Examining The Impact of Inflation on Financial Development in The Fragile Five Economies with Asymmetric Cointegration Tests

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Kırılgan Beşli Ekonomilerinde Enflasyonun Finansal Gelişme Üzerine Etkisinin Asimetrik Eşbütünleşme Testleri ile İncelenmesi

Abstract

This study examines the relationship between inflation and financial development indicators for the Fragile Five countries between 1981 and 2021. The study analysed the relationship between symmetric and asymmetric distributed lag regression models. Inflation appears to have a negative impact on financial development in countries other than Brazil and India. The results prove that the most extended correction process was experienced in India, and the shortest was experienced in Indonesia among the Fragile Five countries. Research results emphasise that high inflation negatively affects financial development in these economies by increasing the cost of financial intermediation.

Keywords   :   Financial Development, Inflation Rate, Asymmetric Cointegration.

JEL Classification Codes :   C23, E31, F63.

Öz

Bu çalışmanın amacı kırılgan beşli ülkeler için 1981-2021 yılları arasında enflasyon ile finansal gelişme göstergeleri arasındaki ilişkiyi incelemektir. Çalışmada söz konusu ilişki simetrik ve asimetrik gecikmesi dağıtılmış regresyon modelleriyle analiz edilmiştir. Bulgular, Hindistan dışındaki kırılgan beşli ülkelerinde enflasyonun finansal gecikme üzerinde asimetrik etkisi olduğunu ortaya koymaktadır. Enflasyonun Brezilya ve Hindistan dışındaki ülkelerde finansal gelişme üzerinde olumsuz etkisinin bulunduğu görülmektedir. Sonuçlar Kırılgan beşli ülkelerinde en uzun düzeltme sürecinin Hindistan'da, en kısa düzeltme sürecinin ise Endonezya'da yaşandığına yönelik kanıtlar sunmaktadır. Araştırma sonuçları, yüksek enflasyonun finansal aracılığın maliyetini artırarak bu ekonomilerdeki finansal gelişmeyi olumsuz etkilediğini vurgulamaktadır.

Anahtar Sözcükler   :   Finansal Gelişme, Enflasyon Oranı, Asimetrik Eşbütünleşme.

1. Introduction

Along with endogenous growth models, the impact of financial development on economic growth comes to the forefront. India, Indonesia, Brazil, Türkiye and South Africa (the "Fragile Five") emerged as most affected by the policy change in May 2013 when the US Federal Reserve announced that it would end its bond-buying program. However, in developing countries, the impact of inflation on financial development is limited due to the substitution of money, which prevents the expected effectiveness of monetary policy. Economic actors in economies without price stability start holding their savings in foreign currency. Therefore, investment instruments in national currency are not preferred. As a result, efficiency in resource allocation cannot be achieved, and inflation indirectly hinders economic growth. This is because high inflation reduces household savings. Financial development is adversely affected as intermediation costs in the financial system increase. Additionally, when high inflation brings high-interest rates, it negatively affects total investment expenditures in the economy. Rising current interest rates create a hysteria effect, and the decrease in investment expenditures per labour leads the economy to deviate from the equilibrium value of a stagnant state. Thus, financial markets cannot provide the expected benefit in economic growth. Therefore, policymakers must first ensure price stability to bring out the expected impact of financial stability on economic growth.

After the introduction section, which provides the aim and motivation of the study, the second section includes a theoretical background and a literature review. The empirical analysis is presented in the third section, and policy recommendations are included in the final section.

