Projection of the Foreign Trade between the years 2009-2018 in Turkey
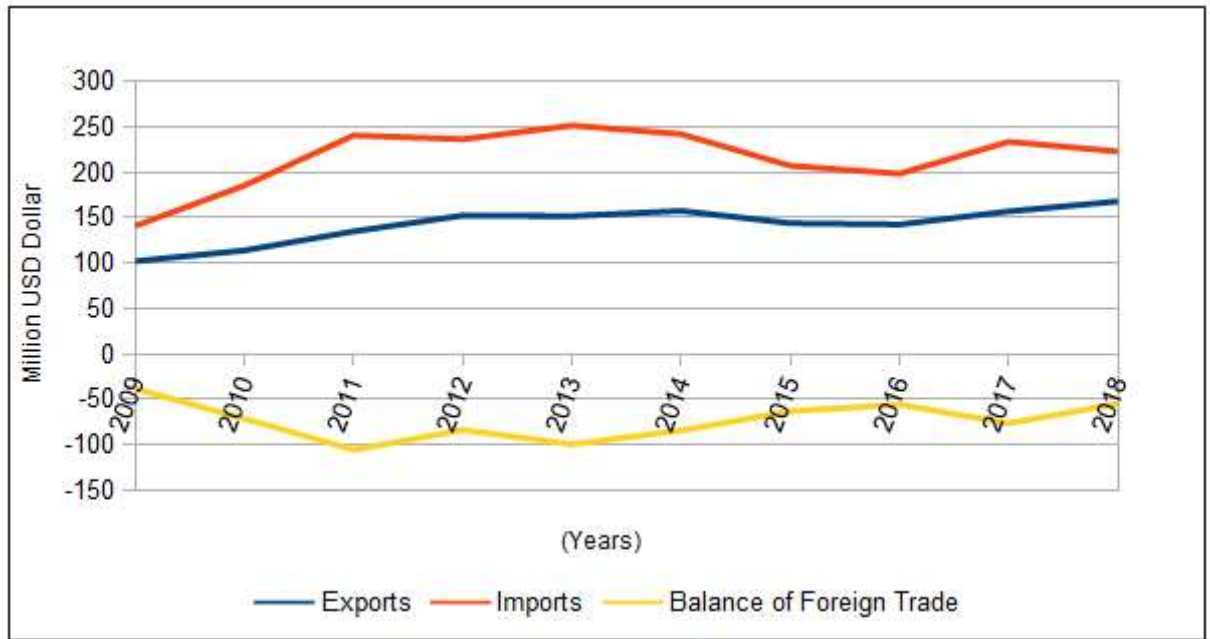
Source: Data from Turkish Statistical Institute, TUIK, edited MS Excel with statistical tools.

Along with the impact of the 2008 economic crisis, both imports and exports decreased significantly since 2009. As can be seen in Figure 4, foreign trade continued to decrease as the decreases in imports and exports changed in parallel with each other.

Turkey's economy, although it has entered into a renewal process after the crisis is still not open to foreign trade balance continued. Especially in 2013, the foreign trade deficit increased by $ 15 million to $ 99 million. Failure to close the foreign trade deficit in recent years caused the current account deficit to continue. Accordingly, it is seen that the biggest factor forming the current account deficit is the foreign trade deficit. Despite all the foreign trade policies implemented, imports cause excessive foreign currency outflows from the country, whereas exports remain at levels that are not sufficient to provide the necessary foreign currency inflows.

4.4. The Volume of Foreign Trade in Turkey between the years 2009-2018

Foreign trade volume refers to the total revenues that a country receives from exports of goods and services with other countries, and the total price it pays for imports of goods and services with other countries. When we look at this definition, it is useful to evaluate the foreign trade volume as a whole in terms of import, export, foreign trade deficit and foreign trade surplus.

Graph No. 3: Shares of Exports- Imports in Foreign Trade between the years 2009-2018 in Turkey.

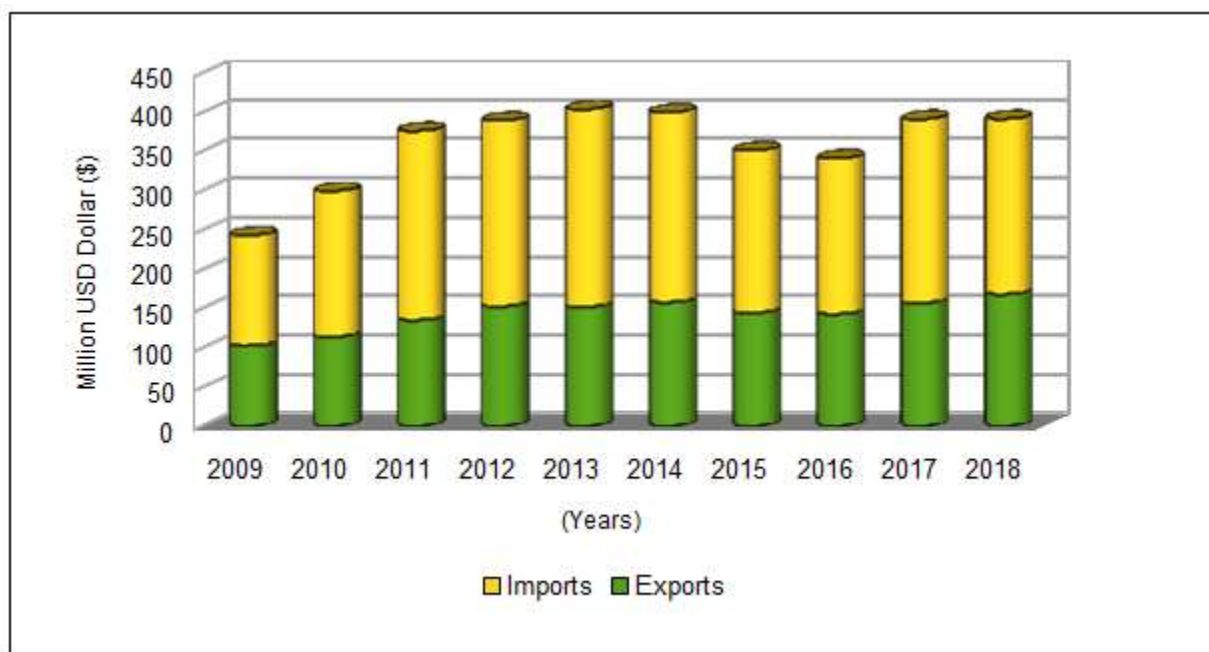*Source: Data From Turkish Statistical Institute, TUIK, edited in MS excel with statistical tools*

The foreign trade volume, which gained momentum after the 2008 economic crisis, reached 403 billion 463 million dollars as of 2013. However, in the period from 2013 to 2018, foreign trade volume started to decrease. This may be caused by improper exchange rate policies, developments in foreign and domestic politics.

4.5. The Proportion of Import Covered by Export in Turkey between the years 2009-2018

Developments in foreign trade are of great importance for countries with an open economy model as they give important clues about the internal and external economic structures of the countries. In this regard, one of the most important criteria is the ratio of exports to imports. The ratio of exports to imports is calculated only on the trade of goods, the figures obtained from the trade of services do not participate in this rate.

While evaluating the foreign trade performances of the countries, if this ratio is below 100%, it means there is a foreign trade deficit. If this rate is above 100%, it means there is a foreign trade surplus. At this point, the goals of the countries are to be close to the balance point of 100%.

