An Empiric Analysis on the Relationship between Exchange Rates and Inflation in Fragile Five Countries[1]

Kırılgan Beşli Ülkelerinde Döviz Kuru ve Enflasyon Arasındaki İlişki Üzerine Ampirik Bir Analiz

Murat EMİKÖNEL, University of Kocaeli, Türkiye, murat.emikonel@kocaeli.edu.tr

Orcid No: 0000-0002-8415-0510

Ayhan ORHAN, University of Kocaeli, Türkiye, aorhan@kocaeli.edu.tr

Orcid No: 0000-0002-8109-4306

Abstract: The exchange rate, which is defined as the value of one unit of foreign currency against the national currency or the value of one unit of national currency against foreign currency, has an impact on the inflation of countries that depend on foreign inputs in their domestic production, especially since it interacts with foreign trade. As a result of the fragilities created by the policies implemented in the country or external shocks, the five countries that lost the most value against the US dollar among the currencies of the developing countries were defined as the Fragile Five by Morgan Stanley. In this context, in this study, it is aimed to determine the long-term and short-term relationship (the existence of cointegration) between the exchange rate and inflation with the monthly data of the 1990:M1-2020:M12 period obtained from the IMF online database for the countries defined as the Fragile Five. After determining the existence of cointegration, ARDL test was applied to determine the effect of exchange rate on inflation. The findings show that there is cointegration between the exchange rate and the inflation rate in the countries included in the study. In addition, it has been determined that the exchange rate has no significant effect on inflation in the long run for Brazil, Türkiye and India, while it has significant effect on in Indonesia and South Africa.

Keywords: Exchange Rate, Inflation, Fragile Five, ARDL Bounds Test

JEL Classification: C32, E31, F31

Özet: Bir birim yabancı para biriminin ulusal para birimi karşısındaki değeri ya da bir birim ulusal para biriminin yabancı para karşısındaki değeri olarak tanımlanan döviz kuru, dış ticaret ile etkileşim halinde olması sebebiyle özellikle yurtiçi üretiminde dış girdiye bağlı olan ülkelerin enflasyonu üzerinde etkili olmaktadır. Ülke içinde uygulanan politikalar veya dışsal şokların oluşturduğu kırılganlıklar sonucunda gelişmekte olan ülke para birimlerinden ABD doları karşısında en çok değer kaybeden beş ülke Morgan Stanley tarafından Kırılgan Beşli olarak tanımlanmıştır. Bu bağlamda bu çalışmada Kırılgan Beşli olarak tanımlanan ülkeler için IMF çevrimiçi veri tabanından temin edilen 1990:M1-2020:M12 dönemine ait aylık verilerle döviz kuru ile enflasyon arasındaki uzun ve kısa dönemli ilişkinin (eşbütünleşmenin varlığının) araştırılması amaçlanmaktadır. Eşbütünleşmenin varlığı tespit edildikten sonra döviz kurunun enflasyon üzerindeki etkisini belirlemek için ARDL testi uygulanmıştır. Elde edilen bulgular, çalışmaya dahil edilen ülkelerde döviz kuru ile enflasyon oranı arasında eşbütünleşme olduğunu göstermektedir. Ayrıca, uzun vadede Brezilya, Türkiye ve Hindistan için döviz kurunun enflasyon üzerinde etkili olmadığı, Endonezya ve Güney Afrika'da ise etkili olduğu belirlenmiştir.

