Interest Rate and Industrial Development Nexus in Nigeria: A Co-Integration Approach

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Abstract

The study examined Interest Rate and Industrial Sector Development nexus in Nigeria for 36 years period. The model of the study regressed Interest Rate (IR) along with other influential variables as Bank Credit to industrial sector (BCIND), Exchange Rate (EXR), and Gross Fixed Capital Formation (GFCF) on Industrial Sector Gross Domestic Product (GDPIND). Data were collected from the 2021 Central Bank of Nigeria (CBN) Statistical Bulletin covering 1985 to 2021. It used Augmented Dickey Fuller (ADF) test of stationarity, Johansen co-integration and Gauss-Newton / Marquardt steps least squares analytical techniques. The findings satisfied all the variables stationary at 1(1) and the model (R^2 adjusted) 99.47% good fit. Long run relationship was found between interest rate and industrial development in Nigeria. IR, BCIND, and GFCF had positive impact while EXR made inverse contribution. The impact of IR and EXR were insignificant while BCIND and GFCF were significant. It found also that disequilibrium in the short run had 5.85% speed of convergence to equilibrium in the long run annually. The study concluded that interest rate and industrial development in Nigeria are co-integrated and interest rate has insignificant positive relationship on industrial development. It therefore recommended that, the Monetary Policy Committee proffer a moderate rate of interest (MPR) that will be good enough to simultaneously mobilise more funds and permit the industrial sector access to the funds; as well as policy measures that will grow gross fixed capital formation and bank credit to the industrial sector and reduce exchange rate.

Key Words: Interest Rate Industrial Development Relationship Nigeria

INTRODUCTION

1.1 Background of the Study

Industrial development has been found to be much fundamental in the growth and sustenance of every economy both in the developed, in developing, and in the third world economies; and all efforts geared towards its promotion cannot be adjudged to be in excess. The Nigerian industrial sector is yet to harness its maximum productive level and therefore requires necessary attention in identifying essential factor inputs that will fine-tune its growth potentials into speedy

transformation. The import of growing the industrial sector now is very germane at this period when the country's economy is so volatile and at precipice of collapse.

Considering industrial development as of macroeconomic concern in evaluating useful growth factor(s), Ezeaku, Ibe, Ugwuanyi, Modebe, and Agbaeze (2018) and Owolabi, and Adegbite, (2014) asserted that monetary policy can be used to influence economic activities and achieve a country's economic objectives such as industrial development. This is achieved through monetary flows conditioned by the rate of interest. Studies have proved that interest rate has remained an instrumental monetary policy tool in achieving sectorial or holistic economic adjustment. The industrial sector in Nigeria is perceived as the engine of economic growth and the financial sector is widely accepted as the lubricant of that engine, thereby establishing a synergetic relationship between these two sectors (Udeala, 2002 in Owolabi, and Adegbite, 2014).

One may argue that an expansionary monetary policy measure that increases supply of money may spark off inflation if not kept in check as observed by Khan & Jacobson, (1989) that there are lots of draw-back in finding a balance or trade-off between set goals- inflation and price stability. This critical enquiry however has been in the purview of the monetary authorities that have perfect achievable professional means of injecting control measures to strike a balance between money supply and inflation rate through interest rate adjustment. Ensuring industrial sector productivity is a precondition for the growth of the economy and it belongs to the deficit spending unit which depends basically on borrowed funds from the surplus spending units for investment (George-Anokwuru and Itoro, 2020). The idea here buttresses the fact that the validity of increasing financial access to the industrial sector remains sacrosanct.

The Nigerian industrial sector faces overwhelming challenges ranging from infrastructural woes to highly unstable business environment and the need for appropriate financing is equally intensified by the cyclical nature of industrial out-put; Bridging the funding gap depends mainly on both availability and cost of fund, which is largely determined by money supply through monetary policy action (Ezeaku, Ibe, Ugwuanyi, Modebe, and Agbaeze, 2018). Interest rate movement informs the level of money supply and degree of investment in all sectors of an economy, industrial sector inclusive. Oliver, (2016) posited that interest rate has an effect on the demand and allocation of available funds.

Particularly, interest rate movement is affected by some macroeconomic and fiscal variables as inflation, exchange rate, gross capital formation, time and savings deposits, foreign portfolio and direct investments. These variables among others, acting either independently or jointly impact the degree and direction of interest rate flow (Tomori, 2012). The current increase in interest rate from 13% to 14% affects components of interest rate as lending rate, deposit rate, real interest rate and premium rate implying increase in bank facilities as overdrafts, corporate loans, structured loans, refinanced loans, and other forms of lending offered to businesses. The usefulness of the effect is expected to impact better in the industrial development of the country.

