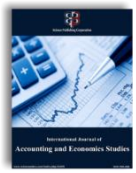
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Research paper



Effect of Monetary Policy on Industrial Development in Nigeria; A Vector Error Correction Model

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Abstract

This paper analyzed the effect of monetary policy on the development of Nigeria's industrial sector using the Vector Error Correction Mechanism. The research used monetary policy rate, liquidity ratio, Treasury bill rate, money supply, and exchange rate as explanatory variables, while industrial development was represented by the value added of the industrial sector to the gross domestic product. To establish the existence of a cointegrating relationship in the model, a Johansen approach was adopted, which resulted in the use of the Vector Error Correction Model for estimation to ensure a parsimonious model. The results of the research revealed that the monetary policy rate has a significant negative effect on industrial development in both the short and long run, while the liquidity ratio had a significant positive effect on industrial development in both the long and short run. The Treasury bill rate had a significant positive long-run effect on industrial development. Money supply had a significant negative effect on industrial development in the long run. The exchange rate was found to have affected industrial development in both the short and long run in Nigeria. Based on the research, the study recommends that monetary policies be leveraged to enhance a favorable investment environment by promoting the emergence of market-based interest and exchange rate regimes, which will attract both domestic and foreign investments to Nigeria's industrial sector in the future.

Keywords: *Monetary Policy, Industrial Value Added, Liquidity Ratio, Money Supply, Exchange Rate, Nigeria.*

1. Introduction

The industrial sector development of any nation plays a crucial role in the comprehensive economic development of the nation. It enhances structural transformation and economic diversification, which enables the country to fully utilize its resource endowment, reduce unemployment, and enhance the overall growth of the country's economy. This process reduces the economy's dependence on imported raw materials and finished goods, fostering long-term growth and development in the country. For every developing country, industrialization is particularly significant, as it involves the strategic and continuous application of infrastructure management expertise, appropriate technology, and other essential resources. Consequently, Nigeria's industrialization is a key aspect of governmental policies aimed at restructuring and diversifying the country's economy towards a more productive and independent framework (Agbonrofo & Ajibola, 2023). Industrialization seeks to enhance productivity, which increases exports and reduces the country's dependence on oil, which will also subsequently generate foreign exchange, enhance the country's earning potential, reduce unemployment rates, and increase per capita income, ultimately resulting in distinct consumption patterns.

In order to enhance the development of Nigeria's industrial sector, the government has implemented several industrial policies over the years in order to address this crucial issue. Some of these policies have incorporated both monetary and fiscal policy strategies. However, research indicates that the government's monetary measures should be prioritized in stabilizing the economy, as they seem to influence economic activity more rapidly and profoundly than fiscal policies. In the research work of Onyele, Ikwuagwu, & Onyekachi-Onyele (2020), they argued that monetary policies are more reliable and more effective than fiscal policies in driving needed changes in the level of economic activities, particularly within the industrial sector. Monetary policy serves as a crucial macroeconomic policy used by a nation's monetary authority to regulate its economy in a directed manner and fulfill some macroeconomic objectives. The Central Bank of Nigeria has, over the years, adopted several monetary policy actions aimed at enhancing price stability and ensuring the availability of accessible credit to promote industrial development in the country. Recently, several scholars and researchers have expressed concerns

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over the influence of monetary policy on the growth of the industrial sector in Nigeria. In the research work of Balogun (2021), he explained that the government's basic responsibility in monetary policy is to establish a flexible framework that can be adjusted to achieve medium-term stabilization goals in response to macroeconomic conditions of the nation's economy. In the work of Imoughele & Ismaila (2014), they defined monetary policy as the government's efforts to create supportive policies amidst unpredictable macroeconomic circumstances to cultivate a secure business climate. This monetary policy effect extends to the investing public through specific economic sectors, including manufacturing. Hammed (2020), in their work, emphasized the critical essence of monetary policy's effect on the industrial sector, emphasizing its significance for effective economic management.

Over the years, Nigeria has faced numerous economic challenges, ranging from the global financial crisis to the international oil market crisis and a significant decline in foreign exchange revenues, all of which have adversely affected the macroeconomic landscape of the country's economy. The country's dependence on the importation of capital goods has consistently resulted in a deficit balance of payments, resulting in a significant decline in the capacity utilization rates, socio-economic infrastructural problems, and a decline in agricultural sector production, which is crucial for generating wealth for a larger population of the Nigerian economy. As a result, this has contributed to a decrease in the income levels and a constant decline in the living standards of the majority of the populace, forcing the majority of Nigeria's populace into abject poverty (Onyele & Ariwa, 2020). The industrial sector in Nigeria has, over the years, adjusted persistently to fluctuations in real exchange rates and interest rates, which have negatively influenced the return on investment significantly. Manufacturers most times face challenges in securing loans for investments due to increased interest rates, resulting in high production costs and high inflationary pressures, as a result decreases the nation's currency value when acquiring raw materials (Ezeaku, Ibe, Ugwuanyi, Modebe & Agbaeze, 2018). The main aim of monetary policy in Nigeria has been the creation of a favorable balance of payments, enhanced price stability, reduced unemployment, and the enhancement of rapid industrial growth; however, these efforts have not yet yielded the desired significant industrial transformation within the country.

