MONETARY POLICY AND GROWTH OF MANUFACTURING SECTOR: EVIDENCE FROM NIGERIA

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ABSTRACT
This study empirically examines the impact of monetary policy on manufacturing sector growth in Nigeria using secondary data from the Central Bank of Nigeria and the World Bank for the period 2000 to 2020. In concluding the analysis, the study employs the ordinary least squares multiple regression method, along with other residual diagnostics tests, to analyze data on variables such as the monetary policy rate, treasury bill rate, cash reserve ratio, and inflation rate in Nigeria during this period. The analysis revealed that the monetary policy rate and inflation rate had a negative impact on manufacturing sector growth, while the treasury bill rate and cash reserve ratio had a positive impact. However, all variables except the treasury bill rate were statistically non-significant. The study concludes that the monetary policy rate is an effective tool for stimulating investments and enhancing manufacturing sector growth, while the cash reserve ratio and treasury bill rate are useful for managing investment costs. Additionally, the inflation rate strongly influences monetary policy and, in turn, manufacturing sector growth. It is recommended that the government enhance coordination between monetary and fiscal policies to maintain low and stable inflation rates.
Keywords: Inflation rate, monetary policy, manufacturing sector, performance
JEL: E52, L60

INTRODUCTION
While no economy is entirely self-sufficient, many aim for self-reliance. Successful economies often have a more developed economy with significant economies of scale, which can boost growth and development (Ćorić, Perović, & Šimić, 2012). A more developed economy can lead to increased production of goods and services and value creation through effective monetary policy. Monetary policy is a vital macroeconomic tool used by central banks to achieve goals like price stability, economic growth, and full employment. In Nigeria, the central bank's monetary policy objectives include promoting manufacturing growth, correcting exchange rate imbalances, and ensuring sustainable development (Uju & Ugochukwu, 2021). The bank manages money supply and interest rates to reach these goals, which in turn influence economic activity and overall development.

The importance of monetary policy on the manufacturing sector is well recognized for its role in

Economic stabilization, job creation, wealth generation, and trade balance improvement are key objectives. The COVID-19 pandemic highlighted the vital role of the manufacturing sector in stabilizing the economy. Nigeria's manufacturing industry, one of the largest in Africa, contributes around 10% to the country's GDP annually (NBS, 2020). It is mainly based in major cities like Lagos, Ogun, Port Harcourt, and Ibadan, with a wide range of manufacturing activities producing goods such as cement and building materials, food and beverages, tobacco, chemicals and fertilizers, wood, and textiles. Despite its importance, the sector faces challenges like limited access to imported raw materials and supply chain issues, which lead to stockouts, low-capacity utilization, and a shrinking workforce.

The government has implemented various policies and programs to promote industrial development, including indigenization policies aimed at increasing employment and domestic production of goods. However, these efforts have proven ineffective over time, with the manufacturing sector still facing challenges in sourcing raw materials locally and exporting its products due to weak demand and limited export markets. Despite these challenges, the monetary authorities continue to develop policies to promote growth and stability in the economy (Oseasunmhen, 2022). Given this context, an in-depth study of this topic is necessary to examine the impact of monetary policy on the growth of Nigeria's manufacturing sector.

LITERATURE REVIEW

There is extensive literature both within and outside Nigeria that uses time-series and panel data to examine the relationship between monetary policy and industrial performance in Nigeria. For example, Eche, Edidiong, Pam, and Ato (2022) assessed the contribution of monetary policy to the growth of Nigeria's manufacturing sector from 1985 to 2019. The findings revealed a long-term relationship between monetary policy and the manufacturing sector's contribution to GDP. In the short term, the monetary policy rate has a negative and significant impact on the manufacturing sector, while liquidity ratio, inflation rate, and treasury bill rates have positive effects. Another study by Uju and Ugochukwu (2021) explored the effect of monetary policy on Nigeria's industrial growth between 1986 and 2019. The results indicated that open market operations, measured by treasury bill rates, positively influence Nigeria's manufacturing sector gross domestic product. Additionally, the cash reserve ratio positively affects the manufacturing sector's gross domestic product, whereas the monetary policy rate has a negative impact. The study concluded that monetary policy is a valuable tool for promoting industrial sector growth in Nigeria. Osakwe, Ibenta, and Ezeabasili (2019) analyzed the effect of monetary policy on the performance of Nigeria's manufacturing sector over 32 years (1986-2017). The results showed that monetary policy tools significantly affect manufacturing output in Nigeria, but only in the short run.

