Gusau Journal of Economics and Development Studies (GUJEDS), Vol 4 (1), December, 2023
ISSN: 3027-1126 (Online); 2786-9695 (Online)
©Authors
DOI: https://doi.org/10.57233/gujeds.v4i1.12

EFFECTS OF EXCHANGE AND INTEREST RATES ON MANUFACTURING SECTOR PERFORMANCE IN NIGERIA: ARCH AND GARCH APPROACH

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ABSTRACT

This study evaluates the effects of exchange, and interest rates on manufacturing sector performance in Nigeria. The data were sourced from the World Bank's World Development Indicators (WDI) and the Statistical Bulletin of the Central Bank of Nigeria (CBN) for the analysis. The unit root test was performed on the formulated model using the Augmented Dickey Fuller (ADF) method. The log of manufacturing sector contribution to GDP (MUFQ), exchange rate (LEXR), inflation rate (LIFR), and bank size (LBKS) were integrated at order zero I(0) while and the log of interest rate spread (LIRS). was stationary at order one I(1), as shown by the Augmented Dickey Fuller unit root test. In order to determine whether there is a long-run relationship between interest rate, exchange rate, and inflation, a bound test was conducted using the Auto-regressive Distributive Lag (ARDL) model. High volatility in exchange and interest rates have a positive effect on manufacturing sector performance, as shown by the results of the Auto-regressive Distributive Lag (ARDL) bound test, and the results from Arch and Garch corroborate these findings. Auto-regressive Distributive Lag (ARDL) results indicated a positive and statistically significant relationship between the exchange rate and the performance of the manufacturing sector over time at 0.05 level. However, bank size revealed a positive but insignificant relationship with manufacturing sector performance in the short-run, while the coefficient of interest rate spread and inflation rate were both negative and significantly influenced manufacturing sector performance in the current year period. The paper concludes that Nigeria's manufacturing sector is strongly correlated with the country's exchange and interest rates. The study recommended amongst others that as a result of too much dependence on oil, the federal government should peg the local currency rate and mandate the deposit money banks through the Central bank of Nigeria (CBN) to maintain a single digit interest rate. This would boost investors' confidence on the Nigerian economy as well as the financial system while efforts should be taken to diversify the economy to ease the pressure from the local currency.

Keywords: Bank Size, Exchange Rate, Interest Rate, Inflation Rate, Manufacturing Sector Performance.

1.0 Introduction

The manufacturing sector plays a crucial role in the overall development of a country's economy. Like other industrial operations, it creates numerous employment opportunities not only provide a source of income but also contribute to the overall growth and stability of the countries labour market. Additionally, manufacturing sector has a significant impact on supporting agriculture. Many manufacturing sector requires raw materials sourced from agriculture, which helps to strengthen the agricultural sector and improve its productivity. Furthermore, manufacturing sector also plays a vital role in diversifying the economy. By promoting the establishment of various manufacturing sectors a country can create a more balanced and resilient economy. The diversification helps to mitigate risks associated with fluctuations in specific industries and ensures sustainable economic growth.

Businesses that use mechanical, physical, or chemical means to change raw materials, substances, or components into finished goods are classified as part of the manufacturing industry. Workers in the manufacturing industry engage in operations such as production planning and control, maintenance, and manufacturing process engineering, among other relevant professional and technical support activities. Afangideh (2010) observed, manufacturing sub-sector is the centre of the economy, which encompasses processing, quarrying, craft and mining. Manufacturing sector has to deal with the conversion of raw materials into completed consumer products or intermediate or producer goods. It helps raise a country's exports and foreign currency while also creating new job opportunities and bolstering agriculture**.**

More so, manufacturing sector contributes to increasing a country's foreign exchange reserves. Through exports of manufactured goods, a country can earn valuable foreign currency that can be used to finance imports or pay off debt obligation. This increase in foreign exchange reserves strengthens the country's overall financial position and enhances its ability to engage in international trade. Conclusively, the manufacturing sector plays a critical role in helping local labour develop skills. As manufacturing sector require specialized knowledge and technical expertise, they provide opportunities to individuals to acquire new skills and improve their employability. This skills development is essential for the long-term growth and competitiveness of the labour force. Overall, manufactory sector have far-reaching positive impact on employment, agriculture, economic diversification, and skill development, making it an integral part of a country's economic development strategy. However, it is imperative to note that, growth of the manufacturing sector in Nigeria has been limited by constant shift in both exchange and interest rate. These macroeconomic indicators has adversely affected the manufacturing sector.

Exchange rate shift in the context of this paper refers to the fluctuations in the value of currencies in relation to each other. These changes can occur due to various factors such as market forces, official devaluation or

revaluation of currencies or any other cause. When there is a shift in exchange rate, it directly impacts the prices of imported goods and also affects domestic products that rely on imported parts and raw materials. Exports will become more costly and imports will become cheaper, for instance, if there is a positive shock to the exchange rate of a native currency in the products market. As a result, foreign manufacturers may become more of a threat. Nyahokwe and Ncwadi (2013) state that the degree of uncertainty or risk related to the size of fluctuations in a currency's exchange rate is referred to as an exchange rate shift**.** This shift occurs when the value of a particular series experiences rapid and unpredictable changes. It is important to note that one significant factor contributing to exchange rate shifts is the interest rate. An interest rate shift implies a fluctuating annual interest rate that remains equal to the prime rate at all times. These shifts in interest rates can be attributed to changes in the supply and demand for bonds. For instance, it the supply of bonds decreases, bond prices increase, resulting in an equilibrium shift. When the demand for bonds decreases, it has a direct impact on both prices and quantity. This decreases in demand leads to a decrease in the quantity of bonds being purchased and sold. On the other hand when interest rate increases, loans becomes more expensive for both businesses and consumers. This increase in interest rates results in everyone having to spend more on interest payments, which can have a significant impact on their budgets and overall spending. According to Soyibo and Adekanyo (1992), the interest rate shift refers to the differences between the income earned by banks or credit union from loans and investments, and the interest or dividends they pay to their depositors. This shift in exchange and interest rates can have far reaching consequences for the manufacturing sector and economy as a whole.

