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DETERMINANTS OF EXCHANGE RATE VOLATILITY: EMPIRICAL EVIDENCE FOR TURKEY

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ABSTRACT

Purpose- In the literature the effect of exchange rate volatility on various macroeconomic variables has been extensively studied but there are not enough studies about the reasons of exchange rate volatility. The aim of the research is to present the theoretical framework about the determinants of exchange rate volatility and to determine the factors affecting exchange rate volatility in Turkey for a period from 1974 to 2016.

Methodology- In this research the stationary analysis of the series is determined by the Augmented Dickey Fuller Test (ADF) and the PP (Phillips-Perron test) unit root tests. In addition the GARCH model is used to calculate the real effective exchange rate volatility. The Johansen cointegration test is used to determine whether there is a long-term relationship between variables. The coefficients of the long-run relationship between the variables are estimated by the FMOLS method.

Findings- The ADF and PP unit root test results show that the series are stationary at first difference. According to Johansen cointegration test results, it has been found that there is a long-run relationship between the variables involved in the analysis. Results from the FMOLS method for determining the direction and severity of the long-term relationship between the variables reveal that LGFCF, LMONEY and LTRADE positively affects significantly, while LFDI, LGDPC, LGGEXP negatively affects real effective exchange rate volatility.

Conclusion- The rise in domestic investment (LGFCF), money supply (LMONEY) and trade openness (LTRADE) increases the real effective exchange rate volatility, while the rise in foreign direct investment (LFDI), output (LGDPC) and government expenditures (LGGEXP) also reduces the real effective exchange rate volatility.

Keywords: Exchange rate, exchange rate volatility, GARCH, Johansen Cointegration analysis, FMOLS analysis.
JEL Codes: C32, F30, F31

1.INTRODUCTION

Following the collapse of the Bretton Woods system in 1973, the fixed exchange rate system was abandoned and the countries were left to fluctuate their money. For countries adopting a floating exchange rate system, exchange rate volatility has become an inevitable fact of life. Exchange rate volatility corresponds to large fluctuations around the balance value of the exchange rate or short-term fluctuations around the long-term trends of the exchange rate (Oaikhenan and Aigheyisi, 2015: 47; Giannellis and Papadopoulos, 2011: 41). In other words, the exchange rate volatility is a variation of the price of one currency in another currency. Volatility refers to all movements and changes that are effective in depreciation or appreciation of a currency. The profitability of foreign exchange transactions is affected by the appreciation or loss of foreign currency (Martins, 2015: 14). Exchange rate volatility is associated with unpredictable movements in relative prices in the economy. For this reason, exchange rate stability is one of the main factors affecting foreign (direct and portfolio) investments, price stability and stable economic growth (Ajao, 2015: 44).

The changes in the main economic factors make the exchange rates more volatile by causing unexpected changes in the exchange rate level. In addition changes in these factors can lead to further growth of the volatility, by exceeding the target for the long-term equilibrium exchange rate in the short term (Ayhan, 2016: 10).

Excessive exchange rate volatility leads to delays in investment decisions, causing uncertainty in the economy. The uncertainty that is caused by volatility also negatively affects economic growth by affecting investment and investor confidence, productivity, consumption and international trade and capital flows (Oaikhenan and Aigheyisi, 2015: 49). Exchange rate volatility leads to high degree of uncertainty in ensuring price stability and economic growth and in setting

macroeconomic and monetary policy targets (Ajao, 2015, 44). Finding reasons for real exchange rate volatility due to possible negative effects is important in terms of developing appropriate economic policies to minimize fluctuations.

Although there is no consensus on the causal factors of exchange rate volatility, many factors have been identified in the literature. Some factors are mostly country-specific. Trade opennes, capital flows, economic growth rate, level of financial development, foreign reserve level, external debt and the current exchange rate regime are among the commonly mentioned factors. The extent to which each factor affects exchange rate movements depends on the method used, the period of analysis and the economic conditions prevailing in each country (Stancik, 2007: 2; Oaikhenan ve Aigheyisi, 2015: 50).

There is a wide literature analyzing the effect of exchange rate volatility on various macroeconomic aggregates such as economic growth, trade flows, domestic and foreign investments and capital flows. However, there are not many studies on the causes or determinants of exchange rate volatility.

The objective of this study is to determine the sources of exchange rate volatility in Turkey for the period 1974-2016. To achieve our objective, this paper consists of the following sections: the next section provides theoretical framework on the determinants of exchange rate volatility. Section three presents applied literature. While the fourth section presents data and econometric methodology, the fifth section concludes the paper.