Anahtar Kelimeler: Döviz Kuru, Enflasyon, Kırılgan Beşli, ARDL Sınır Testi

JEL Sınıflandırması: C32, E31, F31

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1. Introduction

Exchange rates, which are defined as the value of a local currency against foreign currency, are important factors affecting the economic structure countries and determining inflationary trends in open economies. The changes in the general level of prices observed in all countries since the 1970s have been a worrying issue for countries. It is observed that inflation in foreign countries triggers domestic inflation especially for developing countries. This situation ensures that domestic policies are ineffective. Continuous devaluation of the inflation rate and currency in the 1980s proves that there is a relationship between the inflation rate and the exchange rate (Madesha et al., 2013: 52). Fluctuations in exchange rates significantly affect inflation in these countries compared to other developed economies. Therefore, the phenomenon of exchange rate and inflation is important in developing economies (Dornbuch, 1976). Increases or decreases in exchange rates will increase production costs for countries that import intermediate goods. These will be reflected in the price of the final goods. In this context, while the increase in the exchange rate will increase inflation, the decrease in the exchange rate will cause the inflation to decrease. Agenor and Montiel (1996) explained the effect of an increase in exchange rate on inflation in four ways. The first is that an open economy can affect the price of tradable goods and imported substitutes. The second is that the price increase in intermediate goods will increase the prices of final goods. The third is that the uncertainty resulting from the fluctuations in the exchange rate will increase the prices. Fourth, prices can rise through wages. The effect of the exchange rate on inflation is determined by the exchange rate pass-through. This pass-through can be handled in two ways. First, the dependence of imported goods on domestic prices on the exchange rate; The second is the direct effect of the exchange rate on inflation. When looking at the studies examining the relationship between exchange rate and inflation, exchange rate pass-through can be seen partially (Rowland, 2004; Ito and Sato, 2006; Shu and Su, 2009; Frimpong and Adam, 2010; Ponomarev, 2014; Kumar, 2014; Bhat and Bhat, 2021). The effect of the pass-through in the exchange rate has full effect if the prices of imported goods are determined in the currency of the producer country, while there is no pass-through effect if they are determined according to the currency of the importing country. Having domestic substitution of imported goods; in the case where production factors are imported, part of the cost increase is reflected on the producers and some of them on the importing country are the cases where there is partial pass-through. Since payments such as sales services and transportation costs are added to the price of the final goods, it is another determinant factor on pass-through (Kataranova, 2010: 46). After the 2008 global crisis, the FED reduced

interest rates and started to drive money into financial markets through bond purchases in order to reduce the impact of the crisis. The abundance of liquidity in the financial markets provided hot money inflows to developing countries as well. However, the FED's decision to tighten monetary policy by leaving monetary expansion in 2013 made the effect of exchange rate on inflation more visible. Following this decision, currencies of developing countries started to depreciate against the US dollar. In this process, currencies most depreciating countries Brazil, Indonesia, India, Türkiye and South Africa have been. These five countries are defined as fragile five in the Morgan Stanley Investment Bank Report of August 2013 (Morgan Stanley, 2013: 1-2). According to the report, low economic growth rates and inflation risk are other factors that increase vulnerabilities. These factors also pose an exchange rate risk in these countries. The inflation rates of fragile quintet countries covering the years 2004-2020 are given in figure 1.
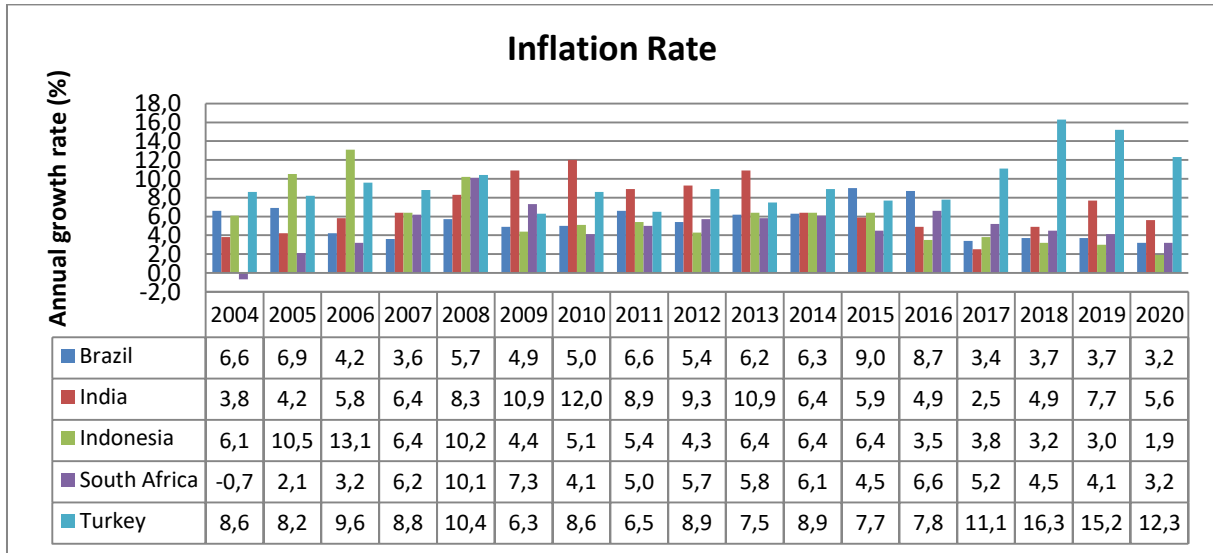
Inflation Rate