1.2 Statement of the Problem

Nigeria in less than a decade ago managed to survive economic recession occasioned by depleted internal industrial productivity mechanisms and currently there is imminent threat that owing to scarcity of funds that have eroded industrial development, the country is again prone to the chances of sliding into another recession. The industrial production of the country has not been enough in meeting the domestic market demand, hence falling abysmally low in volume of export which consequently mounts pressure on naira leading to its continuous depreciation; as such that naira dollars exchange currently stands around N700/$1. One of the major feasible approaches in improving the industrial productivity is the increase of money supply. But the increase of money supply will threaten further the country's inflation rate that currently stands at 20.50% which is considered as all-time high. The growth of money supply is correlated with the high inflation episodes because money growth was often in excess of real industrial growth (Owolabi, 2014).

A common point here is that the country is faced with the challenge of increasing money supply to grow industrial productivity and at the same time pruning inflation rate. Apparently, the simultaneous pursuit of these macroeconomic objectives leads to policy conflict. The functional denominator in striking a balance between these conflicting objectives is the relevant interest rate which has a dual effect of controlling money supply (in other words increasing industrial productivity) and controlling inflation. Other components connected to interest rate and industrial sector growth are gross capital formation and savings deposit which affect volume of bank credit that can be extended.

The Nigerian government through its monetary authorities over the years has continued to pursue policies that will grow and sustain the economy such as the fixing of the interest rate referred to as Monetary Policy Rate (MPR) by the Monetary Policy Committee (MPC) of the Central Bank of Nigeria. The major point of concern remains to evaluate the extent and direction to which the interest rate has impacted industrial development in the long run in Nigeria. The answer to this is considered critical in providing workable options for future policy formulations and adjustment of interest rates in the country, especially as the industrial sector demands urgent bailout.

The main objective of this study is to examine whether long term relationship exists between interest rate and industrial sector development in Nigeria. Other specific objectives are to;

1. examine the impact of Interest Rate on Industrial Development in Nigeria.
2. assess the impact of Bank Credit to the industrial sector on industrial development in Nigeria
3. evaluate the effect of Exchange Rate on Industrial Development in Nigeria.
4. investigate the effect of Gross Fixed Capital Formation on industrial development in Nigeria

REVIEW OF RELATED LITERATURE

2.1 Conceptual Review
2.1.1.1 Concept of Industrial Development
Considering industrial development as a process, it is said to be the building and growing of industries within an economy by using new technologies which make jobs easier, faster, and better and lead to an increase in a business' output and an increase in profits (IGI Global, 2022). It is a development that encompasses a manufacturing or industrial process, and shall include, among others electric power production, food and food by-product processing, paper production, agrichemical production, chemical processes, storage. The 2021 Central Bank of Nigeria (CBN) statistical bulletin expanded the Nigerian industrial sector to include; i) Mining and Quarrying, ii) Manufacturing, iii) Electricity, Gas, Steam & Air conditioner, iv) Water supply, sewage, waste Mang, and v) Construction

2.1.1.2 Industrial Development Policy Objectives
There are lots of industrial development objectives globally but common among them and particular to Nigeria include;
1. Provision of greater employment opportunities to stem the social and political consequences of unemployment
2. Increased export of manufactured goods
3. Promotion of industrial development and national integration through industrial dispersal
4. Improvement of the nation's technological capacity
5. Increasing local content of industrial output to promote greater linkages and backward integration in order to raise the general level of economic activity
6. Attracting foreign investment to attain accelerated pace of industrial development
7. Increased private sector participation aimed at accelerated pace of industrial development.

2.1.2.1 Concept of Interest Rate

On the basis of loanable fund theory and as amplified in Femi (2010) and Etale and Ayunkun (2016), interest rate is regarded from two perspectives: as the price paid for borrowing money from a lender; and as the rate of return associated with investing money or the cost of capital for borrowing money. Similarly, Teriba, (2012) considered interest rate as the amount payable on the borrowed money, expressed as a percentage of the principal, from a lender to a borrower for the use of the money. The CBN (1998) position looked at interest rate as the payment made by fund borrowers for the use of credit and the return to lenders for parting with liquidity. It is frequently stated as a percent of the principal money borrowed on annual bases or whatever other time period – semi-annual, quarterly, monthly, or in days etc.as fixed between the lender and the borrower in a loan agreement.