2. THEORETICAL FRAMEWORK

In both developed and emerging economies, exchange rate stability is important in achieving macroeconomic policy objectives. Governments have adopted different exchange rate management policies, especially for developing economies, to create a realistic and stable exchange rate.

For this reason, many countries have been exposed to exchange rate fluctuations, which have become highly uncertain or volatile. Exchange rate volatility is an important factor that increases the risk in the financial world (Hassan et.al.,2017: 2). So exchange rate volatility and its determinants for countries have become a new focus of interest.

All factors that determine foreign exchange supply and demand cause indirect exchange rate volatility to change. There are many factors that affect the real exchange rate volatility, even if the effect of each depends on the economic conditions of the countries of the world. These factors include output level, inflation, trade openness, interest rates, domestic and foreign money supply, exchange rate regime, central bank independence, changes in the balance of payments, international capital movements, developments in information and communication technologies and monetary and fiscal policies to be implemented. In addition, speculations, news, expectations that contribute to the exchange of these variables will indirectly affect the volatility of the exchange rate (Ayhan, 2016:10; Stancik, 2007:2; Ajao, 2015: 47; Hassan et.al., 2017: 2).

In terms of the fundamental determinants of exchange rate volatility, the focal point is almost exclusively focused on macroeconomic fundamentals and structural features of the foreign exchange market. However, some studies have also analyzed the effect of "soft power" measures on exchange rate volatility (Cevik, 2015: 4). In this respect, it can be said that the "soft power" factors have an important influence on the exchange rate volatility, directly and indirectly, by reinforcing complementarities among different institutions, promoting better policy choices and shaping the pattern and evolution of macroeconomic bases and risk premiums (Cevik, 2017: 272).

Theoretical support for the determination of the exchange rate is based on monetary and macroeconomic theories. The theory of money, which assumes the integration of goods and capital markets, suggests that the rate of change between two countries' currencies should be equal to the total price level between the two countries. Macroeconomic (real) theory draws attention to macroeconomic variables in determining the exchange rate. This approach is divided into the Balassa-Samuelson approach and the approach of payment balance, as proposed by Nurkse. The Balassa-Samuelson approach focuses on the trade balance between traded and non-trade sectors, while Nurkse's approach draws attention to the balance of payments (Hassan et.al.,2017:3). An appropriate payment balance leads to an excessive appreciation of the exchange rate, and an imbalance in payments leads to the depreciation of the exchange rate of the country. Therefore, foreign exchange demand and supply have an important role in determining the exchange rate in the foreign exchange market (Hassan et.al.,2017: 3). In addition, the floating exchange rate regime is more volatile than the fixed exchange rate regime (Oaikhenan and Aigheyisi, 2015: 48).

3. APPLIED LITERATURE

With the emergence of floating exchange rate regimes, the volatility of exchange rates attracted much attention in economic researches. In the literature on the determinants of exchange rate volatility, there are various empirical studies using time series or panel data analysis methodologies on different countries or groups of countries. Table 1 presents some empirical studies investigating the determinants of exchange rate volatility. When table 1 is examined, it appears that the

factors affecting exchange rate volatility are financial openness, net foreign asset and interest rate, fiscal balance, economic (trade) openness, inflation, inflation volatility, commodity prices, oil prices, output, domestic output movements, growth rate, volatility of output, government expenditures, money supply growth, money supply volatility, terms of trade shocks, FDI flows, foreign reserves, current account balance, domestic and external debts.