Graph No. 4: Comparison between Balance of Foreign Trade and PICE in Turkey

Source: Data from Turkish Statistical Institute, TUIK, edited MS Excel with statistical tools

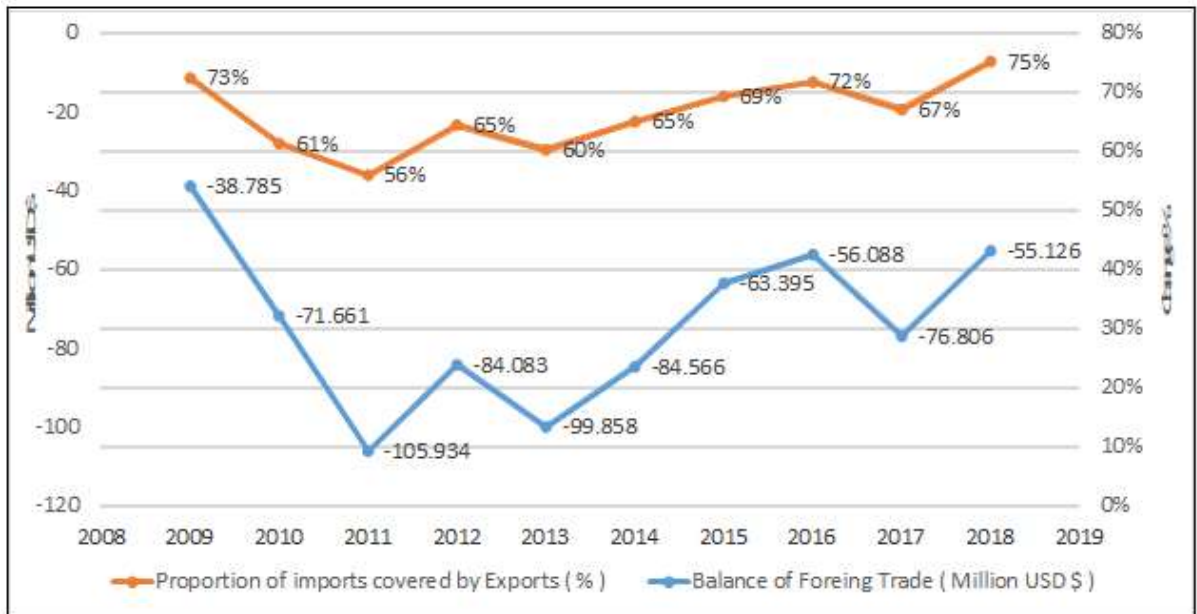A comprehensive assessment can be made when looking at the export balance from Table 5 , import from Table 2 and foreign trade balance and PICE rates from Graph 4, After 2009, it is seen that both graphs (foreign trade balance and PICE) progress in parallel.

When we look at Graph 4, It is observed that the year following the global crisis of 2008 exceeded 70% in 2009. The reason for this is that in these years, imports decreased much more than exports. By 2013, the ratio of exports to imports, which was 60%, increased steadily after this date and this increase continued until 2016. However, in 2017, there was a 5% decrease in the ratio of exports to imports. The reason for this law in Turkey as internal political turmoil shown.

4.6. Relationship between the Foreign Exchange Rate and Foreign Trade

The second most important factor after the ratio of exports to imports affecting the foreign trade performances of the countries is the changes in the exchange rate. As we explained in the theoretical part, the foreign exchange policies to be applied are very important since the taxes, quotas, tariffs or subsidies used by the countries affect the value of the currencies of the countries.

The Central Bank continued its floating exchange rate regime in 2009, along with inflation targeting. With the monetary tightening applied since the last quarter of 2011, excessive depreciation in the exchange rate was eliminated.

Graph No. 5: Relationship between the export-import and Average change in TL
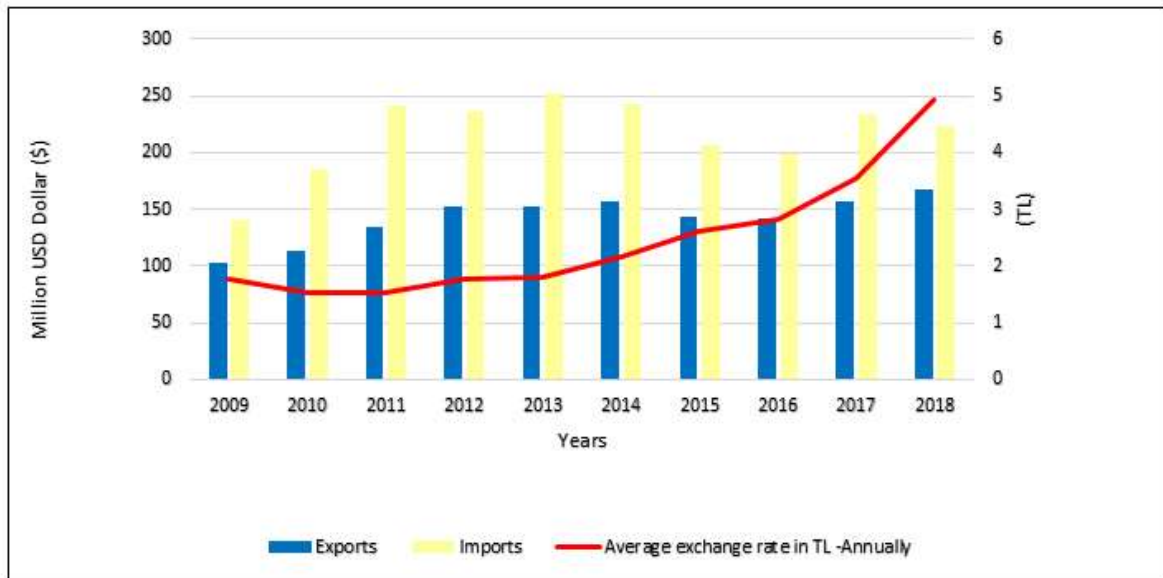
Source: Data From Electronic Data Distribution System (EDDS), edited MS Excel with statistical tools.

Especially starting from the beginning of 2011, it is possible to say that foreign trade movements are largely based on exchange rates. Changes in the real exchange rate can seriously affect macroeconomic balances, especially in developing countries. Changes in the real exchange rate are the main determinants of the competitiveness of countries and hence foreign trade movements. While the increase in the real effective exchange rate (REER) indices shows that the Turkish Lira gains real value, in the opposite case, the Turkish Lira is losing value.

The depreciation of TL against foreign currencies is a phenomenon that increases our exports, reduces our imports and thus leads to a decrease in our foreign trade deficit. However, this relationship is not as strong as it is assumed, since the elasticity of demand for imported goods is relatively rigid and the elasticity of external demand for export goods is relatively flexible.