Over the last two decades, several strategies and policies aimed at transforming the industrial sector have been formulated and executed to enhance the industrial sector of the nation. Some of these policies include import substitution, export promotion strategies, industrialization driven by foreign private investment, and reform measures such as the indigenization policy and structural adjustment programs of the nation. These initiatives are aimed at establishing essential engineering infrastructure aimed at producing raw materials, spare parts, equipment components, and machinery needed by the industrial sector of Nigeria's economy. The government has prioritized the establishment of industries as the basic project to lay the groundwork for the growth and development of the industrial sector of the country. Despite these efforts, the economy of Nigeria remains underdeveloped, raising concerns about the effectiveness of the country's industrial policy-making strategies and how they have fostered the economic development of the country. The Central Bank of Nigeria's (CBN) ineffective implementation of monetary policy and its lack of an adequate long-term financing plan for the industrial sector have severely affected the growth of the industrial sector in Nigeria. Consequently, there has been a decline in both foreign and domestic investment in growth, acquisition of new facilities, hiring of qualified personnel, and research and development in the country (Uju & Ugochukwu, 2021). Previously, research has yielded conflicting results on the effect of monetary policy on industrial development, potentially due to variations in time series data, regional disparities, or the statistical methods applied in data analysis of the research. This research work, therefore, aims at addressing the existing gaps in the literature by specifically examining how monetary policy has affected the performance of the industrial sector of Nigeria, using a dataset and a comprehensive analysis that considers macroeconomic disruptions within the country, covering the period 1986 to 2023.

Before the introduction of the Structural Adjustment Programme (SAP) in the mid-1980s, which was marked by a significant shift in monetary policy, it had previously relied heavily on direct monetary controls because of the financial and capital markets' underdevelopment. This reliance ranged from numerous factors, including credit allocation for specific sectors, cash reserve requirements, fixed interest rates, credit ceilings, and special deposit enforcement. Achieving financial objectives during this period was highly challenging and resulted in a distorted resource distribution, which led to widespread inefficiencies. The Structural Adjustment Program (SAP), which initiated economic liberalization, facilitated a transition from the previously stringent direct monetary control approach to a more indirect strategy that leveraged market mechanisms for monetary management (CBN, 2023). This shift aimed to reduce the distortions and inefficiencies resulting from prolonged administrative controls, which allowed competition among banks and other financial institutions. In this context, two primary policy regimes can be identified for short-term and medium-term frameworks.

Despite Nigeria's increased focus on monetary policy since 1986, the nation continues to face challenges in economic growth and development, especially in the industrial sector. The aims of increasing employment and general output, as well as promoting both internal and external stability, have remained consistent with previous eras (CBN, 2008). Under the Structural Adjustment Program (SAP), the primary aim of monetary policy has been to enhance a market-focused financial system that effectively mobilizes financial savings and allocates resources, which adheres to the fundamental principles of economic management (Salami & Toriola, 2021). The monetary policy rate and open market operations have been the main instruments within this market-based framework, which include, supplemented by reserve requirements and discount window operations. Implementing a market-based framework, such as open market operations, required substantial enhancements to the macroeconomic, legal, and regulatory environments in an economy that had historically been subject to direct control (Sanusi, 2002).

Before the completion of the banking sector consolidation process in December 2005, Nigeria's monetary policy framework experienced several modifications. This transition involved a shift from direct monetary policy control to indirect (market-based) monetary management, as well as a move from a short-term to a two-year medium-term framework. During this period, the strategies and tools employed in monetary policy were aimed at addressing the evolving financial landscape, although the overarching goals remained largely unchanged, with monetary aggregates continuing to serve as the intermediate target for achieving the ultimate objective of controlling inflation in the country (Aigbokan, 2016).

