ASYMMETRIC EFFECT OF INTEREST RATE ON REAL SECTORS PERFORMANCE IN NIGERIA

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Abstract: Departing from prior literature, this study integrates an asymmetric framework into how Nigerian real sectors (agricultural, industrial and service sectors) respond to changes in interest rates. Nonlinear Autoregressive Distributed Lag (NARDL) approach was adopted to capture the objective, using data from Nigeria spanning the period of 1981–2021. The empirical findings established asymmetric structure in the interest rate - real sectors performance nexus in the long run, while there is no evidence of asymmetric relationship in the short-run. The empirical result further revealed that contractionary (negative component shock) interest rates policy significantly boosts Nigerian real sectors performance both in the short-run and long-run. However, the expansionary (positive component shock) interest rates policy exhibits adverse effect on the growth of real sectors in Nigeria. This study therefore concludes that contractionary interest rate policy is a panacea to propel the growth of real sectors in Nigeria. Based on the findings of this study, it is recommended that monetary authority should reduce the interest rate for Nigeria's real sectors in order to have easy access to credit facility to embark on large scale production and consequently boost their performances. This will create enabling credit facility environment to revitalize Nigerian real sector.

Keywords: Interest Rate, Real Sector Performance, Asymmetric Effect, NARDL

INTRODUCTION

Interest rate has been one of the most topical issues in the context of Nigerian contemporary. This is due to the fact that it is one of the mark-worthy and efficient monetary transmission mechanism channels through which Nigerian government via Central Bank of Nigeria interfere in economy. It has the

aptitudes to impact on the aggregate economy through determining the size of macroeconomic indicators like capital flows, investment, exchange rate and credit demand. A number of empirical studies (Lyndon and Peter, 2016; Apere and Akarara, 2018; Mattar and Momodou, 2021) alluded to the above strand that the behaviour of interest rates is a determining factor for investment undertakings and hence economic growth of a country. In this regard, (Etale and Ayunku, 2016; Aigbogun, 2020) empirically established that high interest rate dampens investments, abates output, and inhibiting growth through high cost of borrowing, whereas a significantly lower interest rate attracts risk-free projects and more borrowers, increasing investment and consumption, which boosts productivity and economic growth.

Aside from the over-concentration of production in the oil and gas sector and infrastructure deficits, one of the main issues slowing the growth of Nigeria's real sectors over time is interest rate volatility, which always results in strict and restrictive credit guidelines for the sector to access loans from commercial banks. Empirical evidences abound to this effect that the insignificant contribution of real sector to GDP over time could be attributed to the infrastructural deficits as well as inaccessibility to affordable finance characterized by stringent, cramping credit guideline coupled with high and fluctuating interest rate (Opusunju, 2019; Aigbogun, 2020 and Ubong, 2020). In light of this, Nigerian economy has adopted a number of interest rate regimes over the years, which include regulated interest rate regimes, interest rate reforms, and market-based interest rate determination. Meanwhile, all these were put in place in a bid to encourage increased credit availability to the private sector for investment purposes in various economic sectors to boost investment and productivity. Manufacturing sub-sector, agricultural, and solid mineral sectors were prominent among the selected sectors, and deposit money banks were instructed to charge favourable interest rates on all advances and credits to the said sectors (Udoka and Anyingang, 2012). Despite the formulation and adoption of several measures to mitigate the impact of high and interest rate volatility on the country's economy, the growth rate of Nigeria's real sector is still sluggish and whenever there is an oil shock or deft, the country's real GDP plummets to unbearable or negative levels.

Empirically, plethora of literature abound in this phenomenon (Obamuyi *et al,* 2012; Lyndon and Peter, 2016; Apere, 2018; Abubakar, 2019; Opusunju, 2019; Ubong, 2020; 2021; Ubong, 2022, etc). However, a careful review of these literature reveals that none of it considered the asymmetric nature of

interest rate in Nigerian context. Furthermore, findings from the empirical inquiries into this phenomenon are mostly inconclusive, with evidence of both positive and negative effects of interest rate on sectoral performance or economic growth. For instance, (Obabuyi *et al,* 2012; Lyndon and Peter, 2016; Saba and Danish, 2016; Abubakar, 2019; Aigbogun, 2019; Ubong, 2020; Tadera, 2022, etc) found strong inverse relationship between interest rate and sectoral performance/economic growth, while other studies found significant positive relationship between interest rate and real sector performance or economic growth (see Opusunju, 2019; Matarr and Momodou, 2021; Berkko *et al.*, 2022, etc).

