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Does Devaluation of Turkish Lira Improve Merchandise Trade Deficit?

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Abstract

After the fall of Bretton Woods System, exchange rates become the focus of researchers and politicians. When a floating exchange rate system was started researchers investigated the impact of exchange rate volatility on international trade but the development of derivative instruments changed the researchers focus from currency volatility towards the impact of currency appreciation or depreciation on international trade. The main objective of this research was to investigate the short run and long run relationship between Turkey's merchandise trade deficit and real effective exchange rate. The monthly data was collected from Central Bank of Republic of Turkey from March 2005 to September 2017. Autoregressive distributed lag (ARDL) approach and Error correction model (ECM) was used for the analysis. The finding shows that the variables have long run relationship but it is not significant at 5% significance level. The short run model also shows the insignificant results. These findings have the following policy implication: Turkey cannot improve the merchandise trade deficit by devaluating its currency.

Keywords: ARDL, Merchandise trade, Short run, Long run, Real effective exchange rate.

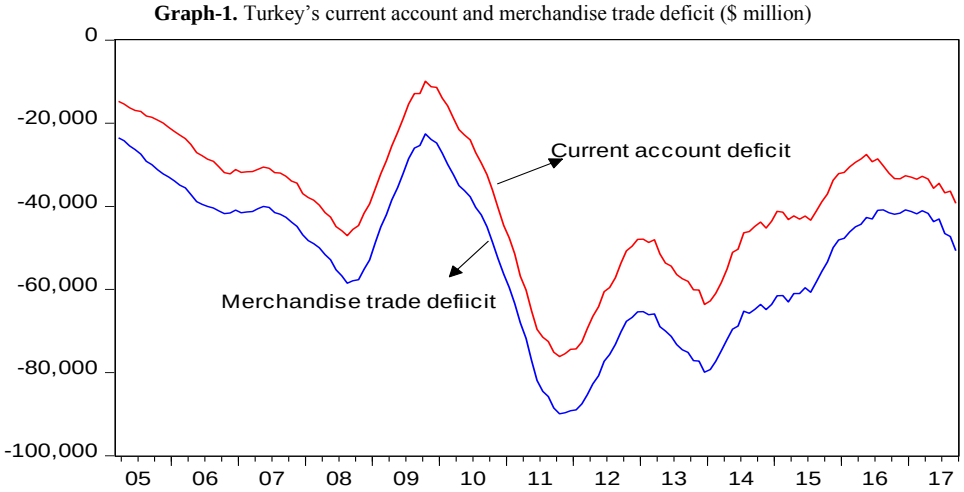
1. Introduction

In order to improve a country's current account deficit there are two approaches at the authorities disposal. These are the fiscal policy and monetary policy. These policies include: reducing inflation, influencing labor productivity, decreasing taxes and devaluation of currency (Stučka, 2004).

Turkey's merchandise trade decifit takes the lion's share of the country's current account deficit. In short, the main source of Turkey's current account deficit is the merchandise trade deficit. Graph 1 clearly shows that current account deficit has a similar movement with merchandise trade deficit from the year 2005 to 2017 and it is one of the cause for high current account deficit of the country. In addition to this, the graph also indicates the country has a significant amount of current account deficit.

Among other factors a high amount of current account deficit makes the country to be in the group of 'Fragile five' or BIITS which implies Brazil, India, Indonesia, Turkey and South Africa (Ünver and Doğru, 2015). The concept of fragile five countries used after Morgan Stanley's 2013 report which investigates countries reponse to Federal Reserve's tight monetary policy. Turkey is in fragile five in Morgan Stanley 2013 report and also in 'new fragle five' by S&P report in 2017. High and accelerating current account deficits make fragile five countries to be more dependent on foreign capital flows (Global emerging markets equity team, 2013). Fragile five has the following things in common; high inflation, weak economic growth, high trade deficit, high dependency to external financing, low level of local saving and depriciation of the countries currencies against American Dolar (Amaro, 2017; Önder *et al.*, 2015; Ren, 2016; Ünver and Doğru, 2015; Yenice and Tekindal, 2015).

