MONETARY POLICY AND INDUSTRIAL GROWTH IN NIGERIA

VECM APPROAH 1993 -2017

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Abstract

This study examined the effects of monetary policy instruments on the industrial growth in Nigeria between 1993 and 2017 using Vector Error Correction Model (VECM). Specifically, it examined the impact of monetary policy instruments on the manufacturing growth which is one of the components of industrial sector.Secondary data were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletins. Manufacturing Gross Domestic Product (MFGGDP) as proxy for the industrial growth was regressed on Monetary Policy Rate (MPR), Open Market Operation (OMO) and Liquidity Ratio (LR).VECM was used to gauge impulse responses of the exogenous variables on the dependent variable. Philip Perron (PP) tests was used for a robust test of stationarity, Breusch Pagan Test and Godfrey serial correlation were used to test for the normality and serial correlation of the series and Auto regressive distributed lag bound test was used to investigate long run relationship among the variables.The results of the stationarity test revealed that MPR, OMO and LRR are co-integrated of difference order. Breusch pagan test and Godfrey serial correlation revealed that there exists normal distribution of the residuals and that series were free from auto correlation. The ARDL bound test revealed that there is existence of long run relationship among the variables. The VECM coefficients revealed that, MPR of 0.0032 LRR of 0.0016 have positive effect on manufacturing sub sector growth while OMO of -0.0091 has negative effect on manufacturing sub sector growth during the years of review while the error correction mechanism revealed that there is insignificant short run relationship among the variables. From the impulse response and variance decomposition tests, it was revealed that manufacturing sub-sector responded to all monetary policy components (MPR, OMO, LR) especially the monetary policy rate. The study as stated above concluded that monetary policy has insignificant effect on industrial growth in Nigeria. It is recommended that monetary authorities (CBN, FGN, and Minister of Finance) should efficiently implement monetary policy favour manufacturing sub sector especially by lowering the interest rate at which they borrow and favourable exchange rate, so as to stimulate further growth in the sector.
Keywords: Monetary policy, market based instruments, industrial growth, manufacturing

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Introduction

The functional relationship between monetary policy and growth of industries has been a contentious subject in finance literature. The simple reason for this is that there are essentially two schools of thought on this subject. The first line of thought is that which follows Keynes (1936), this forms the Keynesian school while the second thought follows McKinnon (1973) and Shaw (1973), which became McKinnon-Shaw hypothesis. To Keynesians, a discretionary change in money supply permanently influences real output by lowering the rate of interest and through the marginal efficiency of capital, stimulate investment and output growth (Athukorala, 1998; Molho, 1986). The implication of this is that monetary policy is believed to affect industrial growth. In contrast to Keynesian school of thought, McKinnon-Shaw hypothesis, advocating the financial liberalization hypothesis, argued that a market force induced by higher interest rate would enhance more investment by channeling savings to productive investment, thereby stimulating real output growth. This implies that monetary policy does not affect growth of industries. By this, there are conflicting views between the two schools of thought, and this remains an unresolved issue in finance and subsequent studies have not been able to resolve it.

In the last two decades, several studies have been carried out on monetary policy and industrial growth; however, results emanating there-from are mixed: some tailed towards supporting the Keynesian school while others tended to support the Mckinnon-Shaw hypothesis. Essentially, the identified gaps are in three strands.First, previous studies were unable to differentiate between the policy instruments, transmission channels and ultimate targets of monetary policy. Worst still, some of them even employed capital market performance indicators like All-Share Index (ASI), Asset price index (API), Gross fixed capital formation (GDCF) and others adopted inflation rate proxy by consumer price index as one of the components of monetary policy, whereas inflation is one of the ultimate targets of monetary policy and not its component. Studies which have confused policy instruments with transmission channels and ultimate targets of monetary policy include Alam and Waheed, (2006); Amoo, Odey, Kanya, Eboreime, Ekeocha, Akpan, and Ochu, (2014); Owolabi and Adegbite, (2014); Saibu and Nwosa, (2011)

Second, most of the previous studies did not disaggregate economic growth into different sectors, as they examined the impact of monetary policy on the real economic growth which

lacked focused on how disaggregated sectors in Nigeria responded to the monetary policy impulses. These studies include Adigwe, Echekoba and Onyeabo, (2015); Okulegu, Onwe and Okoro, (2013). Although few studies that disaggregated economic growth to different sectors of the economy in Nigeria such as Amoo *et al*, (2014); Owolabi and Adegbite, (2014); Saibu and Nwosa, (2011) mixed up the variables employed to proxy monetary policy. Hence, there is a need to investigate the long-run relationship between monetary policy instruments and disaggregated industrial growth in Nigeria.

Third, to the best of our knowledge, little research attention has been given to the causal relationship between monetary policy instruments and industrial growth in Nigeria. As the industrial sector is regarded as the engine of economic growth, financial sectordevelopment is acknowledged as the lubricant of that engine. Therefore, there is the need to investigate the causal link between market-based monetary policy instruments and the industrial growth of the Nigeria economy. On the basis of the above gap, the study disaggregated industrial sector into three, which is in line with categorization of Central bank of Nigeria Statistical Bulletin (2016) which includes, crude petroleum and Gas, manufacturing and mining sector.

