AN EMPIRICAL STUDY ON REAL EXCHANGE RATE AND ECONOMIC GROWTH IN TURKISH ECONOMY

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ABSTRACT

In this emprical study the affair between the real effective exchange rate and economic activity for the Turkey was analyzed. As in the case of Uddin et al. (2014), which is the direction of the affair between real effective exchange rate and economic activity, the existence of a bidirectional relationship is generally determined. However in our research, the presence of the affair between economic activity and the real effective exchange rate for Turkey's economy, Granger causality (Granger causality) was tested. The industrial production index and the real effective rate are used during the period of 1995-2019. According to the obtained results, unilateral relationship from the real exchange rate to economic activity has been determined.
Keywords: Economic Activity ,Growth,Real Effective Exchange Rate, Granger Causality Analysis

I. INTRODUCTION

The effects of exchange rate on economic growth is one of the most studied topics in economics. The relationship between exchange rates and economic growth in the economy is extremely important in definitional, political and economic terms. Research on this subject and information obtained from developing countries show that there is a strong connection between the real exchange rate and economic growth.

In economics, the definition of exchange rate can be defined as the local price of a foreign currency. The exchange rate can be called the conversion factor that determines the rate of exchange of money. Real and nominal exchange rates are different rates. If we leave aside the effects of inflation, this real exchange rate can be defined as the effects of inflation. If we include, then this will be the nominal exchange rate. The nominal exchange rate can be expressed in two or more periods. Real exchange rate volatility means short-term fluctuations of the real exchange rate. The policies followed to determine the value of any country's currency against the currencies of other countries are called exchange rate regimes. The regime in which the exchange rate remains constant is the fixed exchange rate regime, which occurs as a result of fluctuations in the exchange rate. The exchange rate is known as the free exchange rate regime. For a long time, economists have known that poorly managed exchange rates negatively affect economic growth. Avoiding overvaluation of the currency is one of the most important imperatives that can be gleaned from various experiences regarding economic growth around the world.

This study, which will examine the relationship between the real effective exchange rate and the industrial production index, which is an economic activity and represents economic growth, using data from Turkey, covers five chapters in total. The first part is an introduction to the subject, the next part is a literature review on the subject, and the third part is a literature review on the subject.

The methodology of the model and the set of data used, the fourth one, the empirical results, and finally, the last part, the conclusion part. In the analysis part, the causality relations between the real effective exchange rate and economic activity will be tried to be determined by using the data set of Turkey.

2. LITERATURE REVIEW

There are many authors who have different views on the effects of exchange rates on economic growth. Some conclude that the exchange rate has a positive effect on economic growth, others on the contrary. In general, many empirical studies have been conducted investigating the effect of real exchange rate changes on growth.

Rodrik (2008) put forward the idea that the relationship between real effective exchange rate and growth will give different results for developed and other developing countries. In developing countries, factors such as low real exchange rate, high inflation, economic crises due to budget deficits and recession negatively affect economic growth. Rodrik (2008), in his study with data collected from 188 countries, found that low real exchange rates negatively affect economic growth in developing countries, while high real exchange rates affect growth positively. Furthermore, Rodrik and Kennedy (2007) revealed in their study that high real effective exchange rates affect economic growth in developing countries. Razin and Collins (1997) used smaller time periods for some countries in their research based on 93 countries covering the years 1975-1992. In the analysis, it was concluded that the excessive appreciation of the real exchange rate had a negative impact on growth, but no relationship was found between the excessive depreciation of the real exchange rate and economic growth. Aguirre and Calderón (2005) worked with panel data consisting of a period between 1965 and 2003. They used cointegration methods and made econometric analysis based on 60 countries. As a result, it turned out that the overvalued real exchange rate hindered economic growth. Uddin et al. (2014) conducted a study based on Bangladesh, and in this study, the relationship between exchange rate and economic growth was examined using time series techniques. This study covered the period between 1973 and 2013, and as a result, a significant positive relationship was found between exchange rate and economic growth. These results also supported that there is a long-term relationship between exchange rate and growth. The study concluded that there is a bidirectional relationship from exchange rate to growth and vice versa, from growth to exchange rate. Domaç and Shabsigh (1999), based on the countries of Morocco, Tunisia and Egypt. They examined the dependence between the real effective exchange rate and economic growth in their studies and found that deviations in the real exchange rate had a negative impact on economic growth. Brigitta (2016), after observing the data obtained from 74 countries for 2012, found a positive relationship between the fixed exchange rate and the growth in GDP and it was determined that there was a significant relationship. Upadhyaya (1999), in his study, based on 6 Asian countries (India, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand), developed an ADL model with the data of Gross Domestic Product (GDP) showing the real exchange rate and growth between 1963 and 1993 made an estimation and as a result, it was determined that the depreciation of the currency had a contractionary effect in the long term for Pakistan and Thailand, while it was neutral in other countries. Suna (2013) tested the relationship between exchange rate and economic growth in nine European countries by using panel data analysis using annual data for the period 2002-2011. As a result of the study, a causality from exchange rate to economic growth was detected for nine European countries.