Graph-1. Turkey's current account and merchandise trade deficit ($ million)



Source: Central Bank of Republic of Turkey, Electronic data distribution system, http://www.tcmb.gov.tr

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As it is indicated in graph 1 and in the report of Morgan Stanley and S&P, Turkey has a significant amount of current account deficit which arises mainly from mechandise trade deficit. Therefore, the main focus of this article is to investigate whether the country's merchandise trade deficit can be improved through devaluation of Turkish Lira or not. In short, the objective of this work is to investigate statistically the short term and long term relationship of merchandise trade deficit and real effective exchange rate. Real effective exchange rate is one of the most important economic indicator of a country's competitiveness (Esteves and Reis, 2006; Maitah *et al.*, 2016; Stučka, 2004). Accordingly, the short term and the long term impact of change in real effective exchange rate on trade deficit is analyzed.

Investigating and quantifying the short term and long term responsiveness of merchandise trade balance to change in exchange rate is important for economic policy purpose. First, if there is no long run relationship between the two, then depreciating a currency may not be a reasonable solution to improve a country's competitiveness on the long term basis. Second, if there is a long term relationship it is important to indicate and quantify the extent to which currency depreciation will likely lead to improvement of trade deficit in the long run. Third, it is also important to estimate the immediate and medium term impact of exchange rate change on the trade balance (Stučka, 2004).

Following this brief introduction this articles is organized as: the second section gives a detail literatures review on the subject matter. The third section explain the source of data, variables and the methodology of the research. The fourth section presents the emperical findings and explanations. Finally, conclusion is presented.

2. Literatures Review

Macroeconomic policies have a significant role in the enhancement of international trade and economic growth of a country. For the past several decades many countries used foreign trade policy and exchange rate to influence trade flow and economic growth. In the 21st century where the level of tariff between countries is too low and the existance of very few number of non tariff barriers, exchange rate has a significant role in influencing international trade flows. This indicates that exchange rate is a major factor in determining the international competitiveness of a country. An overvaluation of exchage rate leads to rising trade deficit (due to more amount of import) and falling foreign reserves. Foreign trade policy also plays pivotal role in influencing the level of country's trade. If a country has an import substitution policies, then there could be a decline in the level of imports (Kemal and Qadir, 2005).

After the fall of Bretton Woods System in 1973 and the start of floating exchange rate regime, exchange rate volatility was huge. As a result, the focus of many researchers was on impact of exchange rate volatility on international trade (trade flows). Therefore, the relationship between exchange rate and trade flow get an important focus after the fall of Bretton Woods System (Boke and Doganay, 2014). After the development and increasing availability of financial instruments (like forwards, futures, options and swaps contracts) to hedge against exchange rate risks, the importance of exchange rate volatility to influence international trade became limited (Nicita, 2013). The impact of exchange rate volatility on international trade is found to be negative but its magnitude is relatively small compared with other variables (Tsen, 2014). After 2000, the focus of researchers shifted to investigate the relationship between the level of currency appreciation or depreciation and trade flows. It is assumed that depreciation of currency improves trade deficit by making nation's export cheaper to foreigners and making imports more expensive for local markets. Therefore, in this way the country's balance of trade improves (Boke and Doganay, 2014).

According to Kharroubi (2011) globalization has affected the relationship between the trade balance and the real exchange rate. This means globalization makes the trade balance to be more sensitive to real exchange rate movements. For this reason the trade performance of countries is being significantly affected by exchange rates. The relative valuation of currenies often have important repercussions on international trade, the balance of payments and overall economic performance. Currency depreciation is found to support exports and hinder imports, the reverse is true in case of currency appreciation. Trade policy is used to compensate for some of the repercussions of an overvalued currency. But, trade policy response seems to be largely restricted to anti dumping intervention (Nicita, 2013). The following paragraphs focuses on explaining chronologically what is done so far in the 2000s, what methods applied and what was the findings of those empirical researchs in the related topics.

Stučka (2004) estimated the impact of real exchange rate on the merchandise trade balance of Crotia using ARDL Delta approach, Bewley type ARDL model and the ARDL instrumental variable approach for the period between the first quarter of 1994 and the first quarter of 2002, using quarterly data. The finding of this reserach indicates that depreciation in the value of Crotia's currency results in an improvement of trade balance.

