

Monetary Policy Variables and Performance Manufacturing Sector in Nigeria

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DOI: 10.56201/wjeds.v9.no2.2024.pg53.66

Abstract

Monetary Policy in Nigeria have not been effective over the years due to fiscal dominance through heavy and persistent government budget deficits, poor data quality that make econometric analysis difficult, inefficient payments system and poor banking habits where the CBN finds it difficult to control huge funds outside the banking system. The crux to this study is to examine the effect of monetary policy variables on the performance of manufacturing sector in Nigeria. The manufacturing sector performance served as dependent variable, while open market operations, the monetary policy rate, the liquidity ratio, and the cash reserve requirement served as proxies for the monetary policy. The study's geographic focus is Nigeria, and its temporal scope spans 1987 to 2022, taking into account the post-structural adjustment program and additional measures including economic deregulation throughout this time. The Central Bank of Nigeria (CBN), the National Bureau of Statistics (NBS), and the World Bank Index (WBI) annual statistical report served as the sources of data for this quasi-experimental study. The acquired data were statistically analyzed using the error correction model, the Johansen co-integration test, the unit root test, and other methods to achieve the goals like error correction model. The findings showed that the increase in open market operation, cash reserve ratio and liquidity ratio led to increase in manufacturing sector performance (MSP) in Nigeria. While increase in monetary policy rate led to decrease in manufacturing sector performance (MSP) in Nigeria. This shows that the variables OMO, MPR, CRR and LR and MSP share mutual stochastic trend and are linked in a common long-run equilibrium relationship. In conclusion, there is a long-run equilibrium relationship between monetary policy indicators and manufacturing sector performance in Nigeria. To encourage manufacturers to invest and boost output, an expansionary monetary policy involving a reduction in lending rates is advised. Nigeria's GDP growth rate should be accelerated by increasing and closely monitoring manufacturer-specific credits.

Keywords: Monetary Policy Variables, Performance, Manufacturing Sector, Nigeria

INTRODUCTION

In any developing nation, the drive for a thriving manufacturing sector performance cannot be overemphasized. Manufacturing sector refers to coordinated set of actions taken by the monetary authorities of a country to control the cost of credits, quantity, and availability of credit in an economy in accordance with the anticipated level of economic activity. This is a direct result of the idea of manufacturing activities which has the potential to break through technological barriers and create connections that boost growth and monetary turn of events (Ghosh and Parab, 2021; Adesina, 2021). As state by Nwokoma (2016), Sub-Saharan Africa (SSA) countries like Nigeria is home to by far most of the world's least fortunate individuals. A strong manufacturing activity is vital to the locale's possibilities for quick growth in the economy. An increase in manufacturing activity results in an increase in employment is useful. According to Lawal *et al.*, 2022 it is an effective treatment for the rising youth unemployment rate. Large scale manufacturing of merchandise also, administrations for homegrown and worldwide business sectors is made conceivable by manufacturing activities, which raise factor earnings, the way of life of individuals, and unfamiliar trade earnings. The ability of nations to significantly increase their tax base expansion of the manufacturing industry. Europe's economic transition has previously benefited from the expansion of manufacturing (Adesina, 2021).

The real sector output is quantitatively measured as the sector's contribution to the Total Gross Domestic Product. This sector is crucial for various reasons, as it produces and distributes tangible goods needed to meet aggregate demand and supply in the economy. The sector's performance can serve as a gauge for the effectiveness of monetary and macroeconomic policies. The manufacturing sub-sector acts as a catalyst for accelerating structural transformation and diversification of the economy, enabling the country to leverage its factor endowments and reduce dependence on foreign supplies of finished goods or raw materials. The real sector growth is influenced by the relationship between monetary policies and the credit and interest rate channel. This channel explains that monetary policy affects bank assets (loans) and liabilities (deposits). It is important to note that monetary policy not only impacts the supply of deposits but also the supply of bank loans. For example, an expansionary monetary policy that increases bank reserves and deposits also increases the availability of bank loans. This increase in bank loans leads to higher investment and consumer spending, ultimately resulting in an increase in aggregate output. Conversely, when monetary policy tightens, banks have fewer reservable deposits, which prompts them to either replace the lost deposits with non-reservable liabilities or reduce their assets, such as loans and securities, to align with the reduced liabilities. The overall objective of monetary policy is to maintain a monetary policy rate that aligns with the desired growth rate of the economy. The baseline interest rate in an economy is known as the monetary policy rate (MPR), and it serves as the foundation for all other interest rates within the economy. The monetary transmission mechanism operates through the interest rate channel, which connects changes in monetary aggregates (such as money supply and nominal interest rate) to the overall economy by influencing aggregate output and prices. This mechanism is responsible for how changes in monetary policy impact the level of economic activity, as measured by output and inflation. The specific channels through which monetary policy affects manufacturing sector performance in Nigeria.

