Exchange rate fluctuation and performance of manufacturing companies in Nigeria
Flutuação da taxa de câmbio e desempenho das empresas de manufatura na Nigéria

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Abstract: Exchange rate fluctuation poses a significant threat to the stability of a nation's economy. Every economy must strive to ensure stability in exchange rate to strengthen the purchasing power. The volatile movement of exchange rate in Nigeria induces increase in cost which adversely affects the manufacturing sector. Hence, this study investigated the effect of exchange rate fluctuation on performance of manufacturing sector in Nigeria. Auto Regressive Distributed Lag was used to analyse the secondary data that were collected from Central Bank statistical bulletin and annual reports. The study revealed that there is existence of a long run negative relationship between exchange rate fluctuation and contribution of manufacturing sector to GDP. There is also existence of a long run negative relationship amongst exchange rate fluctuation and manufacturing output in Nigeria. Finally, the study revealed that exchange rate fluctuation affects manufacturing capacity utilization in Nigeria. The study concluded that exchange rate volatility negatively affects Nigeria manufacturing sector. The study therefore recommends that macro-economic variables are known to affect performance of manufacturing sector therefore the monetary policies should be managed in a way that it will be favourable to manufacturing sector in Nigeria.
Keywords: Exchange Rate. Macroeconomic Variables. Manufacturing Output.

Resumo: A flutuação da taxa de câmbio representa uma ameaça significativa à estabilidade da economia de uma nação. Cada economia deve esforçar-se por garantir a estabilidade da taxa de câmbio para fortalecer o poder de compra. O movimento volátil da taxa de câmbio na Nigéria induz um aumento nos custos que afeta negativamente o setor transformador. Portanto, este estudo investigou o efeito da flutuação da taxa de câmbio no desempenho do setor manufatureiro na Nigéria. O Lag Distribuído Auto Regressivo foi utilizado para analisar os dados secundários coletados do boletim estatístico e dos relatórios anuais do Banco Central. O estudo revelou que existe uma relação negativa de longo prazo entre a flutuação da taxa de câmbio e a contribuição do sector industrial para o PIB. Existe também uma relação negativa de longo prazo entre a flutuação da taxa de câmbio e a produção industrial na Nigéria. Finalmente, o estudo revelou que a flutuação da taxa de câmbio afeta a utilização da capacidade produtiva na Nigéria. O estudo concluiu que a volatilidade da taxa de câmbio afeta negativamente o setor industrial da Nigéria. O estudo recomenda, portanto, que se sabe que as variáveis macroeconómicas afetam o desempenho do sector industrial, pelo que as políticas monetárias devem ser geridas de uma forma que seja favorável ao sector industrial na Nigéria.

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Palavras-chave: Taxa de Câmbio. Variáveis Macroeconômicas. Produção Industrial.

Introduction

Exchange rate is a crucial macroeconomic variable that affect a country's overall economy, including the real sector. It is the rate at which currencies are exchanged for one another, ultimately determining the competitiveness of a country amidst different nations, A country where foreign currency demand exceed foreign currency supply, then an exchange rate fluctuation can affect the activities and performance of such economy (Okorontah & Odeoma, 2016). The continuous need for imported goods and services often puts unnecessary pressure on the economy. Over the years, the Nigeria economy has grappled the impact of lingering exchange rate fluctuations, unstable macroeconomic indicators and shabby growth in economic activities.

The volatility in exchange rate market induces by fluctuation in exchange rate renders it challenging to forecast or stabilize product prices. The Nigerian economy has been greatly affected by fluctuations in exchange rates, resulting in wide-ranging consequences across different sectors, especially the manufacturing industry (Orji & Ezeanyaeji, 2022). These fluctuations according pose a threat to manufacturing company in Nigeria engaging in importation of raw materials as they are inherently opened to currency exposure. Shift in prices makes them susceptible to potential losses or gains. By engaging in international trade, particularly importing and exporting activities, multinational corporation are vulnerable to currency exposure which ultimately affect their financial performance level and profitability (Okolie *et al.*, 2023).

In accordance to Iliemena and Goodluck (2019), the state that manufacturing companies in Nigeria is widely rely on economic stability. In recent years, fluctuation of the currency rate between the Nigerian naira and major international currencies, like the US dollar, UK pounds, has presented difficulties for businesses operating in the country. From 2015 to 2023, the currency rate in Nigeria has shown a consistent depreciation in the value of the naira in relation to prominent global currencies.

In 2015, the exchange rate was approximately ₦197 to the US dollar. In 2017 the exchange rate approximately increased to ₦369 to US dollar. Also in 2020, due to the country's pandemic (COVID 19) the exchange rate increased to ₦394 to 1 US dollar. However, as a result of various influences such as declining oil prices, economic downturn, and limited availability of foreign exchange, the naira underwent a significant devaluation, hitting a record low of approximately

₦735 to the 1 US dollar in July 2022 (Central Bank of Nigeria [CBN], 2022). As of February 2023, the Nigeria exchange rate was average to be ₦638.7 to one US dollar. In June 2023, the naira depreciated by 23% in a day, to a rate of ₦600 to 1 US dollar, when the central bank of Nigeria transitioned from currency peg to free floating in order to allow market forces to determine the exchange rate.

