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Macroeconomic Determinants of BRICS Property Market Returns: A Regime-Switching Approach

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Abstract

Purpose: The aim of the study was to examine the effect of macroeconomic variables on Brazil, Russia, India, China and South Africa's (BRICS) property market returns under changing market conditions.

Design/methodology/approach: The study utilised a Markov regime-switching model for the period February 2011 to June 2025. The dependent variables comprised BRICS's property market returns, whereas the independent variables consisted of domestic inflation growth rate, gross domestic product growth rate and interest growth rate of each BRICS nation.

Findings: The findings revealed that macroeconomic variables have a regime-specific effect on BRICS's property market returns in bull and bear market conditions. That being said, inflation growth rate had a negative significant effect on Brazil's, India's and South Africa's property returns in a bull market condition, whereas in the bear market condition, only India's returns were negatively affected. Similarly, gross domestic product (GDP) had a negative significant effect on Russia's and China's property returns in a bull market condition, whereas in the bear market condition, the effect was insignificant. In contrast, interest growth rate had only a negative significant effect on South Africa's and Brazil's returns in bull and bear market conditions, respectively. The transition probabilities revealed that the bear market condition dominated BRICS property market returns, illustrating that the returns were decreasing across the sample period.

Practical implications: Collectively, the study presents important implications for policymakers and investors, such that monetary policy adjustments and investment decisions must factor in the state of the property market, as bull and bear periods dictate the return perspective that influences investors and policymakers' decisions.

Originality/value: The study contributes to the literature by providing a comprehensive asymmetrical analysis of macroeconomic fundamentals' influence on BRICS's property market return. Unlike previous studies that focus predominantly on the linear effect, this study highlights the nonlinear perspective between macroeconomic and property market returns, offering nuanced insights for policymakers and investors.

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INTRODUCTION

Property market and macroeconomic variables are seriously interlinked and intertwined. Globally, macroeconomic fundamentals have historically been the focus of many scholars, particularly on their impact on market returns, with early research demonstrating the procyclicality of the real estate market, indicating a strong correlation between fluctuations in macroeconomic variables such as inflation, interest rates, income growth and property returns (Ghent and Owyang 2010; Ling and Naranjo 2015). Research has further enhanced the link with empirical findings on macroeconomic links to commercial property returns, revealing that, over time, the economic relationships with property return varied, generally becoming weaker, and lead time increased, suggesting that explanatory powers are not uniform across global markets (Hoskins et al. 2004).

While the world continues to grapple with the effects of global shocks such as the war in Iran, the global financial crisis, the US-China trade disputes, the COVID-19 pandemic, and the Russia-Ukraine war, among others, global, regional and bloc growth gets revised as macroeconomic variables bear the effect of uncertainty. Such incidents have serious impacts on the behaviour of macroeconomic variables, which, in turn, significantly affect property market returns. The backward and forward relationship between the property market and the economy has influenced a rise and fall in future of property returns with residential markets being significantly influenced by macroeconomic indicators (Wahab et al. 2017).

Research has focused on the relationship between stock and bond market returns and how macroeconomic shocks, such as fluctuations in interest rates, inflation rates, and industrial production, have affected asset markets. Although the co-movements of real estate and other asset prices suggest similarities in risk factors, most studies have ignored the effect on the real estate markets. However, Belo and Agbatekwe (2002) argue that the measure of a country's economic growth and prosperity lies in the quality and quantity of the country's housing stock, with real estate becoming the focal point of the government's fiscal and monetary policies. As such, the real estate sector has become a yardstick for realising low inflation, high employment and balanced economic growth with reverse implications on one another (Apergi 2003; Fraser 1993). Therefore, economic instability through macroeconomic fluctuation often creates a disequilibrium in the property market. Furthermore, Chen et al. (1986) found several US macroeconomic variables to be significant in explaining expected stock, confirming that monetary policy shocks have a significant impact on property prices in developed countries, with macroeconomic variables being the primary drivers of property prices.

The extent of the interdependency of economic forces verified by the financial crises has resulted in greater attention being placed on linkages between the real economy and financial markets. Developing economies, on the other hand, and BRICS in particular, are largely associated with economic variations that can potentially hinder and delay domestic growth and foreign investment. The volatility of the macroeconomic factors associated with asset price fluctuations, unstable discount rates and risk premiums has an additional implication on the risk perception of investors (Bansal et al. 2012). Moreover, BRICS economies have provided investors with opportunities for international portfolio diversification. These portfolio diversification strategies are based on the principle of low correlations in the business cycles of different economies. A clear appreciation of the role of emerging markets' property market returns in international portfolio diversification is not possible without understanding the relationship between the risk and return dynamics of property market returns and volatility in key macroeconomic variables that underlie business cycles.

Understanding the relationship between macroeconomic variables and property market returns is important to investors in several ways. Firstly, the relationship provides a clear and strategic implication on real estate decision-making and portfolio management (Hoskins et al. 2004). Secondly, knowing the relationship and whether the link is consistent or changing over time provides a useful tool in the decision-making process as companies expose themselves in the international market in a globalised world.

LITERATURE REVIEW

Theoretical conceptualisation

The theoretical underpinnings of the study rest on the idea that property market returns are not generated by one stable linear process. Instead, returns may shift between expansionary and contractionary states, with macroeconomic and geopolitical variables exerting different effects across bull and bear regimes rather than assuming one stable relationship throughout the sample. Real estate occupies a unique position within asset markets, functioning simultaneously as a consumption good, a production input, and an investment asset. As such, its returns are influenced by a complex interaction of macroeconomic forces, including economic growth, interest rates, inflation, and financial conditions.

A central theoretical framework for understanding property market returns is Minsky's financial instability hypothesis, which argues that periods of stability can generate financial fragility as investors, lenders, and firms become more optimistic, increase leverage and take greater risks (Minsky, 1999). In this framework, financial markets evolve endogenously from relatively stable conditions into speculative and crisis-prone states. Therefore, financial cycles are not accidental deviations from equilibrium but intrinsic features of capitalist financial systems, such that the property market may operate differently in expansionary and contractionary regimes, represented as:

$$R_t = f(L_t, E_t, C_t) \tag{1}$$

where:$\frac{\partial R_t}{\partial L_t} > 0$ in expansionary phases but$\frac{\partial R_t}{\partial L_t} < 0$ when leverage becomes excessive, and fragility rises.

