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Effect of Monetary Policy on Non-oil Output in Nigeria

AKIDI, Victor
AGIOBENEBO, Tamunopiriye Jones (Ph.D)
OHALE, Lawrence (Ph.D)
Department of Economics, Faculty of Social Sciences, University of Port Harcourt,
Port Harcourt, Nigeria.

Abstract

Following the Monetarist view that monetary policy is critical for stimulating real economic activities, this study examined the effect of monetary policy on non-oil output in Nigeria. The regressand is non-oil output while the regressors are monetary policy measures defined as real broad money supply and exchange rate. Pre-estimation diagnostic, error correction model and post-estimation diagnostic analyses were conducted using secondary data from Central Bank of Nigeria statistical bulletin spanning 1980 to 2016. The pre-tests results showed that all the variables were not normally distributed except exchange rate, they were all individually integrated of order I(1) and jointly exhibited cointegrating relationships. The ECM model analysis revealed that the adopted measures of monetary policy conformed to theoretical expectations and significantly influenced non-oil output over the sampled period. The ECM coefficient was consistent with theory and significant at 5 per cent, with moderate speed of adjustment. The various post-estimation tests individually confirmed that the result is fit for policy. Therefore, the study recommends that monetary policy authorities should ensure sufficient credits are made availability to non-oil sector investors at market-based interest rate, the developmental and discretionary powers of the apex bank is employed to deliberately allocate sufficient credit to drive key non-oil sub-sectors via her specialized partner institutions like banks of industry and agriculture, and unify the exchange rate system.

Key words: Non-oil Output, Dutch Disease, Monetary Policy, Error Correction Mechanism, Nigerian Economy.

1.0 INTRODUCTION

Nigeria is widely known among economies as producer of primary products which include non-oil and petroleum and gas. The non-oil sector which was the principal source of economic prosperity to the country was dominated by the agricultural sub-sector in the 1960s. What the economy has however experienced for over thirty years, a structural trajectory from non-oil to crude oil and gas dominance as the main source of government revenue and foreign exchange earner in Nigeria began in the 1970s. This structural change from the non-oil sector and its effects, technically referred to as Dutch Disease exposed the economy to the cyclical brunt of key oil sector variables (Onodugo, Benjamine and Nwuba, 2015). Consequently, the economy is caused to face persistent

macroeconomic challenges which include unsustained growth, exchange rate volatility, loss of jobs, high cost of living to mention a few, as the non-oil sector is too weak to absorb shocks occasioned by gyration in the crude oil and gas sector (Emmanuel, 2015).

The non-oil sector of the economy is a collection of economic activities, excluding the activities of oil and gas industry and those directly related to it. The sector broadly includes agricultural, manufacturing and service sub-sectors. However, in terms of supporting the economy (that is already standing on the volatile legs of the petroleum and gas industry); the non-oil sector has continued to perform below its potentials. There is therefore, the urgent need for deliberate macroeconomic policy action to launch the sector on the path of broad-based production and stable/inclusive economic growth as well as international competitiveness.

Burdened by the preceding desire, the apex monetary authorities have over the years utilized various monetary policy measures to stimulate the Nigeria's economy for stable/inclusive growth via the non-oil sector (Riti, Gubak and Madina, 2016). Thus, Monetary policy is the gamut of instruments in the hands of the 'monetary management authorities' which are employed for discretionary management of liquidity, currency value and cost of loanable funds targeted at driving an economy from a less desirable to a more desirable condition (Tom-Ekine, 2014). Such instruments are known as monetary policy tools, which are under the control of the Central Bank of Nigeria (CBN) that manages its conduct to achieve predetermined macroeconomic objectives ranging from 'increasing output, employment generation, price stability to external balance'. This variant of economic policy is fundamentally the array of tools for actualizing the key terms of office of the apex financial institution, CBN such as monetary stability and stable general prices. The utilization of monetary policy measures for restructuring and re-engineering the non-oil sector for competitive performance becomes necessary for important reasons. First, the cyclical nature of the international oil market with the attendant volatility of government revenue gives credence to any argument for deliberate restructuring for greater reliance on non-oil economy. Secondly, the facts that crude oil is an exhaustible asset and its facilities are often vandalized make it unreliable for sustainable development of the Nigerian economy (Utomi, 2004). Thus, the undesirable effects of over reliance on black gold economy amplified the need for diversification of the Nigerian economy towards the non-oil sector.

However, existing empirical literatures have reported a plethora of findings on the efficacy of monetary policy on various macroeconomic endogenous variables, but hardly is there any empirical record on the effect of monetary policy on non-oil output in Nigeria. What is rather easily found in existing literatures were monetary policy and economic growth, monetary policy and price stability, monetary policy and manufacturing sector output, monetary policy and non-oil export among others (Nenbee and Madume, 2011; Imoughele, 2014; Adesoye, 2014; Akinjare, Babajide, Akhanolu and Tochukwu, 2016; Obadeyi, Okhiria and Afolabi, 2016; etc.). While some of these studies adopted the ordinary least squares, others applied error correction mechanism, vector error correction

mechanism or vector autoregression estimation techniques for data analysis, thereby recording incongruent empirical results.

