ASECU South-Eastern Europe Journal of Economics 2 (2016) 159-174 SEEJE

MONETARY POLICY AND MANUFACTURING CAPACITY UTILIZATION: FURTHER EVIDENCE FROM NIGERIA

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Abstract
This study investigates the nexus between monetary policy and manufacturing capacity utilization in Nigeria for the 1980-2014 period, using an error-correction modelling approach. The results reveal that both current and past values of lending rate adversely affect manufacturing performance, but manufacturing responds positively to the current period's banking credit, confirming that policy to enhance access to funds can stimulate investment in manufacturing sub-sector in Nigeria. Real exchange rate shows mixed performance; the current exchange rate has a negative but insignificant effect, whereas the impact of the one-period lagged value was positive and significant at 5%. Broad money supply positively and significantly influences manufacturing. The error-correction term is significant and correctly signed. Further, the variance decomposition shows shock in monetary policy phenomena, explains relatively significant variations in manufacturing performance. This study recommends that monetary authorities should implement policies in line with the structure of the economy to enhance contribution of manufacturing sector to overall economic growth. Effort should be made to enhance the flow of credit to the economy, while adopting effective exchange rate management in a stable macroeconomic environment to boost industrial production.

JEL Classification: E43, E52, L60
Keywords: Monetary Policy, Capacity Utilization, Nigeria

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1. Introduction

In developing countries, the importance attached to the manufacturing sub-sector lies in the perceived close association that exists between manufacturing and growth in real per capita income. This is summed up in the maxim commonly held by researchers in economics and policy makers alike, that the manufacturing sector could be a remarkable catalyst and engine to attaining a non-declining economic growth trajectory (Kaldor, 1957). Some development theorists have shown using time-series and cross-country data that countries with relatively large industrial sector tend to record faster growth and poverty reduction (see Perkins, Radelet and Lindauer, 2006). Thus, the role of the manufacturing sector in electrifying economic progress cannot be overemphasised, and, hence, efforts to boost the sector are often taken seriously by most planners in global economies.

Lately, such perceptions have been corroborated by economic success-stories among countries of East and South-East Asia that tremendously benefited from policies that actively promoted the efficiency of manufacturing enterprises (Timmer and de-Vries, 2008; Lall and Uratu, 2013). Manufacturing activities and production for export is still very limited in most sub-Saharan Africa (SSA) countries, which brings to focus the need for governments of respective countries in the region to design and implement policies that encourages local entrepreneurs to take advantage of their large domestic markets, while also looking to capture a reasonable share of world market.

Nigeria ranks amongst the top producers of natural gas, crude oil, cocoa and many other commodities in Africa, but the nation's manufacturing industries are not producing optimally, despite measures and steps taken by successive governments, both at the State and Federal levels. For instance, the manufacturing capacity utilisation in the 1970s was as high as 78.7%, but declined as low as 43.8% in the 1980s. Between 2000 and 2010, it fluctuated between 36.1% and 55.5% (Obadan and Edo, 2004; CBN, 2010). The sub-optimal utilisation of installed capacity by players in the manufacturing sector has been largely blamed on ease to assess credit facilities, and also due to prevalence of high interest rate, thus affecting the importation of critical raw materials (Mike, 2010). Hence, an understanding of how monetary policy affects the manufacturing sector in Nigeria becomes imperative. The motivation for this paper emanate from findings reported in some influential studies that the impact of monetary policy on output growth is stronger than fiscal policy (Gramlich 1971; Carlson 1978; Saqib and Yesmin 1987; Upadhyaya 1991; Jayaraman 2002; Adefeso and Obolaji 2010).

