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# Effect of Monetary Policy Changes on the Manufacturing Sector Value Added in Nigeria

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## **Abstract**

The application of appropriate monetary policy to supports the productive capacity of manufacturing firms is central in boasting the non-oil sector. Therefore, this paper analyses the effect of monetary policy changes on manufacturing sector value added in Nigeria for the period of thirty–eight years leaning on secondary data from 1986 to 2023. The annual time series data for the independent variables, proxied by broad money supply, monetary policy rate, credit to private sector and exchange rate were sourced from Central Bank of Nigeria Statistical bulletins. While data for the dependent variable represented by manufacturing sector value added was sourced from World Bank Development Indicator. Upon determination of the stochastic properties of the series using KPSS, the Auto–Regressive Distributed Lag models was utilized to analyse the data. The paper found the absence of long–run relationship between the monetary policy and the manufacturing sector value added in Nigeria. Secondly, the paper revealed that the broad money supply exerts positive effect on the manufacturing value added in Nigeria. Lastly, the paper established that monetary policy rate, credit to private sector and exchange rate negatively affects manufacturing value added in Nigeria. Consequently, the paper recommends that money supply and credit advances to the private sector must be made with caution and should be based on the productive capacity of the manufacturing sector. Similarly, the monetary policy rate should be efficiently regulated to reduce overburden of acquiring facilities on the manufacturers while the central bank should activate the bilateral currency swap agreement with Peoples Bank of China to ease importation of goods by manufacturers and stabilise the exchange rate.

**Keywords:** ARDL; Manufacturing value added; Monetary policy instruments; Nigeria

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## **1. Introduction**

The significant role of non–oil sector to the prosperity of the Nigerian economy has well been acknowledged in the history of Nigeria as a nation. Therefore, Nigerian economy has prior to the discovery of petroleum resources relied significantly on the non-oil sectors that include the manufacturing sector. Hence, manufacturing sector for instance, constitutes one of the fascinating sectors that lends unwavering contribution to the growth and development of the Nigerian economy and as such, the importance of non–oil sector particularly, the manufacturing in the growth of the Nigerian economy cannot be under looked (Budina & Wijnbergen, 2008; Abdullahi, Muhammad & Yahaya 2024). However, the non-oil sectors that is categorised into manufacturing, agriculture, services and tourism, among others, is an important sector in need of due attention for growth enhancement of economy in Nigeria (Chenery & Bruno, 1962 Obafemi, 2022). In this direction, the manufacturing sector which is

most noticed of the non-oil sector can be classified into electronics, chemicals, steel, wood, foods and beverages, among others.

Though, Nigeria is the largest economy in Africa with largest population and market with shared territories with several countries like Niger Republic, Chad Republic, Benin Republic and Ghana, among others, for which most of these neighbouring countries rely heavily on Nigeria for supply of their essential needs (Aliyu, 2005 and Donwa, Mgbame & Ezeani, 2015; Thoburn, 2000). In returns of these supplies of essentials to the neighbouring African countries, Nigeria earns revenue in both local and foreign currencies thereby, boosting both revenue base and foreign exchange earnings for Nigeria (Ibrahim, 2008; Obafemi, 2022). Consequently, the over dependence on the oil sector has crippled the revenue earning potential of the non-oil and gas sector of the economy with consequences of slowing down the growth potentials of the Nigerian economy. In view thereof, Budina and Wijnbergen (2008) argued that oil revenue dependent countries like Nigeria are characterised by declining productivity, de-industrialization and slow economic growth. Therefore, the needs to revive the manufacturing sector to birth industrialised economy by the Nigerian government becomes imperative so as to take advantage of the potential features endowed in Nigeria. Tkalec and Vizek (2009) state that, manufacturing sector is one among other most important driver of every economy that most often assume most competitive sector in an economy. Thus, the Nigerian government has undertaken several institutional and macroeconomic policy reforms spanning different political regimes as steps towards reviving the neglected manufacturing sector in Nigeria. For instance, the country has developed several developmental plans right from 1960s in phases: The First National Development Plan (NDP) (1962–1968), the Second NDP (1970–1974), Third NDP (1975–1980) and Fourth NDP (1981–1985) as well as the Structural Adjustment Plan (1986–1993) amongst others. The recent ones are the Vision 2020, National Integrated Infrastructure Master plan and transformation agenda and the National Development Plan (2021–2025).

Despite these efforts, the Nigerian economy presently faces significant economic challenges. Inflation remains extremely high, reaching all time level of about 32% in February, 2024, with food inflation even worse, largely due to fuel subsidy removal and currency depreciation (National Bureau of Statistics, 2024). In addition, poverty levels are also a concern, with around 46% of the population living below the poverty line. This is an indicative of the fact that the manufacturing sector has recorded insignificant improvement due to myriads of problems such as low level of technical know-how and technology to process raw-materials to finished or semi-finished goods, in-accessibility to credit facilities and unfavourable operating environment confronting the sector. This is further followed with unbearable operating costs and loss thus, affecting growth and development of business landscape in Nigeria. To pull the country out of the socio-economic challenges, changes in monetary and fiscal policies initiated by the CBN were specifically targeted at restoring economic development, generating employment and reducing inflation.

