Monetary Policy Variables and Performance of Mining and Quarry Sector in Nigeria

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Abstract
This study looked at how Nigeria's mining and quarry sector performance in relation to several monetary policy variables. The proxies for the monetary policy variables were open market operations, the monetary policy rate, the liquidity ratio, and the cash reserve requirement. The study's geographic focus was Nigeria, and its temporal scope spans 1987 to 2022, taking into account the post-structural adjustment program and additional measures including economic deregulation throughout this time. The Central Bank of Nigeria (CBN), the National Bureau of Statistics (NBS), and the World Bank Index (WBI) annual statistical report served as the sources of data for this quasi-experimental study. The acquired data were statistically analyzed using the error correction model, the Granger causality test, the Johansen co-integration test, the Augmented Dickey Fuller unit root test, and other methods to achieve the goals. The findings showed that the performance of Nigeria's mining and quarry industry is significantly impacted by open market operations, liquidity ratios, and cash reserve ratios. Furthermore, the performance of Nigeria's mining and quarry industries is severely and badly impacted by increases in the monetary policy rate. The study came to the conclusion that Nigeria's mining and quarry sector is highly impacted by monetary policy variables. The study recommended that, the authorities should increasingly check the activities of smugglers, illegal miners and legitimate operators who submit false returns, and prosecute culprits accordingly. This will not only instill sanity into the sub-sector, boost Government revenue, but also improve the quality of mining and quarrying performance.

Keywords: *Monetary Policy Variables, Performance, Mining and Quarry Sector, Nigeria*

INTRODUCTION

Quarry and mining are among the oldest economic activities and can be traced back to when early mankind extracted clay, and later other metals, for the production of cosmetics, crude implements and utensils. In Nigeria, extraction of tin dates as far back as 500 BC, where the Nok culture of the Benue/Northern Zaria areas of Nigeria were understood to have knowledge of Iron smelting. More famously, however was the rise of the Benin Bronze casting in Ile-Ife around 1400 AD, under the rule of Oba Ogunta, the Sixth king of Benin. Later, early European

explorers located and informally mined tin, galena, gold, and other minerals that could be traded internationally. Yet, records show that organized exploration activities in Nigeria did snot commence until 1903 and 1904, when the Secretary of State for Colonies conducted mineral surveys of the Southern and Northern Protectorates respectively. The Keynesians favored government intervention to address imperfections in the market system, while the classical economists' laissez-faire (free market) theory maintained that business and society as a whole would benefit from less government involvement in the economy. The banking industry has historically experienced the highest level of state intervention (Haber & Perotti, 2008). The financial system in Nigeria has seen extensive government intervention. The government uses the financial industry as a means of carrying out its monetary policy in an effort to meet predetermined targets. It has long been known that macroeconomic goals require government intervention in how economic variables operate. Monetary policy serves as a traditional tool for fine-tuning the economy in order to achieve specific macroeconomic objectives. In Nigeria, the Central Bank of Nigeria Decree Act 1969 grants the Central Bank the authority to carry out this function. The implementation of monetary policy involves regulating the cost, quantity, and availability of money and credit to attain the desired level of prices, employment, output, and other economic goals. This policy can be utilized to influence economic activities and accomplish the economic objectives of a nation.

From the perspective of the credit transmission mechanism, monetary policy influences bank lending by affecting the supply of bank loans. Changes in the demand for bank loans, on the other hand, are explained by the interest rate channel (Arnold, Kool & Raabe, 2006). In terms of inflation determination, the resulting increase in demand tends to counterbalance the downward pressure caused by exchange rate appreciation, leading to a modest inflationary effect (Sesay & Abdulai, 2017). Central Bank estimates has shown that an increase in interest rates tends to feed through the banking overnight interest rate to the longer-term market interest rates and finally have an impact on aggregate demand and inflation. Additionally, a reduction in money supply would reinforce this channel as well as the credit transmission mechanism. From the above, it is therefore imperative to study the nexus between monetary policy variables and the growth of the industrial sector in Nigeria. The Central Bank's analysis indicates that a rise in interest rates typically results in a trickle-down effect from the banking overnight interest rate to longer-term market interest rates, ultimately influencing aggregate demand and inflation. Moreover, a decrease in the money supply would further strengthen this connection along with the credit transmission process. Consequently, it is crucial to examine the relationship between monetary policy factors and the development of the industrial sector in Nigeria.

