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Turkish J- Curve: Trade Balance and Real Exchange Rate Relation

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ABSTRACT

This study investigates the relationship between trade balance and real exchange rate relation using available data from 1992 :M1 to 2015 :M12 in Turkey. We take real effective exchange rate, industrial production indexes for both Turkey and five developed high income trade partner countries (Germany, France, Spain, Italy and the USA) proxies for real exchange rate and income effects and imports to exports rate as proxy for trade balance. At this research paper, We will look at the case for Turkey foreign trade with selected trade partners and exchange rate policy relations. Solely devaluation/depreciation of the currency does not bring success to elimination of trade deficit. At these studies investigating j-curve hypothesis and Marshall Lerner condition, different models and econometric techniques are used. With different perspectives, these papers found different results. Some of them found evidence supporting j-curve hypothesis, on the other hand some others did not found evidence from empirical data. Empirical research show that this result does not exist for every country and every time. At this research paper, We will look at the case for Turkey foreign trade with selected trade partners and exchange rate policy relations. Solely devaluation/depreciation of the currency does not bring success to elimination of trade deficit. In this context, cointegration tests are applied in order to search short-run and long-run elasticities of the trade balance and currency depreciation/devaluation. Empirical findings suggest that in the long run exchange rate and foreign trade balance have a relation. For the period. results of the cointegration tests show that devaluation/depreciation has long run impacts on trade dynamics and for a short time there exists j-curve pattern for Turkey. According to Granger causality tests, there are bidirectional relations between income level of Turkey with trade balance, real effective exchange rate and foreign income levels respectively. Also there exists unidirectional relations between trade balance with real effective exchange rate and foreign income respectively.

Keywords: J Curve, Trade Balance, Real Exchange Rate, Turkish Economy

Türkiye J- Eğrisi: Ticaret Dengesi ve Reel Döviz Kuru İlişkisi

ÖZ

Bu çalışmada, Türkiye'de dış ticaret dengesi ile reel döviz kuru arasındaki ilişki 1992:01- 2015:12 verileriyle incelenmiştir. Türkiye ve yüksek gelir grubundaki beş gelişmiş ticaret partneri ülkenin (Almanya, İspanya, İtalya ve ABD) reel döviz kuru, gelir etkileri ve ticaret dengelerini analiz etmek üzere reel efektif döviz kuru, sanayi üretim endeksi ve ihracatın ithalatı karşılama oranı değişkenleri kullanılmıştır. Bu çalışmada, seçilmiş ticaret ortakları ile Türkiye dış ticaretine ve döviz kuru politikası ilişkisi incelenmiştir. Bu bağlamda sadece paranın devalüasyonu, ticaret açığının ortadan kaldırılması için yeterli değildir. J-eğrisi hipotezini ve Marshall Lerner durumunu inceleyen çalışmalarda farklı modeller ve ekonometrik teknikler kullanılmıştır. Farklı bakış açıları ile bu makaleler farklı sonuçlar bulmuştur. Bazıları j-eğrisi hipotezini destekleyen kanıtlar bulurken, bazıları ise ampirik verilere göre yeterli kanıt bulamamıştır. Ancak, ayarlama gecikmesi nedeniyle döviz kuru değişikliklerinin ticaret dengesi üzerindeki etkileri anlık değildir. Nitekim, ilk başta ticaret dengesi kötüleşecek ve iyileşme ancak gecikmeler gerçekleştikten sonra gelecektir. Hem iç hem de dış piyasaların tepkileri döviz kurundaki değişimin etkisini belirlemektedir. İthalat-ihracat esnekliklerinin toplamı Marshall Lerner koşulunun üzerindeyse, açık azalmaktadır. Marshall-Lerner koşulu karşılanırsa, para devalüasyonu/revalüasyonu uzun vadede ticaret dengesini iyileştirecektir. Bu çerçevede, ticaret dengesinin kısa vadeli ve uzun vadeli esnekliklerini ve para revalüasyonu/devalüasyonunu araştırmak için eşbütünleşme testleri uygulanmaktadır. Ampirik bulgular uzun vadede döviz kuru ve dış ticaret dengesinin bir ilişkisi olduğunu göstermektedir. İnceleme döneminde için eşbütünleşme testlerinin sonuçları, devalüasyon/revalüasyonun ticaret dinamikleri üzerinde uzun vadeli etkileri olduğunu ve kısa bir süre için Türkiye için j-eğrisi paterni olduğunu göstermektedir. İnceleme döneminde J eğrisi çok kısa bir süre geçerli olmuştur. Reel efektif döviz kuru ile dış ticaret dengesi arasında ve beş gelişmiş ülkenin ulusal gelirler düzeyleri ile dış ticaret dengeleri arasında Granger nedensellik testlerine göre, Türkiye'nin gelir dengesi ile ticaret dengesi, reel efektif döviz kuru ve yabancı gelir düzeyleri arasında iki yönlü ilişkiler bulunmaktadır. Öte yandan, Türkiye'de dış ticaret dengesinden ulusal gelir düzeyine doğru tek yönlü nedensellik bulunmaktadır.