Annual growth rate (%)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
■ Brazil	6,6	6,9	4,2	3,6	5,7	4,9	5,0	6,6	5,4	6,2	6,3	9,0	8,7	3,4	3,7	3,7	3,2
■ India	3,8	4,2	5,8	6,4	8,3	10,9	12,0	8,9	9,3	10,9	6,4	5,9	4,9	2,5	4,9	7,7	5,6
■ Indonesia	6,1	10,5	13,1	6,4	10,2	4,4	5,1	5,4	4,3	6,4	6,4	6,4	3,5	3,8	3,2	3,0	1,9
■ South Africa	-0,7	2,1	3,2	6,2	10,1	7,3	4,1	5,0	5,7	5,8	6,1	4,5	6,6	5,2	4,5	4,1	3,2
■ Turkey	8,6	8,2	9,6	8,8	10,4	6,3	8,6	6,5	8,9	7,5	8,9	7,7	7,8	11,1	16,3	15,2	12,3

Figure 1. Inflation Rates of the Fragile Five Countries

Source: OECD Stats

In Figure 1, the lowest inflation rate of 1.9 percent in 2020 is belong to Indonesia and the highest inflation rate of 12.3 percent is belong to Türkiye. When the inflation rate of the countries is examined one by one, Brazil's inflation rate was 6.6 percent as of the beginning year and it was 3.2 percent in 2020. While 2015 had the highest inflation rate for Brazil with 9 percent, 2020 was the year when it was the lowest. India's inflation rate increased from 3.8 percent in 2004 to 12 percent in 2010. This year was the year in which inflation was the highest in 17 years. Later, inflation was reduced with the measures taken. As of 2020, it was 5.6 percent. Indonesia's inflation rate reached the highest level in 2006 as 13.1 percent in the

period between 2004-2020. In the following years, declines started to occur and in 2020 inflation rate was 1.9 percent. South Africa's inflation rate was -0.7 percent in 2004 and it was 10.1 percent in 2008. According to Figure 1, 2008 was also the year in which inflation was the highest in South Africa. After 2008, the inflation rate started to decrease gradually and it was 3.2 percent in 2020. Referring to Türkiye in 2004 was realized as 8.6 percent inflation rate. While the inflation rate remained flat until 2018, it increased to 16.3 percent in 2018, decreased to 15.2 percent in 2019 and was 12.3 percent in 2020.

When looking at the literature, the relationship between inflation and exchange rate has always been a subject of research for economists (Svensson, 2000). However, as a result of the rapid spread of the coronavirus seen in Wuhan in December 2019, the World Health Organization's declaration of a pandemic has changed many things in the world. During the pandemic, even developed countries had difficulties in ensuring their financial stability, while this process was more difficult for developing countries. In this context, the study aims to investigate the short and long-term relationship between exchange rate and inflation between the years 1990:M1-2020:M12 for countries that are more affected by shocks and defined as fragile quintets. The most important feature that distinguishes this study from other studies is that, by working with monthly data, the damage caused to the economies in the early stages of the pandemic can be seen. The flow of the study consists of four parts. The first chapter includes the introduction, the second chapter includes the literature, the third chapter includes the data set and method, and the fourth chapter includes the conclusion.

2. Literature Review

In the literature, there are many studies examining the relationship between exchange rate and inflation. These studies are generally studies aimed at determining the causality direction between variables. In these studies, Mihaljek and Klau (2001), Darvas (2001) and Kesavarajah (2010) found a causal relationship from exchange rate to inflation. Leigh and Rossi (2002), Coricelli et al. (2004), Albuquerque and Portugal (2005), Edwards (2006), Zaferio et al. (2008), Imimole and Enoma (2011), Fetai et al. (2016), in their studies using the VAR model analysis, concluded that there is a direct relationship from exchange rate to inflation rate.