Here, R_t is property market returns, L_t is leverage or credit conditions, E_t is investor expectations and C_t is the market regime. Therefore, the same financial conditions may support returns in a bull market but intensify vulnerability in a bear market. The bull regime can be interpreted as a period of optimism, rising returns, stronger liquidity and risk-taking, while the bear regime reflects deleveraging, falling confidence and heightened sensitivity to macroeconomic shocks. Minsky's formulation explicitly treats instability as an internal feature of capitalist financial systems rather than merely the result of external shocks.

Second is Hamilton's regime-switching theory, which provides the direct econometric bridge between financial-cycle theory and empirical modelling. Hamilton proposed that economic time series may be governed by parameters that shift according to an unobserved discrete-state Markov process (Hamilton 1989). Hamilton does not observe the regime directly but infers it probabilistically from the data. The general Hamilton-style regime-switching model is presented as:

$$yt = \mu s_t + \beta'_{s_t} X_t + \varepsilon_t, s_t \tag{2}$$

where $\varepsilon_t, s_t \sim N(0, \sigma^2_{s_t})$ and s_t is an unobserved state variable. The regime transition process is:

$$P(S_t = j | S_{t-1} = i) = p_{ij} \tag{3}$$

For two regimes:

$$P = \begin{bmatrix} p_{11} & p_{12} \\ p_{21} & p_{22} \end{bmatrix} \tag{4}$$

where $p_{11} + p_{12} = 1$ and $p_{21} + p_{22} = 1$

This entails that property market returns can remain in a bull or bear state with some probability, but can also switch between states when market conditions change. This provides the econometric bridge between theory and method in that if financial instability theory suggests that property markets alternate between expansionary and contractionary phases, the regime-switching model provides a formal empirical framework for estimating those phases, their transition probabilities and their state-dependent coefficients (Hamilton 1989).

Empirical review

Empirically, the influence of macroeconomic factors on property market returns has been extensively examined in both developed and emerging markets, reflecting the dual nature of real estate as both a consumption good and an investment asset, with existing literature focusing on the US property market (Chan et al. 1990; McCue and Kling 1994) and a few others examined the effect on the UN's property returns (Brooks and Tsolacos 1999). The relationship between macroeconomic variables and property market returns has been explored in the literature. While some focused on the effect of monetary policy shocks on real estate (Anderson et al. 2012), other researchers concentrated on the effect of changes in key macroeconomic variables (Yunus 2012). Yunus (2012) investigated the dynamic interactions among securitised property markets, stock markets, and key macroeconomic factors for ten developed nations throughout North America, Europe, Australia, and Asia. The results indicated that each property market is co-integrated with its respective stock market, with key macroeconomic factors in the long run, and is also

influenced by the overall economy in the short run. Further analysis revealed that, for the overwhelming majority of countries involved, shocks to the stock market, GDP, money supply, and inflation induce a positive response in property returns, while shocks to long-term interest rates induce a negative response, although the extent of the responses differs across countries/regions.

A central theme in the literature is the role of economic growth, typically proxied by GDP. Studies such as Chen and Tzang (1988) and Fama (1990) suggest that real estate returns are positively correlated with economic activity, as higher income levels increase demand for both residential and commercial property. In periods of economic expansion, rising business activity stimulates demand for office and retail space, while increased household income supports housing demand. However, the relationship is not always linear. McGough and Tsolacos (2001) argue that property markets often lag broader economic cycles due to adjustment costs and market rigidities.

Other studies in this area have focused on the effects of interest rate (Bernanke and Gertler 1995; Ling and Naranjo 1997), inflation (Fama and Schwert 1977; Hoesli et al. 1997), exchange rate (Quan and Titman 1999), credit availability and financial development (Iacoviello 2005), unemployment rates and labour market conditions (Case and Shiller 1989). While, for example, higher interest rates increase borrowing costs, reducing demand for property investment and exerting downward pressure on returns, and consequently, find a strong inverse relationship between interest rates and real estate returns, particularly in commercial property markets. Others, who have focused on inflation, have found that property returns can partially hedge against expected inflation, while other studies indicate that real estate performs poorly during periods of unexpected inflation due to distortions in capital markets and policy responses. Furthermore, exchange rate movements have gained increasing attention, particularly in open economies, affecting property markets through capital flows and foreign investment. Studies such as those by Quan and Titman (1999) highlight the growing importance of global capital flows in determining property prices, particularly in emerging markets where foreign direct investment plays a significant role.

Credit availability and financial development have been identified as key drivers of property price cycles. Iacoviello (2005) demonstrates that housing markets are highly sensitive to credit conditions, with easier access to financing leading to increased demand and higher returns. Conversely, credit tightening can trigger sharp declines in property markets, as observed during the global financial crisis of 2008. In addition, unemployment rates and labour market conditions influence property demand in that higher unemployment reduces household income and weakens demand for housing, leading to lower returns. Studies such as those by Case and Shiller (1989) show that expectations about future income and employment prospects play a critical role in housing market dynamics.

Lin (2022) employed novel data containing both capital appreciation and income components in the US to examine whether the largest variations in house price changes are mainly driven by local or national factors. The results show that macroeconomic factors, absorbed by time fixed effects, account for 43% of the variation in capital gains and 2% of the variation in rental yields. Overall, the findings empirically support the prior literature assuming that the nature of housing markets is mainly local, suggesting a greater role of local factors for understanding cross-sectional income returns in housing markets. Erol and Ileri (2013) investigated the macroeconomic sources of time-varying risk premia in the Turkish real estate investment trust (REIT) industry within the arbitrage pricing theory framework and found that inflation risk appears to be the major concern in REIT investment, with Turkish REITs behaving more like stocks than real estate.

Beyond these core variables, recent literature emphasises the role of institutional and structural factors, including regulatory frameworks, urbanisation, and demographic trends. Glaeser et al. (2008) highlight how land use regulations and housing supply constraints can amplify the impact of macroeconomic shocks on property prices. Similarly, rapid urbanisation in developing countries has been associated with sustained increases in property demand, independent of short-term macroeconomic fluctuations.

Despite the extensive body of research, several gaps remain. Firstly, much of the literature is concentrated in developed markets, with limited empirical evidence from developing BRICS economies. Secondly, the interaction between macroeconomic variables is often complex and nonlinear, suggesting the need for more advanced econometric approaches such as regime-switching models. Thirdly, the increasing integration of global financial markets implies that domestic property returns are influenced not only by local macroeconomic conditions but also by global shocks.