In view of the apparent gap in empirics, this study examined the influence of selected monetary policy tools on non-oil output in Nigeria. The study specifically examined the impacts of real broad money supply and official exchange rate on Nigeria's non-oil output from 1980 to 2016. Other sections of this study are organized as follows: the review of related literature and the study methodology are presented in sections two and three respectively. Section four presents the empirical results and discussion whilst section five focused on the summary, policy recommendations and conclusion.

2.0 REVIEW OF RELATED LITERATURE

2.1 Theoretical Framework

Led by Milton Friedman, the monetarist theory believes that monetary policy performs very important role in driving economic growth. The central theory of the monetarists holds that only money matters to economic growth stabilization (Anyanwu, 1993). Monetarism considers that changing the volume of money in circulation play a direct deterministic role in output growth of any economy. That is, money supply performs a causal function in investment and output (economic) growth. And as mostly exogenously determined tool, disequilibrium in economic aggregates can be managed via tinkering with the quantity of money supplied. Therefore, monetarist believed that 'monetary policy is effective' for output growth stabilization.

Founded on the assertion above, the monetarists generally believed that fiscal easing adversely affects growth stabilization in the long run. They opined that, although quantitative fiscal easing through borrowed funds would initially drive aggregate demand and output, but would later cause high interest rate. Increase in government borrowing (assuming that supply of money remains constant) would increase liquidity demand in the market, which would cause increase in the market rate of interest and further transmit to lower private investment demand because investment is sensitive to vagaries of interest rate. Therefore, Anyanwu, (1993) averred that quantitative fiscal easing is counter-productive (weakens fiscal efficacy) as it results in crowding-out of private investments.

Also, monetarists exposed the crowding out effect of easy (expansionary) fiscal measure on aggregate economic stimulation via government's manipulation of fiscal instruments (government expenditure or taxes). Fiscal expansion policy would boost aggregate demand and create employment, and consequently transmit to boosting national productive activities (Ahuja, 2013). Furthermore, growth in national (productive activities) income would bring about increased liquidity demand for purpose of transactions which, given that supply of money remains unchanged, market cost of borrowing would climb and lower private investment. The crowding out of private sector investment counteracts initial effects of productive fiscal (policy) measures on total economic activities, occasioned by expansion in public expenditure or reduction in taxation. Therefore, Tom-Ekine, (2014) submits that where investment demand is highly interest elastic, contraction in private sector investment caused by cost of loanable funds may be enormous. Thus, the

monetarists hold that the monetary measure of expanding money supply is largely the most strategic instrument that matters directly for output growth stabilization.

Following the believe that quantitative monetary easing matters directly for staging recovery from economic recession, the monetarists emphasize a direct transmission mechanism where supply of money is deemed a causal variable to growing the output of the economy in the stabilization process. Friedman, (1968) professed that in adopting monetary (measure) policy, increasing supply of money will create excess liquidity than required in the hands of the public, so that increased aggregate effective demand would by extension boost real growth performance. This process is shown below as adapted from (Anyanwu, 1995 and Ahuja, 2013):

↑*Mss* ↑*AgD (i.e. C + I + G)* ↑*RGDP* ⟶

The first link arrow in the above transmission path revealed quantitative monetary easing *(Mss),* which raises actual volume of money above what is required hence, causing significant increase in *AgD*. And the last link on the path showcased effect of increased aggregate demand *(AgD)* on real output *(RGDP)* with implied employment generation in the economy.

2.2 Review of Related Empirical Literatures

In their econometric analyses of supply of money - Nigeria's economy's output growth nexus in 2010, Ogunmuyiwa and Ekone utilized the least squares and ECM approaches for testing data from secondary sources covering 1980-2006. They reported from the outcome that increasing monetary liquidity (supply of money) is pro-economic growth in our economy.

Using time series data from 1970 to 2009 and taking price stability as proxy for macroeconomic stability while policy tools of the monetary sector were Money Supply, Treasury Bills & Minimum Rediscount Rate, Nenbee & Madume in 2011 examined how those monetary measures impacted stability in Nigeria's macro-economy. Adopting cointegration & ECM techniques, it was reported from the results that measures of the monetary sector exhibited mixed results in influencing stability in general price level of Nigeria.

Utilizing VAR framework for investigating how shocks in monetary measures affected Nigeria's outputs in the real sector, Edoumiekumo, Karimo and Amaegberi (2013) applied official secondary data spanning 1970-2011. It was evidently reported that private sector's obtained credits and investments directly and instantaneously influenced real outputs, MPR and costs of credits did not but caused inverse effects via credits and investments links; however, changes in MPR, private sector's obtained credits and lagged real economic outputs influenced real aggregate outputs more in the long-run. Therefore, MPR and deposit money banks costs of credits are two critical instruments of monetary sector for managing the Nigeria's real aggregate outputs.

Agbonlahor (2014) utilized the VECM to empirically analyze influence of monetary tools on growth of the economy in the UK, employing time-series data from 1940 to 2012. The

research made apparent that tools of monetary sector such as inflation rate and supply of liquidity (money) significantly stimulated United Kingdom's economic/output growth. Thus, the study recommended driving the UK economy by ensuring proportionality of liquidity (money) and RGDP growths.

Fitra (2014) examined the interdependency between the Indonesian aggregate economic growth and policy measures of the monetary sector between periods 2000 to 2011. SVAR (structural vector autoregression) and the IRF for analyzing open market operation (OPT), reserve requirement (RR) and discount rate as proxies for monetary measures were utilized. The results exposed interdependency of the Indonesian economy's outputs growth and vagaries of the monetary sector's tools. However, such tools produced negative but significant impacts on the growth of the economy's outputs.