In practical terms, interest rate exists in two unique forms known as deposit rate and lending rate. The deposit rate is the rate that financial institutions pay on demand, time or savings deposits while the lending rate is the rate that they charge on borrowed funds. The difference between the deposit rate and the lending rate is referred to as "interest rate spread" or "intermediation rate" (Nwokoro,

2017). The deposit rate affects the fund mobilization capacity of the financial institutions while the lending rate affects fund accessibility by the borrowing units such as the industrial sector. Currently the CBN circular of August 15, 2022 reviewed interest on savings deposit from 1.4% to 4.2% (Uba, 2022). The movement of the interest rate as given by the CBN through the MPC most recently has moved from 11.5% to 13.5% in May 2022 and the present moved to 14% in July, 2022 meant to combat the rising rate of inflation (Nairametric, 2022).

Certain dissenting opinions tend to counter interest rate charges claiming that its usury of borrowers or lendees. Clarifying issues on the criticisms of interest rate charges, Femi (2010) noted that interest charges are necessitated for the reasons of i) as a reward for productivity of capital ii) as a compensation for parting with liquidity, and iii) as a cushion for inherent risk of default.

Operational enforcement of interest rate and its management within an economy runs through interest rate policy as issued by the monetary authority. Interest rate policy often offers two main operational approaches in exercising interest rate on financial transactions; which are direct and indirect approaches. The direct approach involves the adjustment of lending rate and saving rates by the apex regulatory authority. The indirect approach also referred to as market based approach means where the rate is determined by the mutual effect of market forces. Each of the approaches tends to have unique way of inducing economic growth. The Central Bank of Nigeria reserves the discretionary mandate to intervene in the financial market to ensure orderly development in interest rates.

Interest rate policy in Nigeria objectively is meant to pursue among other things, moderation of inflation, financial savings and investment, encouragement of reduction of pressure in the balance of payments, achieving favorable exchange rate stability and the promotion of macroeconomic and financial sector stability in the country (Ajayi, Oladipo, Ajayi, and Nwanji, 2017). Buttressing further, Effiong (2020) added that the role of interest rate in the real sector of the economy is connected to its impact on investments, in order words its influence on industrial development.

2.2 Theoretical Review

2.2.1 Neo-Classical loanable fund theory of Interest Rate

The basic tenet of the loanable fund theory as developed by Dennis H. Robertson, Piguo and other neoclassicists' hold that the determination of the rate of interest is enforced by the demand for and supply of loanable funds. In their perspective, the demand for loanable funds emanate from the constituencies of government and its agencies, businessmen, and the consumers who demand for them for the purposes of public works, investment, purchase of industrial equipment, hoarding, and consumption. The supply on the other hand arises from the constituencies of private individuals, corporate bodies including banks from their respective savings, dishoarding of idle balance and bank credit i.e net addition from new money. The borrowing of the loanable funds is interest elastic hence, lower rate of interest offers higher chances of borrowing than higher rates (Jhingan, 1997). However, the lower the rate of interest, the lower the inducement to save, vice

versa. It is therefore, the interaction of the demand for loanable funds and the supply of loanable funds that will determine the rate of interest.

2.2.2 Keynesian Liquidity Preference Theory

This theory as pioneered by John Maynard Keynes's classified interest rate as monetary phenomenon that stands as the price for parting with liquidity for a specified period of time. Because it is the role of the monetary authorities to determine the quantity of money available in the economy per period, its supply is said to be perfectly inelastic. To create liquidity, the monetary authorities will have to raise the rate of interest to induce the holders to part with money and other liquid assets which implies increasing money supply that will promote investment vis-a-vis industrial development. Keynes pointed out that where low rate of interest is offered, the fund holders will increase the demand to hold or trap liquidity for common reasons of; transaction, precautionary and speculative chances. In a simple term, "the fund suppliers will continue to have preference for liquidity as long as rate of interest remains low". The rate of interest therefore could be said to be determined at that rate that induce fund holders to free up liquidity up to the recommended quantity as fixed by the monetary authorities.

2.3 Empirical Review

Finance, economics and market oriented scholars have over the years carried out studies to establish a common point on the impact of interest rate on industrial development and other related areas in Nigeria and other countries, some of the studies are here reviewed.