Consequently, monetary policies are traditionally used by the apex bank of a country to manage the stock and cost of finance through its instruments like exchange rate, reserve requirement, credit to private sector and interest rate, among others, to guarantee stability in gross domestic product, price and currency value (Christopher & Uduak, 2022). This is because, monetary policy has over the years been regarded as an important means of realizing macroeconomic stability and as such, monetary policy is habitually seen as an essential criterion for accomplishing production growth in the long-run. Consequently, monetary policymakers are confronted with goal of setting targets for intermediate variables like short-term interest rate, money supply rise, and exchange rate so as to achieve macroeconomic stability. These aforementioned instruments of monetary policy can be of significant uses in directing the motive the monetary policy is set out to achieve; hence, they are expansionary and contractionary instruments of monetary policy. They are mostly used to stimulate

economic activities in a period of economic contractions especially when there is rise in commodity prices and unemployment rate.

For instance, the monetary authority on one hand, during the expansionary motive of monetary policy lowers the interest rate and reserve requirements, and increases liquidity (i.e. advances credit to private sector) to incentivise business units to expand their investment portfolios, production capacity and employ additional manpower. This in turn intensify effective aggregate demand, absorb more economic resources like labour and capital, and generate income to the various economic agents that possess these resources. On the other hand, contractionary motive of monetary policy is the exact opposite of expansionary with reverse of applying the instruments of monetary policy in the sense that, it is used to deflate the economy especially when there is excess liquidity in circulation. Consequently, monetary policy plays a vital role in determining the operations and financial performance of manufacturing companies in a country especially in taking financing and investment decisions. Hence, the phenomenon of monetary policy in relation manufacturing sector has continue to draw the attentions of scholars and researchers into their investigations. Consequently, several studies investigating the performance of the manufacturing firms using the monetary policy landscape in Nigeria has been advanced by scholars (Christopher and Uduak, 2022; Asiagwu, Utalor and Anaele, 2021; Evans and Saibu 2017; Imoughele and Ismaila 2015; Ku, Mustapha and Goh, 2010; Mazumdar and Mazaheri, 2005). For instance, Christopher and Uduak (2022) averred that, any unexpected shocks in monetary instrument instruments like monetary policy rate and the growth in the stock of money in an economy cause declining effect on the output of manufacturing sector in Nigeria. On the other hand, Ku, Mustapha and Goh (2010) and Okejiri (2003) were of the view that paucity of funds, obsolete manufacturing equipment and instability in macroeconomic policies has also played a role in crippling the sector. Similarly, Also, Adenikinju and Alaba (2002) opined that most of the manufacturing companies selected recorded low performance in terms of productivity due to inappropriate monetary policy and its instruments adopted in the country. Also, Adeniju and Chete (2010); Mazumdar and Mazaheri (2005) adjudged that, cost of borrowings, and fluctuations in foreign exchange due to volatility in oil price have affected manufacturing companies in Nigeria.

In contrast, Asiagwu, Utalor and Anaele (2021) stressed that, monetary policy like money supply growth rate, deposit interest rate and lending rate are effective means of enhancing manufacturing sector output in Nigeria. These are some of the studies viewing the manufacturing sector performance from monetary viewpoint and viewpoint, there are mix and divergent findings to the examination of the monetary policy nexus with manufacturing sector output in Nigeria. This thus, calls for monetary authority through CBN to appropriately adopt regulations of monetary policy instruments that supports the productive capacity of the economy and safeguard the Nigerian manufacturing sector from the danger of misapplying inefficient policy instruments in the pursuits of certain macroeconomic goal. From the foregoing, this study seeks to examine the effect monetary policy dynamism on manufacturing output in Nigeria.

## **2. Conceptual and Empirical Reviews**

This section comprises of conceptual clarification of the key concepts in the paper and review of empirical studies.

### **2.1 Conceptual Review**

#### **2.1.1 Manufacturing Sector Output**

Generally speaking, the manufacturing sector plays a very important function in the revolution of any economy because, it provides a premise for boosting productivity of an economy through imports and export interaction with the rest of the world thereby, fascinating foreign exchange earning capacity (Asemota & Agunobi, 2023). This consequently, boost employment

and income generation which in turn raises per capital income for enhancing consumption expenditure and hence, raising living standard. Following from this premise, the manufacturing sector output can be said to mean total monetary value of finished goods or services produced by a group of industries that engaged in the processing and transforming the crude materials into finished and polished products with a view of either creating new products and services or create value addition to the product or services (Adebayo, 2011). Similarly, Mbelede (2012) conceptualized the manufacturing sector output as the total quantity of goods or services that are processed into final products using available raw materials with a view of adding value to the existing product or creating entirely new product. More so, Asemota and Agunobi (2023) defined manufacturing sector output as the total monetary value of goods produced by the manufacturing industry during a particular period of time (usually one year) with a view to meet the needs of people. This includes the production of physical goods such as cars, machinery, appliances, textiles, and other manufactured products. This study therefore contends with the definitions of manufacturing sector output given by Asemota and Agunobi (2023) as the operational conceptualization of manufacturing sector output due to time preference and means of measuring (monetary measure) the production of manufacturing sector contains in the definition.

### **2.1.2 Monetary Policy**

Generally, monetary policy deals with the discretionary regulation of the supply of money by the monetary authorities to realize preferred economic goals (Johnston, 2009). Monetary policy is a key economic stabilization tool, which includes actions designed to control and regulate the stock, cost, availability and direction of money and credit in an economy as a means of achieving specified macroeconomic policy goal (Anyanwu, 2004). However, according to Ogunjimi (2007), a monetary policy is a deliberate effort of the government through monetary authority usually headed by Apex I Bank in an economy to regulate the stock of money and credit conditions to achieve certain all-encompassing economic objectives. In the same vein, Oyejide (2013) referred to as the mixture of deliberate actions to control the value, supply, and cost of money that is tantamount to the level of economic activities in an economy. While monetary policy is one of the assumed economic plans and actions of the government through the apex bank in the country to nurture macroeconomic stability for promoting economic growth (Hillary, *et. al.* 2018). From the foregoing, monetary policy can in the context of this study be refer to the actions taken by the monetary authority through central banks to regulate the supply of money and manipulation of interest rates for achievement of macroeconomic objectives like managing inflation rate, promoting financial stability and stabilising economic growth.