Given the conflicting evidence and the paucity of study in this phenomenon, this study fills the lacuna by examining the asymmetric effect of interest rate on real sector performance in Nigeria, because assuming symmetry effect may be too limited and not prime and this might have undercut the policy relevance of inferences from empirical evidence from the study, particularly in the Nigerian context. This made Bahmani – Oskooee *et al* (2018) posited that asymmetric effects should be investigated when results from presumed symmetry are mixed and inconclusive. This provides an opportunity to reach a better conclusion on the effect of positive and negative shocks of interest rate on sectoral performance and better workable options for future policy formulations and adjustment of interest rates in Nigeria, particularly in the light of the current excruciating inflationary pressure and stunted real sectors performance. The rest of the study is structured as follows: section 2 presents literature review, section 3 provides details of the methodology and data employed, following by empirical results and discussion in section 4, and conclusion and policy recommendations in section 5.

2. LITERATURE REVIEW

2.1. Theoretical Perspective

2.1.1. The Classical Theory of Interest Rate

The classical theory posited that the interest rate acts as an equilibrium agent between the supply and demand of investable funds. The mechanism of interest rates results in parity between savings and investment. The rate of interest will decline as saving outpaces investment, discouraging saving on the one hand and promoting investment on the other. Until savings and investment are

equal, this propensity will continue to exist. Similarly, if investment surpasses savings, interest rates increase to discourage investment and promote savings until savings and investment are equal. Therefore, the classical approach viewed rate of interest as a stabilizing force between savings and investment. The premise of full employment in the economy serves as the foundation for the classical economists' approach to the equality of savings and investment (Mwega, Ngola, and Mwangi, 1990).

2.1.2. Keynesian Liquidity Theory

Keynesian liquidity theory is another pertinent and useful theory for illuminating how the interest rate mechanism affects economic growth. This theory contends that the supply and demand for money affect the rate of interest. As opposed to the real theory of the classical, the theory is therefore referred to as the monetary theory of interest. According to the notion, the total amount of money available in the nation at any given time for all uses is the supply of money. Although the supply of money is somewhat dependent on the rate of interest, it is still regarded as fixed by the monetary authority, with the assumption that the supply curve is perfectly inelastic (Chick, 2001; Bassey and Onwioduokit, 2011).

On the other end, demand for money (addressed as liquidity preference) is the desire to hold cash. The amount of interest sought in exchange for cash is a "measure of degree of disquietude" and the cash itself "lulls disquietude" According to Keynes, the premium that must be provided to persuade people to retain their wealth in a form other than cash hoarding is the rate of interest. The interest rate that would be offered to cash holders to persuade them to part with their liquid assets would increase as the liquidity preference increased. The interest rate provided to cash holders will decrease in direct proportion to the liquidity preference. Keynes asserts that people's desire to maintain liquid cash is driven by three factors: transactional, preventive, and speculative impulses (Chick, 1983; Smithin, 1996).

EMPIRICAL REVIEW

Various strands of empirical literature have emerged with mixed results and conclusions on the effect of interest rates on sectoral performance, as well as its impact on economic growth. For instance, Lyndon and Peter (2016) examined the relationship between interest rate and economic growth in Nigeria from 1986 to 2014. Data was collected from various issues of the Central Bank of

Nigeria Statistical Bulletin and the National Bureau of Statistics. The study employed Augmented Dicker-Fuller (ADF) unit root tests as well as Johansen integration test followed by Error Correlation Model (ECM) approach and found that interest rate is inversely related to economic growths, but the relationship is statistically insignificant.