Table 1: Applied Studies on the Determinants of Exchange Rate Volatility

Author	Period / Country	Method / Variables	Conclusion
Calderon and Kubota (2018)	1974-2013 82 countries (of which 22 are industrial countries)	Panel regression analysis	The results show that trade in manufacturing helps reduce RER volatility while non-manufacturing trade may contribute to higher RER volatility and that financial openness mitigates (amplifies) RER volatility in a country with higher (lower) share of foreign equity vis-à-vis foreign debt liabilities.
Khin et.al.(2017)	2010-2016 Malaysia	VECM, Johansen Cointegration test and Granger Causality test	The VECM model results indicated a significant and positive short-run relationship between exchange rate, consumer price index (CPI), and the lagged of the exchange rate. Besides, there is also a significant and negative short-run relationship between exchange rate and money supply.
Adusei and Gyapong (2017)	1975-2014 Ghana	Partial Least Squares Structural Equation Modelling approach	These results underpin the conclusion that inflation, monetary policy rate, current account balance, money and quasi money supply per GDP, annual GDP growth rate and the total external debt are significant predictors of the cedi-dollar exchange rate in Ghana.
Hassan et.al. (2017)	1989Q1- 2015Q4 Nigeria	Autoregressive Distributed Lag (ARDL) model and Granger Causality test	The findings revealed that net foreign asset and interest rate have positive and statistically significant impact on exchange rate volatility while fiscal balance, economic openness and oil price have positive and statistically insignificant impact on exchange rate volatility. Furthermore, nominal gross domestic product has negative and statistically insignificant impact on exchange rate volatility.
Alagidede and Ibrahim (2017)	1980 - 2013 Ghana	Johansen cointegration test and VECM	Results showed that in the short-run, output was the most important driver of exchange rate fluctuations. In the long run, exchange rate volatility was significantly influenced by government expenditure and money supply growth and terms of trade shocks, FDI flows and domestic output movements.
Mpofu (2016)	1986-2013 South Africa	GARCH model	The study found that switching to a floating exchange rate regime has a significant positive effect on ZAR volatility. The results also indicate that trade openness significantly reduces ZAR volatility only when bilateral exchange rates are used, but finds the opposite when multilateral exchange rates are used. The study also finds that volatility of output, commodity prices, money supply and foreign reserves significantly influence ZAR volatility.
Cevik et.al. (2016)	1996-2011 115 countries	GMM	The empirical results showed a high degree of persistence in exchange rate volatility, especially in emerging market economies. It was also found that "soft power" variables have a statistically significant effect on exchange rate volatility between countries.
Oaikhenan, and Aigheyisi (2015)	1970-2013 Nigeria	EGARCH model	The results showed that of the economy, government expenditures, interest rate movements as well as the lagged exchange rate are among the major significant variables that influence REXRVOL during this period.
Insah and Chiaraah (2013)	1980- 2012 Ghana	ARDL model	The results revealed that there exist positive relationship between government expenditure and exchange rate volatility, while money supply, domestic and external debts were negatively related to exchange rate volatility.
Mirchandani	1991 - 2010	Pearson's	Exchange rates is correlation with many variables such as

(2013)	India	correlation analysis	interest rate, inflation rate, growth rate and current account balance in either direct or indirect manner.
Ajao and Igbokoyi (2013)	1981 - 2008 Nigeria	GARCH and ECM model	The results indicated that real exchange rate, trade openness, government expenditure, real interest rate have positive impact on exchange rate volatility.
Grydaki and Fontas (2011)	1979-2009 Certain Latin American countries	Multivariate GARCH Model	The study revealed that financial openness, money supply volatility and inflation volatility explained exchange rate volatility. Flexible exchange rate regime was also found to increase exchange rate volatility.
Englama *et al.* (2010)	1999:1 -2009: 12 Nigeria	VAR model and VECM model	The results showed that exchange rate volatility was strongly influenced by changes in oil price at the foreign market both in the long-run and short-run.
Asiama and Kumah (2010)	1980 - 2008 African countries	Panel cointegration approach	The study revealed that real exchange rate was strongly influenced by openness, terms of trade and oil prices.
Morana (2009)	1980:1–2006:6 US, Japan, Euro-12 area, UK, and Canada	FI-F-VAR model	The results of the study show that with causality being stronger from macroeconomic volatility to exchange rate volatility.
Chipili (2009)	1964-2006 Zambia	GARCH model	The results indicated that the switch from the fixed to the flexible exchange rate regimes had significant positive effect on the conditional volatility of real exchange rate. In addition, monetary factors had a relatively larger effect than real factors.
Calderon and Kubota (2009)	1975-2005 82 countries	Panel data regression analysis	The results showed that high productivity shocks and sharp oscillations in monetary and fiscal policy shocks was reason high real exchange rate volatility. It was also found that financial openness led to fluctuations in the real exchange rate.
Al-Samara (2009)	1980 -2008 Syria	VECM and ARCH	The results showed that relative productivity, total investment and oil price have positive impact on exchange rate volatility. Government expenditure was found to have negative impact.
Stancik (2007)	1999-2014 European Union members' countries	TARCH model	The findings revealed that economic openness, information and flexible exchange rate regimes have positive and statistically significant impact on exchange rate volatility.

