

The Asymmetric Pass-Through Effects of Interest Rate and Interest Rate Liberalisation in Nigeria

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Abstract

This study investigates the symmetric and asymmetric effects of interest rate to lending rate in Nigeria prior to and after interest rate liberalisation of 1986 using annual data from 1970 to 2024. By employing a linear ARDL, the study indicates a long-term association and an inadequate pass-through in both the short-term and long-term in Nigeria. The interaction variable between interest policy rate and its liberalisation dummy indicates a receptiveness of lending rate to fluctuations in interest rate. However, the nonlinear ARDL (NARDL) indicate that lending rate reacts more vigorously and quickly to positive interest rate (tightening) than to a negative interest rate (easing), suggesting downward rigidity in lending rate movements. Whilst the amount of the effect increases in the post liberalisation, this asymmetry remains apparent in both pre and post liberalisation periods.

Keywords: ARDL model; nonlinear ARDL model; financial liberalization; interest rate; monetary policy.

JEL Classification Codes: E43, E52, E58, C22, G21.

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1.0 Introduction

Transmission of policy by the central banks via interest rates continues to pose a major challenge in macroeconomic context, especially in developing economies where financial sectors are changing and structural rigidities prevail. The magnitude and pace at which adjustments to policy-regulated rates are transferred to retail banking rates, such as lending and deposit rate, is identified as interest rate pass-through. A quick impact is anticipated in an effective financial sector, thereby allowing central banks to successfully affect inflation, economic growth, and aggregate demand. However, empirical data indicates that pass-through is frequently asymmetric and partial, particularly in developing and emerging economies because of institutional constraints, information asymmetries, and market inefficiencies (Mishkin, 2007; Égert, et al. 2007).

To enhance the efficacy of financial intermediation and strengthen monetary transmission process, financial liberalisation has been widely adopted as a policy framework on a global scale which involves the deregulation of the interest rates, removal of credit limits, and enhanced competitive banking services. According to the interest rate channel theory, adjustments in the policy rate have an impact on market interest rates, which in turn effect the lending and deposit rates across to investment, consumption, and aggregate demand (Mishkin, 2019). The degree and speed of this transmission also known as interest rate pass-through, or IRPT determine how well monetary policy works to achieve stable macroeconomic conditions.

The efficacy of this transmission channel is inextricably related to the structure of periods of financial liberalisation. According to McKinnon (1973) and Shaw (1973) financial repression hypothesis, price signals are distorted and monetary dissemination is weakened by administration-managed interest rates, lending ceilings, and financial market restrictions. Financial liberalisation, on the other hand, is anticipated to boost competition, increase allocative effectiveness, and bolster the sensitivity of banking rates to policy rate changes. Financial liberalisation is typified by interest rate deregulation, the removal of credit constraints. However, the theoretical influence of liberalisation on IRPT is equivocal because it is dependent on the level of market competition and institutional development (Chirwa & Mlachila, 2004).

Pass-through mechanics are influenced by competition in the banking sector. Because of reduced interest margins and restricted pricing power, banks in competitive markets respond quickly and completely to policy rate changes in lending and deposit rates. On the other hand, banks may use market power to smooth interest rate changes in oligopolistic financial markets, leading to slow and incomplete pass-through (Hannan & Berger, 1991). This implies that structural rigidities may limit the efficacy of monetary policy even under a liberalised regime. Furthermore, interest rate rigidity is explained by the menu cost theory. When banks alter interest rates, they incur both administrative and operational expenses, which can result in lagging responses to policy modifications (Mankiw, 1985). These adjustment costs can produce nonlinear reactions and lead to short-run stickiness, especially when banks react differentially to changes in policy rates. The theory of asymmetric price adjustment, which holds that financial institutions may change rates more quickly in one direction than the other, is also empirically supported. It implies that lending rates frequently react swiftly to increases in policy rates than to decreases, demonstrating risk concerns and profit-maximizing practices (Scholnick, 1996). The justification for asymmetric pass-through is additionally strengthened by information asymmetry and market dominance.

Banks with strong market domination could postpone lending rate cuts while quickly increasing them during times of tightening monetary policy, safeguarding profit margins.

In Sub-Saharan Africa, inadequate bank competition, high levels of informality, and underdeveloped financial systems have reduced the efficacy of interest rate pass-through. According to Saxegaard (2006) and Aydin (2007) pass-through in many African economies is frequently slow and insufficient, highlighting inefficiencies in the banking industry and inadequate avenues for transmitting monetary policy. Furthermore, since the 1980s, financial liberalisation reforms have been carried out throughout the region with varying degrees of success. While some nations have seen better financial deepening, others still struggle with enduring structural issues that hinder the effectiveness of their policies.

Addressing the subtleties of pass-through and financial deregulation remains especially intriguing in Nigeria. The Nigerian financial sector was heavily regulated by the government before the Structural Adjustment Programme (SAP) was implemented. This oversight, which included regulated lending policies and controlled interest policy rate, indicates the ability of the interest rate to react to shifts in monetary tools was restricted by these constraints. A major move towards market-driven practices, such as the deregulation of interest rates and the encouragement of competitive banking sector, was signalled by implementation of financial liberalisation under SAP (Sanusi, 2010). The Nigerian banking industry nevertheless demonstrates structural rigidities in spite of these reforms, such as high operating costs, oligopolistic inclinations, and risk-averse lending practices, which could impede efficient interest rate transmission.