Kholdy and Sohrabian (1990) investigated the relationship between exchange rate and inflation with Granger causality analysis between 1973 and 1988 in their study covering Germany, Canada and Japan, which have an important place in the foreign trade of the USA.

As a result, they found a bidirectional causality relationship between inflation and exchange rate for countries other than Canada.

Muço et al. (2004) investigated the relationship between inflation and exchange rate for Albania with the VAR model in the period 1994:01-2003:12. As a result of the analysis, exchange rate stability is very effective in keeping inflation low.

Westerlund (2006) investigated the relationship between exchange rate, interest rate and inflation in the period 1980:01-1999:12 for 14 OECD countries using the panel cointegration method. As a result of the analysis, it was concluded that the Fisher hypothesis is valid for 14 OECD countries.

Vicente (2007) examined the relationship between inflation and exchange rate in the period 2001:01-2006:12 using a cointegration test for Mozambique. The study found that there is a long-term relationship between variables. He found that every 1% increase in the exchange rate increases inflation by 0.15%.

Achsani, et al. (2010) examined the relationship between inflation and exchange rate between 1991 and 2005 using ASEAN + 3, Granger Causality Analysis and Panel Data Analysis for the EU and North America. While a unidirectional causality running from nominal and real exchange rates to inflation was found for Asian countries, the reverse was found for the European Union and North America. On the other hand, the sensitivity of changes in exchange rates to inflation is higher in Asia than in the EU and North America.

Asad et al. (2012) investigated the relationship between real effective exchange rate and inflation for Pakistan between 1973-2007. They determined the existence of a positive and strong relationship between real effective exchange rate and inflation.

Oriavwote and Eshenake (2012) analyzed the relationship between real exchange rate and inflation between 1970 and 2010 using Granger Causality Analysis for Nigeria. As a result of the study using CPI, imports, Money Supply and Real Effective Exchange Rate data, it has been determined that there is a long-term relationship between inflation and real exchange rate.

Helali et al. (2014) analyzed the long and short-term pass-through of the exchange rate for Tunisia using the Var analysis between 1993 and 2011. They found that the increase in the exchange rate had an effect on inflation.

Sheefeni and Ocran (2014) examined the pass-through of the exchange rate to domestic prices for the Namibian economy between 1993 and 2011 using the VAR analysis method. The findings show that in addition to the effect of changes in exchange rates on inflation, this effect increases in the long run.

Lado (2015), in his study examining the relationship between exchange rate and inflation using the Granger Causality Analysis method for South Sudan in the period between 2011:08-2014:11, concluded that there is a unidirectional relationship from the exchange rate to the CPI.

Yien et al. (2017) examined the relationship between inflation, debt and exchange rate with Granger Causality Analysis for Malaysia between 1960 and 2014. In the study, they found that domestic and foreign debt have a positive relationship with inflation in the short term. In the long run, they found that the exchange rate has a significant effect on inflation.

Osabuohien et al. (2018) investigated the effect of inflation rate, exchange rate volatility and exchange rate transition in the period of 2006:01-2015:12 using the Autoregressive Conditional Variable Variance Models (GARCH) method for Nigeria. In the study, they concluded that the market exchange rate is a pass-through to inflation in the short term and the official exchange rate in the long run.

Miyajima (2020) examined the causality relationship between the exchange rate and core inflation in South Africa for the period 2005:Q1-2018:Q2 and found that the nominal effective exchange rate increased the core inflation.

Husaini and Lean (2021) examined the effect of oil prices and exchange rate on inflation for Indonesia, Thailand and Malaysia using annual data between 1978 and 2018 and concluded that exchange rate increases inflation for all countries.

3. Data Set and Method

In this study, it is aimed to determine the long-term and short-term relationship[2] between the exchange rate and inflation with the monthly data of the 1990:M1-2020:M12 period obtained from the IMF[3] online database for the countries defined as the Fragile Five. After determining the existence of cointegration, ARDL test was applied to determine the effect of exchange rate on inflation. In the study, while the exchange rate is the independent variable, inflation is the dependent variable and it is shown by ER_t and Inf_t, respectively. Equation showing the relationship between variables is given in equation 1.

$$Inf_t = \alpha_0 + \beta_1 ER_t + \varepsilon_t \tag{1}$$

Inf, consumer price index

ER_t, exchange rate

ε_t, stands for error term.