There is no gainsaying that the performance of manufacturing sector in Nigeria in terms of value addition and exports leaves much to be desired. The sector has consistently ranked low in comparison to other regions of the world in terms of these performance indices. In comparison to other regions, the manufacturing value-added percentage of Gross Domestic Product (GDP) in Nigeria and other SSA countries has been the lowest during the past 27 years, according to underlying statistics from World Bank (2021), when compared to East Asia and the Pacific and Organization for Economic Cooperation and Development (OECD) countries, SSA Manufacturing sector averaged barely 10.9%, while those regions' values were 29.7% and 17.3% respectively. The manufacturing sector performance in Nigeria is still far from ideal when it comes to exports of manufactured goods. The average percentage of manufactured exports in the Nigeria was 25.1%, compared to 84%, 74.7%, 73.2%, and 17.2% in East Asia, the OECD, Europe, and Central Asia, and the MENA, respectively. The poor performance of the Nigeria manufacturing sector could be a result of numerous issues plaguing manufacturing, including a lack of sufficient funding for industrial growth, inconsistent macroeconomic policies, an influx of imported goods, infrastructure gaps, human capital shortages, a lack of forward and backward linkages, high energy costs, and an unfavorable business climate (Signe, 2018). Again, Kabir (2022), Prihatin and Aisyah (2022), Iortyer and Onuh (2022), point out that the manufacturing sector is one of the industries that are particularly sensitive to monetary policy. This is because monetary indicators like the liquidity ratio, monetary policy, exchange rate, interest rate, and credit to the real sector heavily influence production and investments and may not be completely exonerated from the low-value addition of the manufacturing sector. Thus, this study addressed the existing knowledge gaps by examining the relationship between monetary policy variables and performance of manufacturing sector in Nigeria.

LITERATURE REVIEW

Monetary policy

Monetary policy refers to coordinated set of actions taken by the monetary authorities of a country to control the cost of credits, quantity, and availability of credit in an economy in accordance with the anticipated level of economic activity. Monetary policy refers to the blend of measures designed to adjust the value, supply and cost of money in an economy, to tie with the level of economic activities (CBN,1992). The main aim of monetary policy is to ensure that money supply is at a level that is consistent to spur growth. Thus, according to Owolabi & Adegbite (2014), monetary policy is seen as a critical instrument for the attainment of macroeconomic stability, often viewed as pre-requisite to achieving sustainable output growth. Moreover, in the pursuit of macroeconomic stability, the managers of monetary policy often set targets on intermediates variables which include the short-term interest rate, growth of money supply, and exchange rate. Monetary policy involves a set of measures aimed at regulating the value, supply, and cost of money within an economy to align with the level of economic activities. It is the process of managing the flow and availability of money and credit facilities to promote stable prices and economic growth in a country. The main objective of monetary policy is to maintain an appropriate money supply level that supports sustainable economic growth. Various studies have shown that monetary policy plays a crucial role in stabilizing the macroeconomic environment, as evidenced by research conducted in Nigeria. This research suggests that investors consider monetary policy and macroeconomic events as significant factors affecting stock price volatility, which in turn influences investment decisions.