Among the studies conducted for the Turkish economy, it is important to mention the studies of Domaçin (1997). In his study covering the years 1960-1990 for Turkey, he concluded that unexpected devaluations had a positive effect on economic growth. There are also Berument and Paşaoğulları (2003) who conducted studies for Turkey VAR model and Granger Causality Test, they estimated a model consisting of two variables.

They used the data set between 1995 and 2001 and found that the appreciation of the national currency had a negative impact on GDP based on economic growth. Moreover, Berument and Dinçer (2004)) also conducted some empirical studies. They used monthly data between February 1987 and September 2002 and investigated the effect of exchange rate risks on growth in Turkey with the widely used VAR model. As a result, they stated that positive exchange rate shocks caused a depreciation of RER. In the study conducted by Musa and Yohanna (2017), the relationship between real exchange rate and economic growth for Turkey between 1970 and 2015 was examined using time series data. In the research, ARDL bounds test and Toda-Yamamoto (TY) Granger non-causality tests were used and as a result. It has been determined that the real effective exchange rate affects economic growth negatively in the short term, but positively in the long term. In Hilal et al.'s (2016) research, after investigating the existence of unit root in the time series of GDP, inflation and real effective exchange rate, quarterly data for the period between 1998:1 and 2014:4 were used to investigate Turkey's economic growth and exchange rate volatility. Engle-Granger cointegration analysis was performed. The results provided evidence for the existence of short- and long-term relationships between these two variables.

3. METHODOLOGY AND DATA SET
In this study, the data was first seasonally adjusted. Because seasonality adjustment reflects real changes when working with time series, allowing for more realistic results and interpretations in economic terms. Then, the Unit Root Test was performed by taking the logarithm of the variables. Since the Granger causality test was used in the study, let's briefly look at the definition of this test. So, if there is a lagged relationship between two variables depending on a certain time period, one of the analyzes used to statistically determine the direction of causality of this relationship is Granger causality analysis. These causality tests, which were started to be used by Granger in 1969, are being developed and continued today. Causality tests can be applied mostly using long-term time series. To perform this test, the series must be stationary (Tarı, 2010:437). Although there are different views on the definition of causality, this concept generally shows the relationship of cause and effect. Before performing the Granger causality test, the number of lags in the models must be determined. Therefore, the number of delays will be determined using the VAR model before the test. In this study, the conclusion was reached by performing the VAR model and finally the Granger Test immediately after the Unit Root Test.

In the study, data covering the period 1994:01-2018:07 regarding the Turkish economy was used. These data used were collected from the Federal Reserve Economic Data (FRED) website. Eviews 9, an econometric software, was used for the application.

Table 1. Definition of Series:

Symbol	Explanation of variables
REER	Real effective exchange rate
IP	Industrial production index

4 . EMPIRICAL RESULTS
Before testing whether there are relationships between various variables, it should be determined whether the series used are stationary or not. Two tests: Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests were used to perform the Unit Root Test of the variables we discussed in this article.