The need to disaggregate industrial sector is necessary so as to treat each sector separately as all sectors can't respond in the same manner to the monetary policy instruments, hence, the response of each to the monetary policy will help the monetary authorities in their policy initiation. As a result of this, manufacturing sector is of interest to the researcher because it serves as a catalyst for economic transformation and industrialization. Not only that, it generate more employment that other sub sectors under industrial sector but of recent, its performance has not be encouraging and it has not been performing its function as a catalyst of growth. Hence there is need to unravel the effect of monetary policy on it so as to know if it has been contributing to its decline or not while market based monetary instruments would be looked into so as to know the impact these instruments have on manufacturing growth in Nigeria for the period under review

Conceptual Review

According to Amoo, *et al,* (2014) monetary policy is defined as a course of action taken by public authorities (Central Banks) to influence the decision of other financial intermediaries in the system (Deposit Banks, Discount Companies and other specialist banks, Insurance Companies etc) in pursuance of certain objectives concerning monetary phenomena which relate to the impact of changes in them and economic activities in general.It is defined by Okonkwo Egbulonu and Mmaduabuchi. (2015) as a major economic stabilization weapon which involves measures designed to regulate and control the volume, cost, availability and direction of money and credit in an economy to achieve some specified macroeconomic objectives. This means it is a deliberate effort by monetary authorities to control the money supply and credit conditions for the purpose of achieving broad economic objectives

Adigwe, *et al* (2015) opined that monetary policy has been in use since the Central Bank of Nigeria (CBN) was saddled with the responsibility of formulating and implementing monetary policies by the Central Bank Act of 1958. This role has facilitated the emergence of active money market where treasury bills, financial instruments used for Open Market Operations and raising debt for government have grown in volume and value, becoming prominent earning assets for investors and source of balancing liquidity in the market. Monetary policy can be expansionary or contractionary depending on the objectives that the monetary authority may want to achieve in a particular year. Expansionary policy increases the total supply of money in the economy more rapidly than usual and contractionary policy expands or shrinks the money supply more slowly than the usual or shrinks. Expansionary policy is traditionally an attempt to combat unemployment in a recession by lowering interest rates in the hope that easy credit will ease businesses into expanding. Contractionary policy is intended to slow inflation in order to avoid the resulting distortion and deterioration of assets in the economy (Central Bank of Nigeria Monetary Series, 2011).

According to Central Bank Monetary Policy Series (2011), monetary policy objectives are classified as intermediate objectives and ultimate objectives. The intermediate objectives or target are between the operating target of monetary policy and ultimate objectives while ultimate objectives are the economic objectives to be achieved or influenced indirectly. Intermediate

objectives or target of monetary policy are money supply, nominal interest rates and aggregate demand while the following are the ultimate objectives to be achieved by monetary authority: attainment of price stability/low level of inflation, favorable balance of payments, satisfactory level of employment or low level of unemployment and rapid economic growth.

Monetary policy instruments can either be market based or direct in nature (Central Bank of Nigeria Monetary Series, 2011; Okonkwo *et al*2015). The market based instruments are used by the monetary authorities to control the total quantity of money available for all purposes and the volume of credit that could be created by banks. Some of the tools are Open Market Operation (OMO), Direct Control of Banks Liquidity e.g Liquidity Ratio and Cash Reserve Ratio and Bank Rate/Rediscounting rate/MPR. The direct or selective tools on the other hand are tools employed to restrict the use of money available for certain specific purposes. Some of the tools are credit ceiling, sectoral allocation of credit, interest rate structure, special deposits and moral suasion.

Concept of Industrial Growth

An industry is the coming together of firms or group of firms producing either identical or similar products (Balami, 2006). It is a group of independent firms which produce identical or similar goods in an economy. A distinguishing feature of the industrial sector is, therefore, production; hence, industrial production. Balami further points out that the industry is concerned with the activities of the people in a firm in relation to wealth. Concentration of industries in the economy tends to create employment opportunities, which in turn reduces poverty and widespread income inequality, and ultimately results in improved economic growth. This accounts for why Rizwan (2015) states that an industry can be described as the production of goods and services within an economy. It also refers to that sector of the economy which is related to manufacturing and production of different products. It can be a major source of revenue to a country. It is the soul of the country and through which the country generates its revenue for the sustenance of its polity.

Industries are very important in a developing country like Nigeria because their marginal revenue product of labour is higher than that of agricultural sector; thus, the releasing of labour force from the agricultural sector to the industrial sector, and increases in the overall revenue and output of the economic growth (Jelilov Enwerem & Isik 2015). Industrial growth is the

continuous increase in the total output from the industrial sector in an economy. So to this extent, the increase in industrial production must be consistently experienced so that it can have a positive effect on GDP growth and translate to economic growth. Factors responsible for the industrial growth, among others, include: sophisticated machinery, technology, skilled labour, research and development and consumer patronage.