For instance, in the past five years, interest rate spread has been reported to be highly unstable. In 2018, interest rate spread stood at 7.2% but declined to 6.5% in 2019 and immediately moved-up to 9% in 2020. The value of interest rate spread experienced a marginal decline from 7.3% in 2021 to 6.4% in 2022. Correspondingly, the countries inflation rate has been on a rise and stood at 12.1% in 2018 but slightly slope-down to 11.4% in 2019 and instantaneously upsurge to 133.2 in 2020, 17% in 2021 and 18.8% in 2022. This scenario is believed to be occasioned by continuous depreciation of local currency compared to the dollar which has since raised from 306.08 US$ in 2018 to 306.92 US$ in 2019. Subsequent years between 2020 and 2022 saw the local rate further slide down to 358.81 US$ in 2020 to 401.14 US$ and 425.98 US$ in 2021 and 2022 (WDI, 2022).

Based on this ugly trend, it is expected that the manufacturing sector performance will slope-down, but surprisingly, manufacturing sector contribution to gross domestic product as a proxy for manufacturing sector performance continue to increase in the past five years. For instance, in 2018, the value of manufacturing sector performance was ₦12455.53 billon but increased to ₦16781.06 billion in 2019. Also, the figure of the manufacturing sector performance increased to ₦19539.55, billion, ₦25725.78 billion and ₦27508.52 within 2020, 20221 and 2022 (CBN, 2022). Therefore, the goals of this paper are to investigate whether or not larger banks have had a positive impact on

industrial output. Does a change in the value of the currency affect how well factories do? How much of an effect does the difference between interest rates have on factory output? What role does inflation have in the success of the manufacturing sector? To this purpose, this work added to the body of knowledge by experimentally examining the influence of exchange and interest rate shift on manufacturing sector performance in Nigeria from 1981 to 2022, therefore broadening the scope of the study from what has been done in time past. Following this introductory portion, section 2 provides a short overview of the theoretical and empirical literature, and section 3 conclude the study. Methods, including the definitions of study variables, were be discussed Section 3, while the findings were presented in Section 4. In the last section, conclusion, policy implications and suggestions.

2.0 Literature Review

Changes in interest and currency rates have been the subject of several empirical research showing a positive correlation with expansion in the manufacturing sector. However, such studies' results were contradictory at times. Omolola et al. (2023) studied the impact of currency devaluation on the Nigerian manufacturing sector from 1990 to 2020. The Central Bank of Nigeria Statistical Bulletin and the World Development Indicators both provided us with annual time series data. The research relied on an autoregressive distributed lag (ARDL) model, with optimum estimates of the co-integrating regression supplied by its long and short run variants. Production Capacity Utilisation (PCU), Exports (EXP), Imports of Raw Materials (IMP), Exchange Rate Fluctuations (EXRF), Exchange Rate (EXCR), Interest Rate (INT), and Inflation Rate (INFR) were the model's explanatory variables. A long-term connection between the variables was found using the ARDL model, and both (EXRF) and (IMP) were shown to have a negative impact on manufacturing production in Nigeria. On the other hand, MACU was significantly positively related to MGDP. There was a substantial inverse association between MGDP and EXRF, IMP, INT, and INFR during the short term.

Nwafor (2022) analyses the effect of interest rate spread and exchange rate volatility on industrial production in Nigeria using time series data from 1981-2020. The estimated regression model used manufacturing output (MQ) as the dependent variable, with the following explanatory variables: exchange rate (EXCHT), interest rate spread (IRS), inflation (INF), FDI, credit to private sector (CPS), and government capital expenditure (GCAP). In order to alleviate the issue of stationarity and structural breakdowns connected with the time series data, the model was recorded. The findings showed that there is a negative correlation between FDI and manufacturing output, and that this correlation is statistically significant. Government capital spending is shown to be significantly correlated with capital creation, albeit in a negative way. Using annual time-series data, Osazevbaru (2021) confirmed the presence of the long-term relationship between interest and exchange rates volatility and SMEs' performance by conducting a unit root test, an Autoregressive Distributed Lag (ARDL) bound test for cointegration, and an ARCH regression model for the period 1981-2018. The ARCH regression model also found that SMEs benefited from fluctuations in currency and interest rates. However, only fluctuations in exchange rates were statistically significant.