Graph No. 6: Relationship between Proportions of Imports Covered by Exports and Average change in TL.
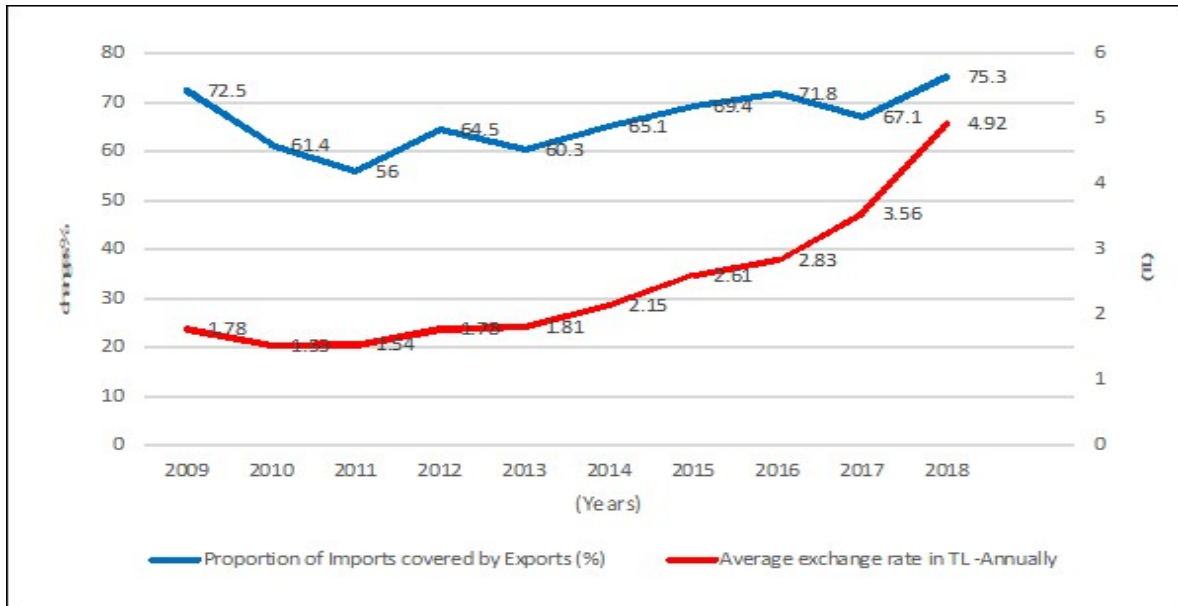
Source: Data from Turkish Statistical Institute, TUIK, edited MS Excel with statistical tools

The relationship that will form the basis of the analysis study in the fourth section is shown in the chart 6 above. Unlike the chart 4, the annual average dollar rate was added to chart 6, which takes into account the period 2009-2018. On the primary (left) axis, the percentage of exports to imports is covered, while on the secondary (right) axis, the average dollar rate in TL appears. When Figure 6 is examined; It is clearly seen that from 2009 to 2017, PICE acted independently from the exchange rate. Although similar comments can be increased on the figure, the strength and direction of the relationship between these two parameters cannot be determined clearly. In other words, it is inadequate in Chart 6 to show the exact result of the analysis. For this reason, Chart 6 has been prepared in this section only as a source of visual ideas before analysis.

5. Analysis

In order to analyse the relationship between foreign exchange rate and foreign trade factors, we have to theoretically combine these variables. Here, proportion of imports covered by exports, which is the main variable of analysis, is associated with exports and imports. The characterization of these selected data is given in the following equation.

$$\text{PICE} = \frac{Total\ Export}{Total\ Import} \qquad (1)$$

The Proportion of Import covered by export is showed PICE. Which is expressed in the above equation, in the case of 1 unit increase in total exports, there will be a decrease of 1 unit in total imports, and accordingly, the proportion of import covered by export will increase. Conversely, in case of a 1 unit decrease in total exports, there will be a 1 unit increase in total imports and the proportion of import covered by export will decrease.

By combining Equation 1 with the foreign exchange rate, we need to obtain the following 2nd and 3rd equations, which contain data that are the main research subject of the analysis. Depending on the changes in the exchange rates, the change that the proportion of imports covered by exports will be explained theoretically, taking into account the import and export data.

$$When\ FEr\ increase,\ \frac{Totatl\ Export\ increase}{2Total\ Import\ decrease} = \text{PICE increase (\%)} \qquad (2)$$

$$When\ FEr\ decrease,\ \frac{Total\ Export\ decrease}{Total\ Import\ increase} = \text{PICE decrease (\%)} \qquad (3)$$

Above of equations, FEr is symbolizes the Foreign Exchange rate. In a country, a decrease in exports occurs with the decrease in exchange rates. If the amount of goods sold by one country to another country decreases, foreign currency inflow to that country decreases. Because when the amount of goods sold to another country decreases, the prices of goods produced in the domestic market will decrease. Accordingly, the demand for goods in the domestic market will

increase. When we look at Equation 3, it is stated that the decrease in foreign exchange rates will decrease the proportion of import covered by export.

In financial models, in order to make as an econometric meaningful result between the determined variables, the time series examined must have a stationary feature. If the average of a time series does not generate a trend and periodic changes do not occur regularly, the series is stationary. Otherwise, in an econometric study, estimates using regular and unstable time series yield unreliable and false results. This situation causes misinterpretation of the analysis.

In 1926, Undy Yule found a solution for the non-stationary series and concluded that the third variable, which caused high correlation, which was not based on fixed data, was the problem with the recognition of the problem of nonsense correlations. Whether the time series are stationary is determined by the unit root tests to be applied to the series and if the series are not stationary, they do not contain a stochastic or deterministic trend. If stationary is achieved as a result of the first difference of a time series, this series is integrated in the first order and is expressed as I (1). In short, the more difference is taken from the time series, the more it integrates. If I (2) is second order, I (3) is third order.

Since the estimates obtained with non-stationary time series will give unreliable regression results, it causes misinterpretation of the data. For this reason, the results of the F-tests and other tests are not considered valid.

5.1. Unit Root Test

Unit root tests are a method used to detect whether a time series is stationary in an auto-regressive model, and the most commonly used unit root tests in studies are the Augmented Dickey Fuller (ADF) -1981 and Philips Perron (PP) -1988 tests. Under the heading of unit root tests, these two tests will be used for the analysis of a specified time series. In this study, it is determined whether the time values used in the analysis of ADF and PP unit tests are stationary or at what level they can become stationary.

According to these tests, a time series should be stationary, but the mean and variance of that series should not change and the value of the covariance between the two periods should only depend on the distance between the two periods. Although ADF and PP tests seem to give the

same results, the most important point that separates both tests is how they managed the time series correlation in both of the tests. (Gujarati, 2011)

According to another unit root test, Dickey Fuller test (1979), the lagged values of the dependent variable are added to the right side of the equation in the ADF test to eliminate the problem of autocorrelation that may occur in the analysis. The autocorrelation problem that occurs as a result of the analysis shows that the time term error term occurs when it is affected by the previous term error terms. The Dickey-Fuller test can give results according to the independent distribution of error terms and the error term may occur in some cases as different variances or different series correlations. To clarify this situation, DF test was tried to be explained with parametric ADF test and non-parametric PP test.

The most important deficiency in the application of the ADF test is the choice of delay length and is sensitive to the number of delays added to the model. As a result of the analysis, there is a problem of autocorrelation at first level and level, however, second and higher level autocorrelation problem is less encountered. In order for ADF unit root test to be applied correctly, the degree of autocorrelation is determined so as not to fail.

The regression equations developed for the ADF test used to investigate the stationary of series are follows:

$$\Delta Yt = k1\,Yt - 1 + \sum_{i=1}^{n} \beta i\,\Delta\,Yt - i + \epsilon i \qquad (4)$$

$$\Delta Yt = k0 + k1Yt - 1 + \sum_{i=1}^{n} \beta i\,\Delta Yt - i + \varepsilon i \qquad (5)$$

$$\Delta Yt = k0 + k2trend + k1Yt - 1 + \sum_{i=1}^{n} \beta i \Delta Yt - i + \varepsilon i \qquad (6)$$

According to equation 1 shown above, Yt symbolizes the first difference of the variable used in the stationary analysis, k is the time trend, t is the delay length, Yt-1 is the delayed difference terms, the mean of meat is zero and variance is constant, non-sequentially dependent, probable error term. Equation 1 shows the ADF test model, which is simple (non-constant and non-trend), equation 2, only constant, and equation 3 is constant and trend.

