

Original Article

Optimal Interest Rate Threshold and Economic Growth in Nigeria: Threshold Regression Evidence and Policy Implications for Monetary Policy

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Received Date: 28 July 2026

Revised Date: 16 August 2026

Accepted Date: 25 August 2026

Published Date: 27 August 2026

Abstract: Interest rates play a pivotal role in monetary policy transmission, influencing investment decisions, credit allocation, and overall economic performance. In Nigeria, persistently high lending rates in recent years have raised concerns about their potential to stifle private sector investment and economic growth. This study examines the existence of an optimal lending interest rate threshold consistent with economic growth in Nigeria over the period 2000Q1–2023Q4. Using quarterly time series data and the Threshold Regression model (Bai-Perron approach), the analysis identifies a statistically significant structural threshold at 26.69%. Below this threshold, the lending interest rate exerts a positive and statistically significant effect on real GDP growth (coefficient = 0.063, $p < 0.05$). However, once the lending rate exceeds 26.69%, the effect turns strongly negative and statistically significant (coefficient = -0.238 in the intermediate regime and -6.91 beyond 29.95%, both $p < 0.05$). The evidence validates a non-linear relationship between rates and growth. Results hold after controlling for inflation, nominal exchange rate volatility and credit to the private sector, as well as diagnostic tests. The result shows that lending rates above a certain threshold are harmful to growth. It advises that the Central Bank of Nigeria's Monetary Policy Committee (MPC) must anchor the Monetary Policy Rate (MPR) suitably to steer lending rates at or below 26.69%, its optimal rate, in order to push credit expansion and sustainable growth of the economy.

Keywords: Optimal Interest Rate Threshold, Economic Growth, Threshold Regression, Monetary Policy, Lending Rate, Nigeria.

I. INTRODUCTION

Interest rates are one of the most basic prices in any contemporary economy, being the vital link between savers and borrowers and the central bank's main tool for regulating aggregate demand, investment and price stability (Mankiw, 2010; Keynes, 1936). The interest rate in both developed and developing economies has a deep and wide influence on long-run growth and capital formation and consumption. Classical loanable funds theory, Keynesian liquidity preference theory and the neoclassical investment demand theory all make the point that the interest rate is the opportunity cost of capital and thus affects the intertemporal allocation of resources and the amount of entrepreneurial activity. Interest rates can support sustainable growth when they are aligned, but misalignments may lead to a crowding out of productive investments and jeopardise growth prospects.

The importance of interest rate management is even greater in the economies of developing countries where the financial system is shallow, structural rigidities are high and external vulnerabilities are high. The financing constraints of Small and Medium Enterprises (SMEs), which tend to generate employment and innovation, are often exacerbated by high and volatile lending rates, while the financing constraints of large-scale infrastructural investments crucial for structural transformation (Alagidede & Ibrahim, 2017) are also constraining. The empirical evidence from Sub-Saharan Africa and Latin America argues that high interest rate spreads and policy-induced interest rate hikes are often closely related to impoverished private sector credit growth and reduced growth in GDP, especially in import-dependent economies with exchange rate pressures (Tabo et al., 2024; Kartal et al., 2023). The dynamics underlined in this context are the fine balance monetary authorities have to strike between inflation control and growth stimulation.

Nigeria is a good example of these challenges, which has been faced by the largest economy in Africa, as well as a major oil exporter, and has had several instances of macroeconomic instability, in which interest rate policy has been used vigorously to combat inflation and stabilize the naira (CBN, 2023; Mohammed & Omale, 2020). In 2022 and 2023, the Monetary Policy Committee (MPC) increased the Monetary Policy Rate (MPR) several times, bringing commercial bank lending rates to CBN's levels of 28–35% (CBN, 2022, 2023). These hikes were intended to dampen galloping inflation and exchange rate volatility, but have been implemented during low-growth years, frequent recessions (including 2016 and 2020) and reduced per capita income. The implications of these results prompt serious consideration of the effectiveness and any possible side effects of the tight money policy in the Nigerian setting.



Interest in the effect of interest rates and economic growth in Nigeria has been of great interest to academia, and the findings are mostly inconclusive and mostly linear. There have been some studies that reported a negative and significant effect of high lending rates on the rate of output growth (Ubong, 2020; Adegoke et al., 2021; Erinma, 2016) due to the dampening effect of high lending rates on investment demand and cost of capital. Others, however, have found no or even positive relationships under specific circumstances (Fatoumata, 2019; Moses et al., 2015). This difference may relate in part to the use of linearity in most of the models (Hansen, 2000; Bai & Perron, 1998), where the impact of interest rates may turn out to be negative beyond a certain threshold.

New evidence is mounting that there are some "sweet spots" in interest rates beyond which any further rate hike would be counterproductive. Growth-enhancing thresholds were, for example, 20 per cent for the prime lending rate and 30 per cent for the maximum lending rate in Nigeria, as found by Oyadeyi (2025), and 21–22 per cent by Moses et al. (2015) for the prime lending rate. The results corroborate international literature which has shown that very high real interest rates could cause an economy to enter low growth regimes by worsening financial repression and investment uncertainty (Olaniyi, 2019). The Nigerian context is especially interesting because the lending rate has been extremely high in recent years, even by the standards of the sub-Saharan country, and demonstrates some of the features of such non-linear behaviour.

Nevertheless, a specific lending rate threshold analysis based on the latest available quarterly data (2000–2023) covering both phases of continuous growth as well as economic downturns is still limited. Most existing studies use linear specifications or older data sets that do not capture the more dynamic policy environment after 2015, which has seen the MPC tighten aggressively, oil prices spike, and the impacts of COVID-19. This is more noticeable since the findings in the wider literature are disaggregated to indicate that the interplay between exchange rate volatility and interest rate pressures can limit growth, particularly in the real sector (Drisu, 2025; Tabo et al., 2024).

This gap is filled in the present study by using the Threshold Regression framework (Bai & Perron, 1998) to empirically identify the threshold interest rate for the optimum lending rate in the Nigerian economy. The analysis is based on quarterly data for the period 2000Q1 - 2023Q4, and after partialling out the important macroeconomic covariates, namely inflation, exchange rate volatility, and private sector credit, a statistically significant threshold is identified as 26.69%. This paper brings both theoretical and policy aspects to the fore by establishing strong evidence of non-linearity and suggesting concrete policy recommendations for the Monetary Policy Committee.