Theoretical Framework

The basic theoretical framework for analyzing monetary policy is the traditional Keynesian IS-LM framework. The mechanism is such that changes in monetary policy usually specified as exogenous shifts in monetary aggregates affect the money supply, which changes interest rate to balance the demand with supply. The changes in interest rates then affect investment and consumption which later cause changes in output and eventually prices. This framework has been employed in most empirical studies, such as Saibu and Nwosa(2011); Amoo *et al*, (2014); Alam and Waheed, (2016)

Empirical Review

Alam and Waheed (2006) used a VAR framework to investigate the monetary transmission mechanism in Pakistan at the sectoral level from 1973-2003. Their results confirmed the existence of sector-specific variation to the real effects of monetary policy changes. Particularly, they discovered that manufacturing, construction, finance, insurance, real estate and business services sectors respond more negatively to changes in interest rate when compared to aggregate output. In contrast however, agriculture, forestry and fishing, mining and quarrying, electricity, gas and water were relatively insensitive to interest rate changes. The short term interest rate was used as a measure of monetary policy stance, while the unrestricted VAR was employed in their analysis with three variables for the aggregate economy as well as for each sector; the level of output, the level of prices (represented by the consumer price index), and a monetary policy indicator.

Crawford (2007) investigated the impact of monetary policy shocks on sectoral output in the Australian economy. The study used an open economy SVAR to examine the effects of monetary policy shocks on nine sectors with the following variables to capture monetary policy;

inflation, exchange rate, credit to private sector and lending rate. The impulse response function showed that monetary policy shocks have uneven impact across the different sectors. Result of the impulse response function indicate that following unanticipated monetary shocks, agriculture, forestry and fishing sectors experienced the largest and most rapid decline in output. The forecast error variance decomposition revealed that monetary policy shocks contribute the least to mining output when compared to others. Furthermore, the study portrayed that after three years, agriculture, forestry and fishing sector displayed the greatest shock persistence, while the construction sector was least. The size and timing of contractions in output confirmed that certain sectors were more sensitive to changes in the policy stance of the monetary authority. The construction and manufacturing sectors were more responsive, in terms of the sizeable and quick decline in output, when compared to mining, services and utilities that reacted more slowly.

Lawson and Rees (2008) employed SVAR to examine the effect of unanticipated changes in monetary policy on expenditure and production components of Gross Domestic Product in the Australian economy from 1983 – 2007. Their findings were in consonance with the extant literature indicating heterogeneous response of the components of GDP to monetary policy impulses. Specifically, they found that dwelling investment as well as machinery and equipment investment were the most interest sensitive expenditure components of GDP, while construction and retail trade sectors were the most interest sensitive production components of GDP.

Saibu and Nwosa (2011) study examined the effects of monetary policy on sectoral output growth in Nigeria over the period from 1986 to 2008 using the following explanatory variables to proxy monetary policy, Interest, Exchange Rate, Credit to Private Sector and All Share Price Index. The study utilized an Autoregressive Distributed lag (ARDL) model and the findings showed that the manufacturing sector is not sensitive to any of the monetary policy variables, the agricultural sector is responsive to changes in interest rate only while service and wholesale/retail economic activities are responsive to exchange rate. Furthermore, the interest rate and exchange rate are the major determinants of mining output growth while building/construction sector is more responsive to changes in exchange rate and bank credit. In general, the exchange rate is the most important and influential monetary policy transmission measure in Nigeria.

Akujobi (2012), evaluated the impact of monetary policy instrument on economic development of Nigeria spanning from 1986-2007 using multiple regression technique of method of analysis. Data was sourced from Central Bank of Nigeria Statistical Bulletin. The following variables were employed: gross domestic product as dependent variable, cash reserve ratio, liquidity ratio, interest rate and minimum discounting rate. It was found that treasury bills, minimum rediscount rate and liquidity rate have significant impact on economic development of Nigeria.

Okulegu, *et al* (2013) examined the extent of monetary policy instruments impact on economic growth in Nigeria and ascertain the extent long-run of equilibrium relationship may exist between monetary policy instruments and economic growth in Nigeria. The empirical analyses that were carried out to achieve the objectives mentioned above include the econometric tests such as unit root, co-integration, error correction model and Granger causality test. The changes in GDP was regressed on money supply, interest rate, exchange rate and credit to economy using annual series data for the period 1980-2009 sourced from CBN Statistical Bulletin. The results of the analyses showed that monetary policy instruments significantly influence the rate of growth of Nigeria economy. The study also found out that long-run relationship exists between monetary policy instruments and economic growth in Nigeria.