Considering the k value in the equations in the ADF unit root test, H_o hypotheses are created that show that the series is not stationary. According to the test result, if the ADF value is smaller than the absolute value, the hypothesis is rejected and it is understood that the series is not stationary and contains a unit root. In contrast, if the ADF value is greater than the absolute value, the hypothesis is accepted and the series is determined to be stationary and does not contain a unit root. If the probability value (Probe *) is less than 0.05, it is concluded that the series is stationary.

As can be seen in the table below, the ADF unit root test results of the foreign exchange rate (EXCH) and the ratio of exports to imports (PICE) time series are included.

Table No. 5: Results of ADF test.

	Series	ADF Values	Critical Values			Prob*
			1%	5%	10%	
Interception	EXCH	0.2633	-3.486	-2.886	-2.579	0.9754
	PICE	-3.591	-3.486	-2.886	-2.579	0.0073
	Δ(EXCH)	-9.205	-3.487	-2.886	-2.58	0
	Δ(PICE)	-8.316	-3.487	-2.886	-2.58	0
Interception and Trend	EXCH	-2.264	-4.037	-3.448	-3.149	0.4493
	PICE	-4.714	-4.036	-3.448	-3.149	0.0011
	Δ(EXCH)	-5.373	-4.04	-3.448	-3.15	0.0001
	Δ(PICE)	-8.542	-4.039	-3.448	-3.149	0
None	EXCH	1.43	-2.584	-1.943	-1.614	0.9616
	PICE	-0.496	-2.584	-1.943	-1.614	0.499
	Δ(EXCH)	-8.683	-2.584	-1.943	-1.614	0
	Δ(PICE)	-9.81	-2.584	-1.943	-1.614	0

Source: Data From Electronic Data Distribution System (EDDS), edited MS Excel with statistical tools.

In the table above, EXCH; the level value of the foreign exchange rate time series, Δ (EXCH); the first difference of the foreign exchange rate series, PICE; the level value of the proportion of imports covered by exports, Δ (PICE); the first difference of the proportion of imports covered by exports are represented.

According to the result of ADF unit root test; Based on the hypothesis (H1: α1 <0), it was determined that both series became stationary in their first level differences and did not contain unit root.

As we have stated in the analysis section, this situation is shown with I (0) and it is obtained that the series are integrated in the first level. Critical values in the table; 1%, 5% and 10% are accepted for each of the significance levels and are verified by (Prob *) showing probability values.

Phillips and Perron (1988) developed Dickey-Fuller's assumption that the error terms are statistically independent and have fixed variance. For this purpose, a non-parametric unit root test was developed by adding the correction factor (K2 Trend) into the ADF unit root test. Thus, they solved the problem of autocorrelation without changing the threshold values of the tests.

Table No. 6: Results of Phillips-Pierron Test.

	Series	PP Values	Critical Values			Prob *
			1%	5%	10%	
Intercept	EXCH	1.587	-3.48	-2.885	-2.579	0.9994
	PICE	-3.911	-3.486	-2.885	-2.579	0.0027
	Δ(EXCH)	-6.806	-3.486	-2.885	-2.579	0
	Δ((PICE)	-14.806	-3.486	-2.885	-2.579	0
Intercept and Trend	EXCH	-1.2758	-4.036	-3.448	-3.149	0.8889
	PICE	-4.4457	-4.036	-3.448	-3.149	0.0028
	Δ(EXCH)	-6.7585	-4.037	-3.448	-3.149	0
	Δ(PICE)	-15.643	-4.037	-3.448	-3.149	0
None	EXCH	2.657	-2.584	-1.943	-1.614	0.9981
	PICE	-0.4324	-2.584	-1.943	-1.614	0.0028
	Δ(EXCH)	-6.745	-2.584	-1.943	-1.614	0
	Δ(PICE)	-14.72	-2.584	-1.943	-1.614	0

Source: Data From Electronic Data Distribution System (EDDS), edited MS Excel with statistical tools.

In the table shown above, PP unit root test results were determined. The level values of the series obtained and the results of the first order differences are included. The symbols shown in the table are the level value (EXCH) of the foreign exchange rate series, the first difference values of the exchange rate series (EXCH), the level value of the export coverage ratio (PICE) of the export, the first order difference of the export coverage ratio (PICE)) is represented.

When the table is analysed, non-stationary results were obtained in the level values of the exchange rate and the proportion of imports covered by exports. However, with the results of both series, the first differences of which were taken, it was observed that for each of the critical values, 1%, 5%, 10% significance levels, stagnation was present and they did not contain a unit root.

The stability of the series was tested by means of ADF and PP unit root tests. According to the results obtained, in the non-trending and non-stationary state of the series, it was determined that the series are integrated with each other in the first order, as expressed in the first equation of the ADF model. As a result, both the exchange rate and the proportion of imports covered by exports were proved by both separate test results, which are I (1).

5.2. Johansen Co-integration Test

The Johansen co-integration (1988) test is a VAR based analysis method calculated based on true values and real vectors. In theory, the assumption that there is a significant relationship between the selected variables should be proved with the help of empirical tests. In practice, in an analysis using multiple explanatory (dependent variable) variables, it is very important to use this method to determine Johansen co-integration relationships between the series. In other words, to determine the long-term relationship between two or more non-stationary series, the Johansen co-integration test method can be used after proving that the result of the unit root test applied to the series is equally stationary. In this study, the Johansen method will be applied to examine the co-integration relationship between the series.

The most important point in the Johansen method is the condition that the series should be stationary. However, linear combinations of series with the same degree of stability are not always reflecting real values. Accordingly, the Johansen co-integration test is carried out to prove the long-term relationship between the series. Even if it is very rare, the result of the co-integration test may not result in stasis in some cases. However, it is anticipated that there may be a long term relationship between the series. Theoretically, the Co-integration test is an approach that prevents incomplete knowledge and meaninglessness arising from getting noticed in the long term series.

In the previous analysis, it was proved that I (1) that EXCH and PICE series were integrated in the same order (first order) in both ADF and PP tests in order to test the stability of the series. According to this result, it was determined that the co-integration test can be performed. Johansen co-integration test will be applied considering the non-stationary level values of the series.

The appropriate delay length for the analysis was determined as 3 and model verification tests were applied. The results obtained in the characteristic reverse root test of the predicted VAR model confirm the selected delay length as shown in the figure below. In the figure, the points representing the inverted roots remain in the unit circle shows that the test result is consistent.

