THE FELDSTEIN-HORIOKA PUZZLE: EVIDENCE FROM EMERGING COUNTRIES

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ABSTRACT

This paper examines the saving-investment nexus and the level of capital mobility for the BRICS and Fragile Five countries within the scope of the Feldstein-Horioka (1980) puzzle that asserts a substantial correlation between domestic investment and domestic savings in spite of the increasing capital mobility in the world. It is used the Autoregressive Distributed Lag (ARDL) bounds test approach for the period 1980-2018 on a country-by-country to identify the nature of the saving retention coefficient. Findings of the paper reveal the Feldstein–Horioka (1980) puzzle holds for China, South Africa and Turkey period examined while there is not any long-run relationship between savings and investment in Brazil, India and Indonesia. Based on the saving-retention coefficients range from 0.46 to 0.74 for the four countries which there is a cointegration between saving and investment, there is moderate to low capital mobility in these countries.

Keywords: Feldstein-Horioka Puzzle, BRICS, Fragile Five, ARDL Bounds Test.

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FELDSTEIN-HORIOKA BULMACASI: GELİŞMEKTE OLAN ÜLKELERDEN BULGULAR

ÖZ

Bu çalışma dünyadaki artan sermaye hareketliliğine rağmen yurtiçi yatırım ile yurtiçi tasarruflar arasında güçlü bir korelasyonu olduğunu ileri süren Feldstein-Horioka bulmacası kapsamında BRICS ve Kırılgan Beşli ülkelerinde tasarruf yatırım ilişkisini ve sermaye hareketliliğinin düzeyini incelemektedir. 1980-2018 dönemi için her bir ülkedeki yurtiçi tasarrufların ne kadarının yurtiçi yatırımlara dönüştüğünü gösteren tasarruf tutma katsayısını belirlemek için ARDL Sınır testi yaklaşımı kullanılmaktadır. Çalışmanın bulguları, Feldstein-Horioka bulmacasının incelenen dönem için Çin, Güney Afrika ve Türkiye'de geçerli olduğunu; buna karşın Brezilya, Hindistan ve Endonezya'da ise tasarruf ve yatırım arasında uzun dönemli bir ilişki olmadığını ortaya koymaktadır. Çalışmadan elde edilen bulgular eşbütünleşme ilişkisi gösteren dört ülke için tasarruf tutma katsayının 0.46 ile 0.74 arasında değiştiğini göstermektedir. Bu durum, söz konusu ülkelerde orta ve düşük düzeyde bir sermaye hareketliliği olduğunu ifade etmektedir.

Anahtar Kavramlar: Feldstein-Horioka Bulmacası, BRICS, Kırılgan Beşli, ARDL Modeli.

INTRODUCTION

Understanding of dynamic relationship between saving and investment is crucial since it produces valuable information about the economic development process in emerging countries. As the economic growth needed by developing countries is mostly shaped by the accumulation of capital intensively, domestic and foreign savings play a big part in determining capital accumulation. (Ang, 2007; Tapsin and Koksal, 2013). Therefore, a higher level of savings will lead to higher economic growth through capital formation.

In a world where full capital mobilization exists, saving goes to the place that provides the highest return. As a result of this rationale, the link between savings and investments is expected to be low in any country fully integrated with financial markets on the international scale. Feldstein and Horioka (1980) objected the popular wisdom about the low relationship between saving and investment by employing the following:

$$\left(\frac{I}{Y}\right)_i = \alpha + \beta \left(\frac{S}{Y}\right)_i \quad (1)$$

Where $\left(\frac{I}{Y}\right)_i$ and $\left(\frac{S}{Y}\right)_i$ represent the share of investment to Gross Domestic Product (GDP) and the share of saving to Gross Domestic Product

(GDP) in the country i. α shows the constant of equation and β represents the saving retention coefficient and evaluates how much of the domestic savings turn into a domestic investment. Furthermore, this coefficient provides information about capital mobility level in each country. When capital mobility is perfect, the coefficient β is expected to close to zero, which means that there is no relationship between domestic investment and domestic saving. This shows that domestic savings move globally in pursuit of profitable investment opportunities in other countries. On the contrary, if the β coefficient is close to one, it means that the movement of capital mobility is low.