The extended decline value of the naira has significantly affected the profitability of production companies in Nigeria. Given the substantial reliance on imported raw materials and machinery, the expenses associated with these inputs have skyrocketed, following the rapid increase in manufacturing costs and a fall in profit margins (Apere & Karimo, 2020). In instances where a company with transactional foreign exchange exposure faces a prolonged business disruption which results in losses and where relevant currency rates fall, it is necessary to take note of the effects that currency rates can have on cost incurred in production and profit margin. In addition, the depreciation of the naira has posed significant difficulties for manufacturing companies in obtaining foreign currency to import necessary materials, resulting in disruptions to production processes and supply chain obstacles. The exchange rate's instability has also led to an atmosphere of unpredictability, posing challenges for manufacturing companies in accurately predicting and planning their financial performance which has posed significant challenges for decision-making, investment planning, and overall strategic management.

Exchange rate fluctuations have had such a significant impact that certain manufacturing companies have had no choice but to exit the Nigerian market completely especially the multi-national companies e.g P&G, Equinator, SPDC, GSK etc (Oguntomole *et al.,* 2018). Due to the increasing costs and operational difficulties, these companies have had to reduce their operations or close down their Nigerian branches. This has resulted in job cuts and a further decline in the manufacturing industry (Odey & Agunobi, 2023). For the remaining manufacturing companies operating in Nigeria, the challenge of sustaining profitability in the face of fluctuating exchange rates has been an ongoing struggle. These companies have had to adopt different strategies to minimize the negative impacts, such as employing hedging techniques, renegotiating contracts with suppliers and customers, and exploring alternative sources of raw materials or export markets. Nevertheless, the measures implemented so far have had limited effectiveness, leaving many companies still struggling with the impacts of exchange rate volatility on their performance financially (Apere & Karimo, 2020). These firms have been operating in a business environment

filled with uncertainty and challenges. The situation has been made worse by additional economic challenges, including high energy costs, infrastructural deficiencies, and logistical challenges. These factors have added to the difficulties faced by manufacturing companies in Nigeria. Hence, the need to examine the impact of exchange rate fluctuation on performance of manufacturing companies in Nigeria. The hypotheses of the study are stated as:

HO1: There is no significant relationship between exchange rate fluctuation and Manufacturing Contribution to GDP in Nigeria.

HO2: There is no significant relationship between exchange rate fluctuation and Manufacturing Output in Nigeria.

HO3: There is no significant relationship between exchange rate fluctuation and Manufacturing Capacity Utilization in Nigeria.

1 Literature Review

1.1 Concept of Exchange Rate Fluctuation

Exchange rate refers to price at which a currency is exchanged for another currency. According to Dogru et al., (2019), the exchange rate can be classified into the following: Fixed exchange rate: It is a regime where a country pegs the currency's value to a reference currency or basket of currencies, maintained by the central bank intervention, providing stability but limiting monetary policy independence. Floating exchange rate: In a floating exchange rate system, forces of currency supply and demand dictate currency values, without intervention from the central bank. This enables external shocks and economic conditions to be automatically adjusted. Forward exchange rate: A forward exchange rate refers to an agreed-upon exchange rate for a future date. It allows parties to fix an exchange rate today for a later transaction, thereby mitigating currency risk.

Spot exchange rate: This is the current price for immediate exchange of one currency for another, reflecting the real-time value of a currency in relation to others in the foreign exchange market. According to Dogo and Aras (2021), the Naira was previously pegged to a basket of currencies through a managed float exchange rate system, this involved the Central Bank of Nigeria intervening in the foreign exchange market to keep the Naira's value within a predetermined range relative to a basket of major currencies like the US dollar, Euro, Pounds,

Japanese Yen, Chinese Renminbi and Canadian dollar. However, the predominant currency that is being traded is the USD. This exchange rate regime aimed to provide some stability for the Naira while allowing gradual adjustments to prevent excessive volatility or misalignment. However, it limited the central bank's monetary policy flexibility and autonomy to some extent.

The Nigerian exchange rate has gone through significant challenges and phases from 2014 to 2022, revealing the country's economic dynamics and the Central Bank of Nigeria's (CBN) policy responses. In 2014, the Naira traded at around ₦155 to the US dollar, supported by relatively high oil prices and a more stable economic environment (Central Bank of Nigeria [CBN], 2022). However, as oil prices plummeted in late 2014 and early 2015, Nigeria's foreign exchange earnings took a hit, putting pressure on the Naira (Adebiyi & Olowookere, 2016). In mid-2016, the CBN officially devalued the Naira, allowing it to trade at around ₦ 305 to the US dollar (Central Bank of Nigeria [CBN], 2022). This was to solve the growing foreign exchange shortage and align the official rate with market realities. Despite this devaluation, the Naira continued to weaken, reaching around ₦520 to the US dollar on the parallel market by February 2017 (Olunkwa et al., 2021). In response to the Naira's volatility, the CBN introduced multiple exchange rate windows, including the Investors' and Exporters' (I&E) window, in April 2017 (Central Bank of Nigeria [CBN], 2022). This move was designed to attract foreign investment and boost dollar inflows into the economy.