Figure No.1: Characteristic Inverse Roots of the VAR Model
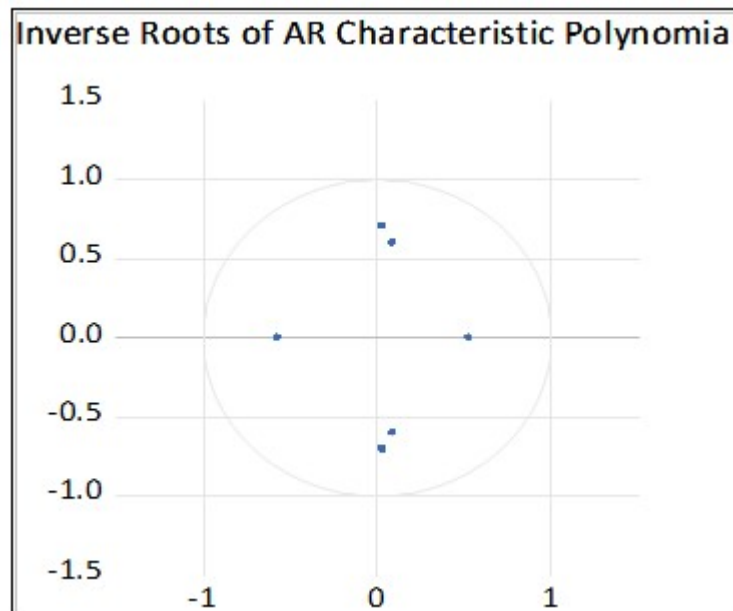
After the results obtained from the VAR model, as the other model verification conditions, the Autocorrelation LM test was used primarily to investigate the problem of autocorrelation, and the White tests for the variance problem. As a result of both tests, it was seen that no problems were encountered. Therefore, the analysis does not create any econometric obstacle in order to pass the Johansen co-integration test.

Table No. 7: Exchange Rate and PICE Johansen Co-integration Test Results

Maximum Eigen- Value Test			Trace Test		
Hypothesis No. of CE(s)	Max - Eigen Test	Critical Value (0.05)	Hypothesis No. of CE(s)	Trace Test	Critical Value (0.05)
Ho: r = 0	12.54	14.26	Ho: r = 0	16.22	15.49
Ho: r ≤ 1	3.67	3.84	Ho: r ≤ 1	3.67	3.84

Source: Data From Electronic Data Distribution System (EDDS), edited MS Excel with statistical tools.

The table above shows the results of the Johansen co-integration test for the exchange rate and PICE series. The hypotheses tested by this method are shown as follows:

H0: r = 0 (There is no co-integration between series).

H0: < 1 (There is co-integration between series)

According to the results of Johansen co-integration test, both maximum Eigen and trace statistic values were found to exceed critical values. Accordingly, the hypothesis (Equation 4), where there is no co-integration relationship between the series, is rejected at the level of 5% significance, and the alternative hypothesis (Equation 5), which states that there is a co-integration relationship between the series, is accepted. As a result, it is understood that there is at least one co-integrated vector between the series.

Figure 2: Co-integration Graph
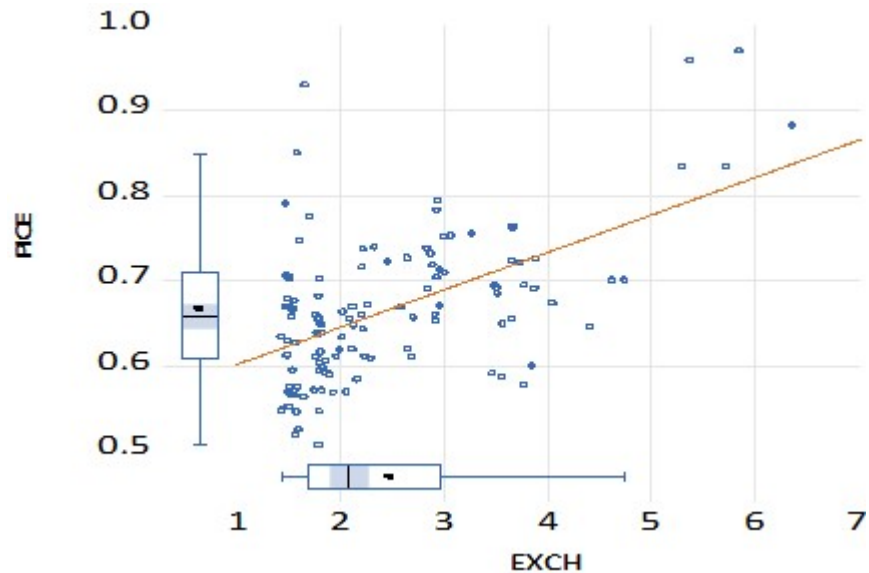
The above figure was obtained as a result of the data obtained according to the co-integration result. When the figure is examined; It is possible to see that the co-integration relationship between the variables is concentrated around 0.6-1. It can be concluded that the deviations from the average decreased after the 2008 crisis and the co-integration relationship relatively strengthened in these years.

Another premise confirming the test result is the examination of normalized co-integrated coefficients of the series. As a result of Johansen co-integration analysis, PICE coefficient; 1.00000 and the exchange rate coefficient; It was found to be -0.053622. The difference between the coefficients is 0.946378 and which is means that the expected positive relationship between the variables has been confirmed.

Accordingly, the normalized regression model is as shown below:

$$PICE = 0.053 \, EXCH + 3$$

(7)

Another result, according to equation 6; PICE will be affected positively and 0.053 by each unit change in EXCH. As a result of these results, according to the theory of economics, the positive relationship between the exchange rate and the ratio of exports to imports has been empirically proved.

The requirement to establish the error correction model (Vector Error Correction) must be fulfilled as the final stage of the Johansen co-integration analysis. The results of the VEC model obtained are given in the table below.

Table No. 8: Error Correction Model Results

Error Correlation	ΔPICE	ΔEXCH
Co-integrationEq1	-0.310112	-0.593507
Standard Errors	0.07696	0.19356
T-Statistic	-4.02961	-3.06624

Source: Data From Electronic Data Distribution System (EDDS), edited MS Excel with statistical tools.

According to the coefficient results obtained from the Vector Error Correction model; It is predicted that the problems caused by PICE will improve by 0.31 in the year. Similarly, problems arising from EXCH are expected to improve by 0.59 during the year.

6. Findings and Researches

In the application section, the stationary tests of the PICE and EXCH time series were carried out primarily to perform the analysis studies. As a result of the analyses made through ADF and PP unit root tests, both series are observed to be stationary in the first degree differences in both tests. Then, the VAR model was estimated with the series that seemed to be stationary in their first differences. The appropriate delay length, which plays an important role in the estimation of the VAR model, was determined to be 3.

The most appropriate lag length was provided by several model verification tests and it was decided that the lag length determined in the results of autocorrelation and variance tests was

suitable for the model. In the next step, the co-integration relationship between the series was investigated with the Johansen co-integration test and as a result of this test, it was concluded that there is at least one co-integrated vector between the series. Briefly, it has been determined that there is a long term relationship between EXCH and PICE series used in the analysis. In a more concrete statement, it has been determined that the increase in exchange rates and proportion of imports covered by exports increased in the long run. In parallel, it was concluded that the decrease in exchange rates caused a decrease in the proportion of imports covered by exports. Presence of long term relationship between PICE and EXCH series, the vector was corrected with normalized co-integrated coefficients and Vector Error Correction Examination was performed.

At the last stage, it is determined that the problems caused by PICE will improve after 0.31 period within the year, and the problems caused by EXCH will improve after 0.59 periods within the year. In the practical part, the steps applied throughout the empirical analysis were determined to be in parallel with the econometric processes and the results obtained were realized in accordance with the theory of economics.