The model was tested by Feldstein and Horioka (1980) using the 21 OECD countries over the period 1960-1974 and revealed a strong and positive link among saving and investment. It. also is revealed that the value of β ranged between 0.87 and 0.90, which it was meant the low capital mobility for the 21 OECD countries investigated. Based on this conclusion, the authors concluded that domestic savings almost completely turned into domestic investments, contrary to the view that international capital markets, which are widely accepted in the economics literature since the 1970s, are integrated. This finding contradicted the belief that capital mobility was beneficial for developed countries because it is believed that the savings-investment nexus presents a low correlation in developed countries. It was called as the Feldstein-Horioka (F-H) puzzle after Obstfeld and Rogoff (2000) coined the seminal work "the mother of all puzzles" (But and Morley, 2016).

This paper targets to examine the link between investment and saving within the scope of Feldstein-Horioka (1980) puzzle for emerging market countries called BRICS and Fragile Five by using time series econometric techniques on a country-by-country basis. Additionally, this paper intends to investigate the mobility of capital, especially in BRICS and Fragile Five countries.

BRICS represents the initials of the five fastest-growing emerging countries on a global scale, namely, Brazil, Russia, India, China and South Africa. These countries explain nearly 42% of the world's population, 23% of the world's GDP, 30% of the total areas and 18% of global trade. BRICS countries, which come together at the official summits every year since 2009, have been cooperating in fields such as science policy, trade, energy, health, education, innovation, etc. Policymakers expect the BRICS countries to catch up with the G-7 countries by 2030 and become the dominant suppliers of manufactured goods, services and raw materials by 2050.

The Fragile Five has been defined by a Morgan Stanley financial analyst in 2013 to exhibit emerging market countries that the financing of their growth depends heavily on volatile and short-term foreign capital. They were Brazil, India, Indonesia, South Africa and Turkey. After the consequences of the 2008 global crisis improved in the United States and developed countries, financial

investors began to withdraw their money from the developing countries and return it to US dollar. These sharp and volatile capital outflows stemmed primarily from emerging countries, namely; Brazil, India, Indonesia, South Africa and Turkey. These outflows led to the depreciation of the national currencies of those countries and the difficulty of financing their current account deficits. Due to the lack of development of new physical investment opportunities, this situation brought about a significant economic slowdown in the mentioned economies.

The study shows a powerful long-run relationship between saving and investment in Russia, China, South Africa and Turkey over the investigated period. These findings also reinforce the Feldstein-Horioka (1980) puzzle that there is low to medium degree of capital movements in countries examined. However, it is not found any long-run relationship between saving and investment in Brazil, India and Indonesia. The rest of the study is organized as follows. Section I briefly provides the related literature. Section II presents the methodology and data examined. Section III presents a summary of the results and concludes.

I. LITERATURE REVIEW

Literature shows that there is a considerable amount of studies that consider the Feldstein-Horioka (1980) puzzle. As emphasized by Obstfeld and Rogoff (2000), the Feldstein-Horioka (1980) puzzle has been one of the most frequently investigated puzzles in international economic literature. Furthermore, this phenomenon has been inserted by the academicians into the six major economic puzzles over the last 30 years[1]. While some of the studies in the literature that investigates the Feldstein-Horioka (1980) puzzle have been used time series analysis for one country, others have applied panel data approach and cross-section data methods for different regions and countries. Besides, there are many studies that have been conducted on many developed and developing countries from different regions. However, it is seen that the findings obtained from these studies which examine Feldstein-Horioka (1980) puzzle on different country or group of countries in different period range vary significantly depending on the econometric methods applied. For convenience, studies can be separated into two groups: developed and developing countries.

Many studies that examine the Feldstein-Horioka puzzle has commonly concentrated on developed countries which are generally called OECD and European Union (EU) countries (Chen and Shen, 2015; Coakley et al., 2004; Drakos et al., 2018; Erataş et al., 2013; Feldstein, 1983; Golub, 1990; Kollias et al., 2008; Murphy,1984; Telatar et al., 2007; Tesar, 1991; Singh, 2019; Sinn, 1992; Yalcinkaya and Hüseyni, 2016). In addition to the studies on OECD and EU, there are also studies conducted for many developed countries, including the

[1] For more information about puzzles, see Obstfeld and Rogoff (2000).

