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CONCEPTUAL PAPER

Effects of Real Exchange Rate on Economic Growth: Evidence From Turkey

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Abstract

Various studies show that the exchange rate is a key variable and not paying attention to its proper management can create problems for the economy of any country. Since there is a strong correlation between economic growth and the real exchange rate, exchange rate policies should be adjusted in a way that does not negatively affect economic growth. The aim of this study is to investigate the relationship between the real exchange rate and economic growth in Turkey for the period 1981-2017. For this purpose, the Cointegration Vector Autoregressive Model has been used. According to the research findings, the real exchange rate has had a negative effect on Turkey's economic growth during the period under study.

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INTRODUCTION

The exchange rate is the relative price of foreign currency to domestic currency, which has always been considered by the economic and financial community as one of the macroeconomic factors. In fact, this rate reflects the country's economic situation and is a factor in comparing the national economy with the economies of other nations. Exchange rate fluctuations affect the growth of production and demand in the country and some other variables. Therefore, the choice of foreign exchange policies, in a way that leads to the establishment of a proper exchange rate system, according to economic conditions not only can be a way to achieve growth and development, but also will affect other macro factors (Mankiw, 2010: 140-143).

The value of the national currency of a country is not only influenced by the domestic economic policies of the country, but also any economic and political events in the international arena affects the value of domestic currency and thus, the economy. Economic growth is one of the most important economic variables, which is supersensitive to real exchange rate changes. If the exchange rate is not properly adjusted to the domestic and international economy, as well as in a stable and secure environment, it will slow down the growth of the economy (Bahmani and Gelan, 2018: 23-24).

In developing countries such as Turkey, although exchange rate has a major impact on economic growth, a few studies have been conducted in this area and most of which have focused on trade, imports and economic enterprises rather than economic growth. On the other hand, Turkish Lira has been in depreciation since 2013. Turkish Lira, which was around 1.90 and 2.18 in 2013 and 2014, rose to 3.64 in 2017, 4.81 in 2018 and 5.67 in 2019 (Central Bank of the Republic of Turkey, Various Years). Therefore, it is important to examine how this depreciation in Turkish Lira affects economic growth. Due to the lack of adequate studies on the relationship between exchange rate and economic growth, the results of this study are very important, especially in the Turkish economy. The following research questions are expected to be answered in this article: is there any effect of real exchange rate volatility on economic growth in Turkey?

Section 2 explores the literature on economic growth and the real exchange rate. Section 3 contains empirical results and section 4 includes the findings.

Literature

Changes in the real exchange rate affect national income by affecting exports and imports. According to Balassa (1964) and Samuelson (1964), the reason for the change in the real exchange rate is the relative price difference between traded and non-traded goods in the long run. They also argued that the emergence of this difference was due to productivity differences. Under the assumption that markets are competitive, in the sectors where tradable goods are produced, prices are in international markets and there is no productivity difference between countries in the production of these goods. However, the situation is different in the production of non-commercial goods. These goods are produced in the service sector, and prices in this sector differ from country to country and productivity differences are higher. According to this view, an increase in efficiency in the commercial goods sector causes an increase in wages in this sector, but the price of the goods does not change because it depends on international demand. Under the assumption that the labor force is fully mobile, wage increases in the sector where commercial goods are produced will lead to an increase in wages and prices in the sector where non-commercial goods are produced. Price increases in the sector where non-commercial goods are produced will also affect the real exchange rate. According to the effect of Balassa (1964) and Samuleson (1964), a faster increase in the price of non-commercial goods in a country compared to other countries, will increase the imports of this country and may negatively affect net foreign trade and indirectly economic growth.

The relationship between exchange rate and economic growth may be positive or negative.

Razin and Collins (1997) analyzed 93 countries. The results of their research show that the increase in the real exchange rate has a negative and significant effect on economic growth. Ghosh et al. (1998)