The nation's advancement towards industrialization and economic growth, and development has faced significant challenges over the years. These challenges include increased unemployment rates, inadequate investment, and increasing inflation rates, which have all hindered the progress of the economy (Igbafe, 2022). Again, the exchange rate system has remained volatile for more than two decades, which has significantly affected domestic productivity in Nigeria (Aigbokan, 2016). The industrial sector contribution to the Real Gross Domestic Product (RGDP) from 1986 to 2022 is shown in Figure 1 below. The figure shows that the industrial sector's share of the RGDP was 49.08% in 1986, increasing to 50.13% in 1987 and 50.50% in 1988, before it declined to 49.17% in 1989. This increased in 1990 to 51.94%, and in 1991, it was reduced to 50.65% and later rose to 51.38% in 1992. Conversely, a decrease followed, with the share reducing to 45.46% in 1995, later increasing from 46.09% in 1996 to 45.63% in 1999, and falling again to 42.57%. It continued to decrease in the years 2000, 2001, and 2002 by 43.56%, 43.42%, and 38.14%, respectively. In 2003, this industrial sector's contribution to the RGDP continued to decrease from 39.85% to 25.32% in 2010 because of the global financial crisis, which commenced in 2008. The industrial sector's share of the RGDP had further declined to 26.06% as of 2022, down from 26.06% in 2011, in the midst of the econom-

ic downturn. Again, it experienced an increase, to 29.16% in 2016. To overcome the prevailing industrial challenges, in July 1986, the Structural Adjustment Programme (SAP) was partially implemented (Abiodun, 2017). The implementation of SAP led to a significant rise in capacity utilisation in the country, although the situation worsened for several import-dependent countries, including those dealing with basic metals, iron and steel, electrical and electronics, and vehicle assembly, which had previously experienced a decrease in capacity utilisation. At the moment, some companies in Nigeria have started sourcing their raw materials domestically. According to CBN (2022), the percentage of raw materials sourced domestically remains relatively low for basic metals, iron and steel products, motor vehicles, and miscellaneous assembly.

Generally, Figure 1 indicates that in periods of increased monetary policy rate, industrial value added declined, and vice versa. This shows that there is no harmony between the trend of the monetary policy rate and the industrial sector value added in Nigeria.

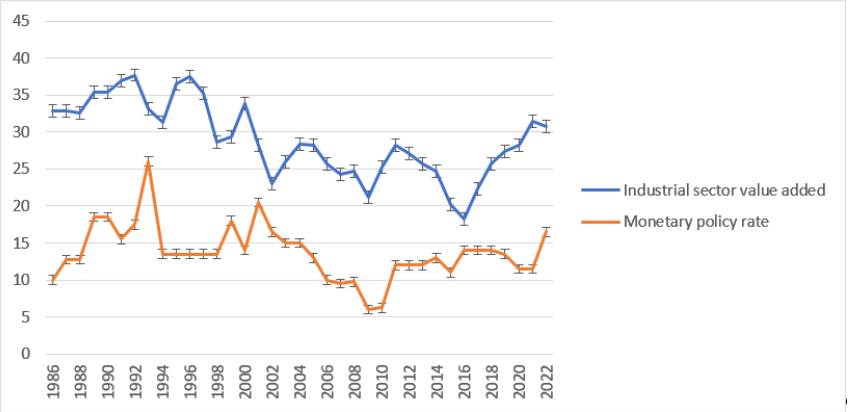


Fig. 1: Monetary policy rate and industrial sector contribution to real GDP

Source: Authors'computation

Nigeria's industrial sector output has consistently decreased in value over time. However, the overall growth of the industrial sector has been enhanced by various other subsectors within it in the country. More especially, the manufacturing sector has been a critical component, with the Nigerian industrial sector heavily depending on the manufacturing sector from 1986 to 2022. Nigeria's manufacturing sector has significantly contributed to the growth of the industrial sector of the nation. Figure 2 shows the classification of the various other subsectors that constitute Nigeria's industrial sector. As a result of the implementation of the 1986 Structural Adjustment Programme (SAP), industrial production in Nigeria saw an increase, with SAP believed to have contributed to lowering production costs in the country. Nevertheless, the costs of production across the different subsectors of the economy have experienced considerable fluctuation over time. Production in Nigeria is dominated by the manufacturing sector, while other subsectors contribute minimally.

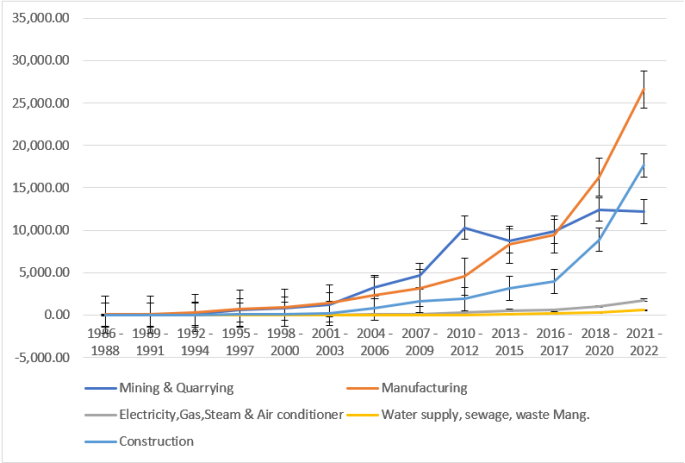


Fig. 2: Components of the Nigerian industrial sector

Source: Authors'computation

2. Empirical Review

Akinleye & Akpore (2025) examined how monetary policy influences economic development in Nigeria, with an emphasis on gross fixed capital formation. Their findings revealed that nearly all the variables examined—except for GDP—had a statistically significant effect on capital formation. They also observed that increases in money supply and credit to the private sector had a direct negative effect on gross fixed capital formation. In contrast, the exchange rate, inflation, and GDP had a positive effect on capital formation in the short run for the period under review. However, they concluded that monetary policy tools had no notable short-term impact on Nigeria's broader economic development.