US, UK, Australia (De Vita and Abbott, 2002; Kumar et al. 2012; Ma and Li, 2016). Many studies on developed countries show that the saving retention coefficient is close to zero or negative (Chen and Shen, 2015; Coakley et al., 2004; De Vita and Abbott, 2002; Drakos et al., 2018; Eratas et al., 2013; Kollias et al., 2008; Kumar et al., 2012; Yalcinkaya and Hüseyni, 2016). These studies suggest which high capital mobility is valid for these countries. In contrast to these studies, there are also many studies that concluded with a high savings retention coefficient of close to unity, so this means these countries have low capital mobility (Feldstein, 1983; Golub, 1990; Ma and Li, 2016; Murphy, 1984; Tesar, 1991; Singh, 2019; Sinn, 1992). Telatar et al. (2007) reveal that the saving retention coefficient is close to zero, which shows high capital mobility for many countries, whereas the so-called coefficient is found to around one in Germany, the UK and the Netherlands and indicates low capital mobility.

In the literature, there are considerable papers examining developing countries. Most of these studies have focused on Asian countries (Abdul Latif et al., 2015; Adebola and Dahalan, 2012; Ang, 2007; Kaur and Sarin, 2019; Ketenci, 2016; Khundrakpam and Ranjan, 2010; Narayan, 2005; Yildirim and Orman, 2018). While some of them have confirmed a high international capital mobility (Ketenci, 2016; Yildirim and Orman, 2018), others have found that there is a low capital mobility (Abdul Latif et al., 2015; Adebola and Dahalan, 2012; Ang, 2007; Narayan, 2005; Kaur and Sarin, 2019; Kkhundrakpam and Ranjan, 2010; Yildirim and Orman, 2018). In some other studies, it has been found that there is low capital mobility for developing countries (Grullon, 2016; Phiri, 2019; Tursoy and Faisal, 2019). Some papers focus on Turkey in related literature by using different econometric methods. (Arisoy, 2013; Demir and Cergibozan, 2017; Erdem et al., 2016; Esen et al. 2012; Mercan, 2014; Yildirim and Koska, 2018). All of these studies have found a long-run saving-investment nexus and have revealed that the relatively high capital mobility is observed in the Turkish economy.

Finally, BRICS countries and some other emerging market economies (EME) are other noteworthy studies that have been investigated in the scope of Feldstein-Horioka (1980) puzzle in literature. The findings of these studies show that all the studies concluded with a high saving retention coefficient and low capital mobility (Ay and Özmen, 2017; Behera, 2015; Kónya, 2015; Mosikari, 2017; Pata, 2018).

II. METHODOLOGY AND DATA

The relationship between investment and saving explained above that suggested by Feldstein and Horioka (1980) can be represented by using the following equation:

$$\left(\frac{I}{Y}\right)_t = \alpha + \beta \left(\frac{S}{Y}\right)_t + \varepsilon_t \quad (2)$$

Where (I/Y) and (S/Y) show the investment as a percentage of GDP and the saving as a percentage of GDP at time t and ε_t is a random error term. α shows the constant of the equation. According to Feldstein and Horioka (1980), coefficient β demonstrates the saving-retention coefficient in equation (2) and measures how much of the domestic saving turns into a domestic investment.

This paper uses the ARDL bounds test method introduced by Pesaran et al. (2001) to find out the saving-investment nexus for BRICS and Fragile Five countries. One of the advantages of this method is that it allows the variables to be applied to the model regardless of the order of integration. It is not suitable to apply the ARDL method if one of the orders of variables is I(2). The following ARDL model can be written to determine the FH puzzle in the context of the research question:

$$\Delta\left(\frac{I}{Y}\right)_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta\left(\frac{I}{Y}\right)_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta\left(\frac{S}{Y}\right)_{t-1} + \delta_1\left(\frac{I}{Y}\right)_{t-1} + \delta_2\left(\frac{S}{Y}\right)_{t-1} + \varepsilon_t \quad (3)$$

where α_0 is a drift component and ε_t is an error term, Δ is the first difference operator, and p is the maximum number of lag in the equation (3). There are two steps to interpret the ARDL bounds test method. Firstly, to determine the presence of a long-run cointegration between saving and investment, F-test is used, which specifies the joint significance of the lagged level variables in Equation (3). The null hypothesis (H_0: $\delta_1 = \delta_2 = 0$) states the absence of long-run link among variables whereas the alternative hypothesis (H_1: $\delta_1 \neq \delta_2 \neq 0$) points to the existence of cointegration. Secondly, by using the upper and lower critical values of the bound tests introduced by Pesaran et al. (2001), the existence of cointegration between variables is investigated. The fact that the calculated F statistic is higher than the upper critical value leads to rejection of the null hypothesis, which means there is long-run relationship between saving and investment. Contrarily, since the calculated F statistic is below the lower critical value, the null hypothesis that there is no cointegration relationship between these variables cannot be rejected. However, when the calculated F statistic remains between the upper and lower critical values, it cannot be possible to make a decision about cointegration between variables. Determining the optimal lag length is so vital in using the ARDL bound test approach. Schwarz Bayesian Criteria (SBC), Hannan-Quinn (HQ) and the Akaike Information Criteria (AIC) are often preferred criteria in determining the level of the suitable ARDL model.

