Effect of Selected Macroeconomic Variables on Manufacturing Sector Output in Nigeria

JUSTINE, David
Department of Banking and Finance Nasarawa State University, Keffi
davidjustine2018@gmail.com

Abstract

This study examines the effect of selected macroeconomic variables—exchange rate, interest rate, money supply, unemployment rate, and inflation rate—on the manufacturing sector output in Nigeria. The study employs an ex post facto research design and utilizes the Autoregressive Distributed Lag (ARDL) model for regression analysis to explore both short-run and long-run dynamics. The findings reveal that, in the long run, the exchange rate has a significant positive effect on manufacturing sector output in Nigeria, indicating that exchange rate stability fosters industrial growth. Conversely, inflation rate, money supply, and unemployment rate were found to have no significant effect on manufacturing output in the long term. Additionally, the interest rate was found to have a significant negative effect on industrial sector output, suggesting that high borrowing costs deter investment in the manufacturing sector. In the short run, the exchange rate, money supply, and unemployment rate were statistically significant in influencing industrial output, while the inflation rate and interest rate did not show any significant impact. Based on these findings, the study recommends that the Nigerian government should focus on diversifying the economy to reduce dependency on oil and mitigate the impact of external shocks, such as global oil price fluctuations. The government should also encourage the development of financial markets to support industrial growth, promote public-private partnerships (PPPs) for skills development in the manufacturing sector, and reduce interest rates to improve access to affordable financing, especially for small and medium-sized enterprises (SMEs). Furthermore, introducing foreign exchange hedging mechanisms could help manufacturers manage risks related to exchange rate volatility.

Keywords: ARDL Model, Exchange Rate, Interest Rate, Inflation Rate, Macroeconomic variables, Money Supply, Unemployment Rate, Manufacturing Sector Output

1.0 Introduction

The manufacturing sector plays a critical role in the economic development of nations, especially in developing countries like Nigeria. As a significant contributor to GDP, employment, and industrialization, the performance of the manufacturing sector is crucial for fostering economic stability and growth. However, in many developing economies, including Nigeria, the sector faces several challenges, one of the most prominent being the volatile macroeconomic environment. The impact of macroeconomic variables such as *inflation, exchange rates, interest rates, money supply*, and *unemployment* on manufacturing sector output has long been a subject of study, given their potential to shape the profitability, competitiveness, and sustainability of manufacturing firms.

Inflation refers to the persistent rise in the general price level of goods and services in an economy over a period of time. In Nigeria, inflation has often been unpredictable, with periods of high inflation negatively affecting manufacturing firms' production costs (Adebiyi, 2022). For instance, inflation increases the cost of raw materials and intermediate goods, leading to higher production costs. These rising costs can squeeze profit margins, reduce investment in the sector, and lower output levels (Ogunleye, 2021). The unpredictability of inflation also makes it difficult for manufacturers to plan for long-term production and pricing strategies.

exchange rate, which measures the value of one currency relative to another, is another critical macroeconomic variable influencing manufacturing in Nigeria. Given that many manufacturers in Nigeria rely on imported raw materials and machinery, fluctuations in the exchange rate can significantly affect their costs (Ogujiuba & Adeniran, 2020). A depreciating naira increases the cost of imports, thereby raising production costs for manufacturers who may not be able to pass these costs onto consumers due to competition and price sensitivity. This can lead to reduced output or even the shutdown of some manufacturing businesses that cannot sustain such high production costs.

Interest rates represent the cost of borrowing money and are central to investment decisions in any economy. High-interest rates in Nigeria have historically discouraged investment in the manufacturing sector (Akintoye, 2020). Manufacturers rely on loans for expansion, technological upgrades, and working capital, and when interest rates are high, the cost of financing increases, reducing their capacity to invest in production. Additionally, high borrowing costs may deter new businesses from entering the manufacturing sector, thus limiting sector growth.

money supply, which refers to the total amount of money circulating in the economy, has an indirect but powerful effect on manufacturing output. When the Central Bank of Nigeria increases the money supply, it can lead to inflationary pressures, which, as noted earlier, affect production costs (Eze & Okoye, 2021). On the other hand, a restricted money supply can lead to higher interest rates, further curtailing access to finance for manufacturers. The balance between money supply and inflation is crucial for creating an environment that fosters manufacturing growth.

Unemployment, which reflects the percentage of the labor force that is without work but actively seeking employment, is a key indicator of economic health. In Nigeria, the high unemployment rate limits the purchasing power of consumers, reducing the demand for manufactured goods (Anyanwu, 2020). Lower demand for goods can lead to a reduction in production by manufacturers, affecting overall output. Furthermore, high unemployment rates contribute to social instability and reduce consumer confidence, further hampering demand for manufactured products.

2.0 LITERATURE REVIEW

Manufacturing Sector Output

manufacturing sector output refers to the total value of goods produced by the manufacturing industry within a specific period. It is a key indicator of industrial performance and economic development, as it reflects the productivity and efficiency of the manufacturing sector. In the context of Nigeria, manufacturing sector output is measured as a component of the Gross Domestic Product (GDP) and is often expressed in real terms to account for inflation (Ogunleye, 2021).

Manufacturing output encompasses a wide range of activities, including the production of goods from raw materials, the processing of materials into finished products, and the use of labor and capital to enhance the value of goods for consumption or export. The performance of this sector can be influenced by various factors such as technological advancement, access to raw materials, labor skills, and importantly, macroeconomic conditions like inflation, exchange rates, interest rates, and unemployment (Adebiyi, 2022).

The importance of manufacturing sector output lies in its ability to drive economic growth, generate employment, and contribute to the diversification of the economy, especially in countries like Nigeria, which is heavily reliant on oil exports. A thriving manufacturing sector also supports infrastructure development, innovation, and the overall competitiveness of the economy in global markets (Olalekan & Akinbobola, 2022).

Macroeconomic Variables

Macroeconomic variables are key indicators that reflect the overall health and trends of an economy. These variables help in assessing economic performance, formulating policies, and understanding economic relationships (Ukachukwu, & Odionye, 2020).