4.1. Unit Root Tests

Due to the time series characteristics of the variables used in the economy, the results may not be stationary. It is very important to perform unit root tests when working with time series because variables containing unit roots can distort empirical results (Chang et al., 2001:1047).

Table 2:ADF and PP Unit Root Test Results:

Variable	ADF				PP			
	Level		First Difference		Level		First Difference	
	Constant (c)	Constant Trend(c)(t)	Constant (c)	Constant Trend(c)(t)	Constant (c)	Constant Trend(c)(t)	Constant (c)	Constant Trend(c)(t)
REER	-2.486	-2.208	-12.145***	-12.209***	-1.963	-2.076	-12.083***	-12.893***
IP	0.093	-3.676**	-19.223***	-19.200***	0.296	-3.620**	-19.703***	-19.682***

In the table, ***1%, **5%, *10% indicate the significance level.

When we interpret the results shown in the table above, we can say that both ADF and PP tests were performed on the two variables used in the application, and when the first differences of the variables were taken, the series turned out to be more stationary than the surface state.

4.2. Var Model

In the second part of the application, the number of delays should be determined using the VAR model. Since our data is monthly data, the maximum delay length is selected as 12 and the delay length that meets the lowest criterion according to critical values such as Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike (AIC), Schwarz (SC) and Hannan Quinn (HQ) attempts were made to detect it.

Table 3: Determining Delay Lengths with the VAR Model

Number of Delays	LR	FPE	AIC	SC	HQ
1	39.774	7.750	8.394	8.316*	8.363
2	15.071*	7.550*	8.420*	8.291	8.368*
3	6.428	7.590	8.415	8.234	8.343
4	0.540	7.790	8.389	8.156	8.295
5	6.150	7.840	8.383	8.099	8.269
6	3.040	7.970	8.366	8.030	8.231
7	1.086	8.170	8.342	7.954	8.186
8	4.227	8.270	8.329	7.890	8.153
9	4.493	8.370	8.318	7.827	8.121
10	3.406	8.500	8.303	7.760	8.085
11	5.614	8.560	8.296	7.702	8.058
12	3.225	8.690	8.280	7.634	8.021

*Indicates the delay length indicating the smallest information criterion.

According to the results of the table, other values other than the SC critical value show a delay of 2. Finally, after determining the lag length with the VAR model, the Granger Causality test was applied to obtain the results in Table 4.

4.3. Granger Causality Test

In Table 4 shown below, the results of the causality relationship between the variables were obtained using data from Turkey covering the period 1994:01-2018:07.

Table 4: Granger Causality Wald Test Between Real Exchange Rate and Industrial Production Index

Null Hypotheses	Number of Observations	Probe Value
IP is not the reason for Granger of REER	292	0.0650*
REER is not the reason for Granger of IP	292	0.0007***

Example: 1994:01-2018:07, Delays: 2

Based on the probability values given in this table, we can reject the null hypothesis that "REER is not the Granger cause of IP" at the 1% significance level from the real exchange rate to the industrial production index. However, there is a relationship from the industrial production index to the real exchange rate at a 10% significance level. That is, if we consider the 10% significance level, the null hypothesis of IP being the cause of REER can be rejected and it can be said that there is a two-way relationship between the variables at this significance level.

5. CONCLUSION

The main purpose of this study is to empirically test the relationship between the real exchange rate in Turkey and the industrial production index, which can be used as one of the factors indicating economic growth, using the time series econometric method. In the study, whether the series were stationary or not was analyzed with the Unit Root Test, the number of lags was determined using the VAR model, and finally the causality relationship between variables was tested with the Granger Causality Wald Test. Since we considered the 1% significance level in the application, it was determined that the real exchange rate was the cause of the industrial production index and a significant relationship was determined between them. In other words, it has been concluded that there is a one-way relationship between the real effective exchange rate and industrial production index variables.

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