found no systematic relationship between economic growth and exchange rate in 36 developing countries. In the study of Frankel and Rose (2002), the exchange rate has a positive effect on trade and thus economic growth in the selected countries. Bailliu et al. (2003) found that the fixed exchange rate has a positive effect on economic growth of 60 countries. In the study of Yeyati and Sturzenegger (2003), it was determined that the exchange rate has an significant effect on economic growth in developing countries. Reinhart and Rogoff (2004) could not conclude that there is a direct relationship between exchange rate and economic growth rate of 153 countries. Dubas, Lee and Mark (2005) in their research for developing countries, found a positive relationship between fixed exchange rates and economic growth. Rodrik (2008) found a nonlinear relationship between the real exchange rate and economic growth in 188 countries. According to this study, the real exchange rate has a strong and significant impact on the economic growth of developing countries. In addition, declining the real exchange rates can boost economic growth only in developing countries. Gala (2008) examined the relationship between per capita GDP and the real exchange rate in 58 developing countries. According to the results, there is a negative relationship between per capita GDP and the real exchange rate. He (2010), examined the relationship between economic growth and exchange rate in China. According to He, China has implemented a fixed exchange rate policy and thus increased economic growth. In addition, the constant exchange rate has created efficiency in the long run. According to a study conducted by Tarawalie (2010) for Sierra Leone by using quarterly data, it found a positive correlation between real exchange rate and economic growth. According to a study of Musyoki et al. (2012) for relationship between exchange rate and economic growth in Kenya, it has been concluded that exchange rate instability has a negative effect on economic growth. According to a study conducted by Chen (2012) for China, the real exchange rate has a positive effect on the economy of different provinces of China. Ahmad et al. (2013) stated that rising inflation and the exchange rate would reduce Pakistan's economic growth. Vieira et al. (2013) examined the impact of real exchange rate on the economic growth of 82 developed and developing countries and concluded that higher real exchange rate has a negative and significant effect on economic growth, while low exchange rate has positive and significant effect on economic growth. Adeniran et al. (2014) examined the impact of exchange rates on Nigeria's economic growth. The results show that the exchange rate has a positive effect on Nigeria's economic growth, but this effect is not significant. Based on the results obtained by Uddin et al. (2014) for Bangladesh, there is a positive and significant relationship between exchange rate and economic growth. The results also show a long-term relationship between the exchange rate and economic growth in Bangladesh. According to a study conducted by Habib et al. (2017) for developing countries, increase in the real exchange rate has a negative effect on economic growth. Barguellil et al. (2018) examined the effect of exchange rate on economic growth based on samples from 45 developing and emerging countries. According to the findings, real exchange rate has a negative impact on economic growth.

As can be seen from the literature review, the impact of the real exchange rate on GDP can be positive or negative. There are many factors that lead to this result. For example, according to Rodrik (2008), if the domestic currency is overvalued due to the economic problems in the country, economic growth will be negatively affected in the event of a decrease in real exchange rate. The main reason for this result is the effects of the factors that negatively affect economic growth are dominant over the real exchange rate (current account deficit, inflation, budget deficits, etc.). Rodrik (2008) stated that the relationship between economic growth and exchange rate in developing countries where there is economic instability is different from developed countries. Therefore, the effect of the real exchange rate is different. The most important reason for this result is that the economic structure of countries is different.

METHODOLOGY

Exchange rate system implemented in Turkey, varies from period to period. In the period before 1980, fixed exchange rate system was applied. In the period after 1980, exchange rate system has differed from each other according to decision taken by the Central Bank of Turkey. The period of 1981-1989 and the period after 1989 differ from each other. In the period of 1980-1989 fixed exchange rate system was

applied. In the period of 1989-1999, free exchange system was implemented. In the 2000-2001 period, a fixed exchange rate system, in which daily increases were determined, was implemented. Starting from the second half of 2001, the free exchange system, which is limited by the the Central Bank of Turkey interventions, has been implemented (Central Bank of the Republic of Turkey, Various Years). In this study, the period in which fixed and free exchange systems are applied (since 1981) is taken into consideration. The period examined in this study is from 1981 to 2017. The annual data used in this study were obtained from Turkish Statistical Institute and the Central Bank of the Republic of Turkey[1]. The estimation technique is Cointegration Vector Autoregressive Model.

The model used in this study is formulated as follows taking into account the study of Adeniran et al. (2014). The model is defined by the equation (1):

$$GDP = f(REXR, INR, IFR) \quad (1)$$

GDP: Gross Domestic Product

REXR: Exchange Rate

INR: Interest Rate

IFR: Inflation Rate

There is a possibility that series may have variance problem. Therefore, the model is defined in natural logarithmic form with the equation (2):

$$LnGDP_t = \beta_0 + \beta_1 LnREXR_t + \beta_2 LnINR_t + \beta_3 LnIFR_t + \varepsilon_t \quad (2)$$

LnGDP: Natural Logarithm of Gross Domestic Product

LnREXR: Natural Logarithm of Real Exchange Rate (Nominal Exchange Rate/PPP)[2]

LnINR: Natural Logarithm of Interest Rate

LnIFR: Natural Logarithm of Inflation Rate

t: Time

ε: Error Term

β_0: Intercept

Unit Root Test

In order not to spurious regression, it is necessary to examine whether the time series are stationary or not. For this reason, the time series used in the model were tested by the Augmented Dicky-Fuller (ADF) test and the degree of cointegration was determined.