World Bank (2023) sees macroeconomics as changes in economic output, inflation, interest and foreign exchange rates, and the balance of payments, poverty reduction, social equity, and sustainable growth. Keynes identified some main macroeconomic variables that study the economy as a whole: GDP, Exchange rate, Interest Rate, Inflation, and Money Supply. GDP is a measure of the annual improvement in the standard of living of the average citizen/resident of a

country. It considers all the production inside a country, independent of whose, domestic or foreign, owns the production site (Tapsin 2017).

Macroeconomic variables are factors pertinent to the economy as a whole and affect a large population as opposed to a selected number of individuals (Osamwonyi & Evbayiro-Osagie 2012). According to Anochie (2023), macroeconomics is the study of the economy as a whole as it focuses on the behavior of an entire economy. It includes inflation, employment, productivity, finance, and international trade balances. Inflation is an overall increase in the consumer price index, which is a weighted average of prices for different goods and services.

Ghareli and Mohammadi (2016) in his works identified several macroeconomic variables like the Inflation rate (Though the Consumer Price Index was used as a proxy), Interest Rate, Real Gross Domestic Product, Exchange Rates, Oil Prices, Money Supply long-term Bond Interest Rates Industrial Production, etc. and all tend to either enhance the performance of aggregate economic growth and business performance.

The factors that impact an economy as a whole market, customers, businesses, governments, and the foreign sector are known as macroeconomic variables. Macroeconomic variables include things like pricing trends, national income, economic growth rate, and shifts in the unemployment rate that affect the entire economy. Indicators of an economy's current trends and macroeconomic variables are closely related to economic growth, aggregate output, and the value of both domestic and foreign investments in any given country (Chowdhury et al. 2019). These macroeconomic variables show the state of a country's economy and are related to it. When it comes to creating investment policies, the government wants to know the main factors influencing how the macroeconomy is currently behaving. According to Koba and Kibati (2016), macroeconomic variables including the money supply, interest rate, inflation rate, and exchange rate are important markers of an economy's present tendencies and a country's overall economic health.

Given the above definitions and varying views on the concept of macroeconomic variables, this study uses Chowdhury et al. (2019) definition, which states that macroeconomic variables are indicators of the state of an economy and are closely related to GDP, aggregate output, economic growth, and the value of both domestic and foreign investments in any given economy.

Interest Rate

The Central Bank of Nigeria (CBN) sees interest rate as the Minimum Rediscount Rate (MRR). The MRR is the official interest rate that anchors all other interest rates in the money market and the economy. Keynes (1983) defined interest as "the reward for parting with liquidity. While Fisher (1930) viewed interest as the "reward for waiting." He emphasized the time preference for money, suggesting that people require compensation for choosing to have money later rather than sooner.

Liu and Lee (2022) describe interest rate as the amount of interest paid per unit of time expressed as a percentage of the amount borrowed. Interest rates differ mainly in term/maturity that is the length of time for repayment and liquidity that is quick conversion of assets to funds. The interest rate could be seen as the return or yield on equity or opportunity cost of deferring current

consumption into the future. Some examples of interest rates include the saving rate, lending rate, and discount rate.

Interest rate is also the measure of reluctance to part with money in liquid form and, at the same time, as the price which brings into balance the desire to hold wealth in the form of cash. Keynes also captures the rate of interest as compensation for parting with liquidity or as a reward for not hoarding. Interest rate is the amount charged on borrowed money, expressed as a percentage of the principal, by a lender to a borrower for the use of money. It is often expressed as a percentage of the amount borrowed (principal) for one year or any other period – month, week, day, etc. – as agreed by the lender and borrower at the time of contracting the loan. Specifically, the interest rate is the percentage of the principal that is paid as a fee over a specified period. It can as well be described as the rental payments for the use of credit by borrowers and return for parting with liquidity by lenders over time. The interest rate is the rate charged or paid for the use of money or more precisely the cost of borrowing.

Inflation

Inflation remains one of the major macroeconomic variables that can distort economic activities in both developed and developing countries. Although it has been argued that moderately rising prices (single-digit inflation) initially activate the level of economic activities (Ghareli, and Mohammadi, 2016), persistent inflation is however a distress to producers, investors, and consumers in an economy. Thus, understanding the factor's driving inflation is very vital for the formulation and implementation of appropriate macroeconomic policies (Ghareli, and Mohammadi, 2016).

Bryne and Zekaite (2021) define inflation as a continued increase in the general price level. The inflation rate is measured as the percentage change in the consumer price index. The consumer price index measures the price of a representative basket of goods and services purchased by the average consumer and is calculated based on periodic surveys of consumer prices. Inflation is one of the most frequently used terms in economic discussions, yet the concept is variously misconstrued. There are various schools of thought on inflation, but there is a consensus among economists that inflation is a continuous rise in prices. Simply put, inflation depicts an economic situation where there is a general rise in the prices of goods and services, continuously. Binder and Kamdar (2022) describe inflation as a continuing rise in prices as measured by an index such as the consumer price index (CPI) or by the implicit price deflator for Gross National Product (GNP).

Inflation is an indicator of price stability. According to Olasehinde et al. (2022), inflation rate affects the purchasing power of individuals, families, companies and economies. In periods of high prices of goods and services, people find it difficult to meet their daily consumption needs as a result of the decline in the purchasing power of money in their hands. Aggarwal (2013) stated that inflation means a persistent rise in the general level of prices of goods and services. Inflation is the rise of general price of goods and services for the specified period. It is measured by using the consumer price index (World Development Indicators, 2012).

Exchange Rate

The concept of foreign exchange has been described from different perspectives by researchers. The exchange rate is the price of one unit of currency in one country in terms of the other country's currency. In most countries, the exchange rate is expressed in terms of the external currency as the base currency but some nations also express exchange rate by using the home countries as the base currency. Each country has its own exchange rate systems. The most vital characteristic of an exchange rate system is to what extent the country is trying to control the level of exchange rate. The exchange rate system can be described as completely flexible when it is solely determined by the supply and demand in a free market without interferences from the government or the central bank. The system is described as completely fixed when it is pegged to another currency or to an average of several currencies by the Central Bank.