The Central Bank of Nigeria (2011) defines monetary policy as the specific measures it takes to control the value, supply, and cost of money in the economy in order to achieve predetermined macroeconomic objectives. To reach these goals, the CBN implements monetary regulations. It divides money into Narrow Money (M1) and Broad Money (M2). M1 includes currency in circulation among the non-bank public and demand deposits (current accounts in banks). This type of money is used for daily transactions and short-term financial needs. Broad Money (M2) comprises narrow money, savings, time deposits (such as call money), and foreign currency-denominated deposits. This classification assesses the total money supply in the economy. The CBN addresses liquidity and inflation concerns through broad money. The necessity to control money supply stems from the observed direct correlation between money supply and economic activities. An excess or shortage of money supply can have negative effects on economic activities, leading to inflation or illiquidity, which can hinder the growth of industries.

Monetary Policy Instruments

The Monetary Policy is a financial process whereby the monetary regulatory authority (central bank) design measures to regulate the monetary supply in an economy. The central bank employs various instruments of monetary policy or monetary variables at its disposal to control the availability of credit and liquidity management (money supply) in a manner that stimulate and enhance easy access to financial resources by the economic agent. The instruments of monetary policy are also referred to as “weapons of monetary policy” and features prominently in the determination of funding to the private sector of the economy. The instruments of monetary policy employed by the monetary authority depend on the level of development of the economy, especially its financial sector. Monetary policy is enacted by a central bank to sustain a level economy and keep unemployment low, protect the value of the currency, and maintain economic growth. By manipulating interest rates or reserve requirements, or through open market operations, a central bank affects borrowing, spending, and savings rates.

Open-Market Operation

Open market operation (OMO) is a term that refers to the purchase and sale of securities in the open market by the federal reserve (Fed). The Fed conducts open market operations to regulate the supply of money that is on reserve in U.S. banks. The Fed purchases Treasury securities to increase the money supply and sells them to reduce it. By using OMOs, the Fed can adjust the federal funds rate, which in turn influences other short-term rates, long-term rates, and foreign exchange rates. This can change the amount of money and credit available in the economy and affect certain economic factors, such as unemployment, output, and the costs of goods and services. The effect of Open Market Operations in particular and monetary policy in general on economic activities as well as the degree and relative potency of the policy has been the subject of debates and controversies among prominent schools of thought in economics. An open-market operation is essentially a transaction undertaken by a central bank in the market for securities (or foreign exchange) that has the effect of supplying reserves to, or draining reserves from, the banking system. Theoretically, monetary policy got its root from the works of Irving Fisher who laid the foundation in the Quantity Theory of Money using the famous ‘Equation of Exchange’, and posited that money has no effect on the economic aggregates except price level (Diamond, 2003). Open Market Operations (OMO) can be defined as the

sale or purchase of government or other eligible securities thereby altering the reserve base of banks and their credit creating capacities, aggregate demand and the general level of economic activity (Nzotta, 2019). OMO is the purchase or sale of securities by the Central Bank as a means of changing interest rate and money supply.

Monetary Policy Rate

Monetary Policy Rate (MPR) is the rate which central banks lend to Deposit Money Banks in performing their duties as lenders of last resort. It is usually set at a level that is consistent with the objective of price stability of central banks. The monetary policy rate is expected to communicate the stance of monetary policy and acts as a guide for all other market interest rates (CBN, 2016). The monetary policy rate is used as a monetary authority policy tool that defines the focal point of a standing facility meant to steer market interest rates. While the upper bound corridor of the monetary policy rate represents monetary authority (CBN) lending rate to deposit money banks, the lower bound corridor represents the deposit rate at which the monetary authority (CBN) accepts deposits from deposit money banks under the Standing Lending Facility (SLF) and Standing Deposit Facility (SDF) of the central bank. There is general agreement among economists and policymakers that monetary policy works mainly through interest rates. When the central bank policy is tightened through a decrease in reserve provision, for instance, interest rates rise. Interest rate rise means that the banks have to adjust their lending rates upwards. The rise in interest rates leads to a reduction in spending by interest sensitive sectors of the economy, such as housing and consumer purchases of durable goods. Therefore, the cost of credit becomes high and, in most cases, becomes unaffordable reducing demand for credit. Some economists and policymakers have argued that an additional policy channel works through bank credit (Keeton, 1979; Stiglitz & Weiss, 2001). In this view, monetary policy directly constrains the ability of banks to make new loans, making credit less available to borrowers who depend on bank financing. Thus, in the credit channel, restrictive monetary policy works not only by raising interest rates, but also by directly restricting bank credit. The Central Bank's principal objective is formulation and implementation of monetary policy directed to achieving and maintaining stability in the general level of prices. The aim is to achieve low inflation and to sustain the value of the currency. Interest can be thought of as "rent of money". Interest rates are fundamental to a capitalist society and are normally expressed as a percentage rate over the period of one year.