2. Literature Review

There are many questions in the literature regarding the development of the financial system. When the theoretical literature is considered, indicators such as product diversity, structural indicators, transaction margins, and quantity measures are considered indicators of financial development (Levine, 1997). In the empirical literature, private sector credit volume, stock market capitalisation, and banking system deposits are included in the analysis (Lynch, 1996). General findings in studies examining the impact of financial development on inflation suggest that inflation has a negative effect on financial development. Haslag and Koo (1999), Odhiambo (2012), and Alimi (2014) argue that the positive effect of financial development on growth diminishes in countries experiencing high inflation. According to Türkmen and Ağır (2020), the inefficiency of domestic savings instruments due to the emergence of money substitution caused by high inflation hinders financial development. As a result, savings rates decrease, and financial development is negatively affected in economies with high inflation, as a significant portion of household budgets is directed towards basic needs. Internal growth models claiming that the financial system's development is an important determinant of economic growth suggest that efficient financial markets positively impact economic growth. Boyd et al. (1996) and Bandura (2020) argue that inflation has a negative effect on financial development when it exceeds a

particular threshold value. Bandura (2020) suggests that inflation positively affects financial development in countries below 31% but has a negative effect when it exceeds this figure. Boyd et al. (2001) consider the threshold value of inflation as 15%, Khan et al. (2006) as 6%, Rousseau and Yılmazkuday (2009) as 18.6%, Keho (2010) as 36.5%, Rousseau and Wachtel (2011) as 25%, and Abey (2012) as 16%. Bittencourt (2011) suggests that every 10% decrease in inflation increases financial development by 0.55%. According to Bittencourt (2011), economic uncertainty leads to a decrease in private-sector credit demand, while according to Naceur and Ghazouani (2005), the negative effect occurs through stock markets and commercial banks. Haslag and Koo (1999) suggest that when central banks have low nominal reserves, Cuadro et al. (2003) suggest that integrating central banks into international payment systems can mitigate the negative effect of inflation on financial development. However, Huybens and Smith (1999) argue that the economy cannot reach a steady-state equilibrium with per capita capital stock due to high inflation. This is because the high interest rate path caused by the Fisher effect hinders the diversification of financial instruments. Ang and McKibbin (2007) have stated that uncertainty in inflation rates will create a "fear of hyperinflation" effect in the medium and long term. English (1999), Kim et al. (2010), Abey (2012), and Bittencourt (2008) argue that inflation has a positive effect on financial development in the short term. According to the relevant literature, during periods of high inflation, economic actors tend to turn to alternative financial instruments denominated in the national currency to protect their real wealth in the financial system.

3. Empirical Results

In this study, the impact of inflation on financial development in the economies of Brazil (BRA), India (IND), Indonesia (IDN), Türkiye (TUR), and South Africa (ZAF), collectively referred to as the Fragile Five, is examined using symmetric and asymmetric regressions. The financial development index (FD) is based on the study conducted by Sahay et al. (2015). While Raheem and Oyinlola (2015) use M2 money supply growth as a measure of the general price level, Batayneh et al. (2021) and Dar and Nain (2024) use the GDP deflator. However, in this study, the consumer price index (INF) is used following the works of Bittencourt (2011), Almaki and Batayneh (2015), and Ehigiamusoe et al. (2022). Ismail and Masih (2019) and Dar and Nain (2024) use the ratio of exports and imports to GDP (TO) as a measure of trade openness. The natural logarithm of the financial development index and gross domestic product variables is considered. The financial development index is obtained from the IMF, while the other variables are obtained from the World Bank data distribution system. Empirical analyses involve the application of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests, as well as symmetric (ARDL) and asymmetric (NARDL) distributed lag regression models.