Anahtar Kelimeler: J Eğrisi, Ticaret Dengesi, Reel Döviz Kuru, Türkiye Ekonomisi

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1. Introduction

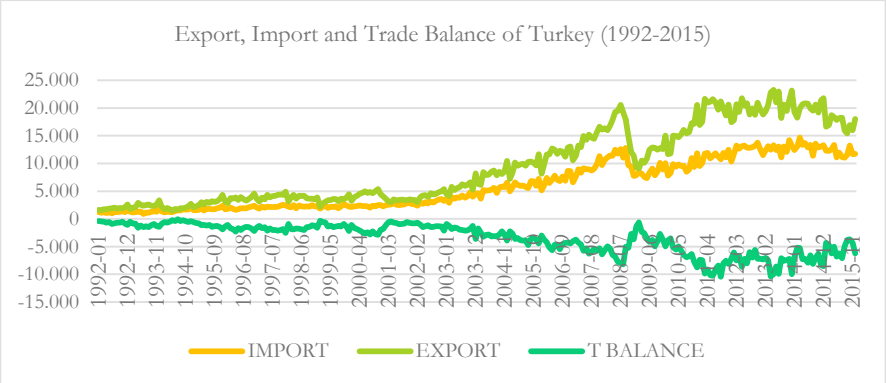
In general, currency devaluation under fixed exchange rate system or depreciation under flexible exchange rate system are at the main interest of policy makers. Policy makers, in order to eliminate trade deficits, choose to use foreign exchange transactions/interventions as a tool for changing foreign trade potential of the country. A depreciation/devaluation will improve trade balance in the long run, but in the short run will worsen the trade balance. This is a questionable situation depending on the country and time.

At this research paper, we will look at the case for Turkey foreign trade with selected trade partners and exchange rate policy relations. Solely devaluation/depreciation of the currency does not bring success to elimination of trade deficit. Elasticity of exports and imports of a country is another factor. Responses of both domestic and foreign markets determine the impact of change in foreign exchange rates. If sum of import and export elasticities is over unity, which is known as Marshall-Lerner condition, deficit declines. If Marshall-Lerner condition is satisfied, currency devaluation/depreciation will improve trade balance in the long run. However, due to adjustment lag effects of exchange rate changes on the trade balance is not instantaneous. As a matter of fact, the trade balance will worsen at first and improvement will come only after the lags are realized, hence the j-curve pattern. Empirical research show that this result does not exist for every country and every time.

Under certain conditions, after devaluation/depreciation trade balance does not improve in a short time, provision of commitments to foreign trade partners and low level of price elasticities for some imported products at the beginning may worsen trade balance, with allowance of a time for markets to adopt this new rate of the currency, the volume of exports start to increase with their highly competitive prices and domestic consumers start to consume less import products and more domestic substitutes depending on their elasticities. Then, trade balance start to improve. Graphically this situation seems as a j shaped curve for trade balance of a country.

Focus of this paper will be investigating trade balance and exchange rate relation for Turkey and existence of j-curve pattern during last two decades with long and short run distinction and casualty relations between the variables.

In Turkey case, trade oriented development strategy and market based economic system begins at 1980 and this is followed by implementation of financial liberalization since 1989. Export subsidies and allowance for exchange rate depreciation made Turkish exports more competitive and export promoted industries became important power of the economy - export led growth policy. However, changing policies without necessary infrastructure and resources resulted with serious economic crises and liberalizing trade caused the emergence of current account deficit problem on the following years. As seen on the Graph 1 below, only after economic crises there are short term positive trade balance periods. Then trade deficit started to increase. Especially, after 2008 Great Depression, deficit volumes increased and Turkey showed a chronic high trade deficit performance with the support of economic conditions of the world economy.