Investigating monetary policy's role(s) in driving economic (output) growth of South Africa within periods 2000 to 2010, Chipote and Makhetha-Kosi (2014) employed the Johansen's long run test and ECM to identify the long and short runs inclusive adjustments of the model. The results revealed that long run relationship existed among the dependent and explanatory variable(s), and the short run mechanism exposed that money supply, repo rate and exchange rate are insignificant measures of the monetary sector for driving growth of South Africa whilst inflation is significant.

Using the Johansen Cointegration Test and Mechanism of VECM, Udude (2014) investigated the influence of monetary sector measures on economic growth of Nigeria covering 1981 to 2012, selecting liquidity (money) supply, cost of loanable funds, exchange rate and liquidity ratio as proxies for policy measures of the monetary sector. Evidence from the outcome was; only exchange rate exerted veritable influence on Nigeria's economic output's growth. Therefore, inference from the study stated that policy measures of the monetary sector did not impact significantly on growth in outputs of the economy over the sampled period.

Nigeria's manufacturing sector performance nexus with measures of monetary policy was investigated by Imoughele and Ismaila (2014), utilizing time series data spanning 1986-2012, which was analyzed by adopting vector autoregressive (VAR) econometric techniques. The results revealed that external reserve, exchange rate and inflation rate exerted significant influence on manufacturing sector output while broad money supply and cost of credit did not in their lagged period(s) and current year. However, the result indicated that interest rate, exchange rate and external reserve were negative performers but supply of broad money and general levels of prices drove the sector positively during the duration covered.

Also using the VAR model framework, Adesoye (2014) examined the dynamic interaction between tools of monetary policy and Nigeria's economic outputs' growth. The study considered official secondary data spanning 1970-2007. It was evidentially reported that shock to Exchange rate, Saving rate, Lending rate and money supply growth had mix friendly and unfriendly powers on outputs' growth throughout the data period. It was also

reported that changes in outputs' growth was significantly influenced by innovation in itself over the studied period, compared to the causal variables employed.

The Nigeria's non-oil exports and its responsiveness to exchange rate, taking from 1986-2013, was studied by Imoughele and Ismaila (2015). Adopting the ADF's stationarity and the Johansen's co-integration tests for sampled data analyses. The result established long-run joint association between the regressors and the regresand. The OLS results exposed that non-oil exports growth was significantly driven by effective rate of exchange, supply of liquidity, private sector's loans and the economy's output production but appreciated exchange rate negatively impacted on the exports of Nigeria's non-oil outputs.

Studying how monetary policy tools affected aggregate economic outcomes in Nigeria, Akinjare, Babajide, Akhanolu and Tochukwu (2016) utilized GDP and price levels as endogenous variables but the exchange rate, interest rate and money supply were used as exogenous variables. Applying the OLS method for the analyses of secondary official statistical data from 1999 to 2013, the resultant evidence showed that all explanatory variables proved significant for accelerating GDP but very weak in curtailing general price level over the reviewed time frame.

Obadeyi, J. A., Okhiria, A. O. and Afolabi, V. K. (2016) examined selected monetary policy tools and growth in output of an emerging economy. The selected instrumental variables were supply of money, rates of inflation, interest rate and exchange rate which exerted causation in the economy's growth projection. The study used the method of classical LS, and the result confirmed evidence of long-run interactions between the regressand and regressors over sampled period 1990-2012.Countercyclical policy for output and employment expansion was advised.

Adeleke and Harold (2017) analyzed how exchange rate regimes as monetary sector's measure transmit to influence manufacturing sectors in Libya and Nigeria. The study utilized structural VAR approach. It was revealed that exchange rate regime has some influences on the manufacturing rate of output production in the two oil exporting countries through the policy's transmission path. Oil price shocks greatly affect the monetary policy's mechanism in both countries. While monetary policy instrument appeared ineffective in promoting manufacturing sector's output in Libya that practices fixed exchange rate, the Nigeria's case was different from this outcome. Flexible exchange rate as monetary policy's tool appears to create positive driving influence on manufacturing output growth in the face of oil price shock.

3.0 METHODOLOGY

This section captured the methods employed to obtain relevant information on the effects of monetary policy tools on non-oil output in Nigeria.

3.1. Data Source

Secondary time series data from 1980 to 2016 were obtained from the Central Bank of Nigeria statistical bulletin (various issues).

3.2. Model Specification

The research model for this study is founded on the explicit form of the Monetarist theory which argued that monetary policy (MP) measures are more influential for income and output growth in an economy. It is also adapted to the 2016 empirical model of Akinjare etal whose study expressed that;

$GDP = f(EXR, INTR, M2, INFR).$ (3.1)

Where GDP = Gross domestic product, EXR = Exchange rate, INTR = Interest rate, M2 = Money supply and INFR = Inflation rate. And data spanning 1999 to 2013 were analyzed using the Ordinary Least Squares approach.