Onwuka (2021) used the ARCH/GARCH and Autoregressive Distributed Lag (ARDL)

Model to analyse the effects of exchange rate volatility on the productivity of Nigeria's manufacturing sector from 1981 to 2020. The ARCH/GARCH model's positive and statistically significant at the 1% level coefficients provide more evidence of the substantial volatility of exchange rates. The findings of the ARDL reveal that in the long term, the manufacturing sector is affected positively by import and gross capital creation and negatively by exchange rate volatility, interest rate, and inflation rate. Import and inflation were shown to have little effect on manufacturing performance, however exchange rate volatility, gross capital creation, and interest rate did. The results also demonstrate that the manufacturing sector in Nigeria is adversely and strongly connected to exchange rate volatility in the near term. Accordingly, Nura (2020) uses yearly data from CBN, NBS, and Index Mundi Nigeria to analyse the effects of changes in the Exchange Rate on manufacturing performance in Nigeria over a 37-year period (from 1981 to 2018). The analysis was conducted using an ARDL strategy. From the estimated variables' coefficients, the long-run relationship analysis, and the causal relationship between the dependent and independent variables, it is clear that exchange rate volatility has had a negative impact on the performance of the Nigerian manufacturing sector.

Furthermore, Irene et al. (2020) use time series data from 1981-2019 to draw conclusions. investigates how fluctuations in the value of the naira affect the country's industrial sector. The vector autoregressive (VAR) model was used to analyse the data in the research. Exchange rate volatility persistence was identified and series of volatility were extracted using the GARCH (1, 1) model. Exchange rate volatility's effect on industry output was estimated using the VAR model. Exchange rates are subject to continuous volatility, as seen by the GARCH (1,1) estimates. Production in the manufacturing sector was broken down into two categories, oil-related and non-oil related. VAR estimate findings demonstrate that fluctuations in the value of the naira have a detrimental impact on industrial production in Nigeria. Sylvester (2020) used secondary data from 1980 to 2019 to analyse how interest rate changes affected the performance of Nigeria's manufacturing-sub sector. This finding demonstrates how Nigeria's high interest rate has impacted the country's industrial sector The GARCH and ARCH result suggest that interest rate dynamics has affected the performance of the manufacturing sub- sector. Long-term correlation between the variables is further confirmed by the findings.

Ojeyinka (2019) analysed the impact of fluctuating currency rates on Nigeria's manufacturing sector's performance from 1981 to 2016. The World Bank's World Development Indicators and the Statistical Bulletin of the Central Bank of Nigeria provided the annual data used in this analysis. The research concluded that there is a positive and considerable long-term effect of exchange rate volatility on the performance of the manufacturing sector. The research also indicated that the exchange rate has a positive but insignificant long-term effect on manufacturing sector production, while having a negative and considerable short-term effect. The manufacturing sector's performance is negatively impacted by imports in both the short and long term. The impact of increased interest rates on the output of the Nigerian manufacturing sector is analysed by Idisi et al. (2019). The research includes data collected over a period of eighteen (18) years, from 2000 to 2017. The models were examined with the use of ordinary least squares. The study's findings indicate that a rise in Nigeria's interest rate

has a negative impact on the country's manufacturing sector. Based on these results, the research suggests that the Nigerian government should work to improve infrastructure facilities, especially electricity and maybe rail transportation, to decrease the high cost of manufacturing in addition to attempting to regulate interest rate for increased economic development.

The effects of currency rate deregulation on Nigeria's industrial production performance from 1980 to 2016 were studied by Tams-Alasia et al. (2018). Exchange rate and industrial production were examined for a long-term link using the normalised cointegration method, and the direction of causality was determined using the Granger causality test. The rate at which the model returns to equilibrium after a brief departure from it was also determined using the error correction mechanism (ECM). The empirical results showed that the exchange rate has a favourable long-run influence on manufacturing output, although the effect is not statistically significant. However, the paired granger causality test demonstrated that the exchange rate has a causal influence on manufacturing output, but only in one direction. In addition, Olabode (2018) inestigates at how changes in the foreign currency rate affected Nigeria's manufacturing sector. Research was conducted from 1990 to 2016. Returns on equity (ROE) were employed as the dependent variable, with the real effective exchange rate, the parallel exchange rate, interest rates, inflation, and money supply serving as the independent variables. All of the investigated independent variables were shown to have statistically significant effects on the ROE of Nigerian manufacturers (p-values less than 5%).

Ogbu (2018) examined the relative effect of interest and currency rate variations on industrial production in Nigeria: 1986-2016 using secondary data. The results indicated that interest rate and currency rate changes had short term beneficial influence on the production of manufacturing sector in Nigeria. Manufacturing output in Nigeria is therefore a function of interest and currency rates. Anthonia and Taiwo (2017) analyse the impact of interest rate changes on Nigeria's manufacturing sector. The empirical findings showed that interest rates had a detrimental effect on value added and capacity utilisation in Nigeria's manufacturing sector. It was also shown that interest rate changes have a long-term effect on the productivity of Nigeria's industrial sector. In light of this, it was suggested that, rather than enacting short-term measures that are unsustainable to industrial development, regulatory authorities should make the most of this opportunity to design appropriate long-term policies that can enhance industrial expansion through the appropriate interest rate regime.

Several past studies were reviewed and extensive evaluation was conducted. As a consequence, the present research discourse discovered discomforting results from past studies. For instance, earlier studies on exchange and interest rate shift in relation to manufacturing sector performance conducted by; Omolola et al. (2023); Nwafor (2022); Onwuka (20221); Nura (2020); Irene et al. (2020); Sylvester (2020); Idisi et al. (2021); Olabode (2018); and Anthonia and Taiwo (2017), all agreed that exchange and interest rate shift had high volatility with manufacturing sector performance with such volatility leading to negative impact on manufacturing sector performance.