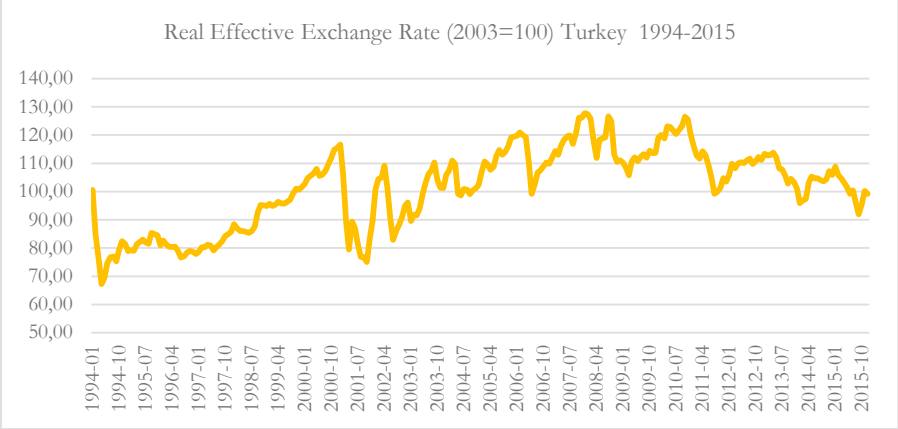


Graph 1: Foreign trade performance of Turkey (Source: www.tcmb.gov.tr)

At 1989, there was a change in policy to control inflation and creating resources for borrowing from markets easily which reversed the depreciation of Turkish Lira and it started to appreciate. These changes in

conditions are followed by several world crises and Turkey took its share from these crises with developing structure of economy. 1994, 1999 and 2001 recessions caused devaluations and these arrangements of currency showed some improvements in trade balance in the short run but did not last in the long run. As a result, accumulation of problems made Turkey to implement a stabilization program with IMF. Stabilization program and European Union candidacy reforms in several areas bring Turkish economy to a stronger position than previous years. These developments carried Turkish economy to a higher level, but economic problems starting in 2008 in United States of America, European Union and nowadays China`s slowdown generates possibility of future economic crises in developing countries like Turkey. Also, political problems inside the country and with neighbor countries affected overall economy in Turkey.

In order to check financial soundness of the economy, Real Effective Exchange Rate (REER) can be taken as blood pressure of overall economy, which is known as an indicator of competitiveness. According to Graph 2, after 2001 Crisis, Turkish economy shows a fluctuating structure and continuous fluctuations affect foreign trade performance as well. As REER increases, Turkish Lira appreciates and loose competitive position. As in the case, between 2001 Crisis and the end of 2010, Turkish Lira appreciates and becomes to over 120 levels which is unofficially taken as a benchmark for overvalued Turkish Lira. Beginning from 2011, Turkish Lira started to depreciate with fluctuations and as of May 2016, REER is around 100 levels.



Graph 2: Real Effective Exchange Rates for Turkey. (Source:www.tcmb.gov.tr)

2. Literature Review

There are many studies investigating existence of Marshall-Lerner condition and j-curve effect in the literature. Bahmani-Oskooee (1985), Bahmani-Oskooee and Malixi (1992), Rose (1991), Rose and Yellen (1989), Brada et al., (1997), Meade (1988), Akbostanci (2004), Halicioglu (2007, 2008a, 2008b), Irhan et.al (2011) are among countless others.

At these studies investigating j-curve hypothesis and Marshall Lerner condition, different models and econometric techniques are used. With different perspectives, these papers found different results. Some of them found evidence supporting j-curve hypothesis, on the other hand some others did not found evidence from empirical data. Also, there are some papers with mixed results for bilateral trade relations. Some of the countries in the sample countries have j-curve trends but others do not have or vice versa. Same works also made for sectoral relations. Again there is no clear cut results. This creates an attraction of attention of economists to the subject. It will be better to classify papers according to their results.

As mentioned before, economists are not in the same line. If we separate papers into two groups with having j-curve or not; in the existence of j-curve result group we will see; Noland (1989) for Japan during 1970-1985 period, j-curve effect exist and satisfy Marshall Lerner conditions for the long run. Lal and Lowinger (2002a) for seven East Asian countries during 1980-1989 period, found j-curve effect except for