It is against this background that this study present a stronger and more policy-relevant of the transmission mechanism based on the persistent evidence of incomplete policy pass-through in Nigeria as demonstrated by Oyadeyi (2022), Oyadeyi (2023), Jibrilla and Balami (2022), Ogundipe and Alege (2013), and Usman (2012). Firstly, this study makes a methodological contribution by using the linear ARDL, which establishes symmetry in adjustment and determines the presence of long-run relationships and average pass-through elasticities. This assumption is limited in the monetary transmission setting, where lending and deposit rates may react variably to policy rate hikes vs cuts depending on menu costs, market power, and banking sector frictions. In addition to testing for cointegration, this study determines if the size, speed, and direction of pass-through vary between tightening and easing by simultaneously applying ARDL and nonlinear ARDL. This approach yields more detailed results than previous Nigerian studies that utilise exclusively on symmetric ARDL or asymmetric cointegration techniques without explicitly addressing dynamic asymmetry across both horizons. Also, its nonlinear extension relaxes this restriction by decomposing explanatory variables into positive and negative partial sums, thereby capturing asymmetries in both the short run and long run. Secondly, the study presents a theoretical perspective on how financial liberalisation influences the pass-through process. Initiated in Nigeria under the SAP in 1986, financial liberalisation changed the banking industry's competitive structure by deregulating interest rates. In theory, IRPT is impacted by liberalisation in a number of ways. It optimises the responsiveness of retail rates to policy signals, lessens interest rate rigidity, and increases competition among financial intermediaries. On the other hand, inadequate liberalisation or flaws in the market could lead to asymmetric reactions, especially if banks raise lending rates more quickly than they lower them in order to protect margins (Hannan & Berger, 1991). Hence, this study analyses the degree to which the slope and asymmetry of pass-through

have evolved in the liberalised regime by explicitly capturing financial liberalisation as both a regime shift and an interaction term with the policy rate. Thirdly, the study offers notable empirical distinctiveness from Nigerian studies that are closely related. For example, Jibrilla and Balami (2022) looked at symmetric and asymmetric cointegration between lending, deposit, and policy rates before and after liberalisation. However, their method viewed liberalisation as a sample split rather than an endogenous modification of the transmission process, and thus, fails to properly represent nonlinear dynamic adjustments within a coherent framework. Similarly, Oyadeyi (2023) discussed the significance of financial development in monetary policy's interest rate channel, using a financial development index to relate policy rates to money market and retail rates. Although instructive, this method does not explicitly reflect asymmetric pass-through dynamics and abstracts from regime-specific structural alterations.

In contrast, this study uses nonlinear ARDL to model the asymmetry while retaining long-run equilibrium via ARDL bounds testing, and takes into account financial liberalisation and its interaction effect that modifies the transmission rather than simply dividing the sample or acting as a control variable. This specification makes it possible to examine whether liberalisation increases, decreases, or redistributes the transmission of policy rate changes in an asymmetrical manner.

Hence, the remainder of this study is structured as follows: section 2 presents the literature review. Section 3 presents the data and methodology. Section 4 presents the empirical results while section 5 presents the conclusion.

2.0 Literature review

The literature on the effect of policy rate indicates a degree of intermixture through different countries, methodologies and financial systems, and variations arise on dimensions such as credit market segmentation, financial development, institutional structures and macroeconomic variables. One strand shows that there are distinctions in the completeness and speed of pass-through across different economies. For instance, Gregor and Melecky (2018) have found a comprehensive pass-through in small and medium enterprise (SME) lending rate in the Czech Republic whereas Maravalle and Pandiella (2022) report a rapid and complete transmission only in short-term lending rates in Mexico but a weak effect in mortgage and automotive credit markets. Likewise, Bennouna (2019) recorded a high level of heterogeneity in credit classifications in Morocco, whereas Doojav and Kalirajan (2016) discovered that pass-through in Mongolia is typically weak, slow and asymmetric. All these studies imply that pass-through effectiveness is context-specific and differs among financial systems and credit sectors.

Another category of studies focuses on the influence of policy rate liberalisation and structural reforms. Li et al. (2021) demonstrate that in China, despite policy rate liberalization, the pass-through is not complete at the retail level and does not have an equal response to asymmetrical effects, with greater response to positive shocks. Conversely, Li and Liu (2019) examines that the speed and completeness of pass-through is improved by policy rate liberalization. On the same note, Ngo et al. (2021) indicate that institutional changes at the State Bank of Vietnam increase the transmission of pass through, but indicates slow adjustment from retail and market rates. These results reveal that interest rate liberalization in itself is incomplete to ensure efficient transmission since it will be influenced by coexisting institutional and structural factors.

The role of financial crises and macro-financial environments is also highlighted in the literature. Hristov et al. (2014) indicate that policy rate in the Euro area are much weaker in the course of Financial Crisis because of heightened financial frictions. Equally, pass-through in Europe in the post-pandemic is slower and heterogeneous as determined by Beyer et al. (2024). Gregor and Melecky, (2021) also demonstrate with the use of a meta-analysis that macro-financial conditions, including stock market development, volatility, and apex bank autonomy, have a systematic influence on pass-through strength, but a general tendency involves weak pass-through subsequent to the financial crisis.

Another aspect of comparison is associated with the structure and competition in the banking sector. Gopalan and Rajan (2017) analyse the presence of foreign banks boosts pass-through in high-participation economies but insignificant impact in low-participation countries. Similarly, Ozdemir and Altinoz (2012) point out that competition in the financial sector is a decisive variable in the pass-through in emerging markets. Also, Maravalle and Pandiella (2022) substantiate that the greater the competition in the financial market, the greater the lending rate, which also reflect the weaker competitive pressures. Another theme is the presence of asymmetry in adjustment of policy rate. Iorngurum (2025) through meta-regression concludes that lending rate respond to an increase more than the decrease in policy interest rates. This is similar to the findings of Li et al. (2021) and Doojav & Kalirajan (2016), who report asymmetric reactions in China and Mongolia, respectively. On the country level, Jibrilla and Balama, (2022) observe positive inflexibility in lending rates and negative rigidity in saving rates in Nigeria which corroborates the adverse customer reaction hypothesis.

De Bondt (2005) demonstrates that whilst the effect is perfect in the short run money market, its partial in the retail banking segment, and that it is adjusting gradually in the long-term. Identically, Ngo et al. (2021) and Li et al. (2021) investigate that policy pass-through as a multi-step process, with inefficiencies tending to occur during the change of market rates to retail rates. Wang (2010) also expanded by showing that financial market integration and unexpected interest policy actions play a important function in both the instability in the short-term and long-term transmission in Asia.