However, it is adjudged that foreign exchange refers to the price of a country's currency in relation to another currency (Adesoye, 2012). Likewise, the price which unit of domestic currency is converted to a unit of foreign currency referred to the foreign exchange rate (Jhingan, 2003). Due to some factors, the foreign exchange rate of a country's currency can appreciate or depreciate in relation to another currency over time. Even though the depreciation will reduce the purchasing power of the currency in the international market, appreciation can lead to the current account problems. This can result in the overvaluation of the currency.

Money Supply

Ahuja (2010) defined money supply as the total stock of monetary medium of exchange available to society for use in connection with the economic activity of the country. It is called money because there is backing by the law on what it should be in terms of acceptability for immediate transactions. The money supply is that part of the money that can be accessed for immediate transactions (Kuhe & Alfred, 2016). Money supply represents the stock of money at a point of time and it can be obtained by summing up the financial assets that can perform the functions of money including currency in circulation (Laxman, 2019). This therefore unveils the usefulness of near money or near cash instruments as they also provide near or immediate liquidity to the holders of the in instruments that are easily convertible into cash.

The monetarists used the quantity theory of money as the framework for explaining the relationship between money supply and the price level. According to Jhingan (2016), the Monetarists emphasize the role of money as the principal cause of demand-pull inflation. They contend that inflation is always a monetary phenomenon. Price tends to rise when the rate of increase in the money supply is greater than the rate of increase in real output of goods and services.

According to Omofa (2016), the monetary conclusion is based on the joint validity of a particular assumption about the demand for and supply of money. They are both assumed to be perfectly interest elastic. This is what is referred to as the exogeneity of money. The Monetarist's contention hence goes thus: given the level of real money supply and the level of demand for money at certain income levels, money do not change alone with changes in the level of interest rate. For the

derivation of the general equilibrium, the equilibrium is the real (goods) market is needed which together with the money market equilibrium, yield the general equilibrium level refer to as the aggregate demand in the economy, while the full employment level yields what is referred to as aggregate supply level. Therefore, national income and price are determined by the equilibrium of aggregate demand and supply.

Unemployment rate

According to NBS (2020), unemployment is the state in which physically fit men and women who are actively looking for work but are not able to find any good positions despite their qualifications. The proportion of those in the labor force (not in the entire economically active population, nor the entire Nigerian population) who were actively looking for work but could not find work for at least 20 hours during the reference period to the total currently active (labor force) population" is how the NBS calculates the unemployment rate. This formula is based on an ILO variation. The percentage of the workforce that is unemployed is known as the unemployment rate.

According to the International Labour Organization (ILO, 2016), unemployment is the proportion of the economically active population that is unemployed but available and seeking employment, including those who have quit their jobs willingly and those who have lost their jobs. Consequently, if an individual can and is willing to work at the going rate but cannot find a suitable job at the going rate, they are considered unemployed. Unemployed people can be divided into two categories: those who have never worked and are actively looking for work, and those who have lost their jobs and are looking to reenter the labor force. The number of unemployed people as a percentage of the labor force is known as the unemployment rate.

According to Christian (2019), unemployment is the state in which people who are able and wanting to work but are unable to locate gainful job. The disparity between the supply and demand of labor is highlighted by this viewpoint. Nigeria's economy is greatly impacted by unemployment, which shows up as a number of socioeconomic problems. Because a large percentage of the workforce is unemployed, high unemployment rates impede economic growth by reducing consumption and expenditure, which has a detrimental effect on firms and total economic productivity. Consequently, the underutilization of Nigeria's human resources frequently results in stunted GDP growth.

Empirical Literature

Effiong et al (2024) examined the effect of exchange rate depreciation on the agricultural and industrial sectors of the Nigerian economy using annual data from 1981 to 2021 in an autoregressive distributed lag (ARDL) model. The findings show that the effect of exchange rate depreciation on industrial and agricultural output was fairly similar. Exchange rate depreciation, inflation, interest rate, and government expenditure have negative effects on industrial output in

the short run and positive effects in the long run. Similarly, past agricultural output, exchange rate depreciation, and government expenditure have negative effects on agricultural output in the short run and a positive effect in the long run. Inflation also has a long-term positive effect on agricultural output. Government expenditure had the most substantial long-run effect on industrial and agricultural output. The study shows the need to manage high exchange rate volatility to facilitate realistic forecasts and sound production decisions in the agricultural and industrial sectors. The findings of this study underscore the importance of considering both short-run dynamics and long-run adjustments in understanding the effects of exchange rate depreciation and other economic variables on the industrial and agricultural sectors. This study focused on industrial and agricultural output, while the current study intends to improve on this work by focusing only on industrial sector output.

Abiola (2024) investigated the impact of exchange rate volatility on the manufacturing sector's growth performance in Nigeria from 1978 to 2022. Employing the Autoregressive Distributed Lag (ARDL) technique, the study utilized the Augmented Dickey Fuller (ADF) test to assess the stationarity of the variables. The regression analysis revealed a partial effect of the exchange rate on the manufacturing sector's growth. However, the study concluded that exchange rate volatility insignificantly influenced Nigeria's manufacturing sector throughout the examined period. It suggests that other factors, including government policies, global economic conditions, and domestic market dynamics, play pivotal roles in shaping the overall growth performance of the manufacturing sector. This study intends to improve on this research by including robustness checks.

Li, Hu, and Zhao (2023) investigated the impact of industrial green development and technological innovation on China's employment structure. Data from 30 Chinese provinces from 2009 to 2019 were used to assess the level of industrial green development. This study innovatively integrates industrial green development, technological innovation, and employment structure into the analytical framework, and empirically investigates the influence of the two factors on employment structure and their interaction by applying a two-way fixed-effect model. We are investigating. The specific conclusions are as follows. First, China's industrial green development level has the characteristics of fluctuating and evolving over time, and there are regional differences. Second, industrial green development, technological innovation, and their interaction will contribute to the optimization of China's employment structure. Third, we will promote the optimization of the employment structure in the eastern and northeastern regions through industrial green

development. Technological innovations in the Northeast, East and West regions will help improve the employment structure. Rather, the employment structure is influenced by technological innovation in the central region. The interaction of industrial green development and technological innovation has a positive impact on the relevant employment structure of the four regions. The concrete results of this study have the necessary theoretical significance and provide a realistic reference price on whether the green development and interaction of industries will affect the employment structure. The economy and variables used in this work are different from those of the current study, creating gaps to be filled.

