Monetary Policy Tools and Nigeria's Manufacturing Sector Output

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ABSTRACT

Manufacturing sector output has been experiencing dwindling output over the years, despite the efforts by the monetary authorities. Manufacturing sector in any economy is seen as one of the drivers of industrialization and economic development, as such government policies affect their performance. Hence, this paper examined the asymmetric effect of monetary policy tools on Nigeria's manufacturing sector output between 1986 and 2022. Non-linear Auto regressive Distributed Lag (NARDL) method was adopted in carrying out empirical analysis. Cointegration using bounds test revealed the variables have long-run relationship. Findings from the paper revealed that positive effect of private sector credit has a corresponding positive impact on manufacturing sector output. While the negative effect led to a decrease in the output. Further findings showed that positive effect of monetary policy rate led to an increase in manufacturing sector output; while the negative effect led to a decrease in manufacturing sector output. Both variables were found to have statistically insignificant relationship with manufacturing sector output in Nigeria during the period covered. Based on these findings, the monetary authorities are encouraged to continue with improving programmes or schemes that will lead to more funding for the manufacturing; and are encouraged to take into account monetary policy that captures the economic reality on the ground.

Keywords: private sector credit, monetary policy rate, manufacturing output

JEL codes: E51, E52, L60

INTRODUCTION

The manufacturing sector is a vibrant sector that spurs growth in every other sector of the economy. For instance, the creation of a manufacturing firm in a particular environment increases demand for raw materials, labour, infrastructural facilities, etc., within the area. In Nigeria's setting, the efforts towards spurring industrialization by increasing the output of manufacturing firms have proved abortive. The output of the manufacturing sector and its contribution to GDP remains quite insignificant compared to what it ought to be. The determinants of manufacturing firms and the manufacturing sector at large is therefore, considered critical in the process of industrialization and as such, governments over the years have made attempts at mitigating the unfavorable business environment currently prevalent. It is argued that the fastest channel through which an economy can be transformed from having a predominantly traditional sector to a modern sector is via increasing industrial capacity and technological innovation (Peace, 2019). Also, the interaction of macroeconomic indices and the ability to sustain such improvement have a long impact on manufacturing output due to time lag. For instance, the persistent nature of general price level reduces purchasing power of individual or household and this moves down into capacity underutilization. Considering the case of the sector access to credit, the inability to acquire credit hampers the ability to procure goods and services. Also, sustainability of manufacturing sector performance lies in the ability to maintain the obtained improvement in productivity overtime. Nigeria is a mono-economy with major source of revenue coming through oil and gas sector, therefore, sustainability also entails the sector to provides huge revenue to government's coffer.

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The Central Bank of Nigeria organizes monetary policy targets into three stages with the first being operational target: the manipulation of reserve money over which it has substantial direct control; intermediate target which has indirect impact on the private credit ultimate target of final objective of monetary policy in the areas such as inflation and output. Interest rates on the other hand, have remained a subject for critical assessment with diverse implications for savings mobilization and investment promotion. Generally, interest rates are the rental payments for the use of credit by borrowers and return for parting with liquidity by lenders (CBN, 1997). In the Nigerian economy, the minimum rediscount rate (MRR) now monetary policy rate (MPR) is the official interest rate of the Central Bank of Nigeria (CBN), which anchors all other interest rates in the money market and the economy (Ogunbiyi and Ihejirika, 2014).

The monetary policy rate is an important tool that can be used to influence the manufacturing sector. A higher monetary policy rate can make it more expensive for businesses to borrow money, which can lead to a decline in investment and output in the manufacturing sector. A lower monetary policy rate can make it cheaper for businesses to borrow money, which can lead to an increase in investment and output in the manufacturing sector. The impact of the monetary policy rate on the manufacturing sector depends on a number of factors, including the level of inflation, the exchange rate, and the state of the global economy. In general, a higher monetary policy rate is likely to have a negative impact on the manufacturing sector, while a lower monetary policy rate is likely to have a positive impact on the manufacturing sector. The Central Bank of Nigeria (CBN) has been using monetary policy to try to stimulate the manufacturing sector. In recent years, the CBN has reduced the monetary policy rate and has also introduced a number of other measures to support the manufacturing sector. These measures have had some success in stimulating the manufacturing sector, but there is still more that needs to be done.