This study is aware that several factors affect manufacturing activities in Nigeria as documented in extant studies, and these are policy reversals, unguided trade policies, poor institutional infrastructure, reliance on oil for fiscal sustenance, financial risks, amongst others, but the core focus of this paper is to ascertain the extent to which monetary policy influence manufacturing sector. More so, the study also seeks to identify the most effective monetary policy tool that, if properly administered, would prop-up the performance of the manufacturing sector in the country. This is so because the manufacturing sector is expected to become dominant as the economy transforms from agriculture-based to modern sector-based, driven by industrial production as reflected in the nation's industrialisation drive. Nigeria expects the share of non-hydrocarbon production led by manufacturing to provide over 25% of the forecast national output of US$900 billion by end-2020.

Hence, given the importance of high capacity utilisation in the manufacturing sector to boosting economic growth and welfare, it is necessary to evaluate how the current monetary policy stance affects Nigeria's manufacturing performance. To achieve this objective, this paper is structured into five sections. Following this introduction, section 2 contains review of related literature. Section 3 presents the methodology for the paper, while data analysis and discussion of empirical results are discussed in section 4. Section 5 concludes the paper with some policy recommendations.

2. Literature Review

The term capacity utilisation is often used to describe the extent to which firms use the installed productive capacity of their plants and machineries during the creation of utilities. In essence, it represents the fraction of installed capacity or output that a firm actually produces from its potential output level, in line with prevailing economic fundamentals. Thus, for a firm, capacity utilisation is defined as the firm's optimal output relative to its capacity output (Kim, 1999). Hence, an economic measure of capacity output is characterised by the steady state or long run level of output, given the existing levels of capital and exogenous input prices.

Monetary policy, on the other hand, is a complex process that involves measures designed to regulate and control the volume, cost and availability of money and credit within an economy in order to achieve some specified macroeconomic policy objectives, such as full employment and steady growth in output (Anyanwu, 1993). Similarly, Epstein and Heintz, (2006) maintain that monetary authorities can effectively use monetary policy tools to influence real economic outcomes, like raising employment opportunities, investment and inclusive growth.

In designing monetary policy, the Central Bank of Nigeria (CBN) reviews developments in the global and domestic economic environments over a period of time, and adopts monetary policy strategy in line with expected macroeconomic outcomes. However, the goals of monetary policy have remained broadly the same over the years. These include attainment of price stability, sound financial system, balance of payments equilibrium, as well as improvement in economic growth trajectories. To attain the goal of price stability, monetary authorities may have to trade-off achieving full-employment objectives (Mortensen, 1970).

Interestingly, the World Bank, (2002) hinted that the existence of high interest rate in the Nigerian financial system, coupled with extremely insufficient infrastructural facilities and poor institutional framework, would make the Nigerian economy frightfully open to vagaries in global economic environment. The financial sector becomes the primary conduit through which monetary policy affects real economic outcomes, since monetary policy determines the resources available to financial institutions for onward lending to the deficit economic units. To this extent, monetary policy stance by authorities provides a benchmark for other interest rates in the economy, including the lending rate, and thus, becomes a key factor that could influence the level of capacity utilisation in industries.

There is no doubt that inefficiency in the financial system can negatively distort manufacturing sector activities, which could lead to reduction in capacity utilisation. In this regard, Ukoha (2000) investigated the determinants of capacity utilisation in the Nigerian manufacturing industry for the period 1970 to 1998. The study finds manufacturing capacity utilisation to be positively influenced by exchange rate, Federal Government capital expenditure and real per capita income.

Ehinomen and Oladipo, (2012) examined the nexus between exchange rate management and manufacturing sector performance in the Nigerian economy, and their study suggests that exchange rate appreciation, gross domestic product (GDP) and inflation are significant determinants of manufacturing sector productivity. Mojekwu and Iwuji, (2012) findings reveal, amongst others, that adequate power supply enhances capacity utilisation, while inflation and interest rate spread have adverse effect on capacity utilisation. Study by Usman and Adeyemi (2012) shows that the negative effect of interest rate on capacity utilisation is robust to other interest rate variants. In this regard, Obamuyi (2009) postulated that investment-friendly interest rate policies should be formulated and properly implemented to promote economic growth. Gajanan and Malhotra (2007) find that variation in demand leads to variation in capacity utilisation in four selected industries in India. Adenikinju (2008) listed tariffs, poor infrastructure, weak institutions and policy inconsistency among plethora of factors that constrain manufacturing performance in Nigeria. Lending rate was observed to have no significant impact on manufacturing performance in Nigeria, suggesting that players in the productive/real sector respond more to policies that ease credit availability, rather than, cost of funds.