Therefore, an understanding of macroeconomic variables and their resultant impact on the return and evaluation of risk-return relationship in BRICS is important for both academics and investors as real estate investments as indirect investment instruments are increasingly becoming an important part of investors' diversified portfolio.

METHODS

Data

The primary objective of this study is to examine the effect of geopolitical uncertainty on the property market return volatility of BRICS countries. In doing so, the study applies monthly data for the period February 2011 to June 2025. The choice of monthly frequency is directly related to the availability of data, as BRICS's property market data is only available in quarterly and monthly frequencies. Similarly, the sample period is constrained as China's property market data is only available from January 2011. Considering the above, the sample period remains robust as it considers three important historical events, namely the COVID-19 pandemic, the US-China trade war and the Russia-Ukraine war. The dependent variable comprises a proxy for each BRICS property market, as measured by the real residential property price index. The key explanatory variables used in the study were inflation, gross domestic product and interest rate. The geopolitical risk index, developed by Caldara and Iacoviello (2022), was used as a control variable. The property price data was obtained from the Federal Reserve Bank of St. Louis (FRED), sourced from the Bank for International Settlements (BIS), while the macroeconomic variables were obtained from the World Bank and the geopolitical risk index was collected from the Economic Policy Uncertainty (EPU) website. For Russia and India, property market data was only available at a quarterly frequency. As a result, these series were converted to monthly observations using the quadratic interpolation technique, consistent with the approach adopted by Dlamini (2017).

Empirical model

To achieve the study's objective, a nonlinear modelling approach, capable of distinguishing between bull and bear market phases, is required. Accordingly, this study employs the Markov regime-switching model. The choice of this model is motivated by its ability to incorporate regime changes driven by an unobserved state variable that evolves according to a first-order Markov process (Hamilton 1989). As a result, the model accommodates regime shifts that occur at irregular time intervals, unlike many alternative nonlinear models that rely on exogenous structural changes occurring at fixed periods (Camacho et al. 2018). The Markov regime-switching model is specified as follows:

$$\Delta \mathrm{I}_t = \mu_{ct} + a_{1ict}\Delta CPI + a_{2ict}\Delta INT + a_{3ict}\Delta \mathrm{REER} + \varphi_{1ict}\Delta GPRS + \varepsilon_{tct} \quad (5)$$

$\Delta \mathrm{I}_t$ are the BRICS property market returns, and the state-dependent mean is given by μ_{ct}. The model considers two market conditions ($\mathrm{C_t}$), i.e. bull (1) and bear (2) market conditions. The state-dependent explanatory variables are the inflation growth rate (ΔCPI), long-term interest growth rate (ΔINT) and real effective growth rate (ΔREER) of each BRICS country. The state-dependent control variable is the geopolitical risk index ($\Delta GPRS$) of each BRICS country. ε_t is the state-dependent variance.

Market conditions are assumed to evolve according to a first-order Markov process, governed by a constant transition probability matrix. Consequently, the likelihood of transitioning between bull and bear market regimes is expressed as follows:

$$Prob = \begin{bmatrix} Prob(C_t = 1/C_{t-1} = 1) & Prob(C_t = 2/C_{t-1} = 1) \\ Prob(C_t = 2/C_{t-1} = 2) & Prob(C_t = 1/C_{t-1} = 2) \end{bmatrix} = \begin{bmatrix} Prob_{11} & Prob_{21} \\ Prob_{22} & Prob_{12} \end{bmatrix} \quad (6)$$

Where $Prob_{11}$ is the probability that the BRICS property market return is at a bullish state and will not move, $Prob_{21}$ is the probability that the returns are in a bullish state and will move to a bearish state. $Prob_{22}$ is the probability that the returns are in a bear regime and will not move, $Prob_{12}$ is the probability that the returns are in a bearish regime and it will move to a bullish state (Brooks 2019).

Preliminary and diagnostic tests

Prior to the estimation of the Markov regime-switching model, it is essential that various preliminary tests are estimated to ensure the properties of the empirical model are met. To this extent, the study considers the variance inflation factor test (VIF) to ensure that there is no collinearity among the independent and control variables. Similarly, the augmented Dickey-Fuller (ADF) test for unit root, the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test for stationarity and the ADF breakpoint unit root tests are estimated to ensure the dependent, independent and control variables express stationarity properties in levels and in the presence of structural breaks. Once these tests are estimated and met, the Markov regime-switching

model will be estimated and the Durbin-Watson diagnostic test for serial autocorrelation is estimated to confirm the robustness of the model output.

RESULT AND DISCUSSION

Summary statistics

Table 1 below shows the descriptive statistics of BRICS property market returns, giving insights into the return characteristics. Russia and South Africa reflect the countries with the highest and lowest mean returns, with 0.005929 and 0.0000223, respectively. This indicates a huge difference in market attractiveness in returns on investments for these two countries. Russia again comes up as the country within the bloc with the highest standard deviation, a reflection of its volatility and high risk in returns, while South Africa reflects the lowest standard deviation, a reflection of how volatile and stable the property market returns in both countries are. The skewness statistics indicate that the return distribution is symmetric, with all countries displaying a positive skewness, implying a higher likelihood of extreme positive returns (large gains). In addition, the kurtosis values of the countries show different degrees of normality. Russia and China exhibit kurtosis values of 13.378 and 7.9422, which are both highly leptokurtic, indicating the presence of outliers and the presence of sharp peaks compared to the lower or normal distributions of Brazil, India and South Africa. The Jaque-Bera value confirms the non-normality of the returns series, and also confirms volatility clustering, thereby rejecting the null hypothesis that the data follows a normal distribution.