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[2] the existence of cointegration
[3] International Monetary Fund

Granger & Newbold (1974) showed that if non-stationary time series are studied, spurious regression problem can be encountered. Economic time series also generally have non-stationary processes (Johansen and Jesulius, 1990: 170). If the series are used without stabilization, the results will not be reliable (Gujarati, 1999; 726). Therefore, in econometric analysis, in order to interpret the variables among the variables reliably and correctly, the analyzed series must be stationary. For this reason, it is important to examine the stationarity of the series before analyzing the time series. In this context, the series were analyzed with the Augmented Dickey-Fuller (ADF) unit root test in order to obtain consistent and reliable results in the analysis. Test results are presented in table 1.

Table 1. ADF Unit Root Test Results (Level and First Difference)

Country	LCPI		ER	
	Level	First difference	Level	First difference
	With Constant	With Constant	With Constant	With Constant
BRAZİL	-3.6466.	-6.3978	-0.4791	-13.5615
	0.0053***	0.0000***	0.8921	0.0000***
INDIA	-1.0346	-3.8732	-1.0469	-15.0444
	0.7418	0.0025***	0.7373	0.0000***
INDONESIA	-2.0075	-5.8239	-1.1875	-13.1316
	0.2837	0.0000***	0.6810	0.0000***
SOUTH AFRICA	-4.8453	-6.9555	-0.9613	-14.2528
	0.0001***	0.0000***	0.7677	0.0000***
TÜRKİYE	-2.9522	-1.3251	4.3229	-9.8344
	0.0406**	0.6189	1.0000	0.0000***

Note: **, *** denote statistical significance 5%, 1%, respectively.

According to the unit root test results that will determine the cointegration test to be used in the study, it is seen that the variables for each country are stable at different levels (at 5 percent or at 1 percent). For this reason, it was decided to use ARDL boundary test as a cointegration test. Because while other cointegration tests suggest the condition of the variables to be stationary at the same level, in the ARDL boundary test developed by Pesaran et al. (in 2001), the lack of a condition that requires the series to be stationary at the same level provides an important advantage for the studies (Pesaran et al., 2001: 289–326). In other words, according to this approach, the existence of a long-term relationship can be investigated regardless of whether the variables are I (0) or I (1). In addition to this important advantage, it can be used with small-observation data set as another important advantage (Narayan & Narayan, 2004).

In order to determine the existence of long-term relationship between variables, the adapted form of the model to the study is presented in equation 2.

$$\Delta \text{Inf}_t = \delta_0 + \rho_1 \text{Inf}_{t-1} + \rho_2 \text{ER}_{t-1} + \sum_{i=1}^{a} \gamma_{1i}\Delta\text{Inf}_{t-i} + \sum_{i=0}^{b} \gamma_{2i}\Delta\text{ER}_{t-i} + \varepsilon_t \qquad (2)$$

Here δ_0 is the constant term, ε_t is the error term, Δ is the first difference of the series, $\rho_{1,2}$ is the long-term factors and a, b is the lag length of the variables.

In order to test the relationship for the existence of cointegration in the ARDL model, H_0: $\rho_1 = \rho_2 = 0$ there is no cointegration versus H_1: $\rho_1 \neq \rho_2 \neq 0$ there is cointegration hypothesis is tested with the help of F statistics. If it is above H_0, there is cointegration, if it is below the limit, H_0 cannot be rejected and it is concluded that there is no cointegration. If the result obtained is between the lower limit and the upper limit, no interpretation can be made (Pesaran et al., 2001).