Over the years, the government of Nigeria has adopted the use of direct monetary instruments such as credit ceilings, selective credit controls, administered interest, prescription of cash reserve requirements and special deposits in order to maintain the desired macroeconomic objectives. Nevertheless, with the advent of Structural Adjustment Policy (SAP) of 1986, the implementation of monetary policies was aimed at inducing the emergence of market-oriented financial system for effective mobilization of financial savings and efficient resource allocation. The main instrument of a market-based framework is the open market operations. This process was complemented by several regime changes in reserve requirements and discount window operations. Also, the October 1996, position of monetary policy objective was directed at abolishment of mandatory credit allocation. The commercial and merchant banks were subjected to equal treatment since their operations were found to produce similar effects on the monetary policy process. In 2005 the minimum paid-up capital was further raised to 25 billion naira for all commercial banks in accordance with the recapitalization exercise. An important implication of the various policies initiated above was to bring about stability in the macroeconomic policies. The conduct of monetary policy was largely influenced by the global financial crisis which started in 2007 in United States of America (USA) and spread to other regions and emerging markets including Nigeria. Consequently, in the wake of the global financial crisis, the bank largely adopted the policy of monetary easing to address the problem of liquidity shortages in the banking system from 2008 to September 2010. Private sector credit is a key driver of economic growth in Nigeria. It provides businesses with the funding they need to invest and grow, which can lead to increased output and employment. The manufacturing sector is a major recipient of private sector credit, and its performance is closely linked to the availability of credit.

A study by the Central Bank of Nigeria (CBN) in 2022, found that there is a positive relationship between private sector credit and manufacturing sector output. The study found that a 22% increase in private sector credit leads to a 3% increase in manufacturing sector output. This suggests that increasing access to credit for businesses can help to boost manufacturing output and economic growth. The CBN has taken a number of steps to increase access to credit for businesses, including: reducing the monetary policy rate, introducing a number of credit guarantee schemes and providing direct loans to businesses.

These measures have had some success in increasing access to credit for businesses, but there is still more that needs to be done.

The contribution of the manufacturing sector to GDP have fluctuated widely over the years in spite of monetary policies implemented. From a trifling 4.8% at independence in 1960, it grew fifteen years later to 7.4% in 1975. By the end of 1980, its contribution tumbled to 5.4% only to surge to its peak of 10.7%, five years later in 1985. Since then, the manufacturing portion of GDP had declined: 1992 (7.9%), 1997 (6.3%). The lowest ebb ever was 3.4% recorded in 2001, beyond which some traction of 4.21% was gained in 2009 (Central Bank of Nigeria, 2012). Real GDP growth in the manufacturing sector in the second quarter of 2021 was 3.49% (year on year), higher than the same quarter in 2020 and the preceding quarter by 12.27% points and 0.08% points respectively. On a half year basis, growth rate of the sector stood at 3.44% compared to -4.07% recorded for half year 2020. On a quarter-on-quarter basis, growth stood at -13.10%. Real contribution to GDP in Q2 2021 was 8.69%, lower than the 8.82% recorded in the second quarter of 2020 and the 9.93% recorded in the first quarter of 2021 (CBN, 2021).

This paper therefore sets to examine the impact of monetary policy tools on the output of Nigeria's manufacturing sector by investigating the effect of private sector credit and evaluating the impact of monetary policy rate on manufacturing sector output. The hypotheses stem from the above objectives.

The remaining part of this paper consists of four parts. Section two provides the review of related literature consisting of the theoretical, conceptual and empirical reviews. Section three presents the research methodology while section four presents the results and discusses the findings. Finally, section five presents the conclusion and recommendations of the study.

LITERATURE REVIEW

Conceptual Review

Monetary policy states that an increase in money supply, ceteris paribus, will lead to a fall in interest rates and increase investment. Mordi, Adebiyi, Adenuga, and Evbuomwan (2014) assert that monetary policy will have larger output effects in a recession than in a boom. In the same view, Peersman and Smets (2005) assert that financial structure can explain why some industries are relatively more sensitive to monetary policy changes in recession versus inflation. These assertions give the idea of the relevance of monetary policy instruments as a bridge or transmission channel between the real sector and policies.

The monetary policy rate (MPR) is the interest rate at which the Central Bank of Nigeria (CBN) lends money to commercial banks. It is the most important tool used by the CBN to control inflation and economic growth. When the CBN raises the MPR, it makes it more expensive for commercial banks to borrow money. This, in turn, makes it more expensive for businesses to borrow money and invest. This can help to slow down the economy and bring down inflation. When the CBN lowers the MPR, it makes it cheaper for commercial banks to borrow money. This, in turn, makes it cheaper for businesses to borrow money and invest. This can help to stimulate the economy and boost growth. The CBN sets the MPR at its monthly Monetary Policy Committee (MPC) meetings. The MPC is made up of the CBN Governor, the Deputy Governors, and some other senior officials. The MPC considers a variety of factors when setting the MPR, including inflation, economic growth, and the exchange rate. The MPR has been a controversial tool in Nigeria. Some economists argue that it is too blunt an instrument and that it can have unintended consequences. For example, raising the MPR can make it more expensive for businesses to borrow money to invest, which can hurt economic growth (Osakwe, Ibenta and Ezeabasili, 2019).