Evidence from Nigeria exhibit weak and incomplete policy pass-through. Oyadeyi (2023) concludes that policy pass-through is not complete but with higher magnitude in the long-term, and Oyadeyi (2022) finds weak transfer of money market rates to retail rates notwithstanding long-run overshooting. Similarly, Jibrilla and Balami (2022), Ogundipe and Alege (2013) and Usman (2012) also record sluggish and incomplete pass-through, which has greater long-run effect.

Thus, the literature indicated that policy rate pass-through is a process of passing of monetary actions, but the degree of its effectiveness in different countries and situations is different. Among the main determinants include the expansion of financial markets, competitiveness of the banking sector, the institutional quality, macroeconomic stability, and the existence of asymmetries. It is also consistently evident that policy effect can be incomplete, slower in the short-run, and prone to structural frictions, especially in emerging and developing economies.

3.0 Data and Methodology

3.1 Data

This study employed yearly timeseries starting from 1970 to 2024. Variables include lending rate (lr_t) which satisfies the private sectors short term and long-run credit demand; interest rate (i_t) indicating the benchmark policy rate for cost of borrowing; inflation rate (inf_t) reflects a yearly discrepancy in the cost of purchasing a basket of goods in Nigeria; the exchange rate (exr_t) which represents the amount of US Dollars expressed in Naira; the money supply (ms_t) is expressed as the amount of liquid instruments held by money financial sectors. The interest rate paid on savings deposits by commercial or equivalent financial institutions is known as the deposit interest rate (dr_t). All variables under this study were obtained from the World Bank.

3.2 Econometric Specification

The baseline model is of policy interest rate pass-through based on the monetary approach, where interest rate anchored by the apex bank is communicated to commercial bank lending rate via the process of financial intermediation. In accordance with the theoretical underpinning of monetary economics (Mishkin, 2019) and empirical specification literature (De Bondt, 2005; Gregor & Melecký, 2018; Jibrilla & Balami, 2022), the model is specified as:

$$LR_t = \alpha_0 + \beta_1 INTR_t + \beta_2 INF_t + \beta_3 LEXR_t + \beta_4 LMS_t + \beta_5 DR_t + u_t \quad (1)$$

where: LR_t = lending rate; $INTR_t$ = interest rate, INF_t = inflation rate, $LEXR_t$ = log of exchange rate, LMS_t = log of money supply, DR_t = deposit rate. $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are coefficients to be estimated. Prior to estimating the ARDL model, the study estimates the ARDL Bounds test to investigate a possible cointegration between the lending rate and interest rate as follows:

$$LR_t = \alpha_0 + \beta_1 INTR_t + \beta_2 INF_t + \beta_3 LEXR_t + \beta_4 LMS_t + \beta_5 DR_t + \beta_6 D_{1986} + \beta_7 (INTR_t \times D_{1986}) + u_t \quad (2)$$

where α_0 is the intercept term; D_{1986} is the structural dummy variable after 1986 Structural Adjustment Programme (SAP). In equation (2) an estimated F-statistics are utilised to evaluate the significance of the long-term cointegration. Hence, the F-statistic which is expressed as the null hypothesis of no cointegrating relationship indicated as: $H_0: \sigma_1 = \sigma_2 = \sigma_3 = \sigma_4 = \sigma_5 = \sigma_6$ alongside the alternate hypothesis of cointegration is shown as: $H_1: \sigma_1 \neq \sigma_2 \neq \sigma_3 \neq \sigma_4 \neq \sigma_5 \neq \sigma_6$. Once cointegration is established using the ARDL model, the ECM is defined as follows:

$$ECT_{t-1} = LR_{t-1} + \beta_1 INTR_{t-1} + \beta_2 INF_{t-1} + \beta_3 LEXR_{t-1} + \beta_4 LMS_{t-1} + \beta_5 DR_{t-1} + \beta_6 D_{1986} + \beta_7 (INTR_{t-1} \times D_{1986}) + u_t \quad (3)$$

Hence, the short-run ARDL model is estimated as defined in equation 4 as follows:

$$\begin{aligned}\Delta LR_t = & \alpha_0 + \sum_{i=1}^p \alpha_i \Delta LR_{t-i} + \sum_{j=0}^{q1} \beta_j \Delta INTR_{t-j} + \sum_{k=0}^{q2} \gamma_k \Delta INF_{t-k} + \sum_{l=0}^{q3} \delta_l \Delta LEXR_{t-l} \\ & + \sum_{m=0}^{q4} \phi_m \Delta LMS_{t-m} + \sum_{n=0}^{q5} \lambda_n DR_{t-n} + \rho_1 D_{1986} + \rho_2 (INTR_t \times D_{1986}) \\ & + \phi ECM_{t-1} + \varepsilon_t\end{aligned}\quad (4)$$

The coefficients in equation 4 are defined in equation 1 and 2 while ϕ is expressed as the speed of adjustment of the ECM_{t-1} indicating the degree of disequilibrium been corrected.

After estimating the linear ARDL model, it is imperative to accommodate for any asymmetries in the IRTP process. The linearity assumption states that lending rates react symmetrically and proportionately to changes in market or policy interest rates. However, in developing financial systems like Nigeria, this assumption is frequently undermined. From the standpoint of macroeconomic and monetary policy, asymmetry results from adjustment costs, information asymmetry, and imperfect competition. According to Mishkin (2019), banks exhibit downward rigidity due to profit-maximizing behaviour and risk -related factors, which causes them to modify lending rates quickly when policy rates rise than fall.