Kemal and Qadir (2005) investigated the short run and the long run behaviour of the real exchange rate, import and export of Pakistan using a monthly data from December 1981 to January 2003. The researchers used Engle-Granger approach and the Johanson cointegration techniques and found the existance of long run relationship between the real exchange rate, export and import. Their finding indicates that the real exchange is negatively related with export and positively with import. They concluded that devaluation of Pakistan currency might be helpful in improving the trade balance of the country and in the short run movement in the real exchange rate do not affect export.

Yuen-Ling *et al.* (2008) studied the relationship between the real exchange rate and trade balance in Malaysia from 1955 to 2006 using cointegration technique and Vector Error Correction Model. The finding showed the long run relationship between the two variables and devaluation of Malaysian currency will improve trade balance in the long run.

Petrović and Gligorić (2010) investigated whether real effective exchange rate depreciation improves Serbia's trade balance or appreciation of the currency worsens it. The researchers used a monthly data from January 2002 to September 2007; they used Johanson's and Autoregressive distributed lag (ARDL) approach of data analysis. The result of the research showed that exchange rate depreciation improves Serbia's trade balance in the long run; however, in the short run following currency depreciation trade balance first deteriorates and improves latter on (this is called J-curve phenomenon).

Yaya and Lu (2012) analized the short run relationship between the real effective exchange rate and the balance of trade in China. They investigated the causal relationship between effective exchange rate and balance of trade with Granger-Causality test using the monthly data from January 1994 to August 2009. The finding of the research showed that in the short run balance of trade causes a change in effective exchange rate but not vice versa.

Twarowska (2015) investigated the effects of exchange rate on Poland's bilateral foreign trade flows with Euro countries for the period between 2004 and 2013. The findings of the study confirm that exchange rate is the main factor to influence the bilateral trade flows between Poland and its main trading partners. Thus, the depreciation of Polish Zloty is the cause for the country's export growth. At the same time, the depreciation of the country's currency results a reduction of Polish imports.

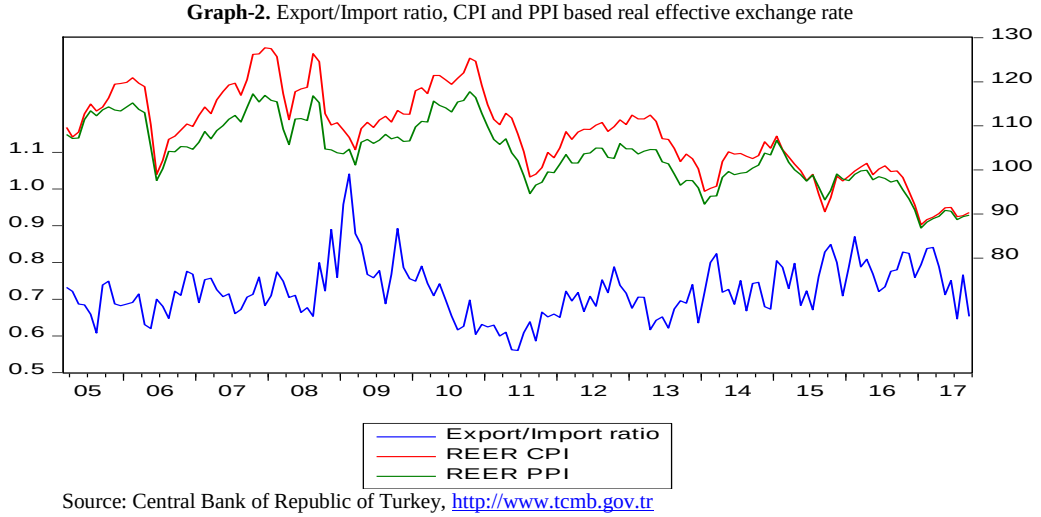
Kang (2016) examined the impact of exchange rates on the global trade growth by taking a sample of 59 countries from the year 2001 to 2015 and the subject matter was analyzed in detail by classifing the the study period as pre and post global financial crisis. The analysis uses graphs, tables and gravity model. Kang conlude that the number of countries which appreciate their currencies declined significantly after the 2007/08 global financial crisis. However, it appears that devaluating currencies do not contributed to the trade growth as before and expected. Therefore, local currency depreciation is not a significant factor to enhance export growth as much as the conventional wisdom dictates. The researcher stressed that the more countries undergo currency devaluation, the more likely international trade grows slower.