### **2.2 Empirical Review**

Plethora of empirical studies investigating the nexus between monetary policies and manufacturing sector output exists in the literature. For instance, Asemota and Agunobi (2023) adopted ARDL model to study the effect of monetary policy on the manufacturing sector growth in Nigeria. The study revealed that, broad money supply and inflation had a positive effect on manufacturing sector output in Nigeria, though, the positive effect of broad money supply on manufacturing sector output is statistically significant, while that of inflation rate on manufacturing sector output is insignificant statistically. Moreover, the lending rate portends negative and insignificant effect on manufacturing sector output in Nigeria. Similarly, Christopher and Uduak (2022) utilized vector autoregressive (VAR) and generalized method of movement (GMM) to investigate the nexus between monetary policy and industrial performance with a view of evaluating impact of such correlation between monetary policy and industrial output on the Nigerian economy. The finding of the study revealed that, shocks to credit supply and Treasury bill rate produces positive growth outliers at different magnitudes

in the industrial sector. Additionally, the study revealed that any unforeseen change in monetary policy rate and money supply growth can generate negative impact on industrial sector output that is consistent with no sign of convergence throughout the period. By implication, the study viewed sudden alteration to the monetary policy instruments like monetary policy rate, broad money supply and credit to private sector generate instability in the output level of industrial sector in Nigeria.

In a related study, Nwachukwu, *et al.* (2022) studied the impact of monetary policy on the manufacturing sector's contribution to the gross domestic product in Nigeria from 1985 to 2019. The study used Autoregressive Distributed Lag (ARDL) Bounds testing approach as a tool of analysis with capturing of long-run dynamics of ARDL cointegration model in the study. The finding of the study revealed the existence of long-run relationship between monetary policy and the manufacturing sector's contribution to gross domestic product in Nigeria. In explicit term, the study showed that in the short run, monetary policy rate portends a negative and significant impact on manufacturing sector's contribution to the GDP, while liquidity ratio, inflation rate and treasury bill bears positive and significant impact on manufacturing sector's contribution to GDP in Nigeria. While, exchange rate appears to be the only instrument of policy examined in the study with positive and insignificant impact on manufacturing sector's contribution to GDP in Nigeria. However, monetary policy rate is in the long run negatively impact on the manufacturing sector's contribution to GDP in Nigeria at a significant level of statistics, while, exchange rate and liquidity ratio were found to have positive but insignificant impact on manufacturing sector's contribution to GDP in Nigeria. Also reported that in the long-run, inflation rate and Treasury bill exert positive and significant on the manufacturing sector's contribution to the gross domestic product in the long run in Nigeria. Consequently, the study concluded that the manufacturing sector's contribution to the gross domestic product can be enthused through effective and efficient monetary policy in both short and long run.

In the same vein, with the aid of multivariate regression model using OLS regression technique, Akpunonu and Orajaku (2021) studied the effect of monetary policy on industrial growth in Nigeria for the period of thirty-four years and showed that, Open Market Operation (OMO) proxy by the Treasury bill rate and Cash Reserve Ratio (CRR) had a positive and significant effect on the Nigerian manufacturing output while, monetary policy rate (MPR) portends negative and significant effect on the Nigerian manufacturing sector output in Nigeria. Consequently, the study concludes that monetary policy is an inducing tool for improving industrial sector output growth in Nigeria. Furthermore, Obi (2021) investigated the effect of monetary policy instruments on manufacturing sector output in Nigeria from 1987 to 2019. The Autoregressive Distributive Lag (ARDL) Bounds test for cointegration was adopted as a tool of analysis in the study. The finding of the study shows that, the monetary policy rate and the money supply have a positive and significant effect on manufacturing sector output in the short run while the effect of Treasury bill rate on manufacturing sector output is insignificant in the short run. Therefore, manufacturing subsector output non-oil sector is an endogenous variable in the discourse of the effect of monetary policy on manufacturing sector output in Nigeria.

In addition, Ibbih *et al.* (2020) examined the effect of monetary policy on manufacturing value-addition in Nigeria from 1918 to 2018 where monetary policy is disaggregated into its various instruments like monetary policy rate, prime lending rate, open market operation, broad money supply and manufacturing sector credit as the examined variables of the monetary policy in the study. The study utilized Autoregressive Distributed Lag (ARDL) model as the technique of analysis to found that, broad money supply remained the only variable of monetary policy that exert positive impact of manufacturing value addition in Nigeria in the short-run while, credit to private sector is the only variable of monetary policy that portends

positive impact on manufacturing value addition in Nigeria. More so, Osakwe, *et al.* (2019) investigated the effect of monetary policy on the performance of the Manufacturing sector in Nigeria. The study adopted Autoregressive Distributive Lag (ARDL) as a tool of analysis in the study. The findings of the study indicate that: monetary policy tools like monetary policy rate, treasury bills rate, cash reserve requirement and money supply have significant effect on the manufacturing sector output in Nigeria in the short run only. The study thus concludes that monetary policy tools such as monetary policy rate, treasury bills rate, cash reserve requirement and money supply do not portend positive effect on manufacturing output in Nigeria in the long-run and as such, they may not be regarded as viable policy instrument for the growth of the manufacturing sector output in Nigeria.