Furthermore, the magnitude of financial liberalisation influences monetary communication via the interest rate conduit. In Nigeria, the post-1986 liberalisation changes influenced financial institutions' pricing behaviour but did not completely eradicate market inefficiencies. Moreover, macroeconomic uncertainty caused by inflation and exchange rate changes can accentuate asymmetric reactions since banks incorporate risk premia disproportionately during policy rate tightening and easing periods. This suggests that significant nonlinear dynamics in the pass-through process could be obscured by a linear ARDL structure. Consequently, the study employs nonlinear ARDL approach propositioned by Shin et al. (2014) to investigate nonlinearities. The basic idea is that increases in interest rates may affect lending rates variably in both extent and direction relative to decreases. To empirically evaluate this asymmetry, the interest rate series is segmented into its positive and negative partial sums, formulated as follows:

$$INTR_t^+ = \sum_{i=1}^t \Delta INTR_t^+ = \sum_{i=1}^t \max(\Delta INTR_i, 0) \quad (5)$$

$$INTR_t^- = \sum_{i=1}^t \Delta INTR_t^- = \sum_{i=1}^t \min(\Delta INTR_i, 0) \quad (6)$$

Where $INTR_t^+$ and $INTR_t^-$ indicate the partial sum of positive (increase) and negative (decrease) values of $\Delta INTR_i$.

To capture the effect of interest rate liberalisation, a dummy variable D_{1986} is expressed as:

$$D_{1986} = \begin{cases} 0 & \text{pre interest rate liberalisation} \\ 1 & \text{post interest rate liberalisation} \end{cases}$$

The analysis uses a regime-specific decomposed methodology instead of simply adding interaction terms, which could lead to multicollinearity. The asymmetric variables are divided into the components such as before and after liberalisation:

Pre interest rate liberalisation:

$$INTR_{pre}^+ = INTR_+^+(1 - D_{1986}), \quad INTR_{pre}^- = INTR_+^-(1 - D_{1986}), \quad (7)$$

Post interest rate liberalisation:

$$INTR_{post}^+ = INTR_+^+(D_{1986}), \quad INTR_{post}^- = INTR_+^-(D_{1986}). \quad (8)$$

Therefore, equation 7 and equation 8 of $INTR_t^+$ and $INTR_t^-$ before and after the interest rate liberalisation are incorporated into the following non-linear ARDL model:

$$\begin{aligned} \Delta LR_t = & \phi(LR_{t-1} - \theta_1 INTR_{t-1,pre}^+ - \theta_2 INTR_{t-1,pre}^- - \theta_3 INTR_{t-1,post}^+ - \theta_4 INTR_{t-1,post}^- \\ & - \delta' Z_{t-1}) + \sum_{j=i}^{q1} \eta_i \Delta LR_{t-i} + \sum_{j=i}^{q2} \lambda_{i,t-1,pre}^+ \sum_{j=i}^{q3} \lambda_i^- \Delta INTR_{t-i,pre} \\ & + \sum_{j=i}^{q4} \kappa_i^+ \Delta INTR_{t-i,post}^+ + \sum_{j=i}^{q5} \kappa_i^- \Delta INTR_{t-i,post}^- + \sum_{j=i}^{q6} \omega_i \Delta Z_{t-i} + \varepsilon_t \end{aligned} \quad (9)$$

Where ϕ is the ECT, θ_i represents the long-term coefficients, whilst the short-term subtleties are captured by the differential terms. Distinctly, the long-term specification is given as:

$$\begin{aligned} LR_t = & \alpha_0(LR_{t-1} - \theta_1 INTR_{t-1,pre}^+ - \theta_2 INTR_{t-1,pre}^- - \theta_3 INTR_{t-1,post}^+ - \theta_4 INTR_{t-1,post}^- \\ & - \delta' Z_{t-1}) + u_t \end{aligned} \quad (10)$$

Where Z_t is a vector of control parameters which includes; inflation, exchange rate, deposit rate and money supply). According to Shin et al. (2014), the estimating methods and diagnostic tests proffer by Pesaran et al. (2001) for linear ARDL approach are also suitable in the NARDL setting following the estimation of equation 9.

4.0 Empirical result

Table 1 depicts the descriptive statistics postulating a preliminary insight of the macroeconomic variable's behaviour under consideration. Starting with central tendency, the mean and median values show the typical levels of each variable. With a mean of 15.16 and a median of 16.67, LR exhibits a little right skew and reasonable stability. With a negative mean (-1.71) and a positive median (1.32), INTR suggests the existence of extreme negative values (perhaps due to policy distortions or real interest rate compression). The high average inflation rate of 18.31 percent reflects the ongoing inflationary pressures seen in developing nations like Nigeria. The exchange rate (EXR) exhibits significant depreciation events, as evidenced by the wide difference between the mean (90.10) and median (21.89). Rapid monetary expansion over time is reflected in the money supply (MS), which also shows a significant disparity between mean and median.

The descriptive statistics further revealed positive skewness in INF, EXR, DR, and MS indicates erratic values that are associated with increases in inflation, devaluation, and liquidity. Additionally, leptokurtic behaviour is shown by INTR (9.59), INF (6.35), and MS (5.15), showing fat tails and a higher likelihood of extreme events. This is significant in macroeconomic variables since it indicates shock vulnerability. DR and LR are more in line with a normal distribution. Additionally, the relevant p-values and Jarque-Bera (JB) statistics test for normalcy. High p-values (0.696 and 0.227) for LR and DR suggest a normal distribution. However, INTR, INF, EXR, and MS reject normality ($p < 0.05$), indicating that structural breaks, policy shocks, or outside disruptions have an impact on these variables.

Table 1: Descriptive statistics

	LR	INTR	INF	EXR	DR	MS
Mean	15.164	-1.705	18.305	90.098	9.324	7.74e+12
Median	16.670	1.318	13.127	21.890	9.133	3.70e+11
Max.	31.650	18.180	72.835	425.979	23.241	5.22e+13
Min.	6.000	-65.857	3.457	0.547	2.666	9.79e+08
Std. Dev.	5.965	14.084	15.059	115.402	4.743	1.33e+13
Skewness	0.191	-2.104	1.995	1.3269	0.573	1.772
Kurtosis	2.579	9.593	6.354	3.939	3.047	5.148
JB Stat.	0.725	137.622	61.162	17.831	2.962	37.887
P-Values	0.696	0.000	0.000	0.000	0.227	0.000

Source: *Researcher's Computation*

Prior to estimating the linear ARDL, the study estimates the stationarity outcomes using ADF and PP tests in order to insure none of the series is integrated of order two i.e. [I (2)] or more. From Table 2, all the selected parameters in the study are integrated of the same order i.e. [I (1)] with the exclusion of interest rate and inflation that are [I (0)]. Hence, this validates the suitability of the ARDL estimation.