Other economists argue that the MPR is an essential tool for managing the economy. They argue that it is a powerful tool that can be used to control inflation and promote economic growth. The CBN has used the MPR to manage the Nigerian economy for many years. The MPR has been raised and lowered several times in recent years in an effort to control inflation and promote economic growth. The MPR is a complex tool with a significant impact on the Nigerian economy.

Private sector credit refers to the total amount of credit that is extended to the private sector by financial institutions. This includes loans, overdrafts, and other forms of credit. Private sector credit is an important indicator of economic activity, as it is a measure of how much businesses and individuals are borrowing to invest and spend. There is a strong correlation between private sector credit and economic growth. When businesses have access to credit, they can invest in new projects and create jobs. This leads to increased economic activity and higher GDP growth.

Theoretical Review

This paper is anchored on two (2) theories, which are Solow Neo-classical growth theory and the Keynesian theory of money.

The model treats productivity as an 'exogenous' variable, which is assumed to be independent of the amount of capital. Solow postulates a continuous production function linking output to inputs of capital and labour which are suitable. The long run rate of growth is determined by an expanding labour force and technical progress. Thus, Professor Solow has successfully shunted aside all the difficulties and rigidities which go into the modern Keynesian income analysis. Solow's analysis is convergent to equilibrium path to start with any capital-ratio. Solow takes output as a whole, the only commodity in the economy. Its annual rate of production is designated as Y(t) which represents the real income of the community, part of it is consumed and the rest saved and invested. The part which is saved is a constant, 's' and the rate of saving is *sY (t)*. *K (t)* is the stock of capital; thus, net investment is the rate of increase of this stock of capital, i.e., or K. so the basic identity is:

Solow Neo-classical Growth Theory

$K = sY$ ..... (1)

Since output is produced with capital and labour, technological possibilities are represented by the production function; $Y = F\ (K, L)$ .....(2)

This shows constant returns to scale. Inserting equation (2) in (1), we get;

$K = Sf\ (K,L)$.....(3)

In this equation, L represents total employment.

Since population is growing exogenously, the labour force increases at a constant rate, **n**. Thus,

$L\ (t) = K$ .....(4)

Thus, the purpose of this model was to examine what might be called the tight-rope view of economic growth and to see where more flexible assumptions about production would lead to simple model. However, some weakness include: labour and capital does not seem to be a key difference between the neo-classical and Neo-Keynesian studies of growth. And the main difference seems to lie in the investment function and the consequent failure to assign a major role to entrepreneurial expectations about the future. Also, the assumption of labour augmenting technical progress is however, a special case of Harrod neutral technical progress of the Cobb-Douglas production function type which does not possess any empirical justification. Solow assumed flexibility of factor prices which may bring difficulties in the path towards steady growth.

Keynesian Theory of Money

John Maynard Keynes' Keynesian theory of money contested the quantity theory of money, which claimed that the general price level is precisely related to the amount of money. According to Keynesian theory,

changes in the money supply can have an impact on actual variables like production (Ajayi, 2005). Keynes sought to include the interest rate theory into the monetary theory and to connect it to the value theory. The Keynesian theory of money is based on the following tenets: continuous returns to scale; homogenous, perfect divisibility, and interchangeability of all jobless components; and perfect supply elasticity of all factors of production in the event of unemployment. These suppositions hold that the interest rate serves as a bridge between variations in money supply and price fluctuations. As a result, an increase in the money supply will directly impact the interest rate, which will drop as more money is invested, so boosting demand, output, and employment.

Some of the criticisms of the Keynesian theory of money include the unrealistic assumption of perfect homogeneity of resources, the assumption of a perfectly elastic supply of factors of production beyond full employment, the assumption that effective demand rises in proportion to an increase in money quantity while output does not expand, the assumption that money wages remain constant as employment expands, and others. However, because it takes into account the fact of unemployment, the Keynesian theory of money is more accepted.

Empirical Review

Several studies have previously empirically investigated the effect of monetary policy tools on manufacturing sector output. Some of these studies are reviewed below;

Afolabi, Ayodele, Daramola, and Adewumi (2022) conducted research to examine how various financial sector development indicators impacted Nigeria's manufacturing business. It used Autoregressive Distribution Lag for data from the Central Bank of Nigeria Statistical Bulletin between 1991 and 2020. (ARDL). The findings revealed that in Nigeria, the money supply (MS) had a positive and significant impact on manufacturing sector output (MSO), whereas private sector credit (CPS), manufacturing sector loan (LMS), and prime lending rate (PLR) all had a negative but significant impact.