Evidence from Islamic and non-Islamic economies, Saba and Danish (2016) investigate the effect of interest rate on economic performance. The study applied the random effect and system generalized method of moments (GMM) model to distinctly analyse data of 17 non-Islamic and 17 Islamic countries from 2005 to 2013. The results imply that people in Islamic countries are not concerned about the interest rate on savings, but in non-Islamic nations, the interest rate, per capita income, and inflation have significant positive impacts, and national expenditure has a significant adverse effect on savings. Remittances received and national spending, however, have negative significant impacts, whereas per capita income has a positive significant impact on savings. Interest rates and inflation have a negative impact on investment, whereas trade has a beneficial impact on investment in both Islamic and non-Islamic nations. Additionally, local bank credit has a detrimental significant impact on investment in non-Islamic nations, but remittances have a positive significant impact on investment in Islamic nations.

Assessing sector specific, Abubakar (2019) empirically investigate the impact of interest rate on Nigeria's Agriculture sector from a period spanning 1999 to 2016. This study made use of ordinary least square (OLS) and the empirical findings showed that interest rate had a strong significant negative relationship with agricultural sector activity. Similar to Opusunju (2019), who used ordinary least square (OLS) to analyze the effect of interest rate on the growth of Nigeria's manufacturing sector from 1985 to 2015. Data from secondary sources, including the CBN Statistical Bulletin and the National Bureau of Statistics, were gathered and the results show that interest rate have a significant positive impact on the growth of Nigeria's manufacturing sub-sector.

Furthermore, Aigbogun (2019) conducts an empirical investigation of the effects of interest rate dynamics on the performance of Nigeria's manufacturing sub-sector between 1980 and 2019. The study used cointegration technique through error correction mechanism, ARCH and GARCH, and the empirical result indicates that high interest rate hampered the performance of Nigeria's manufacturing sub-sector. The GARCH and ARCH results indicates

that interest rate dynamics positively impacted the performance of Nigeria's manufacturing sub- sector. The result also supports a long run relationship among the variables. Also, Adegoriola and Ben-Obi (2022) accessed the nexus between monetary policy instruments and Nigerian real sector within the framework of Vector Autoregressive Distributed (VAR) lag approach. The outcomes of the findings show that an increase in agricultural output, service output, exchange rate, and inflation rate in the previous period will lead to an increase in agricultural output in the current period. An increase in manufacturing output and interest rate in the previous period will lead to a decrease in agricultural output in the current period. An increase in agricultural output, service output, and manufacturing output in the previous period will lead to an increase in service output in the current period. An increase in agricultural output, manufacturing output, exchange rate, inflation rate, and money supply in the previous period will lead to an increase in manufacturing output in the current period.

Similarly, Ubong (2020) employed an OLS method, cointegration and a dynamic error correction model in the time series data to examine the effect of interest rate on real sector output growth in Nigeria from1985 to 2019. Data were sourced from Central Bank of Nigeria Statistical Bulletin and World Development Indicators. The co-integration test demonstrates the existence of a long run equilibrium relationship between interest rate and real sector output growth. Additionally, interest rate exerted a negative and insignificant effect on real sector growth. In another study, Matarr and Momodou (2021) empirically examined the effect of interest rates on the Gambia economic growth from 1993 to 2017. The Vector Error Correction Model (VECM) is employed and the empirical result indicates that there is no short-run relationship between interest rate and the growth of the Gambian economy. but there exists a long run relationship through real interest rate and real exchange rate to GDP.

In Southern African Customs Union (SACU) nations, Taderera *et al.* (2021) empirically investigated the relationship between inflation rate, interest rate, and economic growth. In order to isolate short and long run effects and for robustness' sake, Pooled Mean Group (PMG) estimators, which include the Panel Autoregressive Distributed Lag (ARDL) model, Fully Modified Ordinary Least Squares (FMOLS), and Dynamic Ordinary Least Squares (DOLS) were adopted to analyse panel data from SACU countries covering the period of 1991 to 2018. The study's findings indicate that while interest rate has a long-run negative effect on growth, inflation has a positive effect on economic growth.