4. DATA AND ECONOMETRIC METHODOLOGY

4.1. Data

This study used data from the 1974-2016 period for Turkey. All variables used in the analysis are used after the logarithms are taken. The functional form of the econometric model will be as:

$$VOL_t = \beta_0 + \beta_1 LFDI_t + \beta_2 LGFCF_t + \beta_3 LTRADE_t + \beta_4 LGGFCE_t + \beta_5 LMONEY_t + \varepsilon_t \quad (1)$$

The abbreviations, descriptions of variables and source of the data are presented in the Table 2.

Table 2: The Dataset-Variable Description

Abbreviations of variables	Definition	Source
REER	Real effective exchange rate (CPI based) considering 67 trading partners, (1974-2016)	Bruegel Database 2017
FDI	Foreign direct investment, net inflows (% of GDP) (1974-2016)	The World Bank (WB) (World Development Indicators 2018)
GFCF	Gross fixed capital formation (% of GDP) (1974-2016)	The World Bank (WB) (World Development Indicators 2018)
TRADE	Trade opennes (% of GDP) (1974-2016)	The World Bank (WB) (World Development Indicators 2018)
GGFCE	General government final consumption expenditure (% of GDP) (1974-2016)	The World Bank (WB) (World Development Indicators 2018)

GDPC	GDP (constant 2010 US$) (1974-2016)	The World Bank (WB) (World Development Indicators 2018)
MONEY	Broad money growth (annual %) (1974-2016)	The World Bank (WB) (World Development Indicators 2018)

In the application part of the study, first, the real exchange rate volatility series (VOL) is estimated using the real effective exchange rate with the GARCH (1,1) model. Then, stationary analysis is performed with the Augmented Dickey-Fuller (ADF) (1981) and Phillips-Perron (PP) (1988) unit root tests. The Johansen cointegration test is used to test whether there is a cointegration relationship between the variables. The coefficients are also estimated with the help of the Fully Modified Ordinary Least Squares (FMOLS) model.

4.2. Econometric Results

4.2.1. Estimated Exchange Rate Volatility

Using the GARCH (p, q) method (Bollerslev, 1986), the real effective exchange rate volatility series (VOL) is established. The GARCH model tries to demonstrate the volatility by allowing delayed conditional variances to enter the model. The estimated model can be expressed in equation 2 below.

$$\sigma_t^2 = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{i-1}^{q} \beta_j \sigma_{t-j}^2 \quad (2)$$

The hypothesis set in Equation 3 is tested

$$H_0 = \alpha_1 = \alpha_2 = ... = \alpha_p = 0$$
$$H_0 \neq \alpha_1 \neq \alpha_2 \neq ..... \neq \alpha_p \neq 0 \quad (3)$$

The Lagrange multiplier (LM) test developed by Engle (1982) is used when testing whether a variable contains ARCH effects in the literature. In the case of LM> χ_p^2 (p degrees of freedom) table, the null hypothesis can be rejected and the existence of ARCH effect and model specification can be decided. After accepting the ARCH effect, the GARCH (1,1) model is developed to estimate the volatility.

Table 3: Lagrange Multiplier Test Results

Heteroskedasticity Test: ARCH			
F-statistic	13.37661	Prob. F(1,40)	0.0007
Obs*R-squared	10.52554	Prob. Chi-Square(1)	0.0012

As seen in Table 3, the probability value of χ^2 according to ARCH LM test result is found to be significant at 5% level. This result indicates that the hypothesis H_0 is to be rejected, in other words, it is the ARCH effect and therefore has a volatility of the series. Thus, the GARCH variance series shows that it can be used as a measure of real effective exchange rate volatility.

4.2.2. Unit Root Test Results

The stationary of the variables is tested with the ADF (Augmented Dickey-Fuller, 1981) and PP (Phillips-Perron, 1988) unit root tests. The null hypothesis for Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) implies that the unit root is contained, ie the series are not stationary. In both tests, the null hypothesis is rejected if the test statistics are less than the critical values.

Accordingly, the level of the null hypothesis for all variables can not be rejected at the level of 5% significance. However, it is found that the first differences of variables are stationary. The Johansen cointegration test can be performed because the variables used in the analysis are stationary ratings I(1).