3. Research data and Methodology

3.1. Research Data and Variables

Monthly data is collected from March 2005 to September 2017 on real effective exchange rate, imports and exports from the Central Bank of Republic of Turkey. Real effective exchange rate and export/import ratio are used as the variables of this study. No other variables are included in the study because data on other variables are found either on quarterly or yearly basis. An increase in export/import ratio means better performance for Turkey and the reverse shows bad performance in international trade. The real effective exchange rate is measured in terms of consumer price index(CPI) and producers price index (PPI). The data on real effective exchange rate started to be reported in 2003 by a country's central bank on a monthly basis. The graphical relationship of the two variables is shown in Graph 2 as follows.

Graph-2. Export/Import ratio, CPI and PPI based real effective exchange rate



Source: Central Bank of Republic of Turkey, http://www.tcmb.gov.tr

3.2. Methodology

In time series data analysis regular regression methods and cointegration based techniques can be used to estimate the parameters in a regression. If all the variables are stationary at level (i.e without taking lag value) regular regression method results an appropriate estimation results. But most macroeconomic variables are non-stationary at level. For this reason estimations based on regular regression method will leads to spurious regression results.

In order to avoid the problem of spurious regression, the variables are tested for stationarity by using Augmented Dickey-Fuller (ADF) test before running any sort of regression analysis. A time series is stationary if its mean and variance do not vary systematically over time (Gujarati, 2004). After testing for stationarity, the presence of long run relationship between dependent and independent variable is investigated by using ARDL bound test. According to Saeed *et al.* (2012) ARDL bounds testing approach to co-integration involves two steps procedure. In the first step, existence of co-integration is tested by comparing the calculated value of F-test with the critical bounds

value. I0 is the critical value for the lower bound and I1 is a critical value for the upper bound. The second step is making a decision based on calculated F-statistics and critical values. If the value of the F-statistics exceeds the upper bound, then it is an evidence for the existence of long run relationship between the explanatory variables and dependent variable. If the F-statistics value is smaller than the lower critical bound, it is an evidence of no long run relationship. If calculated value of F-statistic lies between the upper bound and lower bound, then it is inconclusive.

For two reasons Autoregressive Distributed lag model (ARDL) is used. The first reason is that the data is a time series data and the second reason is, one of the variable is stationary at level but the other varaible is not stationary at level. The ARDL cointegration approach allows for the inclusion of stationary and non stationary variables in the order I(0) and I(1) (Tsen, 2014). After checking the cointegration (long run) relationship between variables using ARDL bound test, then error correction model (ECM) was used to investigate the short run dynamics of the variables.

Regression equation of the ARDL model is as follows:

Export/import ratio = $\alpha + \beta$(REER CPI) $+\varepsilon$ ……equation 1

Export/import ratio = $\alpha + \beta$(REER PPI) $+\varepsilon$ ……equation 2

Where: α is the constant

β is the coefficient of an independent variables

ε is the error term

REER CPI is CPI based real effective exchange rate

REER PPI is PPI based real effective exchange rate

3.3. Descriptive Statistics

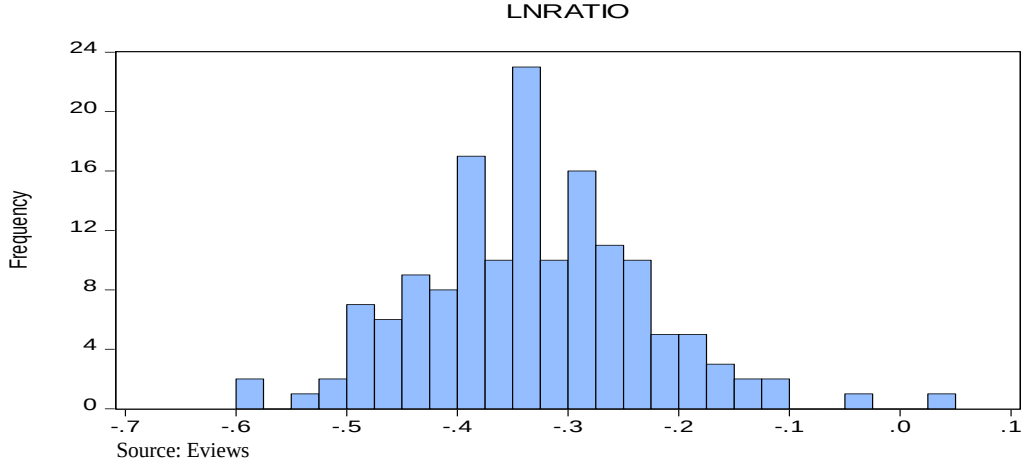
The following table gives the overall picture of the two variables. The mean value of export/import ratio is around 72% and the maximum value of this ratio is 104.1%. According to Jarque-Bera probability value, this variable doesn't show a normal distribution (Pro (0.0000) is less than 5%), the graph does not look like the normal bell shape curve. On the other hand CPI and PPI based real effective exchange rate's Jarque-Bera probility is more than 5% significant level and it indicates the variable is showing normal distribution. Since export/import ratio does not show a normal distribution, it is changed to log form and it's distribution close to normal distribution. The distribution of log export/import ratio is shown in graph 3 as follows.