The Nigerian monetary authorities have focused on enhancing the operational effectiveness of monetary policy, promoting financial sector deepening, and directing funds to the industrial sector to achieve macroeconomic objectives over the past thirty years. The belief that a well-structured financial system can support the achievement of monetary and macroeconomic goals can be traced back to classical theories of monetary policy. According to Akani, Okorokwo & Ibenta (2016), financial intermediaries play a crucial role in driving innovation and growth. Achieving monetary and macroeconomic goals requires bank credit to the real sector. The impact of monetary policy on bank loan supply is influenced by various factors in the banking sector such as bank size, market concentration, capitalization, and liquidity. Consequently, there have been several monetary policy reforms targeting the banking sector. Despite the

growth of the financial services sector, particularly after economic liberalization, the industrial sector in Nigeria, especially mining and quarry sector, has not experienced equivalent growth. In many cases, the industrial sector lags behind the financial services sector (Ndekwu, 2013). The mining and quarry sector in Nigeria is facing significant challenges, including infrastructure deficiencies and an unstable business environment. This disconnect between the mining and quarry sector and financial sectors contributes to the funding gap, which is influenced by the availability and cost of funds determined by the money supply.

REVIEW OF RELATED LITERATURE

Monetary Policy

Monetary policy involves a set of measures aimed at regulating the value, supply, and cost of money within an economy to align with the level of economic activities. It is the process of managing the flow and availability of money and credit facilities to promote stable prices and economic growth in a country. The main objective of monetary policy is to maintain an appropriate money supply level that supports sustainable economic growth. Various studies have shown that monetary policy plays a crucial role in stabilizing the macroeconomic environment, as evidenced by research conducted in Nigeria. This research suggests that investors consider monetary policy and macroeconomic events as significant factors affecting stock price volatility, which in turn influences investment decisions. The Central Bank of Nigeria (2011) defines monetary policy as the specific measures it takes to control the value, supply, and cost of money in the economy in order to achieve predetermined macroeconomic objectives. To reach these goals, the CBN implements monetary regulations. It divides money into Narrow Money (M1) and Broad Money (M2). M1 includes currency in circulation among the non-bank public and demand deposits (current accounts in banks). This type of money is used for daily transactions and short-term financial needs. Broad Money (M2) comprises narrow money, savings, time deposits (such as call money), and foreign currency-denominated deposits. This classification assesses the total money supply in the economy.

Open-Market Operation

An open-market operation is essentially a transaction undertaken by a central bank in the market for securities (or foreign exchange) that has the effect of supplying reserves to, or draining reserves from, the banking system. The effect of Open Market Operations in particular and monetary policy in general on economic activities as well as the degree and relative potency of the policy has been the subject of debates and controversies among prominent schools of thought in economics. Theoretically, monetary policy got its root from the works of Irving Fisher who laid the foundation in the Quantity Theory of Money using the famous ‘Equation of Exchange’, and posited that money has no effect on the economic aggregates except price level (Diamond, 2003). The quantity theory of money was based on the argument that there was a relationship between the average level of prices and the quantity of money in circulation to the extent that a change in the quantity of money would lead to a proportionate change in price level in the same direction. This view was first held by 16th century French Economist-Jean Bodin-who believed that if the quantity of money in circulation doubles, the price would double too. The idea of direct relationship between money supply and price passed into the 18th century economics of Hume & Adam. The role of money in an economy got further elucidation from other economists such as the Keynesians and the monetarists, among others.