Owolabi and Adegbite (2014) examined the impact of monetary policy on industrial growth in Nigerian making use of secondary data sourced from central bank of Nigeria statistical bulletin for the period of 1970 to 2010. The study used monetary policy tools as treasury bills, deposit and lending rates, and rediscount rate as explanatory variables regressed on manufacturing output as a proxy for industrial development. Employing multiple regression analytical, they found Treasury Bills, Deposit & leading and Rediscount Rate were all found to have significant effects on the industrial Growth with the Adjusted R^2 of 81.56% and concluded that Rediscount Rate, and Deposit have significant positive effect on industrial output but Treasury Bills has negative impact on industrial output. They recommended that government should develop the industrial sectors of the economy through its capital expenditure.

Davis and Emerenini (2015) investigated the Impact of Interest rate on Investment in Nigeria. The study obtained secondary data from the central bank of Nigeria statistical bulletin for period of 1986 to 2012. Interest rate, inflation rate, and exchange rate were regressed on capital formation as proxy for investment. Augmented Dickey Fuller (ADF), Johansen co-integration and Error Correction Model statistical technics were used. It was found that long run equilibrium exists in the model. Interest rate and exchange rate had insignificant inverse effect while inflation had insignificant positive effect on investment. The model had 40.90% speed of adjustment to equilibrium annually. In line with the findings, the study recommended among others that relevant monetary authority should evolve policies that will encourage savings and reduce prime lending

rate to genuine investors, consider economic policies that will increase income level of the people in order to mobilize investment.

Ajayi, Oladipo, Ajayi, and Nwanji (2017) studied the effect of interest rate on Economic Growth in Nigeria for the period of 1980 to 2012. Secondary data were obtained from the central bank of Nigeria statistical bulletin of various years. The study adopted multiple regression technic and Error-Correction Mechanism to test for long run relationships among the saving deposit, real interest rate and inflation. The result found that savings deposit had significant positive effect while real interest rate and inflation had insignificant negative effect on economic growth. The co-integration rank test confirmed the existence of long run relationship between interest rate and economic growth and ECM was found negative and significant with 25.64% speed of adjustment. Further test of Granger causality indicates that there is a causal relationship between saving deposit and GDP and a unidirectional relationship exists between saving deposit and GDP. The study recommended that policies which would boost the saving accumulation in Nigeria that will increase Capital Formation are necessary for economic growth.

Nwokoro (2017) studied the impact of Foreign Exchange and Interest Rates variations on the Nigeria‟s manufacturing Output. The research employed a time-series secondary data from the Central Bank of Nigeria‟s statistical bulletin (various editions of annual reports) as well as Federal Bureau of statistics covering period 1983 to 2014. The study used the Ordinary Least Square (OLS), co-integration, together with Error Correction Modelling and found that the entire variables were stationary at first difference and there also exists long run relationships in the model. Interest Rates (INTR) had insignificant negative impact; Foreign Exchange Rate (FREX) had significant negative impact while Capacity Utilization, Government Expenditure on Manufacturing Sector, and Investment in Industrial Production were significant positive contributors. The model had 15.47% speed of adjustment to equilibrium. It concluded that the Nigerian manufacturing sector is still faced with the problem of poor funding as a result of high interest rates and this have forced manufacturers to resort to informal and even illegal forms of borrowing or acquiring funds. It therefore recommended among others, the implementation of more realizable monetary and fiscal policies that will be targeted at reducing interest rate on loans to the manufacturing sector.

Ozigbu (2018) analyzed the long-term implication of interest rate deregulation on the productivity of the industrial sector in Nigeria. The study culled secondary data from the Central Bank of Nigeria Statistical Bulletin ranging 1987 to 2016. The Augmented Dickey-Fuller (ADF) stationarity test approach and the Autoregressive Distributive Lag (ARDL) based bounds test approach to cointegration were applied to test the null hypotheses of a unit root and no long run relationship respectively. The ADF tests results showed that variables are integrated at missed order. The bounds test result also indicated that the variables shared long run relationship, The long run regression result shows that at 10 percent level, prime lending is positively related to industrial output. It was equally uncovered from the result that monetary policy rate negatively impacted on industrial output at 5 percent level. the deposit rate contracts the productivity of the industrial sector in the long run. The paper therefore recommended among others that the Central Bank of Nigeria should ensure that interest rate deregulation is frequently monitored

and primarily tailored towards ensuring that the prevailing market rate of interest provides opportunity for improved performance of the industrial sector.

