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The threshold Impact of Interest Rates on Economic Growth: Empirical Evidence from Panel Data

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ABSTRACT

Purpose: The symmetric relationship between interest rates and economic growth had been explored in many empirical studies using various econometric techniques. However, the asymmetric relationship between them was still limited because it had not been thoroughly examined. This paper sheds light on the asymmetric impact of interest rates on economic growth using a panel threshold (PTR) model.

Design/methodology/approach: Using the PTR model allowed us to accurately determine the threshold value of the interest rate and its impact on economic growth at each critical level. Data from 34 developing economies for the period 1992-2022 were analysed for this study.

Findings: Experimental results showed that interest rates less than or equal to 5.286% promoted economic growth. In the opposite context, interest rates caused overall economic growth to decline.

Research limitations/implications: The limitation of this study was that it did not consider the threshold effect of interest rates in individual country contexts. Furthermore, the empirical model only analyzed the impact of nominal interest rates and did not consider real interest rates. Therefore, future research will benefit from expanding its scope as well as examining the relationship between interest rates and economic growth in different contexts.

Originality/value: The core of the policy implication lay in the fact that adjusting interest rates below the threshold level of developing countries was essential to effectively promote rapid and sustainable economic growth.

Keywords: Economic growth, Interest rate, Panel data, PTR model, Threshold impact

I. Introduction

A country's economy is affected by many macro factors, such as inflation rate, interest rate, exchange rate, foreign direct investment (Chan, 2015; Lee, 2010; Pham and Le, 2023; Tulcanaza Prieto and Lee, 2019). The real exchange rate plays a role in promoting or hindering economic growth by promoting diver-

sification. For developing countries, the exchange rate is seen as an instrument of industrial policy, and highlights the central role of economic diversification for long-term growth (Guzman et al., 2018). Therefore, based on the economic situation of each country, it is necessary to adjust the exchange rate regime accordingly, which brings great benefits to economic growth (Moutaib and Lahrichi, 2023). Many studies emphasize the impact of the foreign direct investment (FDI) on a country's economic development. FDI creates new ways to promote the implementation of necessary work to move the

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economy forward in the direction of development and growth (Jehangir et al., 2020; Sanyal and Samanta, 2007; Vaatanen et al., 2007). The foreign invested firms both contribute to regional economic innovation as well as enhance market competition, thereby promoting economic growth (Li et al., 2020).

Similarly, trade openness is a factor that greatly affects economic growth. Through channels such as promoting capital formation, improving resource allocation efficiency, accelerating technical progress and boosting factor productivity, then trade openness can promote economic development (Kong et al., 2021). In addition, a moderate inflation rate is reasonable for effective economic growth. When prices increase, it leads to a structural shift from the traditional living area to the industrialized area of workers. Therefore, economic resources are used more optimally and fully, helping the economy develop. However, when inflation is too high, it will reduce the purchasing power of money, investment will not be encouraged, leading to economic weakness (Adaramola and Dada, 2020).

Interest rates are widely acknowledged as pivotal elements in fostering sustainable and inclusive economic growth. According to Adofu et al. (2010), the essential macroeconomic variables that have the ability to change, transform and redirect the growth pattern of a country's economy are collectively known as interest rates. Capital flows, investments, exchange rates, and credit demand can be measured to determine the potential impact of interest rates on the economy as a whole (Idris, 2019). Inflation and high consumption rate are undesirable factors that are compensated for by interest rates, which is why interest rates are related to economic growth. Interest rates help the economy grow for the following specific reasons. In the economic system, interest rates have a great influence on the cost of borrowing for businesses and production, which is a required source of financing that can lead to economic growth. In addition, savings returns are also greatly affected by interest rates. In the view of Utile et al. (2018), when savings interest rates increase, it will create incentives for individuals to save, leading to bank

loan capital always being available, thereby promoting economic growth. Furthermore, in the total return of many investments, interest is an essential component. Certain interest rate sources help provide insight into future economic and financial market activity. Besides, monetary policy activities have been implemented by banks through different monetary transmission channels. In particular, one of the prominent and effective monetary transmission mechanisms is interest rates (Utile et al., 2018).