### **2.3 Theoretical underpinnings**

This study utilized complementary theory of Cobb–Douglas production function developed by Charles Cobb and Paul Douglas between 1927 and 1947, and classical quantity theory of money as the theoretical framework for the paper.

#### **2.3.1 Cobb–Douglas Production function**

The Cobb–Douglas form was developed and tested against statistical evidence by the independent work of Charles Cobb and Paul Douglas between 1927 and 1947 (Cobb & Douglas, 1928). The Cobb–Douglas production function is a precise functional form of the production function that is widely adopted to epitomise the technological relationship between the quantities of two or more inputs more precisely, physical capital and labor and the quantity of output produced by the combination of these inputs. Thus, the Cobb–Douglas production function relates the total quantity of output that can be produced using certain quantity of two or more inputs, that is, physical labour and capital. And this can be expressed in a functional form as:

$$Q = f(L, K) \dots\dots\dots (2.1)$$

Where Q is total quantity of output produced; L is labour input and K is capital input engaged in the production function.

#### **2.3.2 The Classical Theory of Quantity of Money**

The classical quantity theory of money evolved through several refinements that saw different applications by scholars and later championed by Milton Friedman in 1956 (Dimand, 2016). The theory is often stated in terms of Fisher equation of exchange and asserted that, there is a direct connection between the monetary sector and the real sector of the economy as such, advocates for the utilisation of monetary policy as an instrument of actualizing the output growth in an economy (Christopher & Uduak, 2022). Thus, the Monetarists support the views that the effectiveness of monetary policy impact substantially on output growth by adopting the equation of exchange postulated by the neoclassical economists led by Irving Fisher which is thus, stated as:

$$MV = PY \dots\dots\dots (2.2)$$

Where M is the supply of money, V is velocity of circulation, that is, the number of time money is used to transact in an economy, P is the price level and Y is the level of output prevailing in an economy. Though, for the sake of analysis, the Monetarists assume that velocity (V) is assumed to be constant, and subsequently, the equation indicates a one-to-one relationship between changes in money stock and changes in the value of national output (Volckart, 1997). Consequently, equation (2.2) is restated as:

$$M = kPY \dots\dots\dots (2.3)$$

Where k is constant assumed for the velocity of money in circulation. Therefore, changes in output can only be brought about through changes in money supply. On the basis of the constant assumption of velocity of money in circulation, direct connection exists between monetary sector (M) and manufacturing sector (Y) of the economy. This thus, laying the premise for the

postulation of monetarists that changes in monetary policy affect manufacturing output. Though, it is to the belief of monetarists that the economy may not constantly operates at full employment level of real output and so, in the short-run, expansionary monetary policy measure may generate increase in the level of real output arising from increase in aggregate demand (Bieda, 1973). Though, in the long run when the economy attained full employment level, the modification of the equation of exchange would be a good approximation of the connection between the money supply, the price level, and the real output (Wennerlind, 2005). Impliedly, this clarification established an interrelated and systematic relationship between the financial sector (monetary policy) and industrial sector (manufacturing output) of the economy.

### **3. Study Methods**

#### **3.1 Sources of Data**

The study utilised ARDL to analyse the effect of monetary policy change on the performance of manufacturing sector in Nigeria leaning secondary data spanned from 1986–2023. The time series data for the manufacturing sector proxy by the manufacturing sector value added which is the dependent variables is sourced World Bank Development Indicator (WDI, 2023). While, the time series data for monetary policy proxy by its various indicators, broad money supply, monetary policy rate, credit to private sector and exchange rate were sourced from Central Bank of Nigeria Statistical bulletins (CBN, 2023).

#### **3.2 Model Specification**

In accordance to the complementary theories of Cobb–Dougllass production function and the classical quantity theory of money that relates national output to the variation in the monetary policy variables like money supply and interest rate, the model of the study is specified as:

$$Qty = f(MP) \geq 0 \dots\dots\dots (3.1)$$

Where Qty is the national output and MP is monetary policy. However, monetary policy is in this study proxy be its indicators such as broad money supply, credit to private sector, monetary policy rate and exchange rate, and so, monetary policy is expressed as:

$$MP = f(M^2, CPS, MPR, EXCR) \dots\dots\dots (3.2)$$

Where MP is monetary policy,  $M^2$  is broad money supply, MPR is monetary policy rate and EXCR is exchange rate. Therefore, substituting equation (3.2) equation (3.1) and regarding Qty in equation (3.1) as the output of manufacturing sector to establish the model of the study for estimation. Thus, the model of the study is express as:

$$MQty = f(M^2, CPS, MPR, EXCR) \dots\dots\dots (3.3)$$

Where MQty is output of manufacturing sector and the mathematical representation of equation (3.3) is expressed as:

$$MQty = M^2 + CPS + MPR + EXCR \dots\dots\dots (3.4)$$

The econometric specification of equation (3.3) is expressed as:

$$MQty_t = \beta_0 + \beta_1 M^2_t + \beta_2 CPS_t + \beta_3 MPR_t + \beta_4 EXCR_t + \varepsilon_t \dots\dots\dots (3.5)$$

#### **3.4 Model estimation Procedure**

Firstly, the study test the stochastic properties of the series employed for the variables specified in the model using PP unit root test framework. The PP unit root test is preferred to ADF in this study due to its greater reliability in the midst of serial correlation and heteroscedasticity (Hamilton, 1994). The unit root test for variables carried out with both trend and intercept is specified as:

$$\Delta MQty_t = \beta_0 + \beta_1 MQty_{t-1} + \beta_2 T + \sum_{i=0}^n \varphi_i \Delta MQty_{t-i} + \varepsilon_t \dots\dots\dots (3.6)$$

Where,  $\beta_0$ ,  $\beta_1$ ,  $\beta_2$  and  $\varphi_i \dots \varphi_n$  are parameters to be estimated, and  $\varepsilon_t$  is the white noise disturbance term.