Ezeaku, Ibe, Ugwuanyi, Modebe, and Agbaeze (2018) examined the industry effects of monetary policy transmission channels in Nigeria gathering secondary time series from the Central Bank of Nigeria (CBN) Statistical bulletins for various years, covering the period 1981-2014. Analytical techniques employed were Johansen cointegration and error correction model (ECM). Our regression estimates reveal that the private sector credit, interest rate, and exchange rate channels have negative effects on real output growth, both in the long run and in the short run. The results further show that, relatively, the degrees of the established effects are higher in the long run than in the short run. It was also found that, monetary policy transmission channels jointly have a long-run relationship with real output growth of the industrial sector, and disequilibrium in the system is corrected at the speed of 72.2% annually. They recommended therefore, that credit should be made available to the productive sectors of the economy at a competitive rate with adequate monitoring.

Idiris (2019) evaluated the impact of interest rate on economic growth in Nigeria using annual time series data from the archive of Central Bank of Nigeria and the national account data of World Bank spanning 1980 to 2017. The Vector Autoregression (VAR) model and the Granger causality test were employed to estimate the model coefficients and measure the causal relationship among the concerned variables. The findings revealed existence of negative relationship between interest rate and economic growth in Nigeria. The recommendation held that monetary authorities should designed and implement interest rate policies that enhance investment and take into cognisance other elements that retard investment progression.

Effiong (2020) assessed the effect of interest rate on real sector output growth in Nigeria using secondary time series covering the period 1985 to 2019 sourced from the World Bank Database on World Development Indicators and the Central Bank of Nigeria 2019 Statistical Bulletin. The analytical methods used were Augmented Dickey-Fuller unit root test, Co-integration, and the Error Correction Mechanism. The stationarity test indicated that the variables were stationary at mixed order of levels 1(0), and first difference 1(1) necessitating the use of Auto-regressive Distributive Lag (ARDL) model to test for co-integration. The co-integration test supported the existence of a long run equilibrium relationship between interest rate and real sector output growth. Also, interest rate was observed to exert a negative and significant effect on real sector growth. The error correction term showed that 59.9% of the short run disequilibrium in real sector output growth is corrected annually. The study recommended that monetary authorities should promote cheap policy that will keep interest rate at a favourable level so as to encourage investors to borrow.

George-Anokwuru and Itoro (2020) evaluated the effect of interest rate on industrial sector in Nigeria. Data for the study were sourced from Central Bank of Nigeria statistical bulletin of various issues for period of 1980 to 2018 and analysed using Autoregressive Distributed Lag model. The findings revealed the existence of long run relationship among the variables. A positive relationship between interest rate and industrial output both in the long run and short run was

found. The rate of inflation was negatively related to industrial output but the relationship was not significant in both the short run and the long run. The number of labour force had significant positive effect in both the short run and the long run. Gross investment had a positive relationship with industrial output but the relationship was not significant. Foreign direct investment was not significant in affecting industrial output in the short run but it was positive and significant in the long run. The model was found to adjust to equilibrium at a speed of 60.58% annually. The study concluded that interest rate has the ability to influence industry output in Nigeria and recommended among others that the apex monetary institution should ensure that the rate of interest that will encourage investors to borrow in order to start to do businesses or to expand their businesses by so doing, increasing industrial output that supports economic growth in Nigeria.

The available empirical studies on interest rate effect in Nigeria have largely been lumped on economic growth, with non or insignificant studies on disaggregated sectors as the industrial sector. To this effect, there is, however, dearth of literature to explain the industrial development response, from a disaggregated point of view to interest rate in Nigeria. The few studies on interest rate and industrial development in Nigeria include George-Anokwuru and Itoro (2020) whose studies found that interest rate has significant positive impact on industrial productivity. Davis and Emerenini (2015) and Nwokoro (2017) found that interest rate has insignificant negative impact on investment and manufacturing respectively. These findings prove that there is still divergent opinion on its position in Nigeria thereby creating a gap and making it an ongoing debate. This study employs Bank Credit to the industrial sector (BCIND) as a fresh variable that has not been employed in the model of previous studies.

METHODOLOGY

3.1 Research Design
The research is designed in experimental form in which existing data were deployed to analyze the relationship between interest rate and industrial development in Nigeria.