Exploring Ghana's perspective, Berko *et al* (2022) investigates the effect of interest rate spread on economic growth from 1975 to 2018. The study employed the Engel Granger Two-Step approach which uses the OLS technique and the findings established long- run and short-run relationships between interest rate spread and economic growth. The study found that although interest rate spread is a statistically essential basis of economic growth, it has a negative long-run effect. The finding also demonstrates favourable long-run and short-run effects of labour force, capital stock, and exports on economic growth in Ghana. Government spending did not, however, seem to be a statistically significant role in Ghana's economic growth.

Insight from asymmetric effect, Olayiwola and Ogun (2019) used Nigeria quarterly data from 1986 to 2016 on output (GDP), interest rate, money supply, inflation rate, investment and real effective exchange rate to investigate asymmetric effect of positive and negative monetary policy shocks on output and prices in Nigeria using interest rate shocks. The study utilized Non-linear Autoregressive Distributive Lag (NARDL) approach and the outcomes revealed that in the short run, negative shocks have more significant effects on output than positive shocks, but the effects of positive and negative monetary policy shocks do not have significant effects on price level; while in the long run, positive shocks have more significant effects than the negative shocks on both output and prices. Similarly, Adelowokan *et al*, (2020) adopted Non-Linear Autoregressive Distributed Lag (NARDL) technique to examine the asymmetric impact of major macroeconomic determinants of manufacturing sector performance in Nigeria, covering the period between 1981 and 2018. The macroeconomic variables include GDP per capita, exchange rate, inflation rate, interest rate proxied by prime lending rate, and gross fixed capital formation. The findings established the presence of asymmetric shocks on manufacturing performance for exchange rate at both time periods and interest rate only in the long run. The empirical findings further established the important roles for all the macroeconomic variables, although at different time periods. In the long run, important role on manufacturing sector performance is found for all variables except GDP per capita. In the short run however, it alongside exchange rate and period lags of manufacturing value added meaningfully determines manufacturing sector performance

Furthermore, Opoku, (2022) uses nonlinear autoregressive distributed lag (NARDL) to examine the asymmetric effect of lending rate on Ghanaian economic growth from 1970 to 2019. The study indicates evidence of long-

run and short-run asymmetrical effects of lending rate on economic growth in Ghana. Explicitly, the long-run and short-run dynamic NARDL positive changes in lending rate generate adverse effect on economic growth whereas negative changes brought about increase in economic growth, respectively. Other significant results from this research demonstrated that, in the short run, the time it takes for economic growth to react to positive changes in interest rates differs from the time it takes to react to negative changes in interest rates, further demonstrating the existence of asymmetries in interest rates. In the same vein, Leshoro and Wabiga (2023) accessed the asymmetric effects of interest rates on private investment in South Africa within the framework of nonlinear autoregressive distributed lag (NARDL) technique. The study employed annual time series data spanning from 1971 to 2019. The outcomes of the findings indicate that interest rates and private investment displayed short-run and long-run asymmetric relationships, with private investment responding differently to negative and positive shocks in interest rates.

The research outcomes from existing studies on effect of interest rate and real sectors performance produced mixed and inconclusive results. In the first instance, this makes it an unfinished business that requires more empirical investigations. Also, aside from the inconclusive results, most of the extant studies were carried out within the context linear framework. Assuming symmetry effect may be too limited and not prime and this might have undercut the policy relevance of inferences from empirical evidence from the study, particularly in the Nigerian context. This made Bahmani – Oskooee *et al* (2018) posited that asymmetric effects should be investigated when results from presumed symmetry are mixed and inconclusive. This provides an opportunity to reach a better conclusion on the effect of positive and negative shocks of interest rate on sectoral performance and better workable options for future policy formulations and adjustment of interest rates in Nigeria, particularly in the light of the current excruciating inflationary pressure and stunted real sectors performance. However, the few empirical studies (Opoku, 2023; Leshoro and Wabiga, 2023) were not conducted in Nigerian context, while that of (Olayiwole and Ogun, 2019) on concentrated on total output and general price not a sector specific. The only sector specific study (Adelowokan *et al*, 2020) only considered manufacturing sub-sector which is only subset of industrial sector. Therefore, this study is distinctively different from extant studies by integrating an asymmetric framework into how Nigerian real sectors (agricultural, industrial and service sectors) respond to changes in interest rates in Nigeria.