On the contrary, according to Shaukat et al. (2019), high interest rates will weaken local investment, leading to a weaker market structure in the economy. This discourages investors from participating in the market when faced with high deposit interest rates. Therefore, there exist three behavioral attributes including risk-lover, risk-averse, and risk-neutral. Accordingly, high interest rates cause most investors to become averse to risk by increasing savings, making the feasibility of economic projects weaker. Therefore, central banks adjust their policy rule (benchmark interest rate) downward when the country's economy weakens and increase in the face of small inflationary pressures (Assefa et al., 2017).

Many empirical studies are conducted at the individual country level or employ panel data with various estimation methods. The heterogeneous results on the impact of interest rates reflect the complex relationship between interest rates and economic growth. The question arises: Do interest rates have a completely positive or negative impact on economic growth? Indeed, previous empirical studies have mainly examined the linear impact of interest rates on economic growth. This can obscure the hidden effects of interest rates. In other words, the nonlinear relationship between interest rates and economic growth has not been comprehensively considered. To address this question, the present study utilizes panel data for 34 developing countries and employs the panel threshold (PTR) model developed by (Hansen, 1999). The PTR model allows for the estimation of threshold levels of the interest rate variable, thereby determining its effectiveness on economic growth corresponding to each critical level.

This study carefully and thoroughly examine the affect of interest rates towards economic growth during 1992-2022. The empirical results of this study offer a more general and comprehensive view of the correlation between interest rates and growth in the economy than previous studies. This can serve as an important tool, assisting policymakers in formulating appropriate monetary policy.

II. Literature Review

Examining the affect of interest rates on the economy may become an attractive area of research due to the relationship of variables in financial and macroeconomic analysis. In particular, the relationship between these two variables is debated more after the global financial crisis (Shaukat et al., 2019). In theory, interest rates have a negative relationship with economic growth as explained by (Barro and Becker, 1989; Shaw, 1973). From an empirical perspective,

Table 1. Selection and summary of previous research literature

Authors	Countries	Method	Data period
<i>Positive impact</i>			
Ayanou (2016)	US	SAS data conversion	1982 - 2009M
Maiga (2017)	Nigeria	OLS regression analysis	1990 - 2013A
Gopalan and Rajan (2017)	57 emerging and developing economies	Maximum Likelihood Estimation (MLE)	1995 - 2009A
Goyal and Arora (2016)	Indian	State-space model	1990 - 2011Q
Lee and Werner (2018)	US, U.K., Germany, Japan	DCC-GARCH	1957 - 2008Q
Aydemir and Ovenc (2016)	Turkish	Dynamic panel data	2002 - 2014Q
Otieno et al. (2014)	Kenyan	Error Correction Model (ECM)	1980 - 2010A
Onyishi et al. (2015)	Nigeria	ARDL	1970 - 2011A
Bhunja (2016)	India	Cointegration test, VECM and Granger causality test	1992 - 2015A
Saymeh and Orabi (2013)	Jordan	Cointegration test and Granger causality test	2000 - 2010A
Omri (2014)	13 MENA countries	Generalized method of moments GMM)	1990 - 2010A
Holston et al. (2017)	US, Canada, Euro Area, U.K	Laubach-Williams	1961 - 2016Q
<i>Negative impact</i>			
Shaukat et al. (2019)	38 countries	GMM (n-step estimation)	1996 - 2015A
Idris (2019)	Nigeria	VAR	1980 - 2017A
Khurshid (2015)	China	Vector error correction model (VECM)	2003 - 2012A
Semuel and Nurina (2014)	Indonesia	Partial least square (PLS)	2003 - 2013M
Sonaglio et al. (2016)	Brazil	Structuralist model	2003 - 2007A
Chughtai et al. (2015)	Pakistan	Linear regression model	1981 - 2013A
Di Giovanni and Shambaugh (2008)	Major industrial countries	Panel estimation approach	1996 - 2002A
Assefa et al. (2017)	21 developed and 19 developing economies	Fixed effect model, System GMM	1999 - 2013Q
<i>No impact</i>			
Araujo (2017)	US, European Union, Japan	Regression approach	2009 - 2016M
Faroh and Shen (2015)	Sierra Leone	Multiple regression analysis	1985 - 2012A

Note: M, Q, A represent data by month, quarter and annual respectively.

although there have been a large number of published studies, the results were still not consistent. In the literature, various studies make assertions about the positive impact of interest rates on economic growth in developed and developing economies. A publication by Obansa et al. (2013) empirically established a positive relationship between interest rates and Nigerian economic growth during the period 1970-2010. The research showed that when the supply did not meet enough loan capital, interest rates increased, thus problems such as financial deepening, investment and economic growth would increase.