Table 1. Descriptive statistics of BRICS's property market returns

	BRAZIL	RUSSIA	INDIA	CHINA	RSA
Mean	0.003780	0.005929	0.002622	0.003997	2.23E-05
Median	0.004013	0.003819	0.001529	0.001998	3.79E-06
Maximum	0.014395	0.090279	0.032264	0.061790	0.003290
Minimum	-0.002525	-0.031726	-0.021725	-0.016126	-0.001888
Std. dev.	0.003844	0.013709	0.008794	0.011814	0.000824
Skewness	0.218928	2.289689	0.550992	1.695542	0.290016
Kurtosis	2.726951	13.37836	4.121601	7.942252	3.908547
Jarque-Bera	1.908289	922.2142	17.71856	257.4647	8.326920
Probability	0.385141	0.000000	0.000142	0.000000	0.015554

Notes:1. Source: Authors' own estimation (2026)

The descriptive statistics of the macroeconomic variables of the BRICS bloc are shown in Table 2. Among the bloc countries, Russia has the highest mean inflation growth rate with 0.57243, and China exhibits the lowest mean of 0.13405, which indicates that China has a relatively stable growth level. Brazil has the largest standard deviation (0.982377), indicating the most variability; South Africa (0.456712) and China (0.494173) seem to be more stable. The skewness values reflect high asymmetry, especially for Brazil (-10.40369) and Russia (6.038590), indicating extreme negative and positive inflation growth shocks, respectively. The kurtosis values are exceptionally high for Brazil (127.31) and Russia (55.63), reflecting heavy tails and extreme observations. The Jarque-Bera statistics (all significant at conventional levels except marginally for China) confirm non-normality, justifying the choice of robust econometric models capable of adapting to the extreme volatility and distributional irregularities.

Table 2. Descriptive statistics of BRICS's macroeconomic variables

	CPIBRAZIL	CPIRUSSIA	CPIINDIA	CPICHINA	CPISA
Mean	0.404238	0.572431	0.459687	0.134059	0.438746
Median	0.439963	0.460010	0.505334	0.093991	0.361664
Maximum	1.620050	7.613075	2.928177	1.582586	3.742204
Minimum	-11.52694	-0.540012	-1.547721	-1.231323	-0.628931
Std. dev.	0.982377	0.723626	0.670763	0.494173	0.456712
Skewness	-10.40369	6.038590	0.257183	0.364353	2.382898
Kurtosis	127.3136	55.63245	3.909106	3.542332	17.60649
Jarque-Bera	114517.5	21019.74	7.864619	5.947861	1701.615
Probability	0.000000	0.000000	0.019598	0.051102	0.000000

Source: Authors' own estimation (2026)

The descriptive statistics of gross domestic product growth rate across BRICS economies are discussed in Table 3, showing a significant change in economic performance and volatility. Overall, China shows the highest mean growth rate (0.857211), followed by Russia (0.546054) and India (0.462248), whereas Brazil (0.103168) and South Africa (0.099352) indicate average growth rates less than expected. However, the median figures, especially for Russia (1.866529) and China (1.888500), indicate that typical growth is greater than the mean, signalling a potential negative shock, dragging averages downwards. The wide range between maximum and minimum values (e.g., India: 18.57193 to -22.21853) reflects extreme economic fluctuations. China's and Russia's standard deviations are highest (5.200416 and 4.862814, respectively), which reflect more macroeconomic volatility. All countries show negative skewness, which means extreme economic downturns are more likely. Kurtosis values are well above three or very high, particularly for South Africa (60.11) and Brazil (38.05), implying heavy tails and extreme observations. Jarque-Bera statistics support non-normality for all these series and also corroborate the necessity for an adequate modelling approach.

Table 3. Descriptive statistics of BRICS's GDP

	GDPBRAZIL	GDPRUSSIA	GDPINDIA	GDPCHINA	GDPSA
Mean	0.103168	0.546054	0.462248	0.857211	0.099352
Median	0.128426	1.866529	0.663266	1.888500	0.132688
Maximum	5.817076	9.029295	18.57193	18.29525	11.24857
Minimum	-6.446699	-14.97951	-22.21853	-20.58737	-12.68992
Std. dev.	0.822995	4.862814	3.371918	5.200416	1.427275
Skewness	-1.103962	-1.261255	-1.180056	-0.958058	-1.512633
Kurtosis	38.04553	4.939944	19.05132	5.827216	60.11269
Jarque-Bera	8888.338	72.99470	1897.342	84.08267	23578.54
Probability	0.000000	0.000000	0.000000	0.000000	0.000000

Source: Authors' own estimation (2026)

Table 4 shows the descriptive statistics of interest rate growth rates in BRICS, which reveal a strong degree of monetary variation and volatility. Russia has the highest mean interest rate growth rate of 1.219406 and a maximum value of 135.2941, indicating episodes of extreme monetary tightness or instability. More so, Brazil and South Africa have moderate mean values of 0.388605 and 0.223527, respectively, while India and China have means of -0.056664 and -0.370334, indicating a downturn in the monetary environment. High standard deviations, particularly in the case of Russia (13.88589) and Brazil (6.869995), illustrate large variability and interest growth rate instability, respectively. The distribution of skewness indicates asymmetry, with Russia (6.236663) and Brazil (1.566049) being significantly positively skewed, suggesting occasional large upswings in interest growth rate, while negative skewness is observed for China (-2.083063). All countries have high kurtosis, especially Russia (57.66), suggesting leptokurtic distributions in which there are extreme observations. The Jarque-Bera statistics are all very significant for the whole series, thereby showing non-normality. These results indicate that BRICS's interest growth rates are extremely volatile and highly volatile, which highlights the need for models that can model the non-linear structures and the clustering in volatility space.

Table 4. Descriptive statistics of BRICS's interest rates

	INTBRAZIL	INTRUSSIA	INTINDIA	INTCHINA	INTSA
Mean	0.388605	1.219406	-0.056664	-0.370334	0.223527
Median	0.000000	0.000000	0.000000	0.000000	0.000000
Maximum	37.50000	135.2941	11.36364	4.302926	15.78947
Minimum	-25.00000	-35.29412	-14.56311	-7.462687	-19.04762
Std. dev.	6.869995	13.88589	2.824503	1.468998	3.555772
Skewness	1.566049	6.236663	-0.006808	-2.083063	-0.289523
Kurtosis	11.24634	57.66249	10.77549	11.05733	14.27086
Jarque-Bera	560.8959	22659.92	435.8047	593.0813	918.1085
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	67.22865	210.9572	-9.802882	-64.06775	38.67013
Sum sq.	8143.980	33421.92	1372.740	394.8946	2183.328
Sum sq. dev.	8117.855	33164.67	1372.184	371.1681	2174.684
Observations	173	173	173	173	173

Source: Authors' own estimation (2026)