Table: 1
Unit Root Test Results

		lnFD				INF			
		ADF (1981)	PP (1988)	ADF (1981)	PP (1988)	ADF (1981)	PP (1988)	ADF (1981)	PP (1988)
	Countries	Level		First Differences		Level		First Differences	
Constant	BRA	-0.563 [0.867]	-0.412 [0.897]	-5.548 [0.00]ᵃ	-8.004 [0.00]ᵃ	-2.111 [0.241]	-3.233 [0.025]ᵇ	-2.800 [0.069]ᶜ	-15.943 [0.00]ᵃ
	IND	-1.901 [0.328]	-1.928 [0.316]	-6.218 [0.00]ᵃ	-6.225 [0.00]ᵃ	-3.631 [0.00]ᵃ	-3.653 [0.00]ᵃ	-8.838 [0.00]ᵃ	-9.624 [0.00]ᵃ
	IDN	-3.569 [0.011]ᵇ	-3.023 [0.041]ᵇ	-5.761 [0.00]ᵃ	-5.155 [0.00]ᵃ	-4.927 [0.00]ᵃ	-4.938 [0.00]ᵃ	-7.776 [0.00]ᵃ	-26.427 [0.00]ᵃ
	TUR	-0.795 [0.809]	-0.818 [0.802]	-4.788 [0.00]ᵃ	-4.754 [0.00]ᵃ	-1.105 [0.704]	-1.113 [0.701]	-6.173 [0.00]ᵃ	-6.179 [0.00]ᵃ
	ZAF	-1.684 [0.431]	-2.408 [0.145]	-6.028 [0.00]ᵃ	-6.121 [0.00]ᵃ	-1.299 [0.619]	-1.658 [0.444]	-5.891 [0.00]ᵃ	-9.471 [0.00]ᵃ
Trend	BRA	-2.451 [0.349]	-2.501 [0.326]	-5.467 [0.00]ᵃ	-8.091 [0.00]ᵃ	-4.053 [0.016]ᵇ	-3.563 [0.046]ᵇ	-2.648 [0.263]	-16.56 [0.00]ᵃ
	IND	-1.714 [0.726]	-1.714 [0.762]	-6.393 [0.00]ᵃ	-6.393 [0.00]ᵃ	-3.906 [0.02]ᵇ	-3.981 [0.017]ᵇ	-8.693 [0.00]ᵃ	-9.448 [0.00]ᵃ
	IDN	-4.585 [0.00]ᶜ	-3.272 [0.085]ᶜ	-5.680 [0.00]ᵃ	-5.145 [0.00]ᵃ	-5.117 [0.00]ᵃ	-5.117 [0.00]ᵃ	-7.674 [0.00]ᵃ	-29.353 [0.00]ᵃ
	TUR	-3.584 [0.044]ᵇ	-2.128 [0.514]	-4.721 [0.00]ᵃ	-4.684 [0.00]ᵃ	-1.777 [0.697]	-1.767 [0.701]	-6.160 [0.00]ᵃ	-6.167 [0.00]ᵃ
	ZAF	-1.830 [0.670]	-1.474 [0.821]	-6.241 [0.00]ᵃ	-9.288 [0.00]ᵃ	-0.926 [0.941]	-2.740 [0.227]	-5.916 [0.00]ᵃ	-10.363 [0.00]ᵃ
		lnGDP				TO			
Constant	BRA	-1.038 [0.730]	-1.104 [0.704]	-4.519 [0.00]ᵃ	-4.522 [0.00]ᵃ	-0.177 [0.933]	-0.252 [0.923]	-5.604 [0.00]ᵃ	-5.604 [0.00]ᵃ
	IND	0.679 [0.99]	0.693 [0.99]	-6.02 [0.00]ᵃ	-6.048 [0.00]ᵃ	-0.792 [0.810]	-0.830 [0.799]	-5.319 [0.00]ᵃ	-5.328 [0.00]ᵃ
	IDN	-0.126 [0.945]ᶜ	-0.112 [0.841]	-6.265 [0.00]ᵃ	-6.265 [0.00]ᵃ	-2.941 [0.045]ᵇ	-3.007 [0.042]ᵇ	-9.541 [0.00]ᵃ	-9.778 [0.00]ᵃ
	TUR	-0.966 [0.755]	-0.966 [0.755]	-6.362 [0.00]ᵃ	-6.364 [0.00]ᵃ	-1.129 [0.694]	-0.776 [0.814]	-5.868 [0.00]ᵃ	-6.898 [0.00]ᵃ
	ZAF	-0.687 [0.834]	-0.740 [0.824]	-4.780 [0.00]ᵃ	-4.579 [0.00]ᵃ	-1.784 [0.382]	-1.656 [0.445]	-6.558 [0.00]ᵃ	-7.545 [0.00]
Trend	BRA	-2.408 [0.369]	-1.999 [0.584]	-4.484 [0.00]ᵃ	-4.480 [0.00]ᵃ	-1.796 [0.689]	-1.957 [0.605]	-5.678 [0.00]ᵃ	-5.708 [0.00]ᵃ
	IND	-1.762 [0.704]	-1.765 [0.702]	-6.089 [0.00]ᵃ	-6.089 [0.00]ᵃ	-1.485 [0.818]	-1.737 [0.715]	-5.229 [0.00]ᵃ	-5.224 [0.00]ᵃ
	IDN	-0.126 [0.934]	-2.482 [0.334]	-6.231 [0.00]ᵃ	-6.231 [0.00]ᵃ	-3.132 [0.119]	-3.198 [0.092]ᶜ	-6.918 [0.00]ᵃ	-10.409 [0.00]ᵃ
	TUR	-1.469 [0.823]	-1.763 [0.703]	-6.428 [0.00]ᵃ	-6.428 [0.00]ᵃ	-3.416 [0.063]ᶜ	-3.421 [0.062]ᶜ	-5.789 [0.00]ᵃ	-7.225 [0.00]ᵃ
	ZAF	-2.957 [0.156]	-2.175 [0.489]	-4.717 [0.00]ᵃ	-4.489 [0.00]ᵃ	-3.336 [0.075]ᶜ	-3.327 [0.076]ᶜ	-6.509 [0.00]ᵃ	-7.787 [0.00]ᵃ