In his 2025 study titled "The Velocity of Money and Lessons for Monetary Policy in Nigeria: An Application of the Quantile ARDL Approach", Oyadeyi examined what drives the speed at which money circulates in the Nigerian economy. Using advanced econometric modelling, he found that key factors such as per capita income, exchange rate movements, financial sector development, inflation, and interest rates all significantly shape the velocity of money. Based on these insights, he recommended strengthening the oversight and design of monetary policy to foster a more stable and predictable financial environment (Oyadeyi 2025).

Onyenebo, Ilemobayo, and Obi (2024) examined how monetary policy instruments affect both industrial growth and employment in Nigeria. Their research indicated that industrial sector growth was hindered by factors like the cash reserve ratio (CRR), exchange rate, inflation, liquidity ratio, and broad money supply—though only exchange rate and inflation had statistically significant effects. Meanwhile, the monetary policy rate (MPR) and treasury bills had a positive effect on industrial output but were statistically insignificant.
On the other hand, examining the employment in the industrial sector, they found that inflation, liquidity ratio, broad money supply, and treasury bills were negatively associated with job creation in the country, though none of these relationships were statistically significant. But they also revealed that CRR, exchange rate, and MPR positively affected employment levels, with CRR and MPR having a statistically significant impact for the period under review. Based on their results, they recommended the strategic application of the monetary policy rate to help steer the economy and support industrial sector development.
In their research, Agbogun, Oshiobugie, and Oboro (2024**)** examined how various monetary policy tools affect Nigeria's global economic competitiveness. Their findings showed that while the monetary policy rate (MPR) had a slightly positive effect, the cash reserve ratio (CRR) significantly enhanced competitiveness. In contrast, high lending rates and unfavorable exchange rates were found to have a strong negative impact on the economy. The study concluded that Nigeria's declining international competitiveness is largely driven by these two detrimental factors—high interest rates and exchange rate volatility.
In their 2023 study, Idisi, Dirisu, Adewale, Bandele, & Olufemitan studied the role of Open Market Operations (OMO) as a monetary policy tool in Nigeria. While OMO was seen as one of the key instruments for managing inflation, the researchers noted its limited effectiveness in promoting economic growth in the country. They argued that Nigeria's heavy dependence on imported finished products—especially refined petroleum products, industrial and agricultural machinery, and finished goods—makes the top priority of the economy to be controlling imported inflation. Thus, they called on policymakers to take more strategic measures to reduce external inflationary pressures on the economy.
Imandojemu, Adeleye, & Aina (2023**)** explored and examined the relationship between monetary policy and economic growth in Nigeria. Their analysis revealed a statistically significant negative correlation, which suggests that contractionary monetary policy tends to suppress economic growth. In addition, trade openness was seen to have mixed effects: it contributed positively to economic growth in the short term but had a negative impact in the long run when lagged. Similarly, inflation was found to reduce economic growth in the short run, while its long-run effects were also negative and statistically significant for the period under review.
Mohammed, Sanusi, & Mustapha (2024) examined how monetary and fiscal policy tools influence investment levels in Nigeria, employing quarterly data from 2010 to 2022 using ARDL and ECM techniques. The results showed that factors such as money supply, MPR, exchange rate, government expenditure, and public debt all had both short- and long-term effects on investment. Notably, while these variables showed a significant effect, government revenue—possibly weakened by Nigeria's complex and burdensome tax system—had a negative and statistically insignificant effect on investment, especially in the long run.
Awa, Chris-Ejiogu, and Njoku (2020), in their study, analyzed the impact of the Central Bank of Nigeria's monetary policies on economic growth between 1980 and 2018. Their result showed a positive, though statistically insignificant, link between interest rates and Nigeria's Gross Domestic Product (GDP), suggesting that changes in interest rates had little significant effect on economic growth during the period. In contrast, the liquidity ratio had a significant positive relationship with GDP, meaning that it played a more meaningful role in influencing economic performance in the country. They concluded that the limited effectiveness of monetary policy in achieving its objectives often stems from the weaknesses and inefficiencies in the instruments being used in its implementation. Despite these limitations, they confirmed that monetary policy had historically contributed more to economic growth in Nigeria than fiscal policy.
Considering the reviewed literature, there exists limited exploration of transmission mechanisms. While many studies confirm that monetary policy affects industrial output or investment, how these effects occur—i.e., through interest rates, credit availability, inflation expectations, or exchange rate pass-through—is often underexplored. There is an inadequate investigation into transmission channels of monetary policy within Nigeria's industrial economy. Again, insufficient use of high-frequency or recent post-COVID data is another gap in the literature, which the research tries to fill by including post-COVID-19 data up to 2023. The reviewed works showed weak incorporation of post-2020 policy innovations and macroeconomic shocks in modelling industrial outcomes. Most researchers failed to follow the appropriate techniques of data analysis.
Also, the findings from the prior studies were not consistent, as some studies concluded that monetary policy exerts a significant impact on the industrial sector, while other studies hold the opposite. The disparities observed in the findings are attributed to the period studied, the geography of the study, and the methodology applied.
This research will therefore fill the gap by exploring the effect of monetary policy on industrial development in Nigeria, adopting the Vector Error Correction Model covering the period 1986-2023 to determine if there is a relationship existing between monetary policy and industrial development in Nigeria and, if it exists, whether it is in the short run or the long run.