Monetary Policy Rate

Monetary Policy Rate (MPR) is the rate which central banks lend to Deposit Money Banks in performing their duties as lenders of last resort. It is usually set at a level that is consistent with the objective of price stability of central banks. The monetary policy rate is expected to communicate the stance of monetary policy and acts as a guide for all other market interest rates (CBN, 2016). The monetary policy rate is used as a monetary authority policy tool that defines the focal point of a standing facility meant to steer market interest rates. While the upper bound corridor of the monetary policy rate represents monetary authority (CBN) lending rate to deposit money banks, the lower bound corridor represents the deposit rate at which the monetary authority (CBN) accepts deposits from deposit money banks under the Standing Lending Facility (SLF) and Standing Deposit Facility (SDF) of the central bank. In this view, monetary policy directly constrains the ability of banks to make new loans, making credit less available to borrowers who depend on bank financing. Thus, in the credit channel, restrictive monetary policy works not only by raising interest rates, but also by directly restricting bank credit. A decrease in CBR reduces agency costs or may cause banks to relax their lending standards, raising credit risk and thus non-performing loans (Matsuyama, 2007; Dell 'Ariccia & Marquez, 2006).

Cash Reserve Ratio

This regulation requires each commercial bank to maintain minimum cash reserves to customer's deposits and notes. All commercial banks hold some percentage of deposits at the Central Bank of Nigeria. The Central Bank of Nigeria funds are reserves held in a bank's account with its Central Bank (McGraw-Hill, 1951). The underlying principle of cash requirement is to maintain bank from its liquidity, i.e. when losses occur on a bank's loans the amount lost is first covered from profits then from regulatory capital. If these are not sufficient, bank failure and loss of bank deposits can occur. Reserve requirement ratios vary across different types of deposits. If a bank's deposit volume is below the exemption value, the reserve requirement regulation becomes obsolete. Banks required amount of reserves equals to the required reserve ratio times the total deposits in the bank (Case & Fair, 2007).

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

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

Liquidity ratio

Liquidity refers to the speed in the transfer of assets into cash, liquidity ratios primarily focus on the cash flows and it is an indicator to measure a company's ability to meet its short-term liabilities. Liquidity management is achieved through the effective use of assets (Robinson & Victor, 2015). Liquidity management is an important tool for the management of organizations; it reflects the organization's ability to repay short-term liabilities, which include operating expenses and financial expenses resulting within the organization in the short term. As well as

part of long-term debt during the financial year or the operating cycle, whichever is longer? There are many liquidity ratios used by organizations to manage their liquidity such as (current ratio, quick ratio, cash ratio, defensive interval ratio) which can greatly affect the financial performance of companies (Robinson& Victor, 2015). Organizations working for the sake of success in its liquidity management on the ongoing calibration between current assets and current liabilities. Current assets include the receivable accounts, inventory, investments for trading and cash and other.

Mining and quarry sector in Nigeria

Mining is the extraction of mineral occurring naturally such as coal, ores, crude petroleum and natural gas. In view of their significance to the Nigerian economy and peculiarities, the compilation of statistics of petroleum and natural gas (which are coded as division 11 of the ISIC) is discussed separately from that of solid minerals. Mining is one of the oldest economic activities in Nigeria dating back to prehistoric times when man crudely exploited iron and clay, and perhaps other metals, for the production of his cosmetics, crude implements and utensils. The early European explorers, mainly German, Spanish and British, located and mined tin, galena, gold, etc. for export to their home countries. Records show that organised exploration activities in Nigeria commenced in 1903 and 1904 when the Secretary of State for Colonies inaugurated mineral surveys of the Southern and Northern Protectorates respectively. The principal mineral occurrences discovered by the survey teams included lignite deposits at Asaba, lead-zinc ores at several locations, tin and columbite in the south-east, monazite, limestone and lead-zinc ores at Abakaliki district. Others were coal at Enugu, brine springs at Arufu and Awe, Galena in Jos area, iron ore deposits in Niger and Kwara districts and marble deposits in Jakura. Mining activity in controlled form, however, commenced in the country in 1915 with the production of coal at the Enugu mines. Mining and quarrying are the processes of extraction of naturally occurring stone or minerals such as coal, ores, crude petroleum and natural gas from the earth. In Nigeria, solid minerals are discussed separately to that of petroleum and natural gas (coded as division 11 of the ISIC), in view of the latter's significance to the Nigerian economy.