Subsequent to the conduction of unit root test, the test for cointegration using Auto-regressive Distributed Lad model otherwise referred to as ARDL Bound test by Pesaran, Shin

& Smith (2001) for the broad model. The ARDL Bound test is preferred for its accommodating power of conducting cointegration test for the combined stationary and non-stationary series and also considering the entire variables in the cointegrating equation as endogenous (Pesaran *et al.*, 2001; Shin, *et al.*, 2014). Thus, the estimated symmetric ARDL cointegration test model is specified as:

$$\Delta \ln \text{MQty}_t = \phi_0 + \delta_1 \text{MQty}_{t-1} + \delta_2 \text{M}_{2t-1} + \delta_3 \text{CPS}_{t-1} + \delta_4 \text{MPR}_{t-1} + \delta_5 \text{EXCR}_{t-1} + \sum_{i=1}^q \beta_{1i} \Delta \text{MQty}_{t-i} + \sum_{i=1}^q \beta_{2i} \Delta \text{M}_{2t-i} + \sum_{i=1}^q \beta_{3i} \Delta \text{CPS}_{t-i} + \sum_{i=1}^q \beta_{4i} \Delta \text{MPR}_{t-i} + \sum_{i=1}^q \beta_{5i} \Delta \text{EXCR}_{t-i} + \pi_1 \text{ECT}_{t-1} + \Omega_t \dots \dots \dots (3.7)$$

Where model variables are as defined earlier,  $\Delta$  is a first differenced operator,  $\phi_0$  is an intercept term,  $\beta_1$  to  $\beta_5$  are short run coefficients,  $\delta_1$  to  $\delta_5$  are long run parameters and  $q$  being the optimal lag orders and the  $\pi_1$  is the speed of adjustment parameter, while, ECT is the residual series from the long-run equations 3.6 (symmetric long-run).

Nonetheless, all the estimated models in the series of equations specified in the paper is subjected to residual diagnostic tests like Breusch-Pagan for serial correlation, RESET: Ramsey's test for misspecification or specification error, Jarque-Bera test for normality, Breusch-Pagan-Godfrey heteroscedasticity and cumulative sum (CUSUM) and cumulative sum of square (CUSUMSQ) recursive estimates for stability of the estimated coefficients.

#### 4. Results and Discussion of Findings

**Table 4.1: ADF and PP test results on first differenced log-level variables**

Variables	LM-Stat.				
	Level		1 <sup>st</sup> Difference		Remark
	KPSS-Stat.	5% C/V	KPSS-Stat.	5% C/V	
MQty.	0.173596**	0.146000	0.103185**	0.146000	I(0)
InM <sub>2</sub>	0.091160**	0.146000	0.500000**	0.146000	I(1)
InCPS	0.136035**	0.146000	0.424644**	0.146000	I(1)
MPR	0.398543**	0.146000	0.079976**	0.146000	I(0)
EXCR	0.173917**	0.146000	0.164772**	0.146000	I(0)

Source: Author's computation (2024)

The results of KPSS unit root test shown in table 4.1 revealed that, the respective KPSS-statistics (i.e. t-statistics) for variables measuring the performance of manufacturing sector (MQty), monetary policy rate (MPR) and exchange rate (EXCR) are less than critical value at 5% level of statistics; hence, they were found stationary at zero order of integration (i.e. I/0). While, respective KPSS-statistics (i.e. t-statistics) for variables like broad money supply (M<sub>2</sub>) and credit to private sector (CPS) are less than critical value at 5% level of significance at zero order of integration (i.e. I/1) and thus became greater than critical value at 5% level of significant statistics after taking the first difference for the series of the variables. Hence, became stationary at first difference (i.e. I/1). Consequently, the results of KPSS obtained suggests the utilization ARDL as the technique of estimation for the study. Prior to the testing of cointegration using ARDL bound test, the lag length selection criteria were conducted and the result is presented in table 4.2.

**Table 4.2: The Result of Lag Length Selection**

Lag	LogL	LR	FPE	AIC	SC
0	-406.5999	NA	11278.87	23.51999	23.74219
1	-285.1249	201.3014*	46.28633*	18.00714	19.34029*
2	-261.7793	32.01685	55.83314	18.10167	20.54579
3	-230.9206	33.50367	51.57371	17.76689*	21.32197

Source: Author's computation (2024).



The table 4.2 shows the result of lag length selected for the estimated of the study where one (1) lag period was selected for the models of study being estimated because of the dominance of the one (1) lag period among the length selection test criteria as detailed in the table 4.2. Following the test for the stochastic properties of the series, the cointegration test was conducted and the result of cointegration is presented in table 4.3.