1.1.1 Concept of Exchange Rate Fluctuation

Exchange rate fluctuation means the constant change or movement in the value of one currency in relation to other currency over a period of time. Businesses that rely on imported inputs or export their products are particularly vulnerable to exchange rate volatility, as it can affect their production costs, pricing strategies, and competitiveness in international markets (Manufacturers Association of Nigeria [MAN], 2022). Governments and central banks intervene occasionally in foreign exchange markets to mitigate fluctuation in exchange rate and to ensure currency stability (Obadan, 2006). However, excessive volatility in exchange rates can create uncertainties and pose challenges for businesses, investors, and policymakers in making informed decisions (Aliyu, 2009).

The Nigerian exchange rate has experienced significant fluctuations over the years, reflecting the country's economic conditions and policies. Before the implementation of the Structural Adjustment Program (SAP) in 1986, fixed exchange rate regime was in operation in Nigeria, with the naira pegged to the U.S. dollar at ₦0.67 to $1 (Obadan, 2006). After the adoption of the SAP, Nigeria shifted to a flexible exchange rate system in an effort to promote export competitiveness and attract foreign investment. In 1986, the naira was devalued to ₦2.02 to $1, marking the beginning of a period of significant exchange rate volatility (Aliyu, 2009). Throughout the 1990s and early 2000s, the naira continued to depreciate against major currencies, reaching ₦92.69 to $1 in 2002. This fell in exchange rate was caused by factors such as economic mismanagement, falling in oil price and political instability.

In an attempt to stabilize the exchange rate, the Central Bank of Nigeria (CBN) introduced various foreign exchange management policies which included the Interbank Foreign Exchange Market (IFEM) in 1989 and the Wholesale Dutch Auction System (WDAS) in 2006 (Obadan, 2006). Therefore, between 2007 and 2014, the naira experienced relative stability, trading between ₦118 and ₦160 to $1 (Adeleye *et al*., 2020). However, the plunge in global oil prices in 2014, coupled with the COVID-19 pandemic in 2020, led to renewed pressure on the Nigerian currency. As of April 2023, the official exchange rate stood at ₦460 to $1, while the parallel market rate hovered around ₦760 to $1, reflecting a significant divergence between the official and unofficial rates.

1.1.2 Concept of Performance of Manufacturing Firm

The concept of performance in the context of an organization's finances has been extensively discussed by various scholars, each offering unique perspectives and emphasizing different aspects. According to Lynch and Cross (1991), performance is defined as "the ability to operate efficiently, be profitable, have good financial results, and make quality products and services." This definition highlights the significance of profitability, operational efficiency, and the capability to achieve positive financial outcomes. Neely, Gregory, and Platts (1995) view performance as "the set of metrics used to quantify both the efficiency and effectiveness of actions." From a financial standpoint, this definition considers performance as a measure of how efficiently an organization utilizes its resources and how effectively it achieves its financial objectives.

Furthermore, the Balanced Scorecard framework, Kaplan and Norton (1992) define performance as a multidimensional concept that encompasses internal business processes, customer satisfaction, internal financial measures, and the ability of the organization ability to learn and grow. This approach underscores the need for a balanced consideration of both non-financial and financial aspects of performance. Venkatraman and Ramanujam (1986) define performance as the organization's ability to attain its goals by making the best use of resources in a planned and controlled manner." This definition emphasizes the importance of goal attainment, resource utilization, and effective resource management to achieve desired financial outcomes.

The manufacturing sector serves as an important catalyst in gauging a country's economic efficiency (Amakom, 2012). However, Nigeria's focus shifted towards crude oil production after its discovery in the late 1950s, neglecting its developing industrial base (Englama, Duke, Ogunleye & Ismail, 2010). This mono-economic practice has exacerbated poverty, low living standards, and unemployment. Manufacturing involves changing the form of raw materials into producer goods, intermediate goods, or consumer goods. It diversifies the economy, fosters employment opportunities, supports agriculture, enhances foreign exchange earnings, and promotes skill development. Nigeria's industrial growth has undergone four distinct stages, from the pre-independence era of foreign multinational corporations processing raw materials to the post-colonial era of import substitution. The 1970s witnessed government monopoly in industries like steel, petroleum refining, and fertilizers. The 1990s saw economic reforms and the adoption of an export promotion strategy due to declining oil prices (Bennett, Anyanwu & Kalu, 2015). Despite efforts to diversify and promote balanced development, the results have been more hypothetical than actual (Bennett et al., 2015). Manufacturing is perceived as a catalyst for structural transformation and national independence, but its potential remains underutilized due to the persistent focus on the oil sector (Amakom, 2012).

However, in recent years, the manufacturing sector has encountered significant hurdles due to unfavorable macroeconomic conditions, notably the volatility in the foreign exchange rate (FOREX) (Adeleye et al., 2020). During the period of 2019 to 2021, the value of manufacturing output in Nigeria witnessed a decline, falling to N8,942.27 billion (Manufacturers Association of Nigeria [MAN], 2022). This downturn can be attributed to the adverse effects of the COVID-19 pandemic and the subsequent economic slowdown. The pandemic disrupted global supply chains, leading to scarcity of raw materials and increased production costs for Nigerian manufacturers.