Table 2. ARDL Bounds Test and Diagnostic Tests

	ARDL Tests	F statistics	Diagnostic tests				Remarks
			Normality (Jarque-Bera) X^2	Heteroscedasticity X^2	Serial Correlation X^2	Ramsey Reset Tests	
F BRAZIL (CPI/ER)	2,0	5.170927**	152024.0 (0.000000)	1.322520 (0.2035)	1.765997 (0.1725)	8.692272 (0.5773)	Cointegrated
F INDIA (CPI/ER)	6,5	5.078749*	38.39676 (0.000000)	1.735726 (0.1593)	1.53E-05 (0.9969)	1.393481 (0.1644)	Cointegrated
F INDONESIA (CPI/ER)	7,3	4.545269*	9424.699 (0.000000)	1.940882 (0.1226)	0.193172 (0.8244)	1.636384 (0.1027)	Cointegrated
F SOUTH AFRICA (CPI/ER)	2,0	14.95840***	31.36055 (0.000000)	3.532999 (0.2877)	1.465540 (0.2323)	3.238159 (0.0728)	Cointegrated
F TÜRKİYE (CPI/ER)	2,2	24.17745***	17016.75 (0.000000)	1.841541 (0.1756)	0.854785 (0.4262)	6.133867 0.1342	Cointegrated

Significance Level	Critical values T:35	
All countries	Lower bounds I(0)	Upper bounds I(1)
1%	5.157	6.73
5%	3.74	5.15
10%	3.02	4.49

Notes: *, **, *** denote statistical significance 10%, 5%, 1%, respectively.

According to the F statistics results in Table 2 it has concluded that a long-term cointegration is found at 1 percent level for Türkiye and South Africa; 5 percent level for Brazil; and 10 percent level for India and Indonesia. According to the diagnostic test results, it was determined that there was no heteroscedasticity, autocorrelation problem and modeling error in the model. As a result of Jarque-Bera (normality), it was determined that the model did not show a normal distribution. However, due to the unique distribution feature of financial series, the said residues are not expected to show normal distribution characteristics. In addition, there is no structural break according to the cusum test results for countries except Brazil. Test results are presented in Appendix 1.

After determining that there is a long-term relationship between the variables, the short-term relationship of the variables was determined with the error correction model. The form of error correction model adapted to the study is presented in equation 3.

$$\Delta Inf_t = \delta_0 + \sum_{i=1}^{a} \gamma_{1i} \Delta Inf_{t-i} + \sum_{i=0}^{b} \gamma_{2i} \Delta ER_{t-i} + \beta ECT_{t-1} + \varepsilon_t \qquad (3)$$

ECT_{t-1}, which shows a lagged value of the error term obtained from the long-run model, shows the adaptation rate of the system to the long-term equilibrium after short-term shocks (Fosu & Joseph, 2006). The coefficient shows the rate at which the system adapts to the long-term equilibrium after short-term shocks. In order to interpret the error correction term (ECT), the coefficient is expected to be between 0 and -1 and statistically significant. However, Alam and Quazi (2003) explained other values that ECT can take. They stated that when the coefficient of ECT is positive or less than -2, it moves away from equilibrium, and if it is between -1 and -2, it comes to equilibrium by exhibiting decreasing fluctuations around the long-term equilibrium value.

3.1. Long Run Test Results

After determining the existence of cointegration for all countries as a result of the analysis, the ARDL test developed by Peseran et al in 2001 was applied and the long and short term coefficients of the variables were determined. Test results are given in Table 3-7.

Table 3. Long Run Relationship for Brazil

Variable	Coefficient
ER	-1.466865
	(0.2563)
TREND	0.006767
	(0.5725)

Notes: *, **, *** denote statistical significance 10%, 5%, 1%, respectively.

Considering the long term results for Brazil given in Table 3, the probability value of the exchange rate is insignificant in the long run, so it does not cause any effect on inflation.

Table 4. Long Run Relationship for India

Variable	Coefficient
ER	-0.061904
	(0.6487)
TREND	0.011368
	(0.3863)

Notes: * *, **, *** denote statistical significance 10%, 5%, 1%, respectively.

Considering the long term results for India given in Table 4, the probability value of the exchange rate is insignificant in the long run, so it does not cause any effect on inflation.

Table 5. Long Run Relationship for Indonesia

Variable	Coefficient
ER	0.000151
	(0.0000)***
CONSTANT	3.294555
	(0.0000)***

Notes: *, **, *** denote statistical significance 10%, 5%, 1%, respectively.

Considering the long term results for Indonesia given in Table 5, the probability value of the exchange rate in the long run is significant at 1 percent level. This result increases inflation by about two per ten thousand with a one-unit increase in the exchange rate. In other words, the results of the two variables analysis for the period under consideration show that the exchange rate has little effect on inflation for Indonesia.