7. Discussion and Results

The results obtained in the empirical study results, given the location in 2008 after years of economic crisis, Turkey's economy has been seen in the literature to be compatible with the development work of gore. This study also confirms the assumption that the exchange rate is related to foreign trade, as stated in the theoretical section. It is worth mentioning that it is useful to know that the only determinant of foreign trade activities is not the exchange rate. In this research, Turkey's exports, imports and foreign trade developments are examined in detail as part of the equilibrium exchange rate is not only sourced. Turkey's foreign trade with the adoption of an open economy models have brought other country you are making lucrative. However, according to our research, the variable that shows that the developments in exports and imports are the most sensitive in the short term is undoubtedly the exchange rate. It is thought that the most important contribution of this study to theoretical studies is to use the

ratio of exports to imports, which is more specific than these data. In addition, the fact that the average exchange rate was used instead of the real effective exchange rate index, which is another quite common variable, is another unique aspect of the study. The condition for associating the average exchange rate with foreign trade through the PICE variable is to determine the PICE-Export-Import interaction. When evaluating the study in this respect, it should be taken into consideration that PICE is correct with Export and inversely with Import.

Another important point to be emphasized is that the exchange rate phenomenon is an uncontrollable variable in the economies of the country that adopts the floating exchange rate system. In other words, the fact that the exchange rates are determined under market conditions means that there is no intervention. Although there is a chance to steer the exchange rate through interventions on foreign exchange supply and foreign exchange demand, balance level can never be achieved for foreign trade. This feature causes the exchange rate to be set up by the Central Bank of the Republic of Turkey on foreign trade intervention can never fully be able to give the desired result.

With the co-integration analysis made in the application part of the research, no determination has been made about the direction of the relationship determined between the variables. In this respect, it has been observed that causality analysis conducted to determine the direction of the relationship does not reach a clear result. It is useful to state that foreign trade activities also affect the exchange rate under the free exchange system. Considering that the movements in the financial markets are effective on the exchange rate, it is considered that the outcome of causality may vary. Considering all these results, new variables can be added to evaluate the shortcomings of the study or they can be made from different perspectives. In addition, many new variables can be added to the analysis by taking into account foreign currency inflows through short and long term foreign capital.

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Additions

Add 1: **Series of Export-Import and PICE**

Years	Total Exports	Total Imports	Proportion of Imports covered by Exports
2009-01	7,884.49	9,281.14	0.849518006
2009-02	8,435.12	9,074.66	0.929523774
2009-03	8,155.49	10,522.04	0.775086062
2009-04	7,561.70	10,120.32	0.74717961
2009-05	7,346.41	10,867.70	0.675985568
2009-06	8,329.69	12,500.59	0.666343909
2009-07	9,055.73	12,856.29	0.704381787
2009-08	7,839.91	12,811.17	0.611959022
2009-09	8,480.71	12,485.00	0.679271548
2009-10	10,095.77	12,772.51	0.790429693
2009-11	8,903.01	12,617.54	0.705606127
2009-12	10,054.59	15,019.48	0.669436914
2010-01	7,828.75	11,691.25	0.669624663
2010-02	8,263.24	11,781.61	0.701367326
2010-03	9,886.49	15,022.22	0.658124167
2010-04	9,396.01	14,943.42	0.628772339
2010-05	9,799.96	14,726.09	0.665482601
2010-06	9,542.91	15,233.11	0.626458057
2010-07	9,564.68	16,078.48	0.594874838
2010-08	8,523.45	15,434.04	0.552250263
2010-09	8,909.23	15,643.76	0.569507056
2010-10	10,963.59	17,296.68	0.633854973
2010-11	9,382.37	17,134.77	0.547563235
2010-12	11,822.55	20,558.91	0.575057426
2011-01	9,551.08	16,905.38	0.56497291
2011-02	10,059.13	17,520.19	0.574144932
2011-03	11,811.09	21,643.48	0.54571102
2011-04	11,873.27	20,953.46	0.566649619
2011-05	10,943.36	21,107.03	0.518470225
2011-06	11,349.95	21,605.31	0.525331765
2011-07	11,860.00	21,061.31	0.563118112
2011-08	11,245.12	19,679.42	0.571415389
2011-09	10,750.63	21,203.69	0.507016822
2011-10	11,907.22	19,919.21	0.597775695
2011-11	11,078.52	18,649.31	0.594044744
2011-12	12,477.49	20,593.90	0.605882645
2012-01	10,348.19	17,468.98	0.592375168
2012-02	11,748.00	17,787.29	0.660471532
2012-03	13,208.57	20,677.50	0.638789757
2012-04	12,630.23	19,272.81	0.655339
2012-05	13,131.53	21,750.45	0.60373607
2012-06	13,231.20	20,437.94	0.647384193
2012-07	12,830.68	20,835.20	0.615817164
2012-08	12,831.39	18,828.48	0.681488683

2012-09	12,952.65	19,924.31	0.650092989
2012-10	13,190.77	18,786.70	0.70213352
2012-11	13,753.05	20,947.98	0.656533472
2012-12	12,605.48	19,827.51	0.635756917
2013-01	11,481.52	18,802.57	0.610635824
2013-02	12,385.69	19,395.11	0.638598496
2013-03	13,122.06	20,559.35	0.638252447
2013-04	12,468.20	22,825.14	0.54624863
2013-05	13,277.21	23,245.30	0.571178217
2013-06	12,399.97	21,012.83	0.590114261
2013-07	13,059.52	22,965.86	0.568649148
2013-08	11,118.30	18,198.37	0.610950456
2013-09	13,060.37	20,620.82	0.6333585
2013-10	12,053.70	19,482.64	0.618689586
2013-11	14,201.23	21,414.22	0.663168103
2013-12	13,174.86	23,139.03	0.569378103
2014-01	12,399.76	19,286.49	0.642924677
2014-02	13,053.29	18,239.69	0.715653289
2014-03	14,680.11	19,931.71	0.736520386
2014-04	13,371.19	20,658.67	0.64724317
2014-05	13,681.91	20,875.12	0.655416879
2014-06	12,880.92	20,792.87	0.619487486
2014-07	13,344.78	19,941.06	0.66921083
2014-08	11,386.83	19,498.07	0.583997848
2014-09	13,583.12	20,595.98	0.659503424
2014-10	12,891.63	19,184.61	0.671977695
2014-11	13,067.35	21,384.56	0.611064504
2014-12	13,269.27	21,788.28	0.609009652
2015-01	12,301.77	16,645.66	0.739037576
2015-02	12,231.86	16,940.93	0.722030061
2015-03	12,519.91	18,726.11	0.668580501
2015-04	13,349.35	18,373.48	0.726555043
2015-05	11,080.39	17,868.78	0.620097559
2015-06	11,949.65	18,199.15	0.656604857
2015-07	11,129.36	18,225.34	0.610652836
2015-08	11,022.05	15,969.29	0.69020244
2015-09	11,581.70	15,402.92	0.751916309
2015-10	13,240.04	16,917.70	0.782614599
2015-11	11,681.99	15,972.82	0.73136663
2015-12	11,750.82	17,992.18	0.653106852
2016-01	9,546.12	13,452.71	0.709605615
2016-02	12,366.39	15,578.26	0.793823698
2016-03	12,757.67	17,766.24	0.718085128
2016-04	11,950.50	16,187.64	0.738248546
2016-05	12,098.61	17,196.66	0.703544357
2016-06	12,864.15	19,476.28	0.660503581
2016-07	9,850.13	14,695.00	0.670304708
2016-08	11,830.76	16,614.18	0.712088246
2016-09	10,901.64	15,297.88	0.712624056
2016-10	12,796.16	17,008.62	0.752334038