Table 2: Stationarity Tests

Series	Level		First Difference		I(d)
	ADF	PP	ADF	PP	
LR	-1.6980	-1.6690	-8.0162***	-8.0540***	I(1)
INTR	-6.4440***	-6.4499	-11.2393***	-32.9975***	I(0)
INF	-4.1824**	-3.3811*	-7.3842***	-14.6977***	I(0)
LEXR	-1.5570	-1.8219	-5.7700***	-5.7731***	I(1)
DR	-1.4926	-2.0529	-4.7303***	-8.8188***	I(1)
LMS	-2.0692	-1.2042	-4.7355***	-4.6785***	I(1)

Note: I(d) signify the integration for each series. Tests are carried out using intercept with trend. Critical values are given as: -4.6785, -3.5004, -3.1796 levels, respectively. Asterisks, ***, ** and * indicate significance at 1%, 5% and 10% levels.

Table 3 depicts the ARDL Bounds technique to cointegration for a possible long-term between lending rate and policy rate while accounting for structural break and interaction between the financial liberalisation of 1986 and interest rate in Nigeria. Evidently, given the F-statistic of 6.2248 which surpasses the critical values, the null hypothesis of no cointegration between lending rate and the series under consideration is rejected. This indicates a possible long-run relationship.

Table 3: Findings of the ARDL Bounds Test

	F- Statistics	k
	6.2248	7
LR = f (INTR, INF, LEXR, DR, LMS, INTR*1986, 1986)		
Critical values	I(0)	I(1)
10%	1.92	2.89
5%	2.17	3.21
1%	2.73	3.9

Note: Critical bounds values are provided by Narayan (2005). Asterisk (***) depict the significance at 1% level. K depicts the number of independent parameters.

Source: *Researcher's Computation*

Panel A of Table 4 presents the long-term estimate of lending rate and the variable under consideration. Specifically, this shows a 1 percent increase in policy rate reduce lending rate by 0.061 percent at 10 percent level before the interest rate liberalisation. The shows a negative and weak significance pass through before liberalisation, indicating inefficiencies of a regulated financial sector. Nonetheless, there exist a positive significant interaction between the policy rate and the interest rate liberalisation dummy, indicating that liberalisation improved lending rates' responsiveness to monetary policy. According to the combined effect, lending rate rise by roughly

0.27 percent during the post-liberalization period for every 1 percent increase in the policy interest rate, indicating improved policy transmission. In addition, whilst, the deposit rate is positive and significant, rising prices and money supply are positive and insignificant. The positive association of the lending rate and interest rate lends credence to financial intermediation theory, which holds that in order to stay profitable, banks modify their lending rates in reaction to shifts in funding costs. The 1986 reform triggered a considerable upward shift in the long-term equilibrium lending rate, as depicted by positive and significant coefficient of the dummy. This illustrates a shift from a government to a market-oriented interest rate, in which basic economic principles dictate lending rates. Additionally, a steady long-run connection between the series is confirmed by the ECT, which is negative and significant. A quick adjustment process and an effective monetary transmission in the post-liberalization regime are implied by the coefficient's magnitude of 0.8, which indicates that almost 80 percent of short-run anomalies from equilibrium are rectified within a year.

Table 4: Results of the ARDL

Panel A: ARDL (4,1,1,4,2,4,4,3) Long-run coefficient estimates – Dependent Variable: LR								
CONS	INTR	INF	LEXR	DR	LMS	INTR*D1986	D1986	ECT_{t-1}
-15.4669	-0.0609*	0.0494	-2.4106**	0.6571***	0.7673	0.3306**	11.7577***	-0.8013***
(-1.0973)	(-1.8712)	(1.6626)	(-2.3576)	(6.3335)	(1.3449)	(3.5061)	(5.0287)	(-8.9957)
Panel B: ARDL (4,1,1,4,2,4,4,3) Short-run coefficient estimates – Dependent Variable: ΔLR								
Lag order	0	1	2	3	4			
ΔLR	-12.394(-1.1931)	0.1334(0.8172)	-0.4389(-2.9336) **	0.1094(1.0529)	0.3946(3.9429) **			
$\Delta INTR$	-0.0350(-1.9965) *	-0.0137(-0.8858)	-	-	-			
ΔINF	0.0788(3.7372) **	-0.0392(0.1000)	-	-	-			
$\Delta LEXR$	0.8720(1.1459)	-0.3823(0.3876)	1.9808(2.088) *	-2.1481(-3.1105) **	-1.2542(-1.3044)			
ΔDR	0.5842(0.0000) ***	-0.2703(-2.0673) *	0.2127(1.8350) *	-	-			
ΔLMS	1.9094(1.1339)	-4.8132(-2.2646) **	4.6746(1.9908) *	0.6315(0.2748)	-1.7874(-1.4608)			
$\Delta INTR$	0.0973(3.0639) **	0.0323(0.9385)	0.0763(3.6391) **	0.0589(2.8963) **	-			
* D1986								
$\Delta D1986$	0.0973(3.0639) **	0.0858(0.0602)	-0.0484(-0.0308)	6.0327(3.6338) **	0.0973(2.0591) *			
Panel C: Diagnostic Tests								
$\chi^2_{SERIAL C.}$	$\chi^2_{HET.}$	$\chi^2_{NOR.}$	Adjusted R ²		χ^2_{RAMSEY}			
1.604[0.2317]	1.0289[0.4874]	1.114[0.5729]	0.97		5.8219[0.0274]			

The short-run ARDL estimates shows that the lending rate is significance at lags 2 and 4 indicating delayed but non-linear effects on current lending rates. This means that partial mean reversion is indicated by the negative coefficient on lag 2, which implies that periods of high lending rates often adjust downward after two periods. Alternatively, the significant coefficient on lending rate at lag 4 shows that past monetary conditions are still influencing banks' current pricing practices. According to Berger and Udell (1992), this behaviour is in line with interest rate smoothing behaviour seen in traditional financial institutions with rigidities and adjustment frictions.