Edoumiekumo, Karimo and Amaegberi (2013) evaluated the responsiveness of the real sector output to monetary policy shocks in Nigeria through the use of the VAR model and the following explanatory variables to proxy monetary policy; monetary policy rate , interest rate and credit to Private Sector. The study found that the private sector credit had faster effect on output. The real GDP was observed to have a higher response rate to Monetary Policy Rate (MPR) and CPI shocks, and own innovations in the long-run. Furthermore, the study showed that while interest rate, MPR were direct and instantaneous on the real sector, they did so indirectly via the investment and credit channels.

Baghebo and Ebibai (2014) examined the impact of monetary policy on economic growth in Nigeria from 1980-2011 using ordinary least square method of analysis. Data were sourced from Central Bank of Nigeria Statistical Bulletin while variables employed were gross domestic product, liquidity ratio, money supply and cash ratio. It was revealed that M_2 in the current period stratifies apriori expectation but negate apriori expectation in the one lag period. Cash

Reserve in the current period is positive and statistically insignificant. Liquidity ratio is negative at current period but statistically insignificant which contradicts apriori expectation in the current period and the reason for this by the study is that the Central Bank in an attempt to control the volume of money in circulation as a measures of controlling inflation introduced contractionary monetary policies which reduced M^2 and, hence, negatively impacted on GDP.

Owolabi and Adegbite (2014) empirically examined the impact of monetary policy on industrial growth in the Nigerian economy. Secondary data were obtained from the Central Bank of Nigeria Statistical Bulletin covering the period from 1970 to 2010. Multiple regressions were employed to analyze data on variables such as manufacturing output, treasury bills, deposit and lending and rediscount rate for Nigeria over the period 1970 to 2010. The variables were all discovered to have significant relationship with the industrial growth. It was further revealed that, rediscount rate and deposit have significant positive effect on industrial output but treasury bills have negative impact on industrial output.

Amoo, *et al*(2014) investigated the effect of monetary policy on different components of real output by employing the structural vector autoregressive (SVAR) framework. The study used a suite of policy instruments such as money supply, nominal exchange rate, interbank call rate and monetary policy rate with non-policy such as consumer price index and macroeconomic variables based on quarterly data spanning the period between 1993 and 2012. A six variable SVAR for aggregate output (baseline model) and a seven-variable SVAR for the disaggregated output components were estimated. Inter alia, the study noted that sectoral output responded heterogeneously following contrationary monetary policy shocks, with some immediately responding negatively (services and wholesale/retail sectors), while others displayed lagged negative responses (manufacturing, building and construction, and agriculture). These findings are consistent with economic theory, as output in each sector is expected to decline following monetary tightening. The results of the forecast error variance decomposition show that the most important monetary policy variables that explain the variation in sectorial output are interbank call rate and money supply. Innovations from the monetary policy rate and exchange rate do not significantly explain the variations in output.

Nandini (2014) examined sectoral effect of monetary policy in India using a Vector Auto-Regression model. The study revealed that the impact of a monetary policy shock at the sectoral level is heterogeneous with manufacturing being the most responsive. The sectors such as Manufacturing, Mining and Quarrying, Construction and Trade are the fastest to respond. The study emphasized that differential sectoral effects depend upon factors such as capital intensity, interest sensitivity, export-orientation, production planning strategies among others. The sectors also differ in terms of the most effective channel of monetary transmission. The interest rate channel has emerged as the most efficient channel of the monetary policy transmission in most of the sectors followed by the credit channel.

Sulaiman and Migiro (2014) evaluated the link between monetary policy and economic growth in Nigeria using a time series data from 1981 to 2012 employing Granger causality as well as Johansen test for co-integration. The monetary variables used were cash reserve ratio, monetary policy rate, exchange rate, money supply and interest rate while gross domestic product was used as a proxy for economic growth in Nigeria. Using the Johansen test for co-integration, the study found out that a long run relationship exists between the monetary variables and economic growth in Nigeria. On the other hand, the test for causality indicates that monetary policy showed a significant influence on economic growth and that economic growth does not influence monetary policy significantly. The study concluded that monetary policy transmission mechanisms contribute positively to the productivity and growth of the Nigerian economy. However, this study would have used other techniques of estimation such as the SVAR to show how the Nigerian economy responds to shocks in monetary transmission mechanisms.

Adigwe, *et al* (2015) examined the impact of monetary policy on the Nigerian economy. Secondary data were sourced from CBN Statistical Bulletin. Descriptive and the Ordinary Least Square Method (OLS) were used to analyze the data between 1980 and 2010. In demonstration, two multiple regression models were used by the study. In model1, the Liquidity ratios, Money Supply, Cash reserve ratios were the independent variables while Gross Domestic Product (GDP) is the dependent variable. In model 2, the Liquidity ratio, Money Supply, Cash ratio, Interest Rate and Exchange rate are the independent variables while Inflation rate was the dependent variable. The study found out that liquidity ratio and cash reserve have direct although insignificant positive impact on growth while money supply exerts a significant positive impact

on growth. In other words, Liquidity ratio and cash reserve were statistically insignificant and have no significant impact on growth while money supply has a significant relationship with economic growth in Nigeria during the period under review. On model 2, the result showed that explanatory variables have negative impact on inflation.