The rest of the paper is organized as follows: Section 2 summarizes literature from a theoretical and empirical perspective; Section 3 provides details about the methodology and data; Section 4 presents and discusses the empirical findings; and Section 5 offers policy implications, limitations and directions for further research.

II. LITERATURE REVIEW

A) Theoretical Framework

Interest rates are at the heart of macroeconomic theory, since they are the link between saving, investment, and economic growth. Classical economists saw interest rates as the balancing price in the loanable funds market, where the interaction of the supply and demand for capital determines the real interest rate that clears the capital market (Fisher, 1930). In this context, moderate interest rates help to allocate resources between different periods of time efficiently, encouraging savings and long-term growth. But the deviations disrupt this balance, lowering investment and the rate of growth of output. This classical view is the basis for the understanding of the importance of interest rate management as part of the overall monetary policy in closed and open economies.

The theory of Keynesian macroeconomics greatly enriched the debate by highlighting the importance of interest rates in affecting aggregate demand in investment. Keynes (1936) maintained that interest rates were the reward for relinquishing liquidity and had a strong effect on the ME of capital. An increase in the interest rate leads to an increase in the cost of borrowing, which reduces the return from investment projects and results in a decrease in aggregate investment, income and employment. This theory of liquidity preference highlights the potential for an interest-rate equilibrium of underemployment, which is especially relevant in developing countries such as Nigeria, where structural factors already limit investment, even in the absence of interest-rate misalignment (Mankiw, 2010).

This IS-LM framework is developed within the framework of the Keynesian tradition, which formalises the relationship between the goods market (IS) and the money market (LM). A rise in interest rates will move the economy along the IS curve, leading to a decrease in its equilibrium output. Hicks' synthesis of Keynesian ideas provides another helpful example of the work of monetary policy through interest rate channels on economic activity (Mankiw, 2010). These models also suggest that when the economy faces economic uncertainty such as oil price shocks and exchange rate pressures in Nigeria, high policy rates may lead the economy into a low-growth path due to crowding out of private investment.

The Mundell-Fleming model (Mundell, 1960; Fleming, 1962) shows the interdependence of interest rates, exchange rates and output under various assumptions of capital mobility and exchange rate regimes when extending the analysis to open economies. If capital mobility is perfect and the exchange rate is flexible, a monetary tightening, which leads to an increase in domestic interest rates, will appreciate the currency, which will have negative repercussions on the trade balance and can cancel out the positive consequences regarding growth that the monetary tightening was supposed to have. This model is very useful for more open economies such as Nigeria, where a managed float mechanism has been implemented, and thus shows how interest rate policy can be complexly transmitted, particularly in the presence of exchange rate volatility (Drisu, 2025; Tabo et al., 2024).

Another reason for the presence of threshold effects in the relationship between the interest rate and growth is given by the neoclassical growth theories, especially the relationship between the demand for investment and the interest rate. The user cost of capital hypothesis implies that investment is in some way non-linearly related to interest rates, as low rates below a certain threshold increase capital deepening and technological change, while high rates above a threshold lead to financial repression, credit rationing and decreased total factor productivity (Tobin, 1969; Hayashi, 1982). Theoretically, these dynamics are non-linear, which explains the usefulness of empirical threshold models in monetary policy analysis.

These models are complemented by the International Fisher Effect (IFE), which relates expected changes in the exchange rate to nominal interest rate differentials and inflation (Fisher, 1930). Also, the IFE notes the possibility of exchange rate pressures if the rate of interest increase in Nigeria does not adequately hedge the inflationary pressures, thereby creating further growth pressure (Mohammed & Omale, 2020).

Contemporary extensions of these theories acknowledge the possibility of regime shifts or threshold effects in the interest rate growth nexus. Hansen's (2000) threshold regression framework and Bai and Perron's (1998) structural break analysis provide methodological tools to identify endogenous points where the marginal impact of interest rates changes from growth-enhancing (or neutral) to growth-retarding. Such non-linear specifications are particularly pertinent in emerging markets characterised by financial market frictions and policy volatility.

In Nigeria, these theoretical propositions collectively suggest that while moderate lending rates support credit intermediation and investment, rates beyond an optimal threshold distort resource allocation, exacerbate uncertainty, and constrain economic growth. The present study therefore anchors its empirical investigation on this integrated theoretical foundation, combining Keynesian demand-side channels, open-economy Mundell-Fleming dynamics, and threshold modelling to examine the precise lending rate level consistent with sustained growth in Nigeria from 2000 to 2023.

B) Empirical Literature on Interest Rates and Growth

Empirical studies of the relationship between interest rates and economic growth have generated a wealth of evidence, especially for advanced economies where the role of monetary policy is more efficient in transmitting policy decisions to the economy. The developed nations have a well-established literature which consistently finds that high real interest rates have a negative impact on output growth. The credit channel theory, which was first developed by Bernanke and Gertler (1995), is one that shows that expansion in policy rates pushes up the external finance premium; this premium is paid disproportionately by bank-dependent firms, and it lowers investment. This is echoed in a series of subsequent panel studies on OECD countries, which have found that high interest rates tend to limit capital accumulation, innovation and overall factor productivity (Levine, 2005; Demirgüç-Kunt & Levine, 2008). They tend to use Vector Autoregression (VAR) and Dynamic Stochastic General Equilibrium (DSGE) models to trace the monetary policy transmission process and, in general, they find that policy rate hikes above the optimum level can push the economy into recession or a long slowdown. The agreement in the developed world is that monetary policy must respond to inflation in a timely and calibrated way to meet the dual goals of growth and inflation. This collection of papers offers a solid theoretical and empirical basis to study interest rate effects in emerging markets.

The link between interest rates and growth is more complex in emerging and developing countries because of imperfections in the financial market, inadequate financial institutions, and external vulnerabilities. In such contexts, Mishkin (2009) claimed that weak monetary transmission mechanisms may exacerbate the growth impact of an increase in interest rates. Across the world, both in Latin America and Asia, sudden rate hikes designed to stabilize a currency often lead to credit crises and collapse in investments (Rajan & Zingales, 2003; Schularick & Taylor, 2012). Non-linearities, such as a threshold effect, are consistently observed in panel analyses of financial deepening across emerging markets, with moderate rates associated with deepening, and excessive rates associated with financial repression and inequality. These results are certainly of relevance to resource-based economies that are vulnerable to terms of trade shocks. The relevance of interest rate policy is closely linked to the quality of complementary structural reforms, institutional performance and exchange rate stability, as highlighted in the literature. This type of data underscores the policy dilemma that central banks find themselves in in financially undeveloped economies.