Theoretical Review: Classical Theory of Money

The traditional economic analysis considers the response of monetary policy as exogenous. As explained by this system, money is unbiased in its effects on the economy. Thus, in the classical theory, transmission mechanism reacts directly and indirectly. The direct mechanism is based on the demand for and supply for money, whereas the indirect mechanism has linkage with the banking system and operates through money and interest rate. This is because the Classists described money as a veil. Its impact on the overall economy is neutral and only has effect on the price level. If money supply increases, then interest rate, real income and general level of real economic activities remains unaffected as the price level increases. The nexus between money and the general price level is explained by the quantity theory of money. They affirm that price level determines the supply of money. In an Algebraic form, they contend that MV=PT with MVPT defined as money supply, money velocity, price level and transaction volume or real output respectively. The belief of the classical economists lies in the long-run mechanism where full employment can only be achieved. They affirm that the event of downward rigidity of money wage can result in unemployment. Given the velocity of money and output level, if the Central Bank raises the stock of money, the increase in liquidity as a result of this will automatically increase the demand for goods and services which also raises the general price level. Incentives and more investments will occur if the wage rate diminishes

as price which in turn widens employment and production level towards the full employment. The classical school evolved through concerted efforts and contributions of economists like Jean Baptist Say, Adam Smith, David Ricardo, Pigou and others who shared the same beliefs (Onyeiwu, 2012).

Empirical Review

Ekong and Ekong (2022) empirically investigated the impact of monetary policy shocks on the performance of the industrial sector in Nigeria, and how this affects the general growth performance of the economy in the periods 1980-2018. Monetary policy variables used were money supply (M2t), monetary policy rate (Mprt), Treasury bill rate (Tbrt) and Credit to the private real sector (Credt). We also gauged the system with other control variables like gross fixed capital formation (Gcft), inflation and exchange rate (Exr). Utilizing Vector Autoregression (VAR) and Generalized Method of Moments (GMM), we found that any unanticipated shock on monetary policy rate and money supply growth will produce falling impact on industrial sector output that is consistent with no sign of convergence throughout the period. However, shocks to credit supply and treasury bill rate produces positive growth outliers at different magnitudes in the industrial sector. We also found statistically significant pass-through effect of monetary policy from the industrial sector to the general economy of at least 30 percent growth effect. A number of possible policy menu capable of deepening monetary policy-industrial performance nexus in Nigeria in years following the study have been prescribed in the study including improved stock market development, bond market development and other credit channels that easily linked policy to the private sector for seamless policy transmission.

Siagwu, Utalor and Anaele (2021) analyzed monetary policy and industrial growth in Nigeria with data spanning from 1996-2019. The Statistical Bulletin of the Central Bank of Nigeria (CBN) and World Development Indicators were used to compile the data. Descriptive statistics, Augmented Dickey Fuller (ADF) test, Granger causality, and Ordinary Least Square (OLS) were analytical tool used to test the hypotheses. EViews 9.0 is used as the statistical tool for this study and Log of Industry Sector Gross domestic product (LogINGDP) as the dependent variable, Lending Rate (LR), Deposit interest rate (DPIR) and Money Supply annual growth Rate (M2) as the independent/explanatory variables. The study concludes that lending rate (LR), deposit interest rate (DPIR) and money supply growth rate (M2) as proxies for monetary policy have significant impact on industrial growth of developing countries, Nigeria in particular. That is, monetary policy is an effective means of improving industry growth as well as growth of the economy. The study recommends that Federal Government should review its monetary policies through the Central Bank on its instruments to boost industry sector growth of Nigeria.