Obadan, (1998) and Edo (2002) in their analysis of the situation of the Nigerian manufacturing sector, opined that capacity utilisation is an important issue that must be properly addressed due to improper export and production structure. Both authors blamed the current situation of low depth of manufacturing on over-dependence on natural resources, low value-added production due to high import-dependence for critical production inputs, as well as prevalence of unviable state-owned enterprises. In sum, Obadan, (1998) hinted that the issue of low, and sometimes dwindling capacity utilisation in Nigeria, is among crucial issues that must be addressed if the quest to be among the top 20 global economies by 2020 is to be achieved.

3. Theoretical Framework and Model Specification

3.1 Theoretical Framework

The theoretical framework for this study is derived from the standard neoclassical theory as put forward by Kydland and Prescott, (1982) and Prescott, (1986). In their formulation, they emphasised the importance of technological shocks for the behaviour of real variables, such as output, consumption, investment and employment. However, there are extensions to that formulation: Greenwood, Hercowitz and Huffman, (1998) employed endogenous capacity utilisation; Cooley and Hansen, (1989) provided a role for money, allowing money supply to respond to the state of the economy in line with model developed by Garvin and Kydland, (1985). Accordingly, as summarised by Finn, (1996), it was assumed that the manufacturing sector produces output from labour and capital services, as indicated in *Equation 1.*

$$Y_t = f(W_t L_t \,,\; K_t U_t) = (W_t L_t)^{\delta} (K_t U_t)^{1-\delta}; \quad 0 > \delta < 1 \tag{1}$$

Where:
Y is output of goods produced; W is endogenous shock to technology; L is labour supply; K is manufacturing sector stock of initial capital; U is utilisation rate of K; KU is service flow from capital; and 'δ' is labour-output share.

The production function represented in *Equation (1)* is assumed to have the usual properties of constant returns to scale, a unitary elasticity of substitution between labour and capital services. It should be noted that variable U is what distinguished *Equation (1)* from the usual standard neoclassical production function, while the manner in which U enters *Equation (1),* allowing for a direct relationship between labour's productivity and utilisation, follows format laid out by Greenwood, Harcowitz and Huffman, (1988).

3.2 Model Specification

Drawing on literature reviewed and theoretical underpinnings, this study present a simple dynamic model within an error-correction modelling (ECM) framework to evaluate the relevance of monetary policy instruments in stimulating broader manufacturing sector performance in terms of efficiency of usage of installed capacity in Nigeria. From the generalised form in *Equation (2)*, the ECM is derived:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \phi_1 x_t + \phi_2 x_{t-1} + \varepsilon \tag{2}$$

From *Equation (2),* subtract y_{t-1} from both sides; adjusting the other autoregressive component *x* yields:

$$\Delta y_t = \alpha_0 + (\alpha_1 - 1)y_{t-1} + \phi_1 x_t + \phi_2 x_{t-1} + \varepsilon_t$$

$$\Delta y_t = \alpha_0 + (\alpha_1 - 1)y_{t-1} + \phi_1 \Delta x_t + (\phi_1 + \phi_2)x_{t-1} + \varepsilon_t$$

$$\Delta y_t = \phi_1 \Delta x_t - (1-\alpha_1)\left[y_{t-1} + \left(\frac{\alpha_0}{1-\alpha_1}\right) + \left(\frac{\phi_1 + \phi_2}{1-\alpha_1}\right) x_{t-1} \right] + \varepsilon_t$$

$$\Delta y_t = \phi_1 \Delta x_t - \delta\left[y_{t-1} + \left(\frac{\alpha_0}{1-\alpha_1}\right) + \left(\frac{\phi_1 + \phi_2}{1-\alpha_1}\right) x_{t-1} \right] + \varepsilon_t$$