Methodology

Secondary data were sourced from CBN Statistical Bulletin covering a temporal period from 1993 to 2017 which is a period of 25years. In measuring their proxies industry was proxied by the manufacturing GDP which is the one of the sub-sectors of the industrial sector while monetary policy was proxied by market based instruments such as monetary policy rate (MPR), Open Market Operation (OMO) and liquidity ratio (LR). The study employed Vector Error Correction Mechanism (VECM), ARDL bound test was used to test for long run relationship while Philip perron test and Breusch pagan test were used for preliminary tests

Model Specification

The study adapted Akujoibi (2012) model with little modification. The model is stated thus;

$RGDP_t = \beta_o + LR_t + CRR_t + INT_t + MRR_t + \mu_t$………………………………..1

Therefore, to adapt this model, the mode was restructured to incorporate some other market based monetary policy variables like OMO and MPR and replacing RGDP by manufacturing GDP while INT and CRR were dropped from the model. The new model for the study is therefore stated in functional form below;

$MFGGDP = f(MPR, OMO, LR)$ …………………………………………………….2

To state the model in an explicit form, the new model is stated thus;

$MFGGDP_t = \alpha o + \alpha_1 MPR_t + \alpha_2 OMO_t + \alpha_3 LR_t + \mu_t$...3

In order to bring all the variables into the same parenthesis, logarithm will be introduced and the new model is stated thus;

$LMFGGDP_t = \alpha_o + \alpha_1 MPR_t + \alpha_2 LOMO_t + \alpha_3 LR_t + \mu_t$………………………………………4

In this study, the modify model for industry using vector auto regression model is stated below;

$Mfgdp_t = \lambda_1 + \alpha_{11}\sum Mfggdp_{t-1} + \alpha_{12}\sum Mpr_{t-1} + \alpha_{13}\sum Omo_{t-1} + \alpha_{14}\sum Lr_{t-1} + \varepsilon_1$…………5

$Mpr_t = \lambda_2 + \alpha_{21}\sum Mfggdp_{t-1} + \alpha_{22}\sum Mpr_{t-1} + \alpha_{23}\sum Omo_{t-1} + \alpha_{24}\sum Lr_{t-1} + \varepsilon_1$ …………6

$Omo_t = \lambda_3 + \alpha_{31}\sum Mfggdp_{t-1} + \alpha_{32}\sum Mpr_{t-1} + \alpha_{33}\sum Omo_{t-1} + \alpha_{34}\sum Lr_{t-1} + \varepsilon_1$ ……………7

$Lr_t = \lambda_4 + \alpha_{41}\sum Mfggdp_{t-1} + \alpha_{42}\sum Mpr_{t-1} + \alpha_{43}\sum Omo_{t-1} + \alpha_{44}\sum Lr_{t-1} + \varepsilon_1$ ………………8

Where; L=Logarithm, $MFGGDP_t$ = Manufacturing gross domestic product, MPR =Monetary Policy Rate, OMO = Open Market Operation, LR = Liquidity Ratio, α_o = Stochastic Error term, μ_t =Error term, $\alpha_1, \alpha_2, \alpha_3$ …… parameters or coefficients of the exogenous variables

Analysis of Phillip Perron Unit Root Result

The study employed Phillip Perron test to for check the order of integration of the variables. The summary of the results is therefore reported in Table 1.

Table 1: Results of Philip Perron Stationary Test

Variable	ADJ-T STAT	Critical Value	DW	Lag	Difference
LMFGG	**-1.6917**	**-2.998**	**0.9779**	**2**	**I(0)**
LMFGG	-5.0023	-3.0048	0.9218	2	I(1)
MPR	-4.0908	-2.998	1.5663	2	I(0)
LOMO	-5.282	-29980	1.9391	2	I(0)
LRR	-2.4603	-2.998	1.7732	2	I(0)
LRR	-5.2111	-3.0048	1.7659	2	I(1)

Source: Author's Computation from Eviews 9, 2018

The results revealed that, Open Market Operation (OMO) and Monetary Policy Rate (MPR) became stationary at level l(0), while the Manufacturing Sector Output and Liquidity Ratio(LRR) became stationary at first difference l(1) when the t-statistic in the results is compared with the critical value at 5% level of significance. This indicates that, series at level and at first difference have no unit root. Based on the findings, the study accepts the alternate hypothesis which says that, series have no unit root and rejects the null hypothesis

Breusch Pagan for Heteroskcedacity Test

The decision rule under Breusch pagan test states that if p_val < 0.05 you reject the null and infer the presence of heteroskedasticity and if p_val > 0.05 (or your chosen alpha value); you fail to reject the null and conclude there may not be heteroskedasticity.