Onwuteaka, Okoye, and Molokwu (2019) examined how monetary policy affects economic growth in Nigeria using secondary data from 1980 to 2017. Their findings indicated that money supply, credit, interest rate on credit, infrastructure, inflation rate, external debt, and the price index are statistically significant factors influencing economic growth. Shobande (2019) studied the effects of switching from direct to indirect monetary policy on industrial growth in Nigeria, utilizing annual time series data from 1960 to 2015. The results revealed that domestic credit, interest rates, and trade balances have positive effects on industrial output, whereas money supply, inflation rates, and exchange rates have negative effects. Ashamu (2020) analyzed the impact of monetary policy on Nigeria's foreign trade from 1981 to 2017. The findings demonstrated that

monetary policy generally positively influences foreign trade, although interest rates have a negative coefficient and are not statistically significant. Hammed (2020) investigated the effect of monetary policy shocks on manufacturing output in Nigeria with data from 1981 to 2018. The study found that shocks to the broad money supply have a positive and significant impact on manufacturing output, whereas shocks to interest rates have a negative but insignificant effect.

Nwoko, Ihemeje, and Anumadu (2016) examined the extent to which Central Bank of Nigeria's monetary policies could effectively promote economic growth over the period 1990-2011. The results showed that Central Bank's monetary policy measures are effective in regulating both monetary and real sector indicators such as employment, price level, output, and economic growth rate. Ezeaku et al. (2018) assessed the industry effects of monetary policy transmission channels in Nigeria from 1981 to 2014. The findings revealed that private sector credit, interest rate, and exchange rate channels have negative effects on real output growth in both the short run and long run. A study by Ufoeze et al. (2018) analyzed the impact of monetary policy on economic growth in Nigeria using time series data from 1986 to 2016. The research employed an Ordinary Least Squares technique and conducted unit root and co-integration tests to analyze the data. The results indicated a long-term relationship among the variables, with monetary policy rate, interest rate, and investment exerting insignificant positive effects on Nigeria's economic growth.

The theoretical framework for the study was based on Keynesian theory, which states that monetary policy influences interest rates, which in turn affect investment decisions and the performance of financial institutions (Amacher & Ulbrich, 1989; Solomon, 2013). Therefore, the study focuses on Keynesian theory, which shares the view that monetary policy has an indirect effect on output through interest rates. The study also considered the monetarist theory proposed by Milton Friedman in 1956, which suggests that changes in the money supply directly impact economic activity. This perspective is relevant because the money supply is a key factor influencing manufacturing growth. Consequently, monetary policy should aim to maintain a steady growth rate of the money supply rather than attempting to regulate it.

METHODOLOGY

The study employed an ex-post facto research design with data collected from the Central Bank of Nigeria statistical bulletin, International Monetary Fund financial statistics, and World Bank national accounts data files for the period 2000 to 2020. Building on previous work by Akpunonu and Orajaka (2021), this study modified the model by using the contribution of manufacturing sector output to GDP as the dependent variable, while the explanatory variables were adjusted to include monetary policy rate (MPR), treasury bills rate (TBR), cash reserve ratio (CRR), and controlled for inflation rate (INFL). Thus, the model is given by the equation below.

MAN = f (MPR, TBR, CRR, INFL)

To standardize the variables and also interpret the resulting coefficients as elasticities, the equations above were restructured in log form as follows:-

$LnMAN = \beta_o + \beta_1 LnMPR + \beta_2 LnTBR + \beta_3 LnCRR + \beta_4 LnINFL + \mu i$
β_0 = Regression constant; $\beta_1 - \beta_4$ = coefficients of explanatory variables

The paper used a time series analysis with multiple regression, and diagnostic tests were performed to verify the accuracy and reproducibility of the results. E-Views 12.0 software was employed to conduct the analysis.

DATA ANALYSIS, RESULTS AND DISCUSSIONS

The analysis shown in Table 1 indicates that MAN, which represents the manufacturing sector's contribution to GDP, had an average value of 8.2717 from 2000 to 2020. This positive value suggests that the manufacturing sector's contribution to Nigeria's GDP was beneficial. The deviation from the mean for MAN was 0.974432, demonstrating that MAN remained stable over the period. The skew statistics revealed that MAN was rightly skewed (positively skewed), with the median less than the mean, while the kurtosis showed that MAN was platykurtic, with a value below the 3.0 threshold.