Hence, we have *Equation (3)*

$$\Delta y_t = \phi_1 \Delta x_t - \phi_2 \left[ECM\right] + \varepsilon_t \tag{3}$$

Where: Δy_t *and* Δx_t *represent the dependent and vector of explanatory variables, respectively, in their first difference. The ECM coefficient reveals the speed of adjustment from a possible short-run distortion to its long-term equilibrium.*

Equation 3 was augmented in line with the focus of the study, which is to ascertain the impact of monetary policy on manufacturing performance in Nigeria. Only instruments of monetary policy were employed as explanatory variables. The ones considered include banking sector credit *(BSC)*, real exchange rate *(REXR)*; lending interest rate *(LINTR)* and broad money supply *(M_2)*. Dependent variable (manufacturing performance) was captured by capacity utilisation. Thus, Equation 4 captures the expansion of the model with monetary policy related variables.

$$\Delta MANU_t = \phi_0 + \phi_1 \Delta BSC_{t-1} + \phi_2 \Delta REXR_{t-1} + \phi_3 \Delta LINTR_{t-1} + \phi_4 \Delta M_{2t} + \phi_5 \Delta ECM_{t-1} \ldots . (4)$$

Transformations such as logarithms can help stabilise the variance of a time series, while differencing can help stabilise the mean of a time series by removing extreme changes in data, thereby eliminating trend and seasonality (Asteriou and Hall, 2007; Hyndman and Athanasopoulos 2013). In this regard, first-difference of the log time-series data was employed for analysis to obtain efficient estimates. Therefore, the estimated parsimonious ECM model in a dynamic specification used in this study is specified in *Equation (5)*.

$$\Delta InMANU_t = \phi_0 + \phi_1 \Delta InBSC_{t-1} + \phi_2 \Delta InREXR_{t-1} + \phi_3 \Delta InLINTR_{t-1} + \phi_4 \Delta InM2_t + \phi_5 \Delta ECM_{t-1} \ldots . (5)$$

Where: MANU is manufacturing performance (measured by capacity utilisation); BSC is banking sector credit; REXR is real exchange rate; LINTR is lending interest rate, and M2 is broad money supply.

We introduced one-period lag into *Equation 5* to aptly depict the fact that monetary policy instruments do not have an immediate impact on desired objectives, but, rather, the influence is realized after a time lag. See studies conducted in both advanced and developing economies suggesting that macroeconomic phenomenon responds to changes in monetary policy with a lag (Friedman 1961; Jorgenson and Stephenson 1967; Dixit and Pindyck 1994; Gruen et al. 1997; Bernanke et al. 1999; Batini and Nelson 2001).

Further to our ECM model employed in conducting the impact analysis, the study generates the variance decomposition and impulse response functions from empirical results, as both analyses capture the dynamic interactions among variables in focus. The difference between impulse response function and variance decomposition is that while the former traces an effect of a shock to one endogeneous variable on to the other variables in the system, the variance decomposition distinguishes the variance of the error forecast for each variable into components that can be attributed to each endogeneous variable in the system (Enders, 1995).

4. Results and Discussion of Findings

4.1 Descriptive Statistics

Table 1a presents the variables used in the estimation and their characteristics. The Jarque-Bera statistic rejects the null hypothesis of normal distribution for banking sector credit and broad money supply. On the other hand, the null hypothesis of normal distribution is accepted for manufacturing capacity utilisation, exchange rate and interest rate. From the correlation matrix in *Table 1b*, MANU shows a fairly strong positive correlation with BSC (57%), REXR (34%), M2 (57%), but a negative correlation with LINTR (-35%). Interest rate shows a positive correlation with banking sector credit (14%), exchange rate (28%), and broad money supply (10%). Similarly, all other variables under consideration broadly exhibit positive correlation with each other.