Table 4: ADF ve Phillips-Perron Unit Root Test Results

	ADF (%5)		Phillips-Perron (%5)		
Variable	**Level (Intercept)**	**1st. Different (Intercept)**	**Level (Intercept)**	**1st. Different (Intercept)**	**Order of integration**
VOL	-1.740335 (-2.933158)	-6.242312 (-2.935001)	-1.792967 (-2.933158)	-6.263567 (-2.935001)	I(1)
LGDPC	0.269935 (-2.933158)	-6.197479 (-2.935001)	0.299192 (-2.933158)	-6.195244 (-2.935001)	I(1)
LGFCF	-1.638726 (-2.933158)	-5.720557 (-2.935001)	-1.736936 (-2.933158)	-5.719206 (-2.935001)	I(1)
LGGEXP	-1.138135 (-2.933158)	-5.578213 (-2.935001)	-1.460649 (-2.933158)	-5.641496 (-2.935001)	I(1)
LFDI	-1.745577 (-2.933158)	-9.137707 (-2.935001)	-1.456177 (-2.933158)	-9.932143 (-2.935001)	I(1)
LTRADE	-1.523261 (-2.933158)	-4.655854 (-2.936942)	-1.538926 (-2.933158)	-5.466694 (-2.935001)	I(1)
LMONEY	-1.195527 (-2.935001)	-9.537864 (-2.935001)	-1.841850 (-2.933158)	-9.695659 (-2.935001)	I(1)

Note: The numbers in the table are t statistic values and critical values are reported in the parentheses.

4.2.3. Determination of Lag Length and Appropriate Model

It is necessary to find the optimum lag length before proceeding to the Johansen cointegration test. VAR analysis is used to determine the optimum lag length. When the VAR model is established, the model selection criteria values for various lag lengths are as shown in Table 5.

Table 5: Determination of Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	21.59371	NA	1.14e-09	-0.729686	-0.434132	-0.622823
1	258.2276	378.6142	9.95e-14	-10.11138	**-7.746947***	-9.256475
2	311.7785	66.93871	9.99e-14	-10.33893	-5.905618	-8.735982
3	410.2753	**88.64710***	**1.67e-14***	**-12.81377***	-6.311580	**-10.46278***

*Indicates lag order selected by the criterion. LR: Sequential modified LR test statistic (each test at 5% level). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan‑Quinn information criterion

As shown in Table 5, the appropriate number of lag length for the unrestricted VAR model is 3 according to the LR, FPE, AIC and HQ information criteria. The existence of a long-run relationship between variables is determined by the Johansen cointegration test after the appropriate number of lag length are determined.

When the cointegration test is applied, it is important to determine whether the model includes constant, parameter and trend and what kind of trend is affected by the variables. In order to determine the appropriate model, usually the model with the minimum Akaike and Schwarz value is selected. In the study, the model with the smallest Akaike and Schwarz values became a quadratic deterministic trend model.

4.2.4. Johansen Cointegration Analysis

Johansen (1988) and Johansen and Juselius (1990) have developed a cointegration test that can be used even if there is more than one cointegration relationship between variables, using the VAR model that takes all the variables endogenous. The cointegration tests allow the estimation and modeling of the long-run relationship between variables that are stationary at the same level but are not stationary in their levels.

Table 6: Results of Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.998924	541.0258	139.2753	0.0001
At most 1 *	0.923219	274.4790	107.3466	0.0000
At most 2 *	0.846908	174.3736	79.34145	0.0000
At most 3 *	0.805297	101.1818	55.24578	0.0000
At most 4 *	0.568376	37.36691	35.01090	0.0275
At most 5	0.104673	4.599078	18.39771	0.9550
At most 6	0.007332	0.286999	3.841466	0.5921

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.998924	266.5468	49.58633	0.0001
At most 1 *	0.923219	100.1053	43.41977	0.0000
At most 2 *	0.846908	73.19185	37.16359	0.0000
At most 3 *	0.805297	63.81485	30.81507	0.0000
At most 4 *	0.568376	32.76784	24.25202	0.0030
At most 5	0.104673	4.312078	17.14769	0.9465
At most 6	0.007332	0.286999	3.841466	0.5921

Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The results of the Johansen cointegration test for the determination of the existence of a long-term relationship between variables are presented in Table 6. Johansen's maximum likelihood approach uses two types of probabilistic test statistics. One of them is the trace statistic and the other is the maximum eigenvalue statistic. According to the trace statistic and maximum eigenvalue statistic, the null hypothesis (r = 0) that there is no cointegration relation between variables is rejected against the alternative hypothesis that there is a cointegration relation between variables. Because trace statistic and maximum eigenvalue statistic values are greater than the critical value of 5%. Both the trace statistic test and the maximum eigenvalue statistic test at the 5% level show that the equation of cointegration is 5. This result shows that there is a long-run relationship between the variables.