In the ADF test, the rejection of the H_0 hypothesis (existence of a unit root) means the variable is stationary. To reject the H_0 hypothesis, the ADF statistic value must be greater than the critical value (in the form of absolute value). Since the ADF statistic value for the variables in the research model is less than the critical value, H_0 hypothesis cannot be rejected therefore, it is understood that the variables are not stationary at their own level. The results are shown in Table 1.

After taking the first-order difference of all variables, ADF test was performed again. Since the ADF statistic value is greater than the critical value (absolute value), the H_0 hypothesis was rejected and the H_1 hypothesis was accepted. Therefore, the variables are not fixed at their level and are fixed in the first order of difference. The results are shown in Table 2.

[1] The data used in this research were collected in 2019.

[2] Real exchange rate data is obtained by dividing the nominal exchange rate by the Purchasing Power Parity.

Optimum Lag Degree of Model

The optimum lag degree of the cointegration model has been determined. This stage is considered as one of the important stages of cointegration models because it is very important to choose the right lag degree for the model to be meaningful. Schwarz-Bayesian, Akaike, Hannan-Quinn and Log-Likelihood Ratio criteria can be used to determine the optimum lag degree of the model, the maximum value of each criterion indicates the optimum degree of lag. In this study Schwarz-Bayesian (SBC) criterion was used. According to the result, the maximum value of Schwarz-Bayesian shows the first degree.

Cointegration Vectors

In this section, the number of cointegration vectors is determined. The number of vectors, shows that how many linear combinations will exist between the variables. Maximum Eigenvalue Statistic (λmax) and Trace Statistic (λtrace) are used to find the number of cointegration vectors. When the value of λmax and λtrace is compared with the critical value (95% and 90% critical value), if the λmax and λtrace value is greater than the critical values, the H_0 hypothesis (r cointegration vector) is rejected and the H_1 hypothesis (more than r cointegration vector) is accepted. Otherwise, the H_0 hypothesis is accepted.

Maximum Eigenvalue Statistic (λmax) results are in Table 3. According to these results, H_0 hypothesis (r = 0) is rejected in the first line because, λmax = 24.5446 is greater than 95% (21.1700) and 90% (19.2800) critical values. In the second line, the H_0 hypothesis (r <= 1) is accepted because, λmax = 15.2423 is smaller than 95% (17.2200) and 90% (16.2300) critical values.

Trace Statistic (λtrace) results are also in Table 4. According to these results, H_0 hypothesis (r = 0) is rejected in the first line, because, λtrace = 21.2342 is greater than 95% (19.2300) and 90% (17.6500) critical values. In the second line, H_0 hypothesis (r <= 1) is accepted because, λtrace = 15.6654 is smaller than 95% (17.1800) and 90% (16.0100) critical values.

According to the results of Maximum Eigenvalue Statistic, both statistics (λmax and λtrace) state that there is only one cointegration vector (r = 1). Therefore, it is assumed that only one linear combination exists.

Table 5 shows non-normalized and normalized cointegration vectors. Normalization is done based on the dependent variable. In this study, the dependent variable is LnGDP and normalization was based on the LnGDP. The normalized vector was obtained as in equation 3:

$$LnGDP = 3.3454 - 0.2723LnREXR - 0.1143LnINR - 0.1312LnIFR \quad (3)$$

(1.6545) (0.1050) (0.0120) (0.0204)

Values in parentheses indicate standard deviation. According to these amounts, the coefficients are significant (95% confidence interval).

The real exchange rate coefficient was obtained -0.2723. According to this estimate, if the exchange rate increases by 1%, there will be 0.2723% decrease in GDP.

The interest rate coefficient was obtained -0.1143. According to this estimate, if the interest rate increases by 1%, there will be 0.1143% decrease in GDP.

The inflation rate coefficient was obtained as -0.1312. According to this estimate, if the inflation rate increases by 1%, there will be 0.1312% decrease in GDP.