3. Methodology

This research work employed secondary data spanning 1986 to 2023, primarily sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and the World Development Indicators. Monetary policy variables were obtained from the Central Bank of Nigeria's Statistical Bulletin, while data on industrial sector value added were sourced from the World Bank. The selected timeframe captures Nigeria's transition from the Structural Adjustment Program to the present day. Also, within the study period, there was the global financial crisis of 2008 that resulted in economic recessions in numerous countries, including Nigeria inclusive and highlighting vulnerabilities within the financial system. Similarly, the period also captures the COVID-19 period and post-period monetary policies and how they impacted Industrial Development in Nigeria. The empirical model was adapted from the framework of Ayunku & Olulu-Briggs (2020) to examine the effect of monetary policy on industrial sector development in Nigeria, with further reference to Ayodeji & Oluwole (2018) as presented in Equation 1.

$$GDP = f(MS, IR, ER, LR) \quad (1)$$

Where,
GDP = gross domestic product
MS = money supply
IR = interest rate
ER = exchange rate

LR = liquidity ratio
This study modified Equation 1 to develop a tailored model. The interest rate variable was replaced with the Monetary Policy Rate (MPR), which serves as the benchmark for other interest rates in this research. Additionally, Gross Domestic Product (GDP) was substituted with the industrial sector's contribution to GDP for a better reflection of the study's focus on Industrial Development. The resulting functional form is therefore shown in Equation 2.

$$IVA = f(MPR, LQR, TBR, MS, EXR) \quad (2)$$

Where,
IVA = industrial sector value added
MPR = monetary policy rate
LQR = liquidity ratio
TBR = Treasury bill rate
MS = money supply
EXR = exchange rate
In order to address data skewness and mitigate the effect of outliers, the model was therefore transformed into a natural logarithmic form. The resulting econometric specification is then presented in Equation 3.

$$LNIVA = \beta_0 + \beta_1 LNMPR + \beta_2 LNLQR + \beta_3 LNTBR + \beta_4 LNMS + \beta_5 LNEXR + \mu \quad \text{Eqn. (3)}$$

Where,
LNIVA = natural log industrial sector value added
LNMPR = natural log monetary policy rate
LNLQR = natural log liquidity ratio
LNTBR = natural log of Treasury bill rate
LNMS = natural log of broad money supply
LNEXR = natural log exchange rate
β_0 = constant
$\beta_1 - \beta_5$ = coefficients
μ = error term
This research employed econometric models to examine the effect of Monetary Policy on the growth of Nigeria's Industrial Sector. Both the long- and short-term dynamics were analyzed using methods such as the Augmented Dickey-Fuller (ADF) test, Unit Root test, Johansen Co-integration test, Vector Error Correction Mechanism (VECM), and Granger causality test.

4. Results and Discussion

4.1 Correlation Analysis and Variance Inflation Factor (VIF)

The bivariate correlation values between the explanatory variables and the relevant VIFs are displayed in Table 1. Analysis is difficult because of multicollinearity in the data. As a result, it must be guaranteed that there is no multicollinearity in the data before the times they are run. A multicollinearity signal is a very high degree of correlation between the explanatory factors. All the correlation coefficients, according to the data, vary from low to moderate levels of correlation. To ensure that there is no multicollinearity in the data, the study also employed the VIF. Less than 10 is the acceptable value of VIF. Since the independent variable VIF values in the data fall between 1.64 and 3.56, which is within allowable bounds, the sample does not have a multicollinearity problem.