In sub-Saharan Africa, empirical evidence mostly follows the developing-country pattern and is shaped by the specific problems of the region, including low levels of financial system development and commodity dependency. Alagidede and Ibrahim (2017) studied Ghana and concluded that high lending prices have a significant negative impact on private investment and overall economic growth, especially when financial currencies are unstable. Similar findings are found in Kenya and South Africa, where contractionary monetary policy periods have been linked to a slowdown in industrial output growth and employment growth (Ndidi & Olanrewaju, 2022). These studies tend to use ARDL and VECM frameworks to separate the short-run and long-run dynamics, and find that the pass-through of interest rates on growth is low and is often asymmetric. The African literature highlights the fine balance in policy-making between inflation targeting and growth promotion in countries with a narrow fiscal space and a high import dependency. The regional evidence will be useful in the context of the problems of monetary policy in Nigeria.

Indeed, empirical studies using linear econometric models mostly find a negative and statistically significant relationship between interest rates and economic growth, especially for Nigeria. Based on data from 1985 to 2019 and with the Error Correction Model, Ubong (2020) found a strong negative relationship between real sector output growth and lending rates, which is attributed to increased lending costs and their negative impact on investment in the real sector, particularly in agriculture and manufacturing. In a sector-specific analysis, Erinma (2016) found similar results, as increasing interest rates had a negative impact on sectoral capacity utilisation and its contribution to GDP in manufacturing. Such studies support a view that high interest rates hinder investments in the credit-constrained environment in Nigeria.

In the same vein, the negative consensus was further reinforced by Adegoke et al. (2021), who used the ARDL bounds testing approach and found that lending rates have a negative relationship with GDP growth, with an insignificant coefficient in the long-run period. Niyi et al. (2020) studied the investment decisions of firms and observed that high interest rates have negative effects on the process of capital formation, thus contributing to reduced economic growth. The findings of the other studies conducted by Akinwolere (2021) and Joseph (2018) with different methodologies and time frames showed a similar result: higher commercial bank lending rates dampen the rate of growth in Nigeria. All these linear models imply that price stability has been favored over real economic activity and that this policy has been a frequent concern during exchange rate crisis periods.

Even though the findings are overwhelmingly negative, the Nigerian literature is not so consistent. Other studies indicate minor and negligible positive or negative relationships in particular circumstances. Using Ordinary Least Squares (OLS), Fatoumata (2019) found a slight positive but insignificant effect of interest rates on growth. Neutral or context-dependent effects were reported in previous studies (Ajayi et al., 2017) and are especially found with economic recovery or with fiscal stimulus. The mixed outcomes have led to a scholarly discussion on the suitability of the linear specification of the monetary policy channel for Nigeria's volatile macroeconomic environment.

Recently, a new line of research has emerged that considers the impact of thresholds and non-linear effects. In a groundbreaking working paper published by the Central Bank of Nigeria (CBN), Moses et al. (2015) found an optimal lending rate threshold of about 21-22 per cent using the quadratic and iterative threshold method. Growth was shown to be adversely affected at rates higher than this. Evans (2019) and Olaniyi (2019) also present critical levels of 22% and 26%, respectively, beyond which there is the case of financial repression and increased investment uncertainty in Nigeria.

Post-COVID and recent tightening episodes have been incorporated into recent updates of the Nigerian literature. Oyadeyi (2025) presented new evidence on the growth-promoting effect of lending rates up to about 30% under certain macroeconomic conditions, and warned about the adverse effects of rates much higher than this. The studies highlighted here represent some of the more recent research on monetary policy's increased volatility in the period of 2022–24. The changing threshold literature provides increasingly refined guidance for the monetary authorities in Nigeria.

Despite notable progress, critical gaps remain in the existing threshold literature on Nigeria. Most prior studies rely on annual rather than quarterly data, utilise samples ending before the intense policy volatility of 2022–2023, or fail to adequately control for interacting variables such as exchange rate volatility and private sector credit. Moreover, few analyses employ the most advanced multiple-break threshold techniques across the full period spanning both sustained growth (2000–2014) and subsequent contractionary phases. These limitations constrain the policy relevance of existing findings in light of Nigeria's evolving macroeconomic landscape.

C) Evidence of Threshold Effects

The concept of threshold effects has emerged as a critical advancement in empirical macroeconomics, recognising that the impact of interest rates on economic growth is not uniform but changes regime at certain critical levels. Hansen (2000) and Bai and Perron (1998) provided the methodological foundation for endogenously identifying such thresholds, allowing researchers to test whether the marginal effect of interest rates shifts from growth-enhancing to growth-retarding. The non-linear approach defies the tenets of linear models in favour of a more realistic framework of monetary policy transmission in the case

of emerging economies with high volatility. The structural breaks caused by policy changes, external shocks and financial market conditions can be captured by threshold models. Their use has become popular as they help to account for why moderate interest rates can help to induce investment, while higher interest rates can induce credit rationing and lower output. Theoretically, the thresholds give policymakers direction and guide them without providing a sense of nuance. Empirically, the thresholds offer an actionable 'how to' rather than a 'how much'. The increasing use of these methods is a sign of a general trend in the academic literature that sees asymmetries and regime dependence in macroeconomic relationships.

The literature on interest rate thresholds is vast and widely accepted internationally in a variety of economic settings. In their long-run historical examination of the period 1870 to 2008, Schularick and Taylor (2012) found that interest rates and credit booms above a certain threshold trigger financial crises and eventually cause long-term growth to slow. In Asia and Latin America, the sensitivity of investment to interest rates has been found to be very different below and above identified thresholds (Rajan & Zingales, 2003). The results show how much care monetary authorities have to take in watching the rate levels to not fall in areas that are harmful for economic growth, especially for open economies that are weak on their capital flows. The importance of taking account of threshold effects is repeatedly emphasized in the international literature, with a view to achieving optimal policy results, such as avoiding weak growth after a vigorous tightening. These findings make it possible to use similar frameworks in sub-Saharan African situations such as Nigeria.