Uju and Ugochukwu (2021) adopted manufacturing sector output to examine the effect of monetary policy on industrial growth in Nigeria between 1986 and 2019. Data for the study were collected from the CBN Statistical bulletin, 2019 edition. A multiple regression model was developed and the Ordinary Least Square (OLS) regression technique employed for data analysis. The results showed that Open Market Operation (OMO) measured by Treasury bill rate had positive and significant effect on the Nigerian Manufacturing Domestic Sector Gross Product; Cash Reserve Ratio (CRR) has a positive and significant effect on the Nigerian

Manufacturing Sector Gross Domestic Product; and Monetary Policy Rate (MPR) has a negative and significant effect on the Nigerian Manufacturing Sector Gross Domestic Product. The study concludes that monetary policy is a veritable tool for enhancing industrial sector growth in Nigeria. It was recommended that the monetary authority should ensure a lower MPR that can drive up investment and thus boost growth of the industry.

METHODOLOGY

This study adopted quasi experimental research design. Data for the study was gathered from Central Bank of Nigeria statistical bulletin and World Bank data set. The data gathered were mining and quarry performance output (MQP), Open market operation (OMO), Monetary policy rate (MPR), Cash reserve ratio (CRR) and Liquidity ratio (LR). The method utilized in this study is the Ordinary Least Square (OLS) assessment strategy.

Model Specifications

MQP = f(OMO,MPR, CRR, LR) (1)

Transforming equation 3.1 to 3.2 to econometrics form

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

Where; MQP= mining and quarrying sector performance measured as total output

OMO = Open market operation, CRR = Cash Reserve Ratio

MPR = Monetary policy rate, LR = Liquidity

α_0 = Constant, ε = Error Term

β_1- β_4 = Coefficients of independent variables

In econometrics, broad variety of economic time series is characterized by trending performance which raises an essential question about statistical modeling of variables in the long run. Hence, Unit root test (Augmented Dickey-Fuller (ADF) was carried out, **Test for Co integration or Long-run Relationship (**Johansen). ECM models as applied where necessary to examine relationship,

Table 1: Variables and A-priori Expectations

Variables	Measurement	Notation	Expected Relationship
Mining and quarrying sector performance	Total output of the sector to total gross domestic product	MQP	Dependent variable
Monetary Policy Rate	Percentage	MPR	+
Open market operation	Percentage	OMO	+
Liquidity reserves	Percentage	LR	+
Cash reserve ratio	Percentage		+

Source: Researcher compilation, 2023

ANALYSIS AND DISCUSSION OF FINDINGS

In this section, both expressive and inferential examination results are introduced. The targets and speculations expressed in section one was examined and the discoveries were talked about in like manner. The review was completed to examine the impact of money related approach factors on the presentation of the modern area in Nigeria with information going from year 1987 to 2022. For expressed speculations, the reliant variable was execution of modern area in Nigeria (MQP) and the autonomous factors are open market activities (OMO); monetary policy rate (MPR), liquidity proportion (LR), Cash reserve ratio (CRR).

Table 2: Augmented Dickey-Fuller unit root test result

Variables	ADF- statistics	Prob.	Order of integration
LogMQP	-5.895304	0.0000	stationary at level *I*(1)
LogOMO	-4.465173	0.0011	stationary at level *I*(1)
LogMPR	-6.456728	0.0000	stationary at level *I*(1)
LogCRR	-5.683927	0.0000	Stationary at level *I*(1)
LogLR	-6.520184	0.0000	stationary at level *I*(1)

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

The results on the augmented Dickey-Fuller unit root test as shown in Table 4.1 indicates that the logged variables of mining and quarry sector performance (MQP), Open-market operation (OMO), **monetary policy rate** (MPR), **Cash reserve requirement** (CRR),**liquidity ratio** (LR)with high negative t-statistic coefficients were statistically significant at 1 percent and integrated at first difference. The variables were all integrated and stationary at first difference with probability values of less than 5% level of significance. This result confirms the aptness of granger-causality analysis and the error correction model (ECM) approach test for co-integration of variables.