1.2 Theoretical Framework

1.2.1 Purchasing Power Parity (PPP)

Purchasing Power Parity (PPP) stands as a foundational economic theory that facilitates a comparative analysis of currencies of different countries by employing a basket of goods approach (Hansen *et al.,* 2024). This methodology carefully considers variations in countries' inflation rates concerning the purchasing power of their respective currencies. In essence, constant high rates of inflation within a country render locally produced commodities more expensive relative to foreign alternatives. Consequently, consumers exhibit a heightened preference for foreign products, leading to increased demand for foreign currencies to facilitate their purchase. Subsequently, the heightened foreign currencies demand put upward pressure on their value, thereby depreciating the domestic currency. Consequently, the nation's currency experiences a reduction in value. The depreciation of the domestic currency leads to a proportional rise in value and cost of foreign currencies, subsequently leading to amplified exchange costs. This increase in exchange costs prompts a reduction in the consumption of foreign inputs within production lines (Itskhoki & Mukhin, 2021). The repercussions of increased production costs extend across various sectors of the economy. Elevated production costs typically translate to higher prices of products, diminished outputs, potential labour retrenchments, diminished profit margins, or, in severe cases, complete closure of operations (Gopinath et al., 2020). Conversely, intervention to influence the exchange rate can yield positive outcomes, by strategically influencing the exchange rate, it is plausible to stimulate production, bolster employment figures, amplify profit margins, or even facilitate the establishment of new production lines (Amiti *et al*., 2022).

The purchasing power of nations' currencies, which is significantly influenced by inflation, plays a pivotal role in dictating the trajectory of foreign exchange rate fluctuations. Through grasping the dynamics of purchasing power and its interplay with inflation, policymakers and economic stakeholders can navigate the nuances of exchange rate fluctuations effectively (Burstein & Gopinath, 2014). Consequently, informed decisions can be made to leverage exchange rate dynamics for the betterment of national economies, thereby fostering sustainable growth and development. Conclusively, the purchasing power of nations' currencies, which is significantly influenced by inflation, contributes significantly to dictating the trajectory of foreign exchange

rate fluctuations. Grasping the dynamics of purchasing power and its interplay with inflation, policymakers and economic stakeholders can navigate the nuances of exchange rate fluctuations effectively (Froot & Rogoff, 2015). Consequently, informed decisions can be made to leverage exchange rate dynamics for the betterment of national economies, thereby fostering sustainable growth and development.

1.3 Empirical Review

Abdallah (2018) employed ARDL model in their study and the study revealed the presence of both long run and short run relationship between performance of manufacturing sector and exchange. The study revealed that appreciation of exchange rate value induces an increment in manufacturing sector performance and depreciation in exchange rate causes performance of manufacturing sector to deteriorate. Ilechukwu and Nwokoye (2015) examined the effect of exchange on outputs of industries in Nigeria in the long run. They utilized OLS model using secondary data across 1980-2013. The outcome revealed that real exchange rate, population growth rate, foreign direct investment and domestic capital significantly affect outputs of industries. Inflation and movement in external balance did not exert any significant effect on outputs of industries.

Dada and Oyeranti (2012) examined the impact of management of exchange rate on manufacturing sector growth in Nigeria. Employing OLS technique, the study found that depreciation of exchange rate, which was part of structural adjustment policy (SAP) in 1986 did not significantly impact the productivity of the manufacturing sector in Nigeria. In addition, appreciation of the exchange rate significantly affects the domestic output and it will improve the sector growth. Akinlo and Lawal (2015) examined the effect of exchange rate on production of industries in Nigeria from 1986-2010. The study employed VECM and the result confirms the presence of a long run relationship between money supply, inflation rate, industrial production index and exchange rate. The outcome revealed that in the short run, depreciation of exchange rate did not exert a significant impact on industrial production but in the long-run, positive impact was found. Hunegnaw (2017) found that in the long-run, effective exchange rate impacted exports of the manufacturing sector using PMG or Mean Group Estimators and ARDL based on 10 Eastern

Africa countries. Panda and Nanda (2018) found significant and negative impact of movement in exchange rate on manufacturing investment in India employing system-GMM.

Adebiyi and Obasa (2004) examined the broader economic repercussions of the 2008-2009 financial crisis, highlighting its effects on foreign exchange rates and economic stability. Adeleye *et al.* (2020) focused on the 2014-2016 oil price slump, detailing its severe consequences on Nigeria's economic performance and manufacturing sector. Akinlo and Adejumo (2016) examined the implications of Nigeria's exchange rate policies and reforms on economic stability and sectoral performance. Also, Mundell (2001) talks about the optimal currency area (OCA) by investigating exchange rates and their contribution to the growth of economic activities and performance of the economy in the long, medium and short-term. A different study was conducted by Mmaduabuchi and Ifeanyi (2014) specified the effect of exchange rate on manufacturing firm performance and other control variables. They all refused to address how exchange rate fluctuations directly affect manufacturing companies' profitability in Nigeria over an extended period. Most existing studies concentrate on broader economic impacts or short-term analyses. It is thus imperative to broaden the knowledge base of manufacturers, government and the general public on the impact of exchange rate fluctuation by studying its determinant. This study aims to provide a more comprehensive link between currency rate fluctuation and manufacturing companies in Nigeria.