Table-1. The descriptive statistics of the two variables

	EXPORT/IMPORT RATIO	REER CPI	REER PPI
Mean	0.721521	108.4154	104.1034
Median	0.714454	109.2200	104.5200
Maximum	1.040788	127.7200	117.7400
Minimum	0.560431	87.55000	86.83000
Std. Dev.	0.074390	9.475852	7.381727
Skewness	0.779375	-0.114180	-0.140710
Kurtosis	4.822342	2.445085	2.371507
Jarque-Bera	36.18107	2.265498	2.983511
Probability	0.000000	0.322146	0.224977
Sum	108.9497	16370.72	15719.61
Sum Sq. Dev.	0.830077	13468.77	8173.485

Source: Eviews

Graph-3. Log of export/import ratio



Source: Eviews

4. Results and Discussion

As it is mentioned in the methodology part, the stationarity of variables is tested using ADF tests and the result is presented in table 2. The ADF test indicates that lnexport/import ratio is stationary at level and the other two variables are stationary at first difference. Therefore, the use of ARDL approach to analyze the relationship of variables is the appropriate method.

Table-2. ADF test results with intercept

Variable	p-value@ level	Stationarity	p-value@ first difference	Stationarity
lnexport/import ratio	0.0031	Stationary	-	-
REER CPI	0.5218	Non stationary	0.0000	Stationary
REER PPI	0.5070	Non stationary	0.0000	Stationary

Source: Eviews

Testes for Autocorrelation and Heteroscedasticity is also made. It is found that the model is free from the two problems. After testing for stationarity of variables, Autocorrelation and Hetrosdasticity problem; variables are checked to be cointegrated or not using ARDL bound test. The result of this test is presented in Table 4 and 5. ARDL bound test result for both regression equation clearly shows that F-statistics value is greater that the upper bound criticla value. Therefore, the null hypothesis is rejected and there is a long term relationship between dependent and independent variable.

Table-3. ARDL bound test result for lnexport/import ratio and REER CPI

ARDL Bounds Test		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	10.96372	1
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.02	3.51
5%	3.62	4.16
2.5%	4.18	4.79
1%	4.94	5.58

Source: Eviews

Table-4. ARDL bound test result for lnexport/import ratio and REER PPI

ARDL Bounds Test		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	5.702749	1
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.02	3.51
5%	3.62	4.16
2.50%	4.18	4.79
1%	4.94	5.58

Source: Eviews

According to Table 6 and 7 cointEq(-1) probability value (0.0000) there is a long term relationship between CPI and PPI based real effective exchange rate and export/import ratio. Therefore, this result strengths the conclusion that is made from ARDL bound test. However, the long run coefficient of the two independent variables are not significant at 5% level of significance. As a result, it is concluded that even if there is a long term relationship between dependent and independent variables, this relationship is not statistically significant.