2016-11	12,786.94	16,934.53	0.755080566
2016-12	12,780.52	18,410.26	0.694206697
2017-01	11,247.59	15,591.51	0.721391752
2017-02	12,089.91	15,826.00	0.763927115
2017-03	14,470.81	19,017.54	0.760919381
2017-04	12,859.94	17,787.68	0.722968753
2017-05	13,582.08	20,923.45	0.649132079
2017-06	13,125.31	19,173.76	0.684545428
2017-07	12,612.07	21,490.79	0.58685946
2017-08	13,248.46	19,161.72	0.691402779
2017-09	11,810.08	19,978.41	0.591142099
2017-10	13,912.70	21,217.24	0.655726114
2017-11	14,188.32	20,546.98	0.690530722
2017-12	13,845.67	23,084.58	0.599779957
2018-01	12,434.10	21,522.47	0.577726268
2018-02	13,148.02	18,936.78	0.694311278
2018-03	15,553.25	21,434.85	0.725605396
2018-04	13,846.63	20,556.59	0.673585908
2018-05	14,256.70	22,067.05	0.646062715
2018-06	12,924.50	18,449.11	0.700548704
2018-07	14,048.96	20,057.76	0.700425077
2018-08	12,331.98	14,803.53	0.833043695
2018-09	14,397.84	16,326.54	0.881866995
2018-10	15,676.86	16,174.15	0.969254086
2018-11	15,491.51	16,163.97	0.958397419
2018-12	13,810.28	16,554.30	0.834241164

Add 2:

Years	USD Dollar Buying	USD Dollar Selling	Average of Exchange Rate
2009-01	1.5891	1.5967	1.5929
2009-02	1.6524	1.6603	1.6563
2009-03	1.7045	1.7128	1.7087
2009-04	1.6042	1.6119	1.6080
2009-05	1.5518	1.5593	1.5555
2009-06	1.5398	1.5472	1.5435
2009-07	1.5137	1.5210	1.5173
2009-08	1.4792	1.4864	1.4828
2009-09	1.4852	1.4924	1.4888
2009-10	1.4621	1.4692	1.4657
2009-11	1.4800	1.4872	1.4836
2009-12	1.4995	1.5067	1.5031
2010-01	1.4663	1.4734	1.4699
2010-02	1.5056	1.5128	1.5092
2010-03	1.5283	1.5357	1.5320
2010-04	1.4879	1.4950	1.4915
2010-05	1.5348	1.5422	1.5385
2010-06	1.5703	1.5779	1.5741
2010-07	1.5363	1.5437	1.5400
2010-08	1.5016	1.5089	1.5053
2010-09	1.4889	1.4961	1.4925
2010-10	1.4185	1.4253	1.4219
2010-11	1.4295	1.4364	1.4330
2010-12	1.5131	1.5204	1.5168
2011-01	1.5538	1.5613	1.5576
2011-02	1.5828	1.5905	1.5867
2011-03	1.5747	1.5823	1.5785
2011-04	1.5156	1.5229	1.5193
2011-05	1.5642	1.5717	1.5679
2011-06	1.5940	1.6017	1.5979
2011-07	1.6467	1.6547	1.6507
2011-08	1.7442	1.7526	1.7484
2011-09	1.7865	1.7951	1.7908
2011-10	1.8271	1.8359	1.8315
2011-11	1.8038	1.8125	1.8081
2011-12	1.8589	1.8678	1.8633
2012-01	1.8389	1.8478	1.8434
2012-02	1.7511	1.7595	1.7553
2012-03	1.7793	1.7879	1.7836
2012-04	1.7798	1.7884	1.7841
2012-05	1.7970	1.8056	1.8013
2012-06	1.8161	1.8248	1.8205

2012-07	1.8049	1.8136	1.8092
2012-08	1.7858	1.7944	1.7901
2012-09	1.7956	1.8043	1.8000
2012-10	1.7941	1.8028	1.7985
2012-11	1.7855	1.7941	1.7898
2012-12	1.7791	1.7877	1.7834
2013-01	1.7639	1.7724	1.7681
2013-02	1.7699	1.7760	1.7730
2013-03	1.8072	1.8105	1.8088
2013-04	1.7965	1.7997	1.7981
2013-05	1.8228	1.8261	1.8244
2013-06	1.8945	1.8979	1.8962
2013-07	1.9305	1.9340	1.9322
2013-08	1.9547	1.9582	1.9565
2013-09	2.0171	2.0208	2.0190
2013-10	1.9903	1.9939	1.9921
2013-11	2.0217	2.0254	2.0236
2013-12	2.0578	2.0615	2.0597
2014-01	2.2168	2.2208	2.2188
2014-02	2.2128	2.2167	2.2148
2014-03	2.2178	2.2218	2.2198
2014-04	2.1275	2.1313	2.1294
2014-05	2.0908	2.0946	2.0927
2014-06	2.1157	2.1195	2.1176
2014-07	2.1187	2.1225	2.1206
2014-08	2.1583	2.1622	2.1602
2014-09	2.2036	2.2076	2.2056
2014-10	2.2583	2.2624	2.2603
2014-11	2.2336	2.2376	2.2356
2014-12	2.2877	2.2918	2.2897
2015-01	2.3283	2.3325	2.3304
2015-02	2.4552	2.4596	2.4574
2015-03	2.5838	2.5885	2.5862
2015-04	2.6481	2.6529	2.6505
2015-05	2.6461	2.6509	2.6485
2015-06	2.7012	2.7060	2.7036
2015-07	2.6946	2.6995	2.6970
2015-08	2.8456	2.8507	2.8481
2015-09	3.0027	3.0081	3.0054
2015-10	2.9296	2.9349	2.9322
2015-11	2.8713	2.8765	2.8739
2015-12	2.9172	2.9225	2.9199
2016-01	3.0070	3.0124	3.0097
2016-02	2.9407	2.9460	2.9433
2016-03	2.8917	2.8969	2.8943

2016-04	2.8347	2.8398	2.8373
2016-05	2.9266	2.9319	2.9292
2016-06	2.9170	2.9222	2.9196
2016-07	2.9576	2.9629	2.9602
2016-08	2.9629	2.9682	2.9655
2016-09	2.9601	2.9654	2.9628
2016-10	3.0679	3.0735	3.0707
2016-11	3.2675	3.2733	3.2704
2016-12	3.4889	3.4952	3.4921
2017-01	3.7349	3.7416	3.7383
2017-02	3.6724	3.6790	3.6757
2017-03	3.6659	3.6725	3.6692
2017-04	3.6538	3.6604	3.6571
2017-05	3.5639	3.5703	3.5671
2017-06	3.5190	3.5253	3.5222
2017-07	3.5599	3.5663	3.5631
2017-08	3.5125	3.5188	3.5156
2017-09	3.4680	3.4743	3.4712
2017-10	3.6623	3.6689	3.6656
2017-11	3.8791	3.8860	3.8825
2017-12	3.8477	3.8546	3.8512
2018-01	3.7723	3.7791	3.7757
2018-02	3.7780	3.7848	3.7814
2018-03	3.8809	3.8879	3.8844
2018-04	4.0540	4.0613	4.0577
2018-05	4.4141	4.4221	4.4181
2018-06	4.6282	4.6366	4.6324
2018-07	4.7480	4.7566	4.7523
2018-08	5.7302	5.7405	5.7354
2018-09	6.3669	6.3783	6.3726
2018-10	5.8594	5.8699	5.8647
2018-11	5.3735	5.3832	5.3783
2018-12	5.3061	5.3157	5.3109