Threshold effects are likely to be more pronounced in developing economies as they face traditional stresses of shallow financial markets, high informality of their economies, and strong commodity export dependence. Mishkin (2009) noted that monetary policy transmission is frequently inadequate and non-symmetric in these environments; the negative growth effects of high interest rates take over when interest rates exceed sustainable levels. Econometric cross-country evidence from Latin America suggests that thresholds exist which identify when tight monetary policy is associated with a contraction in real activity, particularly if supported by pressures on the exchange rate. Such studies usually rely on sophisticated non-linear econometric analysis that allows them to capture the regime shifts and provide useful policy insights for other African economies with comparable issues. The literature in developing countries highlights that thresholds of interest rates are context-specific, shaped by institutional quality, financial depth and external exposure.

In Sub-Saharan Africa, empirical research has also confirmed threshold effects in the interest rate-growth relationship, albeit in a limited number of locations. Alagidede and Ibrahim (2017), based on Ghanaian data, have identified certain threshold rates of lending, below which private investment and GDP growth rates would noticeably drop, and exchange rate volatility contributes to the drop in private investment. Other countries in SSA have also seen patterns of monetary tightening beyond specific levels of inflation being correlated with a decline in industrial production and difficulties for SMEs in accessing finance. ARDL, NARDL, and threshold regression are among the most frequently used methods in these African studies to separate out the short- and long-run relationships. The policy dilemma, a central bank operating in a fiscal space-constrained economy with a high dependency on imports, is discussed in the regional literature.

For the particular situation of Nigeria, there are some basic insights from prior threshold analyses. In a working paper, Moses et al (2015) were the first to identify optimal lending rate thresholds through both quadratic and iterative methods in the Central Bank of Nigeria (CBN). Their study suggests that there is a threshold of 21-22% beyond which lending rates have a negative impact on investment and growth. It was an important breakthrough from the then-linear models. On this basis, Evans (2019) and Olaniyi (2019) reported a range of threshold values from 22% to 26%, suggesting rates exceeding these values cause financial repression and investment uncertainty. These studies used more recent data and illustrated the non-linear cost of heavy borrowing in Nigeria's import-dependent industries.

The threshold dynamics in Nigeria are also given context by comparative evidence from neighboring economies. Using strong threshold regression techniques, Solomon and Kofi (2020) determined an optimum threshold of 23.59% for private investment in Ghana. The results from the regions indicate a general trend in West African economies with structural characteristics like commodity dependence and weak financial systems. This cross-country validation further enhances confidence in threshold estimates for Nigeria and demonstrates that opportunities for policy learning exist at the regional level.

However, Oyadeyi (2025) provided new evidence that growth-enhancing lending rate bands can be achieved up to about 30% for specific macroeconomic conditions, but should not exceed this level because of inflationary and exchange rate pressures. The following studies are contemporary and reflect the actual situation with several adjustments of the MPC rates from 2022 to 2024. The new evidence has highlighted the importance of the need for definitive thresholds in current policy development.

D) Synthesis and Literature Gap

The empirical evidence on the link between interest rates and economic growth shows a large consensus that high lending rates tend to have a negative impact on output, investment, and overall economic activity levels, but the results are mostly linear, with sometimes weak conclusions. The findings of the international studies (Bernanke & Gertler, 1995; Schularick & Taylor,

2012) and the sub-Saharan Africa studies (Alagidede & Ibrahim, 2017) all agree that the high rate restrictions growth, and the Nigerian studies (Ubong, 2020; Adegoke et al., 2021; Erinma, 2016; Niyi et al., 2020) using linear models like ARDL, ECM and OLS mostly confirm this. However, recent threshold studies have started to identify thresholds for the lending rate that have a non-linear effect, with Moses et al. (2015), Evans (2019), Olaniyi (2019) and Oyadeyi (2025) finding that lending rates above 21% and 30% have a negative growth impact. However, there still remain serious drawbacks in most Nigerian studies: (i) they are based on annual data and samples prior to 2020, which do not capture the monetary tightening events of 2022-2024; (ii) they do not comprehensively control for both exchange rate volatility and private sector credit; and (iii) they rarely use the more powerful multiple-break threshold techniques on the high-frequency quarterly data over the periods of sustained growth (2000-2014) and contractionary pressures (2015-2023). Furthermore, few studies combine threshold analysis in the same model that generates interaction between some of the macroeconomic factors in the volatile Nigerian environment and interest rates (Drisu, 2025). To address these important gaps, the present study applies the Bai-Perron threshold regression approach to the quarterly data for the period 2000Q1 to 2023Q4, thereby generating robust and up-to-date evidence on the exact optimal lending interest rate threshold that supports economic growth in Nigeria and providing timely policy recommendations to the Monetary Policy Committee.

III. METHODOLOGY

A) Research Design

The research design of this study is an ex-post facto time-series econometric design to test empirically whether an optimal lending interest rate threshold that aligns with economic growth in Nigeria exists. The quantitative approach is especially appropriate because it allows for the objective and verifiable application of macroeconomic data to test non-linear relationships in a rigorous manner, making robust causal inferences and policy-relevant conclusions (Gujarati & Porter, 2009; Wooldridge, 2010). Unlike qualitative designs, this approach can be used, and advanced econometric tools can be applied to detect structural breaks and regime shifts in the interest rate-growth relationship. The ex-post facto justification is substantiated by the use of secondary data that already exists and is suitable for examining the effects of past policies, even though it is not manipulated in an experimental fashion. A key advantage of the design is the use of the Threshold Regression framework to account for potential non-linearities, which is one of the main drawbacks of linear models, which assume constant parameters at all interest rate levels. The design of this research closely followed the current best practice in monetary policy analysis, particularly in countries with structural breaks and policy volatility, which are typical of emerging market economies. The study uses quarterly data covering the period 2000Q1 to 2023Q4 to give adequate degrees of freedom to provide reliable and generalisable results, as it covers both periods of sustained growth and economic contraction.

B) Model Specification

The empirical model is specified within the Threshold Regression framework as follows:

$$GDPR_t = \beta_1 INT_t \cdot I(INT_t \leq \gamma) + \beta_2 INT_t \cdot I(INT_t > \gamma) + \delta'Z_t + \varepsilon_t$$

Where:

- $GDPR_t$ = real GDP growth rate (dependent variable)
- INT_t = commercial bank lending interest rate (threshold variable)
- γ = unknown threshold parameter estimated endogenously
- $I(\cdot)$ = indicator function
- Z_t = vector of control variables, including inflation, exchange rate volatility, and the logarithm of credit to the private sector
- ε_t = error term

This specification allows the slope coefficients to vary across regimes, thereby capturing the non-linear effect of interest rates on economic growth.