Cash Reserve Ratio

Cash Reserve Ratio (CRR) is a specified minimum fraction of the total deposits of customers, which commercial banks have to hold as reserves either in cash or as deposits with the central bank. The cash reserve is the amount of capital a bank has. The Cash Reserve Ratio (CRR) is the percentage of total deposits a bank must have in cash to operate risk-free. Cash Reserve Ratio or CRR is the minimum amount as specified by the Central Bank, to be maintained by the Commercial banks of the public deposits with the Central Bank. This article will upkeep you with CRR, its background, advantages and importance of Cash Reserve Ratio, Effects of CRR on Banks, depositors and interest rates, and the need to maintain Cash Reserve Ratio. Under cash reserve ratio (CRR), the commercial banks have to hold a certain minimum amount of deposit as reserves with the central bank. The percentage of cash required to be kept in reserves as against the bank's total deposits, is called the Cash Reserve Ratio. The cash

reserve is either stored in the bank's vault or is sent to the RBI. Banks can't lend the CRR money to corporate or individual borrowers, banks cannot use that money for investment purposes.

Key objectives of the Cash Reserve Ratio. Following are the critical objectives of the Cash Reserve Ratio.

1. CRR helps control inflation. In a high inflation environment, RBI can increase CRR to prevent banks from lending more.
2. CRR also ensures banks have a minimum amount of funds readily available to customers even during huge demand.
3. CRR serves as the reference rate for loans. Also known as the base rate for loans, the banks cannot offer loans below this rate.
4. Since CRR regulates the money supply, it boosts the economy whenever required by lowering the Cash Reserve Ratio.

Liquidity ratio

Liquidity ratios show the entity's ability to meet its short-term liabilities, as the weakness of the value of these ratios indicates that the organization may face difficulties in meeting short-term financial liabilities. Liquidity management is an important tool for the management of organizations; it reflects the organization's ability to repay short-term liabilities, which include operating expenses and financial expenses resulting within the organization in the short term. As well as part of long-term debt during the financial year or the operating cycle, whichever is longer? There are many liquidity ratios used by organizations to manage their liquidity such as (current ratio, quick ratio, cash ratio, defensive interval ratio) which can greatly affect the financial performance of companies. This in turn would negatively affect the volume of company's activity, thus on its financial performance. On the other hand, the improvement in the values of these ratios can be pointing to recovery in liquidity of companies, which may reflect positively on the volume of activity, and therefore on its financial performance.

Manufacturing sector

The manufacturing industry, usually referred to as the industrial or secondary sector, is a component of an economy's real or productive sector. It includes companies that engage in the physical or chemical transformation of components and raw materials into new products, whether the activity is done manually or with power tools, in a factory setting or at the home of the worker, and whether the goods are sold at either retail or wholesale outlets. Production of textile, computers and accessories, pharmaceuticals, aluminum products, electronics, electrical assemblies, automobile engines, valves, gears, food and beverage, metal works, plastic, plant and machinery, processing of petroleum products are all included in the broad category of businesses that fall under manufacturing. The finished commodities may be used as capital goods, consumer goods for sale to clients, or intermediary goods (United Nations ISIC, 2008). The goals of industrial policies were to solve the macroeconomic issues of economic growth, unemployment, and the balance of payment deficit by lowering imports and increasing manufacturing exports, as well as to promote knowledge transfer and technological advancement. Industrial performance indicators such as the index of industrial and manufactured production, percentage contribution and value added to the Gross Domestic Product, manufacturing capacity utilization, percentage growth rate, manufacturing share in

total export, import, and employment are used to assess the performance of the industrial sector in relation to the objectives of industrial policies.