On monetary policy instruments and manufacturing sector output in Nigeria between 1987 and 2019, Obi (2021) in the study employed Autoregressive Distributed Lag (ARDL) method for analysis. His findings showed that monetary policy rate had significant effect on manufacturing sector output only in the short-run.

Usio and Ilemona (2021) investigated the impact of lending rates on the growth of Nigeria's manufacturing sector from 1986 to 2020 in an essay. Using the OLS method for estimation, their findings revealed a positive but small impact of lending rates on the growth of Nigeria's manufacturing sector.

This showed that the lending rate does not impede the activity and performance of Nigeria's manufacturing sector.

Peter, Cletus, and Ugonma (2020) used an Auto-Regressive Distributed Lag (ARDL) bound cointegration test approach and error correction in a study on the effects of bank credits on manufacturing sector production in Nigeria from 1981 to 2018. Their findings demonstrated that the variables have a long-run relationship, and the error correction term produced a negative but statistically significant result.

Osakwe, Ibenta, and Ezeabasili (2019) looked at how Nigeria's manufacturing sector performed in relation to monetary policy from 1986 to 2017. Monetary policy rate, among other variables, were used. Autoregressive Distributive Lag (ARDL) was utilized to estimate the variables. The findings show that monetary policy instruments have a sizable impact on the manufacturing sector production in Nigeria.

In a study by Chineanuife, Madueme, Orji and Anthony (2019), they examined the causal relationship between private sector credit and manufacturing output in Nigeria from 1981 to 2018. The authors used the Toda and Yamamoto Granger causality test to find that there is a bi-directional causal relationship between

the two variables. Their findings showed that private sector credit and manufacturing output affect each other in both the short run and the long run.

Otubu (2019) examined the impact of bank credits on Nigeria's industrial sector from 1980 to 2015. The econometrics techniques of ordinary least squares, co-integration, error correction model, and granger causality test were the primary analytical tools. Using the estimated error correction model, the study discovered that financing for the manufacturing sector had a positive impact on manufacturing sector production. Furthermore, the granger causality conclusion reveals a causal relationship between bank credits and industrial sector production in Nigeria.

Between 1986 and 2016, Ufoeze, Odimgbe, and Ezeabalis (2018) evaluated the impact of monetary policy on economic growth in Nigeria. The OLS approach was used for analysis in their study. According to their findings, money supply, on the other hand, had a strong beneficial effect on Nigerian growth.

In a study carried out by Andabai and Eze (2018), they evaluated the relationship between bank loan and manufacturing sector growth in Nigeria from 1990 to 2016. The Vector Error Correction Model was utilized, and the results demonstrated that bank credit had no short-run equilibrium meaningful association with manufacturing sector growth in Nigeria. Further findings from the causality test revealed that bank loans had no causal association with Nigerian manufacturing sector growth. As a result, the study determined that bank lending had not significantly contributed to manufacturing sector growth in Nigeria throughout the study period.

METHOD OF RESEARCH

Research Design: Ex post-facto research was chosen as the method of inquiry in this study. Ex-post facto research designs aim to establish a causal link between the dependent and independent variables by describing the statistical correlation between them.

Making predictions regarding this correlation as well as testing the anticipated relationship between monetary policy variables and manufacturing sector output are both achievable thanks to the use of this approach.

Sources of Data Collection: determining asymmetric cause-effect nexus among the selected variables, hence, the data used primarily consisted of annual secondary data collected from publications of the Central Bank of Nigeria (CBN) statistical bulletin spanning from 1986 to 2022 (37 years). Generated data on manufacturing sector output (billions of naira); monetary policy rate (percentage) and private sector credit (billions of naira)

Methods of Analysis: before performing the cointegration test, the study performed pre-estimation tests such the unit root test using Phillips-Perron. It is necessary to discover the stationarity level of the variables and whether the series have a long-run connection after doing a unit root test. In order to capture the equilibrium connection between stationary and non-stationary series, a bounds cointegration test was run.

Next is the use of Non-linear Autoregressive Distributed Lag (NARDL) for analysis of variables. The majority of economic interactions yield non-linear outcomes, meaning that a change in one variable (i.e., the independent) does not always result in a change in the other variable (the dependent). The fact that the reaction of the dependent variable to positive changes in the independent variable, is different from the response of the dependent to negative changes in the independent variable. In order to determine if the impact of an increasing independent variable is the same as the impact of a decreasing independent variable on a dependent variable, the Non-linear Autoregressive Distributed Lagged (NARDL) model was developed.

Shin, Yu, and Greenwood-Nimmo (2014) developed the NARDL model. The technique uses positive and negative partial sum decompositions to find the asymmetric impacts in both the long and short term. It can be applied to variables that are stationary at levels [I (0)] or the first difference [I (0)] with the exception of variables that are stationary at the second difference [I (2)], and it performs better when the long-run relationship is sorted for in variables with small sample size (Romilly, Song, & Liu, 2001).