Japan and long run relationship for both countries. Lal and Lowinger (2002b) for five South Asian countries during 1985-1998 period, found j-curve effect and long run relationship with time lags between exchange rate and foreign trade. Narayan and Narayan (2004) for Fiji during 1970-2002 period, j-curve effect and long run relationship exists between income, trade and real exchange rate. Bahmani-Oskooee(1985) for four developing countries, during 1973-1980 period, j-curve exists with similar long run and short run trends. Bahmani-Oskooee and Malixi (1992) for thirteen developing countries from Asia, Europe and Latin America during 1973-1985 period, j-curve exists in some countries. Turkey is one of the sample country in this paper. Inverse N curve exist for Turkey and there is positive relationship between devaluation and trade balance relation. Bahmani-Oskooee and Kutan (2009) for eleven emerging economies of Eastern Europe during 1990-2005 period, only three of them showed existence of j-curve effect. Short run effects of depreciation does not last into long run. Turkey exists in this paper and it did not show j-curve effect. Bahmani-Oskooee and Harvey (2010) for Malaysia during 1973-2003 period, j-curve received empirical support and long run relationship exists for real exchange rate and trade balance. Kale (2001) for Turkey during 1984-1996 period, there exists a delayed j-curve effect and improvement of trade balance in the long run due to depreciation of Turkish Lira. Halıcıoğlu (2008) for Turkey during 1980-2005 period, shows that j-curve phenomenon is supported in the short run, parameter stability tests on the long run, trade balance appear to be inconclusive. According to Yavuz et al., (2010) j-curve effect exists, but Marshall Lerner conditions do not exist for Turkey for 1988-2007 period.

On the other hand, Rose and Yellen (1989), for both bilateral with Group of Seven and the USA during 1960-1985 period, found that there is no statistically reliable evidence of the j-curve. Rose (1990) for thirty developing countries, during 1970-1988 period, found no strong stable effect of the exchange rate on the trade balance. Bahmani-Oskooee and Alse (1994) for nineteen developed countries and twenty two developing countries, only at six countries, during 1971-1990 period, including Turkey j-curve existence found and real exchange rate and trade balance are cointegrated. Bahmani-Oskooee and Ratha (2004) for eighteen industrial major trade partners of the USA, during 1975-2000 period, j-curve effect is not observable and depreciation of the US dollar positively affects trade balance. Bahmani-Oskooee and Harvey (2014) for Singapore during 1974-2011 period, for industry based analysis, some of them showed j-curve effect both not the others. Brada et.al (1997) for Turkey during 1969-1993 period, finds that before 1980s there is no long run relationship, but after policy change in 1980s, real exchange rate has an impact on trade balance both in the short run and long run. Kale (2001) finds that a real depreciation would improve the Turkish trade balance in the long run and a delayed j-curve effect. Yazıcı and Klasra (2010) for Turkey, manufacturing and mining sectors during 1986 and 1998, there is no j-curve effect in both sectors. Yazıcı (2010) for Turkey, service sector, during 1986-1998 period, like the other two sectors mentioned above there is no j-curve effect. Depreciation of Turkish Lira improves trade balance in the long run. Yazıcı and Islam (2011) for Turkey and European Union countries by customs union and exchange rate during 1982-2001 period no j-curve effect and long run improvement in trade balance by customs union and depreciation in exchange rate observed. Akbostanci (2004) for Turkey, argues that for 1987-2000 period there is a long run relationship where Rose and Yellen (1988) and Rose (1989) opposes existence of relation and no j-curve effect exists. Halicioglu (2008) for Turkey with thirteen trading partners during 1985-2005 period, finds no j-curve effect and argues that long run relation exists. Also, in an another paper of Halicioglu (2007) about bilateral trade dynamics of Turkey for 1960-2000 period, there is no evidence of j-curve effect and existence of Marshall Lerner condition with some of the trading partners holds but not with the whole trade partners set. Erdem et al., (2010) for Turkish agricultural sector with European Union countries during 1987-2005 period, j-curve effect is not observable and monetary and real variables have significant effects both on short run and long run.

Sample of results can be increased and overall, there exists a fairly ambiguous set of research work. As seen from both foreign country research and Turkey case research there is no unique result. Relations depend on country specific conditions, world economy and exchange rate conditions. Bahmani-Oskooee and Alse (1994) states that differences arise from three main reasons: Data for different periods, different currency calculations (for export-import balance) and usage of non-stationary data (previous time research) where standard tests such as the t-test cannot yield valid results.

As mentioned before, there is a tendency for making bilateral research for identifying relations in the literature. But, in this paper, We will do an analysis with a composite index for selected foreign trade partners of Turkey calculated by principal component analysis in order to determine the overall conditions with a wider perspective[*] then bilateral trade relations.

3. Data

The primary aim of this study is to analyze the relationship between trade balance and effective real foreign exchange rate for Turkey. The analysis of the study covers monthly data for the period of 1992:M1 to 2015:M12 which come from the following sources and both are electronic databases:

1. IMF : International Monetary Fund, International Financial Statistics database,
2. CBT : Central Bank of Republic of Turkey, Electronic Data Distribution System

MX = measure of the trade balance. It is defined the ratio of Turkey`s imports over exports with five selected countries. Import and export data are compiled from CBT.