3.2 Source of Data
The time series data were sourced from the Central Bank of Nigeria 2021 Statistical Bulletin.

3.3 Model specification
GDPIND = f (IR, BCIND, EXR, SD/GDP, GFCF, INFR) ………………………………..(1)
And the model equation becomes;
$GDPIND_t = IR_t + BCIND_t + EXR_t + SD/GDP_t + GFCF_t + INFR_t + \varepsilon_t$ ……………………(2)
The above equation is log linearized to bring them to common unit as presented
$LogGDPIND_t = LogIR_t + LogBCIND_t + LogEXR_t + LogSD/GDP_t + LogGFCF_t + LogINFR_t$..(3)
Where, LogGDPIND= Log of Industrial Development; LogIR= Log of Interest Rate; LogINFR= Log of Inflation Rate; LogEXR= Log of Exchange Rate; LogGFCF= Log of Gross Fixed Capital Formation; LogSD/GDP= Log of Savings Deposit to Gross Domestic Product ratio; LogBCIND = Log of Bank Credit to industrial sector.

3.4 Analytical Method

The Augmented Dickey Fuller (ADF) was used to test for Unit Root on the time series to ascertain their stationarity status. The decision criterion states that time series of a variable is considered stationary if the absolute value of the F-statistic is greater than the 5% critical value otherwise it is not. Data is valid when stationary at order '0' or '1'. Johansen co-integration test was used to test for long run relationship of the model. A long relationship is established where the value of the trace statistic is greater than the 5% critical value. At least one co-integrating variable establish long run relationship of the model. The Ordinary Least Square Method was used to test for the model functional relationship. The result indicates the nature of relationship and significance level that each individual explanatory variable shares with the dependent variable. It also reveals the global status (joint effect) of the model.

PRESENTATION OF DATA, ANALYSES AND INTERPRETATIONS

4.1: Unit Root Test

The unit root test is conducted to evaluate the stationarity status of the data of the variables that are being studied. The test is conducted using Augmented Dickey Fuller test Schwarz info criterion under 5% level of significance. The Johansen co-integration method employed in the study observes strict rule of all variable being stationary at order one i.e 1(1), this shall be ascertained otherwise the method will be discarded for another technique.

Table 4.1: Unit Root Result

Variables	ADF statistics at 1st difference	Critical Values at 5%	P Value at order of integration	Order of integration
GDPIND	-4.479143	-2.951125	0.0011	1(1)
IR	-7.089119	-2.948404	0.0000	1(1)
INFR	-9.066839	-2.948404	0.0000	1(1)
GFCF	-4.390462	-2.948404	0.0014	1(1)
SD / GDP	-4.747069	-2.948404	0.0005	1(1)
BCIND	-3.079524	-2.948404	0.0374	1(1)
EXR	-5.469618	-2.948404	0.0001	1(1)

Source: Eviews 10 output, 2022.

The assessment of the stationarity standard based on the result of the unit root test as presented in table 4.1 shows that the variables were all evaluated at order one. In tune with the decision rule of the statistics, the absolute value of the Augmented Dickey Fuller (ADF) result for the variables under investigation are greater than the critical value at 5% level of significance at first difference. It is therefore affirmed that the variables are all 1(1) compliant, hence the analyses of the study using Johansen co-integration is considered valid.

4.2: Co-integration Test

This is a test of long run relationship between the regressand and the regressors.

Table 4.2: Johansen co-integration Test Result of the Model GDPIND= ƒ (IR, INFR, EXR, GFCF, SD, BCIND)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.753219	143.6372	125.6154	0.0025
At most 1	0.617549	94.66325	95.75366	0.0593
At most 2	0.442145	61.02285	69.81889	0.2053
At most 3	0.412651	40.59487	47.85613	0.2019
At most 4	0.327575	21.97008	29.79707	0.3001
At most 5	0.134344	8.079835	15.49471	0.4569
At most 6	0.082942	3.030457	3.841466	0.0817

Source: Eviews 10 output, 2022.

The Johansen test result as presented in table 4.2 shows that there is at least one co-integrating equation within the variables in the model on the bases that the trace statistics value of 143.6372 is greater than the critical value of 125.6154 at 5% level of significance. This result hence reveals the existence of co-integration (long run relationship) prompting the rejection of the null hypothesis and the conclusion that long run relationship exists between industrial development and interest rate in Nigeria.

Table 4.3 Vector Error Correction Estimates

Error Correction:	D(GDPIND)	D(IR)	D(BCIND)	D(EXR)	D(SD)	D(GFCF)	D(INFR)
Coint Eq1	-0.058467 (0.01939) [-3.01488]	0.022326 (0.03551) [0.62872]	0.020544 (0.04152) [0.49483]	0.059730 (0.03505) [1.70411]	0.068202 (0.01805) [3.77832]	-0.056417 (0.01528) [-3.69300]	0.098143 (0.13414) [0.73163]

Source: E-views 10 output 2022.