In contrast, Ojeyinka (2019); Tams-Alasia (2018); and Ogbu (2018), in their studies submited that the high volatility between exchange and interest rate with respect to

manufacturing sector performance is positive but does not have any significant impact. Importantly, it was found that previous research had used exchange rate, interest rate, and inflation rate as proxies for the explanatory variables, but had neglected to account for the fact that a larger bank would have more liquid and fixed assets, which would reduce interest rates and slow the exchange rate over the long run. Thus, a void in the canon existed that demanded to be addressed**.**

3.0 Methodology

This analysis examined how changes in currency and interest rates affected Nigeria's manufacturing sector using the Arch and Garch models as well as the Auto-regressive Distributive Lag (ARDL) model. Secondary time series data from the World Bank's World Development Indicators and the Central Bank of Nigeria's Statistical Bulletin were utilised in this analysis. The manufacturing sector's proportion of GDP is used as a proxy for manufacturing sector performance from 1981 to 2022, with the exchange rate, interest rate spread, inflation rate, and bank size serving as independent variables**.** Bank size was included in this paper as a control variable because the size of the bank determines its level of liquidity and asset base, and a bank with larger or high liquidity and asset base is more likely to meet investors obligation with affordable rate.

Model Specification

In order to achieve the objective of this paper, the model adopted for this study is derived from the previous study by Onwuka (2021) with modification. The functional form of the model is therefore specified as follows:

MAN =*f*(EXRVOL, INTR, IMPT, GCF INFL)

Where;

MAN = Manufacturing Sector Performance, EXTVOL =Exchange Rate, INTR, = Interest Rate, IMPT, = Import, GCF, = Gross Capital formation, INFL = Inflation Rate. The model was modified by introducing Bank Size (BKS), as new variable. The model is specified as follows:

Model One: Arch and Garch Model

Mean Equation

$MUFQ = f (C_1 + C_2 {}^{*}EXR + e$ …… 1

Variance Equation

$H_t = f (C_3 + C_4{*}H_{t-1} + C_5{*} + e^2_{t-1} + C_6{*}$ IRS + $C_7{*}$ IFR + $C_8{*}$ BKZ …….2

Model Two: Auto-Regressive Distributive Lag Model

MUFQ = f (EXR, IRS, IFR, BKS) n

The mathematical model could be symbolically expressed as;

$MUFQ=\beta_0+\beta_1 EXR+\beta_2 IRS+\beta_3 IFR+ \beta_4 BKS$ 3

Equation (2) above is transformed into an econometric model by incorporating the disturbance term (ε) as follows;

$MUFQ=\beta_0+\beta_1 EXR+\beta_2 IRS+\beta_3 IFR+ \beta_4 BKS + e$ 4

Logarithmic transformations are often used as a convenient approach for turning highly skewed data into a distribution that is comparable to normalcy (Kenneth, 2011). This is accomplished via the use of the natural logarithm.

$LMUFQ_t=\beta_0+\beta_{1+}LEXR_t+\beta 2LIRS_t+\beta 3LIFR_t + \beta 4LBKS_t + e$

Where,

MUFQ = Manufacturing Sector Share of GDP, EXR=Exchange Rate, IRS = Real Interest Spread, INF = Inflation, BKS = Bank Size.

The ARDL Methodology

The paper applied the autoregressive distributive lag model (ARDL) established by Pesaran, Shin and Smith (2001) to assess the connection between the variables. In order to conduct a test for a cointegration connection, the following model specification is used**:**

The Autoregressive Distributed Lag (ARDL) Model is specified as follows:

$\Delta LMUFQ_t = \beta_0 + \Delta LMUFQ_{t-1} + \Sigma\beta_{1t}\Delta LEXR_{t-1} + \Sigma\beta_{2t}\Delta IRS_{t-1} + \Sigma\beta_{3t}\Delta LIFR_{t-1} + \Sigma\beta_{4t}\Delta LBKS_{t-1} + \Delta LMUFQ_{t-1} + \Sigma\Phi_{1t}\Delta LEXR_{t-1} + \Sigma\Phi_{2t}\Delta LIRS_{t-1} + \Sigma\Phi_{3t}\Delta LIFR_{t-1} + \Sigma\Phi_{4t}\Delta LBKS_{t-1} + U_t$ …. ..5

In order to define the Autoregressive Distributed Lag (ARDL) Model, we have:

Cointegration is inferred if and only if the estimated F-statistics is larger than the upper limit critical value of 5%. Lower bound critical value for F-statistics is 5%, therefore if it's less than that, we can rule out cointegration. However, the inference is deemed inconclusive if the value of the estimated F-statistics falls anywhere between the higher and lower critical levels. The long-run model is calculated as required after the cointegration connection holds**:**

$\Delta LMUFQ_{t-1} + \Sigma\Phi 1t\Delta LEXR_{t-1} + \Sigma\Phi 2t\Delta LIRS_{t-1} + \Sigma\Phi_3t\Delta LIFR + \Sigma\Phi_4t\Delta LBKS_{t-1} + Ut$ …….. 6

Similarly, the short-run model of the error correction specification would be estimated to ascertain the short-run dynamic behaviour of the variables in the model as;

$\Delta LNUFQt = \beta 0 + \Delta LMUFQt\text{-}1 + \Sigma\beta 1t\Delta LEXRt\text{-}1 + \Sigma\beta 2tLIRSt\text{-}1 + \Sigma\beta 3t\Delta LIFRt\text{-}1 + \Sigma\beta 4t\Delta LBKSt\text{-}1 + ECTt\text{-}1 + Ut$ …… 7

Where the ECT in the above equation is specified as;

$ECTt = \Delta LMUFQt\text{-}1\ \beta 0 - \Delta LMUFQt\text{-}1 - \Sigma\beta 1t\Delta LEXRt\text{-}1 - \Sigma\beta 2t\Delta LIRSt\text{-}1 - \Sigma\beta 3t\Delta LIFRt\text{-}1 - \Sigma\beta 4t\Delta LBKSt\text{-}1$……8

Finally, the study diagnosed the model by conducting test for serial correlation, Ramsey reset test and heteroskedasticity.