3. METHODOLOGY AND METHODOLOGY

3.1. Data Sources, Measurement and Descriptions

The study adopts secondary from the Central Bank statistical bulletin (2021), and World Development Indicators (2021), and covers the periods of 1981 to 2021. The data adopted for the study include agricultural sector output, industrial sector output, service sector output, gross fixed capital formation, labour force, and maximum lending rate. The sources and description of these data are presented in the table below:

Table 1: Summary of Variables, Definition, Measurement and Data Sources

Variables	*Description*	*Sources*
Agricultural sector output	This measures the total agricultural value added to real GDP	CBN (2021)
Industrial sector output	This measures the total industrial sector value added to real GDP	CBN (2021)
Service sector output	This measures the total service sector value added to real GDP	CBN (2021)
Gross fixed capital formation	This measures the gross net investment in fixed capital by economic agents as the household, firm, and government in Nigeria	WDI (2021)
Labour force	This measures the total number of capable men and women, who are able to work in the country	WDI (2021)
Maximum Lending rate	This measures the average pf the highest lending rate charged by deposit money banks in Nigeria.	CBN (2021)

Sources: author's computation

3.3. Techniques of Analysis

The study adopts the non-linear ARDL model (NARDL) to investigate the asymmetric effect of interest rate on sectoral performance in Nigeria. The NARDL model was developed by Shin *et al.* (2013). It constitutes the non-linear expansion of the traditional ARDL model by Pesaran *et al.* (2001). Some of the important benefits of this model is that it possesses the advantage of producing valid regression result, regardless of the stationarity condition of the series. i.e., it can efficiently accommodate I(1) and I(0) series. The technique also accommodates both dependent and independent variable in the mode, while controlling for endogeneity in the explanatory variables.

Given that NARDL is the non-linear derivative of ARDL model, this study presents the baseline ARDL model, out of which the NARDL model is construct. With two variables, X and Y, the ARDL is presented as follow:

$$\Delta y_t = \Sigma_{i=1}^{q} \alpha_i \Delta y_{t-i} + \Sigma_{j=0}^{p} \beta_i \Delta x_{t-j} + y_1 y_t + y_2 x_t + \varepsilon_t \tag{1}$$

Drawing from the implication of the work of Shin *et al.* (2013), NARDL can be derived from equation (1), by introducing X^+ and X^- to replace X_t in the model as follow:

$$\Delta y_t = \Sigma_{i=1}^{q} \alpha_i \Delta y_{t-i} + \Sigma_{j=0}^{p} \beta_{1i} \Delta x_{t-j}^{+} + \Sigma_{j=0}^{p} \beta_{2i} \Delta_{t-j}^{-} + \gamma_1 y_t + \varphi_1 x_t^{+} + \varphi_2 x_t^{-} + \varepsilon_t$$

$$\tag{2}$$

The independent variable X, is decomposed into positive (X^+) and negative (X^-) changes in Shin *et al.* (2013) as follows:

$$X_t^{+} = \Sigma_{k=1}^{t} \Delta X_k^{+} = \Sigma_{k=1}^{t} \max(\Delta X_k, 0) \tag{3}$$

$$X_t^{-} = \Sigma_{k=1}^{t} \Delta X_k^{-} = \Sigma_{k=1}^{t} \max(\Delta X_k, 0) \tag{4}$$

Equation 3 and 4 isolate the positive and negative changes in the independent variable of interest. In this case, X is a vector of policy variable in the model.