Stationarity and unit root tests

In Table 5 bellow, the ADF test and ADF breakpoint test are provided to determine whether the timeseries exhibit stationarity properties, a requirement for the estimation of the Markov regime-switching model. If one turns to Panel A, the associated ADF tests for all BRICS member countries, besides South Africa, exhibit a test statistic more negative than the associated critical values as seen by the statistical significance level. Therefore, the null hypothesis of a unit root is rejected in favour of the alternative hypothesis that Brazil's, Russia's, India's, and China's property market returns are stationary in levels. However, such is not confirmed for South Africa, as the test statistic is less negative than the associated critical levels. Despite this, when the ADF test is run in first difference, it then becomes apparent that South Africa's property market return presents stationarity properties, which is confirmed by the ADF breakpoint test. Similarly, in Panel B and Panel C, it is evident that BRICS's geopolitical risk index and macroeconomic variables (inflation, gross domestic product and interest rates growth rates) are stationary in levels, as the ADF test statistic is more negative than the selected critical values at varying levels of significance. To this extent, the null hypothesis is rejected in favour of the alternative hypothesis.

Table 5. Stationarity and unit root test results

Country	ADF	ADF-break
	Panel A: BRICS property market returns	
BRAZIL	-2.974**	-6.390***
RUSSIA	-3.434**	-8.077***
INDIA	-10.253***	-15.384***
CHINA	-4.653***	-6.099***
SA	-1.921 (-6.857) ***	-3.031 (-7.687) ***
	Panel B: BRICS geopolitical risk index	
GPBRAZI	-5.934***	-10.966***
GPRUSSIA	-4.187***	-8.758***
GPINDIA	-10.253***	-15.384***
GPCHINA	-5.867***	-7.625***
GPSA	-7.644***	-9.737***
	Panel C: Control variables	
	Inflation Rate	
CPIBRAZI	-33.705***	-34.927***
CPIRUSSIA	-8.155***	-14.364***
CPIINDIA	-8.684***	-10.107***
CPICHINA	-9.786***	-11.755***
CPISA	-10.894***	-12.036***
	GDP	
GDPBRAZIL	-3.070**	-9.571***
GDPRUSSIA	-4.023***	-7.878***
GDPINDIA	-6.492***	-10.936***
GDPCHINA	-5.867857***	-7.625157***
GDPSA	-6.530***	-11.099***
	Interest Rates	
INTBRAZIL	-2.694*	-8.758**
INTRUSSIA	-11.422***	-16.821***
INTINDA	-5.213484***	-10.90389***
INTCHINA	-7.072044***	-13.21526***
INTSA	-4.306914***	-10.15890***

Notes:
1. *, **, and *** provide the 10%, 5% and 1% level of significance, respectively
2. Source: Authors' own estimation (2026)

Confirming the findings of the ADF test, the ADF breakpoint test for the BRICS property market returns, geopolitical risk index and macroeconomic variables exhibit a test statistic that is more negative

than the associated critical values at all levels of significance. Consequently, the null hypothesis that the timeseries contains a unit root in the presence of structural breaks is rejected in favour of the alternative hypothesis that the timeseries exhibit stationarity properties in the presence of structural breaks.

Collectively, the findings demonstrate that BRICS's property market returns, geopolitical risk and macroeconomic variables are stationary with and without structural breaks at levels. However, South Africa's property market returns are stationary at the first difference. To this extent, the differenced variable is used henceforth.

Variance inflation factor test

A further requirement of the Markov regime-switching model is that the explanatory variables should not exhibit colinear properties. To this end, the VIF test is estimated and presented in Table 6 below. The findings of the VIF test associated with each dependent variable (BRICS's property market returns), and a set of explanatory (geopolitical risk index and macroeconomic variables) variables reveal that there exists no colinear relationship. That being, for Brazil, Russia, India, China and South Africa's property market returns, the associated VIF statistic is 1, suggesting that there is no multicollinearity between geopolitical risk and macroeconomic variables associated with each BRICS country.

Table 6. Variance inflation factor test results

Variable	Coefficient variance	Uncentred VIF	Centred VIF
Dependent variable: BRAZIL			
C	2.71E-07	3.155575	NA
CPIBRAZIL	9.12E-08	1.192904	1.019308
GDPBRAZIL	1.28E-07	1.016869	1.001047
INTBRAZIL	1.87E-09	1.023031	1.019749
GPBRAZIL	4.87E-05	2.966898	1.000710
Dependent variable: RUSSIA			
C	2.83E-06	2.573502	NA
CPIRUSSIA	3.00E-06	2.315419	1.421014
GDPRUSSIA	5.08E-08	1.102356	1.088550
INTRUSSIA	6.06E-09	1.065476	1.057275
GPRUSSIA	1.52E-06	3.209459	1.330162
Dependent variable: INDIA			
C	1.05E-06	2.603150	NA
CPIINDIA	9.52E-07	1.561104	1.060249
GDPINDIA	3.80E-08	1.089224	1.069017
INTINDIA	5.34E-08	1.055003	1.054576
GPINDIA	0.000236	1.922093	1.031582
Dependent variable: CHINA			
C	5.35E-06	6.842766	NA
CPICHINA	4.07E-06	1.358525	1.264896
GDPCHINA	3.59E-08	1.268427	1.234685
INTCHINA	3.71E-07	1.083646	1.018537
GPCHINA	9.62E-06	6.350882	1.024919
Dependent variable: RSA			
C	1.34E-08	3.706525	NA
CPISA	2.80E-08	2.485716	1.121807
GDPSA	2.05E-09	1.163261	1.157729
INTSA	3.35E-10	1.179506	1.174809
GPSA	2.19E-06	2.365162	1.010039

Notes: Source: Authors' own estimation (2026)

Markov regime-switching model

Having met the requirements for the estimation of the Markov regime-switching model, it now permits the estimation of the empirical model whereby the results are presented in Table 7. If one turns to Panels A and B, the associated results of the bull and bear regime are presented. It is evident that the average returns (C) associated with Brazil's, India's, China's and South Africa's property market return are positive and significant in a bull regime. However, in a bear regime, Brazil's, China's and South Africa's property

market return is negative and significant. The findings demonstrate that, on average, when the market is in a bull regime, associated property market returns will remain positive and increasing, whereas in a bear regime it will be negative and decreasing. These observations align closely with the properties of a bull and bear regime, as Mayekiso and Moodley (2026) demonstrate that average returns in a bull regime should exhibit positive and stable returns and the market is stable and less influenced by uncertainty, while in a bear regime, returns should be decreased and negative due to the market demonstrating volatile behaviour. These findings are further supported by the error variance (σ), as in a bull regime, the variance is much lower than in a bear regime, illustrating that the bull regime is a stable market condition, whereas the bear regime is a volatile market condition.