Regarding the central variable of interest, lending rates are negatively and marginally significantly impacted by the contemporaneous interest rate. This unexpected outcome points to a short-term incomplete and potentially unbalanced interest rate pass-through. Standard monetary transmission theory predicts that rises in policy rates will result in higher lending rates; however, the negative sign can be due to regulatory restrictions, liquidity issues, or banks' strategic pricing practices. This might be seen as a sign of inadequate transmission channels in Nigeria, where banks might delay raising lending rates because of worries about declining credit demand or increased default risk. The findings are similar to Oyadeyi (2023), Jibrilla and Balami (2022), Ogundipe and Alege (2013), and Usman (2012).

Banks swiftly react to inflationary pressures by raising lending rates in order to maintain real returns, as seen by the significant and positive contemporaneous effect of inflation. This is consistent with the Fisher theory (Fisher, 1930), which states that nominal interest rates acclimate to anticipated inflation. The exchange rate (LEXR) has an intricate lag structure with alternating signs, with the second and third lags showing significant impacts. The positive coefficient at LEXR (-2) and negative coefficient at LEXR (-3) suggest that exchange rate devaluation temporarily raises lending rates, possibly due to imported inflation and higher foreign borrowing costs, but this effect eventually reverses. In open economies such as Nigeria, this dynamic corresponds with exchange rate overshooting and lag in monetary policy responses (Dornbusch, 1976).

The deposit rate (DR) has a substantial effect on lending rates (0.5842, $p < 0.01$), supporting the cost-of-funds hypothesis. Increased deposit rates raise banks' financing costs, which are then shifted on to consumers. The short-term impacts of the money supply (LMS) exhibit volatility, with a significant negative lagged coefficient at LMS (-1) and a positive rebound at LMS (-2). This suggests that while liquidity injections initially lower lending rates (as would be expected under expansionary monetary inflationary expectations or central bank sterilisation efforts may cause the effect to reverse).

The interest rate liberalisation period is captured by the structural break dummy (D1986), which is mostly insignificant but becomes extremely relevant in lag 3. This implies that the consequences of liberalisation on the dynamics of lending rates take time to manifest, exhibiting slow institutional and market changes. Crucially, interest liberalisation reinforced the interest rate pass-through mechanism, as evidenced by positive and considerable interaction term between interest rate and the liberalisation dummy (INTRD1986) over several lags. To put it another way, fluctuations in policy rates are more successfully in affecting lending rates following liberalisation, which is in accordance with theoretical expectation that deregulated financial systems improve the efficacy of monetary policy (McKinnon, 1973; Shaw, 1973).

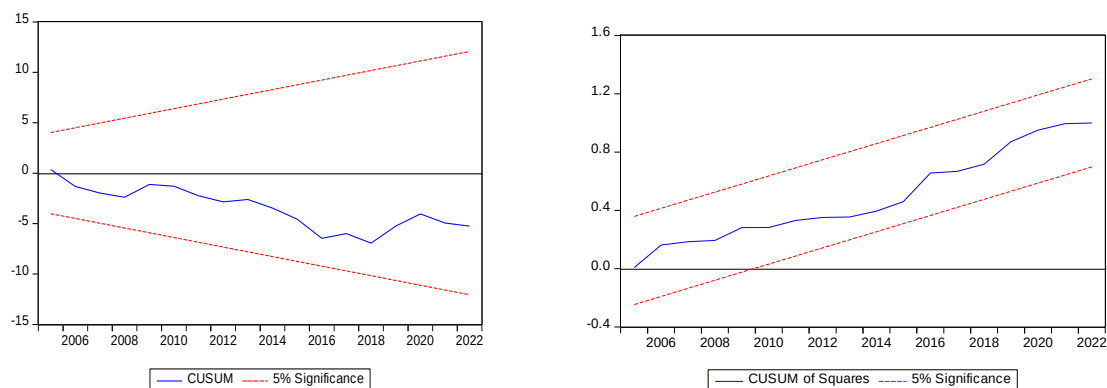


Figure 1: CUSUM and CUSUM of Squares of the linear ARDL model.

Panel C of Table 4 further presents the diagnostic tests. Specifically, with an adjusted R-squared of 97 percent, the study denotes the nonexistence of serial correlation and heteroscedasticity, respectively. The Jarque-Bera of 1.114 and the probability of 0.57 shows the failure to reject null hypothesis of normality. Entailing that the residuals are normally distributed, satisfying the assumption of classical linear regression (Jarque & Bera, 1990, Gujarati & Porter, 2009). According to the Ramsey RESET test, the ARDL model has functional form misspecification, which compromises the dependability of the model's data-generating procedure. This supports the use of a nonlinear ARDL (NARDL) framework to capture potential asymmetries by pointing to the possibility of missing nonlinearities or improper model framework. Accordingly, the CUSUM and CUSUMSQ lies within the 5 percent confidence band as illustrated in figure 1 further indicating the stability of the ARDL model.

Table 5: Result of the NARDL Bounds Test

	F- Statistics	k
$LR = f(INTR_{pre}^+, INTR_{pre}^-, INTR_{post}^+, INTR_{post}^-, INF, LEXR, DR, LMS)$	194.8656***	8
Critical values	$I(0)$	$I(1)$
10%	1.85	2.89
5%	2.11	3.15
1%	2.62	3.77

Note: For critical bounds values see Narayan (2005). Asterisk (***) depicts significance at 1% level. K denotes the number of explanatory variables.