Table 1a. Summary Statistics

Variables	Mean	Median	Standard Deviation	Jarque-Bera Statistic	Probability	Obs.
MANU	46.2659	42.85000	12.87183	3.789671	0.150343	34
BSC	1437912	405096.4	2552667	54.47128	0.000000	34
REXR	57.4290	21.89000	59.83222	4.546312	0.102987	34
LINTR	17.5603	18.13500	5.391933	0.059370	0.970751	34
M2	2083096	344548.5	3553399	24.69074	0.000004	34

Source: Authors' Computation.

Table 1b. Correlation Matrix

Variables	MANU	BSC	EXR	LINTR	M2
Manufacturing Capacity Utilisation (MANU)	1.0000	0.5694	0.3387	-0.3507	0.5720
Banking Sector Credit (BSC)	0.5694	1.0000	0.7211	0.1356	0.9680
Exchange Rate (EXR)	0.3387	0.7211	1.0000	0.2786	0.7633
Lending Interest Rate (lINTR)	-0.3507	0.1356	0.2786	1.0000	0.0988
Broad Money Supply (M2)	0.5720	0.9680	0.7633	0.0988	1.0000

Source: Authors' Computation.

4.2 Testing for Stationarity

Granger and Newbold, (1977) aver that most time series variables are non-stationary, and utilising such non-stationary variables for empirical analysis might produce spurious results. Thus, the time series properties of the dataset were investigated using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP). The results are presented in *Table 2*. The result shows that all variables used in this study are *I(1)* variables, that is, stationary after first difference in both the ADF and PP test procedures.

Table 2. ADF and PP Unit Root Tests

Variables	ADF			Phillips-Perron		Remarks
	Level	1st difference	Remarks	Level	1st Difference	
MANU	-1.9295	-3.7926*	*I(1)*	-1.398	-3.8735*	*I(1)*
BSC	-1.0578	-3.9682***	*I(1)*	-1.559	-4.5980***	*I(1)*
EXR	0.0612	-5.2031***	*I(1)*	0.061	-5.2031***	*I(1)*
lINTR	-2.3666	-8.6403***	*I(1)*	-2.840	-8.6836***	*I(1)*
M2	-1.0875	-4.8319***	*I(1)*	0.078	-4.5435***	*I(1)*

Notes: *** denotes significance at 1%. The null hypothesis is that there is a unit root.

4.3 Testing for Cointegration

Cointegration test is a test meant to ascertain the existence of a stable long-run relationship amongst variables under study which makes the technique important for the purpose of policy-making. This study utilises the methodology developed by Johansen (1988), and Johansen and Juselius (1990). Expectedly, this method should produce asymptotically optimal estimates since it incorporates a parametric correction for serial correlation, and it does not depend on the method of normalisation chosen. The number of lags used in the VAR is based on the evidence provided by the Akaike Information Criteria (AIC).

Following Johansen and Juselius (1990) approach, two likelihood ratio test statistics, the Maximum-Eigen and Trace tests were utilised to determine the number of cointegrating equations. From the results, both maximum-eigen and trace statistics reject the null hypothesis of no cointegration at the 5% level. The maximum-eigen indicates existence of two cointegrating equations, whereas the trace test shows that one long-run meaningful cointegrating relationship exist among the variables. In the face of such conflicts, however, Johansen and Juselius (1990) recommend the use of Trace statistic, since this takes into cognizance all the smallest eigenvalues. In all, the implication is that a linear combination of all five series is stationary and cointegrated. However, this evidence of cointegration does not, in itself, identify dynamic interrelationships. Such short-run dynamics are captured within an error correction modelling (ECM) framework. Essentially, the ECM helps reveal the speed of convergence to long-run equilibrium in the case of shock to any of the variables in the system. Table 3 reports the estimates of Johansen Procedure and Standard Statistics:

Table 3. Johansen's Cointegration Test Results

Null hypothesis	Trace Statistic	Critical Value at 5%	Max-Eigen Statistic	Critical Value at 5%
$\alpha = 0$	95.7015*	60.0614	57.4609*	30.4396
$\alpha \leq 1$	38.2406	40.1749	26.0814*	24.1592
$\alpha \leq 2$	12.1591	24.2759	9.7040	17.7973
$\alpha \leq 3$	2.4550	12.3209	2.4490	11.2248
$\alpha \leq 4$	0.0060	4.1299	0.0060	4.1299

Notes: α represents at most the number of cointegrating equations and * denotes significance at the 5%.