The co-integration or long-term equilibrium relationship established between industrial development and interest rate also implies that there might be disequilibrium in the short run. In order to bond the short-run behavior of industrial development to its long-run value, i.e finding out how the distortion in the short run is adjusted, the need for Error Correction Mechanism (ECM) arose. The result in table 4.4 shows ECM value of -0.058467 being negative and the probability value of 0.01939 being less than 5% is correctly signed and significant. The result holds that disequilibrium in industrial development in the short run is corrected at speed of 5.85% annually. This reflects convergence other than divergence.

4.3 Regression Result

This is the test of each variable's performance in the model in the short run having revealed long run relationship. This is done using Gauss-Newton / Marquardt steps least squares and the result is presented thus;

Table 4.4 Series Regression Analytical Result
Method: Least Squares (Gauss-Newton / Marquardt steps)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.049307	0.098710	0.499515	0.6211
C(2)	0.328855	0.060446	5.440442	0.0000
C(3)	-0.040164	0.067693	-0.593324	0.5574
C(4)	-0.174956	0.091614	-1.909718	0.0658
C(5)	0.767565	0.082326	9.323495	0.0000
C(6)	0.018655	0.024221	0.770178	0.4472
C(7)	0.301213	0.427927	0.703888	0.4869
R-squared	0.995555	Mean dependent var		7.952687
Adjusted R-squared	0.994666	S.D. dependent var		2.070597
S.E. of regression	0.151228	Akaike info criterion		-0.771393
Sum squared resid	0.686101	Schwarz criterion		-0.466625
Log likelihood	21.27077	Hannan-Quinn criter.		-0.663948
F-statistic	1119.801	Durbin-Watson stat		1.318012
Prob(F-statistic)	0.000000			

Source: E-views output 2022.

The regression equation from the result in table 4.4 is therefore presented as;

GDPIND= 0.3012 + 0.0493IR + 0.3289BCIND- 0.0402EXR - 0.1750TSD/GDP + 0.7676GFCF+ 0.0187INF

This equation reveals the functioning of the model. On autonomous bases, industrial development stands at 0.3012 units. Interest rate is positively related to industrial development exerting 0.0493 unit effect in the model at each unit change in the same direction. Bank credit to the industrial sector also has positive effect in the model of which a unit shift in bank credit injects 0.3289 units change on industrial development in the same direction. Exchange rate brandished as a negative contributor to the model reducing industrial development by 0.0402 units for every unit increase vice versa. The ratio of total savings to gross domestic product is also inverse contributor to the model causing 0.1750 units decrease industrial development for each unit increase vice versa. Gross fixed capital formation and Inflation rate are found as positive contributors to the model giving 0.7676 units and 0.0187 units direct effect respectively to the model for each unit change.

The explanatory power of the model as indicated in the coefficient of determination (R^2) adjusted being 0.994666 shows that 99.47% of systematic variation in the dependent variable is explained by changes in the independent variables in the model. The global statistic value of 1119.80 with probability value of 0.0000 portrays that the entire regression model is strong. These results are adjudged a good fit.

4.4: Test of Hypotheses

To achieve the objective of the study, the following hypotheses are formulated and tested using the t-statistic and probability value results in table 4.4.

Ho1: There is no significant relationship between interest rate and industrial development in Nigeria

Given interest rate probability value of 0.6211 which is higher than 0.05 critical value, the null hypothesis is accepted and the conclusion is drawn that there is no significant relationship between interest rate and industrial development in Nigeria. The t-value indicates that interest rate shares positive relationship with industrial development and individually changes it by 0.499515 units in each singular movement in the same direction. The implication of the positive relationship is that interest rate has encouraged industrial development in Nigeria. This result is consistent with the finding of George-Anokwuru and Itoro (2020).

Ho2: Bank credit to the industrial sector does not impact significantly on industrial development in Nigeria.

The value of the t-statistics shows that bank credit to the industrial sector impacts positively on industrial development at 5.440442 units per shift. And the probability value of 0.0000 being less than 0.05 critical value implies the rejection of the null hypothesis with the conclusion that Bank credit to the industrial sector impact significantly on industrial development in Nigeria.

Ho3: There is no significant relationship between exchange rate and industrial development in Nigeria

The result of the t-value of -0.593324 indicates that exchange rate has inverse relationship with industrial development. However, the P-value of 0.5574 units is greater than 0.05 informs that the null hypothesis is accepted and the conclusion be drawn that the relationship between exchange rate and industrial development in Nigeria has been insignificant. This outcome agrees with Davis and Emerenini (2015) and Nwokoro (2017).