Table 2: Summary of Heteroskcedacity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.927755	Prob. F(5,17)	0.4873
Obs*R-squared	4.930584	Prob. Chi-Square(5)	0.4244
Scaled explained SS	3.055247	Prob. Chi-Square(5)	0.6915

Source: Author's Computation from Eviews 9, 2018

From the summary of table 2, F-statistic of 0.9277 with the p-value of 0.4873showed that, series were normally distributed and has no conditional heteroskcedacity in the distribution of residual. The study therefore, accepts the null hypothesis that the series are free from presence of heteroskcedacity. Meaning, the series has a constant variance. The results indicated that monetary policy significantly associated with industrial growth proxied bymanufacturing sector GDP in Nigeria.

Auto Regressive Distributed Lag Bound Testing for Co-integration

From the stationary test conducted, it was revealed that, variables in the model were integrated of different orders. This lends support for the implementation of bounds testing. In doing this, the study carried out some steps in selecting a lag order on the basis of Schwartz Information Criterion (SIC), because computation of F-statistic for co-integration is very much sensitive to lag length. Thus, the lag order of 1 was selected on the lowest value of SIC. Given the need to test for the existence of a long-run relationship, the study also used the ARDL co-integration method to estimate the parameters of the ARDL equation with a maximum order of 1 to minimize the loss of degrees of freedom.

Table 3: Summary of the ARDL Bound Testing

Test Statistic	Value	K
F-statistic	5.797563	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.50%	3.69	4.89

Source: Author's Computation from Eviews 9, 2018

The results of bound testing approach for long-run relationship showed that the F-statistics of the variable (5.97) was greater than the critical value at lower bound (3.23) and upper bound (4.35). This implies that, the null hypothesis of no co-integration cannot be accepted. In effect, there is indeed a co-integration relationship among the variables at 5% level of significance. The study therefore, concluded that series move together in a long-run and has a long-run relationship.

VAR Lag Order Selection

Considering the limited length of the data series, maximum length lag of 1 was permitted in the selection of the optimum lag length to be used in the estimation of the VAR model as shown on Table 4.

Table 4: Summary of Lag order selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-312.9978	NA	38521236	28.81798	29.01635	28.86471
1	-232.6661	124.1490*	114742.7	22.96964	23.96150*	23.20330
2	-213.6034	22.52857	103067.4*	22.69122*	24.47656	23.11180*

Source: Author Computation from Eviews 9, 2018

The Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQ) and the Schwartz Information Criterion (SIC) were employed for the VAR lag order selection. The optimum lag order of 1 was suggested by SIC that the selection criteria satisfy the stability condition

Vector Error Correction Model (VECM)Results

Vector Error Correction Model (VECM) was employed as an estimation technique in this study.

The results of the VECM and Wald test are displayed in table 5.

Table 5:Summary of VECM

Variables	Coefficients	Standard error	T-statistics
ECM	0.0984	-0.0851	1.156
MPR	0.03754	0.0058	6.452
OMO	-0.1574	0.0275	-5.7139
LRR	-0.0317	0.0029	-10.671
		Chi= 3.14	Prob=0.3694

Source: Author's Computation from Eviews 9, 2018

The analysis revealed that, the speed of adjustment ordisequilibrium among the series in a short run was not rightly signed, and it is insignificant, as the probability of 0.3694 was found to be higher than 0.05 i.e 5% level of significant. This implies that, there is no short run relationship among the variables in the series and that, long-run disequilibrium will be difficult to attain

VECM with Other Explanatory Variables

In relation with other variables, results is presented in Table 6

Table 6: Manufacturing Growth as Dependent Variable

VARIABLES	Coefficients	S.E	T-STAT	Prob
MFGGDP	0.2913	0.1882	1.5478	0.1295
MPR	0.0032	0.0048	0.6673	0.5084
OMO	-0.0091	0.0086	-1.0593	0.2958
LR	0.0016	0.0012	1.2534	0.2173
R2= 65.51%	F-STAT=2.11			

Source: Author's Computation from Eviews 9, 2018

It showed that manufacturing growth in Nigeria is influenced by the dictates of manufacturing sectors on itself, Monetary Policy Rate, Open Market Operation and Liquidity Rate. This is due to the fact that, at lag 1, manufacturing growth has a positive innovation on itself by 0.2913, Monetary Policy Rate has a positive innovation on manufacturing growth by 0.0032, and liquidity rate has a positive innovation of 0.0016 while OMO has a negative innovation of -0.0091 on the manufacturing growth in Nigeria. The implication of this is that, a unit increase in own innovation, monetary policy rate and liquidity ratio will bring about an increase in the growth of the manufacturing sector industry while a unit increase in open market operation will bring about a reduction in the manufacturing growth. However, the associated probability revealed that all these market based monetary policy instruments employed have insignificant influence on the manufacturing growth in Nigeria as their p-value are greater than 0.05. The R^2 also showed that, the explanatory variables explained 65.51% variations in manufacturing growth and F-stat is 2.11 which is lesser than the tabulated F-statistics of 3.03.

Impulse Response Function Analysis

The result of the impulse response is presented in Table 7.