However, following the theoretical underpinning with slight modification of equation (3.1) by utilizing non-oil GDP as the dependent variable, extension of time frame, employing more advanced method of estimation as well as dropping INTR and INFR to avoid problem of multicollinearity with RM2 the functional form of this study is specified as:

$Y = f(X)$: $NOGDP = f(MP)$ (3.2)

But $MP = (RM2, EXR)$ (3.3)

Thus, substituting (3.3) into (3.2) yielded

$NOGDP = f(RM2, EXR)$ (3.4)

The linear form of equation (3.4) produced;

$NOGDP_t = \varphi_0 + \varphi_1 RM2_t + \varphi_2 EXR_t + \varepsilon_t$ (3.5)

Where; the dependent variable, *Y* depicts non-oil sector's gross domestic product (*NOGDP*) and the independent variable, *MP* implies selected monetary policy tools, which are real broad money supply (RM2) and official exchange rate (EXR) of the Naira vis-à-vis the US Dollar. ε *is* error term which denotes other variables not included in the model, t is the period of time and φ_0 is the intercept. The parameter estimates are expected to behave in line with $\varphi_1 > 0$ and $\varphi_2 < 0$.

3.3. Model Estimation Procedure

The following estimation procedure was employed in this study.

i. The pre-estimation diagnostic analyses, which include first the descriptive statistics to meaningfully understand, describe and summarize the idiosyncratic features of the time series data (Cookey, 2001) and to ascertain via their averages and Jarque-Bera values whether the variables are normally distributed.

The next step is the determination of the stability of the variables. For the purpose of this research, the Augmented Dickey-fuller (ADF) (Dickey and Fuller, 1981) unit root test is applied. This test is required because a non-stationary time series data invalidates standard empirical analyses results. The presence of a stochastic trend is determined by testing for the unit roots properties of the time series data. The general form of the ADF test statistics is estimated on the basis of the following expression:

$$\Delta Y_t = \square_0 + \square_1 t + \square Y_{t-1} + \sum_{i=1}^{n} \square_1 \Delta Y_{t-1} + \varepsilon_t \quad (3.6)$$

Where, Y_t is a time series, t is the linear time trend, Δ is the first difference operator, $\square_0$ is the constant term, n is the optimum number of lags on the dependent variables, ε_t is the error term. The second equation includes both drift and linear time trend.

Thereafter, the Johansen co-integration test is applied to establish whether there is a long-run relationship among the variables. Cointegration test is conducted based on the test proposed by Johansen (1988). Johansen's methodology takes its starting point in the vector autoregression (VAR) of order P given by

$$Y_t = \mu + \Delta_1 Y_{t-1} + \ldots + \Delta_p Y_{t-p} + \square_t \quad (3.7)$$

Where Y_t is an nx1 vector of variables that are integrated of order commonly denoted I(1) and ε_t is an nx1 vector of innovations, which can be rewritten as:

$$\Delta Y_t = \mu + \pi Y_{t-1} + \Gamma_1 \Delta Y_{t-1} + \ldots + \Gamma_{p-1} \Delta Y_{t-p+1} + \square_t \quad (3.8)$$

Where, $\pi = -(\ell_n - A_1 - \ldots - A_p)\ \Gamma_i$

$= -(A_{i+1} + \ldots + A_p)$

And to determine the number of co-integration vectors, Johansen (1988) and Johansen and Juselius (1990) suggested two statistic tests, the first one is the trace test (λ_{trace}). It tests the null hypothesis that the number of distinct cointegrating vector is less than or equal to n against a general unrestricted alternatives n = r. it is calculated by the expression below:

$$\lambda_{trace(r)} = -T \sum_{r+1}^{n} \ell n\ (1 - \lambda i) \quad (3.9)$$

where, T = The number of usable observations and the λ_i are the estimated eigenvalue from the matrix. The Second statistical test is the maximum eigenvalue test (λ_{max}) which is calculated according to the following expression:

$$\lambda_{max}\ (r, r+1) = -T\ \ell n(1 - \lambda_{r+1}) \quad (3.10)$$

The test concerns a test of the null hypothesis that there is r of co-integrating vectors against the alternative that r + 1 co-integrating vector.

ii. The model estimation applying Error Correction Mechanism (ECM) for integrating the short-run dynamics of the variables with their long-run behaviour is also analyzed. The dynamic error correction model is specified as follows:

$$\Delta NOGDP_t = \varphi_0 + \sum_{i=1}^{n} \varphi_{1t} \Delta RM2_{t-1} + \sum_{i=1}^{n} \varphi_{2t} \Delta EXR_{t-1} + \delta_1 ECM_{t-1} + \varepsilon_t \quad (3.11)$$

Where; δ_1 is the coefficient of ECM and ξ is the error term.

iii. Finally, some post estimation diagnostic tests were conducted to confirm the robustness and validity of the regression model for policy recommendation. They are the Wald test, autocorrelation, heteroscedasticity, normality tests and COSUM's model stability test. The E-views 9.0 software was used to conduct all the analyses. The results of the various evaluations are presented and discussed in the next section.

4.0 EMPIRICAL ANALYSES

4.1 Pre-estimation Diagnostic Tests. They include the Descriptive Statistics and the Unit root tests.

4.1.1 Descriptive Statistics Result

The data characteristics and the summary of the descriptive statistics of the variables are displayed in Table 4.1 below. The result revealed evidence of significant variation in the trends of the variables over the sample period. This is shown by the large difference between maximum and minimum values of the series. Regarding the statistical characteristics of the series, the results showed that all the variables are directly skewed.