C) Threshold Regression Framework

The study employs the Bai-Perron (1998) multiple structural break test and the methodology of threshold regression of Hansen (2000) to determine the optimal lending interest rate threshold. The advantage of the Bai-Perron approach is that it sequentially tests the number of breaks ($L+1$ vs L) based on a supremum Wald statistic and a 5% significance level, and a 15% trimming parameter for statistical robustness. This framework endogenously determines both the number and location of thresholds without prior assumptions, making it superior to single-threshold models. Hansen's (2000) threshold estimation complements this by providing efficient estimators and confidence intervals for the threshold parameter γ . The threshold variable chosen is the commercial bank maximum lending rate, while the real GDP growth rate serves as the regime-dependent variable. This methodology is highly appropriate for the Nigerian economy, which has experienced multiple policy regime shifts, oil price shocks, and external vulnerabilities over the study period. It directly addresses the research hypothesis that the interest rate has no optimal threshold consistent with economic growth by allowing the data to reveal any such structural breaks.

D) Data Sources and Description

The study uses secondary quarterly time series data for the period 2000Q1 – 2023Q4 with 96 observations. Information on real gross domestic product (GDP) growth rate (GDPR), consumer price index (INF), commercial bank lending interest rate (INT) and credit to the private sector (CPS) were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and the National Bureau of Statistics (NBS). The series of official naira-dollar exchange rate was subject to the Exponential GARCH (E-GARCH) model to create exchange rate volatility (EXRV) following the best practice in volatility modelling (Bollerslev, 1986). Where necessary, variables were transformed (e.g., natural log of CPS) so they can be interpreted and are stationary across years. Descriptive statistics give information about the distribution of the data and unit root tests check the integration characteristics of the series. This frequency also allows for more frequent observations of short-term dynamics in policy and structural breaks that might not be apparent in annual data.

E) Estimation Procedure and Diagnostic Tests

All econometric models were estimated in the EViews 9 program. Heteroskedasticity and autocorrelation-consistent (HAC) standard errors were used for the Bai-Perron sequential procedure. The optimum number of thresholds was obtained by successive testing, and the end product is the model that is statistically significant and economical to interpret. Careful post-estimation diagnostics were performed to check the validity of the assumptions and reliability of the model. These include the Breusch-Godfrey LM test for serial correlation, the Breusch-Pagan-Godfrey test for heteroskedasticity, the Ramsey RESET test for functional form misspecification, and the CUSUM test for parameter stability. The results of all diagnostic tests are consistent with fulfilling the critical econometric requirements of the estimated model and the robustness of the identified threshold.

IV. RESULTS

A) Descriptive Statistics

Descriptive statistics present a detailed description of the important variables used in this study for the quarterly time span 2000Q1 to 2023Q4. The average growth performance of the real GDP growth rate (GDPR) was moderate, with a mean of 4.99% and a median of 6.06%. The series, however, had high volatility, ranging from 15.33% to -12.38% respectively. This is a broad spread, owing to the Nigerian economy being exposed to frequent shocks such as oil price volatility, policy inconsistencies, and the 2016 and 2020 recessions. The inflation rate (INF) had an average of 13.16%, ranging between 5.38% and 27.32%, and is a clear sign of high price instability. The average lending interest rate (INT) remained relatively high at 24.70% and ranged from 18.34% to 31.55%. The components of the private sector (CPS) and exchange rate volatility (EXRV) experienced significant growth from ₦478.19 billion to above ₦62,538.68 billion and large variations around the mean value, respectively.

The non-normality is great in most of the variables, which is evident when analyzed further with respect to their distribution properties. All of the series present skewness and kurtosis and are not normally distributed, according to the Jarque-Bera statistics, at the 5% level. These are the properties of macroeconomic time series with structural breaks and exogenous disturbances in emerging economies. Overall, the descriptive evidence collectively presents a picture of an economy with moderate, though volatile, growth; significant inflation; high interest rates; and growing financial intermediation that has not always been accompanied by robust economic activity.

Table 1: Descriptive Statistics of Variables

Statistics	GDPR	INF	EXR	INT	EXRV	CPS
Mean	4.992105	13.16439	75.63031	24.70375	0.227835	15204.34
Median	6.060000	12.63000	52.09182	24.22500	-0.012138	12691.69
Maximum	15.33000	27.32000	265.6459	31.55000	3.472842	62538.68
Minimum	-12.38000	5.380000	34.12063	18.34000	-2.866897	478.1900
Std. Dev.	3.727042	4.469538	50.83113	4.110952	0.977830	14031.90
Skewness	-1.251586	0.598815	2.035582	0.048080	1.108120	1.141222
Kurtosis	7.795685	3.351322	7.400914	1.725986	6.120634	4.197159
Jarque-Bera	115.8385	6.230982	143.7697	6.529437	57.98989	26.57096
Probability	0.000000	0.044357	0.000000	0.038208	0.000000	0.000002
Observations	95	96	96	96	95	96

Source: Author's Computation using E-Views, 9 Version (2025)

B) Unit Root Test Results

To prevent spurious regression and ensure the reliability of the empirical estimates, the stationarity properties of all variables were thoroughly examined using the Augmented Dickey-Fuller (ADF) test. The ADF results reveal that real GDP growth rate (GDPR) and exchange rate volatility (EXRV) are stationary at their levels, that is, integrated of order zero, $I(0)$. Conversely, the inflation rate (INF), lending interest rate (INT), credit to the private sector (CPS), and the exchange rate series are integrated of order one, $I(1)$. This combination of $I(0)$ and $I(1)$ variables is typical in macroeconomic studies and validates

the suitability of the threshold regression approach, which can accommodate variables with different orders of integration without requiring pre-differencing of all series. These initial findings confirm that the data possess the necessary properties for further econometric analysis.