Table-5. ARDL cointegrating and long run form result between lnexport/import ratio and REER CPI

ARDL Cointegrating And Long Run Form				
Dependent Variable: LNRATIO				
Selected Model: ARDL(1, 0)				
Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(REER_CPI)	-0.001223	0.002091	-0.584769	0.5596
CointEq(-1)	-0.364194	0.063974	-5.692879	0.0000
Cointeq = LNRATIO - (-0.0032*REER_CPI + 0.0087)				
Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
REER_CPI	-0.003152	0.001798	-1.753172	0.0817
C	0.008692	0.195595	0.044440	0.9646

Source: Eviews

Table-6. ARDL cointegrating and long run form result between lnexport/import ratio and REER PPI

ARDL Cointegrating And Long Run Form				
Dependent Variable: LNRATIO				
Selected Model: ARDL(2, 0)				
Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LNRATIO(-1))	-0.245822	0.080583	-3.050557	0.0027
D(REER_PPI)	-0.000572	0.002550	-0.224239	0.8229
CointEq(-1)	-0.278376	0.067644	-4.115296	0.0001
Cointeq = LNRATIO - (-0.0045*REER_PPI + 0.1339)				
Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
REER_PPI	-0.004488	0.003040	-1.476627	0.1419
C	0.133901	0.316993	0.422408	0.6734

Source: Eviews

5. Error Correction Model (ECM)

In order to run an error correction model, the variables should be stationary and have a long run relationship. In other words, the variables must be cointegrated. In addition, cointegration of variables and non spurious regression are the main requirement for error correction model (Dhungel, 2014). As the ADF test and the ARDL bound test showed the variables in this study fulfilled these two requirements.

The ECM is as follows:

D(lnratio) = a + bD(reer_cpi) + U(-1) + e……equation 3

D(lnratio) = a + bD(reer_ppi) + U(-1) + e……equation 4

Where,

D(lnratio) – is the first difference of log of export/import ratio

D(reer_cpi) – is the first difference of CPI based real effective exchange rate

D(reer_ppi) – is the first difference of PPI based real effective exchange rate

a - is the intercept

b - is the short run coefficient

U(-1) - is the one period lag of residual

e - is the noise error term

According to the rules of ECM, the lag value of residual should be negative and significant. In this study, for both regression equation lag value of residual is represented by U(-1) and as expected it is negative as well as significant at 5% significance level. The coefficient of U(-1) is called long run equilibrium coefficient and error correction coefficient. D(REER_CPI) and D(REER_PPI) coefficient is called short run equilibrium coefficient (Dhungel, 2014). But the p-value of both independent variable is not significant at 5% significance level. Thus, ECM shows both the short term and long term relationship of variables. If the sign of U(-1) is negative and significant it validates the existance of long run relationship between variables.

The sign of U(-1) in both equation indicates that the speed at which the previous period disequilibrium is adjusted. The coefficient of U(-1) is almost 52%, this means the system corrects the previous period disequilibrium at a speed of 52% monthly.

Table-7. Short run between REER CPI and export/import ratio

Dependent Variable: D(LNRATIO)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(REER_CPI)	-0.001982	0.002053	-0.965611	0.3358
U(-1)	-0.524078	0.081947	-6.395316	0.0000
C	-0.000344	0.006091	-0.056518	0.9550

Source: Eviews

Table-8. Short run between REER PPI and export/import ratio

Dependent Variable: D(LNRATIO)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(REER_PPI)	-0.000890	0.002560	-0.347665	0.7286
U(-1)	-0.523674	0.081962	-6.389230	0.0000
C	-0.000227	0.006112	-0.037169	0.9704

Source: Eviews

6. Conclusion

This paper investigates the short run and long run relationship of import/export ratio and CPI and PPI based real effective exchange rate from March 2005 to September 2017. The ARDL boud test result shows that there is a long run relationship between both CPI and PPI based real effective exchange rate and export/import ratio. However, ARDL cointegrating and long run form result is not statistically significant at 5% level. The ECM also reveals that the existance of long run relationship between variables but the coefficient of the independent variable is not statistically significant. Therefore, even if the country has a huge amount of trade deficit, devaluation of the real effective exchange rate will not help to improve the merchandise trade deficit. As a result, the government should not allow further devaluation of Turkish Lira instead, other monetary and fiscal policies should be used to improve the country's merchandise trade deficit.

One of the factor that makes the country in fragile five is value loss of Turk Lira against dollar and other main currencies. Having this in mind, if the real effective value of Turk Lira depreciates more, then it is going to affect investors perception towards Turkey. This negative perception will reduce foreign direct investment as well as foreign portfolio investment in Turkey. Consequently, the depreciation of real effective exchange rate will further worsens the merchandise trade balance and current account deficit.

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