The theoretical framework upon which the paper was hinged is the Keynesian theory of money, as it captures money supply and interest rate and also captures productivity level which can be linked to manufacturing output.

Model Specification: the explicit linear regression equation is given as:

$$\ln MSO_t = \alpha_0 + \beta_1 \ln PSC_t + \beta_2 MPR_t + U_t \quad \text{.....(3.1)}$$

Where:

MSO = Manufacturing Sector Output

PSC = Private Sector Credit

MPR = Monetary Policy Rate

Ln = Natural log

Where β_1 and β_2 are the slopes of coefficients of the independent variables to be determined and α_0 is the intercept. While µt is the stochastic term.

The NARDL model is specified as thus:

$$\ln MSO_t = \alpha_0 + \beta_1 \ln PSC_t^+ + \beta_2 \ln PSC_t^- + \beta_3 MPR_t^+ + \beta_4 MPR_t^- + \mu_t \quad \text{.....(3.2)}$$

Where $PSC_t^{+} and MPR_t^{+}$ are the partial sums of positive changes in PSC and MPR, while;

$PSC_t^{-} and MPR_t^{-}$ are the partial sums of negative changes in PSC and MPR.

The decomposed above equations can be represented theoretically as:

$$\ln PSC_t^+ = \sum_{i=1}^{d} \Delta \ln PSC_i^+ = \sum_{i=1}^{d} max(\Delta \ln PSC_i, 0), \ln PSC_t^- = \sum_{i=1}^{d} \Delta \ln PSC_i^- = \sum_{i=1}^{d} min(\Delta \ln PSC_i, 0) \quad \text{.....(3.3)}$$

$$M PR_t^+ = \sum_{i=1}^{d} \Delta M PR_i^+ = \sum_{i=1}^{d} max(\Delta M PR_i, 0), M PR_t^- = \sum_{i=1}^{d} \Delta M PR_i^- = \sum_{i=1}^{d} min(\Delta M PR_i, 0) \quad \text{.....(3.4)}$$

Equations 3.3 and 3.4 takes NARDL (unrestricted) form of Shin et al. (2014) as:

$$\Delta \ln MSO_t = \alpha_0 + \alpha_1 \ln MSO_{t-1} + \alpha_2 \ln PSC_{t-1}^+ + \alpha_3 \ln PSC_{t-1}^- + \alpha_4 MPR_{t-1}^+ + \alpha_5 MPR_{t-1}^- +$$
$$\sum_{i=0}^{p} \lambda_i \Delta \ln MSO_{t-i} + \sum_{i=0}^{q} (\lambda_j^+ \Delta \ln PSC_{t-i}^+ + \lambda_j^- \ln PSC_{t-i}^-) + \sum_{i=0}^{r} (\vartheta_j^+ \Delta MPR_{t-i}^+ + \vartheta_j^- MPR_{t-i}^-) + \mu_t \quad \text{.....(3.5)}$$

We can re-specify equation 3.5 to include an error correction term thus:

$$\Delta \ln MSO_t = \omega_{t-1} + \sum_{i=0}^{p} \lambda_i \Delta \ln MSO_{t-i} + \sum_{i=0}^{q} (\lambda_j^{+} \Delta \ln PSC_{t-i}^{+} + \lambda_j^{-} \ln PSC_{t-i}^{-}) + \sum_{i=0}^{r} (\vartheta_j^{+} \Delta MPR_{t-i}^{+} + \vartheta_j^{-} MPR_{t-i}^{-}) + \mu_t \quad (3.6)$$

Using equation 3.6, the error correction term can be expressed as:

$$\delta_{t-1} = \ln MSO_{t-1} - \pi_0 - \pi_1 \ln PSC_{t-1}^{+} - \pi_2 \ln PSC_{t-1}^{-} - \pi_3 MPR_{t-1}^{+} - \pi_4 MPR_{t-1}^{-} \quad (3.7)$$

Where parameters:

$\pi_1 = -\frac{\alpha_2}{\alpha_1}$ and $\pi_2 = -\frac{\alpha_3}{\alpha_1}$ for INR; $\pi_3 = -\frac{\alpha_4}{\alpha_1}$ and $\pi_4 = -\frac{\alpha_5}{\alpha_1}$ for MS represents the long-run impact of positive and negative changes in PSC and MPR.

Similarly, the short-run impact of positive and negative changes is shown by:

$\lambda_j^{+}, \lambda_j^{-}$ for PSC; $\vartheta_j^{+}, \vartheta_j^{-}$ for MPR.