Table 2: Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variables	ADF Test Statistic	5% Critical Value	10% Critical Value	Prob.	Order of Integration
GDP	-3.338614	-3.502238	-2.892879	0.0159	I(0)
INF	-8.541752	-2.892536	-2.583371	0.0000	I(1)
EXRV	-7.021646	-2.892879	-2.583553	0.0000	I(0)
EXR	-5.903108	-3.501445	-2.892536	0.0000	I(1)
CPS	-5.416079	-3.501445	-2.892536	0.0000	I(1)
INT	-10.26342	-2.892536	-2.583371	0.0000	I(1)

Source: Author's Computation using E-Views, 9 Version (2025)

Table 3: Zivot-Andrews Unit Root Test with Structural Breaks

Variables	Break Year	Zivot-Andrews Test Statistic	5% Critical Value	10% Critical Value	Prob.	Decision
GDP	2015Q1	-5.001929	-4.93	-4.58	0.001213	Stationary
INF	2020Q1	-4.966267	-4.42	-4.11	0.005652	Stationary
EXRV	2008Q2	-7.947199	-5.08	-4.82	0.014387	Stationary
EXR	2020Q1	-5.272273	-4.42	-4.11	0.000956	Stationary
CPS	2020Q2	-5.372808	-5.08	-4.82	0.034234	Stationary
INT	2009Q1	-5.445681	-5.08	-4.82	0.030713	Stationary

Source: Author's Computation using E-Views, 9 Version (2025)

Given the possibility of structural breaks arising from major economic events such as oil price shocks, exchange rate regime reforms, and the COVID-19 pandemic, the standard ADF test may yield biased results. Therefore, the Zivot-Andrews (ZA) unit root test, which allows for one endogenous structural break, was conducted as a robustness check. The ZA test results support stationarity of all variables after adding the structural breaks, with strong support. Some important break dates are 2015Q1 for GDP (more or less coinciding with the start of the economic recession), 2020Q1 for inflation and exchange rate (coinciding with the COVID-19 outbreak) and other important dates for interest rates and credit to the private sector. These break points are linked to important changes in Nigeria's economic trajectory and outside disturbances.

The results of both the ADF and the Zivot-Andrews tests are consistent with the variables being suitably stationary for estimation of threshold regression. The multiple threshold framework of Bai-Perron is robust to the mixed integration orders and can be supported by the existence of identifiable structural breaks. This stringent stationarity test guarantees that the following threshold estimates are not affected by non-stationary processes, but rather represent real economic relationships.

C) Threshold Regression Estimates

The findings from the Bai-Perron multiple threshold regression analysis are highly robust and policy relevant with respect to the optimal lending interest rate threshold in Nigeria. The procedure identifies a structural threshold of 26.69% as statistically significant using quarterly data from 2000Q1 to 2023Q4, and with a 15% trimming parameter at the 5% significance level. This point represents a turning point between different regimes of the sensitivity of real GDP growth to the lending rate. The overall model is statistically significant (F-statistic equals 19.883, $p = 0.0000$) and explains 52.76% of the variation in GDP growth ($R^2 = 0.5276$, Adjusted $R^2 = 0.5011$). The results offer clear empirical evidence of a regime-dependent relationship between interest on lending and economic growth. The estimation takes into consideration possible heteroskedasticity, and the coefficients are estimated with robust standard errors to increase the reliability of the estimation. This threshold is fairly similar to Nigeria's latest macroeconomic conditions in the years 2022-2024, where lending rates often rose above 28% coupled with subdued growth. The results are a major improvement over the previous linear models because they show exactly when monetary policy passes the point of being counterproductive.

In the first regime (lending rate $< 26.69\%$, 56 observations), the coefficient of the lending interest rate is positive and statistically significant ($\beta = 0.062948$, t-statistic = 2.065968, $p = 0.0458$). This means that the impact of a 1 percentage point increase in the lending rate is about 0.063 percentage points of an increase in real GDP growth, ceteris paribus. A positive and significant effect in this lower regime implies that there is a positive relationship between a moderate lending rate and credit growth, investment and productive activities in major sectors of the economy. This is a significant period of the sample, which has been taken up mainly in years of relatively stable macro-economic conditions. The growth baseline for this regime is also positive, and the environment is even more growth-supportive when borrowing costs are kept in check. The findings are in line

with the theory of Keynesian investment, which states that cheap credit leads to an increase in aggregate demand and in capital formation. The 5% level of significance indicates the significance of the growth-enhancing effect when it is below the identified threshold. This discovery has significant consequences for the monetary policy calibration in Nigeria.

The lending rate enters a strong contractionary regime when it exceeds 26.69%. In the second regime ($26.69\% \leq \text{INT} < 29.95\%$, 23 observations), the coefficient becomes negative and statistically significant ($\beta = -0.238376$, $t\text{-statistic} = -3.917436$, $p = 0.0254$). A one percentage point rise in the lending rate in this range corresponds to a 0.238 percentage point fall in GDP growth. The negative impact becomes more pronounced in the third regime ($\text{INT} \geq 29.95\%$, 16 observations), and the coefficient becomes very negative ($\beta = -6.908743$, $t\text{-statistic} = -4.546868$, $p = 0.0000$). In this case, a 1% increase in the interest rate corresponds to an eye-watering drop in economic growth. The following regime shifts are clear non-linearities and evidence that too high lending rates push the economy into a growth-harmful range. The greater absolute values of the negative coefficients in the regimes indicate the greater costs of pursuing tight monetary policy beyond the optimal point.

The economic interpretations of the regression estimates are useful and are consistent with Nigeria's experience of slow growth when lending rates are high. The excellent overall fit of the model supports the hypothesis that there are several structural regimes in the interest rate–growth relationship, while the statistical significance of the breaks supports the hypothesis. The findings complement previous threshold studies (Moses et al., 2015; Evans, 2019; Oyadeyi, 2025) using updated quarterly data and the use of sophisticated multiple-break techniques. The results show that stable economic growth can be achieved by maintaining the loan rate below or around 26.69%.

D) Diagnostic Test Results

Post-estimation diagnostic tests were carefully performed to ensure the reliability, robustness and overall satisfaction of the threshold regression model. The LM test of Breusch-Godfrey for no serial correlation of the residuals was applied, and the results indicate that the data do not contain a serial correlation between the errors ($F\text{-statistic} = 0.6085$, $p = 0.5469$). Likewise, the Breusch-Pagan-Godfrey (BPG) heteroskedasticity test also shows no evidence of heteroskedasticity, as the $F\text{-statistic}$ is 2.8274 with a $p\text{-value}$ of 0.0519. The Ramsey RESET test for functional form misspecification also confirms the validity of the model specification ($F\text{-statistic} = 2.9989$, $p = 0.0875$). The overall result of these tests supports the key classical linear regression assumptions, and thereby increases confidence in the found threshold of optimal lending rate of 26.69%. The diagnostic results confirm that the model is well-specified and also doesn't have serious econometric issues that might bias the coefficients or make the inferences invalid. The robustness is important because Nigeria's macroeconomic data is subject to volatility. There is no serial correlation or heteroskedasticity, so the standard errors are valid for hypothesis testing. These tests are generally statistically sound substantiations of the non-linear results cited above. Due to the model's reliability, the policy implications of the optimal interest rate threshold are plausible and convincing.