Short-term coefficients are also obtained after fixing a long-term relationship between variables. The error correction model is important in terms of showing how much of the shocks caused by the independent variables are eliminating within a period. The conditional error correction models (ECM) are written as follows:

$$\Delta\left(\frac{I}{Y}\right) = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta\left(\frac{I}{Y}\right)_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta\left(\frac{S}{Y}\right)_{t-1} + \pi ECM_{t-1} + \varepsilon_t \quad (4)$$

The speed of convergence to the long-term equilibrium in response to a short-term shock is obtained from the error correction model results. In equation (4), the error correction term is called ECM_{t-1}, which indicates the long-term convergence dynamics. If π coefficient that belongs to error correction term is statistically significant and lies between 0 and -1, it shows the error correction model works and how much of the shocks caused by the independent variables will be eliminated stably.

The study uses annual data of BRICS and Fragile Five countries covering the seven countries, namely: Brazil, Russia, India, China, South Africa, Indonesia and Turkey between 1980 and 2018[2]. Data is from World Development Indicators (WDI) and is obtained from the database of the World Bank. The saving and investment series are used as a percentage of Gross Domestic Product (GDP).

Table 1. Descriptive Statistics

Country	Variables	Mean	Minimum	Maximum	Std. Dev.
Investment /GDP					
Brazil	bra_i	0.189	0.144	0.227	0.022
Russia	rus_i	0.219	0.140	0.375	0.045
Indonesia	indo_i	0.328	0.136	0.443	0.062
India	ind_i	0.273	0.182	0.395	0.064
China	china_i	0.374	0.323	0.439	0.030
S. Africa	saf_i	0.203	0.151	0.341	0.040
Turkey	tur_i	0.250	0.181	0.312	0.035
Saving/GDP					
Brazil	bra_s	0.177	0.131	0.255	0.030
Russia	rus_s	0.269	0.156	0.374	0.042
Indonesia	indo_s	0.247	0.124	0.335	0.055
India	ind_s	0.159	0.107	0.237	0.032
China	china_s	0.385	0.318	0.489	0.043
S. Africa	saf_s	0.190	0.148	0.353	0.045
Turkey	tur_s	0.237	0.110	0.339	0.074

Notes: There are 38 observations for all countries except Russia. Russia has 26 observations since the Russia Federation was founded in 1992.

[2] Since the Russian Federation was founded in 1991, its data began in 1992.

Table 1 presents some basic descriptive statistics of BRICS and Fragile Five countries about investment and saving as a percentage to GDP. It is noticed that the mean values for all countries are below 0.40 when considering the average annual investment to GDP ratios. For the period examined, China has the highest annual average investment to GDP ratio with 37.4% and followed by Indonesia with 32.8%, India with 27.3%, Turkey with 25%, Russia with 21.9%, the South Africa 20.3%. Brazil has the lowest annual average investment to GDP ratio with 18.9%. Considering the fluctuations in investment to GDP, it is seen that standard deviations are small for all countries except Indonesia and India. The low standard deviations can be interpreted as that the series do not exhibit much variation during the period investigated. India is the country with the highest volatility in investment to GDP rate with 0.064 standard deviations, whereas Brazil is the lowest with 0.022 standard deviations.

Concerning the average annual saving to GDP ratios, the mean values for all countries are similarly below 0.40. The highest annual average belongs to China with 38.5 % while the lowest is India with 15.9 %. The remaining countries, namely: Russia (26.9%), Indonesia (24.7%), Turkey (23.7%), South Africa (19%), and Brazil (17.7%) in descending order over the period. Table 1 also shows that Turkey has the most volatility saving to GDP ratio with 0.07 than other countries while Brazil is the lowest with 0.03.