Description of Variables in the Model

Manufacturing Sector Performance (MUFQ): The manufacturing sector performance refers to the metric that quantifies the efficiency and effectiveness of the manufacturing. The manufacturing sector performance is considered in this article as the dependent variable and will be quantified in billions of Naira**.**

Exchange Rate (EXR): Exchange rate is the price of one country's currency stated in terms of other currencies. It establishes the competitiveness of local products and the extent to which foreign companies participate in domestic commerce. The nominal exchange rate was used in this analysis. Nigeria's inflationary price level is represented by the nominal exchange rate, which is 1 US dollar for 1 Naira. The value of the US dollar as a trading partner is denoted by P, and the duration of the exchange is denoted by t. Theoretically, a rise in the exchange rate (EXR) should have a negative impact on the manufacturing industry's output. This finding suggests that there is a negative correlation between the

value of the currency and the success of the manufacturing sector

Interest Rate Spread (IRS): IRS refers to the difference in the interest rates charged and paid by commercial banks on loans made to private sector borrowers. Based on these findings, the cost of goods is expected to rise as fewer investors have access to deposit money bank lending facilities and interest rates rise. Therefore, there should be a negative correlation between the gap in interest rates and industrial output. The explanatory variable is stood in for by the interest rate spread**.**

Inflation Rate (IFR): When the cost of living, as a whole, increases steadily over time, we get inflation. Since a rise in the rate of inflation reduces the buying power of people, a negative correlation between inflation and monetary policy contrivance is anticipated. As a dependent variable, inflation is reported as percentage (%)

Bank Size (BKS): This represents the ownership of assets by deposit money banks. It is a metric for determining the total nominal volume of a bank's transactions. Therefore, it is hypothesised that deposit money institutions with a high ratio of assets to liabilities may provide a wider variety of low-cost financial services to their customers. Investors in the industrial sector, who may benefit from easier access to financing, will be drawn to this situation.

4.0 Results and Discusions

In order to prevent false regression, the researchers used the Augmented Dickey Fuller (ADF) unit root test to determine the proper order of integration for the variables under investigation**.**

Table 1: Unit Root Test Using Augmented Dickey Fuller (ADF)

Variables	Levels		First Difference		Order of Integration	P-value
	ADF Statistics	5% Critical Value	ADF Statistics	5% Critical Value		
LMUFQ	-0.875246	-2.867207	-3.577844	-2.867207	I(1)	0.0065
LEXR	-1.913894	-2.867066	-22.82710	-2.867078	I(1)	0.0000
LIRS	-3.204846	-2.867066			I(0)	0.0203
LIFR	-2.086338	-2.867066	-22.36298	-2.867078	I(1)	0.0000
LBKS	-1.776791	-2.867066	-22.36530	-2.867078	I(1)	0.0000

Source: Extracts from E-view 10. * Level of significance at 5%

Table 1 above shows the results of running Augmented Dickey Fuller (ADF) Tests on the study's variables to determine whether or not they are stationary series. The stationarity test findings demonstrate that LMUFQ, LEXR, LIFR and LBKS were stationary at starting difference 1, while LIRS, was stationary at level I(0). According to evaluations of the variables' stationarity in model one, they displayed a mixed order of integration or stationarity of level and first differences**.**

Co-integration Result

Table 2: ARDL Bound Test

Test Statistics	Value	K
F-statistics	6.162896	4

Significance	I (0)	I(1)
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source: Authors computation from E-view 10 Output

The comparison of the F-statistics with the critical bound values is shown in Table 2 as part of the bound test. The F-statistic was calculated to be 6.162896. The results showed that the F-statistic exceeds both the 2.86 and 4.01 threshold values at the 0.05 level of significance. Exchange rate, interest rate, Inflation rate, bank size, and industrial success in Nigeria are all intertwined to some extent. Consequently, the anticipated outcomes of the ARDL in both the long-run and short-run

Table 3 ARDL Long-run Result (Dependent Variable =MUFQ)

Variables	Coefficient	Std. Error	t-statistics	Prob
LEXR	1.165306	0.190015	6.132714	0.0000
LIRS	-0.165435	0.491006	-0.336929	0.7363
LIFR	0.829162	0.532195	1.558004	0.1199
LBKS	-0.551253	0.514891	-1.070622	0.2849
EC = LMUFQ - (1.1653*LEXR -0.1654*LIRS + 0.8292*LIFR -0.5513*LBKS)				

Source: Authors computation from E-view 10 Output

Log value of exchange rate (LEXR) and log value of manufacturing sector performance (LMUFQ) are positively correlated (+1.165306), as shown in Table.3of the long-run results of Autoregressive Distributive Lag (ARDL). If the exchange rate (EXR) goes up by one unit, manufacturing output (MUFQ) will increase by around 1.16 units, on average. Although the p-value for the correlation between the log of the exchange rate (LEXR) and the log of the performance of the manufacturing sector (LMUFQ) is 0.0000, this does not mean that the two are unrelated**.**

Moreso, the log value of interest rate spread (LIRS) reported a negative -0.165435 relationship with log value of manufacturing sector performance (LMUFQ). This means that a unit escalation in the log value of interest rate spread (LIRS) will lead to 0.16% decline the log value of manufacturing sector performance (MUFQ). However, the probability value of 0.7363 shows that there is no significant relationship between the log value of interest rate spread (LIRS) and log value of manufacturing sector performance (LMUFQ). Additionally, the log value of inflation rate (LIFR) revealed a positive +0.829162 relationship with the log value of manufacturing sector performance (LMUFQ). This implies that a unit rise in the log value of inflation rate (LIFR) will lead to an increase in the log value of manufacturing sector performance (LMUFQ) of about 0.82%. Though, the p-value of 0.1199 indicates that the log value of inflation rate (LIFR) is insignificant to influence log value of manufacturing sector performance (LMUFQ).