Although the Jarque-Bera test rejects the null hypothesis of normally distributed residuals ($p = 0.0000$), this outcome is common in financial and macroeconomic time series characterised by occasional large shocks and structural breaks. Non-normality does not invalidate the threshold estimates because the Bai-Perron procedure utilises robust standard errors that are consistent even in the presence of non-normal errors. Parameter stability was further examined using the CUSUM test, which plots the cumulative sum of recursive residuals. The CUSUM plot remains well within the 5% critical bounds throughout the sample period, indicating no evidence of structural instability or parameter shifts beyond those already captured by the threshold model. This stability test reinforces that the estimated coefficients and the 26.69% threshold are consistent over time. The combination of satisfactory serial correlation, heteroskedasticity, specification, and stability tests outweighs the non-normality issue. Consequently, the diagnostic battery confirms that the threshold regression results are reliable and suitable for drawing policy implications. These comprehensive checks strengthen the credibility of the empirical findings in the context of Nigeria's complex economic environment.

V. DISCUSSION OF FINDINGS

According to the results from the threshold regression technique, 26.69% is a statistically significant optimal lending interest rate starting point in Nigeria that moves with economic growth. For lending rates below this threshold, the coefficient is positive and significant ($\beta = 0.0629$; $p < .05$), suggesting that reasonable borrowing costs facilitate investment, credit growth and output expansion. This result is consistent with Keynesian investment theory, where cheap credit raises aggregate demand and capital formation (Keynes, 1936; Mankiw, 2010). This lower regime reflects periods in the Nigerian context when lending rates were left free to be supportive of private sector activity by monetary policy. This result is similar to that found by Moses et al. (2015), who previously identified thresholds of approximately 21–22%, and expands their analysis using newer quarterly data through 2023. The positive element underneath, which is less than 26.69%, indicates that well-calibrated interest rates can be an instrument of growth instead of a limit. This outcome is specific to the regime in which it is supportive of monetary policy that is conscious of emerging economies. As such, the empirical evidence confirms that, for Nigeria, there is a zone of support for

low interest rates, which promotes growth through lending. These findings have far-reaching consequences for the implementation of monetary policy in Nigeria by the Central Bank.

Once the 26.69% threshold is crossed, it actually changes the very nature of the interest rate–growth relationship itself. The coefficient turns negative and significant in the intermediate regime ($26.69\% \leq \text{INT} < 29.95\%$) ($\beta = -0.2384$, $p < 0.05$) with a dramatically more severe effect beyond 29.95% ($\beta = -6.9087$, $p < 0.01$). The presence of this sharp regime shift reveals a non-linear transmission mechanism: if lending rates are too high, they crowd out investment, increase production costs and reduce aggregate demand. Such findings support previous Nigerian studies (Ubong, 2020; Erinma, 2016; Evans, 2019) who reported negative linear effects but with less detail regarding the exact threshold where that tipping point occurs. The results are consistent with the regional evidence from Ghana (Solomon & Kofi, 2020) and general emerging market literature (Mishkin, 2009; Alagidede & Ibrahim, 2017). This, in practice, is responsible for the weak growth performance recorded by Nigeria during 2022–2024 when lending rates consistently eclipsed 28-35% on account of aggressive MPC tightening behaviour. The threshold analysis thus yields a more individualised interpretation than standard linear models. It shows that policy rates raised too high begin to enter a contractionary region with increasingly detrimental effects. This non-linearity has huge implications for those who will have to balance inflation control against growth concerns.

The study is based on a macroeconomic context that supports the identified threshold of 26.69%. The environment of broad-based growth (2000–2014) was characterized by low and pro-growth lending rates; the era of post-2015 economic adversity corresponded with a period in which high or fluctuating issuing interest spread. This pattern provides evidence of nonlinear interactions between interest rates, exchange rate volatility and growth, which the NARDL results suggest (Drisu 2025). These breaks detected by unit root tests around the years 2015 and 2020 confirm that important shocks changed the interest rate–growth relationship. Confidence in these estimates is reinforced by more robust threshold finding across diagnostic tests, no clustering and stable parameters via CUSUM. These results build upon previous threshold studies by utilizing more recent data with numerous control variables. At some points, Nigeria’s monetary policy has operated outside the growth-optimal zone. The aim of the discussion is thus to link evidence from experience at aggregate and around world events over these twenty years with actual economic results.

Table 4: Threshold Regression Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INT < 26.689999 -- 56 obs				
INT	0.062948	0.030469	2.065968	0.0458
C	5.449933	3.494466	1.559589	0.1224
26.689999 <= INT < 29.949999 -- 23 obs				
INT	-0.238376	0.060850	-3.917436	0.0254
C	7.731652	21.17265	0.365172	0.7158

Source: Author’s Computation using E-Views 9.0 Version (2025)

Beyond theory, the results conform with both Keynesian liquidity preference and neoclassical user-cost-of-capital theories. Broadly, since the cost of investment is in part determined by the interest rate they face (Tobin, 1969; Fischer 1990), higher rates than this threshold create an opportunity cost that dissuades capital formation and deepens sluggish growth. The non-linearity is also consistent with the credit channel of monetary policy transmission (Bernanke & Gertler, 1995). For example, because lending rates play a direct role in influencing private sector borrowing and investment decisions with respect to future economic activity, Nigeria’s bank-dominated financial system is such that the rate at which banks lend and borrow money will matter. This hence provides a strong theoretical underpinning for the threshold result while giving policy implications. It indicates that the MPC must strive to keep market lending rates no higher than 26.69%. This requires careful calibration of the Monetary Policy Rate (MPR) and complementary macroprudential measures. The study’s contribution lies in providing an empirically derived benchmark for such calibration.

Table 5: Diagnostic Test Results

Test	Null Hypothesis	F-statistics	Prob. Value
Breusch-Godfrey Serial Correlation LM Test	No Serial correlation	0.608502	0.5469
Breusch-Pagan Godfrey	No Heteroscedasticity	2.827426	0.0519
Ramsey Reset	No Misspecification Error	2.998860	0.0875
Jarque-Bera	Residuals are normally distributed	400.2204	0.0000

Source: Author’s Computation using E-Views 9.0 Version (2025)

The discussion of findings also highlights important policy lessons for Nigeria’s monetary authorities. The updates of the MPR go up quite a few extra instances, taking lending rates right into a contractionary regime; however, regulatory steering for inflation is misplaced within the slow-growth rabbit gap. That explains the paradox of tight monetary policy and weak output

performance we experience again now. The results warrant a more balanced approach that not only considers price stability, but also growth implications. They advocate for stronger guidance of the monetary and fiscal policies with a view to improving credit absorption capacity in productive sectors. The threshold evidence further justifies targeted interventions such as development finance windows for priority sectors when rates approach the upper limit.