However, another stream of research documents has shown the negative impacts of interest rates on macroeconomic indicators in the economy. Assefa et al. (2017) examined the quarterly returns of 21 developed countries and 19 developing countries between 1999 and 2013. The results showed significant negative effects of interest rates on stock returns in developed economies, specifically low-output growth with rising interest rates in developing economies. Another study by Shaukat et al. (2019) showed the negative effects of real interest rates on economic growth in 38 countries with transition economies during the period 1996-2015. The results show that through macroeconomic factors such as domestic and foreign investment, trade openness, exchange rates, inflation, corruption, etc., interest rates are not only detrimental but still limits the economy from maintaining a corresponding level of transformation and achieving a higher growth rate. Furthermore, for developing countries, low interest rates are essential and highly beneficial to maintain the transition process and achieve higher growth rates faster.

On a contrary perspectives, some publications argue that there is no significant correlation between interest rates and economic growth rates, or in other words, interest rates do not have a negative or positive impact on the economy. For example, (Araujo, 2017; Faroh and Shen, 2015) both found no relationship exists between interest rates and economic growth. These studies showed that interest rates are an insignificant factor causing fluctuations in a country's economic growth.

In general, the complex impact of interest rates on economic growth depended on each specific subject and period. To provide a comprehensive overview of the impact of interest rates, documents were selected and presented in Table 1.

III. Design Experimental Models

A. Panel Threshold Model (PTR)

Our empirical model captures the impact of interest rates on economic growth by Equation (1).

$$GDP_{i,t} = \alpha_i + \beta_i IR_{i,t} + \psi_i \Xi_{i,t} + \epsilon_{i,t} \quad (1)$$

In this Equation, $GDP_{i,t}$ represents the gross domestic product of country i in period t . $IR_{i,t}$ represents the nominal interest rate of country i in period t . Finally, Ξ is a vector set of control variables that includes country i 's bilateral real exchange rate relative to the US dollar (RER), inflation rate (INF), savings rate (SR), trade openness ($OPEN$), and foreign direct investment (FDI). $\epsilon_{i,t}$ is the error term.

Interest rates have a threshold effect, therefore, this article applies the PTR model, developed by (Hansen, 1999). The PTR model developed by Hansen (1999) assumed that the relationship between the dependent variable and independent variable changed depending on the value of the independent variable, and estimated the relationship between the dependent variable and the independent variable differently depending on the critical level. PTR model has several advantages, as follows: First, the PTR model did not require a specific nonlinear functional form, and amount of number and its location of threshold effects were endogenously ascertained by the data. A second step of the PTR model was to determine the statistical significance of the threshold effect against a threshold alternative using the bootstrap method. In addition, the PTR model could test for both single threshold effects and multiple threshold effects (Chang et al., 2012).

In this study, the PTR model is used to determine how the *IR* affects the *GDP*, when it has values higher and lower the estimated critical level. A threshold level should not be determined based on an arbitrary classification scheme, but the empirical model allows for endogenous sample separation. If the relationship exists between *IR* and *GDP*, the threshold level is determined, and the threshold model allows for examining that relationship across different regimes classified by the threshold variable. Accordingly, equation (1) is rewritten as a PTR model, as follows:

$$GDP_{i,t} = \alpha_i + \beta_{i1}IR_{i,t}I(Z_{i,t} \leq \gamma) + \beta_{i2}IR_{i,t}I(Z_{i,t} > \gamma) + \psi_i\bar{\epsilon}_{i,t} + \epsilon_{i,t} \quad (2)$$

Where, $I(\cdot)$, $Z_{i,t}$ and γ added to test the threshold effect represent the indicator function, threshold variable, and threshold value respectively. α_i refers to country-specific fixed effects, and β , ψ refer to the estimated coefficients of the variables. β_{i1} and β_{i2} mean the sign and size of the impact of *IR* on *GDP* when *IR*, which is a threshold variable, is less than or equal to the threshold value ($Z_{i,t} \leq \gamma$), and conversely, when it is greater ($Z_{i,t} > \gamma$). Whether a threshold effect of *IR* on *GDP* exists depends on whether the threshold value that satisfies the indicator function in Equation (2) above is significant. If the threshold value is not significant, it means that there is no threshold effect.