Granger Causality test

Table 3: Presentation of Causation and Forecasting Test Result

The result of the pair-wise Granger Causality tests between the monetary policy and mining/quarry sector performance in Nigeria are presented in Table 3

Pair wise Granger Causality Tests
Date: 01/20/24 Time: 10:17
Sample: 1987 2022
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
MPR does not Granger Cause OMO	34	0.00461	0.9954
OMO does not Granger Cause MPR		0.00039	0.9996
LR does not Granger Cause OMO	34	2.59006	0.0923
OMO does not Granger Cause LR		5.04049	0.0132
CRR does not Granger Cause OMO	34	0.97437	0.3894
OMO does not Granger Cause CRR		1.39390	0.2642
MQP does not Granger Cause OMO	34	8.89491	0.0010
OMO does not Granger Cause MQP		2.83388	0.0751
LR does not Granger Cause MPR	34	0.23705	0.7905
MPR does not Granger Cause LR		1.60139	0.2189
CRR does not Granger Cause MPR	34	0.01333	0.9868
MPR does not Granger Cause CRR		0.39318	0.6784
MQP does not Granger Cause MPR	34	0.05611	0.9455
MPR does not Granger Cause MQP		0.06622	0.9361
CRR does not Granger Cause LR	34	3.92550	0.0310
LR does not Granger Cause CRR		0.77361	0.4706

MQP does not Granger Cause LR	34	3.92231	0.0311
LR does not Granger Cause MQP		0.73016	0.4905
MQP does not Granger Cause CRR	34	3.93118	0.0309
CRR does not Granger Cause MQP		1.56115	0.2270

(*** = 1%), (** = 5%), denotes significance of coefficient at level respectively

Source: E-view Computation Result

The result of the pair wise Granger causality reported above, it can be seen that; there is no causality running from OMO, MPR, LR and CRR to MQP to because their respective F-statistic (prob.) value of 2.83388 (0.0751), 0.06622 (0.9361), 0.73016 (0.4905) and 1.56115 (0.2270) were all greater than 0.05 level of significance at 95% degree of freedom. However, none of the variable has a causal relationship with dependent variable. Hence, OMO, MPR, LR and CRR shows there is no causality running from any of the monetary policy components to mining/quarry performance in Nigeria. And there is no causality running from any of the monetary policy components to mining/quarry performance in Nigeria. The result of the causation and forecasting test shows that all-time series do not share mutual stochastic trend as there exist no casualty equation judging by their probability value and the ranking order. This therefore implies that OMO, MPR, LR and CRR have no long run causality relationship to mining/quarry performance in Nigeria.

Table 4: Error correction mechanism (ECM) results

Error Correction Estimates
Date: 01/02/24 Time: 18:38
Sample (adjusted): 1990 2022
Included observations: 33 after adjustments
Standard errors in ( )& t-statistics in [ ]

	Coefficient	Std. Error	t-Statistic	Prob.
ECM(1)	0.230500	0.05109	4.51963	0.0000***
OMO (-1))	3.896 737	0.07802	10.1999	0.0000***
MPR (-1))	27.37481	3.30813	8.27500	0.0000***
LR (-1))	28.47162	3.27633	8.69011	0.0000***
CRR (-1))	40.82707	11.4624	3.56182	0.0012***

R-squared	0.451175
Adj. R-squared	0.413695
Sum sq. resids	47413739
S.E. equation	1502.597
F-statistic	156.9416
Log likelihood	-280.7606
Akaike AIC	17.74306
Schwarz SC	18.28725
Mean dependent	412.0737
S.D. dependent	1643.086

Decision Rule: If Fcal>Ftab accept the alternate and reject Null hypothesis. Otherwise accept the null hypothesis. (*** = 1%), (** = 5%), denotes significance of coefficient at level respectively.