If one turns to the findings associated with the explanatory variables in Panel A, the bull regime, it is evident that the inflation growth rate has a negative significant effect on Brazil's, India's and South Africa's property market returns. However, gross domestic product growth rate has a negative significant effect on Russia's and China's property market returns, whereas interest growth rate and geopolitical risk only have a negative significant effect on South Africa's property market returns and Brazil's property market returns, respectively. In Panel B, the bear regime, inflation growth rate has a negative significant effect on India's property market returns, gross domestic product growth rate has a positive significant effect on Brazil's and South Africa's property market returns, whereas it has a negative significant effect on India's property market returns. Interest growth rate and geopolitical risk have a positive significant effect on Brazil's property market returns.

Collectively, the findings reveal that the effect that macroeconomic variables and geopolitical risk have on BRICS property market returns is not symmetrical; rather, it varies with the state of the financial market. That being said, stable and market conditions dictate the identified effect causing the alternate with market conditions, causing the effect to be nonlinear.

Table 7. Markov regime-switching model results

Variable	Brazil	Russia	India	China	South Africa
			Panel A: Bull regime		
C	0.008206***	0.009614	0.016829***	0.015368***	0.000544***
	(0.0000)	(0.1744)	(0.0000)	(0.0269)	(0.0021)
ΔCPI	-0.000582***	-0.005982	-0.006191**	-0.001873	-0.000448**
	(0.0024)	(0.4675)	(0.0471)	(0.5973)	(0.0490)
ΔGDP	-2.96E-05	-0.003627***	-8.60E-05	-0.004935*	1.23E-05
	(0.3650)	(0.0013)	(0.8776)	(0.0774)	(0.8874)
ΔINT	8.84E-05	-1.07E-05	-0.000318	-0.000670	-8.18E-05***
	(0.6990)	(0.9661)	(0.5429)	(0.6311)	(0.0015)
ΔGEORISK	-0.023692***	0.004628	-0.036177	0.004300	-0.002727
	(0.0001)	(0.4998)	(0.3046)	(0.7418)	(0.1387)
σ	-6.096148***	-3.853929***	-4.962783***	-4.427803***	-7.205754***
	(0.0000)	(0.0000)	(0.0000)	(0.0000	(0.0000)
			Panel B: Bear regime		
C	-0.000485	0.003179	0.001556*	-0.002743*	-0.000582***
	(0.2073)	(0.1323)	(0.0730)	(0.0965)	(0.0000)
ΔCPI	-0.000225	-0.000285	-0.004002***	-0.001191	0.000134
	(0.6670)	(0.8882)	(0.0000)	(0.3473)	(0.4440)
ΔGDP	0.000124***	0.000181	-0.000501***	-0.000203	0.001065***
	(0.0009)	(0.5824)	(0.0005)	(0.7806)	(0.0000)
ΔINT	0.002009***	7.30E-05	2.59E-05	-0.000605	2.76E-06
	(0.0003)	(0.3085)	(0.8799)	(0.1280)	(0.8497)
ΔGEORISK	0.010980**	-0.000469	-0.007315	0.002359	0.001364
	(0.0177)	(0.6709)	(0.5817)	(0.2242)	(0.7053)
σ	-6.505835***	-4.942730***	-5.265519***	-5.118357***	-8.012737***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Notes:
1. *, **, and *** provide the 10%, 5% and 1% level of significance, respectively
2. The parentheses provide the p-values
3. Source: Authors' own estimation (2026)

Transition probabilities and expected duration

The associated transition probabilities and expected duration associated with the BRICS property market returns are provided in Table 8. It is evident for Brazil, Russia, India and China that the transition probabilities in a bear regime are 0.982965, 0.959556, 0.947667 and 0.975626, respectively. However, in a bull regime, the transition probabilities are 0.968081, 0.758528, 0862054 and 0.926951, respectively. This demonstrates that the bear market condition is more persistent for Brazil's, Russia's, India's and China's property market returns, as they are higher in a bear regime and closer to 1, justifying the dominance of the bear regime. These findings are further supported by the associated duration results as the duration that Brazil's Russia's, India's and China's property market returns in a bear regime (58.70113, 24.72581, 19.10831 and 41.02776 months) is higher than the bull regime (31.32932, 4.141263, 7.249224 and 13.68947 months). Contrary to this, South Africa's property market return transition probability is higher in a bull regime (0.901428) than in a bear regime (0.814930), which is further supported by the duration of the bull regime (10.14492 months) as compared to the bear regime (5.403372 months).

In sum, the bear market condition is seen to dominate the BRICS property market returns as appose to the bull market condition, which is supported by both the transition probabilities and expected duration parameters.

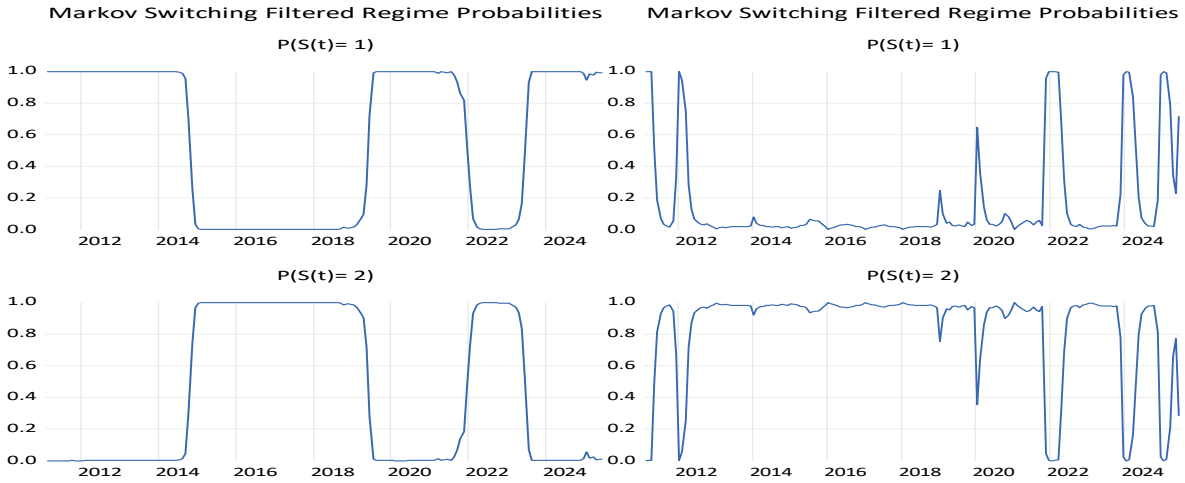
Table 8. Transition probabilities and expected duration results