Amri, (2022) analyzed the effect of the complex variables in the current economy, namely inflation, exchange rates, labor, and the money supply, on the manufacturing industry sector in Indonesia in the long and short term. This study uses the ECM (error correction model) method in empirical testing. The data used is secondary time series data (quarterly) starting from 2011:Q1 -- 2020:Q4; the data obtained comes from the Central Statistics Agency, Bank Indonesia, and the Ministry of Trade of the Republic of Indonesia. This study uses the Eviews10 application as an analytical tool. The analysis results conducted in this study show that the exchange rate and labor have a positive and significant influence on the manufacturing industry sector in the long and short term. The money supply has a positive and significant effect on the manufacturing industry sector in the long term only. Meanwhile, inflation has a negative but not significant effect both in the long term and short term. Of these critical variables, labor has the most crucial influence on the manufacturing industry sector. Therefore, the government needs to pay attention to policies related to labor as the main factor in increasing the output of the manufacturing industry.

Oduor et al (2021) assessed the effect of inflation on the growth of the manufacturing sector in Kenya. The study used descriptive, correlational, and inferential research designs. The study used secondary data, specifically, from the World Bank, United Nations Conference on Trade and Development (UNCTAD), International Monetary Fund (IMF), Central Bank of Kenya (CBK), and Kenya National Bureau of Statistics (KNBS) for the period 2008-2017. Time series data were analyzed quarterly using EViews software. The study employed descriptive statistics, correlation analysis, and regression analysis. Pre-test analysis entailed Augmented Dickey-Fuller (ADF) tests for unit root, Bai-Perron Multiple Breakpoint tests, and Bounds Cointegration tests. The post-test analysis included the Breusch-Godfrey tests for autocorrelation, the Breusch-Pagan-Godfrey tests for heteroscedasticity, Variance Inflation Factors (VIF) tests for multicollinearity, Jarque-Bera statistics tests for normality, and CUSUM tests for model stability. Results: The regression model estimates for inflation were (-0.19269, $p<0.05$) results imply that holding other factors constant, a unit increase in inflation reduces manufacturing value-added by 0.19269 units. The study Conclude that Inflation has a statistically and significant negative effect on the growth of the manufacturing sector in Kenya. To achieve manufacturing value-added growth, the study recommends that the Central Bank of Kenya (CBK) should have inflation targets and adopt appropriate monetary policies to monitor fluctuating inflation rates. Furthermore, the CBK should keep lending interest rates as low as possible so that manufacturers incur less on acquiring credit from commercial banks and ultimately produce goods at affordable prices. This work was done in Kenya and its findings may not apply to Nigeria.

Adesanya and Ajala (2020) examined the effect of interest rate on the manufacturing sector in Nigeria. The study employees ARDL approach involving unit root test, Bound test for cointegration test, short-run and long run test. The unit root test results show that all the series except interest rate are not stationary at levels and the Bound test co-integration test depicts that long run relationships exist among the series. The study uses secondary data covering a period of thirty-eight years from 1981 to 2018. The evidences from the ARDL shows that the effect of Interest Rate (INT) on Manufacturing Output (MQ) in the short run is positive and significant at lag period 1 and it changed to negative in the long run indicating that Interest Rate (INT) is a

determinant of Manufacturing Output (MQ)during the period of the study. The study recommended that In order for credit to be easily accessible by the manufacturing sector, the Government should instruct financial institutions to reduce the interest charged on loans given to manufacturers. Also the Government establish more specialised banks for this sector, so that manufacturers can access loans from there at reduced interest rate.

Atan and Effiong (2020) conducted an empirical investigation into the role of the industrial sector in addressing youth unemployment in Nigeria. They analyzed time series data spanning from 1991 to 2019 and employed the Augmented Dickey Fuller and Philip-Peron test techniques to conduct unit root tests. The data were further analyzed using the ARDL approach and Granger causality test. The results of the unit root test indicated that the variables were integrated with mixed orders of levels and first differences, necessitating the use of the ARDL bounds test of co-integration. The bounds test revealed a long-run/levels relationship between youth unemployment rate (as a proxy for youth unemployment) and explanatory variables such as industrial output, bank credit to the industrial sector, interest rate, inflation rate, broad money, government expenditure on economic services, population growth, and trade openness. Additionally, the results demonstrated that 62.15% of the short-run disequilibrium is corrected annually, as indicated by the error correction term of -0.6215. It was revealed further from the result that industrial output exerts a negative effect on youth unemployment both in the short-run and in the long-run. Implying that increasing the volume of industrial activities will reduce youth unemployment. The Granger causality test also showed that there exists a causal relationship between youth unemployment and industrialization in Nigeria.

Theoretical Framework

The study is underpinned with Keynesian theory

Keynesian theory

John Maynard Keynes is renowned for his revolutionary ideas on economic theory and policy, particularly articulated in his seminal work, *The General Theory of Employment, Interest, and Money* (1936). Keynesian Theory challenged the Classical economic assumptions and provided new insights into managing economic cycles, particularly during periods of economic downturns. Keynesian Theory posits that aggregate demand—the total spending on goods and services in an economy—is the primary driver of economic activity and employment. It comprises consumption expenditure, investment expenditure, government spending, and net exports.

Keynesian economists argue that aggregate supply is influenced by the level of aggregate demand. In the short run, changes in AD can lead to changes in output and employment, whereas in the long run, AS might adjust to a different equilibrium. Keynes introduced the concept of uncertainty and its impact on economic decision-making. He argued that economic agents often make decisions based on expectations, which can be volatile and unpredictable. This uncertainty can lead to fluctuations in investment and employment levels.

The multiplier effect refers to the idea that an initial change in spending (e.g., government expenditure or investment) will lead to a larger overall change in national income and output. For example, an increase in government spending increases aggregate demand, which in turn boosts production and employment. The multiplier (k) is given by where $K = \frac{1}{1-\text{MPC}(1-t)}$ MPC is the marginal propensity to consume and t is the tax rate.