Table 1: Summary of descriptive statistics

	MAN	MPR	TBR	CRR	INFL
Mean	8.271738	2.489483	7.193915	2.611342	2.510904
Median	8.182739	2.564949	7.252347	3.113515	2.500616
Std. Dev.	0.974432	0.287695	0.718139	0.966945	0.0272833
Skewness	0.028115	-0.939038	-0.043893	-1.886250	0.047093
Kurtosis	1.786137	4.028821	1.389346	5.117764	3.720887
Jarque-Bera	1.292048	4.012439	2.276674	16.37710	0.462481
Prob	0.524126	0.034496	0.320351	0.000278	0.793549
Obs	21	21	21	21	21

Source: E-views 12.0 statistical software

The descriptive statistics for the independent variables show that MPR, TBR, CRR, and INFL have mean values of 2.489483, 7.193915, 2.611342, and 2.510904, respectively. For all the variables, the mean and median fall within their maximum and minimum values, indicating good consistency. The respective standard deviation values were 0.287695, 0.718139, 0.966945, and 0.0272833, suggesting that the inflation rate is the most widely dispersed variable, while the cash reserve ratio is the least volatile among them. Additionally, only the skewness of the inflation rate was positive, while monetary policy rate, treasury bill rate, and cash reserve ratio had negative skewness. The kurtosis of MPR, CRR, and INFL was leptokurtic (peaked above the 3.00 threshold). The Jarque-Bera test confirms that the series are normally distributed and suitable for generalization.

VAR lag criteria
The VAR lag order selection criteria test was conducted to select the optimum lag for modelling;

Table 2: VAR lag order selection criteria

Lag formation	AIC	SC	HQ
0	30.11471	30.31076	30.13420
1	27.70470	28.68495	27.80214
2	26.95293	28.71738	27.12832
3	22.76440	25.31305	23.01774
4	-19.75803*	-19.42474*	-19.72490*

the asterisks indicate 5% level of significance

The result from Table 2 collectively selects lag length four as the acceptable criterion with AIC as the lowest information criterion in its model estimation.