Variable	Brazil	Russia	India	China	South Africa
P11	0.968081	0.758528	0.862054	0.926951	0.901428
P22	0.982965	0.959556	0.947667	0.975626	0.814930
D11	31.32932	4.141263	7.249224	13.68947	10.14492
D22	58.70113	24.72581	19.10831	41.02776	5.403372

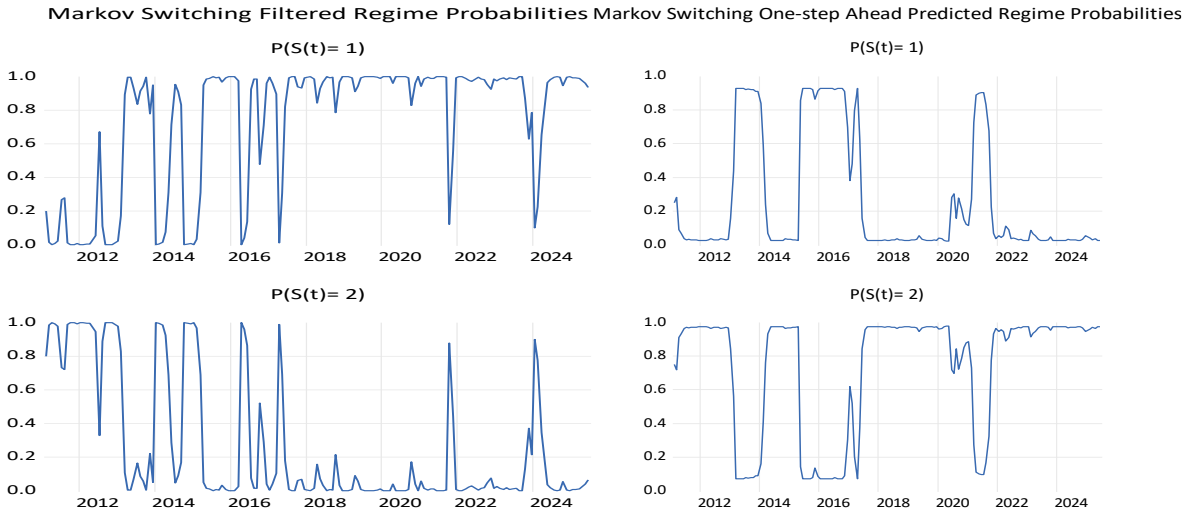
Source: Authors' own estimation (2026)

ROBUSTNESS TESTS

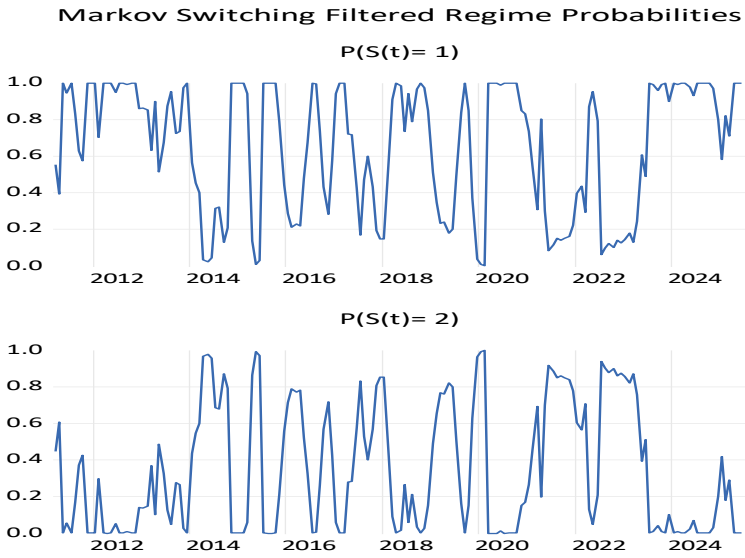
To confirm the robustness of the estimated empirical model results, the study estimates the smooth regime probability graphs of BRICS's property market returns. In Figure 1, it can be visualised for Brazil's, Russia's, India's, and China's property market returns that it was dominated by the bear market condition as Brazil's property market returns stayed in a bear regime from 2014 to 2019 and 2022 to 2023, Russia's from 2012 to 2019, India's from 2017 to 2021 and 2011 to 2017, and China's from 2011 to 2012, 2013 to 2014, 2017 to 2020 and 2022 to 2024. However, for South Africa's property market returns, the bull market condition dominated returns as it stayed in the bull market condition for most of the sample period. Similarly, it is seen that each market condition was persistent as it did not stay for prolonged periods in a bull or bear regime; rather, once it entered a bull or bear regime, it moved into the subsequent regime, as supported by the spikes in the graphs. These findings serve as a confirmation of the transition probability and expected duration evidence as it supports the conclusions made therein, which confirm the robustness of the empirical results and further validate the identified conclusions.



A: Brazil **B: Russia**



C: India **D: China**



E: South Africa

Figure 1. Smooth transition probabilities of BRICS's property market returns
Source: Authors' own estimation (2026)

DISCUSSION OF RESULTS

The findings of this study provide strong evidence that the effect of macroeconomic variables and geopolitical risk on BRICS property market returns is nonlinear and regime dependent. The Markov regime-switching results demonstrate that the relationship between macroeconomic factors and property market returns differs significantly between bull and bear market conditions. This confirms that property markets within BRICS economies respond asymmetrically to changing economic conditions and financial uncertainty.

The results reveal that, in the bull regime, average property market returns for Brazil, India, China, and South Africa are positive and statistically significant, whereas bear regimes are associated with negative and declining returns, particularly for Brazil, China, and South Africa. These findings are consistent with Hamilton (1989), who argues that financial markets exhibit distinct dynamics across economic regimes. Similarly, Moodley and Lawrence (2026), Baumann et al. (2026), and Moodley (2026) posit that bull regimes are characterised by stable and positive returns, while bear regimes reflect heightened uncertainty and market

volatility.