Table 4.1: Descriptive Statistics Result

Variables	NOGDP	RM2	EXR
Mean	24998.52	55.35730	74.41514
Median	15896.72	34.53000	22.07000
Maximum	62393.97	129.7200	253.4900
Minimum	9220.060	16.87000	0.550000
Std. Dev.	17148.56	40.05044	72.02899
Skewness	1.036188	0.983008	0.466344
Kurtosis	2.666421	2.203447	2.010183
Jarque-Bera	6.792613	6.937059	2.851532
Probability	0.033497	0.031163	0.240324
Observations	37	37	37

Source: Computed Result (2018), Using E-Views 9

All the variables are platykurtic in nature as their respective kurtosis values of about 2.67, 2.20 and 2.01 are less than 3, implying their distributions are higher than normal. Finally, the Jarque-Berra statistic rejected the null hypothesis of normal distribution for NOGDP and RM2 at 5 percent critical value while the null hypothesis of normal distribution for EXR was accepted at the same critical value. This may have resulted from the problem of trended data, which will be examined with the unit root analysis.

4.1.2 Unit Root Test Result

The Augmented Dickey Fuller (ADF) unit root test is conducted to ascertain the status of the time series variables. The null hypothesis is rejected if the test statistics in absolute terms is greater than the tests critical values in absolute terms at the conventional 5

percent level of significance chosen for the purpose of this research analysis. The results of the Unit Root tests are presented in Table 4.2.

Table 4.2: ADF Unit Root Test Results

Variables	ADF Test Critical values @ 5%	ADF Test Statistic @ level	ADF Test Statistic @ 1st Difference	Order of Integration
NOGDP	-3.544284	-0.526195	-12.71792	I(1)
RM2	-3.544284	-1.666363	-4.021294	I(1)
EXR	-3.544284	-1.305660	-4.036762	I(1)

Source: Computed Result (2018), Using E-Views 9

The above results showed that all the variables are stationary at first difference, I(1) with constant and deterministic trend, under the Augmented Dickey Fuller Test considering 5 percent level of significance. Therefore, the null hypothesis that the variables have unit root was rejected and the alternative accepted, thus conclude that the variables are integrated of order one.

Since the results of the variables were stationary at first difference, test to determine the long run relationship can be achieved with the application of the Johansen Co-integration test, which is presented in Table 4.3.

4.1.3 Cointegration Test Result

Given that all the variables are found to be integrated of order I(1), the Johansen's cointegration test is used to determine the number of cointegrating equation among the variables. This equation represents the long run equilibrium relationship among the variables. In order to determine the number of cointegrating equations, the Trace and the Maximum Eigenvalue test statistics are examined. Especially, the calculated Trace and Maximum Eigenvalue test statistics are compared to the critical values at 5 percent level of significance to decide the existence of one or more cointegrating equations.

Table 4.3: Johansen Cointegration Test Result

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	0.627936	54.41733	29.79707	0.0000	34.60417	21.13162	0.0004
At most 1	0.345358	19.81316	15.49471	0.0105	14.82836	14.26460	0.0407
At most 2	0.13274	4.9848	3.8414	0.02	4.9848	3.8414	0.02

	6	00	66	56	00	66	56

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
Source: *Computed Result (2018), Using E-Views 9*

Both Trace and Maximum Eigenvalue statistics in Table 4.3 above rejected the null hypothesis that there is no cointegrating relationship and accepted the hypothesis that there is at least one cointegrating equation at 5 percent critical value.

Thus, given that all the variables were integrated of order I(1) and both Trace and Maximum Eigenvalue statistics indicated stable long-run relationship among the variables, the requirements for applying an error correction model are satisfied.

4.2 Model Estimation Results

4.2.1 Error Correction Test Results

Error correction modeling entails utilizing lagged residual to correct for divergence of actual values from the long-run equilibrium value (Iyoha and Ekanem, 2004). Therefore, to adjust for short-run deviations that may have occurred within the period of the study, the general-to-specific approach was followed. The over-parameterized ECM analysis was conducted to show the main dynamic processes in the model, and the lag length was set at three to avoid too short a lag length from hindering the dynamic processes as well as avoiding problems associated with low degree of freedom if higher order lags were used. More so, for data admissibility, theory consistence and convenience in interpretation of the ECM results, the over-parameterized model was transformed to obtain a parsimonious encompassing model, which may be suitable for forecasting purposes. Hence, the result of the parsimonious error correction representation is presented in Table 4.4 below.

Table 4.4: Parsimonious Error Correction Mechanism Result

Variable	**Coefficient**	**t-Statistic**	**Probability**
C	0.014529	0.848279	0.4047
DLOG(NOGDP(-2))	0.189935	1.685129	0.1049
DLOG(NOGDP(-3))	0.148633	4.748099	0.0001
DLOG(RM2)	0.113064	3.735275	0.0010
DLOG(EXR)	-0.041020	-2.533444	0.0182
ECM(-1)	-0.308484	-4.782073	0.0001
R-squared = 0.772827 **D.W. stat**. = 1.565067 **F-statistic** = 10.20577			
Adjusted R-squared = 0.697102 **Prob(F-statistic)** = 0.000004			