Residual diagnostic test
As outlined in the methodology, diagnostic tests such as Breusch-Pagan Godfrey Test, Ramsey RESET Test, Jarque-Bera Normality Test, and stability test were performed to verify the accuracy and reproducibility of the model. The results of the residual diagnostic tests are shown below.
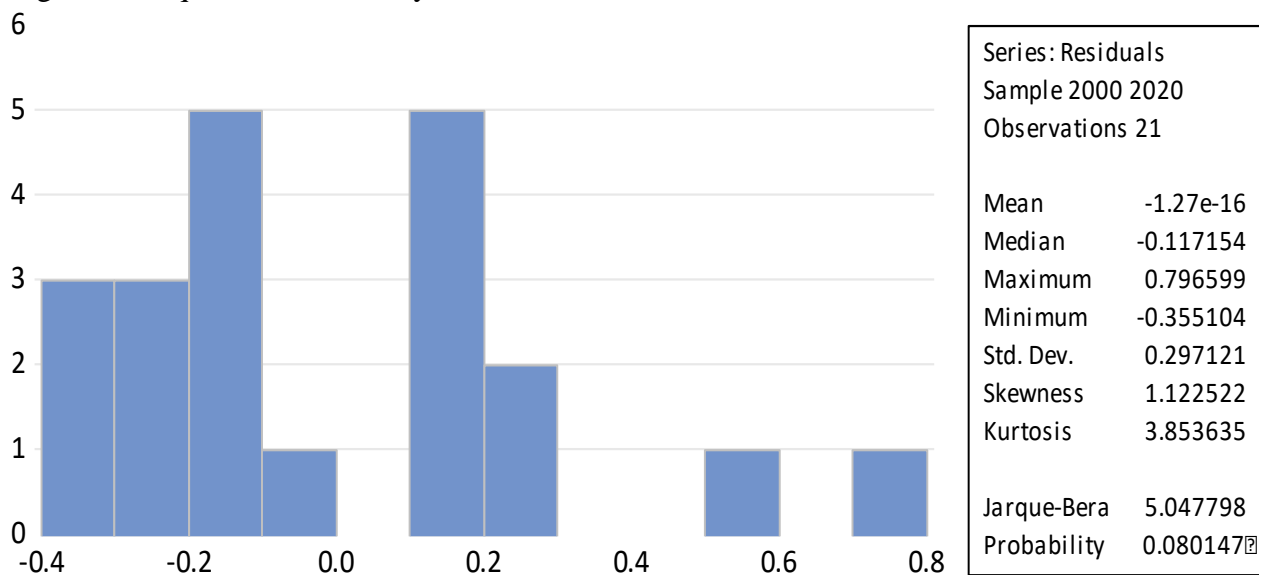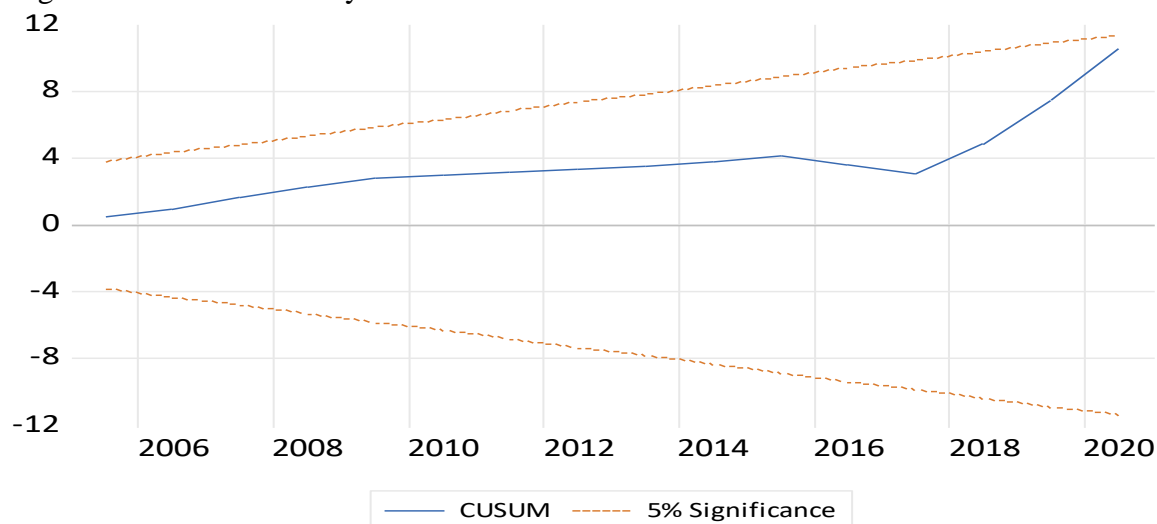
Figure 1: Jarque-Bera Normality test

Series: Residuals	
Sample 2000 2020	
Observations 21	
Mean	-1.27e-16
Median	-0.117154
Maximum	0.796599
Minimum	-0.355104
Std. Dev.	0.297121
Skewness	1.122522
Kurtosis	3.853635
Jarque-Bera	5.047798
Probability	0.080147

Figure 2: CUSUM stability test

Table 3: Ramsey RESET Test Results

	Value	df	P-values
t-statistic	0.519587	16	0.6105
F-statistic	0.269970	(1,16)	0.6105
Likelihood ratio	0.351380	1	0.5533

Table 4: Breusch-Pagan-Godfrey Test Results

F-statistic	0.838463	Prob. F (4, 16)	0.5207
Obs*R-squared	3.639114	Prob. Chi-Square (4)	0.4570
Scaled explained SS	1.808097	Prob. Chi-Square (4)	0.7710

The results showed that the model is normally distributed by Jaque Bera and that, according to the CUSUM test, the estimated model was stable. Additionally, the null hypotheses for the Ramsey and Breusch-Pagan-Godfrey tests were not rejected at the five percent significance level. Therefore, it is free from mis-specification and serial autocorrelation.