Table 1: Correlation analysis and multicollinearity statistics

	LNIVA	LNMPR	LNLQR	LNTBR	LNMS	LNEXR
LNIVA	1.00000					
LNMPR	0.42060	1.00000				
LNLQR	-0.09222	0.27489	1.00000			
LNTBR	0.12833	0.49613	0.07249	1.00000		
LNMS	-0.50434	-0.36563	0.32421	-0.15159	1.00000	
LNEXR	-0.66458	-0.22064	0.40891	-0.09337	0.95669	1.00000
VIF		3.564434	1.541253	2.250004	1.812440	1.647654

Note: Analysis was performed using EViews version 10.0

4.2 Unit Root Tests

As presented in Table 2, none of the variables were stationary at 5% significance level. This is because their critical values were greater than the absolute values of their Augmented Dickey-Fuller (ADF) test statistics. According to the Augmented Dickey-Fuller (ADF) unit root test results in the table, all variables are integrated of order one, I(1), since the absolute values of the ADF t-statistics were higher than the 5% critical values. This finding that the variables justify the use of the VECM approach for the present study.

Table 2: ADF unit root tests (trend and intercept)

Series	ADF test stat.		5% critical values			
	I(0)	I(1)	I(0)	I(1)	Orders	Remarks
LNIVA	-2.985493	-6.012118	-3.544284	-3.548490	I(1)	Not stationary
LNMPR	-3.188199	-6.991665	-3.540328	-3.544284	I(1)	Not stationary
LNLQR	-3.215377	-6.693464	-3.540328	-3.544284	I(1)	Not stationary
LNTBR	-3.070436	-6.136769	-3.540328	-3.544284	I(1)	Not stationary
LNMS	-0.086246	-4.953308	-3.540328	-3.544284	I(1)	Not stationary
LNEXR	-2.659245	-6.197629	-3.540328	-3.544284	I(1)	Not stationary

Authors' computation (2024)

4.3 Lag Length Selection

Table 3 demonstrates that when utilising the Hannan-Quinn Criterion (HQ) and Akaike Information Criterion (AIC) tests, one lag is the ideal number of delays. It should be mentioned that the frequency of the data determines how many lags to use.

Table 3: Lag length selection for VECM using AIC and HQ tests

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-66.86785	NA	2.59e-06	4.163877	4.430508	4.255918
1	99.47833	266.1539*	1.56e-09*	-3.284476*	-1.418058*	-2.640189*
2	132.9005	42.01650	2.19e-09	-3.137174	0.329030	-1.940641

* indicates lag order selected by the criterion

Authors' computation (2024)

4.4 Johansen Cointegration Test

The Johansen cointegrating test is necessary for verifying the presence of cointegration among non-stationary variables before conducting the Vector Error Correction Mechanism. If a cointegration equation/s exists, it predicts the existence of a long-term relationship among the variables in the model. The Johansen test can also be utilized in determining the speed of adjustment of the coefficient, which becomes a measure of the variations in the adjustment processes. The null hypothesis of this test posits that there are 'r' or fewer cointegration relationships among the variables. The test has two versions of the Johansen: the eigenvalue test and the trace test. The result of these tests is presented in Table 4. The Trace Test suggests the existence of at least one cointegrating equation, suggesting a long-term relationship in the model. Also, the maximum eigenvalue test indicates the presence of at least two long-term relationships among the variables. The VECM model was implemented.

Table 4: Trace and maximum eigenvalue cointegration testing

Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.760654	109.8996	95.75366	0.0037
At most 1	0.473997	59.85503	69.81889	0.2398
At most 2	0.393714	37.36937	47.85613	0.3303
At most 3	0.225579	19.85522	29.79707	0.4327
At most 4	0.168965	10.90782	15.49471	0.2172
At most 5 *	0.118886	4.429907	3.841466	0.0353
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.760654	50.04457	40.07757	0.0028
At most 1	0.473997	22.48566	33.87687	0.5701
At most 2	0.393714	17.51414	27.58434	0.5360
At most 3	0.225579	8.947400	21.13162	0.8366
At most 4	0.168965	6.477917	14.26460	0.5527
At most 5 *	0.118886	4.429907	3.841466	0.0353

Note: Trace test and Max-eigenvalue test indicate 1 cointegrating equation (s) at the 0.05 level
Source: Authors' computation (2024)

4.5 Vector Error Correction Model (VECM) Estimation

Table 5 presents the short- and long-run elasticities of the model and the Error Correction Term (ECT) for Nigeria's Industrial Sector Growth from the estimated VECM model. The ECT is statistically significant with a negative coefficient. This indicates the effective adjustment toward long-term equilibrium. About 17% of short-term disequilibria were corrected annually, based on variations in the sector's value added.

The model's explanatory power, as reflected in an adjusted R-squared of 0.69, shows that 69% of the variation in industrial sector output is explained by the included explanatory variables. This indicates a moderate fit. The F-statistic value of 7.82 confirms that the model is statistically significant at the 5% level of significance, with the explanatory variables jointly influencing the dependent variable.