Theoretical Review

Keynesian's Theory of Monetary Policy

The Keynesian theory explains that a change in money supply has effects on total expenditure and output level through changes in interest rate. Hence, the system operates indirectly. Keynesian monetary economics revolves around the liquidity preference theory - Keynesian demand for money introduced in the monetary sector. This liquidity preference theory is one of the hallmarks that differentiate Keynesian monetary theory from the general family of neo-classical theories. It explains why people individually express demands for money; the motives for money as liquid asset. In this theory, the demand for money is determined by interactions between income and interest rate, that is, the price of demand. Thus, Keynesians argued that, to influence the demand for money, should either control directly the price for money or indirectly by inducing changes through real income. Theoretically, a change in interest rate, other things being equal, affects individual preferences for holding liquid (cash) and illiquid assets. Keynesians recognize the importance of the role of money, because it is "first and foremost a financial asset. Money does not affect only the absolute price and quantity of trade, but it affects also the level of financial intermediation, stock prices, and its' own price -interest rates.

Empirical Review

Sankaran and Vadivel (2021) inquired into the effect of monetary policy on manufacturing output in India based on the Auto Regressive Distributed Lag (ARDL) model. The data covered the period from 1980 to 2018. The variables in the model included the lending rate, exchange rate and the manufacturing output (manufacturing value added). In the long-run, lending rates had significant positive effects on output which meant that increasing the lending rate will increase output however, the transmission through which this is achieved was not clearly demonstrated by the study. The study uncovered that increase in exchange rate (depreciation) impacted positively and significantly on manufacturing output meaning that exchange rate depreciation stimulates growth in output.

Obi (2021) examined the effect of monetary policy instruments on manufacturing sector output in Nigeria. The specific objectives are to: evaluate the effect of monetary policy rate on manufacturing sector output in Nigeria. Examine the effect of treasury bill rate on manufacturing sector output in Nigeria. Access the effect of cash reserve ratio on manufacturing sector output in Nigeria and investigate the effect of money supply on manufacturing sector output in Nigeria. The study employed an ex-post facto research design because the data for the study were secondary data which were obtained from Central bank of Nigeria Statistical Bulletin, 2020. The result of the study indicates that manufacturing subsector output is an endogenous variable in the explanation of the effect of monetary policy on manufacturing sector output in Nigeria in the short run, monetary policy rate, money supply has positive and significant effect on manufacturing sector output in the short run while treasury bill rate has no significant effect on manufacturing sector output in the short run. Amongst the recommendations of the study is that the Central Bank Nigeria should employ an expansionary monetary policy that can increase the money supply to the real sectors and boost performance of the Nigerian economy. The Central Bank Nigeria should reduce the MPR to attract low interest rates that can encourage credit and boost productivity across the sectors in

Nigeria. As seen from the results, the various monetary policy tools have diverse effects on manufacturing outputs in Nigeria. The Central Bank Nigeria should employ different set of monetary policy directives under guided deregulation for each of the sectors in Nigeria. Financial institutions, especially the Deposit Money Banks, should not be constrained by CRR as this might hinder growth in the economy.

Uju and Ugochukwu (2021) adopted manufacturing sector output to examine the effect of monetary policy on industrial growth in Nigeria between 1986 and 2019. Data for the study were collected from the CBN Statistical bulletin, 2019 edition. A multiple regression model was developed and the Ordinary Least Square (OLS) regression technique employed for data analysis. The results showed that Open Market Operation (OMO) measured by Treasury bill rate had positive and significant effect on the Nigerian Manufacturing Domestic Sector Gross Product; Cash Reserve Ratio (CRR) has a positive and significant effect on the Nigerian Manufacturing Sector Gross Domestic Product; and Monetary Policy Rate (MPR) has a negative and significant effect on the Nigerian Manufacturing Sector Gross Domestic Product. The study concludes that monetary policy is a veritable tool for enhancing industrial sector growth in Nigeria. It was recommended that the monetary authority should ensure a lower MPR that can drive up investment and thus boost growth of the industry.