**Table 4.3: Results of Cointegration Test**

Dependent Variable	Function	F-Statistic	K
INS.	f(GNIPC./PMSp EXCR)	2.032254**	4
Critical Values Bounds			
10%		5%	
1%			
I(0)	I(1)	I(0)	I(1)
2.2	3.09	2.56	3.49
		I(0)	I(1)
		3.29	4.37

Source: Author’s Computations.

As revealed in table 4.3, the result of ARDL bound test for cointegration shows that there is no evidence of cointegrating or long–run relationship monetary policy and the performance of manufacturing sector in Nigeria since, the computed F-statistics (2.032254\*\*) is less than less bound critical values (2.56) at K equal to 4 and five per cent (5%) level of statistical significance. While, the result of the long–run and short–run effect of monetary policy on the performance of manufacturing sector is presented in table 4.4 panel A and panel B respectively.

**Table 4.4: Panel A: The Result of Short–run Effect of MP on the Performance of MQty**

Variable	Coefficient	Std. Error	t-Statistic	Probability
InM <sub>2</sub>	8.9863	3.267796	0.363642	0.0196
MPR	-0.145011	0.071754	-2.020956	0.0056
InCPS	-2.601368	1.320134	-1.970533	0.0615
EXCR	0.022688	0.053300	-4.034523	0.6745
CointEq(-1)	-0.050705	0.012568	0.425694	0.7419

**Table 4.4: Panel B: The Result of Long–run Effect of MP on the performance of MQty**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
InM <sub>2</sub>	3.738340	1.143314	3.269741	0.0035
MPR	-0.178167	0.068938	-2.584455	0.0169
InCPS	-0.145011	0.071754	-2.020956	0.0556
EXCR	-0.001885	0.005070	-0.371741	0.7136
C	-281.4992	843.8565	-0.333587	0.7419

Source: Author’s computation (2024).

The table 4.4 (panel A and B) shows that, the broad money supply (InM<sub>2</sub>) portends a positive and significant effect on the performance of manufacturing sector (MQty) in both short–run and the long–run in Nigeria and this conform to apriori expectation. This means that, a unit rise in broad money supply (InM<sub>2</sub>) effect 8.99 unit and 3.7383 unit increase on the performance of manufacturing sector in the short–run long–run respectively in Nigeria. Interestingly, the result of such positive effect of the broad money supply (InM<sub>2</sub>) on the performance of manufacturing sector (MQty) is statistically significant since, the p-values in the short–run (0.0196) and long–run (0.0035) is less than 0.05 or 5% statistical level of significance. This finding is in agreement with the findings of a study by Asemota and Agunobi (2023); Obi (2021); Ibbih *et al.* (2020) and Osakwe, *et al.* (2019) that, rise in the stock of broad money supply (InM<sub>2</sub>) exert direct positive influence on the performance of manufacturing sector (MQty) through making more capital and fund available to the manufacturer for both expansion of existing plant and new

investment in new plant that eventually enhances the output of manufacturers thereby, enhances the overall performance of the manufacturing sector in Nigeria.

Similarly, the study found that, the monetary policy rate (MPR) has a negative and significant effect on the performance of manufacturing sector (MQty) in both the short-run and long-run in Nigeria and this conform to apriori expectation as shown in the table 4.4 (panel A and B). This means that, a unit rise in monetary policy rate (MPR) exerts 0.145 unit and 0.178167 unit effect decline on the performance of manufacturing sector in the short-run and long-run respectively in Nigeria. Interestingly, the result of such negative effect of the monetary policy rate (MPR) on the performance of manufacturing sector (MQty) is statistically significant since the p-values in the short-run (0.0056) and long-run (0.0169) is less than 0.05 or 5% statistical level of significance. This finding is in agreement with the findings of a study by Nwachukwu, *et al.* (2022) and Akpunonu and Orajaku (2021) that, rise in monetary policy rate (MPR) exert negative influence on the performance of manufacturing sector (MQty) through reducing the cost of acquiring capital and funds by manufacturers for both expansions of existing plant and new investment in new plant.

This eventually enhances the output of manufacturers that subsequently, enhances the overall performance of the manufacturing sector in Nigeria. Furthermore, the study found that, the credit to private sector (InCPS) has a negative and insignificant effect on the performance of manufacturing sector (MQty) in both the short-run and long-run in Nigeria and this negate the apriori expectation as shown in the table 4.4 (panel A and B). This means that, a unit rise in credit to private sector (InCPS) exerts 2.6014 units and 0.145011-unit effect decline on the performance of manufacturing sector in the short-run and long-run respectively in Nigeria. Though, the result of such negative effect on the credit to privates' sector (InCPS) on the performance of manufacturing sector (MQty) is statistically insignificant since the p-values in the short -run (0.0615) and long-run (0.0556) is greater than 0.05 or 5% statistical level of significance. This finding is in disagreement with the findings of a study by Christopher and Uduak (2022) that, rise in credit to private sector (InCPS) exert positive influence on the performance of manufacturing sector (MQty) through availing the investors an access to credit and funds to enable them undertaken investment decisions on expansion of existing business and open new area of investment. This consequently enhances the performance of the manufacturing sector in Nigeria.

On the contrary, the finding of this study aligned with the findings of a study by Ibbih *et al.* (2020) that, providing credit to private sector distort the performance of manufacturing sector's performance, particularly when the advanced credit is not in tantamount to the level of productivity of the manufacturers; hence, the performance of the manufacturing sector would be distorted by the credit advanced to the private sector due to negative consequences of inflation that accompanied the excessive supply of credit to the private sector.