The underlying hypotheses for cointegration involve the long-run asymmetric parameters. Hence, the null hypothesis of no cointegration is expressed as $H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$ is tested against the alternative hypothesis of cointegration given as $H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq 0$. Wald test was also employed for testing restrictions to ascertain whether the asymmetries matter both in the long run and short run. For the Wald test, the null hypothesis of no asymmetries is stated against the alternative as: $H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$ (for long-run) and $H_0 : \sum_{i=0}^{q} \lambda_i^{+} = \sum_{i=0}^{r} \lambda_i^{-} = \sum_{i=0}^{s} \vartheta_i^{+} = \sum_{i=0}^{d} \vartheta_i^{-}$ (for short-run). The alternative for both long and short-run are given as: $H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq 0$ (for long-run) and $H_0 : \sum_{i=0}^{q} \lambda_i^{+} \neq \sum_{i=0}^{r} \lambda_i^{-} \neq \sum_{i=0}^{s} \vartheta_i^{+} \neq \sum_{i=0}^{d} \vartheta_i^{-}$ (for short-run).

RESULTS AND DISCUSSION

Table 1: Descriptive Statistics

	MSO	PSC	MPR
Mean	4474.683	8234.959	13.58270
Median	1968.557	1421.660	13.50000
Maximum	25725.87	35326.74	26.00000
Minimum	41.62567	15.25000	6.000000
Std. Dev.	5996.298	10784.38	3.724955
Skewness	1.918462	1.107170	0.852139
Kurtosis	6.387534	2.943081	5.202399
Jarque-Bera	40.38761	7.564258	11.95582
Probability	0.000000	0.022774	0.002534
Sum	165563.3	304693.5	502.5600
Sum Sq. Dev.	1.29E+09	4.19E+09	499.5105
Observations	37	37	37

Source: Author's Computation, 2023 (Eviews-13)

From the descriptive results in Table 1, the analysis of the mean (M) and standard deviations (SD) shows the following descriptive statistics MSO (*M* = 4474.683, *SD* =5996.298); PSC (*M* = 8234.959, *SD* =10784.38) and MPR (*M* =13.582, *SD* = 3.724). The analysis indicates that PSC has the highest mean (*M* = 8234.959).

Skewness which measures the shape of the distribution shows that all that variables have their value to be positive, which suggests the distribution tailed to the right of the mean.

Variables with value of kurtosis less than three are known as platykurtic in other words fat or short-tailed, PSC variable qualified. However, variables that their kurtosis value is greater than three (3) are called leptokurtic (slim or long tailed) MSO and MPR variables qualified for this during the study period.

The statistical test which is adopted to know if the series are normally distributed is known as Jarque-Bera. In other to be consistent with the test of skewness the null hypothesis is that the series is normally distributed. Each of the variables were tested at 5% level (0.05) level of significance. If the probability value (PV) is greater than 0.05 (i.e., if PV>0.05), it suggests the variable is statistically significant or normally distributed. From the table, it is observed that all three variables (MSO, PSC and MPR) were all less than 0.05, hence, they are not normally distributed, as their PVs were 0.000000, 0.022774 and 0.002534 respectively.

Unit Root Test Result

Unit root test was performed using the Phillips-Perron approach to determine the stationary status of the variables in order to make sure that the data for the variables included in the model do not vary needlessly. The results of the unit root tests are shown in Table 2.

Table 2: Summary of Unit Root Test Results

Phillips-Perron Statistics			
Variables	PP-Value	Critical Value	Order of Integration
MSO	-3.551112**	-3.544284	*I*(1)
PSC	-7.714280**	-3.544284	*I*(1)
MPR	-3.974539**	-3.540328	*I*(0)

Note: ** represents 5% level of Significance

Source: Author's computation, 2023 (e-views 12)

From the results in table 1, it could be observed that 2 variables of interest (MSO and PSC) were found stationary at first difference form, and are integrated at order one {i.e., I(1)} while just one of the variables (MPR) was found to be stationary at levels and integrated at order zero {i.e., I(0)} . At this order of integration, manufacturing sector output (MSO) test statistics of -3.551112 was found to be greater than the critical value of -3.544284 at 5% level of significance. Private sector credit (PSC) had a test statistic of -7.714280 and was found to be greater than the critical value of -3.544284 at 5% level of significance. Furthermore, monetary policy rate (MPR) also had its test statistic of -3.974539 greater than its corresponding critical value of -3.540328 at 5% level of significance. Since the variables were all found stationary at different orders, they satisfy the condition for using asymmetric bounds approach to cointegration test.

Asymmetry Test

Further to this paper, the asymmetry test was carried out to investigate the long-run and short-run asymmetric properties of the variables under study and the results are presented on table 3. The null

hypothesis of the test is that the inclusion of partial sums of positive and negative changes in PSC and MPR, are not significant (i.e., no asymmetries), and the alternative is that the decomposition of the changes matters (i.e., there is asymmetries).