Source: Authors' Computation.

4.4 Dynamic Error Correction Model

Following Engle and Granger (1987), if cointegration exists between, hitherto, non-stationary variables, then an error-correction representation of the kind specified in *equation (5)* above exists. Essentially, the error correction term (ECM) helps measure the speed of adjustment once there is a systemic distortion in the economy. The adjustment time from a short-run distortion have useful imperatives for monetary authorities and economic planners. It indicates how previous period's deviation from long run equilibrium is regained at time t.

The ECM coefficient, which was derived in equation 5 in the previous session, is the error-correction term (that is, the lagged residual of static regression) and it is expected to be negative, indicating the adjustment time before long-run relationship can be achieved between dependent and explanatory variables; 'Δ' stands for first difference of the series. ϕ_1 to ϕ_4 are parameter estimates of variables, and t time period. Other variables are as defined above.

We estimated *Equation 5* using the least squares method. Following Enders (1995), OLS will give consistent estimates, provided variables included in the model are stationary. The study also tested the model for stability. This study utilises annual time series data for the period 1980 to 2014. The data were obtained from the Central Bank of Nigeria (CBN) and the National Bureau of Statistics (NBS).

Table 4. Dynamic Error Correction Model

Dependent variable: DMANU
Sample (Adjusted): 1982-2014

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-1.9013	1.0948	-1.7366	0.0971
DBSC	1.8300	8.2500	2.2186	0.0365
$DBSC_{(-1)}$	1.1100	1.2700	0.0873	0.9312
DREXR	-0.0028	0.0691	-0.0413	0.9674
$DREXR_{(-1)}$	0.0757	0.0345	2.1942	0.0457
DLINTR	-0.0068	0.2219	-0.0307	0.9758
$DLINTR_{(-1)}$	-0.5348	0.2348	-2.4132	0.0065
DM2	1.3800	4.9200	2.8063	0.0091
$ECM_{(-1)}$	-0.3441	0.1132	-3.0373	0.0063
R-Squared		0.8102		
Adjusted R-Squared		0.8074		
S.E. of Regression		4.6004		
Durbin-Watson Statistic		1.9582		
S.D. Dependent Var.		5.5281		
F-statistic		2.6094		
Prob. (F-statistic)		0.0373		
Akaike Info Criterion		6.1334		
Schwarz Criterion		6.5538		

Source: Authors' Computation.

Results contained in Table 4 show that the coefficient of the error-correction term for the estimated manufacturing capacity utilisation equation is correctly signed and statistically significant at 1%. The speed of convergence to long-run equilibrium is 34.4%. This implies that about 34.4% short-run distortions are recovered annually. In essence, it takes almost three years for any disequilibrium in the system to be fully corrected. Recovery lag-time is rather long, and our result perhaps confirms the slow growth of the manufacturing sector in Nigeria, often always buffeted by structural and socio-economic factors, including dependence on primary commodities export and weak institutional quality. The adjusted R-squared suggests that about 81% systematic variations in manufacturing capacity utilisation is explained by the four explanatory variables in the model, leaving about 19% unexplained, which can be captured by factors not included in the model, such as fiscal policy, resource dependency, political stability and technology.