III. RESULTS

Firstly, it is investigated the stationary of the corresponding variables in the model to observe the existence of a long-term relationship between investment and saving rates. Table 2 shows the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root test results for series to determine the integration orders. It can be seen that the order of integration is not the same for both the series, some of them are stationary at the level while others are not. For Brazil, Indonesia and Turkey both the series are I(1) while for India and South Africa, it is not so clear whether series are I(0) or I(1). For example, investment to GDP in Brazil is determined I(1) using the ADF test, but I(0) while using the PP test. In situations where it is difficult to decide on the stability of the variables, it is convenient to use the ARDL bounds test approach. It strongly analyzes the long-term relationship between variables, regardless of the order of the series.

Table 2. ADF and PP Unit Root Tests

Countries	Variables	ADF Test		PP Test	
		t-stat (level)	t-stat (1st dif)	t-stat(level)	t-stat(1st dif)
Brazil	bra_i	-2.807	-6.119***	-2.915	-6.272***
	bra_s	-2.220	-5.381***	-2.432	-5.362***
Russia[a]	rus_i	-3.415*	-5.317***	-11.072***	
	rus_s	-4.245**	-5.471***	-3.909**	-9.096***
India	ind_i	-1.730	-6.605***	-1.905	-6.605***
	ind_s	-0.904	-6.887***	-0.953	-6.880***
Indonesia	indo_i	-2.176	-5.067***	-2.221	-6.811***
	indo_s	-3.637**	-7.412***	-3.593**	-8.015***
China	china_i	-3.243*	-4.419***	-2.542	-4.258***
	china_s	-3.011	-4.416***	-1.754	-4.504***
S. Africa	saf_i	-2.652	-7.779***	-2.607	-7.640***
	saf_s	-4.739***		-4.596***	
Turkey	tur_i	-2.121	-7.596***	-2.026	-8.858***
	tur_s	-3.362*	-5.647***	-2.995	-7.027***

Notes: ***, **, * indicate significance level at 1% and 5%, respectively. The optimal lag length for the ADF and PP tests are automatically chosen by Schwarz Info criterion. The critical values of ADF and PP are obtained from MacKinnon (1996).

[a] Since rus_i variable presents the I(0) integration order, it cannot be applied ARDL bound test for Russia. Therefore, it would be more appropriate to use OLS instead of ARDL bound test in estimations for Russia.

The findings of the ARDL bounds test are shown in Table 3 for all countries with the optimal model determined by the Hannan-Quinn (HQ) information criteria. According to the F-statistic results, there are two different decisions about the cointegration of variables. In the first one, the calculated *F*-statistic is greater than the upper bound in three of the seven countries:China, South Africa and Turkey. *F*-statistics are 7.97, 11.04 and 7.65, respectively, and higher than the upper 7.3 values for these countries. Thus, the null hypothesis that there is no long-term relationship between the variables is rejected. According to this finding, there is a cointegrated relationship between investments and savings. Secondly, the findings also show that there is no cointegration for Brazil, India and Indonesia. For those countries, the cointegration is not found as the value of F-statistics, which are 4.12, 1.27, and 0.57 respectively, falls below lower bound at 5 %. In other words, the findings suggest that domestic saving is not a long-term determinant of domestic investments in Brazil, India and Indonesia during the period examined. Generally speaking, if one may consider the Feldstein-Horioka (1980), the strong long-run relationship between investment and saving means low capital mobility, while the absence of cointegration implies relatively high capital mobility.

Table 3. ARDL Bounds Test Estimation

Countries	Model	F-statistics	Critical Values (%5)		Decision
			I(0)	I(1)	
Brazil	(1,4)	4.25	6.56	7.3	No Cointegration
India	(1,1)	2.37	6.56	7.3	No Cointegration
Indonesia	(1,1)	4.28	6.56	7.3	No Cointegration
China	(2,0)	7.97	6.56	7.3	Cointegration
South Africa	(2,3)	11.04	6.56	7.3	Cointegration
Turkey	(1,1)	7.65	6.56	7.3	Cointegration

Note: The critical lower (I(0)) and upper values (I(1)) are based on Pesaran et al. (2001). The lag lengths are determined using the Hannan-Quinn Criterion (HQ). The ARDL model is estimated by using restricted intercept and trend for $k = 1$.