Imports/exports rate[**] is used because it is not sensitive to units of measurement. Trade balance by difference of exports and imports requires price adjustments for having real balances and it can be effected by choice of the price index.

REER = the real effective exchange rate of Turkish Lira and source is CBT. (2003=100) A decline reflects a real depreciation of Turkish Lira and increase shows appreciation of Turkish Lira.

IPITR = measure of domestic income. Index of industrial production index for Turkey is used as a proxy for output (2010=100) and source is IMF.

INDEX2 = measure of five developed countries' income. Five developed countries are Germany, France, Italy, Spain and the United States of America. Index of industrial production index is used as a proxy for output (2010=100) and source is IMF.

Five developed countries' industrial production indexes converted to a single index by using Principal Components Analysis (PCA). PCA is defined by Ringnér (2008) as a mathematical algorithm for reducing the dimensionality of the data while preserving richness of the data variations. It accomplishes this reduction by identifying directions, called principal components, along which the variation in the data is maximal. By using a few components, each sample can be represented by relatively few numbers instead of by values for thousands of variables.

As mentioned before, this study does not look at country specific relations and try to investigate Turkey's trade relation with these countries as a group. Sample countries are selected from top 20 trade (export and import) partners of Turkey. Russia, Iran, Iraq and Saudi Arabia are eliminated due to bilateral energy trade relation. United Kingdom and Poland showed unresponsive trade relation according to exchange rate and policy differences. Their trade relations did not affected from the changes in exchange rates. This can be explained by low elasticity levels of commodities subject to trade relations between these countries and Turkey bilaterally. Other countries eliminated due to low level of share in total trade and/or lack of data in entire period.

Dummy variable: In order to eliminate effect of major policy changes and devaluation/depreciation realizations I used dummy variables for the years in which devaluations and exchange rate policy changes took

[*] For Turkey case, trade partners do not have dominance on Turkish Foreign Trade volume. Germany has the biggest share which is less than 10 %.

[**] There is no consensus about trade balance presentation. Some of the researchers take it as a difference and others as ratio of imports and exports. Same situation is valid for ratio presentation. Imports to exports or exports to imports ratios are used. Also, there are some researchers that has used three types of trade balance presentation at their different research papers.

place: 1994 (Financial Crisis/devaluation), 1996 (Currency peg regime) and 2001 (Financial Crisis/depreciation) as "1" and take other years as "0".

In the literature, as in j-curve phenomenon, dummy variables for policy changes and devaluation is not generally used. In some papers, in order to eliminate effect of policy changes and shocks like financial crisis, dummy variables are used for analyzing trade balance and exchange rate relation. Bahmani-Oskooee (1985), Krugman and Baldwin (1987), Noland (1989),Bahmani-Oskooee and Hegarthy (2010), Yazıcı and Islam (2011), Bahmani-Oskooee and Harvey (2014) and Korkmaz et.al (2015) are some examples of dummy variable used research works.

All the data are seasonally unadjusted values and are in their natural logarithms which enable to explain them in a constant elasticity form in line with the existing studies, except INDEX2, for which no logarithmic transformation has been applied.

Table 1: Summary for Descriptive Statistics

	lnREER	lnIPITR	INDEX2	lnMX
Mean	4.58	4.37	0.00	0.46
Median	4.61	4.32	-0.28	0.46
Maximum	4.85	4.90	2.54	0.99
Minimum	4.07	3.83	-1.58	0.02
Std.Dev.	0.16	0.29	1.00	0.14
Observations	288	288	288	288

As seen above, calculations show that standard deviations of lnREER, lnIPITR and lnMX are at very low levels. Dispersion levels are not so much. This means that volatility levels are not so much for them.

Table 2: Correlation matrix

	lnREER	lnIPITR	lnMX	INDEX2
LnREER	1.00			
LnIPITR	0.73	1.00		
LnMX	0.09	-0.01	1.00	
Index2	0.56	0.80	-0.03	1.00

According to correlation matrix, lnIPITR and Index2 has the highest correlation, indicating that income levels of Turkey and selected countries income levels have positive and relatively stronger correlation with respect to other variables. The lowest correlation is between lnMX and lnIPITR, negative and a very poor relation. lnREER has the highest correlation with lnIPITR and lowest with lnMX. As income level of Turkey increases lnREER positively and strongly affected. On the other hand, lnMX and Index2 has negative but low level of relation. As income levels of trade partners increase imports to exports levels decreases which means trade deficit of Turkey declines.