Keynes argued that while saving is beneficial for individuals if everyone increases their savings simultaneously, it can lead to a decrease in overall aggregate demand. This reduction in AD can lead to lower income and employment, which may offset the intended benefits of increased savings. Keynes introduced the Liquidity Preference Theory, which explains how interest rates are determined by the supply and demand for money. According to this theory, people hold money for transaction purposes, precautionary reasons, and speculative motives. Changes in the money supply affect interest rates and, consequently, investment and consumption. The theory posits that when there is an excess supply of money, interest rates fall, which encourages more investment and spending. Conversely, when the money supply is tight, interest rates rise, potentially reducing investment and would affect industrial sector output.

Keynes' Liquidity Preference Theory further highlights the relationship between interest rates and economic activity. He contended that lower interest rates, by reducing the cost of borrowing, stimulate investment in capital goods, thereby increasing overall output and employment. However, if interest rates rise too high, investment diminishes, leading to lower economic growth and potentially higher unemployment. Keynes argued that monetary policy, which affects the money supply and interest rates, plays a significant role in managing economic cycles, especially in times of recession or economic slowdown.

One of Keynes' most notable critiques of Classical Theory was its assumption of flexible wages and prices. In Classical economics, wages and prices are assumed to adjust quickly to restore equilibrium in the labor and goods markets. However, Keynes argued that wages and prices are often "sticky" downward, meaning they do not fall easily, even in response to decreased demand. This rigidity can prevent the labor market from clearing, resulting in persistent unemployment. For instance, during a recession, businesses may be reluctant to cut wages, fearing a drop-in worker morale or productivity. As a result, unemployment may remain high, prolonging the economic downturn. To address such situations, Keynes advocated for active government intervention. He believed that during periods of economic recession, when private sector demand is insufficient, the government should step in to boost aggregate demand through fiscal policy—specifically increased public spending and lower taxes. By increasing government expenditure, Keynes argued, demand for goods and services would rise, leading to higher production and employment. This was the foundation of Keynesian fiscal stimulus policies, which were widely adopted by governments following the Great Depression and have continued to influence economic policy, particularly in times of crisis.

Keynes also introduced the concept of the paradox of thrift, which suggests that while saving is beneficial for individuals, it can be detrimental to the economy as a whole during a recession. When individuals collectively increase their savings, consumption falls, reducing aggregate demand and slowing down economic activity. This can lead to what Keynes referred to as a "demand-deficient" economy, where the lack of demand prevents full employment. In such cases, Keynes argued, government spending could act as a counterbalance to boost demand and support economic recovery.

In the Nigerian, Keynesian principles have often been invoked during periods of economic contraction or recession. For example, during the 2016 recession in Nigeria, the government implemented expansionary fiscal policies, including increased public spending on infrastructure and social programs, to stimulate demand and revive economic growth. Keynesian theory suggests that such fiscal interventions can be powerful tools for managing economic downturns, but their success depends on the efficient allocation of resources and the ability to address underlying structural issues.

This study was anchored on the Keynesian theory, which was postulated by John Maynard Keynes (1936). This theory emphasizes the importance of aggregate demand in driving economic output, which is crucial when considering macroeconomic factors like inflation, interest rates, and government spending that directly influence industrial production. Keynesian economics argues that insufficient demand in the economy can lead to reduced output, unemployment, and underutilized industrial capacity problems that are often central in discussions of Nigeria's industrial sector. Moreover, the Keynesian approach allows for active government intervention, such as fiscal policy, which is highly relevant in the Nigerian context, where the government plays a significant role in stimulating industrial growth through policies and subsidies. The manufacturing sector's performance is often constrained by demand-side issues like low domestic consumption and foreign investment, which Keynesian theory addresses effectively.

3.0 Methodology

The study adopted *ex post facto research design*. *Ex post facto* research design seeks to examine the possible relationship between existing conditions, state of affairs and contributing factors.in carry out the study, secondary data were sourced from Central Bank of Nigeria Statistical Bulletin and Burau of Statistical from 1992-2023. Time series data were used based on the variables employed in the study. Manufacturing Sector output as dependent variable while inflation, exchange rate, interest rate, money supply, and unemployment as independent variables. The data was subjected to tests for normality and stationarity in which ARDL Model was adopted based on the stationarity test.

Model Specification

A multiple linear regression model will be used to assess the combined effect of inflation, exchange rate, interest rate, money supply, and unemployment on manufacturing output. The general model is expressed as:

$$MSO_t = \beta_0 + \beta_1 INF_t + \beta_2 EXR_t + \beta_3 IR_t + \beta_4 MS_t + \beta_5 UNEMP_t + \epsilon_t$$

Where:

MSO_t = Manufacturing Sector output at time t

INF_t = Inflation at time t

EXR_t = Exchange rate at time t
IR_t = Interest rate at time t
MS_t = Money supply at time t
$UNEMP_t$ = Unemployment rate at time t

β_0 = Constant term (intercept)

$\beta_{1\ to}\ \beta_{5\ =}$ coefficients to be estimated

Data Analysis
Summary of Descriptive Statistics
Table 1: Descriptive Statistics

	MSO	INFLR	INTR	EXCR	UNR	MOS
Mean	5254.520	19.70589	13.81447	152.9807	4.506988	11713.65
Median	2147.435	12.88000	13.50000	127.2400	4.453485	2384.866
Maximum	27508.52	72.84000	26.00000	898.8976	5.999000	63512.40
Minimum	41.63000	5.390000	6.100000	4.530000	3.256000	23.80640
Std. Dev.	7117.306	17.17380	3.604013	169.5005	0.767699	16041.71
Skewness	1.760497	1.718435	0.810731	2.461372	0.178588	1.488366
Kurtosis	5.381994	4.764409	5.157913	10.97884	2.053313	4.546118
Jarque-Bera	28.61287	23.63160	11.53573	139.1676	1.621005	17.81473
Probability	6.12E-07	7.39E-06	0.003126	6.03E-31	0.444635	0.000135
Observations	38	38	38	38	38	38

Source: EViews 12 Output, 2024.