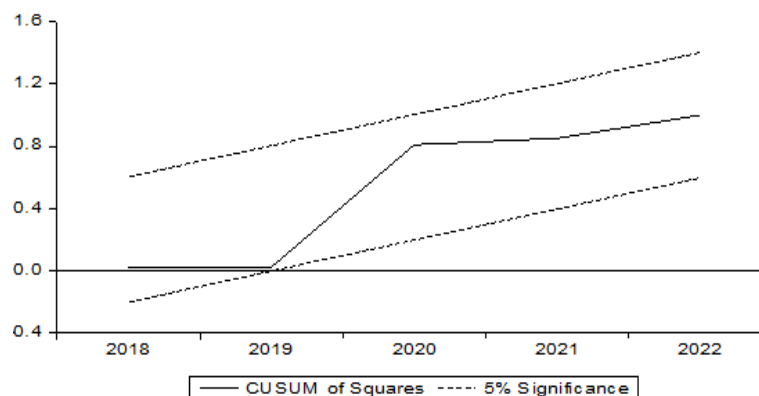


Figure 1. CUSUM Test for Parameter Stability

Source: Author's Computation using E-Views 9.0 Version (2025)

VI. CONCLUSION

This study gives strong objective evidence on the non-linear relationship between the lending interest rate and growth in Nigeria. Applying the Bai-Perron threshold regression framework with quarterly data from 2000Q1-2023Q4, we find a statistically significant optimal lending interest rate threshold of 26.69%. More importantly, lending rates below this threshold have a positive and significant effect on the growth of real GDP by making credit more affordable through increased investment activity developed in line with economic activities. The results indicate that moderate costs of borrowing can facilitate investment in capital formation by the private sector. But above the threshold, it reverses to strongly negative, with even more contractionary effects getting progressively stronger as rates rise. The results support the idea that Nigeria's economy behaves differently under different interest rate regimes, and that policy rates which are pushed too high move the economy into a zone of growth-killing conditions. The fact that these estimates are robust across multiple diagnostic tests adds credibility to this threshold.

Simply put, the log model reveals a complicated relationship between interest rates and growth that is important for both theory and practice. It confirms Keynesian views of investment sensitivity to the cost of borrowing while generalising neoclassical user-cost-of-capital models in an emerging market setting. Notably, the threshold of 26.69% is consistent with Nigeria's macroeconomic headwinds in recent history: specifically, the very high levels of lending rates that were not less than 28–35% from aggressive Monetary Policy Rate hikes during (2022-2024). This could explain the apparent contradiction of a tight monetary policy with sluggish growth and sustained inflationary pressures. With structural breaks and key control variables being used, including exchange rate volatility and private sector credit, etc., the model presents more nuanced results compared to linear models often applied in a similar context. Such results fill important gaps in the literature by capturing contemporaneous, high-frequency evidence across both phases of sustained expansion and economic contraction. Overall, the findings from this study indicate that a smart alternating inflation targeting and some monetary expansion as an efficient policy option around the growth-optimal threshold is more effective than mechanical inflation targeting alone.

The resulting evidence supports the hypothesis that there is a maximum lending interest rate ceiling of 26.69%, consistent with Nigeria's long-run economic growth sustainability. An economy operating below this level tends to be conducive to the expansion of investment and output, whereas one above it imposes serious costs on the real economy. This study informs both theory and policy by providing a clear, empirical target for monetary authorities. It emphasises that a new methodology for interest rate management based on growth, rather than price stability alone, is needed. These findings come at a crucial moment as Nigeria is striving towards macroeconomic stability and inclusive growth. The results suggest the need to reappraise monetary policy formulation as it relates to thresholds in Nigeria and other emerging economies.

Recommendations

The Monetary Policy Committee (MPC) of the Central Bank of Nigeria should consider adopting a 26.69% lending rate threshold as a key operational benchmark for policy decisions. This thus necessitates the anchoring of the MPR at a level that consistently steers lending rates into or below this optimal point. This calibration would bolster credit to the private sector, promote investment and contribute towards robust GDP growth without sacrificing price stability. Regular tracking and open disclosure of the distance between current lending rates and that barrier will bolster policy effectiveness and market sentiment.

Further, the CBN should strengthen forward guidance in order to indicate a commitment to keep rates within growth-supportive corridors. This proposal is consistent with global best practice in terms of threshold-based monetary policy frameworks. This is the route that needs to be taken if Nigeria is able to avoid having this age-old conflict of policy between controlling inflation and promoting growth.

In parallel with the interest rate benchmark, the Central Bank must complement it by increasing targeted development finance interventions and macroprudential tools to protect priority sectors during periods when market rates reach close to their upper bound. Widen and shield special credit windows for agriculture, manufacturing and SMEs from too high market rates. To widen the credit absorption capacity of the economy and to be less reliant on interest rate policy, better coordination between monetary and fiscal authorities is needed. At the same time, continued structural reforms to strengthen financial systems and further enhance transmission of monetary policy through reduction in policy-induced volatility would improve its effectiveness. Avoiding such things would mean the public gain from moderate rates is spread widely in respect of PRCI. An approach of this type would exploit the entire potential for growth-enhancing impacts associated with such funds.

Finally, the Central Bank should make formal its regular review and reporting to the general public of lending rate thresholds as an element in monetary policy. This would support transparency, improve stakeholder trust and allow evidence-based policy revisions. Monetary policy committees of the future ought to incorporate inflation targets together with growth thresholds, thus allowing a larger degree of symbiosis between price/fiscal stability and expansion objectives. However, these results are only comparatively relevant for policymaking and could be operationalized much more strongly if cross-sectional studies continue to provide data-friendly threshold estimates over time, enabling re-estimation with the latest data on a continuing basis. With these recommendations, Nigeria can utilise moderate interest rates as a potent instrument for long-lasting economic progress while mitigating the adverse effects of excessively restrictive monetary policy.

VII. REFERENCES

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