4. Methodology

After, Engle and Granger (1987) paper, cointegration and error correction models were introduced. Cointegration model is used for testing long run effects of currency depreciation on the trade balance and error correction models for testing short run effects or the j-curve phenomenon. Research work conducted on different types of data. Following Rose and Yellen (1989), bilateral level research began. Aggregate trade data and bilateral trade data usage generated mixed conclusion for research papers. But there is a consensus about trade balance to relate with income (domestic and foreign) and real exchange rate. The trade balance model used in this paper is adopted from Rose and Yellen (1989) and it takes the following long run cointegrating form:

$$LnMX_t = \alpha_0 + \alpha_1 \ln REER_t + \alpha_2 \ln IPITR_t + \alpha_3 Index2_t + \alpha_4 d_t + \varepsilon_t$$

where the measure of the trade balance, MX is the ratio of imports to exports. REER is the real effective exchange rate; IPITR is the industrial production index for Turkey; Index 2 is the aggregated industrial production index of five developed countries. Ln is the natural logarithm transformation, dt is dummy variable and ɛt is the random error term. It is expected that $\alpha 1>0$ since an increase in real effective exchange rate initially reduces the demand for the home country's export but increases its demand for imports. As a result, the balance of trade worsens initially but it will improve after a while as export and import volumes adjust to price changes.

As specified in the data section, industrial production indexes of five preselected countries are calculated by principal component analysis by using SPSS and generated a new common index for these countries in order to evaluate Turkey and five developed countries trade relations depending on exchange rate differences.

In order to investigate the cointegrating trade balance model with a view of testing the j-curve, I will test existence of cointegration relationship and then, investigate causality direction between the variables by using STATA.

First of all, we need to determine the degree of integration of each time series using Augmented Dickey Fuller (ADF) test. After examining the stationary properties for variables, if they are at the same stationarity level, that is; if they are all integrated of same order, then it is necessary to apply the Johansen cointegration test, used to specify any long-run relationship between them. Otherwise, it is necessary to apply Autoregressive Distributed Lag (ARDL) Bounds Test to determine existence of long-run relationship among variables. The cointegration test has a crucial role in deciding the model used in detecting the relationship between foreign trade and exchange rate.

When there is a deviation in long run relation between cointegrated variables, it was investigated through Vector Error Correction Model (VECM) whether the deviation disappears in time and long-run balance is regained.

After examining cointegration, a Granger causality test is performed. Causality tests analyze the causal effect amongst a set of variables by testing for their predictability based on past and present values. Groenewold and Tang (2007) argue that Granger causality tests are applicable regardless of the orders of integration of the underlying variables if it has been established that there exists a long-run equilibrium relationship between the underlying series. Granger (1987) and Granger (1988) point out that if two time-series variables are cointegrated, then at least one-directional Granger-causation exists. Therefore, the existence of a stable long-run relationship (cointegrating relationship) among trade balance and real effective exchange rate implies that the variables are causally related at least in one direction. Hence, there are two possible sources of causality: error correction term, which shows long-run causality, and lagged explanatory variables, revealing short-run causality.

According to Granger (1988), when there is cointegration between variables, Granger causality testing requires using the error correction term obtained from cointegration model. In other words, in case the variables are cointegrated, that is, existence of long-run relationship between the variables implies application of the causality analysis by using VECM.

In order to test the presence and the direction of causality between trade balance and exchange rate Granger causality test is applied. The direction of causality determines the direction of the relationship. Granger causality test has three relations in line with the theory:

a) One way causality: In this single equation model, A is the dependent variable and B independent. Causality relationship is unidirectional from A to B ($A \Rightarrow B$)

b) Two-way causality: There can be a bidirectional relation between variables. ($A \Leftrightarrow B$).

c) Lack of Causality: There is no relationship among variables, therefore no causality.

In order to apply Granger causality test, the series that belong to variables should be stationary.

First of all, applied ADF Test which is the most commonly used test in the literature. Applying the ADF unit root test for the intercept model requires estimating the following regression.

$$\Delta yt = \beta 1 + \beta 2 yt\text{-}1 + pt=1\Sigma\phi i\Delta yt\text{-}I + \varepsilon t$$

where Δ is the first difference operator: yt shows series used in the test i.e. lnREER lnIPITR, INDEX2, and lnMX; T is an time trend; p represents the number of lags, which is determined based on the Akaike Information Criterion (AIC); ε is a random error term. For trend and intercept model, it is necessary to include trend variable in the ADF equation. In Equation, where ΔYt is the dependent variable, the null and alternative hypothesis for cointegration analysis are