Moreover, the results of the long-run estimated model presented in the panel of table 4.4 shows that, the exchange rate (EXCR) has a positive but insignificant effect on the performance of manufacturing sector (MQty) in the short-run in Nigeria which negate the apriori expectation. That is, a unit rise in exchange rate (EXCR) affects the performance of manufacturing sector in the long-run in Nigeria to rise by 0.0227 unit. Although, the result of the positive effect of the exchange rate (EXCR) on the performance of manufacturing sector (MQty) is statistically insignificant since the p-values (0.6745) is greater than 0.05 or 5% statistical level of significance. Impliedly, a unit fall in exchange rate (EXCR) contribute to falls in the performance of the manufacturing sector by 0.0227 unit in the short-run and so, the positive direction of the effect can be real sense regarded as negative effect of the exchange rate (EXCR) on the performance of the manufacturing sector (MQty) in Nigeria. But in the long-run, exchange rate (EXCR) has negative and insignificant effect on the performance of manufacturing sector (MQty) in Nigeria which conform to the apriori expectation of the study

as detailed in the panel of table 4.4. This means that, a unit rise in exchange rate (EXCR) affects the performance of manufacturing sector in the long-run in Nigeria to decline by 0.001885 unit. Similarly, a unit fall in exchange rate (EXCR) produces 0.001885 unit increase in the performance of manufacturing sector and thus, the negative direction of the effect of exchange rate (EXCR) in the long-run can be in the real sense seen as positive effect of the exchange rate (EXCR) on the performance of manufacturing sector in Nigeria. Although, the result of the negative effect of the exchange rate (EXCR) on the performance of manufacturing sector (MQty) is statistically insignificant since the p-values (0.7136) is greater than 0.05 or 5% statistical level of significance. Impliedly, since the exchange rate exerts inverse relationship with the performance of manufacturing sector (MQty), it can be deduced that, exchange rate (EXCR) has positive impact of the performance of manufacturing sector (MQty). This finding is in agreement with the findings of a study by Nwachukwu, *et al.* (2022) that, low rate of exchange contribute to the greater performance of the manufacturing sector in Nigeria. This is because, at lower exchange rate, the manufacturers can acquire production input that cannot be sourced locally at the cheapest rate and this would in turn serve as motivation and incentive to expand the production thereby, stimulating the greater performance of the sector in Nigeria. Nonetheless, as shown in the panel (A) of table 4.4, the result of error correction model (ECM) associated with the long-run estimated ARDL model is -0.0510 with p-value 0.0006 showing statistical significance of the estimated short-run dynamic of the long-run ARDL model being estimated. This implies that, the estimated short-run dynamism of the long-run ARDL estimated model certifies and fulfils the conditions governing the principle of the ECM. And as such, the model is moving at the speed of marginally above 5% before the long-run relationship between the monetary policy and manufacturing sector's performance thereby, corroborating the absence of cointegration in the model as obtained and detailed in table 4.3. Therefore, the model is required to move at the speed of 94.89% before the cointegration can be established in the model.

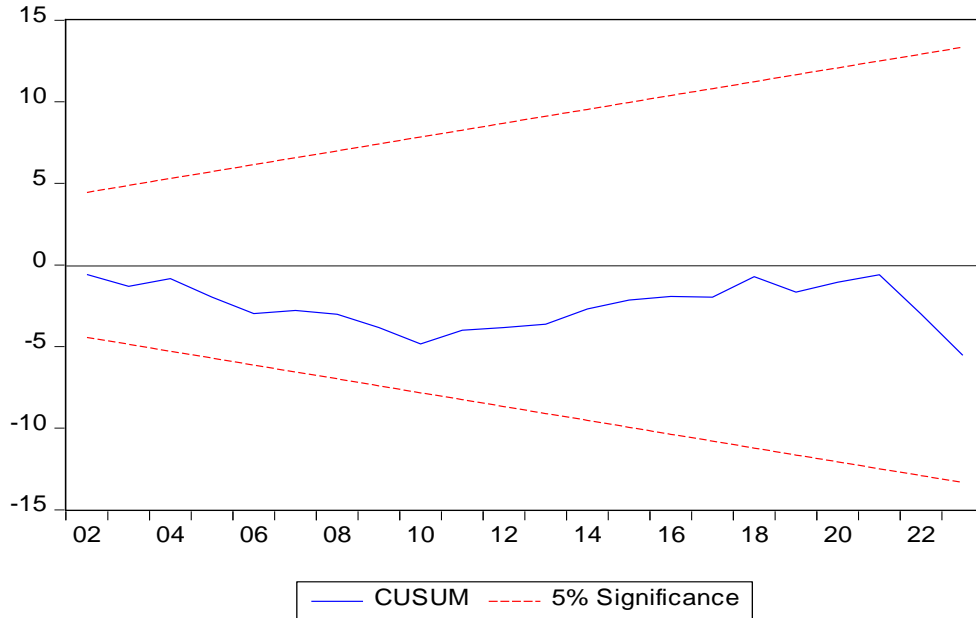
**Table 4.5 Post Estimation Residual Diagnostic Test**

Tests		Outcomes	
		Coefficients	Prob.
Heteroskedasticity: Breusch-Pagan-Godfrey test	F-Stat.	1.810620	0.1137
	N <sup>2</sup>	16.15513	0.1355
Breusch-Godfrey Serial Correlation LM Test	F-Stat.	0.260582	0.7732
	N <sup>2</sup>	0.863478	0.6494
Ramsey-RESET	F-Stat.	0.021275	0.8854
Normality Test	Jarque-Berra	0.489961	0.7830