Table 1 shows that the mean values of manufacturing Sector Output (MSO), Inflation Rate (INFLR), Interest Rate (INTR), Exchange Rate (EXCR), Unemployment Rate (UNR), and Money Supply (MOS) are 5254.520, 19.70589, 13.81447, 152.9807, 4.506988, and 11713.65, respectively. The standard deviations for MSO, INFLR, INTR, EXCR, UNR, and MOS are

7117.306, 17.17380, 3.604013, 169.5005, 0.767699, and 16041.71, respectively. These values indicate the spread of each variable around its mean. MSO, EXCR, and MOS have particularly high standard deviations, suggesting a high level of variability or dispersion. However, UNR has a low standard deviation, indicating less variability over time.

The minimum values for MSO, INFLR, INTR, EXCR, UNR, and MOS are 41.63, 5.39, 6.1, 4.53, 3.256, and 23.8064, respectively, while the maximum values are 27508.52, 72.84, 26, 898.8976, 5.999, and 63512.40 in that order. Also, the skewness values for MSO, INFLR, INTR, EXCR, UNR, and MOS are 1.760497, 1.718435, 0.810731, 2.461372, 0.178588, and 1.483366, respectively. Skewness measures the asymmetry of the distribution. MSO, INFLR, and EXCR exhibit positive skewness, indicating that the data distributions are skewed to the right, with potential extreme values on the higher end. UNR's skewness is near zero, suggesting a nearly symmetric distribution.

Kurtosis values for MSO, INFLR, INTR, EXCR, UNR, and MOS are 5.381994, 4.764409, 1.517913, 10.97884, 2.053313, and 4.546118, respectively. Kurtosis measures the "peakedness" of the distribution. Values greater than 3, as seen in MSO, INFLR, EXCR, and MOS, indicate leptokurtic distributions with pronounced peaks and heavier tails, suggesting possible outliers. INTR's kurtosis is below 3, implying a flatter distribution.

The Jarque-Bera test probability values are as follows: MSO (6.12E-07), INFLR (7.39E-06), INTR (0.003126), EXCR (6.03E-31), UNR (0.444635), and MOS (0.000135). With p-values less than 0.05 for MSO, INFLR, INTR, EXCR, and MOS, these variables are not normally distributed. UNR, with a p-value of 0.444635, is closer to a normal distribution. However, the Guasian theorem (1929) and Shao (2003) submit that the normality of data does not in any way affect the inferential statistics estimate to the Best Linear Unbiased Estimation (BLUE).

Correlation Analysis

Table 2: Correlation Analysis

	MSO	EXCR	INFLR	INTR	MOS	UNR
MSO	1.000000					

EXCR	0.759566	1.000000				
	0.0000--	-----				
INFLR	0.193921	0.176375	1.000000			
	0.2434	0.2895	-----			

INTR	--0.096741	-0.013094	0.388041	1.000000			
	0.5634	0.9378	0.0161	-----			
MOS	0.603862	0.637664	--0.165366	--0.045416	1.00000		
	0.0000	0.0000	0.3211	0.7866	-----		
UNR	0.525743	0.512301	-0.180673	0.256716	-0.530254	1.000000	
	0.0007	0.0010	0.2777	0.1197	0.0006	-----	

Source: Eview 12 Output, 2023.

From Table 2, it can be observed that Exchange Rate (EXCR) and Money Supply (MOS) exhibit significant positive relationship with Manufacturing Sector Output (MSO) in Nigeria, both with *p-values* of 0.0000, below the 0.05 significance level. Unemployment Rate (UNR) has a *p-value* of 0.0007, showing a significant relationship with manufacturing sector performance. Inflation Rate (INFLR), however, has an insignificant relationship with MSO, with a *p-value* of 0.2434, which is above 0.05, and Interest Rate (INTR) also shows an insignificant relationship with ISO, with a *p-value* of 0.5634.

The table above also presents the correlation matrix among the independent variables. It is observed that the variables correlate fairly well between - 0.165366 and 0.759566. The common rule of thumb is that if the correlation coefficient between two regressors is greater than 0.8, then multicollinearity is a serious issue. There is no correlation coefficient greater than 0.8. This indicates that multicollinearity is not an issue in the model valuations; hence there is no problem with the multicollinearity of data (Wallace & Naser, 2005)

Unit Root Test

	AT LEVEL			AT FIRST DIFFERENCE				
Variables	ADF Test Statistic	Critical Value @ 5%	Prob-Value	ADF Test Statistic	Critical Value @ 5%	Prob-Value	Max Lag	Order of Integration
MSO	7.921606	2.960411	0.9999	-7.999651	-3.670169	0.0000	6	1(1)
EXCR	3.312865	-2.943427	0.9999	-2.963971	-2.278039	0.1851	6	1(1)
INFLR	-2.329597	-2.960411	0.1695	-4.159131	-2.957110	0.0028	6	1(I)
INTR	-3.194450	-2.943427	0.0283				6	1(0)
MOS	2.676732	-2.945842	0.9999	-4.656452	-2.948403	0.0006	6	1(I)
UNR	-2.904551	-2.945842	0.0546	-4.705919	-2.945842	0.0005	6	1(I)

Table 3: Augmented Dickey-Fuller Unit Root Test
Source: Eview 12 Output, 2024.

From the table, it could be observed that Interest Rate (INTR) is found to be stationary at level, that is, it is integrated at order zero I(0) because the absolute value of ADF test statistics of -3.194450 is greater than the critical value of -2.943427 at 5%. However, the two other variables such as INFLR, and UNR have absolute ADF Test Statistic of -2.329597, and -2.904551 these values at level are less than the critical values of -2.963972 and -2.945842 while three other variables such as MSO, EXCR, MOS, have absolute ADF Test Statistic of 7.921606, 3.312865, and 2.676732 these values at level are greater than the critical values of 2.960411, -2.943427, and -2.945842. Therefore, MSO, EXCR, INFLR and MOS are not stationary at level. MSO, EXCR, INFLR, MOS, and UNR were found stationary at first difference, that is, order 1(I). All at 5% level of significance. Since all the variables were found to be stationary at different orders, of 1(1) and 1(0), it was safe for the study to employ bound test approach to validate or test for the presence of Co-integration. The order of integration of the variables are mixed, therefore, this study run Autoregressive Distributed Lag (ARDL) as the technique of analysis.