Finally, the ARDL long run result between the log value of bank size (LBKS and manufacturing sector performance (LMUFQ) discovered that the log value of bank size (LBKS) is negative -0.551253 with the log value of manufacturing sector performance (LMUFQ). This means that a unit intensification of the log value of bank size (LBKS) will weakening the log value of manufacturing sector performance (LMUFQ) to about 0.55%. However, the p-value of 0.2849 shows that bank size is statistically insignificant to influence the log value of manufacturing sector performance (LMUFQ).

Table 4 ARDL Short-run Result (Dependent Variable =MUFQ)

Variables	Coefficient	Std. Error	t-Statistics	Prob
C	0.044359	0.010036	4.420159	0.0000
D(LEXR)	0.174774	0.029027	6.021012	0.0000
D(LEXR(-1)	-0.023741	0.028953	-0.819972	0.4126
D(LEXR(-2)	-0.023741	0.028953	-0.819972	0.4126
D(LIRS)	-0.046044	0.020199	-2.279532	0.0231
D(LIRS(-1)	-0.002603	0.020168	-0.129069	0.8974
D(LIRS(-2)	-0.002603	0.020168	-0.129069	0.8974
D(LIFR)	0.039928	0.014488	2.755897	0.0061
D(LIFR(-1)	-0.005285	0.014559	-0.362975	0.7168
D(LIFR(-2)	-0.005285	0.014559	-0.369275	0.7168
D(LBKS)	0.007485	0.039571	-0.189148	0.8501
D(LBKS(-1)	0.005686	0.039593	0.143620	0.8859
D(LBKS(-2)	0.005686	0.039593	0.143620	0.8859
ECM(-1)	-0.012042	0.003647	-3.302269	0.0010
Adj R^2 =0.070360, F-statistics = 3.221568 (0.000016), DW =2.112385				

Source: Authors computation from E-view 10 Output

From table 4, the Auto-regressive Distributive Lag (ARDL) model yields a substantial and negative coefficient for the error-correction component. In other words, the importance is warranted by the negative sign. That is to argue that the ECM will be effective to remedy any deviations from the long-run equilibrium. The ECM coefficient of -0.012042 suggests that any historical divergence will be rectified in the current era at a rate of 1% on the way to long term equilibrium. The current value of MUFQ is therefore sensitive to changes in LEXR, LIRS, DIFR, and LBKS, but only slightly. The short-run ARDL findings show that Bo, the constant parameter, is greater than zero and equal to +0.044359. This implies that MUFQ, as a dependent variable, will increase by 0.04 percent on a yearly basis if all other factors remain same. The result for the logarithmic exchange rate coefficient (LEXR) is +0.174774. Therefore, at the present epoch, LEXR is connected favourably to MUFQ. This finding goes against my preconceived notions. The good news is that the positive finding indicates that a one-unit rise in the log value of exchange rate will result in a 0.17-percent increase in the log value of manufacturing sector performance (LMUFQ). Exchange rates are positively correlated with manufacturing sector performance as measured by the log of the LMUFQ index.

Additionally, throughout the current year, the log value of interest rate spread (LIRS) is -0.046044, which is negative. As a result, we may conclude that LIRS and LMUFQ are correlated negatively. Short-term, a 1% boost

in LIRS will result in a 4% drop in LMUFQ. This finding is both substantial and consistent with existing knowledge by Sylvester (2020). In addition, the LIFR log value is positive in the current year, coming in at +0.039928. This indicates that LIFR and LMUFQ are positively related. An immediate one-unit increase in LINFR will result in a 0.04% rise in LMUFQ. This finding goes against what one could have assumed beforehand, yet it is nonetheless important (Omolola et al, 2023). Finally, it was found that there was a positive relationship between the log value of bank size (LBKS) and the log value of manufacturing sector performance over the current, prior, and subsequent year periods. The correlation between LBKS and LMUFQ is favourable, although it is not statistically significant.