Note: The values in square brackets represent probability values. The values a, b, and c, respectively, indicate the series' stationarity at significance levels of 1% (0.01), 5% (0.05), and 10% (0.1).

The financial development index is stationary at the 5% significance level in both the ADF (1981) and PP (1988) unit root tests in Indonesia, while in the trend model, it is stationary in Türkiye alongside Indonesia. Economic growth is stationary at the level value only in the trend model in Indonesia. The inflation rate is stationary at its current level in almost all five fragile countries due to the rigidity of prices. This is believed to be caused by inflation hysteresis and the variable exhibiting long memory. In terms of trade openness, it is observed that in Indonesia, at the level value, both ADF (1981) and PP (1988) unit root tests show significance at the 5% level, while in the trend model, Türkiye and South Africa are stationary at the 10% significance level. Considering the results of unit root tests, it is believed that the Indonesian economy has experienced a relatively more stable period and has been less affected by internal and external economic crises. Finally, it is assumed that variables, except for the inflation rate, carry a unit root at the level value and are stationary in the first difference. In the distributed lag model:

$$\ln\text{FD}_t = \beta_0 + \beta_{1p} \ln\text{FD}_{t-p} + \beta_{2p} INF_{t-p} + \beta_{3p} \ln GDP_{t-p} + \beta_{4p} \ln\text{TO}_{t-p} + \beta_5 ECT(-1) + \varepsilon_t \tag{1}$$

The parameters β_{2p} represent the impact of the inflation rate on financial development. β_{3p} and β_{4p} represent the impact of economic growth and the trade openness rate on financial development, respectively. ECT(-1) represents the error correction coefficient. From an economic theory perspective, it is expected that β_{2p} will be negative, while β_{3p} and β_{4p} will be positive. The asymmetric ARDL model, developed by Shin et al. (2014), examines the effects of the positive and negative components of the inflation rate on financial development. The nonlinear autoregressive distributed lag (NARDL) model accounts for asymmetric lag.

$$\ln\text{FD}_t = \beta_0 + \beta_{1p} \ln\text{FD}_{t-p} + \beta_{2p} INF_{t-p}^{+} + \beta_{3p} INF_{t-p}^{-} + \beta_{4p} \ln GDP_{t-p} + \beta_{5p} TO_{t-p} + \beta_6 ECT(-1) + \varepsilon_t \tag{2}$$

β_2 represents the positive component of the inflation rate (increase in the general price level) and its impact on financial development; β_3 represents the negative component of the inflation rate (decrease in the general price level) and its impact on financial development; β_{4p} and β_{5p}, respectively, represent the impact of economic growth and the trade openness rate on financial development. From an economic theory perspective, β_{2p} is expected to be negative, while β_{3p}, β_{4p}, and β_{5p} are expected to be positive.