METHODOLOGY

This study adopted quasi experimental design. This is because the study established the relationship between monetary policy variables and performance of manufacturing sector in Nigeria. Quasi experimental design is basically fitted for this study as data used for this research were already documented. In this regard, the secondary data for this study was collected from Central Bank of Nigeria statistical bulletins and World Bank database. This model relates performance of manufacturing sector to explanatory variables that can affect it. The explanatory variables include; Open Market Operation (OMO), Monetary policy rate (MPR), Cash reserve ratio (CRR) Liquidity rate (LR). The model can be specified in a functional form as follows:

$$MSP = f(OMO, MPR, CRR, LR) \dots \quad (1)$$

Transforming equation 1 to econometrics form

$$MSP = \alpha + \beta_1 OMO + \beta_2 MPR + \beta_3 CRR + \beta_4 LR + e_i \dots \quad (2)$$

Where: MSP= Manufacturing sector performance measured as total output

OMO = Open market operation, CRR = Cash Reserve Ratio

MPR = Monetary policy rate, LR = Liquidity

α_0 = Constant, ϵ = Error Term

β_1 - β_4 = Coefficients of independent variables

From the model, the ARDL Bounds test approach to cointegration is applied to equation 3.2. This approach is based on the ordinary least square (OLS) estimation of a conditional unrestricted error correction model (UECM) developed by Pesaran et al. (2001). This approach is applied to ascertain the existence of a long run relationship and for the estimation of long and short run coefficients. Therefore, from the ARDL approach, we can derive a dynamic error correction model (ECM) following a simple linear transformation, where the ECM integrates short run dynamics with long run equilibrium without losing long run information. In order to implement the bounds testing procedure, it is necessary to model equation (2) as a conditional ARDL as in Pesaran and Shin (2001). The variables are as defined above and all logged as so to allow the interpretation of the coefficients in terms of elasticities.

ANALYSIS AND DISCUSSION OF FINDINGS

The data obtained from Central Bank of Nigeria, National Bureau of Statistics and World Bank Report were subjected to unit root test (stationarity test) using Augmented Dickey fuller test, Johansson cointegration test and ECM.

Stationary Test

To avoid having a spurious result, the data were subjected to unit root test using Augmented Dickey-Fuller unit root test thus; the variables were found to be stationary at first difference.

Table 1: Augmented Dickey-Fuller unit root test result

Variables	ADF- statistics	Prob.	Order of integration
LogMSP	3.310432	0.0183	stationary at level $I(1)$
LogOMO	-4.465173	0.0011	stationary at level $I(1)$
LogMPR	-6.456728	0.0000	stationary at level $I(1)$
LogCRR	-5.683927	0.0000	Stationary at level $I(1)$
LogLR	-6.520184	0.0000	stationary at level $I(1)$

Source: Researchers' computation from Appendix (1) E-View 12. The test was performed with trend and intercept and the critical values of the test are at 1% and 5% levels of significance respectively. Note: Order (0) and order (1) indicate stationarity of the various variables at level and at first difference respectively.

The study adopted the augmented Dickey-Fuller unit root test to examine whether the data collected are stationary. The results on the augmented Dickey-Fuller unit root indicates that the logged variables of **Open-market operation (OMO)**, monetary policy rate (**MPR**), Cash reserve requirement (**CRR**), liquidity ratio (LR)with high negative t-statistic coefficients were statistically significant at 1 percent and integrated at first difference. Also, t-statistic coefficients of manufacturing sector performance (MSP)also have high positive coefficient and statistically significant at 5% probability level, and integrated at first difference. The variables were all integrated and stationary at first difference with probability values of less than 5% level of significance. The variables were therefore co-integrated. In effect, they all variables were accepted and null hypothesis of stationary rejected. This result confirms the aptness of the error correction model (ECM) approach test for co-integration of variables.