Coefficient of adjusted R^2 results recording 7% variance in the dependent variable further validated the magnitude of the association, suggesting there is a connection between the variables. Overall, the model's significance was shown by a probability value of 0.000016, indicating that the model is extremely important. The auto-correction issue in the series was shown to be nonexistent by the Durbin Watson of 2.112385. The complete data led to the fact that, there is a considerable influence of currency and interest rate on manufacturing sector performance in Nigeria**.**

Diagnostic Test

Table 5 Ramsey Reset, Serial Correlation LM and Homoscedasticity Tests Results

	F-Statistic	**Prob.Value**
Ramsey Reset Test	0.430851	0.5119
Breusch-Godfrey Serial Correlation LM Test	1.704080	0.1830
Breusch-Pagan-Godfrey Heteroskedasticity Test	1.743159	0.0621

Source: *Author's Computation using E-view 10*

Table 5 shows that the f-statistic (0.430851) from the linearity test of the Ramsey reset test is larger than the 5% (0.05) threshold value, indicating that the model is appropriately defined according to the diagnostic test. The analysis concluded that the alternative was more likely. The Linear Model of the Breusch-Godfrey Correlation, The f-statistic for the serial or autocorrelation test is 1.704080, whereas the Chi-Square probability value is 0.1830. The study proves there is no serial connection in the model by exceeding the significance level of 0.05 with a probability of around 2% (0.1830). The conclusion of the Breusch-Pegan-Godfrey test for heteroscedasticity indicates that the f-statistic is 1.743159 and the Chi-Square probability value is 0.0621. Due to the fact that the probability Chi-square value is more than 5% ($P > 0.05$), the outcome indicates that the model exhibits no heteroskedasticity. Because a constant variance is preferred in regression, we may conclude that residuals are homoscedastic.

Plot for Visualization

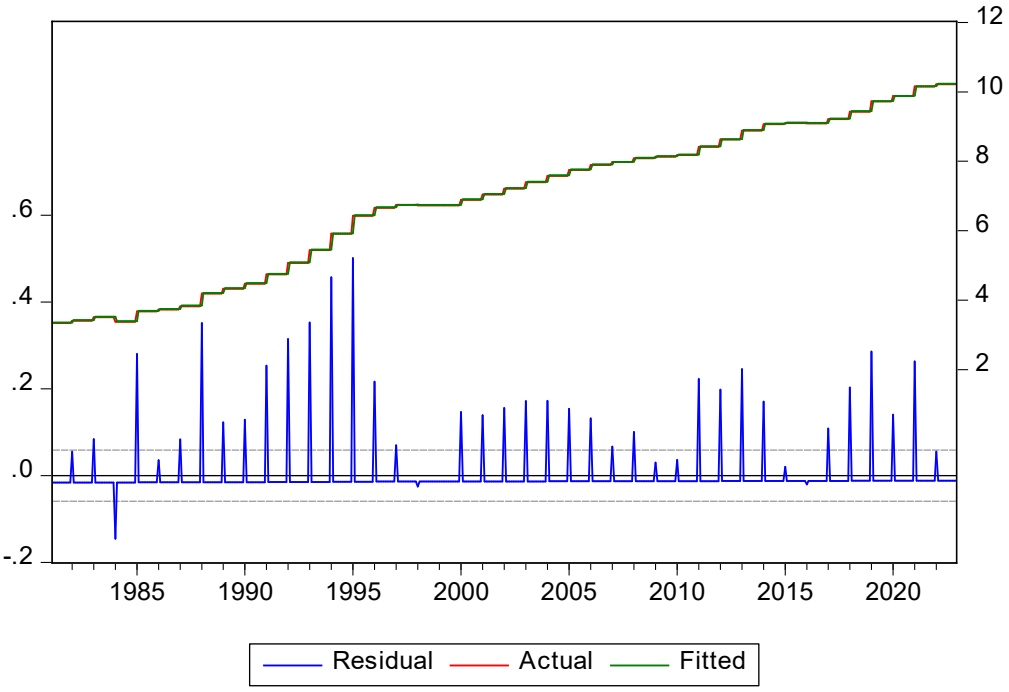


Figure 1: Residual of Manufacturing Sector Performance

The chart in Figure 1 shows two distinct periods of high and low volatility: the first, from January 1981 through December 1996, and the second, from January 1997 through December 2009. As a result, we may expect more of the same when volatility is high and less of it when it is low. This indicates that the Arch and Garch models are suitable representations of the residuals or error term, which suggests that they are conditionally heteroskedastic

Arch & Garch Analysis
Table 6 Arch & Garch Analysis

Mean Equation	(Dependent Variable = LMUFQ)			
Variable	Coefficient	Std. Error	z-Statistic	Prob
C	0.008373	0.003467	1.415050	0.0371
LMUFQ	1.001398	0.001311	763.5528	0.0000
Variance Equation				
C	0.000948	4.34E-05	21.85118	0.0000
RESID(-1)	-0.023723	0.000674	-35.21861	0.0000
GARCH	-0.642918	0.003006	213.8598	0.0000
LEXR	-0.000237	5.66E-05	-41.78929	0.0000
LIRS	0.000612	1.27E-05	48.06617	0.0000
LIFR	0.000667	3.21E-05	20.81017	0.0000
LBKS	-0.000472	1.07E-05	-44.18733	0.0000

Source: Output from E-View 10

In Table 6, the results of both ARCH and GARCH models, which are kinds of auto-regressive conditional heteroskedasticity. The following table shows that the manufacturing sector's performance coefficients are positive and their related p-values are statistically significant based on the mean equation result. Both the current value and historical trend of the constant term C, which indicates manufacturing sector performance, are important. Coefficients are positive and statistically significant (LMUFQt=0.0008373+1.001398 LMUFQ t-1). The performance of the manufacturing sector is 0.008373, and the manufacturing sector's historical value forecasts the current series by1.0014. Consequently, result from the variance equation reveals that (ht=0.000000948+0.64ht-1 -0.0242t-1) the coefficient of the constant variance term (Arch & Garch) (21.85) (213.9) (-35.21) parameters are positive and statistically significant at 1 percent level. As a consequence, the Garch model predicts that the time-varying volatility will include a constant component (0.000000948) and a component related to prior mistakes (0.0242t-1) that has varied over the last 90.64 hours. Finally, there is a negative but substantial association between the coefficient of exchange rate and the quantity of banks and manufacturing sector performance. On the other hand, there is a positive but statistically insignificant relationship between the interest rate spread and manufacturing sector performance**.**