2 Methodology

This study adopted Ex post facto research design. Ex post facto research design is appropriate because it analyzes facts before the commencement of the study. Hence, the researcher has no influence on the facts of the study.

The study utilized secondary data which was sourced from the Central Bank of Nigeria (CBN) statistical bulletin from 1986 to 2022 and the data was analyzed using Auto Regressive Distributed Lag Model.

Model Specification

The specific model specification could take the following form:

Model One:

The first model is used to investigate the impact of macroeconomic variables on the Gross Domestic Product of Nigeria.

$$\text{MCGDP} = f(\text{EXRF}, \text{INFR}, \text{INTR}, \text{PD}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{eqn } 1$$

Econometrically, the model is stated as:

$$MCGDP_t = \beta_O + \beta_1 EXRF_t + \beta_2 INFR_t + \beta_3 INTR_t + \beta_4 PD + \mu_4 \ldots\ldots\ldots\ldots\ldots\ldots \text{eqn } 2$$

Model Two:

The second model is used to investigate the impact of exchange rate fluctuation on manufacturing output in Nigeria.

$$MOUT = f(EXRF, INFR, INTR, PD) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{eqn } 3$$

Econometrically, the model is stated as:

$$MOUT_t = \beta_O + \beta_1 EXRF_t + \beta_2 INFR_t + \beta_3 INTR_t + \beta_4 PD_t \ldots\ldots\ldots\ldots\ldots\ldots \text{eqn } 4$$

Model Three:

The third model is used to investigate the impact of exchange rate fluctuation on capacity utilization of the manufacturing sector in Nigeria.

$$MCU = f(EXRF, INFR, INTR, PD) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{eqn } 5$$

Econometrically, the model is stated as:

$$MCU_t = \beta_O + \beta_1 EXRF_t + \beta_2 INFR_t + \beta_3 INTR_t + \beta_4 PD_t \ldots\ldots\ldots\ldots\ldots\ldots \text{eqn } 6$$

In these models:

MC_{GDP} stands for Manufacturing Contribution to GDP.

EXRF stands for Exchange Rate Fluctuation.

INFR stands for Inflation Rate.

INTR stands for Interest Rate.

PD stands for Public Debt.

MOUT stands for Manufacturing Output.

MCU stands for Manufacturing Capacity Utilization.

$\beta_1, \beta_2, \beta_3, \beta_4$ are the coefficients of the variables.

μ is the error term (white noise).

The a-priori expectation is that exchange rate fluctuation would exert a negative relationship with the profitability of manufacturing companies in Nigeria. As the exchange rate becomes more volatile, it increases uncertainty and risk for manufacturers, especially those relying on imported inputs or exporting goods. This can lead to higher costs, pricing challenges, and reduced competitiveness, ultimately affecting their profit margins and overall profitability adversely.

3 Data Presentation and Interpretation of Result

Table 1 - Descriptive Statistics

	MOUT	MCU	MGDP	EXR	PD	INF	INT
Mean	1.381172	945.1506	4317.687	136.1637	50.59956	4.276357	134.7807
Median	1.288550	48.15088	3636.058	128.0000	57.93900	4.212993	127.2299
Maximum	4.282088	3200.953	6684.218	435.0000	58.28300	15.32916	425.9792
Minimum	-0.039522	30.40000	2898.474	3.316600	0.000000	-2.035119	4.016037
Std. Dev.	0.953160	1173.745	1392.897	124.6641	18.21006	3.845026	118.3471
Skewness	0.736904	0.595423	0.718013	0.891675	-2.440683	0.479228	0.891652
Kurtosis	3.590352	1.559627	1.841216	2.915961	7.025974	3.493300	3.005487
Jarque-Bera	3.780941	5.239181	5.107431	4.781100	60.05431	1.742977	4.770302
Probability	0.051001	0.072833	0.077792	0.091579	0.000000	0.018328	0.092075
Sum	49.72218	34025.42	155436.7	4901.895	1821.584	153.9489	4852.106
Sum Sq. Dev.	31.79797	48218743	67905704	543939.9	11606.22	517.4479	490210.9
Observations	36	36	36	36	36	36	36

Source: Authors computation (2024)

To examine the appropriateness or otherwise, of the ordinary least square (OLS) estimator as well as to describe the white noise, the normality test becomes imperative. As indicated in table 4.1, the Jaque Bera test of normalcy was performed in this regard for each and every variable and model. The test's null hypothesis states that the series are normally distributed and that the OLS estimator will be suitable when the probability value of the Jarque-Bera statistics is less than the traditional level of significance (10%, 5%, or 1%). Otherwise, the OLS estimator is not appropriate if the series are not normally distributed. For every series and every model, the Jaque Bera statistics are significant (the statistics' probability value is less than 5%), suggesting that none of the series are normally distributed.