OLS analysis and discussion of regression results

Table 5: OLS regression result

Sample: 2000 2020				
Included observations: 21				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-26.93273	14.09087	-1.911361	0.0659
LN_MPR	-0.077464	0.372089	-0.208186	0.8376
LN_TBR	1.070184	0.168996	6.332610	0.0002
LN_CRR	0.279024	0.146372	1.906268	0.0737
LN_INFL	-0.003924	0.278749	-0.047895	0.9624
R-squared	0.874700	Mean dependent var		4.610761
Adjusted R-squared	0.852588	S.D. dependent var		3.859728
S.E. of regression	0.374126	Akaike info criterion		5.538342
Sum squared resid	2.379495	Schwarz criterion		5.804973
Log likelihood	-6.876555	Hannan-Quinn criter.		5.630383
F-statistic	2.144310	Durbin-Watson stat		1.041428
Prob(F-statistic)	0.048250			

Source: Researchers' computation using E-Views 12

From the regression results in Table 5, the R-squared of 0.8747 measures the goodness of fit for the regression. This indicates that the independent variables explain 87.47% of the variation in manufacturing sector growth in Nigeria. The adjusted R-squared of 0.8525 suggests that the model is a good fit for testing the hypotheses. Additionally, the results show that the coefficient for the Monetary Policy Rate (MPR) is -0.07746 with an insignificant probability value of 0.8376, indicating a negative relationship between the monetary policy rate and manufacturing sector growth in Nigeria. This finding aligns with the works of Eche, Edidiong, Pam & Ato (2022) and Uju & Ugochukwu (2021), but contradicts those of Ashamu (2020). The coefficient for the treasury bill rate was 1.07018, with a significant probability value of 0.0002, indicating that the treasury bill rate has a positive and significant impact on manufacturing sector growth in Nigeria. This supports the research question, "Does the treasury bill rate have an impact on Nigerian manufacturing sector growth (MAN)?" and confirms that the treasury bill rate positively influences growth in the sector. This finding is highly consistent with Uju and Ugochukwu (2021).

Furthermore, the estimated coefficient for the cash reserve ratio (CRR) is 0.279024, with an insignificant p-value of 0.0737, indicating a positive relationship between the cash reserve ratio and manufacturing sector growth in Nigeria. The study thus answers the research question by showing that the Cash Reserve Ratio has a positive but insignificant effect on manufacturing sector growth in Nigeria. This aligns with the work of Uju and Ugochukwu (2021), who posit that the cash reserve ratio is a valuable tool used by monetary authorities to promote industrial sector

growth in Nigeria. Lastly, the regression equation for the inflation rate has a negative coefficient of -0.003924 and an insignificant p-value of 0.9624, indicating a negative and insignificant impact of the inflation rate on manufacturing sector growth in Nigeria. Economically, this can be interpreted to mean that a persistent rise in the prices of goods results in a decline in manufacturing output in the country. This finding is consistent with the works of Shobande (2019) but contradicts Eche, Edidiog, Pam, and Ato (2022), who concluded that the inflation rate exerted a positive and significant impact on the manufacturing sector.

CONCLUSION AND RECOMMENDATIONS

Using annual data from 2000-2020, this study deployed the ordinary least squares approach to empirically examine the impact of monetary policy on the growth of Nigeria's manufacturing sector. The study specifically focuses on various monetary policy instruments such as the monetary policy rate, treasury bill rates, and the cash reserve ratio, and how they impact manufacturing sector growth. It was found that the monetary policy rate and inflation rate negatively affect manufacturing sector growth, while treasury bill rates and the cash reserve ratio have a positive impact on manufacturing sector growth in Nigeria. However, all variables except the treasury bill rate were statistically insignificant. Overall, the study concludes that a low monetary policy rate (MPR) is a sound tool for increasing investment and boosting growth in the manufacturing sector. Additionally, the cash reserve ratio and treasury bills are effective in controlling the cost of funds and managing investment in Nigeria's manufacturing sector. Meanwhile, the inflation rate strongly influences monetary policy and, in turn, affects manufacturing sector growth.

From the findings, the study makes the following recommendations for policy and practice:
1. Monetary authorities should include the manufacturing sector when developing policies to promote manufacturing growth. Doing so will help the monetary authorities support industrial growth, which will ultimately boost economic growth.
2. Governing bodies of the Manufacturers Association of Nigeria and other similar unions should educate manufacturers about the economic effects of monetary policy tools on their productivity.
3. To boost the manufacturing sector's growth, the government should increase efforts to improve monetary-fiscal coordination in order to keep inflation and inflation expectations low and stable.
4. The monetary authorities should review their policy objectives and adjust key monetary variables to encourage lending, promote investments, and facilitate industrial growth in the economy.

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