In the Brazilian and South African economies, the NARDL model is preferred because the F-statistics in the ARDL model are smaller than the critical values for I [0]. In the Indian economy, the ARDL model is preferred because the F-statistics in the NARDL model are smaller than the critical values for I [0]. In the Indonesian and Turkish economies, the NARDL model is used as the AIC information criterion is lower, considering that both the ARDL and NARDL relationships exist in the boundary test. The alternative hypothesis is accepted at the 1% significance level in all Fragile Five countries, and the models are significant.

Table: 2
Symmetric and Asymmetric Bounds Test Results

	Statistics	BRA	IND	IDN	TUR	ZAF
ARDL	F stat (k)	2.658 (3)	3.422[c] (3)	4.646[b] (3)	7.455[a] (3)	1.863 (3)
	F stat	250.11	155.33	10.093	219.35	225.14
	[prob]	[0.00][a]	[0.00][a]	[0.00][a]	[0.00][a]	[0.00][a]
	Adj. R^2	0.983	0.972	0.742	0.993	0.970
	AIC	-4.398	-4.895	-4.411	-5.738	-4.405
NARDL	F stat(k)	5.457[a] (4)	1.915 (4)	5.474[a] (4)	5.982[a] (4)	3.274[c] (4)
	F stat	162.29	138.7	5.618	222.86	83.047
	[prob]	[0.00][a]	[0.00][a]	[0.00][a]	[0.00][a]	[0.00][a]
	Adj. R^2	0.993	0.973	0.915	0.996	0.975
	AIC	-4.860	-4.895	-4.769	-6.038	-4.109

Note: For linear ARDL, the critical values for I[0] at significance levels of 1%, 5%, and 10% are 3.65, 2.79, and 2.37, respectively. The critical values for I [1] are 4.66, 3.67, and 3.2. For NARDL, the critical values for I [0] at significance levels of 1%, 5%, and 10% are 3.29, 2.56, and 2.2, respectively. The critical values for I [1] are 4.37, 3.49, and 3.09. AIC (Akaike Information Criterion) indicates acceptance of the alternative hypothesis at significance levels of 1% (0.01), 5% (0.05), and 10% (0.1) with values a,b and c.

Table: 3
ARDL and NARDL Parameters Estimation

	BRA	IND	IDN	TUR	ZAF
Constant	-2.709 (0.01)[b]	-8.989 (0.663)	0.504 (0.408)	-0.358 (0.598)	-0.973 (0.678)
INF	-	-0.057 (0.634)	-	-	-
INF+	-0.000117 (0.265)	-	0.020 (0.076)[c]	0.0004 (0.478)	-0.0079 (0.138)
INF-	-0.000136 (0.214)	-	0.019 (0.078)[c]	-0.000087 (0.068)[c]	-0.014 (0.00)[a]
lnGDP	0.237 (0.012)[b]	0.973 (0.645)	0.0145 (0.715)	0.057 (0.356)	0.1003 (0.638)
TO	0.0123 (0.00)[a]	-0.039 (0.679)	-0.0058 (0.077)[c]	0.001 (0.607)	-0.0002 (0.941)
ECT(-1)	-0.423 (0.00)[a]	-0.024 (0.00)[a]	-1.306 (0.00)[a]	-0.471 (0.00)[a]	-0.447 (0.00)[a]
χ^2_{SC}	2.997 (0.078)[c]	1.739 (0.193)	7.669 (0.00)[a]	0.513 (0.609)	1.174 (0.326)
χ^2_H	0.466 (0.938)	1.663 (0.154)	1.163 (0.405)	1.092 (0.433)	1.280 (0.289)
χ^2_{FF}	0.472 (0.501)	0.960 (0.344)	0.437 (0.67)	0.716 (0.484)	4.833 (0.00)[a]
JB	13.221 (0.00)[a]	0.675 (0.713)	0.457 (0.795)	0.735 (0.692)	7.259 (0.026)[b]
$W_{INF^+} = W_{INF^-}$	4.426 (0.00)[a]	-	4.194 (0.00)[a]	4.082 (0.00)[a]	1.258 (0.312)

