http://dx.doi.org/10.22161/ijeab.4437 *ISSN: 2456-1878*

Analysis of Exchange Rate and Interest Rate Policy Instruments' Dynamics on Agricultural Growth in Nigeria

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***Abstract*—** *This research analyzed the dynamics of exchange rate and interest rate policy instruments on agricultural growth in Nigeria for the period 1980-2018. Specifically the study examined the causal relationship between exchange rate and agricultural growth; analyzed the instantaneous and compound growth rate of exchange rate, interest rate and agricultural growth and examined the impact of exchange rate and interest rate policy instrument on agricultural growth. .Data were obtained from Central Bank of Nigeria (CBN) Statistics Data Base;and Food and Agriculture Organization Statistical data (FAOSTATS).From the findings, There exist a unidirectional relationship between exchange rate and interest rate with agricultural growth (P<0.05). The instantaneous growth rate for agricultural output(P<0.05); exchange rate (P<0.05) and interest rate were 5.9%; 17.02% and 0.61%with compound rate of growth of 6.08%; 18.55% and 0.62%.Exchange rate policy instrument yielded significantly (P<0.05)positive impact of 2.85% while a proportionate rise in interest rate significantly (P<0.05) decreased agricultural growth by -1.83% (P<0.05). Thus, macroeconomic policy instruments dynamics which revolved around aggregate price stability impacted agricultural growth. It was recommended exchange rate should be stabilized and interest reduced to encourage investment in agriculture, hence growth.*

***Keywords*— *exchange rate, interest rate, agriculture and policy instruments*.**

I. INTRODUCTION

In spite of Nigeria's rich agricultural resource endowment; there has been a gradual decline in agriculture's contributions to the nation's economy (Manyong et al., 2005). In the 1960s, agriculture accounted for 65-70% of total exports; it fell to about 40% in the 1970s, and crashed to less than 2% in the late 1990s, by 1985, only 37% of the 1970 output was achieved, but by 1988 and 1989, respectively, output reached 79% and 86% of the 1970 level (Maduekwe, 2008). Between 2003 and 2007 its average share of the national real GDP was 41.5%, but there was a reverse of this trend. Agricultural share to GDP dropped from 42.20% in 2007 to 40% in 2010 and to a lower rate of 35% in 2013 (Ajudua, Ojima, and Okonkwo, 2015; Central Bank of Nigeria CBN, 2013). The average agricultural growth rate for 2004–2007 was 7% but dropped to 5.2% from 2008-2013 (Ajudua, Ojima and Okonkwo, 2015). According to Ugwu and Kanu (2012) Nigerian agriculture growth rates was 7.4% 7.2% and 6.5% in 2006, 2007 and 2008 respectively. Of the growth in the 2003 to 2007 period, the crop, livestock, fishery and forestry subsectors contributed 90%, 6%, 3% and 1% respectively. Government activities are usually organized, directed and executed within the framework of policies. Macroeconomic policy makers utilize general instruments in executing their policies. General policy instruments are tools that policy makers utilize to achieve their goal similar to pliers, spanners, and screw drivers in the hands of the mechanic. General policy instruments are further classified into monetary and fiscal policies. Interest rate is a good example of monetary policy instrument that has variously been used in Nigeria.

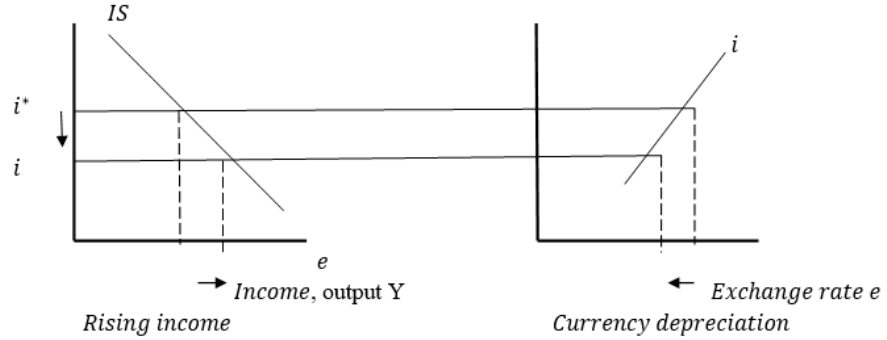
Exchange rate and interest rates as monetary policy instruments basically target the control of supply and demand for money. However any attempt to regulate these affects virtually all sectors of economy particularly the agricultural sector. For instance the devaluation of the Naira affected virtually every facet of Nigerian economy