Source: *Computed Result (2018), Using E-Views 9*

The result above suggested evidence of error correction. The coefficient of ECM has the hypothesized negative sign (- 0.308484) and is statistically significant at the conventional 5 per cent critical level, implying that there the model has potential for restoration of long run non-oil sector equilibrium should there be short run monetary policy chocks. The

speed of adjustment as shown by the ECM factor implies that if there is distortion in the non-oil sector's equilibrium in the short run, approximately 31 per cent of the non-output is corrected annually as the variable moves towards restoring equilibrium in the long run. This portrays that there is a moderate pressure on NOGDP to restore long run equilibrium whenever there is short-run dynamics. Also, the explanatory power of the variables - R^2 is approximately 0.77, which means the model is a good fit. It indicates that over the sampled period, about 77 per cent variation in non-oil output is explained by systematic changes in the adopted monetary policy measures as initially defined while the remaining 23 percent is explained by factors not included but captured as the error term in the model. In overall, the regression model is statistically significant at 5 percent level given the F-statistic value 10.20577 obtained, and the Durbin Watson statistic value of about 1.6 suggests that the model has no serious autocorrelation troubles.

Furthermore, it is apparent in the table above that monetary policy instruments of the apex bank (RM2 and EXR as defined before) behaved in tandem with theoretical expectations and are significant at the conventional 5 per cent critical level.

4.3 Post-Estimation Diagnostic Tests

Following the significance of the adopted instruments of monetary policy in stimulating non-oil output in Nigeria, it is pertinent to confirm if the utilized policy variables are jointly significant in explaining changes in NOGDP, the model is free from auto-correlation, homoscedastic and whether variables are normally distributed and stable for policy recommendation purpose. To accomplish this, the study conducted the Wald, Auto-correlation, Heteroscedasticity, Normality and CUSUM tests. The results are accordingly presented below.

Table 4.5: Wald, Serial Correlation LM and Homoscedasticity Tests Results

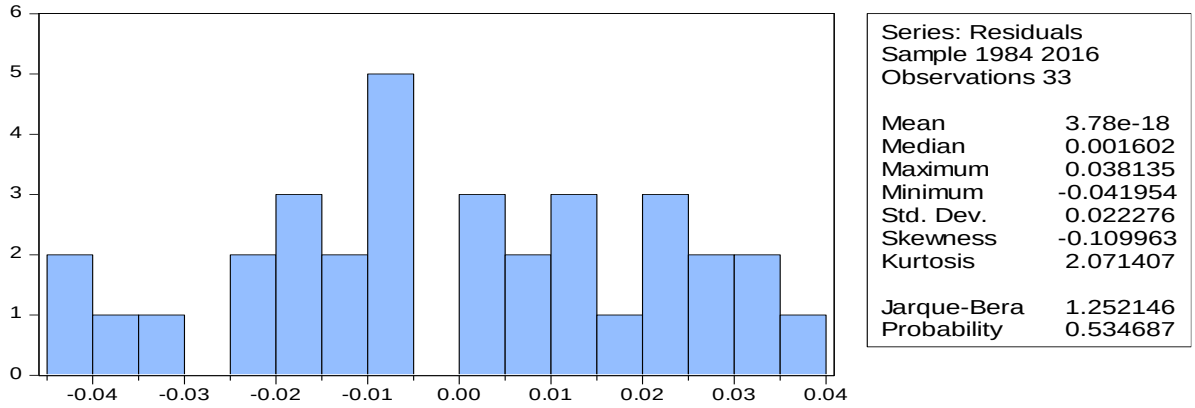
Test	F-Statistic	t-Statistic	Obs*R-Square	Prob. Value
Wald Test	20.62456	-	-	0.0000
Breusch-Godfrey Serial Correlation LM Test	0.740381	-	3.1565	0.5398
Heteroskedasticity Test: ARCH	01.478104	-	4.3710	0.2436

Source: *Computed Result (2018), Using E-Views 9*

Table 4.5 indicated that the estimated encompassing ECM model passed all the considered post estimation diagnostic tests. Specifically, the Breusch-Godfrey serial correlation LM test and Heteroscedastic ARCH test confirmed respectively that the model was considerably free from autocorrelation and it is homoscedastic since their respective probability values are higher than the conventional 0.05 per cent critical value. And the Wald test, evidenced from its F-statistic probability value of 0.0000 implied that the utilized policy tools are jointly significant in explaining changes in NOGDP in Nigeria over the sampled period.

The Jarque-Bera statistic is applied to ascertain whether or not the disturbance term of our ECM model is normally distributed at the conventional significance level.

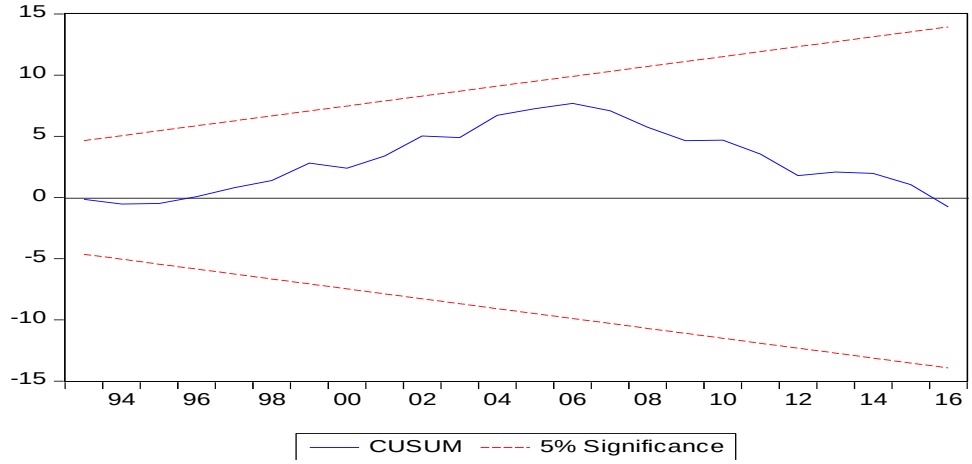
Figure 4.1: Jarque-Bera Normality Test Result