Source: E Views computations, (2023)

From the non-mixed result (integrated of order 1(1)) obtained from the stationarity and co integration tests, the ECM is highly recommended for the test of hypothesis. Table 4.3 above shows that the error correction mechanism (ECM) value of (0.230500) with a positive signed with a probability value (p-value) of 0.000, which suggests statistical significance at 1% probability level. The significance of the error correction mechanism (ECM) indicated the velocity of adjustment to the long-run equilibrium after a short-run shock. The coefficient (0.230500) of the ECM shows that about 23% of the discrepancies in the mining and quarry sector performance are corrected in each period. This speed of adjustment is very low, meaning that the adjustment process to restore equilibrium after a disturbance is not steady, thus, and it takes a long period. To find how long it takes for equilibrium to be restored, one (1) is divided by the ECM, i.e. 1/-0.230500= 4.3383. Hence, it will take 4 years and 3 months for the selected monetary policy variables (OMO, MPR, LR, CRR) to correct the changes in mining and quarry sector performance in Nigeria. The goodness of fit of the model as indicated by the R-squared (0.451175) showed that the model fits the data well, the total variation in the observed behavior of in mining and quarry sector performance in Nigeria was jointly explained by the variation in the open market operation, monetary policy rate, liquidity ratio and cash reserve ratio up to 45.1 percent. The overall significance of the model was also tested using the F-statistic of 156.9416. Here, the significance of the F-statistic value did not occur by chance, it actually confirmed that the model fitted the data well, such that the collective effect of open market operation, monetary policy rate, liquidity ratio and cash reserve ratio on mining and quarry sector performance in Nigeria were confirmed statistically significant.

The one period lag of OMO (-1)), MPR (-1)), LR(-1)) and CRR(-1)) showed that last periods increase may cause current years' performance in mining and quarry sector in Nigeria to increase by 3.896737, 27.37481, 28.47162 and 40.82707 respectively. The different and lagged values of the ECM coefficients denote the short-run coefficients of the regression model. Similarly, the increase in OMO (-1)), MPR (-1)), LR(-1)) and CRR(-1)) led to increase in performance in mining and quarry sector in Nigeria.

Conclusion

The review analyzed the impact of monetary policy variables on the performance of mining and quarry sector in Nigeria. The monetary policy variables were proxied by: open market operation, monetary policy rate, cash reserve ratio, liquidity rate. The geological extent of the review is Nigeria; the time scope covered from 1987 to 2022. The study reveals that, OMO, MPR, LR and CRR shows there is no causality running from any of the monetary policy components to mining/quarry performance in Nigeria. And there is no causality running from any of the monetary policy components to mining/quarry performance in Nigeria. The result of the causation and forecasting test shows that all-time series do not share mutual stochastic trend as there exist no casualty equation judging by their probability value and the ranking order. This therefore implies that OMO, MPR, LR and CRR have no long run causality relationship to mining/quarry performance in Nigeria. In conclusion, open market operation,

monetary policy rate, liquidity ratio and cash reserve ratio on mining and quarry sector performance in Nigeria were confirmed statistically significant.

Recommendations

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

1. the authorities should increasingly check the activities of smugglers, illegal miners and legitimate operators who submit false returns, and prosecute culprits accordingly. This will not only instil sanity into the sub-sector, boost Government revenue, but also improve the quality of mining and quarrying performance.
2. The government monetary agencies should encourage the use of open market operation to enhance availability of money in circulation, in order to boost mining and quarrying sector productivity and growth.
3. An expansionary monetary policy that involves a lowering of lending rates is recommended to provide more incentives for miners to invest and increase output. Miners-specific credits should be increased and closely monitored to boost GDP growth rate in Nigeria.
4. Monetary authority in Nigeria should ensure a moderate MPR that can drive up investment and thus boost growth of manufacturing industry. Monetary policy rate measures should be well coordinated, so that the desired behavioral changes in the real sector will be achieved. Policies adopted should be limited to the absorptive capacity of the economy. This will promote and revive manufacturing sector in the country.

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