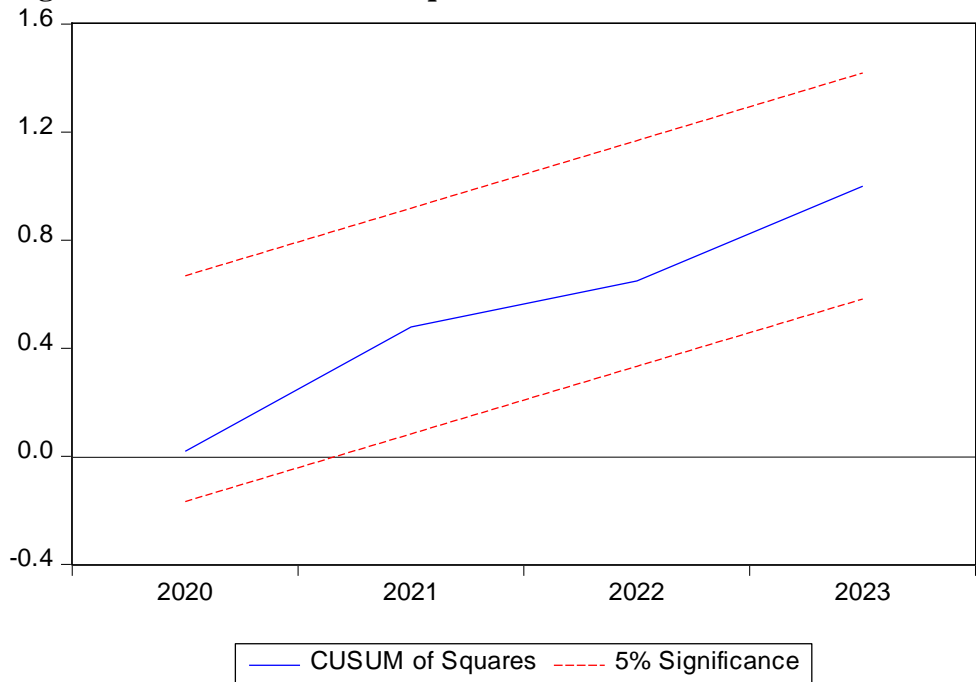
Source: Author's computation (2024).

From the estimated post estimation residual diagnostics test, it is empirically evident shown in the table 4.5 that, there is no evidence of serial correlation in the estimated model and that the model is free from Heteroskedasticity. This is because, the p-value of both tests (serial correlation- 0.7732 and heteroskedasticity-0.1137) was found to be greater than 0.05 or 5%. Also shown in the table 4.5, the Ramsey Regression Specification Error Test (RESET) specification error test showed that the model was well mathematically specified as the p-value 0.8854 was found to be greater than 0.05 or 5%. Similarly, the residual term is normally distributed. The Jarque-Berra which is the test for normality distribution revealed that the result attained a normal distribution with a bell shaped symmetrical distribution at 5% significant level because its p-value 0.7830 is greater than 0.05 or 5% statistical level of significance.

**Fig. 4.1: Cumulative Sum**



**Fig. 4.2: Cumulative Sum of Square**



The cumulative sum of recursive (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) test that are used to determine the stability of the coefficients of the estimated model. Both the CUSUM and CUSUMSQ plots do not cross the 5% critical lines, implying that over the entire sample period under investigation, there exists stability for the estimated coefficients, and so the regression coefficients are reliable and suitable for policy formulation.

### **5. Conclusion and Recommendation**

This paper analyses the effect of monetary policy changes on the manufacturing sector value added in Nigeria for the period of thirty–eight years leaning on secondary data from 1986 to 2023. Thus, monetary policy instruments such as broad money supply, monetary policy rate, credit to private sector and exchange rate plays crucial roles in the enhancing the manufacturing

sector value added in Nigeria. This paper is built on complementary theories of Cobb–Douglas production function and the classical quantity theory of money to base the model of the study being estimated. Subsequent to the determination of the stochastic properties of the time series data for the variable employed in the study, Auto–regressive Distributed Lag Models as technique of analysis was used. The study therefore found that, broad money supply exerts positive effect on the manufacturing sector value added in both in the short–run and long–run in Nigeria. While, monetary policy rate, credit to private sector and exchange rate bears negative effect on the manufacturing sector value added in Nigeria. On this notes, the study therefore suggested the following recommendations:

Money supply must be made by government with conscious to the prevailing capacity of manufacturing sector so as to ensure that the level of money in circulation is tantamount to the level of production capacity of the manufacturing sector whose performance determines the national output in an economy. Thus, appropriately applying monetary policy measures like expansionary or contractionary to increase supply of money into an economy or curb excess of money stocks in an economy in order to stimulate desirable growth of an economy.

The governments at all levels should intensify and increase credit facilities to the actors in private sector so as to enable manufacturers make rightful decision of expanding the businesses thereby, enriching the performance of the manufacturing sector in Nigeria.

Concrete efforts must be instituted to check the influence of monetary policy rate on the credit creation processes so as not to hamper the impact of credit advancement to private sector on the growth of the manufacturing sector due to overburdens of monetary policy rate on the credit facilities advanced to private sector in Nigeria.

Concerted efforts must be instituted to peg the exchange rate at a certain maximum rate like subsidizing for the actors in manufacturing sector so as to avail them the opportunity to import the raw materials needed in the production at a bearable minimum rate thereby, induces industrial investments for growing the manufacturing sector in Nigeria.

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