3.3. Model Specification

The following models are estimated to achieve the objectives of this study

Agric sector output = f (GFCF, LAB, INTEREST RATE$^+$, INTEREST RATE$^-$)

$$\tag{5}$$

Industrial sector output = f (GFCF, LAB, INTEREST RATE$^+$,
INTEREST RATE$^-$) (6)

Service sector output = f (GFCF, LAB, INTEREST RATE$^+$,
INTEREST RATE$^-$) (5)

Where (GFCF) = gross fixed capital formation, (LAB) = labour force, interest rate proxy by lending rate

4. EMPIRICAL RESULT AND DISCUSSION

4.1. Preliminary Analysis

4.1.2. Unit Root Test

Table 1 above shows the unit root test result of the series adopted for the study. Findings reveal the series are stationary in mixed order, i.e., at I(1) and I(0). By

implication, while others have long run properties (I(0)), others have short-run attributes (I(1)). This behaviour informs the adoption of ARDL model, and the introduction of bound test into the analysis to establish whether or not long-run relationship exist in the mode.

Table 2: Summary of Unit Root Test

Variables	*I(0)*	*I(1)*	*I(0)*	*I(1)*	*I(d)*
Log(agricoutput)	-0.281	-5.927	-1.962	-5.926	I(1)
Log(indsoutput)	-4.322	-5.320	-4.338	-5.301	I(0)
Log(serviceoutput)	-2.429	-1.833	-2.001	-3.234	I(1)
LOG(GFCF)	-2.165	-3.8	0.469	-3.831	I(1)
LOG(LAB)	-2.181	-2.384	1.358	-5.962	I(1)
MAX_POS	-1.201	-7.139	-4.35	-7.139	I(0)
MAX_NEG	-1.286	-6.792	-1.076	-6.774	I(1)

Source: Author's computation

4.3. Asymmetric Effect of Interest Rate on Real Sectors Performance in Nigeria

4.3.1. *Asymmetric Effect of Interest Rate on Agricultural Sector Output Growth in Nigeria*

Table 2 below presents the regression and bound test results of the effect of labour, capital and interest rate on agricultural sector output in Nigeria. The bound test result confirms the existence of long run relationship in the model, given that the F-stat exceeds the critical values at 1%. The regression result shows there is no significant relationship among the variables in the model in the short-run. In the long-run however, a percent point increase in the size of labour force likely reduces agricultural sector output by about 16 percent. This might be the implication of the law of variable proportion on agricultural sector output. The above results are in tandem with (Abubakar, 2019; Berko, 2022). Interestingly, a percent point upward review in interest rate significantly reduces agricultural sector output by about 0.06 percent point, while a percent point downward review likely increases agricultural sector output by about 0.05 percent point. This simply connotes that the behaviour of interest rates largely determines the growth of agricultural output in Nigeria. That is, the high interest rate dampens the growth of agricultural output through high cost of borrowing, whereas negative shocks' components of interest rate attract risk-free projects in agricultural sector and more borrowers, which increases

the sector's output. This suggests that if Central Bank of Nigeria through financial institutions reduces interest rate for agricultural purpose, it will go a long way in boosting agricultural output. This result is not shocking as it conforms with a priori expectations and consistent with some extant studies ((Etale and Ayunku, 2016; Aigbogun, 2020; Opoku, 2022), that similarly found positive relationship between negative shocks' components of interest rate and manufactural output.

Table 3: Agricultural Output Regression Result Dependent variable: Agric sector output

Short-Run Non-Linear Effect				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	64.487	28.052	2.299	0.040
DLOG(GFCF)	0.277	0.202	1.367	0.197
DLOG(LAB)	5.918	17.603	0.336	0.743
D(MAX_POS)	0.019	0.011	1.694	0.116
D(MAX_NEG)	0.008	0.015	0.532	0.604
Long-Run Non-Linear Effect				
LOG(GFCF)	0.200	0.211	0.945	0.363
LOG(LAB)	-16.359	7.664	-2.135	0.054
MAX_NEG	0.046	0.025	1.864	0.087
MAX_POS	-0.064	0.023	-2.747	0.018
C	63.095	29.695	2.125	0.055
Bound Test				
F-Bounds Test	Null Hypothesis: No levels relationship			
Test Statistic	Value	Sigf.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	5.2932	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.50%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	35		Finite Sample: n=35	
		10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532