Table 3: Results of the Asymmetry Wald Test

	Wald-Statistic		Evidence of Asymmetry	
Variables	Long-run	Short-run	Long-run	Short run
LogPSC	8.8196(0.00297)**	1.9052(0.1674)	Yes	No
MPR	6.0571(0.0138)**	6.7460(0.0094)**	Yes	Yes

Note: ** denote rejection of the null hypothesis at 5% significance level. Values in parenthesis are the probabilities

Source: Author's Computation, 2023 (Eviews-12)

The result of the Wald asymmetry test as presented in Table 3 showed that the null hypothesis of no asymmetry in the long-run coefficients are rejected for both of the variables. These findings uphold the specification of the NARDL model. However, in the short run, the null hypothesis of no asymmetry was rejected for MPR; while the null hypothesis of no asymmetry was accepted for PSC (i.e., there is a linear/symmetric relationship between MSO and PSC in the short-run.

Cointegration Test Result

This test was carried out to find out if the independent variables (PSC and MPR) have a long-run relationship with the dependent variable (MSO). The idea behind cointegration analysis is that, although policy variables may tend to trend up and down over time, groups of variables may drift together.

Table 4: Asymmetric Bounds Cointegration Test Result

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	44.31389	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Author's Computation, 2023 (Eview-12)

Using the bound test captured in Table 4, it indicates that the F-statistic value of 44.31389 is greater than the upper and lower bound of 2.56 and 3.49 at 5% respectively. This implies that there is a long run relationship that exist among the variables. This led to the rejection of the null hypothesis of no co-integration among the variables. The result thus showed that there is an asymmetric long-run relationship between monetary policy tools and manufacturing sector output in Nigeria.

Table 5: NARDL-ECM Regression Result

	NARDL-ECM			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MSO(-1))	-3.361143	0.126231	-26.62688	0.0000
D(MSO(-2))	4.244668	0.150654	28.17502	0.0000

D(MSO(-3))	-4.50261	0.180947	-24.88352	0.0000
D(MPR_NEG)	58.69197	55.82242	1.051405	0.3238
D(MPR_NEG(-1))	-136.5622	45.42367	-3.006412	0.0169
D(MPR_NEG(-2))	-136.2892	43.92205	-3.102978	0.0146
D(MPR_NEG(-3))	49.06058	26.36507	1.860818	0.0998
D(MPR_POS)	-114.1961	31.50373	-3.624845	0.0067
D(MPR_POS(-1))	-121.4512	68.61234	-1.770107	0.1147
D(MPR_POS(-2))	-151.3828	52.16365	-2.902075	0.0198
D(MPR_POS(-3))	-209.3657	50.95535	-4.108806	0.0034
D(PSC_NEG)	3.976702	0.570728	6.967773	0.0001
D(PSC_NEG(-1))	-7.94351	0.831822	-9.549534	0.0000
D(PSC_NEG(-2))	-0.251719	0.727562	-0.345976	0.7383
D(PSC_NEG(-3))	-13.79853	0.841746	-16.39273	0.0000
D(PSC_POS)	-0.454425	0.097776	-4.647617	0.0016
D(PSC_POS(-1))	-0.43664	0.122803	-3.555604	0.0074
D(PSC_POS(-2))	-2.323823	0.14931	-15.56375	0.0000
CointEq(-1)*	-0.371063	0.017852	-20.78606	0.0000
R-squared	0.996316			
Adjusted R-squared	0.991216			
S.E. of regression	353.7375			
Sum squared resid	1626693			
Log likelihood	-218.7872			
Durbin-Watson stat	3.318108			
F-Stat.	252.3731			
Prob(F-stat)	0.0000000			
	Long-run NARDL			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
MPR_NEG	293.9033	543.3618	0.540898	0.6033
MPR_POS	366.6312	581.8198	0.630146	0.5462
PSC_NEG	31.63712	34.15811	0.926196	0.3814
PSC_POS	3.106693	3.246692	0.95688	0.3666
C	227.4385	2179.317	0.104362	0.9195

Source: Author's Computation, 2023 (Eview-12)

The ECT coefficient value of -0.371063 revealed that once there is disequilibrium in the system, it takes an average (annual) speed of 37.10% to restore a long-run asymmetric relationship between the monetary policy tools and manufacturing sector output in Nigeria. This is implicative of the fact that, once there is disequilibrium in the system, it takes an average speed of 37.10% to adjust itself back towards the long-run equilibrium level as captured in Table 5. The adjusted R-squared 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 99.12% of changes in manufacturing sector output (MSO) were collectively due to private sector credit and monetary policy rate, while 0.88% unaccounted variations were captured by the error term. More so, the F-statistics which examines the overall significance of the regression model equally showed that the overall

result is statistically significant at 1 percent. This was indicated by the value of the F-statistic captured as 252.3731; with an associated p-value of 0.0000 which was found to be significant at the 1percent.