DISCUSSİON, CONCLUSİON and SUGGESTION

This research examined the effect of real exchange rate on Turkey's economic growth from 1981 to 2017. According to the findings obtained from the Cointegration Vector Autoregressive Model, the real exchange rate is affecting Turkey's economic growth negatively. This result is compatible with previous studies such as Razin and Collins (1997), Gala (2008), Musyoki et al. (2012), Ahmad et al. (2013), Vieira

et al. (2013), Habib et al. (2017) and Barguellil et al. (2018). In addition, interest rate and inflation rate have a negative effect on Turkey's economic growth.

To achieve the goals of economic growth in a developing country, the need to import raw materials and intermediate goods will increase. On the other hand, the export potential will be relatively low for some reasons such as the level of technology and weak market power. As a result, increased foreign exchange demand may lead to large fluctuations in foreign exchange prices. An increase in the exchange rate makes raw materials and capital goods more expensive, and as a result, the range of vulnerability of the economy due to exchange rate fluctuations increases. An increase in the exchange rate will have a direct and high impact on increasing inflation in the manufacturing sector. Increased production costs increase the cost of the final product and reduce the purchasing power of domestic buyers. On the other hand, rising costs of raw materials and intermediate goods in the manufacturing sector reduce working capital and as a result, producers need working capital at least equal to the rate of exchange rate appreciation to continue operating at the same scale as before. But providing this working capital entails many overhead costs for the manufacturing sector. An increase in the exchange rate will also hurt the export sector in the long run. Although some export-oriented manufacturing sectors experience sharp growth at the beginning of the exchange rate rise, however, the increase in costs due to the lack of working capital, as well as the increase in the price of raw materials, which increases the cost of products, these products will lose their competitiveness in international trade in the long run and this also makes the growth of these sectors unstable.

According to the findings, this study proposes export incentive strategies to maintain the foreign trade balance. Real depreciation of the national currency does not increase production in Turkey however, due to its foreign production structure, it increases import prices and thus inflation. The effect of real exchange rate on economic growth mostly depends on the position of the country in foreign trade. Because the exchange rate is a very important variable that reveals the competitiveness of a country in the international arena. Low real exchange rate increases imports and also, high real exchange rate increases exports. This, encourages foreign direct investments, and the increase in foreign direct investments increases the country's physical capital stock and employment, thereby supporting economic growth. Therefore, in order to stimulate the economic growth potential of Turkey, it is necessary ensuring macroeconomic and political stability continuously and permanently, acceleration of capital accumulation and scientific and technological activities dissemination.

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Appendix

Table1. ADF Unit Root Test Results (Level Value)

Model	Non-Trended with Fixed		Trended with Fixed	
Variable	ADF	Critical Value	ADF	Critical Value
LnGDP	-0.3302	-2.9674	-2.4227	-3.5733
LnREXR	-0.4111	-2.9674	-2.7256	-3.5733
LnINR	-0.5774	-2.9674	-1.7912	-3.5733
LnIFR	-0.3223	-2.9674	-1.5445	-3.5733

Table 2. ADF Unit Root Test Results (First Differences)

Model	Non-Trended with Fixed		Trended with Fixed	
Variable	ADF	Critical Value	ADF	Critical Value
LnGDP	-4.1323	-2.9667	-3.8356	-3.5835
LnREXR	-3.4766	-2.9667	-3.6923	-3.5835
LnINR	-3.6434	-2.9667	-3.7657	-3.5835
LnIFR	-3.5543	-2.9667	-3.6745	-3.5835

Table 3. Maximum Eigenvalue Statistics (λmax) Results

H_0	H_1	λ_{max}	Critical Value %95	Critical Value %90
r=0	r=1	24.5446	21.1700	19.2800
r<=1	r=2	15.2423	17.2200	16.2300
r<=2	r=3	9.1345	12.3000	11.4100
r<=3	r=4	6.4334	9.8100	6.4500

Table 4. Trace Statistic (λtrace) Results

H_0	H_1	λ_{trace}	Critical Value %95	Critical Value %90
r=0	r=1	21.2342	19.2300	17.6500
r<=1	r=2	15.6654	17.1800	16.0100
r<=2	r=3	10.3445	11.9500	11.3100
r<=3	r=4	6.7894	8.0800	7.4100

Table 5. Non-Normalized and Normalized Vectors

Vectors	Intercept	LnGDP	LnREXR	LnINR	LnIFR
Non-Normalized Vector	2.2132	0.1552	-0.3212	-0.1675	-0.1575
Normalized Vector	-3.3454	1	0.2723	0.1143	0.1312