Figure 4: Stationary for PICE and EXCH Graphs

PICE

EXCH
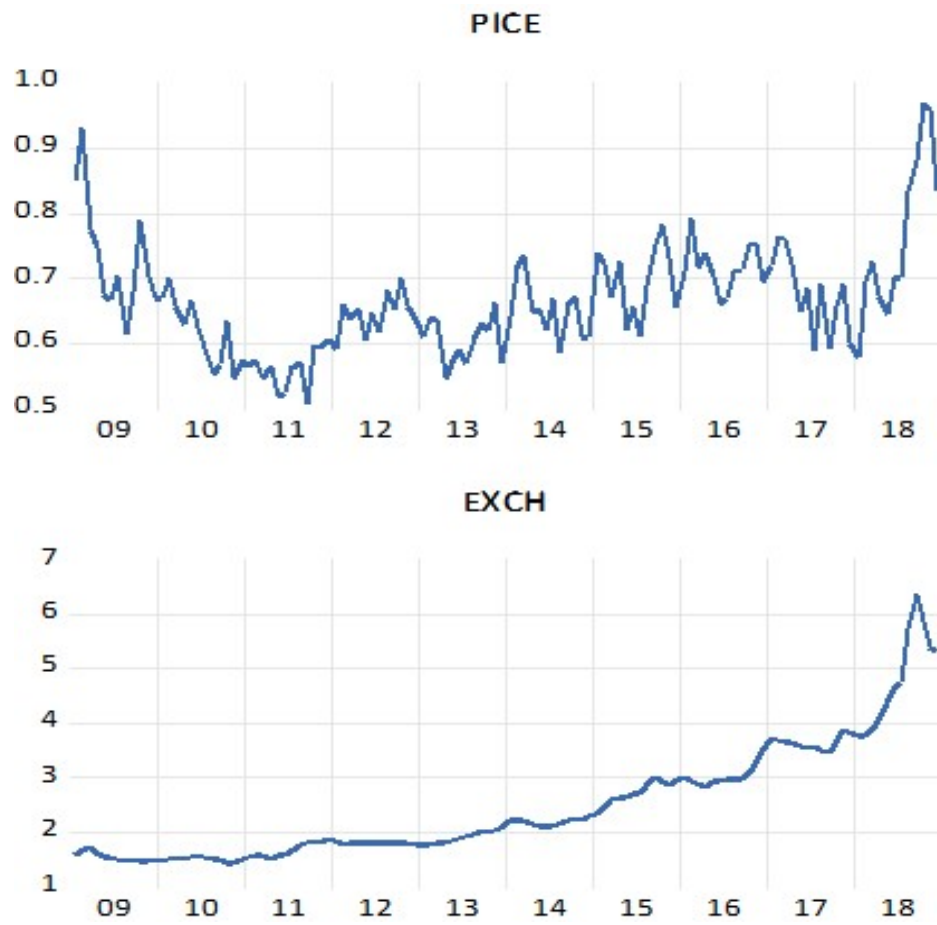
Add 3: VAR Analysis

VAR Residual Serial Correlation LM Tests					
Date: 04/01/20 Time: 22:55					
Sample: 2009M01 2018M12					
Included observations: 119					
Null hypothesis: No serial correlation at lag h					
Lag	LRE* stat	def.	Prob.	Rao F-stat	def.	Prob.
1	21.68321	4	0.0002	5.663088	(4, 226.0)	0.0002
2	19.39357	4	0.0007	5.039231	(4, 226.0)	0.0007
Null hypothesis: No serial correlation at lags 1 to h					
Lag	LRE* stat	def.	Prob.	Rao F-stat	def.	Prob.
1	21.68321	4	0.0002	5.663088	(4, 226.0)	0.0002
2	58.95623	8	0.0000	8.312860	(8, 222.0)	0.0000
*Edge worth expansion corrected likelihood ratio statistic.					

Add4: Characteristic Inverse Roots of the VAR Model

Roots of Characteristic Polynomial	
Endogenous variables: D(EXCH) D(PICE)	
Exogenous variables: C	
Lag specification: 1 3	
Date: 04/01/20 Time: 23:31	
Root	Modulus
0.031061 - 0.705562i	0.706245
0.031061 + 0.705562i	0.706245
0.088372 - 0.602044i	0.608495
0.088372 + 0.602044i	0.608495
-0.572758	0.572758
0.526226	0.526226
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

Add 5: Johansen Co-integration Test

Date: 04/02/20 Time: 13:58				
Sample (adjusted): 2009M06 2018M12				
Included observations: 115 after adjustments				
Trend assumption: Linear deterministic trend				
Series: PICE EXCH				
Lags interval (in first differences): 1 to 4				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.103343	16.22181	15.49471	0.0388
At most 1	0.031471	3.677381	3.841465	0.0551
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.103343	12.54443	14.26460	0.0918
At most 1	0.031471	3.677381	3.841465	0.0551
Max-eigenvalue test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):				
PICE	EXCH			
-21.19211	1.136372			
-5.000927	-1.218324			

Unrestricted Adjustment Coefficients (alpha):				
D(PICE)	0.012267	0.005051		
D(EXCH)	0.027159	-0.014200		
1 Cointegrating Equation(s):		Log likelihood	279.1080	
Normalized cointegrating coefficients (standard error in parentheses)				
PICE	EXCH			
1.000000	-0.053622			
	(0.01962)			
Adjustment coefficients (standard error in parentheses)				
D(PICE)	-0.259962			
	(0.09514)			
D(EXCH)	-0.575546			
	(0.23404)			

Add 6: VEC Test

Vector Error Correction Estimates		
Date: 04/02/20 Time: 14:23		
Sample (adjusted): 2009M04 2018M12		
Included observations: 117 after adjustments		
Standard errors in ( ) & t-statistics in [ ]		
Cointegrating Eq:	CointEq1	
PICE(-1)	1.000000	
EXCH(-1)	-0.065061	
	(0.01318)	
	[-4.93669]	

C	-0.501040		

Error Correction:	D(PICE)	D(EXCH)	
CointEq1	-0.310112	-0.593507	
	(0.07696)	(0.19356)	
	[-4.02961]	[-3.06624]	
D(PICE(-1))	-0.233164	0.289637	
	(0.09197)	(0.23131)	
	[-2.53527]	[1.25214]	
D(PICE(-2))	-0.134103	0.264143	
	(0.08584)	(0.21590)	
	[-1.56221]	[1.22343]	
D(EXCH(-1))	0.050685	0.472118	
	(0.03479)	(0.08750)	
	[1.45691]	[5.39565]	
D(EXCH(-2))	0.058710	-0.489381	
	(0.03646)	(0.09169)	
	[1.61042]	[-5.33714]	
C	-0.003061	0.033337	
	(0.00468)	(0.01178)	
	[-0.65373]	[2.83115]	
R-squared	0.303873	0.354476	
Adj. R-squared	0.272516	0.325398	
Sum sq. resids	0.258485	1.635172	
S.E. equation	0.048257	0.121372	
F-statistic	9.690730	12.19067	
Log likelihood	191.7170	83.80412	
Akaike AIC	-3.174650	-1.329985	
Schwarz SC	-3.033000	-1.188335	

Mean dependent	0.000506	0.030789	
S.D. dependent	0.056578	0.147773	
Determinant resid covariance (dof adj.)		3.39E-05	
Determinant resid covariance		3.06E-05	
Log likelihood		276.1367	
Akaike information criterion		-4.480969	
Schwarz criterion		-4.150452	
Number of coefficients		14	

List of graphs

List of tables

List of Figure