The result in Figure 4.1 above depicts that the error-term was distributed normally at the conventional 5 percent level. Certainly, the J-B statistic probability value of approximately 0.534687 is above the 0.05, implying that the Jarque-Bera statistic hypothesized normal distribution in residuals of the parsimonious ECM model is accepted.

Finally, the outcome of the CUSUM residual test for model stability as displayed in Figure 4.2 below demonstrated that the plot of CUSUM for the ECM model under consideration is within the 5 per cent critical bounds.

Figure 4.2: CUSUM Residual Test for Model Stability



Source: *Graphical Result (2018), Using E-Views 9*

The graph suggests by implication that the parameters of the model did not suffer structural instability over the studied period. By implication, the parsimonious inclusive ECM model is stable.

4.4. Discussion of Findings

The results presented above indicated that all the variables were integrated of order one and have cointegrating relationship amongst them. The parsimonious ECM result

revealed that the speed of adjustment as depicted by the ECM coefficient is in absolute terms 0.308484, which implies that in the event of distortion in monetary policy conduct in the short run, about 31 per cent of non-oil sector's output is corrected annually as NOGDP tends towards restoring equilibrium in the long run. This portrays that there is a considerable pressure on NOGDP to restore long run equilibrium whenever there is monetary policy shock. The explanatory power of the policies variables - R^2 indicated that about 77 per cent of variations in non-oil output were explained by systematic changes in the monetary policy tools. The entire model is statistically significant at 5 percent level as seen from the F-statistic value of about 10.21 and the model is reasonably free from serial correlation since the Durbin Watson statistic value is about 1.6.

Furthermore, real broad money supply (RM2) and official exchange rate (EXR) were utilized to verify the effect of monetary policy on non-oil output in Nigeria. The parsimonious encompassing ECM result showed that RM2 and EXR behaved in consonance with a priori expectations. These suggest that quantitative monetary easing through real broad money supply positively influenced non-oil output and exchange rate inversely associated with non-oil output in Nigeria during the sampled period. The implication of this outcome is that a Naira expansion in supply of real broad money stimulated NOGDP by about 11 per cent and a unit depreciation of the Naira in relation to the US Dollar decreased NOGDP by about 4 per cent since importation of non-oil sector inputs become more expensive. Furthermore, the result indicated that over the studied period, the contemporaneous values of the monetary policy tools impacted significantly on NOGDP at the 5 per cent level, which implied that the null hypothesis is rejected and the alternative hypotheses that the selected tools were statistically significant for explaining changes in non-oil output accepted at the conventional 5 per cent critical level.

Therefore, the policy implication averred from the result is that a deliberately and consciously articulated expansionary monetary policy (with effective and optimal implementation and monitoring mechanisms) to re-engineer the performance of the non-oil sector will further improve and sustain output in the sector. By so doing, domestic demand for non-oil products will be adequately satisfied and excess output exported for expanded foreign exchange earnings which will shore up the value of the Naira exchange rate in relation to the US Dollar. This outcome is consistent with the results of Akinjare, Babajide, Akhanolu and Tochukwu (2016) and Ogunmuyiwa and Ekone (2010).

5.0 SUMMARY, RECOMMENDATIONS AND CONCLUSION

Change in the structure of the Nigeria's economy and the resultant dominance of the black gold sector with the susceptibility of the economy to the cyclical behaviour of the international oil market has remained a major source of concern to policy makers and principal stakeholders in the country. Available evidence revealed that empirical investigations have hardly been conducted on the impact of monetary policy on non-oil output in Nigeria, thus motivating this study.

The study evidenced that the theory consistent and statistically significant influences of real broad money supply and exchange rate on NOGDP implied expansionary monetary

policy significantly influenced non-oil output in Nigeria over the sampled period. However, the reductive behaviour of exchange rate may be due to over reliance on unstable oil economy, weak or non-existent capital goods sector, multiplicity of operational exchange rates and FOREX market malpractices.

Based on these results, the study recommends that:

i. The apex monetary authority should ensure a healthy and competitive financial system that will play a catalytic role to the non-oil sector by making sufficient credit available and accessible to genuine non-oil sector investors at market-based interest rate rather than concentrating on financing government deficit, which could result in crowding-out of non-oil private investment.

ii. Monetary policy management should take tenacious steps to unify the exchange rate system rather the practice of multiple systems where foreign health and education demands as well as SMEs' imports having different rates, which create data generation and measurement problems. In addition, policy implementation and surveillance should be ensured to minimize market malpractices (such as artificial scarcity) in order to guarantee effective operation of foreign exchange activities.

iii. The apex monetary authority may also employ her developmental and discretionary powers to deliberately allocate sufficient credit through her specialized partner institutions such the bank of industry (with sufficient monitoring and evaluation mechanisms) to drive the informal sector, SMSEs and other real non-oil production activities for effective and optimal local production and value addition to primary and intermediate commodities to ease the pressure on foreign exchange demand for imports.

iv. Stable polity, policy consistency and sustainable economic restructuring should be regularly pursued to encourage both domestic and foreign investments in the non-oil sector and to enhance diversification for moderate reliance on the petroleum oil and gas sector.