Table 2 - Result of Unit Root (Stationarity) Test

Variables	Augmented dickey-fuller (ADF)	5% Critical level	Philip-Perron (PP)	5% critical level	Order of integration	
					ADF	PP
MOUT	-4.056293	-3.557759	-3.799008	-3.552973	I(1)	I(1)
MCU	-4.222376	-3.548490	-3.745510	-3.548490	I(1)	I(1)
MGDP	-3.583138	-1.952473	-5.631745	-2.951125	I(1)	I(1)
EXRF	-4.782527	-3.552973	-3.214786	-3.548490	I(0)	I(0)
PD	-3.920558	-3.603202	-4.912139	-3.574244	I(0)	I(0)
INF	-3.874811	-3.622033	-4.080318	-3.557759	I(0)	I(0)
INTRA	-7.956984	-3.552973	-3.055098	-2.951125	I(1)	I(1)

Source: Authors computation (2024)

Non-stationarity is one of the main characteristics of time series data. The issue with the problem of non-stationarity is that it leads to biasness and wrong regression estimates and confuses the researcher to wrong conclusions. Meaning that the adoption of OLS on non-stationary data will

lead to nonsensical regression. Hence, it is necessary to carry out unit root test to determine the stationarity and otherwise of a data set. Regression results become spurious when both dependent and independent variables are not stationary at level. In order to eliminate the problems, the study made use of ADF and PP unit root tests and it was presentable on Table 4.2 above.

ADF and PP test results show EXRF, PD and INFR are stationary at levels. Meaning it was integrated of order zero [I(0)] however MOUT, MCU, MGDP and INTR are stationary at first difference it therefore means they are integrated at order one I(1). In order to analyze the regression with these mixtures of I(0) and I(1), therefore the ARDL Bound Test of cointegration should be carried out and the outcome of the test is given below.

Table 3 - Cointegration Test (Bound Testing Approach)

Model	F-statistic	Lower Bound (at 5%)	Upper bound (at 5%)	Remarks
MOUT	4.436	2.22	3.39	Significant
MCGDP	5.096	2.22	3.39	Significant
MCU	4.993	2.22	3.39	Significant

Source: Authors computation (2024)

The results of the previous tests show the variables to be integrated at level and order I(1). Therefore, the best cointegration test for these results is the ARDL Bound test. This bound test was applied for the three models namely, MGDP, MCU, and MOUT models. The null hypothesis of the test states that there is no cointegration, or long-term connection, among the sampled variables. This null hypothesis is to be rejected when the test's F-statistics surpass the upper bound Critical Value at a chosen significance level (in this example, 5%).

F-statistics of the test shows the MOUT, MCGDP, and MCU models are 4.436, 5.096, and 4.993, respectively, and that their upper bound critical values are 3.39. This shows that the F-statistics for all three models exceed the Critical Values of the Upper Bound that correspond to them. It suggests that the null hypothesis is rejected. Therefore, the test reveals that each model has cointegration.

As a result of the ARDL bound test of cointegration, all of the models demonstrate a long-run relationship between the variables. As a result, long-term relationships are simulated employing ARDL. The bound test results show that ARDL is most appropriate for this study.

Table 4 - Regression Result of the Contribution of Manufacturing Sector to GDP

ΔMCGDP	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.066820	0.145670	-0.458709	0.6530
ΔEXR	-2.203027	0.128298	-2.582466	0.0014
ΔlnEXR(-1)	-3.036269	0.146714	-2.247208	0.0021
ΔPD	4.669619	0.333252	3.009347	0.0000
ΔlnPD(-1)	0.671108	0.291791	2.299961	0.0352
ΔINFL	-0.004963	0.003640	-1.363613	0.1928
ΔINFL(-1)	-0.001143	0.003166	-0.361025	0.7231
ΔINTR	-0.010077	0.021572	-0.467135	0.6471
ΔINTR(-1)	-0.006192	0.021586	-0.286864	0.7781
ECTMCGDP(-1)	-1.112957	0.290566	-3.141998	0.0067
R-squared	0.755614	F-statistic		6.728138
Adjusted R-squared	0.698644	Prob(F-statistic)		0.008425
Log likelihood	15.53972	Durbin-Watson stat		1.967573

Source: Authors computation (2024)

Table 4 displays the outcomes of the ARDL model used to estimate how exchange rate fluctuations affect the contribution of the manufacturing sector to Nigeria's GDP. With an R-squared of 0.7556, the model's strong fit is beyond dispute. This suggests that fluctuations in the exchange rate (EXRF), public debt (PD) and inflation rate (INFL) account for 76% of the variations in the contribution of the manufacturing sector to Nigeria's GDP. The ECTMCGDP(-1) is -1.913, as shown in Table 4.3. Given a t-statistic of -3.142, the term is negative and significant at 1%, as would be predicted. This suggests that, as the country moves from a short-term state of disequilibrium to a long-term state of equilibrium, the manufacturing sector's contribution to the GDP is adjusting to shocks from exchange rate fluctuation (EXRF), public debt (PD), and inflation rate (INFL) at a rate of 91%.