According to (Chan, 1993; Hansen, 1999), a consistent estimate minimized the sum of squared errors. The threshold value (γ) was estimated using least squares (LS) as follows:

$$\hat{\gamma} = \underset{\gamma}{\operatorname{argmin}} S_1(\gamma) \quad (3)$$

In order to determine whether a threshold effect exists, the null hypothesis must be tested. Based on Equation (2), the presence of threshold is presented as follows:

$$H_0: \beta_{i1} = \beta_{i2} \quad H_1: \beta_{i1} \neq \beta_{i2} \quad (4)$$

F_i is used to test these hypotheses:

$$F_1 = \frac{S_0 - S_1(\hat{\gamma})}{\hat{\sigma}^2} \quad (5)$$

Where, the sum of squared errors of the regression is denoted by S_0 . However, the table of critical values cannot be generated because the asymptotic distribution of F_i is non-standard and depends on the moments of the sample (Hansen, 1996). Therefore, Hansen (1999) proposed a bootstrap procedure with the following steps. First, the sample errors sum of squares is minimized to estimate the coefficients. Next, based on the null hypothesis, the errors are distributed to create a new sample. Hence, the coefficients are estimated and the simulated F_i statistics are also obtained. The process is repeated many times. Finally, based on the number of simulated statistics which exceeds the actual estimation of F_i determined the p -value.

B. Data Selection

Current research used annual data for 34 developing countries over the period 1992-2022 (Table A1). The actual exchange rate was calculated according to the formula:

$$RER = \frac{NER \times P^{US}}{P^i} \quad (6)$$

Where *NER* represented the bilateral nominal exchange rate between country currency *i* and the US dollar. P^i and P^{US} respectively represented the consumer price index of country *i* and the US. Similarly, the variable *OPEN* was defined as the ratio of the total value of exports and imports to GDP. Data for *GDP*, *RER*, *INF*, *SR*, *OPEN*, and *FDI* were collected from the World Bank (WB). Data for *IR* was collected from the International Monetary Fund (IMF) (see Table A2).

IV. Experimental Results

A. Unit Root Test and Fixed Effect Test

The asymptotic theory for the PTR model, extended by Hansen (1999), was a theory for fixed regression variables. Therefore, the procedure of PTR model specification relied on the assumption that all variables in Equation (2) were level variable $I(0)$ processes. First, this study applied the Breitung test, IPS (Im - Pesaran - Shin) test, and Hadri test to test the panel unit root. Table 2 indicates that all variables rejected the null hypothesis of unit root. This means that the estimated variables in the PTR model were appropriate.

If the error term is a fixed variable estimated for each country and $\epsilon_{i,t}$ is *iid* (independent and identically distributed) $\sim (0, \sigma_\epsilon^2)$, it is more appropriate to analyze using a fixed effect model. On the other hand, if the error terms are all random, it would be more appropriate to use a random effect model. Various methods such as the F-test, Breusch-Pagan test, and Hausman test are used to determine whether to use the Pooled OLS model, the fixed effect model, or the random effect model as the regression model

in this study. This means, if the p -value of the F-test statistic is less than 5%, it means that the fixed effect model is more valid than the Pooled OLS model. Breusch-Pagan test statistics are furthermore more valid if they have p -value less than 5%, indicating that random effect models are better than pooled OLS models. Lastly, if the Hausman test statistic shows that the fixed effect model has a p -value less than 5%, it means that the fixed effect model is more valid than the random effect model, and vice versa.