Table 7: Summary of the Impulse Response of one S.D Innovations of LMFGGDP

Response of DLMFGGDP:				
Period	DLMFGGDP	MPR	LOMO	DLRR
1	0.041304	0.000000	0.000000	0.000000
2	0.069390	-0.010355	-0.014233	0.012807
3	0.076709	-0.020226	-0.021742	-0.000263
4	0.092022	-0.037863	-0.007883	-0.008626
5	0.097509	-0.063565	-0.016929	-0.019131
6	0.128604	-0.074623	-0.022958	-0.015482
7	0.144483	-0.08521	-0.02357	-0.021005
8	0.167265	-0.102121	-0.033707	-0.022183
9	0.183154	-0.114728	-0.031065	-0.028994
10	0.199339	-0.135157	-0.036779	-0.035818

Source: Author's Computation from Eviews 9, 2018

it is obtainable that, in the first year, MFGGDP responded to shocks from only its own innovation and it records 0.041, while no shocks was recorded from other endogenous variables as they all recorded 0.00000. In the second year, MFGGDP reacted to monetary policy variables impulses at 0.069. In same second year, it was revealed that MPR and OMOtransmitted negative shocks to manufacturing GDP with their respective values (0.01035) and (-0.01423) while LRR transmitted a positive shocks of 0.01280 to MFGGDP. In the third year, MFGGDP responded positively to its innovation by 0.0767; however, shocks from other endogenous variables were negative. It was also revealed from the study that, MFGGDP was constantly having an increase in its own innovation till the end of the 10 years and at the same time, other endogenous variables also exhibited negative shocks throughout the period of 10 years.

This implies that, manufacturing gross domestic product is impacted by the action and decision of monetary policy authorities. Monetary policy rate is the baseline rate that affects all other rates and if this is high, all other interest rates would be high; and if it is low, all other interest rates would be low. This study actually revealed that, manufacturing sector responded to monetary policy innovation during the year under review. Meaning, innovation from MFGGDP impacted

more on the MFGGDP however, despite the fact that innovations from other endogenous variables exhibit insignificant negative effect on MFGGDP, this dependent variable did not respond to them.

In line with Era-Dabla and Holger (2006), the monetary policy variable which accounted for the largest proportion of the variation in each manufacturing sector GDP, was taken as the most significant instrument through which monetary policy decision affects manufacturing sector in Nigeria. Therefore, the results from the variance decomposition estimates generated from the restricted Vector Auto-Regression (VAR) models for forecast horizon of first ten years revealed that, shocks from monetary policy rate, open market operation explained the largest variation in manufacturing sector GDP.

Table 4.1.14: Summary of Variance Decomposition Error of LMFGGDP

Variance Decomposition of DLMFGGDP:					
Period	S.E.	DLMFGGDP	MPR	LOMO	DLRR
1	0.041304	100.0000	0.000000	0.000000	0.000000
2	0.083636	93.22629	1.532976	2.896033	2.344703
3	0.117307	90.14815	3.752107	4.907400	1.192344
4	0.154270	87.70596	8.193312	3.098646	1.002078
5	0.194937	79.95024	15.76413	2.694869	1.590758
6	0.246728	77.07704	18.98812	2.548080	1.386761
7	0.300012	75.32241	20.90897	2.340538	1.428079
8	0.360613	73.64804	22.49147	2.493648	1.366839
9	0.422558	72.42496	23.75218	2.356593	1.466268
10	0.489075	70.67664	25.36776	2.324701	1.630900

Source: Author's Computation from Eviews 9, 2018

From the Table 8, it can be obtained that, in the first year, variation in the manufacturing sector GDP was explained by its own innovation recording 100%;however, no shocks was recorded from other endogenous variables, as it can be seen from the table. In the second year, variation of 93.22 in MFGGDP was explained by shocks from open market operation, recording highest shocks to MFGGDP at 2.89 followed by liquidity ratio with 2.34 while monetary policy rate recorded 1.53. In the fourth year, the variation in MFGGDP was 87.70 while shocks from monetary policy rate recorded highest variation in MFGGDP by 8.19, open market operation recorded 3.09 and liquidity ratio recorded 1.00. The sixth to tenth year showed the same trend as

monetary policy continued to have higher shocks than other variables employed, while variations in MFGGDP continue to have a downward trend from 77.07, in the sixth year to 70.67 in the tenth year.