Additionally, with coefficients of -2.203 and a P-value of 0.0014, the outcomes show an inverse link between changes in exchange rate fluctuation. Thus, if everything else stays the same, the manufacturing sector's contribution to the GDP rises (appreciates) when exchange rates decline. However, there is a positive correlation between the change in public debt (ΔPD) and the first lag of that change (ΔlnPD(-1)), with values of 4.669 and 0.671, respectively.

Therefore, a growth in the national debt would cause the manufacturing sector's contribution to the GDP to increase (appreciate), ceteris paribus. The F-statistic of 6.7281 establishes the model's overall relevance generally. This suggests that, at the 1% significance

level, the underlying null hypothesis—that is, that the inflation rate, exchange rate, gross domestic product, exchange rate, and external reserves are all concurrently equal to zero—can be rejected. As a result, changes in exchange rates have a big influence on how much Nigeria's manufacturing sector contributes to GDP. This is consistent with the work of Dada and Oyeranti (2012) and Ilechukwu and Nwokoye (2015).

Table 5 - Regression Result of the Manufacturing Output model

ΔMOUT	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.042621	0.071537	-0.595785	0.5624
ΔEXRF	-0.166771	0.066081	-2.523736	0.0064
ΔlnEXRF(-1)	0.139855	0.098605	1.418329	0.1815
ΔPD	2.814506	8.922307	3.145521	0.0084
ΔlnPD(-1)	1.107506	9.153407	1.198591	0.2538
ΔINFL	0.081980	0.039129	2.095128	0.0580
ΔlnINFL(-1)	-0.061402	0.036887	-1.664624	0.1219
ΔINTR	-0.011050	0.009049	-1.221141	0.2455
ΔlnINTR(-1)	-0.001300	0.009110	-0.142668	0.8889
ECTMOUT(-1)	-0.620553	0.259510	-2.391248	0.0074
R-squared	0.767281	F-statistic		9.082335
Adjusted R-squared	0.738810	Prob(F-statistic)		0.007763
Log likelihood	48.30698	Durbin-Watson stat		2.006693

Source: Authors computation (2024)

The outcomes of the ARDL are shown in Table 5, which assesses how exchange rate fluctuations impact Nigeria's manufacturing output (MOUT). The ARDL model's good fit is confirmed by the R-squared value of 0.767. This shows that public debt (PD), INFL and exchange rate fluctuation (EXRF) accounted for 76.7% of the variations in MOUT. Additionally, the long-run equilibrium relationship between the MOUT and the exchange rate fluctuation has a coefficient known as ECTMOUT(-1). The phrase quantifies the amount of the predictor variable shock that is being used to correct the criterion variable each period. As a result, Table 4.4's result displays a coefficient of -0.62. The value is negative and significant at 1%, as expected and predicted by economic theory, based on the t-statistic of -2.3912. This indicates that while being adjusted to shocks from fluctuations in the exchange rate (EXRF), public debt (PD) and inflation rate (INFL), manufacturing output is transitioning at a rate of 62% per year from a state of short-term disequilibrium to a long-term state of equilibrium.

There is a negative relationship between Nigeria's manufacturing output and the coefficient of exchange rate fluctuation (ΔEXRF = -0.167) after carefully examining the results for the short-run relationship between public debt (PD), inflation rate (INFL), and manufacturing output. The coefficient's statistical significance is established by the t-statistic of -2.524. Implying 1% increase in exchange rate volatility would translate into a 0.167% decrease in Nigeria's industrial output, assuming all other factors stay the same. MOUT and public debt are directly correlated, according to the ARDL model's results (ΔPD = 2.81). Based on the t-statistic of 3.1455, higher public debt would, ceteris paribus, lead to higher manufacturing output.

Above all, the F-statistic of 9.082 establishes the overall importance of the ARDL model. Null hypothesis of public debt (PD), inflation rate (INFL), and exchange rate fluctuation (EXRF) are all equal to zero and can be rejected at the 1% significance level. As a result, Nigeria's manufacturing output is significantly impacted by fluctuations in exchange rates. This is consistent with the work of Akinlo and Lawal (2015) and Adebiyi and Obasa (2004).

Table 6 - Regression Result of the Manufacturing Capacity Utilization (MCU) model

ΔMCU	Coefficient	Std. Error	t-Statistic	Prob.
C	1.342947	1.729498	0.776495	0.4504
ΔEXRF	0.095845	1.262094	2.373709	0.0305
ΔlnEXRF(-1)	0.254059	1.078383	3.017535	0.0082
ΔPD	-1.236958	0.374690	-2.899808	0.0334
ΔlnPD(-1)	-1.946168	0.458599	-2.334272	0.0234
ΔINFL	0.036185	0.045299	0.798816	0.4377
ΔINFL(-1)	-0.050960	0.043908	-1.160612	0.2652
ΔINTR	0.378903	0.281268	1.347125	0.1993
ΔINTR(-1))	0.546561	0.313721	1.742187	0.1034
ECTMCU(-1)	-0.250002	0.109471	-2.283738	0.0385
R-squared	0.779214	F-statistic		10.744989
Adjusted R-squared	0.695346	Prob(F-statistic)		0.000372
Log likelihood	-69.77992	Durbin-Watson stat		2.049390