F-test results in Table 3 show that the fixed effects model is more appropriate than the Pooled OLS model at the 1% level, indicating that the fixed effects model is more appropriate. Breusch-Pagan rejection threshold is 1%, so the null hypothesis is rejected. Therefore, compared to the Pooled model, the random effects model seems to be more appropriate. Similarly, in the case of the Hausman test, there is no dependence between the independent variables and the noise. Therefore, the null hypothesis is rejected, or in other words, fixed effects should be used. Overall, the null hypothesis is rejected in all specifications. This shows that the PTR model with fixed effects is considered appropriate.

Table 2. Result of unit root test

Variable	Breitung		IPS		Hadri	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
<i>GDP</i>	-0.557	-8.293***	3.522	-13.985***	20.630***	-0.280
<i>IR</i>	-1.040	-6.667***	-2.731***	-18.050***	8.379***	6.673***
<i>RER</i>	-1.764**	-6.108***	-6.029***	-16.676***	6.750***	5.705***
<i>INF</i>	-0.281	-4.663***	-10.496***	-24.579***	10.730***	12.745***
<i>SR</i>	1.942	-1.427*	-2.645***	-15.125***	12.334***	3.997***
<i>OPEN</i>	-1.330*	-2.679***	-2.206**	-17.005***	15.373***	2.000**
<i>FDI</i>	-4.102***	-11.388***	-7.089***	-23.545***	10.027***	2.380***

Note: 1) IPS is representative of the Im - Pesaran - Shin test.

2) "I(0)" and "I(1)" represent the level and 1st difference, respectively.

3) * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table 3. Result of cointegration test

Model Specification	F-test	Breusch-Pagan	Hausman test
Statistic	249.88	10399.27	36.88
p -value	0.000	0.000	0.000

B. PTR Model Results

The bootstrap procedure was performed with 10000 iterations to determine the threshold number. As indicated in the results of Table 4, in the test case where one threshold effect existed, the estimated value of F_1 was 113.01 and was statistically significant at the 10% significance level. However, in the test case where two threshold effects existed, the estimated value of F_2 was 61.46, but it was not statistically significant because the p-value was 0.314. Similarly, in the test case where three threshold effects existed, the value of F_3 was estimated to be 43.94, but it was not statistically significant. Therefore, it can be concluded that the PTR model in this study exhibited one threshold effect ($\gamma = 5.286\%$).

Table 5 provided interesting estimation results of the PTR model. Firstly, interest rates stimulated economic growth when $IR \leq 5.286\%$. Specifically, when the interest rate was less than or equal to the threshold value, it had a positive impact on economic growth, with an impact of about 0.129 percentage points. The positive correlation between interest rates and economic growth was also supported by Lee and Werner (2018), who argued that central banks could not stimulate growth by lowering interest rates. Lee and Werner (2018) examined the relationship between interest rates and nominal GDP in the US, UK, Germany and Japan. The results indicate a positive relationship between economic growth and short-term interest rates. Growth can be stimulated by raising interest rates, whereas lowering interest rates causes weaker growth. In other words, economic growth causes interest rates to be increased, and

interest rates will be lowered after the growth rate decreases. However, the positive effect of interest rates on economic growth was observed only after reaching the threshold of 5.286%. In the opposite scenario ($IR > 5.286\%$), interest rates had a negative impact on economic growth. Explaining this, Shaukat et al. (2019) argued that, in developing economies, government public debt played a significant role in using monetary policy (such as interest rates) to manage revenue and expenditure. This led to an increase in nominal interest rates, which in turn contributed to inflation. In this scenario, the interest rate set by the central bank was more geared towards managing public debt rather than fostering economic growth. Therefore, increasing interest rates to manage budget deficits led to higher inflation rates, which negatively affected economic growth. Another transmission channel was also explained, indicating that nominal interest rates had a notable positive

Table 5. Threshold number test results

Variable	Coefficients	Standard error
$IR \leq \gamma$	0.129***	0.012
$IR > \gamma$	-0.001***	0.000
RER	-1.528***	0.141
INF	-0.000	0.000
SR	0.017***	0.003
$OPEN$	0.003***	0.001
FDI	0.007**	0.003
Constant	25.982***	0.218
R^2	0.288	
Obs.	1054	

Note: ** $p < 5\%$, *** $p < 1\%$

Table 4. Threshold number test results

Threshold	F_i	p-value	Critical values		
			10%	5%	1%
Single	$F_1 = 113.01$	0.070*	107.005	118.068	138.677
Double	$F_2 = 61.46$	0.303	75.259	82.107	96.483
Tribble	$F_3 = 43.94$	1.000	224.512	240.992	272.259

Note: 1) bootstrap = 10000
2) * $p < 10\%$

influence on nominal exchange rates. This strengthened the value of the domestic currency, leading to an overall decline in economic growth due to the trade effect. The threshold effect identified in this study is much smaller than the 21.1% reported in the study by (Olaniyi, 2019).