H0: $\sigma 1Y = \sigma 2Y = 0$, there is no cointegration (there exists no long-run equilibrium relationship),
H1: $\sigma 1Y \neq 0$ and $\sigma 2Y \neq 0$, there is cointegration (there exists long-run equilibrium relationship)

These hypotheses are tested using the F-test. Nevertheless, F-test has nonstandard distributions that depend on the sample size, the inclusion of intercept and trend variable in the equation and the number of regressors. If the test statistic is above an upper critical value, the null hypothesis of no long-run relationship can be rejected regardless of the orders of integration of the underlying variables. The opposite is the case if the test statistic falls below a lower critical value. If the sample test statistic falls between these two bounds, the result is inconclusive.

The existence of a cointegration does not necessarily imply that the estimated coefficients are stable. Therefore, stability tests of Brown et al. (1975), which are also known as cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests based on the recursive regression residuals, may be employed to that end. These tests also incorporate the short-run dynamics to the long run through residuals. The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the break points of the model. Providing that the plot of these statistics fall inside the critical bounds of 5% significance, one assumes that the coefficients of a given regression are stable. These tests are usually implemented by means of graphical representation. In this paper, will use CUSUM Test for checking stability.

5. Emprical Results

In order to check stationarity, first, applied ADF Test for the variables and found that both dependent and independent variables are stationary.

Table 3: ADF Unit Root Test results

ADF Unit Root	Coefficient	T	P>|t|
lnREER	-0.027834	-2.03	0.043
lnIPITR	-0.0378115	-2.31	0.022
Index2	-0.2959186	-7.01	0.000
Ln(M/X)	-0.3088771	-7.25	0.000

Since the p-value of Level (1) is lower than 5% significance level, can reject the null hypothesis that the series for the both variables are non-stationary. So, I conclude that lnREER, lnIPITR, Index2 and lnMX are stationary at same level.

All variables are integrated at the same order and I can apply Johansen Test of Cointegration, According to Johansen's Cointegration tests, there is cointegration between variables and the number of of cointegrated vector is at most 1 at 10% significance level.

Then, checked at VECM to find long run relationship of the variables in the model.

Results show that lnREER, lnIPITR, D01 and INDEX2 are statistically significant at 5% level. According to the Table 4, 1% increase in lnREER(-1) causes increase in lnMX by 46%, 1% increase in lnIPITR(-1) causes increase in lnMX by 19%, 1% increase in D01 causes decrease in lnMX by 3% and 1% increase in INDEX2 (-1) causes decrease in MX by 2% in the short run.

Table 4: Short run elasticities

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004769	0.005562	0.857305	0.3921
Δ(LNMX(-1))	-0.492134	0.066110	-7.444188	0.0000
Δ(LNREER(-1))	0.460499	0.152084	3.027935	0.0027
Δ(LNIPITR(-1))	0.199655	0.092924	2.148575	0.0326
Δ(INDEX2(-1))	-0.026289	0.010779	-2.438918	0.0154
D01	-0.031166	0.015724	-1.982034	0.0485
ECT(-1)	-0.159774	0.040385	-3.956266	0.0001
R-squared	0.483739	Mean dependent var		0.000448
Adjusted R-squared	0.447860	S.D. dependent var		0.111578
S.E. of regression	0.082909	Akaike info criterion		-2.076239
Sum squared resid	1.780358	Schwarz criterion		-1.828308
Log likelihood	307.5972	Hannan-Quinn criter.		-1.976771
F-statistic	13.48248	Durbin-Watson stat		2.044128
Prob(F-statistic)	0.000000			

Δ(lnmx(-1)) Δ(lnmx(-2)) Δ(lnREER(-1)) Δ(lnREER(-2)) Δ(lnREER(-3)) Δ(lnIPITR(-1)) Δ(lnIPITR(-2)) Δ(INDEX2(-1)) Δ(INDEX2(-2)) Δ(INDEX2(-3)) Δ(INDEX2(-4)) Δ(INDEX2(-5)) Δ(INDEX2(-6)) Δ(INDEX2(-7)) Δ(INDEX2(-8)) Δ(INDEX2(-9)) are all short run coefficients.

Narayan and Narayan (2004) states that positive coefficients followed by negative coefficients will support the j-curve hypothesis where this shows that an initial worsening of the trade balance followed by an improvement.

According to Table 4, lnREER is only one lag significant with 0.27% at 5% significance level and j-curve exists for a short time and following lags results are statistically insignificant.