The results of the analysis revealed a negative long-term connection between the Monetary Policy Rate (MPR) and Industrial Sector Value Added (IVA) for the period under review, with an elasticity of approximately -0.75. This shows that a 10% rise in MPR could lead to a 7.5% decrease in Industrial Sector Value Added (IVA). This might be explained by rising borrowing costs for companies, which deters investment and may even slow down industrial output and manufacturing. When the Monetary Policy Rate (MPR) has a negative long-term connection with the industrial sector, it implies that increases in the benchmark interest rate tend to decrease industrial growth over time. A negative long-term relationship between the Monetary Policy Rate (MPR) and the industrial sector indicates that tight monetary policy dampens industrial activity, primarily through high borrowing costs, limited credit access, and reduced competitiveness, which in turn slows down economic diversification and structural transformation.

Conversely, the Liquidity Ratio (LQR) shows a positive connection with Industrial Sector Value Added (IVA) in both the short and long term, with a long-run elasticity which is about 0.37, indicating that a 10% increase in Liquidity Ratio (LQR) increases Industrial Sector Value Added (IVA) by at least 3.7%. Some monetary policy tools inject money into the banking system, leading to more money being available than banks strictly need, which could be invested in the industrial sector of an economy. When the Liquidity Ratio (LQR) has a positive effect on industrial sector growth, it means that when banks maintain higher liquidity, the industrial sector tends to perform better in the long term. This implies that the country has a relatively Strong Banking Sector Stability. Higher liquidity ratios suggest that banks have enough liquid current assets to meet short-term maturing obligations. This stability reassures bank depositors and enhances investors' confidence, thereby reducing the risk of banking collapse that may disrupt industrial financing in the country.

Similarly, the Treasury Bill Rate (TBR) has a positive long-term effect on Industrial Sector Value Added (IVA), with an elasticity of 0.44. This signifies a 10% increase in Treasury Bill Rate (TBR) results in a 4.4% rise in Industrial Sector Value Added (IVA). A plausible reason for this is that long-term industrial development can benefit from a higher Treasury bill rate since it can draw in foreign investment and foster financial stability, which can result in more capital formation and better infrastructure for industrialization. If the Treasury Bill Rate (TBR) has a positive long-term effect on the industrial sector, it means that higher T-bill rates are somehow supporting industrial growth rather than crowding it out. This is a bit counterintuitive, because in many economic theories, high TBR tends to draw funds away from industry. A positive long-term relationship between Treasury Bill Rate (TBR) and industrial development implies that the economy's interest rate environment is supportive, relatively stable, and not crowding out private investment. If this is sustained and government borrowing is channeled into industrially supportive infrastructure, it will lead to inflation control, making higher yields compatible with sustained industrial growth.

The Money Supply (LNMS) shows a negative long-term relationship with Industrial Sector Value Added (IVA), where a 10% increase in money supply decreases Industrial Sector Value Added (IVA) by 6.3%. This is consistent with monetarists, who hold that the money supply is the primary force behind demand in an economy and that inflation results from growing the money supply more quickly than actual income, which in turn impacts industrial production by driving up input prices and lowering output value. If Money Supply has a negative long-term effect on the industrial sector, it implies that increases in the money supply are somehow harming industrial growth rather than supporting it. This may be responsible for the Inflationary Pressures & cost escalation Nigeria has faced in recent times. Excess money supply without matching increases in production fuels inflation. Price instability discourages long-term industrial planning and investment. This result also implies that Nigeria misallocates resources; if new money circulates mainly into consumption or speculative sectors like the stock market or real estate instead of manufacturing, industry is starved of productive investment. This results in credit crowding-out, where industrial firms cannot access affordable financing. A negative long-term effect of money supply growth on the industrial sector development reflects inflationary, structural, and policy inefficiencies in the economy. Instead of Money Supply stimulating production, the extra liquidity increases costs, which erodes competitiveness, weakens incentives for investment, and may eventually lead to a gradual collapse in manufacturing capacity.

Finally, the Exchange Rate (LNEXR) is negatively related to Industrial Sector Value Added (IVA) in both the short and long term, with a long-run elasticity of -0.59. This suggests that a 10% decrease in the exchange rate could lead to a 5.9% decline in Industrial Sector Value Added (IVA). Exchange rate depreciation, in which the value of the Nigerian Naira declines against other currencies, hurts Nigeria's industrial sector value added (IVA) by increasing the cost of imported manufacturing inputs. The implication is that when exchange rates exert a negative effect on Industrial Sector Value Added (IVA) both in the long and short run, imported inputs will be high, and machinery and raw materials will become more expensive. Industries that rely on imported technology or intermediate goods face cost inflation, which reduces competitiveness. Smaller firms may be forced to cut production or shut down entirely because of the high cost of production. Exchange rate volatility also leads to reduced Industrial Output as Persistent exchange rate instability discourages expansion and capacity utilization, firms may scale back production due to the high unpredictability of costs, resulting in a decline in industrial growth. This negative effect of the Exchange Rate (LNEXR) on Industrial Sector Value Added (IVA) could be responsible for the Inflationary Pressures, declining Foreign Direct Investment (FDI) in Industry, and the Decline in Export Competitiveness Nigeria has faced in the last four decades. The economy has been characterized by rising costs of imported industrial inputs, leading to **cost-push inflation.** Inflation has eroded purchasing power, which has reduced domestic demand for industrial goods. If these are not addressed, it may lead to the collapse of Nigeria's Industrial sector.