The coefficient representing growth in lending interest rate is negative and statistically significant at the 1 percent level for the one-period lag ($DLINTR_{-1}$), however the current value (DLINTR) was not significant. This suggests that uncompetitive interest rate management can adversely influence growth of the manufacturing industry in Nigeria. Broad money supply, extent of monetisation of an economy, is positive and significant at the 1 percent level. Current values of banking credit (DBSC) were significant at the 5 percent level, while the one-period lagged value ($DBSC_{-1}$) not significant, but both were positively signed. This shows that any given effort at increasing availability of credit to players in the real economy does not have significant positive lag-effect on productivity. The performance of real exchange rate was mixed, whereas the current value of real exchange rate (DREXR) was negative and not significant; the coefficient of its one-period lag value ($DREXR_{-1}$) was positive and significant at the 5 percent level, confirming extant findings that exchange rate depreciation can boost overall economy, especially domestic production (Adenikinju, 2008). However, the resulting rise in cost of imports due to depreciation of the domestic exchange rate may raise expenditure on important production inputs, such as raw materials, plants and machineries required, which in turn would negatively affect the manufacturing sector.

4.5 Stability Test, Variance Decomposition and Impulse Response Function

Following Brown, Durbin and Evans, (1975), this study investigated the short-run stability of the parameters in the manufacturing capacity utilisation model using the plots of the cumulative sum of the residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMsq). The results from the two tests are presented in *Figures 1(A)* and *1(B,)* respectively. Basically, the existence of parameter instability is established if the ploted residual in the CUSUM and CUSUMsq lie outside the bands represented by the two critical (dotted) lines. From the graphs, both CUSUM and CUSUMsq remain within the 5 percent critical lines, suggesting stability of the model throughout the period under study. Thus, the finding is relatively robust for policy analysis and formulation.

Figure 1. Stability test using CUSUM and CUSUMsq of residuals.

Figure 1(A)

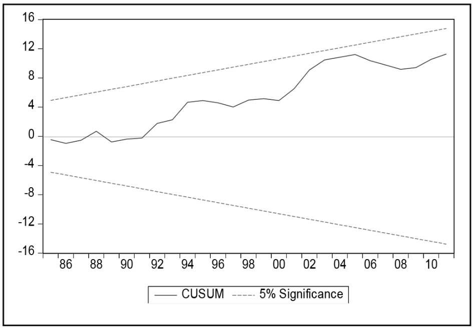
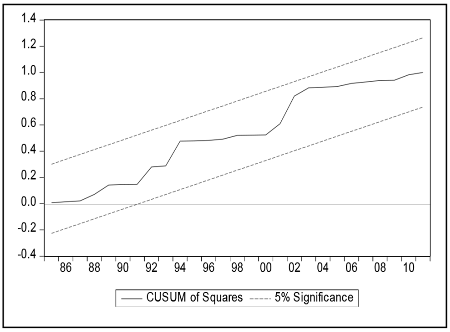


Figure 1(B)



In a bid to further examine the short-run dynamic properties of manufacturing capacity utilisation, we computed the variance decomposition and impulse response function. Essentially, variance decomposition provides the proportion of movements in dependent variables due to their own shocks, versus shocks to other variables in the system. Most empirical studies have shown that the highest percentage error variance decomposition of macroeconomic variables often originates from their own past shocks, but expected to decline over the forecast horizon. We computed the variance decomposition over a ten-period in an unrestricted variance autoregressive (VAR) framework.

Results in Table 5 shows that MANU is fully explained by its own variation, accounting for 100% in the first year. Shocks to broad money supply (M2) accounted for most variations in MANU, reaching 37.1% in the tenth year, while innovations in banking sector credit, real exchange rate (REXR) and lending interest rate (INTR) explained only 18.7%, 15.4% and 10.4%, respectively in the tenth year. The variance decomposition of MANU shows that only about 17.9% of its own forecast error variance is explained by itself in the tenth year. Thus, the result provides evidence that shocks induced by monetary phenomena can sufficiently explain a significant proportion of changes in MANU overtime in Nigeria.