http://dx.doi.org/10.22161/ijeab.4437 *ISSN: 2456-1878*

and many have linked the rise in foreign exchange to the rise in prices of goods particularly food.Preliminary also observations showed that macroeconomic policy instruments in Nigeria have become defective over time with its attendant consequences: The value of the Naira against the Dollar keeps depreciating, the interest rate is unstable, the expenditure on agriculture and income are on the decline despite the rise in inflation (Agu, Idike, Okwor, and Ugwunta, 2014; Ugwu et al., 2012).The value of the naira against the US dollars has depreciated throughout the 80's. It depreciated from N0.61 in 1981 to N2.02 in 1986 and further to N7.901 in 1990. The policy of fixed exchange rate pegged the Naira at N21.886 in 1994. But further deregulation pushed it from N86.322 to $1.00 in 1999. The US Dollar has persistently gained weight against the Naira to the extent that the present value of the naira against the Dollar is now N362.86=$1.00 as at May 2018 (CBN, 2018 and NBS, 2018). This development heralded the decline of agricultural production and the resultant drop in both volume and value of traditional export commodities as well as private domestic investment (FAO, 2017; Adubi and Okunmadewa, 1999). Interest rate which facilitates the establishment of agricultural business through availability of credit and finance for start-up, investments, and expansion (Ammani and Aliyu, 2012) has continued to rise leading to low access to credit, productivity and growth (Ochalibe, Abu and Audu, 2013). These raise questions on the effectiveness of exchange rate and interest rate policy instruments in Nigeria with dire implications for the economy as a whole and the agricultural sector in particular if not addressed.

II. THEORITICAL AND EMPIRICAL FRAMEWORK

Exchange rate is the price of one country's currency in terms of other countries' currencies. It is the numerical value of a country's domestic currency at any given time in relation to countries in which the home country has foreign or trade links (Nwankwo, 1980). A reduction of the nominal rate is an appreciation; an increase in the nominal rate is a depreciation or devaluation. A shift in exchange rate will have effect on certain economic variables such as interest rate, money supply etc (Okoduwa, 1997). This means that exchange rate is a strong determinant necessary for any economic well-being of Nigeria. In a market-friendly environment, exchange rate must respond to the market forces of demand and supply. The exchange rate, when applied in conjunction with other macroeconomic policies leads to the achievement of the goals of price stability, improved and sustained economic growth, reduced unemployment and balance of payment stability (Caballero and Corbo, 1989). Exchange rate policy targeted at stabilizing the value of naira may affect the prices of goods and services which may have impact on agricultural growth and resource sustainability.This influence, in turn curbs inflation, increase employment and maintains a healthy value of money (Agu et al., 2014). Policy fluctuations are likely, in turn, to determine economic performance and agricultural growth as a sector.Monetary policy under the floating exchange rate: Figure 1 shows the effects of expansionary monetary policy (a lower policy rate) stimulates investment and this effect is reinforced by a currency depreciation that stimulates net exports in an open economy. The policy change also has consequences for the equilibrium on the money market. The lower interest rate raises money demand both because of its direct effect on money demand and because of and the indirect effect via higher income (Floden, 2010).



(a) The goods market (b) The foreign exchange market

Fig.1: Monetary expansion under floating exchange rates

http://dx.doi.org/10.22161/ijeab.4437 *ISSN: 2456-1878*

Suppose the government stimulates domestic spending by increasing government expenditure purchases or by cutting taxes since such expansionary fiscal policy increases planned expenditure it shifts the curve to the right (Floden, 2010). This can be seen as shown in figure 3 below:

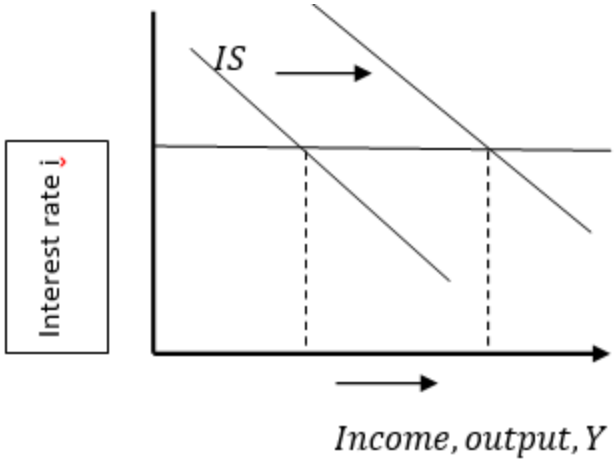


Fig.3: A fiscal expansion under floating exchange rates

According to Floden (2010)the outcome is that income increases if the CBN holds the interest rate constant. Investment, the exchange rate and the net exports are unaffected since the interest rate is held constant. Private consumption increases since household disposable income increases. On the money market higher income implies, higher money demand. The CBN must therefore let money supply increase if it holds the interest rate constant. Interest rate is currently constant at 18% and it remains largely to be seen the consequences of the action of the government of Nigeria particularly on agricultural sector. Agriculture is typically a sector which is most exposed to the influence of foreigntrade because almost all of its products are either exported or importable, or they are close substitutesin production or consumption with products which are importable or exportable. Cushman (1988); Chambers and Just (1991) indicated a significant depressive effect of exchange risk. However Abel (1983) showed that if one assumes perfect competition, convex and symmetric costs of adjusting capital, and risk neutrality, investment is a direct function of price (exchange rate) uncertainty. Hence, agriculturalprices are largely determined by those of international markets and by the filterthrough which the latter are transmitted to the domestic economy, which is the exchange rate. The summarized policy effects of Mundell-Fleming model is shown in Table 1:

Table 1: The Mundell-Fleming Model: Summary of Policy Effects

	Exchange –Rate Regime					
	Floating			Fixed		
Policy	Y	E	Nx	Y	E	Nx
Fiscal expansion	↑	0	0	↑	-	0
Monetary expansion	↑	↓	↑	-	-	-
Devaluation	-	-	-	↑	↓	↑

The table 1 shows the direction of impact of various economic policies on income Y, the exchange rate e, and the trade balance Nx. The arrow signs indicate the direction of movement of the variables. 0 indicates no effect and dash indicates that the policy or variable cannot be used. Maskus (1986) compared the effects of exchange rate risk across major sectors of an economy, e.g., manufactured goods, agriculture, chemicals and others and found that aggregate bilateral agricultural trade (the United States and its major western trading partners) is particularly sensitive to exchange rate uncertainty. It implies that exchange rate fluctuations affect agricultural as well. Therefore, policy makers are expected to consider this perspective when exchange rate policy instrument is to be use. The disability nature of foreign exchange subsidy (premium) is the fundamental reason why unification of exchange rate is canvassed as a short to medium term objectives of exchange rate management (Akpan and Atan, 2011).

Theory of Exchange Rate and Interest Rate on the Economy

Mundell-Fleming model shows the impact of policy and of domestic and foreign shocks on output and the balance of trade in the short-run. Mundell-Fleming model has been described as the dominant policy paradigm for studying open economy monetary and fiscal policy. It relies on the following assumptions:

MF1: Prices and wages are fixed: hence inflation and expected inflation are zero and real and normal interest rates are equal.

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MF2: The home economy is small: This means the home economy cannot affect the world interest rate of world output.

MF3: Perfect capital mobility and perfect asset substitutability: i.e. residents of the home economy can buy and sell bonds of the foreign country (with the interest rate) in unlimited amounts at 100% transactions costs. There is no difference in risk between bonds. This implies that uncovered interest parity holds.

The equation for aggregate demand proposed by the Mundell-Fleming model of a large open economy is

$Y = C(Y - T) + I(r) - G + NX_e$……(1)

C (Y – T) represents consumption as a function of disposable income, defined as income less taxes.

I (r) represent investment as a function of the interest rate, where an increase (.) the interest rate decreases investment

G represents government spending, which is predominantly unaffected by interest rates

NX_e represents net export defined as exports less imports as a function of the real exchange where an increase in the real exchange rate decreases net exports

Y is the total amount of goods and services purchased by consumers, business, and the government taking into account foreign trade Y = CIDP = Aggregate Demand = Aggregates Supply = National income = Total output.