Based on findings shown in Table 3, the study continues with the empirical analysis conducted for countries with long run cointegration. Table 4 shows the estimated long-run coefficient of the model that explains relationship between investment and saving for China, South Africa and Turkey. The estimated value of the coefficient β_1 representing the long-term relationship between saving and investment ranges from 0.46 to 0.74, which indicates a moderate to low degree of capital mobility. Furthermore, based on these findings, an increase in the domestic savings leads to a rise in domestic investment 0.46, 0.74 and 0.67 unit in China, South Africa and Turkey, respectively. The estimated saving-retention coefficient of 0.74 for South Africa indicates there exists low capital mobility in the South Africa. It is also shown that domestic investments depend heavily on domestic savings as compared to the other countries examined. The fact that this parameter is high for South Africa indicates that the mobility of international capital flows in the group of countries are less/limited and the environment that will attract foreign investors is relatively low. For China, the long-term coefficient is found to be 0.46, which is lowest compared to the other countries. Based on these findings it is stated that China is the country with the highest international capital mobility while South Africa is the lowest one within the countries examined. The so-called coefficient is found as 0.61 for Russia by estimating the OLS estimation method. It represents the medium capital mobility in the Russian economy.

Table 4. ARDL Long-Run Results

Regressor (s/gdp)	Coefficient	T-statistics	P-value
China	0.462	2.63	0.012**
South Africa	0.742	4.08	0.000***
Turkey	0.671	4.83	0.006***

Note: The t-statistics for the OLS estimates are obtained from Newey-West (HAC) standard errors. *** and ** indicate significance level at 1% and 5%, respectively

Table 5 indicates the findings of the short-term coefficient which achieved from the error correction model. It is seen that the error correction terms (ECT_{t-1}) are statistically significant at the 1% level with a negative coefficient in all countries. This confirms the presence of a long-run relationship between the analyzed variables for China, South Africa and Turkey. The coefficient estimates show that changes in investment to GDP ratios are corrected each year by 45.3 %, 52.3 % and 57.2 % per year for all three economies. These findings reveal a moderate adjustment process to restore the long-run equilibrium.

Table 5. ARDL Short-Run Results

Regressor (s/gdp)	Coefficient	T-statistics	P-value	ECT_{t-1}
China	0.20	2.08	0.044**	-0.453 (0.00)***
South Africa	0.69	3.878	0.000***	-0.523 (0.00)***
Turkey	0.82	4.775	0.008**	-0.572 (0.00)***

Note: *** and ** denotes the significance of the coefficient at 1% and 5%.

Table 6 presents the diagnostic test results for the ARDL bounds test. The diagnostic tests are found to be satisfactory. According to the diagnostic tests, the model has no serial correlation; which shows no sign of autocorrelation, heteroscedasticity; implying that errors are homoscedastic and misspecification problem; model is well specified and the residuals are normally distributed. Additionally, CUSUM/CUSUMSQ tests on the recursive residuals of each country present the stability of the model parameters. The appendix informs about the CUSUM and CUSUMSQ graphs and shows that the model parameters are in the range of the critical bounds. This means the parameters are stable at 5% level of significance.

Table 6. Diagnostic Tests

	China	South Africa	Turkey
χ^2 **(Serial Correlation)**	0.36	0.33	0.78
χ^2 **(Heteroskedasticy)**	0.95	0.68	0.13
χ^2 **(J-B Normality)**	0.83	0.56	0.73
χ^2 **(Functional Form)**	0.43	0.33	0.48
CUSUM	Stable	Stable	Stable
CUSUMSQ	Stable	Stable	Stable

Note: p-values are used to determine diagnostic tests.

CONCLUSION

In this paper, the Feldstein-Horioka (1980) puzzle, which reveals strong insights into the relationship between saving and investment is investigated for BRICS and Fragile Five countries by employing the ARDL bounds test approach. By considering the availability of data, the analysis is conducted on annual observations over 1980-2018 sample periods for all countries, except for Russia, which is formed over 1992-2018. The evidence from the cointegration analysis shows the existence of significant long-term saving-investment nexus in China, the South Africa and Turkey as suggested by Feldstein and Horioka (1980) while it does not hold for Brazil, Indonesia and India. These findings are similar to those in the literature which previously found a long-term cointegration relationship between saving and investment (Behera, 2015; Kònya, 2015; Ketenci, 2015; Mosikari et al. 2017; Hüseyni and Yalçınkaya, 2017; Yildirim and Orman, 2018).