Johansen co-integration analysis

Under the Johansen co-integration test, co-integration exists when the Trace Statistic and Max-Eigen values are greater than the 0.05 critical values. The results obtained from the Johansen approach to co-integration were captured in Table 4.2

Table 2: Unrestricted Co integration Rank Test (Trace)

Series: MSP OMO MPR CRR LR

Lags interval (in first differences): 1 to 1

Unrestricted Co integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.548612	69.54390	62.81889	0.0157
At most 1*	0.442576	47.49937	35.85613	0.0219
At most 2	0.235037	25.62880	29.79707	0.0881
At most 3	0.171844	6.519273	15.49471	0.6341

At most 4	0.003184	0.108441	3.841466	0.7419
Trace test indicates no co integration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Co integration Rank Test (Maximum Eigen value)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None*	0.548612	33.04453	27.87687	0.0210
At most 1*	0.442576	27.87057	23.58434	0.0302
At most 2	0.235037	9.109526	21.13162	0.8235
At most 3	0.171844	6.410831	14.26460	0.5611
At most 4	0.003184	0.108441	3.841466	0.7419

Max-eigen value test indicates no co integration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: E-Views 12 computations

The result of the unit root test established that the data are stationary of the order 1(1), the researcher proceed to apply the Johansen co-integration technique to verify the existence of long-run co-integrating relationship between the indicators of monetary policy variables and the manufacturing sector performance measures. This test is aimed at investigating whether the variables share mutual stochastic trend and are linked in a common long-run equilibrium. The Johansen co-integration procedure is based on maximum Eigen value, trace statistics and the critical value. Table 3 captures the trace and the maxi-Eigen value statistics for the model. The null hypothesis of the absence of a co-integrating relationship amongst the variables was rejected at the 5% level for both statistics. The trace and maxi-Eigen statistics indicated that there were at least one co-integrating equations in the model.

As shown in Table 2 the first-two hypothesis of None and At most 1*co-integrating vector were rejected since the observed value of trace statistics 69.54390 and 47.49937 were greater than the critical value of 62.81889 and 35.85613 at 5% confidence level respectively. The second null hypothesis (at most 2, 3 and 4) were accepted because the value of trace statistics 25.62880, 6.519273 and 0.108441 were less than the critical value of 29.79707, 15.49471 and 3.841466 respectively. This result implies that there is a long-run equilibrium relationship between monetary policy indicators and manufacturing sector performance in Nigeria. This shows that the variables OMO, MPR, CRR and LR and MSP share mutual stochastic trend and are linked in a common long-run equilibrium relationship. These means that in spite of these controversies, the Nigeria government in collaboration with its monetary authority still adopts monetary policy to regulate the economy.

Error Correction Mechanism (ECM)

Having carried out the co-integration test to find that a long-run relationship exists in model, the vector error correction was carried out. The result obtained from the ECM analysis was presented in Table 3 as shown below:

Table 3: Vector Error Correction Estimates

Date: 01/20/24 Time: 09:55

Sample (adjusted): 1990 2022

Included observations: 33 after adjustments

Standard errors in () & t-statistics in []

	Coefficient	Std. Error	t-Statistic	Prob.
D(ECM(-1))	0.202603 0.134	0.07005	2.89242	0.0124
D(CRR (-1))	361	0.05807	2.31379	0.0357
D(LR (-1))	1.200693	0.12159	9.87495	0.0000
D(MPR (-1))	-0.125774	0.04680	-2.68748	0.0225
D(OMO (-1))	0.119430	0.03822	-3.12481	0.0056
R-squared	0.694608			
Adj. R-squared	0.534641			
Sum sq. resids	0.028493			
S.E. equation	0.036835			
F-statistic	94.42190			
Log likelihood	69.57592			
Akaike AIC	-3.489450			
Schwarz SC	-2.945265			
Mean dependent	0.077515			
S.D. dependent	0.053997			