Table 5 depicts the NARDL bounds to cointegration. Given the F statistic of 194.86 which exceed the critical values at all level, the study rejects the null hypothesis of no cointegration. Therefore,

there is a long-term cointegration between lending rate and selected variables under consideration. Panel A of Table 6 shows that before the liberalisation, both positive and negative partial sums were statistically significant. This demonstrates skewed transmission and is economically contradictory since it signifies that both rises and drops in interest rates eventually result in increases in lending rates. The banking sector seems to show upward rigidity instead of symmetric adjustment, in which lending rates do not decrease when policy rates drop.

Although the coefficients are still positive in the post-liberalization era, there is a noticeable imbalance in their amplitude and adjustment. Although the positive shock is less than it was during the pre-liberalization era, it is still statistically significant, suggesting that interest rate hikes are still being reflected in lending rates, albeit to a lesser extent. The negative shock, on the other hand, is likewise substantial and large, suggesting that interest rate decreases do not result in lower lending rates but rather continue to apply upward pressure—again indicating downward rigidity. Nonetheless, compared to the pre-liberalization system, the reduced coefficient indicates some increase in responsiveness. In contrast, the interest rate liberalisation has lessened the amount of pass-through but not its asymmetry. The persistence of positive coefficients for both positive and negative shocks suggest incomplete pass-through, in which lending rates react more easily to monetary policy tightening than to easing. This is in line with Nigeria's high intermediation costs, risk aversion, and oligopolistic banking practices.

The *ECT* shows a negative and quite significant magnitude, suggesting a moderate pace of adjustment near long-term equilibrium, correcting about 28.6 percent of short-run disequilibrium every year. The transmission mechanism is further strengthened by control variables. While the negative coefficient on the exchange rate indicates that currency devaluation might exacerbate monetary conditions, potentially through tighter monetary policy actions or external balance pressure, inflation and deposit rates have positive effects on lending rates in line with cost and expectations channels.

Table 6: Results of the Non-Linear ARDL

Panel A: NARDL (4,4,4,4,4,4,4,4,4) Long-run coefficient estimates – Dependent Variable: LR									
CONS	$INTR_{pre}^+$	$INTR_{pre}^-$	$INTR_{post}^+$	$INTR_{post}^-$	INF	LEXR	DR	LMS	ECT_{t-1}
-51.9923	4.2680	4.1924	1.2392	0.4136	-0.5234	-26.7992	4.4463	-2.0501	-0.2863
(-1.9498)	(2.2375)	(2.2557)	(2.4689) *	(3.0131) *	(-1.9568)	(-2.2896)	(2.7789) *	(-1.0935)	(-88.2871) ***
Panel B: NARDL (4,4,4,4,4,4,4,4,4) Short-run coefficient estimates – Dependent Variable: ΔLR									
Lag order	0	1	2	3	4				
ΔLR	-14.8893(-2.1740)	0.6082(7.4663) **	-0.4776(-110.1551) **	0.0789(1.1644)	0.5041(12.2852) **				
$\Delta INTR_{pre}^+$	0.5781(11.6244) **	0.1996(6.4498) **	0.0488(3.0807) *	0.1439(5.8142) **	0.2516(9.3576) **				
$\Delta INTR_{pre}^-$	0.09621(11.4450) **	0.5942(11.9225) **	0.2161(6.8862) **	0.0986(6.6225) **	0.1952(9.6366) **				
$\Delta INTR_{post}^+$	0.2900(16.9991) ***	-0.0796(-6.7196) ***	-0.0402(-2.9997) *	0.1008(4.2238) **	0.0838(4.7096)				
$\Delta INTR_{post}^-$	-0.1250(-5.0414) **	0.2540(12.8155) **	0.0924(4.9887) **	-0.0896(-6.9298) **	-0.0132(-0.6018)				
ΔINF	0.1710(11.6943) ***	-0.1996(-13.2642) ***	-0.0248(-2.0735)	-0.0499(-3.5546) *	-0.0465(-3.8922) *				
$\Delta LEXR$	0.7504(2.6244) *	-5.0303(-13.3298) ***	0.6278(2.6993) *	-1.6994(-6.7772) *	-2.3230(-7.2929) **				
ΔDR	0.9340(16.8316) ***	-0.9526(-9.4721) **	0.2135(5.4714) **	0.6468(12.0473) **	0.4314(7.6234) **				
ΔLMS	-5.5410(-11.3755) **	-3.3661(-3.1142) *	16.9946(10.1676) **	-10.0702(-7.4157) **	1.3957(2.2997)				
W_{LR} 6.813(0.0090)									
W_{SR} 0.745(0.3880)									
Panel C: Diagnostic Tests									

$\chi^2_{\text{SERIAL C.}}$	$\chi^2_{\text{HET.}}$	NORMALITY	Adjusted R ²	χ^2_{RAMSEY}
0.9368[0.5899]	0.3777[0.9394]	0.2850[0.9600]	0.99	0.1530[0.7334]

The short-run nonlinear ARDL finding indicate the presence of lag-dependent effect of interest policy rate to lending rate, high levels of asymmetry, and strong dynamic adjustment. First, high short-run stickiness and oscillatory adjustment are confirmed by the lagged dependent variable.

The positive and negative fluctuations in interest rates in the pre-liberalization period are positive and significant at all lags. This implies that the increase in lending rate are caused not only by policy rate increase but also by policy cuts, which substantiate the long-run downward rigidity. Furthermore, the asymmetric finding that both positive and negative interest rate shocks increase lending rates in the pre-liberalisation period is consistent with the theory of financial repression. Under the administratively controlled interest rate regime prevailing in Nigeria prior to 1986, lending rates were not determined by market-clearing conditions but by regulatory constraints, credit rationing, and risk-based pricing. As argued by McKinnon (1973) and Shaw (1973), repressed financial systems distort the price mechanism, while Stiglitz and Weiss (1981) shows that interest rates incorporate credit risk rather than purely reflecting the cost of funds. Consequently, a decline in policy rates may increase loan demand without a corresponding increase in supply, leading banks to raise lending rates to ration credit and preserve profitability.