DISCUSSION OF FINDINGS

Findings from the study (as captured in Table 5) revealed that the long-run effect of a positive change in private sector credit had a corresponding positive effect on manufacturing sector output. This explains that as private sector credit increases, the manufacturing sector output also increases. This positive effect was however found to be statistically insignificant as the p-value of 0.3666 was found to be greater than 0.05 (i.e., 0.3666 > 0.05). The increase in the private sector credit implies manufacturing firms can invest in new machinery, technology, and infrastructure, leading to improved production capabilities. This, in turn, can increase output levels as businesses can produce more goods efficiently. Also, firms that make new equipment and staffing investments create jobs. As a result, workers may earn more money, which may enhance consumer spending. This might then result in a rise in business demand for their products and services, which would prompt even more spending and hiring. With respect to the long-run negative effect of private sector credit on manufacturing sector output, the result showed that negative changes in private sector credit have a negative influence on manufacturing sector output; and this negative asymmetric effect also had an insignificant effect on manufacturing as captured by the p-value of 0.3814 found to be greater than 0.05. The decrease in the private sector credit a decrease in private-sector credit can lead to a decrease in manufacturing sector output. This is because when businesses have less access to capital, they are less able to invest in new equipment and hire more workers, which can lead to decreased productivity and output. Based on magnitude, the asymmetric positive effect of private sector credit implies that if private sector credit increases by 1%, manufacturing sector output will also increase by 3.1%. While the negative effect of private sector credit implies that a 1% decrease in private sector credit will lead to a 31.63% decrease in manufacturing sector output.

Further findings revealed the long-run effect of a positive change in monetary policy rate had a corresponding positive effect on manufacturing sector output. This is because when the central bank lowers interest rates, it makes it cheaper for businesses to borrow money. An increase in the monetary policy rate, however, might occasionally result in an increase in the output of the manufacturing sector. In reaction to a robust economic expansion, the central bank may decide to boost interest rates, which might result in this. Inflation may start to rise when the economy is expanding quickly. Without intervention from the central bank, inflation might spiral out of control and trigger a recession. In this situation, increasing interest rates may actually aid in slowing the economy and preventing unchecked inflation. Enterprises, perhaps trying to expand their operations in preparation for future expansion, this may result in higher investment in the manufacturing sector. This positive effect was however found to have statistically insignificant effect on manufacturing sector output, as captured by the p-value of 0.5462 which was found to be greater than 0.05. The asymmetric negative effect of monetary policy rate was found to also be statistically insignificant with its p-value of 0.6033 greater than 0.05.

This means that a decrease in monetary policy rate will lead to an increase in manufacturing sector output as well. Based on magnitude, the positive effect of monetary policy rate implies that if monetary policy rate increases by 1%, it will lead to 3.66% increase in manufacturing sector output in Nigeria. While the negative effect implies that a 1% decrease in monetary policy rate will lead to a 2.93% decrease in manufacturing sector output.

CONCLUSION AND RECOMMENDATIONS

The dwindling amount of manufacturing sector output over time can be attributed to poor implementation of monetary policy tools, despite the beautiful policy formulation in the form of private sector credit, and relatively friendly interest rates, amongst others. Hence, this study attempted to ascertain the asymmetric

effect of monetary policy tools on manufacturing sector output in Nigeria. Findings from the paper revealed that monetary policy tools had an overall effect on manufacturing sector output (using F-statistic). Furthermore, the results were indicative of the fact that a long-run asymmetric relationship existed between private sector credit and monetary policy rate on manufacturing sector output. An increase in private sector credit boosted the output of the manufacturing sector, while a decrease reduced manufacturing sector output in Nigeria. It was observed that an increase in monetary policy rate might occasionally result in an increase in the output of the manufacturing sector. While a decrease in monetary policy rate will also lead to an increase in manufacturing sector output.

Based on the findings, the following are recommended:

1. Central bank should continue in its drive to give credit to businesses to boost their output/production. Selective credit schemes can be implemented vigorously to help increase their output.

2. As changes to the monetary policy rate by the CBN result in a commensurate shift in the banking system and financial markets, monetary policy rates are closely linked to the market interest rate faced by banks andend-users of funds. Therefore, in order to protect the economy from the spillover effects of inflationary pressure that could slow down domestic economic activity and put pressure on manufacturing sector output, the monetary policy committee (MPC) members are encouraged to take into account monetary policy stance (that captures the economic reality on the ground).

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