Table 6 presents estimates from the impulse response function of manufacturing capacity utilisation against its own stocks and shocks due to other variables in the system which include; banking sector credit, exchange rate, interest rate and broad money supply over a ten-year horizon. The time horizon will enable the capturing of short-term, medium-term and long-term responses. The result shows that manufacturing capacity utilisation (MANU) had a positive correlation with its past values in the first four years, while the relationship turned negative in the remaining periods up till the tenth year. Similarly, in its response to the shocks of exchange rate and broad money supply (with the exception of second year in the latter case), there was a positive relationship throughout the 10-year horizon. Conversely, in its response to the shocks of banking sector credit (BSC) and interest rate (INTR) (except for first year in the case of BSC and first two years for INTR), there was a long-run negative correlation between them.

Table 5. Variance Decomposition of MANU

Period	Variance Decomposition of MANU					
	S.E.	MANU	BSC	EXR	INTR	M2
1	3.316396	100.0000	0.000000	0.000000	0.000000	0.000000
2	4.538589	90.79747	1.308705	1.306300	0.658863	5.928659
3	4.804362	85.69982	1.623337	2.127018	3.424339	7.125489
4	4.961068	80.95117	1.723040	3.448418	6.225554	7.651821
5	5.335945	70.41798	2.176755	4.827444	9.627077	12.95075
6	6.042410	55.70728	4.321470	5.447969	11.19353	23.32975
7	6.993224	42.09101	9.051289	6.344614	11.41151	31.10158
8	8.283525	30.53994	14.30391	7.968561	10.89213	36.29546
9	9.679173	22.85064	17.52114	10.96352	10.57685	38.08785
10	11.11018	17.92289	18.71212	15.73531	10.48893	37.14074

Source: Authors' Computation.

Table 6. Impulse Response of MANU

Period	Response of MANU				
	MANU	BSC	EXR	INTR	M2
1	3.316396	0.000000	0.000000	0.000000	0.000000
2	2.775734	-0.519209	0.518731	0.368399	-1.105094
3	1.038248	-0.324221	0.471035	-0.809126	0.650742
4	0.377775	0.222218	0.598143	-0.861303	0.488449
5	-0.354638	-0.442374	0.725089	-1.099457	1.343167
6	-0.538058	-0.978789	0.783969	-1.160081	2.197836
7	-0.495535	-1.687824	1.055345	-1.222285	2.586973
8	-0.608964	-2.321279	1.537831	-1.375866	3.113598
9	-0.672618	-2.569054	2.191701	-1.560526	3.283040
10	-0.845798	-2.585070	3.025182	-1.743000	3.187780

Source: Authors' Computation.

5. Conclusion and Policy Implications

This study examined the relationship between monetary (policy) phenomena and manufacturing performance (measured by capacity utilisation) in Nigeria within the context of Johansen cointegration and a dynamic error correction modelling framework, applying annual data from 1980 to 2014. Results from the study show that one-period lagged lending interest rate is negative and significant, though current value was not significant. Current level of banking credit has immediate impact on manufacturing performance, confirming that policy to enhance access to funds could be a veritable channel to stimulate real sector investment and economic growth in the country. The mixed findings of exchange rate suggests the need for monetary authorities to adopt effective exchange rate management strategy because any uncertainty in the macroeconomic policy environment affects players in the manufacturing sector, as they become highly reactional to exchange rate dynamics. On the other hand, the extent of monetisation of an economy measured by broad money supply positively and significantly influences manufacturing performance in Nigeria, reviving the need for monetary authorities to adequately monitor supply of money in line with economic structure and fundamentals of the country. In sum, this study has identified one-period lagged lending interest rate, broad money supply and credit to private sector as critical monetary policy instruments that, if properly administered, would enhance manufacturing sector performance in the country. Thus, it can be argued that fluctuations in the nation's manufacturing capacity utilisation can partly be explained by the scope and depth of monetary policy stance in the country. Accordingly, the study recommends that for manufacturing sector to play a leading role in broadening the productive base of the economy, the Nigerian government should re-consider the manufacturing sector as engine for economic growth by de-emphasising counter-productive policies. Others include strengthening the capital market, empowering development finance institutions for effective credit delivery, and adopting appropriate monetary policy measures that will enhance the productivity of the manufacturing sector so that a non-declining economic growth may be achieved in the country.

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