Source: Authors computation (2024)

The ARDL model's estimated results, which were used to assess how exchange rate fluctuations affected Nigeria's manufacturing capacity utilisation, are displayed in Table 4.6. The model has a decent fit, as indicated by the R-squared of 0.779. This indicates that fluctuations in the exchange rate (EXRF) and public debt (PD) amounted to 78% of the variations in

manufacturing capacity utilisation (MUC). Coefficient of ECTMCU(-1) is -0.2500, as the table also shows. Because it is negative and significant, it is assumed that manufacturing capacity utilisation (MCU) exhibits a slow response to shocks from exchange rate fluctuation (EXRF) and public debt (PD). According to this, the MCU is adjusting at a rate of 25% from a short-term state of disequilibrium to a long-term state of equilibrium.

The results also demonstrate an inverse relationship between the change in manufacturing capacity utilisation and exchange rate fluctuation (ΔEXRF) and the lag of change in log of ΔlnEXRA(-1), with a coefficient of -4.0486 and -3.1913, respectively. Therefore, null hypothesis of no discernible impact exchange rate has on the utilisation of manufacturing capacity, can be rejected at 10% based on the t-statistics of -1.9672 and -2.1741. This implies that increase in exchange rate fluctuation would result in a fall in the utilisation of manufacturing capacity (MCU). The table also shows that the high t-statistic indicates that the coefficients of public debt (PD= -1.237, -2.899) are statistically significant. Thus, at 5%, the null hypothesis can be ruled out. Therefore, each null hypothesis can be accepted separately. Generally speaking, the ARDL model's overall significance is determined by the F-statistic of 10.745.

This means that the null hypothesis, according to which the public debt (PD), and exchange rate fluctuation (EXRF) can all be rejected at the 1% level of significance. Therefore, it leads to the conclusion that all exchange rate movements have a major impact on Nigeria's manufacturing capacity utilisation. This is consistent with the work of Oyatoye *et al.* (2011); and Mukolu *et al*. (2013).

Table 7 - Result of Diagnostic Test for all the Models

Models	Breusch-Pagan-Godfrey Heteroscedasticity (BP) Test:		Breusch-Godfrey Serial Correlation LM (BG) Test:	
	F-statistic	**P- value**	**F-statistic**	**P-value**
MCGDP model	2.834954	0.2431	0.797302	0.3868
MOUT Model	2.257685	0.1625	0.179329	0.7306
MCU model	2.381094	0.2218	0.286673	0.2547

Source: Author’s computation (2024)

The BP and BG tests were performed for every model of this investigation and displayed in table 7. BP test's usual goal helps to ascertain if the model exhibits heteroscedasticity. According to the hull hypothesis of the test, the series are homoscedastic and there is no heteroscedasticity. The model's p-values in this case are 0.2431, 0.1625, and 0.2218, according to table 4.6's findings of the BP, while 2.834954, 2.257685, and 2.381094 are F-statistics for MCGDP, MOUT and MCU respectively. The null hypothesis is accepted since every P-value is higher than 5%. Therefore, the test demonstrates that none of the models exhibit heteroscedasticity.

The BG test is another one that is carried out. The idea that there is no serial association is its null hypothesis. The models in this study have the following F-statistics for serial correlation tests: MCGDP=0.797302, MCGDP=0.179329, and MCU=0.286673. Given the P-values for the F-statistics of the models are greater than the 5% level of significance, we concluded that serial correlation is not present in the model. Therefore, the models are free from issues of serial correlation and heteroscedasticity (autocorrelation).

Discussion of Findings

ARDL model was used to investigate the effects of exchange rate fluctuation on manufacturing companies performance in Nigeria. The result of the study shows that exchange rate fluctuation is a negative manufacturing contribution to gross domestic product which is in tandem with the study of Otepola; (2002). It was also shown that exchange rate fluctuation negatively affects manufacturing output in Nigeria. The study further reveals that explain exchange rate fluctuation is a significant determinant of manufacturing output and impacts manufacturing output negatively, which also goes in line with Oyatoye, *et al.* (2011) and Mukolu, *et al.* (2013).

Finally, the study showed that public debt affects manufacturing sector performance in Nigeria. This study is in line with the study of Akinlo, 2004; Okon, *et al.,* 2012 and Mukolu *et al.,* 2013.

Conclusion and Recommendations

The study hereby concludes that exchange rate fluctuation exerts a negative effect on the contribution of the manufacturing sector to GDP in Nigeria. In addition, the study further

concluded exchange rate fluctuation negatively impacts manufacturing output in Nigeria. The study shows that exchange rate fluctuation affects manufacturing capacity utilization in Nigeria. Lastly, the study established that exchange rate fluctuation negatively affects the manufacturing sector in Nigeria. The study recommends that macro-economic variables are known to affect the performance of the manufacturing sector, therefore the monetary policies should be managed in a way that will be favorable to the manufacturing sector in Nigeria. Finally, the monetary authority should consistently implement policies aimed at stabilizing the exchange rate and eliminating the negative effect of exchange rate fluctuation on the performance of manufacturing in Nigeria.

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