Decision Rule: If $F_{cal} > F_{tab}$ accept the alternate and reject Null hypothesis. Otherwise accept the null hypothesis. (***) = 1%), (** = 5%), denotes significance of coefficient at level respectively- $t_{tab} = 2.042$

Source: E-views computations (2023)

Table 3 above showed that the error correction mechanism (ECM) value of (0.202603) with a positive signed, with a probability value (p-value) of 0.0124, which suggests statistical significance at 5% level probability level. The significance of the error correction mechanism (ECM) indicated the velocity of adjustment to the long-run equilibrium after a short-run shock. The coefficient (0.202603) of the ECM shows that about 20.2% of the discrepancies in the manufacturing sector performance (MSP) in Nigeria are corrected in each period. It is pertinent to state that this speed of adjustment is low, implying that the adjustment process to restore equilibrium in MSP after a disturbance is steady, thus, and it takes a long period. To find how long it takes for equilibrium to be restored, one (1) is divided by the ECM, i.e. $1/0.202603 = 4.9357$. Hence, it will take 4 years and 9 months to correct the variations in manufacturing sector performance (MSP) in Nigeria. The goodness of fit of the model as indicated by the R-squared (0.694608) showed that the model fit into the data properly, the total variation in the observed behavior of manufacturing sector performance (MSP) in Nigeria was jointly explained by the variation in the components of Open market operation, monetary policy rate, cash reserve ratio and liquidity ratio up to 69.4percent. This signifies that, 30.6% were explained by stochastic variables not listed in the analytical model. The overall significance of the model was also tested using the F-statistic of 94.42190. Here, the significance of the F-statistic value did not occur by chance, it actually confirmed that the model fitted the data

accordingly, such that the collective effect of Open market operation, monetary policy rate, cash reserve ratio and liquidity ratio were confirmed statistically significant on manufacturing sector performance (MSP) in Nigeria. The one period lag of D(CRR (-1)), D(LR (-1)) and D(OMO (-1)) showed that last periods increase may cause current years' manufacturing sector performance (MSP) in Nigeria to increase by 0.134361units, 1.200693units and 0.119430units respectively. More so, the one period lag of D(MPR(-1)) showed that last one periods increase may cause current years' manufacturing sector performance (MSP) in Nigeria to decrease by 0.125774 units. The different and lagged values of the ECM coefficients denote the short-run coefficients of the regression model. Similarly, the increase in open market operation, cash reserve ratio and liquidity ratio led to increase in manufacturing sector performance (MSP) in Nigeria. While increase in monetary policy rate led to decrease in manufacturing sector performance (MSP) in Nigeria.

Conclusion

In conclusion, that there is a long-run equilibrium relationship between monetary policy indicators and manufacturing sector performance in Nigeria. This shows that the variables OMO, MPR, CRR and LR and MSP share mutual stochastic trend and are linked in a common long-run equilibrium relationship. These means that in spite of these controversies, the Nigeria government in collaboration with its monetary authority still adopts monetary policy to regulate the economy. Therefore, Nigeria's monetary policy should always be targeted and tailored towards inducing manufacturing sectors activities. This is critical because, an economy that consistently produced most of what it consumes will find itself in the trajectory of growth, against the country that don't. Moreover, favourable monetary policy will attract more investment to the existing firms, as well as entrance of new firms.

Recommendation

Based on the findings of this study, the following recommendations are stated:

1. To encourage steady growth of the gross domestic product, monetary policy rate should be managed in such a way as to favour the productive sector of the economy which the manufacturing sector is significant.
2. More monetary instruments should be introduced into the open market to ginger manufacturing sector performance. And Central Bank should minimize the issuances of emergency policies that are usually short lived as effective policies require ample gestation for achievement and consolidation of intended objective.
3. Central Bank Monetary Policy could be an effective tool to encourage investment in industrial sector and reduce lending rate and stabilize the economy of Nigeria.
4. The monetary authority in Nigeria (CBN) needs to create inspiring awareness on the importance of open market operations and the economic benefits of available market instruments such as Treasury bills and treasury certificates. And attractive rates should be offered in the open market to encourage development of the treasury bills and certificates markets.

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