Ho4: Gross fixed capital formation does not impact significantly on industrial development in Nigeria.

The t-value of 9.3235 implies that gross fixed capital formation shares positive relationship with industrial development in Nigeria. This nature of relationship aligns with George-Anokwuru and Itoro (2020). This result holds that on singular action, gross fixed capital formation improves industrial development by 9.3235 units for every unit increase and vice versa. The P-value of 0.0000 indicates that the established relationship is significant at 5% therefore prompting

the rejection of the null hypothesis and the conclusion that gross fixed capital formation significantly impact on industrial   development   in Nigeria.

4.5: Post Estimation Confirmatory Test

This consists of number of statistical examinations on the properties of the time series of the variables used in the analyses to guarantee their validity, such that policy decisions drawn from the results will not be spurious. .

Table 4.5: Diagnostic Result

Normality Test	Jacque Bera Joint Chi-sq	P-value	Remark
	0.461282	0.794024	Normally Distributed
Serial Correlation	LRE* stat	P-value	No Serial Correlation
	24.44478	0.9987	
Heteroscedasticity Test	Chi-sq	P-value	No Heteroscedasticity
	457.3454	0.3698	

Source: E-views 10 Output 2022.

The result on table 4.5 houses the outcome of the tests. The Normality result shows Jacque-Bera joint chi-square stands at 0.461282 with P-value of 0.794024. Since the probability value is greater than 5% level of significant, the null hypothesis is accepted and it is concluded that the residuals are multivariate normal. On the serial correlation, the statistic value of 24.44478 with associated probability value of 0.9987 being higher than 5% significant level indicates that the model is free from serial correlation. Also, from the hecteroscedasticity test the chi-square of 457.3454 has probability value of 0.3698 which is greater than 5% significant level, this leads to acceptance of the null hypothesis and conclude that the residuals of our model have constant variance. This implies presence of homoscedasticity and absence of heteroscedasticity in the model.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This research specifically focused on empirical evaluation of the relationship between interest rate and industrial sector development in Nigeria for the period 1985 to 2021. The study made use of secondary data retrieved from several issues of Central Bank of Nigeria (CBN) Statistical Bulletin. The method of data analyses for this work was Johansen co-integration and Gauss-Newton / Marquardt steps least squares techniques. The researcher employed one of the latest analytical tools been Econometric-views 10. Summarily, the findings are enunciated thus;

1. The research demonstrated existence of long run relationship between interest rate and industrial sector development in Nigeria within the period of the study.
2. The short run behaviour of the model evidenced that;

i.   Interest rate has insignificant positive relationship with industrial development in Nigeria.
ii. Bank credit to the industrial sector is a significant positive contributor to industrial development in Nigeria.
iii. Exchange rate is an insignificant negative contributor to industrial development in Nigeria.
iv. Gross fixed capital formation shares significant positive relationship with industrial development in Nigeria.

3. The short run disequilibrium disturbance adjusts to equilibrium in the long run at a speed of 5.85% annually.

5.2 Conclusion

The findings of this research provide enough evidence to conclude that interest rate and industrial sector development in Nigeria are co-integrated; and the nature of interest rate impact on industrial development in Nigeria is positively insignificant. Interest rate policy has remained a veritable macroeconomic policy tool in inducing real sector performance in Nigeria.

5.3 Recommendations

On the bases of the findings of the study, its conclusion and the resulting policy implications, the following recommendations are therefore drawn;

1. The Central Bank of Nigeria as the country's financial regulatory authority through the Monetary Policy Committee, should proffer a moderate rate of interest (MPR) that will be good enough to simultaneously mobilise more funds and permit the industrial sector access to the funds.
2. The overall macroeconomic policy programs of stimulating the productivity of the industrial sector should incorporate interest rate policy.
3. Policy measures that will grow gross fixed capital formation and bank credit to the industrial sector and reduce exchange rate should be encouraged.

5.4 Contribution to Knowledge

This study has fashioned the latest position on the enquiry about the nature and extent of relationship between interest rate and industrial development in Nigeria. The study's unique contribution to knowledge holds that "*Interest rate and industrial development shares long run relationship in Nigeria*". ***"Interest rate has positive insignificant effect on industrial development in Nigeria". "Bank credit to industrial sector in Nigeria has significant positive impact"***.

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