The saving-retention coefficients range from 0.46 to 0.74 for the three countries. This finding can be evaluated as evidence of moderate to low capital mobility. The relatively low saving-retention coefficient, posed by Feldstein and Horioka (1980) as a measure of capital mobility, may be interpreted as having explanatory power to developments in the BRICS and Fragile Five countries. This result also indicates the importance of domestic savings for the financing of fixed capital investments, which are necessary for countries to achieve a sustainable growth path. Owing to intense exposure to capital movements (i.e. short-term and speculative capital movements) in countries examined, domestic savings cannot be regarded as a binding constraint on domestic investments. Many factors are contributing to the development of domestic investments. However, the impact of policy measures to increase domestic savings on domestic investments is expected to be weaker than would be expected if the relationship was found to be one to one. Another finding obtained from the study is the short-term relationship between the variables interpreted by considering the error correction model results. In the short-term, the effects of shocks would converge to equilibrium at a rate of 45.3%, 52.3%, and 57.2% for China, South Africa and Turkey in the first year consistent with the F-H (1980).

Compared to OECD countries, a moderate level of capital mobility in BRICS and Fragile Five countries leads to different economic policies for these countries. One of these can be the rapid implementation of structural changes and economic reforms aimed at the development of financial markets. Over the nearly recent thirty years, most of these countries have sought to strengthen their economic structures through such reforms as well as structural reforms such as justice, human rights and democracy. Secondly, one may conclude that some of the emerging countries examined in the study are integrated into the global financial system, but some of them are still at the integrated stage. However, the absence of a cointegration relationship between investment and saving for

Brazil, India and Indonesia reveals that these countries are mainly integrated into the global financial system. Thus, it can be said that the economic policy aimed at promoting economic growth through the encouragement of domestic savings will not be effective.

The coefficient of saving-retention estimated shows that international capital mobility is relatively immobile for the group of countries, where the barriers to international capital are quite low and the Feldstein-Horioka puzzle holds in these countries. Furthermore, the saving-retention coefficient parameter estimated in BRICS and Fragile Five countries is still smaller than that in Feldstein and Horioka (1980). This shows that, since 1980, as a result of the liberalization with the international financial markets, the dependence of domestic investments on domestic savings has decreased in the process and an increasing proportion of domestic investments have started to be financed by international sources. For further research, it would be interesting to investigate the validity of Feldstein-Horioka puzzle for larger developing and emerging economies under different econometric methods. Also, decomposing the domestic investment such as direct and indirect could increase the power of findings in the model.

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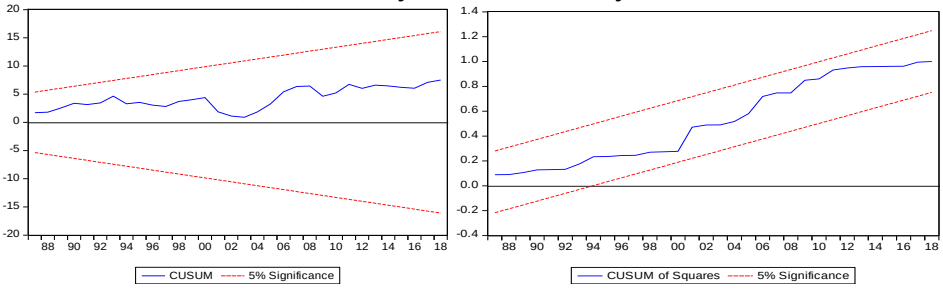
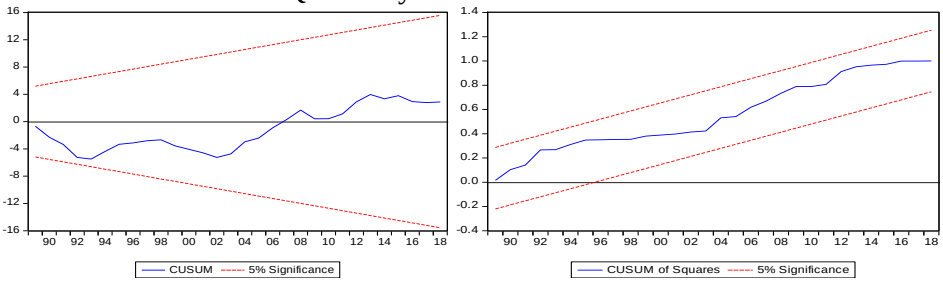
APPENDIX

CUSUM and CUSUMSQ Stability Results of Turkey



CUSUM and CUSUMSQ Stability Results of South Africa



CUSUM and CUSUMSQ Stability Results of China