Note: a, b, and c values, respectively, indicate that the alternative hypothesis is accepted at significance levels of 1%, 5%, and 10%. The values in parentheses indicate probability values. χ^2_{SC}, χ^2_H, χ^2_{FF}, and χ^2_{NJB}, respectively, represent serial correlation, the Breusch-Pagan-Godfrey heteroskedasticity test, the Ramsey RESET test, which checks the appropriateness of the functional form of the model, and the Jarque-Bera JB normality test. The Wald test examines the null hypothesis that the coefficients of INF+ and INF- are not statistically different.

The table includes ARDL results for India and NARDL results for other countries. In Brazil, the positive and negative components of the inflation rate are statistically insignificant. A 1% increase in GDP in Brazil increases financial development by 0.23%, and a 1% increase in TO increases financial development by 0.012%. Symmetric ARDL results were obtained for India, and the coefficient indicating the impact of inflation on financial development is statistically insignificant. Similarly, income and trade openness do not affect financial development. In Indonesia, both the positive and negative components of inflation are statistically significant. The impact of both components on financial development is positive (INF+ 0.02 and INF- 0.019). Accordingly, the response of financial development to inflation shocks is asymmetric. However, contrary to the Brazilian economy,

it was found that GDP (-0.0058) and TO (-1.306) have a negative impact on financial development in the Indonesian economy. In Türkiye and South Africa, the impact of the positive inflation component on financial development is statistically insignificant. The impact of the negative inflation component on financial development is relatively lower in the Turkish economy compared to the South African economy. The error correction term is statistically significant in all Fragile Five economies. The most extended correction process is observed in India, while Indonesia is the shortest. The autocorrelation problem exists at a significance level of 10% in Brazil and 1% in Indonesia, while only model specification error exists at a significance level of 1% in South Africa. No variance problem was encountered in any of the Fragile Five countries. According to the Jarque-Bera test, using nonlinear parameter estimation methods would yield more robust results when examining the impact of inflation on financial development in Brazil and South Africa. The empirical findings indicate that, in line with the views of Huybens and Smith (1999) and Kayhan et al. (2013), the Brazilian economy is not moving away from a steady state. Similarly, in line with the study by Stefani (2007) for the Brazilian economy, it is seen that the demand-led growth hypothesis from economic growth to financial development is valid. The fact that the independent and control variables are statistically insignificant for the Indian economy does not allow for sufficient policy recommendations.

4. Conclusion

Although neglected in neoclassical growth models, the impact of financial development on economic growth has been theoretically and empirically explained in endogenous growth models. On the other hand, inflation limits the impact of financial development on economic growth in developing countries experiencing chronic price stability problems. This study examines the impact of financial development on economic growth in the Fragile Five countries using symmetric and asymmetric cointegration methods from 1981 to 2021. As a result of unit root tests, it is seen that price stability is relatively achieved in the economies of Brazil, India, and Indonesia. Similar results to the literature were obtained for Türkiye and South Africa, which suggest that inflation has a negative impact on financial development. Additionally, the negative impact of inflation on financial stability is higher in the South African economy. The negative impact of the negative component of inflation (decrease) on financial development in Türkiye and South Africa indicates the existence of downward rigidity in the general price level in these countries. The only result that contradicts the literature emerges in the Indonesian economy. There is a positive relationship between the positive inflation component and financial stability in Indonesia. According to Abey (2012) and Bittencourt (2008), this situation in the Indonesian economy results from inflation below the ideal. Thus, there is a positive effect from both the positive and negative components of inflation towards financial development in Indonesia. However, this raises the question of what the inflation threshold value should be for Indonesia, which reveals the effect of inflation on financial development. It was concluded that price stability must be ensured to increase financial development's impact on economic growth. When considering the control variables, it is concluded that economic growth and trade openness rate positively affect financial development in Brazil, parallel to the

literature. Nonlinear time series methods can be considered for future studies to analyse if there is a positive effect on financial development when current inflation is below the optimal inflation rate.

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