Inflation growth rate was found to exert a significant negative effect on Brazil, India, and South Africa during bull market conditions, implying that rising consumer prices reduce property investment attractiveness and purchasing power. These findings are supported by Apergis (2003) and Wahab et al. (2017), who report that inflation negatively affects real estate performance through increased financing costs and reduced affordability. However, during bear regimes, inflation only significantly affected India, suggesting that inflationary pressures become less dominant relative to broader market uncertainty during downturns.

Gross domestic product growth rate exhibited a negative significant effect on Russia and China during bull regimes, while positive effects emerged for Brazil and South Africa in bear regimes. This suggests that economic growth does not uniformly translate into stronger property returns across BRICS markets due to structural and institutional differences. The findings align with Yunus (2012), who argues that macroeconomic growth influences property markets differently across countries, depending on market maturity and financial integration.

Interest growth rates negatively affected South Africa during bull regimes and positively influenced Brazil during bear regimes. This reflects the sensitivity of property markets to monetary policy adjustments and borrowing costs, supporting Bernanke and Gertler's (1995) credit channel theory. Furthermore, geopolitical risk negatively affected Brazil in the bull regime but positively affected Brazil during the bear regime, illustrating that geopolitical uncertainty amplifies market instability and investor risk aversion.

The transition probability results further showed that bear regimes dominate most BRICS property markets, with Brazil exhibiting a bear regime persistence probability of 0.982965 and a duration of approximately 58.7 months. These findings imply that negative market conditions are more persistent than positive regimes within emerging property markets. Overall, the results demonstrate that macroeconomic variables and geopolitical risk affect BRICS's property markets asymmetrically, reinforcing the importance of regime-sensitive investment and policy strategies.

CONCLUSION

This study examined the effect of macroeconomic variables and geopolitical risk on BRICS property market returns under bull and bear market conditions using a Markov regime-switching framework. The findings reveal that macroeconomic fundamentals exert asymmetric and state-dependent effects on property market returns, implying that the influence of inflation growth rate, gross domestic product growth rate, interest growth rates, and geopolitical risk varies significantly across market regimes. The results further demonstrate that bear market conditions dominate most BRICS property markets, indicating that negative return phases are more persistent than positive market periods.

The empirical findings show that inflation growth rate significantly reduced property market returns in Brazil, India, and South Africa during bull regimes, while its influence weakened during bear regimes. This suggests that rising inflationary pressures diminish property market performance, primarily during expansionary market conditions through declining purchasing power and higher financing costs. Gross domestic product growth produced mixed effects across BRICS economies, illustrating structural heterogeneity in property market responses to economic growth. Interest growth rate movements were also found to exert regime-dependent effects, particularly in South Africa and Brazil, reflecting the sensitivity of property investments to borrowing costs and monetary policy adjustments. In addition, geopolitical risk contributed significantly to property market instability in certain regimes, confirming that uncertainty and political tensions remain important determinants of emerging market property returns.

The transition probability results provide important insights into the persistence of market conditions. Brazil recorded the highest bear regime persistence probability of 0.982965, with an expected duration of approximately 58.7 months, while China's bear regime duration was estimated at 41 months. Similarly, Russia and India exhibited bear regime durations exceeding 19 months. In contrast, South Africa demonstrated relatively stronger persistence in bull market conditions, with a bull regime probability of 0.901428 and an expected duration of approximately 10 months. These findings collectively suggest that downturns in BRICS's property markets tend to persist for prolonged periods, increasing systemic risk exposure for investors and policymakers.

The study presents several important policy implications. Firstly, monetary authorities should account for regime-specific market behaviour when implementing interest rate and inflation-targeting policies. The results indicate that contractionary monetary policy during already fragile market conditions may intensify property market downturns and prolong bearish cycles. Consequently, policymakers should adopt more flexible and countercyclical monetary policy frameworks capable of stabilising property market volatility during periods of economic stress. Secondly, financial regulators should strengthen macroprudential surveillance mechanisms to monitor persistent bearish market conditions and systemic

risks within the property sector. The prolonged duration of bear regimes identified in the study highlights the importance of early-warning systems and stress-testing frameworks to mitigate contagion risks within financial and real estate markets.

Thirdly, institutional and portfolio investors should incorporate regime-dependent risk assessment into investment strategies and portfolio allocation decisions. The findings demonstrate that macroeconomic shocks affect property markets differently across market states, implying that static investment strategies may produce suboptimal outcomes during volatile periods. Investors should therefore adopt dynamic portfolio rebalancing strategies and diversify across asset classes to reduce exposure to prolonged bearish market conditions. Finally, the study contributes to the broader emerging market property literature by shifting the focus from conventional linear modelling approaches toward nonlinear and asymmetric market dynamics. This provides deeper insights into how macroeconomic uncertainty and geopolitical tensions influence property market behaviour across different economic conditions.

Despite the important contributions of the study, several limitations should be acknowledged. Firstly, the study focused on a limited set of macroeconomic variables, namely inflation, GDP growth, and interest rates, due primarily to data availability constraints across BRICS economies. Other important determinants, such as unemployment rates, exchange rates, credit growth, housing supply indicators, and investor sentiment measures, were not incorporated into the analysis. The exclusion of these variables may limit the comprehensiveness of the estimated relationships.

Secondly, the study relied on aggregate national residential property indices, which may mask important regional or sectoral differences within individual property markets. Property market dynamics may vary substantially across commercial, industrial, and residential sectors as well as across urban and rural regions. Future studies may therefore improve the analysis by employing disaggregated property market data at sectoral or metropolitan levels.

Thirdly, although the Markov regime-switching framework effectively captures nonlinear regime changes, it does not explicitly model volatility clustering and time-varying conditional variance, which are common characteristics of financial and property market returns. Future research may therefore extend the analysis using Markov-switching GARCH or stochastic volatility models to jointly capture regime changes and volatility persistence.

Finally, the sample period includes major structural events such as the COVID-19 pandemic, geopolitical conflicts, and monetary tightening cycles, which may have introduced structural breaks into the data. Although the regime-switching framework partially captures these shifts, future studies should formally incorporate structural break tests and crisis-specific dummy variables to improve model robustness and empirical precision.

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