The implication of this is that, monetary policy rate accounted for the largest variation in industrial growth while open market operation accounted for the second largest variation and LRR accounted for the least variation among the variables in the series. This result supported the hypothesis which states that monetary policy rate plays a significant role in transmitting monetary policy impulses to the manufacturing sector. This implies that when monetary policy rate is increased, it affects the borrowing ability of firms in the manufacturing sector both at the capital market and money markets as it influences all the rates in the economy

Discussion of Findings

This study was ventured into as many studies on monetary policy concentrated on the impact of monetary policy on the aggregate economy without looking at the effects of it on the sub-sectors of the economy. More importantly, variables were mixed; several studies used variables that were not within the control of monetary authorities to measure monetary policy. Some were unable to differentiate between monetary policy transmission channels variable and ultimate targets. However, several studies from developed and developing countries revealed empirical evidences that, economic sectors responded heterogeneously to the monetary policyand to ascertain the response of manufacturing sector to monetary policy instruments, this has to be test runfrom the Nigeria perspective. The reason being that, the manufacturing growth since the introduction of structural adjustment programme, has been on reverse gear, and despite all the government policies, the growth continue to decline further

However, from the results emanating from the empirical analysis of this study, it was discovered that market basedmonetary policy instruments have positive effects on the growth of manufacturing sector as a result of the overriding effect of monetary policy rate and liquidity ratio. It was also revealed that the variables moved together in a long run. This position was supported by studies including those of Okulegwu,*et al*(2013), Edoumiekumo, e*t al*(2013) and Sulaiman and Migiro (2014) as they all found that long-run relationship between monetary policy and economic growth. The only point of difference was that, these studies looked at

economy growthin aggregate while this study concentrated at industrial growth. Sulaiman and Migiro (2014) also found that, monetary policy has positive impact on economic growth although, the study employed Johansen co-integration and Causality tests. In addition, Akujobi (2012) found that there is significant positive impact of monetary policy instruments such as cash reserve rate, liquidity ratio, interest rate and minimum rediscounting rate on economic growth, though the study employed regression analysis as the estimation technique. In the same manner, empirical findings from Edoumiekumo *et al*. (2013) revealed that, there is positive significant effect of monetary policy on the economic growth and that GDP responded very well to the monetary policy rate.

The findings of Owolabi and Adegbite were not left out as they were also at tune with the findings of this work. The said study found that rediscounting rate, which was replaced by monetary policy rate, has significant impact on industrial growth in Nigeria. Unfortunately, it negates the findings of Rami and Bassam (2017) which pointed that rediscounting rate has an inverse relationship with economic growth, although, the spatial scope of that study was Jordan and not Nigeria. Baghebo and Edibau(2014) also found that liquidity ratio has negative and insignificant effect on economic growth. This position negates the findings of this study which revealed that liquidity ratio has positive effect on manufacturing growth in Nigeria, though; the reason given was that this may have been as a result of contractionary measure of the Central Bank of Nigeria.

The findings of this study also supported findings of Adigwe *et al*.(2015), the study found that liquidity ratio as one of the variables of monetary policy instruments has positive insignificant impact on economic growth in Nigeria. Nevertheless, the findings of this study are at variance with those of Saibu and Nwosa (2011) and Amoo *et al* (2014) which found that manufacturing sector is not sensitive to any monetary variables such as monetary policy interest, exchange rate and credit to private sector despite the fact that the same estimation techniques were employed by those studies and this study

In sum, the findings of this study are in line with those of the studies that have established the fact that, market-basedmonetary policy instruments in Nigeria have positive effect on the manufacturing sector growth. However, decline in the growth of the manufacturing sector in Nigeria may have been as a result of other factors other than the monetary policy instruments, as

the policy, through its instruments, have contributed positively, though insignificantly to manufacturing sector growth in Nigeria except foropen market operation which was found to exert insignificant negative effect on the growth of manufacturing sector in Nigeria.Theseobservations are in line with those of, Adigwe, *et al,* (2015) Okulegu, *et al* (2013), Amoo,*et al (*2014).

The empirical findings of this study have been able to put to rest the long conflict between Keynesian school and McKinnon-Shaw school of thoughts. The findings portrayed that, there is a relationship between monetary policy and industrial growth and that, this occur by altering the interest rate to spur increase in investment and consequently, growth. It shows that, altering the monetary policy instruments such as monetary policy rate, liquidity ratio and open market operation, help in achieving growth in the industrial sector thereby supporting Keynesian school of thought. Furthermore, the market forces explained by McKinnon-Shaw hypothesis can only be achieved in a country with a developed financial market. Hence, monetary policy is necessary for the industrial growth as shown by the empirical findings of this study.

Conclusion and Recommendations

Arising from the findings of this study, it was concluded that,there is insignificant effect of monetary policy on the industrial growth in Nigeria. Although the variables employed exhibited different effects; monetary policy rate and liquidity ratio insignificantly affected manufacturing sector growth positively while open market operation affected manufacturing growth negatively. It was recommended that:

i.   Efficient implementation of monetary policy that will incorporate the interest of the Nigeria industrial sector especially the manufacturing sub-sector is necessary so as stimulate growth in the sector.

ii.   ii. More importantly, availability of cash or credit is necessary for the industrial production; therefore, more of money market assets should be introduced to enable the manufacturing sector of the economy raise more short term loan for working capital

iii.   The monetary policy which is the baseline rate should be made flexible enough to encourage more borrowing by the real sector of the economy, especially the manufacturing sector, which is acknowledged to be the engine of growth in a nation.

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