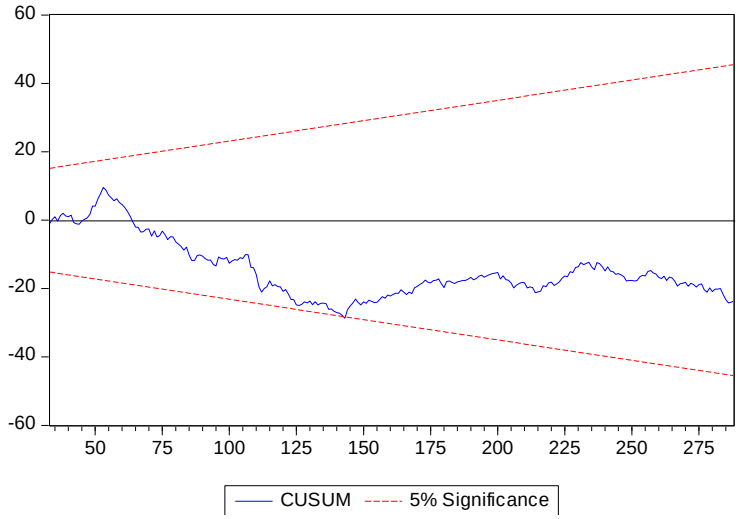
LnIPITR is only one lag significant with 3.26% at 5% significance level and INDEX2 is only one lag significant with 1.54% at 5% significance level. As income level of Turkey increases, imports to exports ratio increases, but as income level of selected countries increases, they start to buy more Turkish exports and Turkish imports declines by the increase at price levels of these countries.

Dummy variable is less than 5% significance level and statistically significant. It shows that policy and exchange rate changes effect trade balance. 15.97% of deviations from long run balance recover in a period and it will approach to long-run balance.

In the model, the coefficient of error correction term is defined as ECT(-1). It has to be negative and statistically significant. It shows the speed of adjustment. The P-value of error ECT(-1) is 0.001 which is lower than 5% significance level which implies that there exists long run relationship between variables.

The R-square of the model is 48%, which is not to low and I can say that this is a moderate model. 0.48 variation in lnMX is explained by lnREER, lnIPITR and INDEX2.

In order to test to determine stability of all coefficient estimates of the error-correction models, applied Cusum Test. This test is based on cumulative sum of the recursive residuals. According to test results, all equations have structural stability. The blue line is within the interval of red lines meaning that this model is stable.



Graph 3 : Cusum results

In order to investigate causality relations between variables, I applied Granger causality tests and results are shown below. We reached to three kind of empirical findings; one way causality, two way causality and lack of causality. Out of table values do not show any mutual relation between each other.

Table 5 : Granger Causality Results (under 5% significance level)

Variable	*Result*	*Causality*
lnREER and lnMX	*REER causes MX*	*Unidirectional*
LnIPITR and lnMX	*IPITR causes MX* *MX causes IPITR*	*Bidirectional*
INDEX2 and lnMX	*INDEX2 causes MX*	*Unidirectional*
LnIPITR and lnREER	*IPITR causes REER* *REER causes IPITR*	*Bidirectional*
INDEX2 and lnIPITR	*INDEX2 causes IPITR*	*Unidirectional*
lnREER and INDEX2	*REER causes INDEX2*	*Unidirectional*
LnIPITR and INDEX2	*IPITR causes INDEX2*	*Unidirectional*

In view of the causality test results, there is bidirectional causality relationship between lnIPITR to lnMX and lnREER to lnIPITR. There is no causality between lnMX to lnREER and lnMX to INDEX2. Directions are summarized in the following Table 6

Table 6: Causality Relations and Directions

	LnMX	lnREER	lnIPITR	INDEX2
LnMX		NO	→	NO
LnREER	→		→	→
LnIPITR	→	→		→
INDEX2	→	NO	→	

6. Conclusion

This paper has attempted to estimate existence of j-curve and Marshall Lerner condition through a reduced form trade balance model in search of providing empirical evidence in the case of Turkey with its five trade partners during 1992:M1 and 2015:1M2 period. Cointegration tests are applied in order to search short-run and long-run elasticities of the trade balance and currency depreciation/devaluation. Results of the cointegration tests show that devaluation/depreciation has long run impacts on trade dynamics and for a short time there exists j-curve pattern for Turkey with aforementioned trade partners where in general, for different time periods results are consistent with Kale (2001) and Brada et.al (1997). According to Granger causality

tests, there are bidirectional relations between income level of Turkey with trade balance, real effective exchange rate and foreign income levels respectively. Also there exists unidirectional relations between trade balance with real effective exchange rate and foreign income respectively.

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