Table 6. Long Run Relationship for South Africa

Variable	Coefficient
ER	0.017036
	(0.0459)**
TREND	0.003606
	(0.0000)***

Notes: *, **, *** denote statistical significance 10%, 5%, 1%, respectively.

When looking at the long term results for South Africa given in Table 6, the probability value of the exchange rate in the long run is significant at 5 percent. The results of the two variables analysis show that for South Africa, a one-unit increase in the exchange rate increases inflation by about two percent.

Table 7. Long Run Relationship for Türkiye

Variable	Coefficient
ER	0.558274
	(0.5028)
CONSTANT	-0.040137
	(0.2846)

Notes: *, **, *** denote statistical significance 10%, 5%, 1%, respectively.

Given the long term results given in Table 7 for Türkiye's long-term exchange rate probability value does not cause any impact on inflation because it is meaningless.

When the long-term results are evaluated in general, the increasing effect of exchange rate increases on inflation is valid for Indonesia and South Africa. When the results are compared for Indonesia and South Africa, South Africa is more affected by the changes in the exchange rate than Indonesia, as well as being severely affected proportionally. As for Brazil, India and Türkiye, no interpretation can be made as the long-term results are statistically insignificant.

4. Conclusion

Understanding the relationship between these two phenomena that affect the stability of economic policies, determining how and to what extent the variables affect each other are factors that increase the chances of success of economic policies. Exchange rates affect the input prices and national prices of final goods and services subject to exports and imports. Fluctuations in exchange rates that affect the production phase of goods and services are also reflected in consumer prices. For example; An increase in the exchange rate will increase the price of intermediate goods imported for use in production, and this will affect the increase in the price of goods produced domestically. For this reason, considering the effects of changes in exchange rates on inflation, these two concepts have become even more important, especially for developing countries. Another issue where the demand for foreign currency is important and foreign currency has a great impact on the economies of the country is the crisis periods. The effects of global crises are mostly seen in developing countries. In order to reduce the impact of the global crisis in 2008, the FED first followed an expansionary monetary policy and then announced that it would implement a contractionary monetary policy in 2013, causing the currencies of developing countries to lose the most value against the US dollar. In 2013, Morgan Stanley currencies stated the most depreciating countries as the fragile five. Morgan Stanley Investment Bank's report said these countries are Brazil, India, Indonesia, South Africa and Türkiye. High inflation rates are just one of several macroeconomic indicators that determine countries as the fragile five. In this study, the short-term and long-term relationship between exchange rate and inflation has been investigated with the ARDL boundary test for Brazil, India, Indonesia, South Africa and Türkiye expressed as fragile3 five. The study was analyzed using monthly data from the IMF for the period 1990M1-2020M12. According to the results of the analysis, it has been determined that there is a co-integration between the exchange rate and the inflation rate in the countries included in the study. It was determined that the exchange rate did not have any effect on the inflation rate for Brazil, Türkiye and India in the long run, while the inflation rates in Indonesia and South Africa had an effect on the exchange rate. When the results were compared with the literature, it was seen that the same results were obtained Sharifi (2017) for India, Leigh and Rossi (2002) for Türkiye, Achsani et al. (2010) for Indonesia, Smile (2016) for South Africa, for Minella et al. (2002) for Brazil. It has been observed that the findings obtained differ from the results of the study conducted by Mohanty and Bhanumurthy (2014) for India.

Although the exchange rate is not the only factor affecting inflation, it is one of the important factors. The fluctuations in the exchange rate affect the prices of imported main and intermediate goods and indirectly determine the inflation. In addition, increases in exchange rates do not only affect inflation, but also cause deterioration in many macroeconomic indicators. In order for growth, which is one of the important indicators in economies, to be stable and sustainable, price stability must be ensured. In economies that are easily affected by exchange rate fluctuations, new policies should be developed at the same time as existing monetary policies are revised in order to reduce the impact on inflation. For this reason, economic policies that ensure stable fluctuation of exchange rates should be implemented. By solving structural problems and reducing economic dependency, the value of national currencies should be brought under control by eliminating the vulnerabilities in the economy. In future studies, unlike this study, interest rates and money supply variables can be added as control variables and the relationship between exchange rate and inflation can be presented up-to-date by extending the period under consideration.

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Appendix 1.