Additionally, concerning the control variables, the real exchange rate negatively impacted economic growth by 1.528 percentage points. This shows that undervaluing the domestic currency inhibited that country's economic growth. Karahan (2020) explained that an increase in exchange rates not only reduced production inputs (reduces imports of intermediate goods, raw materials, investment goods) but also limited the transfer of new technology from abroad. This had a negative impact on economic growth in developing countries. Similarly, (Vaz and Baer, 2014; Yiheyis, 2006) reinforced this view by arguing that the depreciation of the domestic currency increased the costs of the production process, thereby reducing economic growth. This result was contrary to the research findings by (Rodrik, 2008). Rodrik (2008) analyzed the role of exchange rates in developing countries and concluded that undervaluation of the domestic currency had positive impact on economic growth. The undervaluation index was measured the as the real exchange rate minus the Balassa-Samuelson-adjusted rate, where the real exchange rate was measured based on the exchange rate and purchasing power parity (PPP) conversion factors.

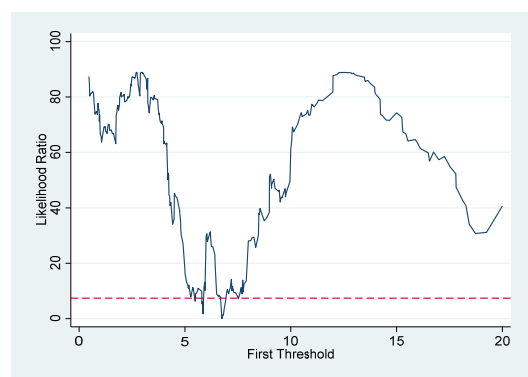


Figure 1. Confidence interval construction for threshold

A positive relationship between undervaluation and economic growth was detected in all survey periods. Additionally, the real exchange rate had been approached from different angles, such as the real effective exchange rate (REER) index; the real exchange rate was constructed using either the wholesale price index (WPI) or the consumer price index (CPI), and similar estimation results were found across all cases. Thus, based on the increase in its income elasticity of the demand for exports, an economy's long-term growth is affected when a currency depreciates. The results of the current study differed from Rodrik's study, possibly due to differences in how the real exchange rate variable was measured, the dependent variable approach (Rodrik used GDP per capita data), and the estimation method. Meanwhile, the savings rate, trade openness, and foreign direct investment had a positive relationship with economic growth, with influences of 0.017, 0.003, and 0.007 percentage points, respectively. Finally, the inflation rate had an insignificant impact on economic growth.

V. Conclusion

As for the conclusion, it takes carefully and thoroughly examined the impact of interest rates on economic growth using a PTR model. The experimental results contributed significantly to the previous research literature in several aspects. First, the non-linear impact of interest rates on economic growth was specifically considered, which had appeared to be a limitation of previous studies. Second, in terms of methodology, through the PTR model, the threshold value of the interest rate was decomposed using the bootstrap process, and then the relationship between the interest rate and economic growth was measured at separate critical levels. This also addressed the problem of endogeneity in the data. Many studies had difficulty establishing the relationship between interest rates and economic

growth, or they lacked determination of a specific threshold level for the interest rate variable. Meanwhile, in this study, the PTR model helped consider the comprehensive impact level and determined the threshold value of interest rates in developing countries to be 5.286%. Specifically, the findings showed that interest rates promoted economic growth when they were less than or equal to the threshold value. Conversely, when interest rates exceeded this threshold level, they had a negative impact on growth. Therefore, central banks in developing countries should follow a trajectory of applying interest rate adjustment policies below 5.286% to effectively stimulate economic growth. Exceeding this threshold, through inflation effects and trade effects, interest rates can cause the total economy to decline. This article is insightful because it sheds light on the potential effects of interest rates if only traditional linear models are relied upon. The relationship between interest rates and economic growth was complex because, in addition to linear effects, interest rates also exhibited non-linear effects on economic growth. Traditional linear models appeared to be insufficient to capture these nonlinear effects. Meanwhile, the PTR model allowed for considering the impact of interest rates at different critical levels. This has great significance for policy-makers, helping them have a more comprehensive view of the relationship between these two variables and thereby building effective interest rate adjustment policies.