The realignment is less pronounced during the post-liberalization stage. In the case of positive shocks, the contemporaneous effect is substantial and an upward pass-through occurs instantly when policy rates are increased. The negative coefficients at lags 1 and 2 are indicative of either an initial overshoot or partial correction and later followed by stabilisation at lag 3. The contemporaneous effect is negatively significant, denoting that interest policy rate decreases initially result in lower lending rates, which is in line with theory. Nevertheless, subsequent positive coefficients at lag 1 and 2 show a reversal, indicating that the initial reduction is not sustained. This illustrates asymmetric and partial pass-through, in which lending rates only momentarily decline before rising again, thereby demonstrating downward rigid adjustment. In addition, banks swiftly raise lending rates in reaction to inflationary pressures, as seen by the strong positive contemporaneous effect of inflation. Short-run fluctuations are suggested by negative lagged coefficients, which may be the result of earlier over-adjustment or the rapid expectations. The fluctuating signals of the exchange rate indicate the instability of currency rate pass-through. Lending rates may first rise due to depreciation (due to imported inflation and risk). The cost-of-funds channel is confirmed by the strong positive contemporaneous effect of deposit rates: higher deposit rates lead to higher lending rates.

The money supply fluctuates greatly, showing a substantial positive rebound that indicates inflationary or policy counter effects after an initial negative effect (liquidity expansion decreasing rates).

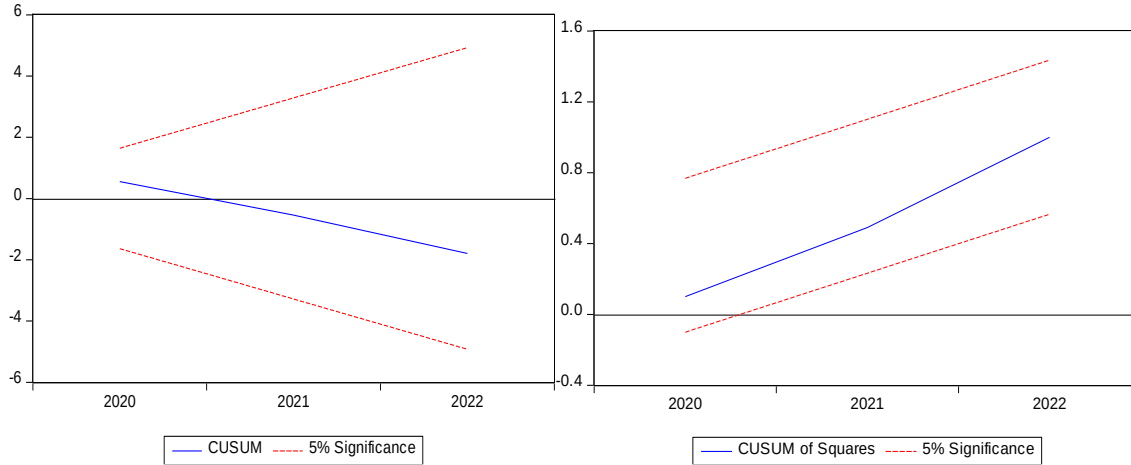


Figure 2: CUSUM and CUSUM of Squares of Non-Linear ARDL.

The null hypothesis of no autocorrelation is failed to be rejected, according to the serial correlation test. This suggests that there are no omitted lag effects and that the model has sufficiently captured the dynamic nature of the data because the residuals are serially independent. Additionally, the homoskedasticity null hypothesis cannot be rejected by the heteroskedasticity test. This indicates that the residuals' variance remains constant throughout time. Additionally, the null hypothesis of normally distributed residuals is failed to be rejected by the normality test. The adjusted R-squared explains about 99% of the fluctuations in lending rates. Also, CUSUM and CUSUMSQ tests in figure 2 lies within the 5 percent confidence band. Lastly, the Ramsey RESET test verifies the accurate specification of the NARDL model, suggesting the validity of the asymmetric decomposition of interest rate shocks. These results highlight how crucial it is to describe pass-through asymmetrically because linear ARDL specifications are unable to account for these subtleties.

5.0 Conclusion and Recommendations

According to the ARDL and NARDL models, there is ineffective, asymmetric and regime-dependent interest rate effect on lending rates in Nigeria. The linear ARDL results indicate structural rigidities of the transmission, indicating a long-term relationship between lending rates and their determinants, but with poor and slow transmission of policy rates. The NARDL results can further clarify this imbalance as it indicates huge asymmetries. The pass-through mechanism is clearly distorted during the pre-liberalization period; both increases and decrease on the interest rates lead to the increase in lending rates. It is revealed that there is heightened responsiveness in the post-liberalization period particularly in the short-run. However, the inability of lending rate to decrease correspondingly after policy easing confirms that pass-through is still asymmetrical and insufficient. This denotes that the efficacy of monetary policy remains limited to structural difficulties like high intermediary service, risk aversion and oligopolistic banking behaviour.

The findings of the diagnostic results denotes that the models are econometrically rigorous. Therefore, the findings imply that the interest rate liberalisation has indeed enhanced the

transmission structure, but the underlying constraints in the banking sector of Nigeria have not been resolved.

Moreover, the study recommends that given asymmetry exists primarily in the long run. Therefore, the central bank should prioritise policies that influence long-term expectations rather than short-term adjustments. The central bank should adopt a forward-looking monetary policy framework that emphasizes consistency, credibility, and transparency. The reduced magnitude of post-liberalisation coefficients suggests partial improvements in transmission but highlights persistent inefficiencies. To address this, monetary authorities should enhance interbank market efficiency, improve liquidity management frameworks and strengthen policy rate signaling mechanisms. Also, the finding that negative interest rate shocks still increase lending rates suggests significant rigidity in downward adjustments. This reflects structural inefficiencies such as menu costs, risk aversion, and market power. To address this, policymakers should introduce benchmark-linked lending rate frameworks, mandatory disclosure of lending rate adjustments and consumer protection policies that enhance borrower mobility. In addition, the significant impact of exchange rate movements on lending rates highlights the importance of external sector stability. Policymakers should maintain a stable and credible exchange rate regime and improve foreign exchange market transparency.

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