Source: Author's computation

4.3.2. *Asymmetric Effect of Interest Rate on Industrial Sector Output Growth in Nigeria*

Table 3 below presents the regression and bound test result of the effect of capital, labour and interest rate on industrial sector output in Nigeria. The

bound test result established the existence of long-run relationship among the series in the model, given that the F-stat exceeds the critical values at 1%. While capital and labour had insignificant effect on industrial output in the short-run, interest rate had both short-run and long-run significant relationship with industrial sector output. The short-run coefficients of negative component of interest rate boosts industrial sector output in Nigeria, such that a percent point reduction in interest rate results in about 0.01 percent point increase in industrial sector output, while the short-run coefficients of positive component of interest rate dampens the industrial sector output, such that a percent point increase in interest rate likely reduces industrial sector output by 0.02 percent point in the short-run. This result is in conformity with the findings of (Abubakar, 2019 and Ubong, 2020). The same effect is recorded in the long-run. A percent point increase in interest rate in the long-run likely result in about 0.05 percent point decline in industrial sector output, while a percent point decline in interest rate likely result in about 0.01 percent point increase in industrial sector output. This suggests that Nigerian industrial sector will perform very well when they have access to low interest to embark on large scale production. This implies that if Central Bank of Nigeria can downward review the present interest rate, it will further enhance the industrial sector output growth. This result is line with the extant findings of (Saba and Danish, 2016; Opoku, 2022 and Berko, 2022). Similarly, capital had a significant direct effect on industrial sector output in the long-run. The capital appears to be a both short and long-run factor of industrial growth in Nigeria. This finding is in tandem with the finding of (Aigbogun, 2029 and Tadera *et al*, 2021). This follows the theoretical proposition of endogenous growth theory which emphasizes capital formation as a crucial factor of production that drive a long-run steady-state. However, labour had a significant inverse relationship with industrial sector output.

Table 3: Industrial Sector Regression Result Dependent Variable: Industrial Sector Output

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Short-Run Non-Linear Effect				
C	105.864	23.335	4.537	0.000
DLOG(MAX_NEG)	0.012	0.007	1.783	0.089
DLOG(GFCF)	0.223	0.193	1.160	0.259
DLOG(LAB)	20.964	18.691	1.122	0.275
D(MAX_POS)	-0.016	0.008	-1.993	0.059

Long-Run Non-Linear Effect				
LOG(GFCF)	0.743	0.117	6.342	0.000
LOG(LAB)	-32.005	5.449	-5.873	0.000
MAX_NEG	0.012	0.007	1.810	0.085
MAX_POS	-0.046	0.012	-3.834	0.001
C	111.856	22.950	4.874	0.000
Bound Test				
F-Bounds Test	Null Hypothesis: No levels relationship			
Test Statistic	Value	Signf.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	9.594	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.50%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	36		Finite Sample: n=40	
		10%	2.427	3.395
		5%	2.893	4
		1%	3.967	5.455

Source: Author's computation

4.3.3. Asymmetric Effect of Interest Rate on Service Sector Output Growth in Nigeria

Table 4 above present the regression and bound test result showing the effect of capital, labour and interest rate on service sector output in Nigeria. Just like the agricultural sector regression result, there exist a long-run relationship in the model. The short-run finding established favourable relationship between gross capital formation and service sector output. Conversely, the coefficient of gross capital formation is not favourable to service sector output growth in the long-run. Similarly, the coefficients labour force in both the short-run and long-run are consistently negative. This could be as a result of Nigerian labour force does not have the requisite training and expertise needed in service sector. However, it is found that both the contractionary and expansionary interest rate policies in Nigeria dampened the growth of service sector output in Nigeria. This could be attributed to the fact that most of the operators in the service sector don't have other requirements for loan despite the level of interest rate. This finding aligns with the extant studies like (Obabuyi *et al,* 2012; Lyndon and Peter, 2016).