The long-run equation highlights that key monetary policy instruments used in this model—namely the Monetary Policy Rate (MPR), Treasury Bills (TBR) as a proxy for Open Market Operations (OMO), and exchange rate (EXR) fluctuations—have significantly contributed to the decrease of Nigeria's industrial sector performance. The sector's performance was also affected by external shocks, including the 2008–2009 global financial crisis, the 2016 economic recession, and the 2020 COVID-19 pandemic. Since 2011, additional economic pressures like political instability, insecurity, and economic disruptions—mostly in the Northern region—have further undermined industrial development in Nigeria.

The long-term cointegrating equation of the model is stated as follows:

$$LNIVA = -7.027222 - 0.753242LNMPR + 0.365557 + 0.442426 - 0.627204 - 0.588306$$

Table 5: VECM estimation

	Coefficient	Std. Error	t-Statistic	Prob.
ECT(-1)	-0.174980	0.046792	-3.739507	0.0021
LNIVA(-1)	0.810009	0.294143	2.753792	0.0155
LNMPR(-1)	-0.222742	0.096793	-2.301227	0.0373
LNLQR(-1)	0.173797	0.048750	3.565107	0.0013
LNTBR(-1)	-0.009125	0.081726	-0.111657	0.9119
LNMS(-1)	0.243851	0.144960	1.682190	0.1026
LNEXR(-1)	-0.338178	0.090151	-3.751257	0.0010
C	48.93324	16.35174	2.992540	0.0304
R-squared	0.779383	Mean dependent var		-0.001714
Adjusted R-squared	0.692556	S.D. dependent var		0.112210
S.E. of regression	0.106891	Akaike info criterion		-1.436381
Sum squared resid	0.308494	Schwarz criterion		-1.080872
Log likelihood	33.13666	Hannan-Quinn criterion.		-1.313659
F-statistic	7.816756	Durbin-Watson stat		1.998519
Prob(F-statistic)	0.000074			

Source: Authors' computation (2024)

5. Conclusion and Recommendations

Using a multivariate regression model, this research investigated the effect of monetary policy on the development of Nigeria's industrial sector. Key monetary policy variables used in this research include money supply, exchange rate, Treasury bill rate, liquidity ratio, and monetary policy rate. Industrial Sector Value Added was employed as a proxy for Industrial Sector Development in Nigeria. The results revealed that these monetary policy tools collectively had a statistically significant effect on industrial development, as shown by the

adjusted R-squared. Each policy instrument also demonstrated individual effectiveness in significantly influencing the industrial sector. Additionally, the Granger causality test revealed a one-way (unidirectional) causal relationship from monetary policy rate, liquidity ratio, money supply, and exchange rate to the industrial sector value added in Nigeria. By implication, CBN often adjusts interest rates to control inflation or stimulate economic growth. When interest rates are lowered, borrowing becomes more affordable, encouraging SMEs to invest in expansion, purchase equipment, or increase inventory, which could spur industrialization. This was the case during the 2008 financial crisis, which began with cheap credit and lax lending standards that fueled a housing price bubble. The low-quality loans were packaged and resold to financial institutions as investments. When the bubble burst, the institutions were left holding trillions of dollars of worthless mortgages, thus questioning the effectiveness of monetary authorities. The study concludes that effective implementation of monetary policy can significantly drive sustainable growth in Nigeria's industrial sector.

Based on the findings of this research, the study recommends the following policy actions: Monetary policy should support a market-based interest and exchange rate regime that will attract both domestic and foreign investment into Nigeria's industrial sector. The Central Bank of Nigeria (CBN) should maintain an optimal liquidity ratio in order to enhance financial accessibility as well as promote low-interest borrowing, especially for entrepreneurs and small businesses. Additionally, the government should leverage Open Market Operations (OMO) and maintain a viable Treasury bill rate that will stimulate liquidity and industrial productivity. Expanding the money supply is also essential, as it will drive industrial growth in the country. Again, maintaining a stable exchange rate is very crucial, as excessive volatility will create uncertainty in the economy, which discourages investment and hinders industrial development. Finally, this research works for further studies on the effect of monetary policy on manufacturing sector development in Nigeria. This will concentrate on the manufacturing sector and how monetary policy from the period of the Structural Adjustment Program (SAP), through the COVID-19 period till date, has impacted on Manufacturing sector Development in Nigeria.

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