Results of Long-run Relationship

Table 6: Long Run Form
Dependent Variable: MSO

Variables	Coefficient	Std error	T-statistics	Prob
C	-1.488103	2.966755	-5.015926	0.0074
EXCR	2.3609187	3.454009	6.835298	0.0023
INFLR	-4.3459912	1.178777	3.686864	-0.0211
INTR	4.0324682	6.602894	6.107122	0.0036
MOS	0.315490	0.042184	7.478784	0.0017
UNR	1.677393	4.393383	3.817999	0.0188
R^2	0.999			
Adj. R^2	0.989			
F-Statistic	31.1403			
Pro. F-statistic	0.0000			

Source: Eview 12 Output, 2024.

In the long run, the coefficient showed that the exchange rate revealed a coefficient of 2.3609187, the coefficient is positive. This implies that the exchange rate has a positive effect on manufacturing sector output in Nigeria in the long run. It indicates that an increase in the exchange rate will improve manufacturing sector output in Nigeria in the long run. However, the exchange rate has a significant positive effect on manufacturing sector output in Nigeria in the long run as the probability value of 0.0023 is less than the 0.05 level of significance. The inflation rate also has a positive coefficient of 4.3459912 on manufacturing sector output in the long run, the inflation rate has a significant effect on industrial sector output in Nigeria with a probability value of 0.0211 which is less than 0.05 level of significance.

Likewise, interest rate, money supply, and unemployment rate all have a positive coefficient of 4.0324682, 0.315490, and 1.677393 respectively. This implies that interest rate, money supply, and unemployment rate all have a positive effect on manufacturing sector output in Nigeria in the long run. It indicates that an interest rate, money supply, and unemployment rate will increase industrial sector output in Nigeria in the long run.

Results of the ARDL Short-run Relationship

Table 7: ARDL Error Correction Regression

Dependent Variable: D(MSO)

Variables	Coefficient	Std error	T-statistics	Prob
D(EXCR)	-4.363567	8.910165	-4.897291	0.0081
D(INFLR)	2.456094	1.372456	1.789561	0.1480
D(INTR)	-2.256997	5.847006	-0.386009	0.7191
D(MOS)	-0.012310	0.098606	-0.124848	0.9066
D(UNR)	1.413615	3.43721	4.112682	0.0147
ECM(-1)	-0.394710	0.054329	-7.265208	0.0000
R^2	0.999			
Adj. R^2	0.989			
F-Statistic	31.1403			
Pro. F-Statistic	0.0000			

Source: E-view 12 Output, 2024.

As expected, the ARDL Error Correction Term (ECT) is negative (-0.394710) and statistically significant at a 5 percent level of significance. The coefficient revealed that once there is disequilibrium in the system, it takes an average speed of 39% to adjust itself back toward the long-run equilibrium level. This means that approximately 39% of the discrepancy in the previous year is adjusted for by the current year.

The coefficient of determination (R-square), which was used to measure the goodness of fit of the estimated model, indicates that the model is reasonably fit in prediction. It showed that 99 percent of changes in industrial sector output in Nigeria are collectively due to the exchange rate, inflation rate, interest rate, money supply, and unemployment rate while 1 percent of unaccounted variations were captured by the white noise error term. Likewise, the adjusted R-square value of 0.98 shows that if additional independent variables are introduced to the model, the R-square will reduce from 99% to 98%, the adjusted R-square reveals the ability of the independent variables to predict the dependent variable when additional independent variable is introduced into the model. An adjusted R-square value of 98 percent is also fit; it shows a good measure of the goodness of fit of the estimated model.

Post Estimation Diagnostics Tests
Table.8: Post Estimation Diagnostics Tests

Test	P-Value
Heteroskedasticity Test	0.7357
Serial Correlation LM Test	0.0979
JB Normality Test	0.1516

Source: Author's Computation from E-view 12 Results, 2024.
The result as presented in the above table revealed that there was no evidence of heteroskedasticity, serial correlation, and the data are normally distributed in the estimated ARDL-ECM model and have the *p-values* of 0.7357, 0.0979, and 0.1516 respectively. They were found to be greater than the 0.05 level of significance.

Discussion of Findings

The empirical evidence derived from the ARDL-ECM model indicates that the exchange rate has a significant negative effect on manufacturing sector output in Nigeria in the short-run. This indicates that an increase in the exchange rate will translate to an increase in manufacturing sector output in Nigeria. The negative effect of the exchange rate on manufacturing sector output in Nigeria indicates that exchange rate depreciation where the Nigerian currency weakens relative to foreign currencies negatively impacts manufacturing output by raising the costs of imported inputs essential for manufacturing.

Depreciation in the exchange rate increases the cost of importing raw materials, machinery, and other inputs needed for production in Nigeria's industrial sector, as many of these inputs are sourced internationally. Higher input costs reduce profitability for manufacturers and may lead to scaled-back production, thus lowering the overall output of the sector. Consequently, the

competitiveness of Nigeria's industrial products may also decline as domestic prices rise to cover higher production costs, making it harder for local industries to thrive in both domestic and international markets. The significant effect of the exchange rate on MSO in Nigeria is consistent with prior findings of Amri (2022).

This study revealed that the inflation rate has a significant negative effect on manufacturing sector output in Nigeria in the short run. High levels of inflation reduce MSO by increasing the costs of production inputs like raw materials, labor, and energy. When inflation rises, manufacturers face higher operational expenses, which can lead to reduced profitability and force some firms to cut back on production. This inflationary pressure may discourage investment in the industrial sector, as the cost of capital preservation becomes challenging for both local and foreign investors the findings derived from this study indicated that inflation rate has significant negative effect on manufacturing sector output in the long run in Nigeria and this supports the findings of Amri, (2022) also Alshamsi et al. (2015). But in the short run, it was found that inflation has significant negative effect on foreign direct investment in Nigeria.