In the long-run, the coefficient of negative component of interest rate is positive and significant, such that a percent point reduction in interest rate

significantly increases service sector output by 0.1 percent point. However, the positive component of interest rate exhibits adverse effect on the growth of service sector output, a percent point increase in interest rate significantly reduces service sector output by 0.08 percent point. This result simply connotes that contractionary interest rate policies is catalysts to spur the growth of service sector output in Nigeria in the long-run. This is a pointer to Nigeria's government and Central Bank of Nigeria to prioritize the favourable interest rate policy to further enhance service sector output. This finding is line with the study of (Berko, 2022 and Opoku, 2022).

Table 4: Service Sector Regression Result Dependent variables: Service sector output

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Short-Run Non-Linear Effect				
C	93.609	19.261	4.860	0.000
DLOG(GFCF)	0.052	0.127	0.410	0.688
DLOG(LAB)	-10.429	9.355	-1.115	0.285
D(MAX_POS)	0.010	0.006	1.696	0.114
D(MAX_NEG)	-0.008	0.007	-1.124	0.281
Long-Run Non-Linear Effect				
LOG(GFCF)	-0.366	0.308	-1.192	0.255
LOG(LAB)	-47.410	7.282	-6.510	0.000
MAX_NEG	0.097	0.025	3.912	0.002
MAX_POS	-0.079	0.026	-3.034	0.010
C	201.105	31.809	6.322	0.000
Bound Test				
F-Bounds Test	Null Hypothesis: No levels relationship			
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	6.325044	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.50%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	35		Finite Sample: n=35	
		10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532

Source: Author's computation

4.4. Post-estimation Results

Table 5 below shows the heteroscedasticity test for the three models estimated in table 2, 3, and 4, respectively. Results show that the models are free from heteroscedasticity, which give credence to the reliability of the models. Similarly, Table 6 depicts the test result for serial correlation of the estimated models. Finding shows that the null hypothesis of no serial correlation in the model should be accepted, given the probability level of the test for each model exceeding 0.05. this, in addition to the heteroscedasticity test give credence to the reliability of the estimated models.

Table 5: Heteroscedasticity Test

AGRIC MODEL			
F-statistic	0.539	Prob. F(22,12)	0.899
Obs*R-squared	17.391	Prob. Chi-Square(22)	0.741
Scaled explained SS	2.275	Prob. Chi-Square(22)	1.000
INDUSTRY MODEL			
F-statistic	2.065	Prob. F(14,21)	0.065
Obs*R-squared	20.851	Prob. Chi-Square(14)	0.106
Scaled explained SS	5.820	Prob. Chi-Square(14)	0.971
SERVICE MODEL			
F-statistic	2.004	Prob. F(21,13)	0.099
Obs*R-squared	26.739	Prob. Chi-Square(21)	0.180
Scaled explained SS	3.143	Prob. Chi-Square(21)	1.000

Source: Author's computation

Table 6: Serial Correlation Test

AGRIC MODEL			
F-statistic	1.365	Prob. F(2,11)	0.295
Obs*R-squared	6.960	Prob. Chi-Square(2)	0.031
INDUSTRY MODEL			
F-statistic	0.638	Prob. F(2,19)	0.539
Obs*R-squared	2.265	Prob. Chi-Square(2)	0.322
SERVICE MODEL			
F-statistic	0.208	Prob. F(2,27)	0.813
Obs*R-squared	0.577	Prob. Chi-Square(2)	0.749

Source: Author's computation

5. CONCLUSION AND RECOMMENDATION

Investigation into the asymmetry effect of interest rate on sectoral performance in Nigeria shows interest rate is an importance determinant of sectorial

performance in Nigeria. Findings from study reveals that interest rate does not have short-run effect on the performance of agricultural and service sector. However, in the long run, a significant asymmetry relationship exists between interest rate and agricultural and service sector performance in Nigeria. Increase in interest rate reduces sectorial performances, while decrease in interest rate improves sectoral performance in the country. It should be noted, however, that increase interest rate creates more disincentives to sectoral performance, than decrease in interest rate create incentive for sectoral performance. Based on the findings of this study, it is recommended that monetary authority should reduce the interest rate for Nigeria real sectors in order to boost their performance. This will create enabling credit facility environment to revitalize Nigerian real sector and embark on large scale production.

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