In conclusion, monetary policy is significant for driving the non-oil sector of Nigeria. This is based on the evidence that all causal policy tools: real broad money supply and exchange rate significantly impacted on NOGDP over the period captured in this study. Thus, buttressing the Monetarist postulation that monetary policy is more effective for propelling economic output.

REFERENCES

Adeleke, O. & Harold, N. (2017). Monetary policy transmission mechanism and growth of the manufacturing sector in Libya and Nigeria: does exchange rate matter? *Journal of Entrepreneurship, Business and Economics,* 5(1), 67-107.

Adesoye, A. B. (2014). Dynamics of monetary policy and output nexus in nigeria, *Developing Country Studies*, 4(14), 22-33.

Adulagba, D. (2011). Executive Director/CEO, NEPC in Onuba, I., 2012, Non-oil Export Trade, Punch, April 16, 2012.

Agbonlahor, O. (2014). The impact of monetary policy on the economy of the United Kingdom: a vector error correction model (VECM). *European Scientific Journal*, 10(16), 19-42.

Ahuja, H. L. (2013). *Macroeconomics: Theory and Policy,* 19th rev. ed. New Delhi, S. Chand & Company PVT. Ltd.

Akinjare, V., Babajide, A. A., Akhanolu, I. A. & Tochukwu, O. (2016). Monetary policy and its effectiveness on economic development in Nigeria. *International Business Management,* 10(22), 5336-5340.

Anyanwu, J. C. (1995). *Modern Macroeconomics: Theory and Applications.* Onitsha, Joanee Educational Publishers Ltd.

Anyanwu, J. C. (1993). *Monetary Economics: Theory, Policy and Institutions.* Onitsha, Hybrid Publishers.

Chipote, P. & Makhetha-Kosi, P. (2014). Impact of monetary policy and economic growth: a case study of South Africa. *Mediterranean Journal of Social Sciences,* 5(15), 76-84.

Cookey, E. A. (2001). *First Lessons in Business and Economic Statistics.* Onisha, Abbot Books Ltd.

Dickey, D. A. & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica, 49*, 1057-1072.

Edoumiekumo, S. G., Karimo, T. M. & Amaegberi, M. (2013). Real sector responsiveness to monetary policy shocks in Nigeria. *JORIND*, 11(2), 269-277.

Emmanuel, O. (2015). International oil price and exchange rate in nigeria: a causality analysis*. International Journal of Academic Research in Economics and Management Sciences,* 4(3), 11-22.

Fitra, W. (2014). Interdependency between monetary policy instruments and indonesian economic growth. *Journal of Economics and International Finance,* 6(9), 203-210.

Friedman, M. (1968). The role of monetary policy. *American Economic Review,* Vol. 58: 1-17.

Imoughele, L. E. & Ismaila, M. (2015). The impact of exchange rate on Nigeria's non-oil exports. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 5(1), 190-198.

Imoughele, L. E. & Ismaila, M. (2014). Empirical investigation of the impact of monetary policy on manufacturing sector performance in Nigeria. *International Journal of Education and Research*, 2(1), 1-20.

Iyoha, M. A. & Ekanem, O. T. (2004). *Introductory Econometrics.* Benin City: Mareh Publishers.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12, 231–254.

Johansen, S. & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration- with applications to the demand for money. *Oxford Bulletin of Economics and Statistics, 52,* 169– 210.

Nenbee, S. G. & Madume, J. M. (2011). The impact of monetary policy on Nigeria's macroeconomic stability. *International Journal of Economic Development Research and Investment,* 2(2), 174-183.

Obadeyi, J. A., Okhiria, A. O. & Afolabi, V. K. (2016). Evaluating the impact of monetary policy on the growth of emerging economy: Nigerian experience. *American Journal of Economics*, 6(5), 241-249.

Ogunmuyiwa, M. S. & Ekone, A. F. (2010). Money supply-economic growth nexus in Nigeria. *Journal of Social Sciences*, 23(3), 199-204.

Onodugo, I. C., Benjamin, A. A. & Nwuba, B. N. (2015). Diversification of the economy: a panacea for Nigerian economic development. *International journal of multidisciplinary research and development,* 2(5), 477-483.

Riti, J. S., Gubak, H. D & Madina, D. A. (2016). Growth of non-oil sector: a key to diversification and economic performance in Nigeria. *Public Policy and administration Research,* 6(3), 64-75.

Tom-Ekine, N. (2014). *Macroeconomics: Public Policy and International Finance,* 4th ed. Port Harcourt, Dominus Printing Co.

Udude, C. C. (2014). Monetary policy and economic growth in Nigeria. *Journal of Policy and Development Studies,* 9(1), 234-247.

Utomi, P. (2004). *The curse of oil*. A paper delivered for Heinrich Böll Foundation Oil-Conference by Lagos Business School.