Despite its significant contributions, this article still has limitations. First of all, this study's results are backed up by the use of econometric techniques and data from 34 countries in a panel data sample. Consequently, considering the threshold impact of rate hikes on the growth of the economy at the country level is still something that needs to be addressed. As for the second point, this article only analyzes the impact of nominal interest rates without considering the impact of real interest rates. In the future, further research is likely to clarify the actual relationship between the exchange rate and the growth of the economy.

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Appendix

Table A1. List of developing countries

No.	Symbol	Countries	No.	Symbol	Countries
1	ALB	Albania	18	IND	India
2	BGD	Bangladesh	19	JAM	Jamaica
3	BGR	Bulgaria	20	MAC	Macao SAR, China
4	BLR	Belarus	21	MDG	Madagascar
5	BOL	Bolivia	22	MEX	Mexico
6	BWA	Botswana	23	MUS	Mauritius
7	CHN	China	24	MYS	Malaysia
8	COL	Colombia	25	NGA	Nigeria
9	CRI	Costa Rica	26	PER	Peru
10	CZE	Czechia	27	ROU	Romania
11	DOM	Dominican Republic	28	SGP	Singapore
12	EGY	Egypt, Arab Rep.	29	SLB	Solomon Islands
13	FJI	Fiji	30	SYC	Seychelles
14	HKG	Hong Kong SAR, China	31	THA	Thailand
15	HND	Honduras	32	TZA	Tanzania
16	HUN	Hungary	33	URY	Uruguay
17	IDN	Indonesia	34	ZAF	South Africa

Table A2. Data description

Variable symbol	Variable name	Description	Source
<i>GDP</i>	Gross domestic product	Logarithm of GDP	WB ¹
<i>IR</i>	Nominal interest rate	Rate (number of countries); Discount rate (11); Monetary Policy rate (4), money market rate (11); Treasury bill rate (7); Savings Rate (1).	IMF ²
<i>RER</i>	Real exchange rate	The bilateral real exchange rate represents the domestic currency's value relative to the US dollar	WB ³
<i>INF</i>	Inflation rate	Inflation, consumer prices (annual %)	WB ⁴
<i>SR</i>	Saving rate	Gross national income less total consumption, plus net transfers, as % of GDP	WB ⁵
<i>OPEN</i>	Trade openness	Total trade, exports plus imports, at current prices, as % of GDP	WB ⁶
<i>FDI</i>	Foreign direct investment	Foreign direct investment inflows, as % of GDP	WB ⁷

Note: 1) <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>

2) <https://data.imf.org/regular.aspx?key=63087881>

3) <https://data.worldbank.org/indicator/PA.NUS.FCRF>

<https://data.worldbank.org/indicator/FP.CPI.TOTL>

4) <https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG>

5) <https://data.worldbank.org/indicator/NY.GNS.ICTR.ZS>

6) <https://data.worldbank.org/indicator/BX.GSR.GNFS.CD>

<https://data.worldbank.org/indicator/BM.GSR.GNFS.CD>

7) <https://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD>

Table A3. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
<i>GDP</i>	1054	24.633	2.011	19.410	30.519
<i>IR</i>	1054	12.740	61.066	-0.654	1889.390
<i>RER</i>	1054	1.443	1.010	-0.750	4.327
<i>INF</i>	1054	14.504	88.677	-4.009	2221.017
<i>SR</i>	1054	23.587	13.537	-86.912	73.958
<i>OPEN</i>	1054	92.003	76.001	0.000	442.625
<i>FDI</i>	1054	4.825	7.897	-40.086	106.594