Diagnostic Test

Table 7 Correlogram Test

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.|. |	.|. |	1	0.030	0.030	0.4595	0.498
.|. |	.|. |	2	0.029	0.028	0.8871	0.642
.|. |	.|. |	3	0.024	0.023	1.1919	0.755
.|. |	.|. |	4	0.020	0.018	1.3952	0.845
.|. |	.|. |	5	0.015	0.013	1.5173	0.911
.|. |	.|. |	6	0.011	0.009	1.5787	0.954
.|. |	.|. |	7	0.006	0.004	1.6000	0.979
.|. |	.|. |	8	0.002	0.000	1.6019	0.991
.|. |	.|. |	9	-0.003	-0.004	1.6054	0.996
.|. |	.|. |	10	-0.007	-0.008	1.6314	0.998
.|. |	.|. |	11	0.011	0.011	1.6919	0.999
.|* |	.|* |	12	0.130	0.130	10.405	0.580
.|. |	.|. |	13	0.014	0.007	10.511	0.652
.|. |	.|. |	14	0.014	0.006	10.613	0.716
.|. |	.|. |	15	0.013	0.006	10.695	0.774
.|. |	.|. |	16	0.011	0.005	10.760	0.824
.|. |	.|. |	17	0.010	0.004	10.811	0.866
.|. |	.|. |	18	0.008	0.004	10.848	0.901
.|. |	.|. |	19	0.007	0.004	10.873	0.928
.|. |	.|. |	20	0.006	0.004	10.890	0.949
.|. |	.|. |	21	0.004	0.004	10.900	0.965
.|. |	.|. |	22	0.003	0.004	10.904	0.976
.|. |	.|. |	23	0.007	0.004	10.929	0.984
.|. |	.|. |	24	0.007	-0.011	10.951	0.989
.|. |	.|. |	25	0.008	0.005	10.989	0.993
.|. |	.|. |	26	0.007	0.003	11.013	0.996

.|. |	.|. |	27	0.006	0.003	11.031	0.997
.|. |	.|. |	28	0.005	0.002	11.043	0.998
.|. |	.|. |	29	0.004	0.001	11.050	0.999
.|. |	.|. |	30	0.003	0.000	11.054	0.999
.|. |	.|. |	31	0.002	-0.001	11.056	1.000
.|. |	.|. |	32	0.001	-0.001	11.056	1.000
.|. |	.|. |	33	-0.000	-0.002	11.056	1.000
.|. |	.|. |	34	-0.001	-0.003	11.057	1.000
.|. |	.|. |	35	-0.002	-0.004	11.060	1.000
.|** |	.|** |	36	0.267	0.274	50.035	0.060

*Probabilities may not be valid for this equation specification.

Source: Output from E-View 10

From the correlogram output in table 7 the coefficient of the p-value is greater than 0.05 level of significance. This an indication that the Q-value and p-value are not significant. This means that the model is free from serial correlation.

Table 8: Arch Effect Test Result

Heteroskedasticity Test: ARCH			
F-statistic	0.292804	Prob. F(1,500)	0.5887
Obs*R-squared	0.293803	Prob. Chi-Square(1)	0.5878

From table 8, both the F-statistics and the observed R-square with their related p-values are not statistically significant, as determined by the LM Auto-Regressive Conditional Heteroskedasticity (ARCH) test. As a result, we may conclude that the model is homoscedastic and suitable for use

5.0 Conclusion and Recommendations

From 1981 until 2022, this study investigates how exchange rate and interest rates affected Nigeria's manufacturing sector performance. Manufacturing sector proportion to GDP were utilised as a proxy for the dependent variable, whereas exchange rate, interest rate, inflation, and bank size captured the independent variables The World Bank's World Development Indicator and the Central Bank of Nigeria's Statistical Bulletin 2022 were used as secondary sources of data. Low volatility is followed by low volatility, while high volatility is followed by high volatility, the data revealed. Moreover, the Arch mean equation demonstrated that the manufacturing sector's past realisation is crucial in predicting the manufacturing sector's present series of performance. In addition, the results of the Auto-regressive distributive lag (ARDL) showed that the performance of the manufacturing sector was positively correlated with the exchange rate a year ago, while it was negatively correlated with the interest rate spread and inflation. Last but nontheleast, there was a positive but negligible correlation between bank size and manufacturing sector performance. Therefore, the paper concludes that Nigeria's manufacturing sector is strongly correlated with the country's exchange and interest rates.

Based on the findings, the following recommendations were made;

i. The federal government should peg the local currency rate and mandate the deposit money banks through the Central bank of Nigeria (CBN) to maintain a single digit interest rate. This will boost investors' confidence on the Nigerian economy as well as the financial system while efforts should be taken to diversify the economy to ease the pressure from the local currency.

ii. Investors should also look inward to source for local materials for their production and rely less on imported material. This situation will equally free the local currency from unnecessary shocks and pressure from the external sector. This situation will encourage the extractive industries in the country to increase both labour and material resources thereby ensuring food and price stability.

iii. Finally, the federal government of Nigeria, in collaboration with the manufacturing association of Nigeria (MAN) should provide enabling environment for manufacturers. this will help improve on thire output which will inturn stable or reduce the prices of goods and service (Inflation).

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