This study found that interest rate has significant effect on manufacturing sector output in the long run in Nigeria. The coefficient of interest rate is negative, which indicates that increase in interest rate reduces industrial sector output, and this is statistically significant. Higher interest rates raise borrowing costs for businesses, making it more expensive for firms to finance industrial projects, which can stifle growth in the sector. Conversely, lower interest rates tend to promote investment by reducing capital costs, potentially boosting MSO. But the finding of this study is quite contrary to the above assertion. In the short run, the result indicated that interest rate has a negative effect on industrial sector output, but not statistically significant. This result supports the findings of Adesanya & Ajala (2020).

This study revealed that money supply has an insignificant negative effect on manufacturing sector output in Nigeria in the short run. Likewise, it was found that money supply has a positive significant effect on manufacturing sector output in Nigeria. In the long run, an increase in the supply of money will result in encouraging investment in the manufacturing sector and ultimately boosting output. This result supports the findings of Amri (2022).

This study revealed that the unemployment rate has a significant positive effect on manufacturing sector output in Nigeria in the short run. Likewise, it was found that there is no significant effect of the unemployment rate on manufacturing sector output. In the long run, the relationship between the unemployment rate and industrial sector output in Nigeria tends to reflect a negative relationship as persistently high unemployment erodes the skill levels of the workforce, making it less competitive and hindering productivity growth. This skill degradation impacts industries' ability to maintain high output levels over time. This result supports the findings of Atan and Effiong (2020).

Based on these findings the study concludes and recommended that:

Government should Diversifying the economy away from reliance on oil and ensuring a more robust manufacturing sector can help reduce the inflationary effects of external shocks, such as fluctuations in global oil prices.

Government and its parastatals should encourage the development of financial markets and tools that promote investment in the manufacturing sector, such as bonds and equity markets specifically targeted at industrial growth.

Government should encourage Public-private partnerships (PPPs) in training and skills development for the workforce in key manufacturing sectors can help align the skills of the labor force with industry needs.

CBN should reducing interest rates through coordinated fiscal and monetary policies to make financing more affordable for manufacturers, especially small and medium-sized enterprises (SMEs).

Government should Introducing foreign exchange hedging mechanisms could also help manufacturers mitigate risks associated with exchange rate fluctuations.

References

Abiola, Olawale .M, (2024). Impact of exchange rate volatility on the manufacturing sector growth performance in Nigeria.

Adebiyi, M. (2022). "Inflation and its impact on Nigerian industrial growth." *Journal of Economics and Development*.

Adesanya, T. A., & Ajala, O. A. The effect of interest rate on manufacturing output in Nigeria: *An ARDL Approach. 2(1) 23-34*

Akintoye, I. (2020). "Interest rate and investment in Nigeria's manufacturing sector." *African Journal of Economic Review*.3(2) 23-34

Amri, F. (2022). The effect of inflation, exchange rate, labor, and money supply on the manufacturing industry sector in INDONESIA 2011--2020. *Jurnal Ilmu Ekonomi Terapan*, *7*(1).

Anochie, U. C., Okereafor, G. and Bashir, M. O. (2023). Macroeconomic variables and productivity of Nigeria's manufacturing sector. *Nigerian Journal of Management Sciences*, 24(1), 244 – 254.

Anyanwu, J. C. (2020). "Unemployment and its effect on manufacturing sector performance in Nigeria." *Journal of Development Studies*.

David-Wayas, O. M., Ugwu, J. O., Chukwuma, Q. O., & Anyaegbuna, P. C. (2018). The impact of macroeconomic variables on manufacturing productivity in Nigeria. *International Journal of Recent Research in Social Sciences and Humanities*, 5(1), 246-258.

Eze, S., & Okoye, O. (2021). "Money supply and inflationary pressure in the Nigerian economy." *Nigeria Economic Review*.

Ezeani, E., & Okeke, C. (2021). The impact of power supply on industrial productivity in Nigeria. *Energy Economics*.

Ezu, G. Jeff-Anyeneh, S. E. & Adaora, O. N. (2019) Macroeconomic variables and performance of manufacturing sector in Nigeria. *IOSR Journal of Business and Management*, 22(11).

Ghareli, S. & Mohammadi, A. (2016). A study on the effect of macroeconomic variables and firm characteristics on the quality of financial reporting of listed firms in the Tehran stock exchange. *Journal of Fundamental and Applied Sciences,* 8(25), 1777-1797

Haruna, A., & Chiebonam, O. G. (2022). Interest rate and its effect on economic growth: An issue for Nigeria industrial sectors. *Journal Of Advanced Education and Sciences*, *2*(1), 01-04.

Li, Y., Hu, M., & Zhao, L. (2023). Study on the impact of industrial green development and technological innovation on employment structure.

Ogujiuba, K., & Adeniran, O. (2020). "The effect of exchange rate volatility on manufacturing performance in Nigeria." *International Journal of Economics*. 5(6) 35-46

Ogunleye, A. (2021). "The role of manufacturing in Nigeria's economic development." *Economic Development Quarterly*.

Olalekan, B., & Akinbobola, S. (2022). "Macroeconomic challenges and the Nigerian manufacturing sector." *Global Economic Insights*.ISN155534

Olaniyan, S. (2021). Exchange rate volatility and industrial output in Nigeria**.** *Journal of Economic Studies*, 46(5), 77-93.

Olasehinde, O., Olaolu, E. O., Adeleke, L., & Enueshike, P. (2022). Effect of selected macroeconomic variables on share price performance in the Nigerian banking industry.*Quest Journals Journal of Research in Business and Management, 10*(10), 14-21.

Olokoyo, F. O., Ibhagui, O. W., & Babajide, A. (2020). Macroeconomic indicators and capital market performance: Are the links sustainable?*Cogent Business & Management*, *7*(1).

Tapsin, G. (2017). The impact of selected macroeconomic variables on the balance sheets of manufacturing sector in Turkey. *Account and Financial Management Journal*, 2(5), 737-747.

World Bank. (2023). *Public-Private Partnerships and Industrial Development in Nigeria*.