4.2.5. Fully Modified Ordinary Least Squares

As described in Juselius (1999), parameter quantities obtained from the Johansen cointegration test are not interpreted (Saatçi and Dumrul, 2013: 18). For this reason, after the long-run relationship between variables has been established according to the results of the cointegration test, the severity and direction of this relationship has been estimated using the FMOLS method developed by Phillips and Hansen (1990). The FMOLS test is valid under the assumption that all variables are stationary in the first difference and that there is a cointegration relationship between the variables. Table 7 shows the estimation results obtained from the FMOLS analysis.

Table 7: Dynamic Analysis of Variables Affecting Real Effective Exchange Rate FMOLS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFDI	-0.016000	0.014694	-1.088940	0.2836
LGDPC	-0.138941	0.067748	-2.050860	0.0478
LGFCF	0.360964	0.072455	4.981939	0.0000
LGGEXP	-0.173188	0.075062	-2.307281	0.0271
LMONEY	0.072992	0.016973	4.300455	0.0001
LTRADE	0.126775	0.047180	2.687030	0.0110
C	2.402814	1.548743	1.551461	0.1298
R-squared	0.678041	Mean dependent var		0.098298
Adjusted R-squared	0.622848	S.D. dependent var		0.109765
S.E. of regression	0.067410	Sum squared resid		0.159043
Long-run variance	0.003134			

The value of the R^2 indicates that about 67 % of the variation in exchange rate volatility is due to variations in the independent variables. This result shows that the variables involved in the analysis are among the major variables affecting exchange rate volatility. Results from the FMOLS reveal that LGFCF, LMONEY and LTRADE positively affects significantly real effective exchange rate volatility. An increase in LGFCF which is used as a demonstration of domestic investment and LMONEY which is used as a indicator of money supply increases the exchange rate volatility. In the literature, it is stated that as the openness of the economy increases, exchange rate volatility will decrease (Al-Samara, 2009: 8). However, FMOLS results show a statistically significant positive relationship between real effective exchange rate volatility and trade openness. The reason for the increase in exchange rate volatility of the trade openness can be explained by the fact that the non-manufacturing trade is higher. The correlation between trade openness and RER volatility varies, especially when there is a distinction between trade in manufacturing and non-manufacturing goods. Non-manufacturing trade may contribute to higher RER volatility, while manufacturing trade helps balance RER volatility (Calderón and Kubota, 2018: 183).

FDI negatively affect insignificantly exchange rate volatility. The LGDPC coefficient is negative and significant. The increase in LGDPC shows that the exchange rate volatility are reduced. The increase in LGDPC suggests that the increase in output increases the volatility. The effect of LGGEXP on exchange rate volatility is negative and statistically significant. This effect indicates that an increase in government spending has reduced exchange rate volatility.

5. CONCLUSION

The exchange rate volatility and uncertainty caused by volatility, investments, capital movements, production, imports and exports negatively affect. It is important to know the factors that cause exchange rate volatility in order to create economic policies that will minimize exchange rate volatility. In this study, the factors that led to the real effective exchange rate volatility for the 1974-2016 period in Turkey, Johansen cointegration test and FMOLS test is attempted to be determined. In addition, the GARCH model is used to calculate the real effective exchange rate volatility in the study.

According to Johansen cointegration test results, it has been found that there is a long-run relationship between the variables involved in the analysis. Results from the FMOLS method for determining the direction and severity of the long-run relationship between the variables reveal that domestic investment (LGFCF), money supply (LMONEY) and trade openness (LTRADE) positively affects significantly, while foreign diret investment (LFDI), output (LGDPC), government expenditure (LGGEXP) negatively affects real effective exchange rate volatility. This result implies that the exchange rate volatility will increase as domestic investment (LGFCF), money supply (LMONEY) and trade openness (LTRADE) increase, exchange rate volatility will decrease as the foreign direct investment (LFDI), output (LGDPC) and government expenditure In some of the studies in the literature, the increase in government expenditures has positively affected the exchange rate volatility, whereas in this study it is reached that the spending negatively affects the volatility, consistent with the Al-Samara (2009). In addition, while the trade openness is expected to negatively affect the exchange rate volatility, in this study it is reached that it affects the volatility positively. This result is consistent with the workings of Ajao and Igbokoyi (2013) Stancik (2007) and Hassan et.al. (2017).Policy makers can develop appropriate macroeconomic and monetary policies, taking into account these factors that affect exchange rate volatility. In future studies, the effect of soft power indicators on exchange rate volatility can be analyzed for Turkey.

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