According to the Mundell-Fleming model, an open economy can be described of four equations

$Y = C(Y - T) + I(r) - G + NX_e$

IS…… (2)

$e = {(1 + i)E_{e'}}/{1 + i^*}$ i

IRP……(3)

$\varepsilon = {eP}/{p^*}$

RER…… (4)

$r = i - E\pi$

FISHER…… (5)

the equation (2) describes equilibrium in the goods market, equation (3) is the interest rate parity condition which describes equilibrium in the money market for foreign exchange (e) and equation (4) just states the definition of real exchange rate (e) the final equation (5) is the fisher equation stating the relation between the real interest rate(r) which is determined by the central bank. T and G are fiscal policy variables, i is the foreign interest rate, Ee is the expected future exchange rate, eP and P* are domestic and foreign price levels respectively and $E\pi$ is the inflation expectation. The four (4) equations above then determine the equilibrium values for the four endogenous variables which are income(Y) the nominal exchange rate (e) the real exchange rates (E) and the real interest rate (r). One lesson from the Mundell-Fleming model is that the behavior of an economy depends on the exchange-rate system it has adopted. Other policy fluctuations along with the exchange rate are likely, in turn, to determine economic performance and in the context of this work, agricultural growth as a sector.

III. METHODOLOGY

The study utilized secondary source of data . Data on Gross Domestic Product (GDP), exchange rate, interest rate, were obtained from CBN Statistics Data Base (Finance and real sector.Data for the study were analyzed through the application of both descriptive and inferential statistical tools. Unit root test (ADF) was adopted as a pre-estimation technique. After the estimation, a diagnostic test of misspecification, robustness/ heteroscedasticity were carried out to assess the validity of the empirical model. The study adopts a survey design. Unit Root Test, and Granger Causality Pre-estimation tests were carried out to avoid spurious parameters. After the estimation, a diagnostic test of misspecification, robustness/heteroscedasticity, autocorrelation and multicollinearity were carried out to assess the validity of the empirical model. Objective I was achieved using Granger Causality Test. Objective II was achieved using Trend analysis growth model while Objective III was achieved through the use of distributed lag model.

3.1 Unit Root Test -Augmented Dickey-Fuller (ADF) Model

The AugmentedDickey–Fuller (ADF)test consistsof estimating the following regression:

$\Delta y_t = x_t'\beta + \delta y_{t-1} + \sum_{i=1}^{p} \Delta y_{t-p} + \varepsilon_t$…… (6)

Where Δ= difference operator; y=vector of the n variables (i.e. interest rate, exchange rate, government expenditure, etc); x = optional exogenous regressors which may consists of constant or a constant and trend; p = number of lags; ε_t= error term. Null hypothesis: H_0: $\delta = 0$ (i.e., there is a unit root or the time series is non-stationary, or it has a stochastic trend).Alternative hypothesis: H_1: $\delta < 0$ (i.e., the

http://dx.doi.org/10.22161/ijeab.4437 *ISSN: 2456-1878*

time series is stationary, possibly around a deterministic trend). If the ADF statistic is greater than the critical value at 5% level of significance, that means the series is stationary, if the ADF statistic is less than the critical value at 5% level of significance, it means the series is non-stationary.

3.2 Growth trend Model

$Yt = Y_0 (1 + r) t$ …..…… (7)

Where Y_t= rate of agricultural growth; Y_0 = rate of agricultural growth in a base year; r = compound rate of growth of Y; t = time in chronological years in natural log form we have

$InY_t = lnY_0 + tln(1 + r)$ ……..…… …(8)

Substituting InY_0 with β_1 and $Ln(1 + r)$ with β_2, we re-write equation as

$InY_t = \beta_1 + \beta_2 t$ ……..... (9)

Adding the disturbance term to equation we obtain

$InY_t = \beta_1 + \beta_2 t + \mu t$ ……..…… (10)

Equation (10) is a growth rate model developed for this study. A semi-log growth model was developed for this study instead of a linear trend model because the point of interest in this study is both absolute and relative change in the parameters of interest. The most important parameter in equation (10) is the $coefficient\beta 2$. This is the coefficient of the slope which measures the constant proportional or relative change in Y for a given absolute change in the value of the regressor, t. Multiplying $\beta 2$ by 100 gives the instantaneous growth rate at a point in time.

IGR=β_2 x 100…..…… (11)

Where: IGR= Instantaneous growth rate

According to Gujarati (2009) β_2 is the least-square estimate of the coefficient of the slope $\beta 2$, then taking the anti-log of β_2 and subtracting 1 from it and then multiplying the difference by 100 give the compound growth rate (CGR) over a period of time:

CGR = [antilog $\beta_2 - 1$] x 100 ……..……..(12)

If the coefficient β_2 is positive and statistically significant or negative and statistically significant there is acceleration or deceleration in growth process respectively. If β_2 is not statistically significant there is stagnation in the growth process.

3.3 Dynamic Model: Finite Distributed Model

$InAgth_t = b_0 + b_1 Inforex_t + b_2 Ini\_rate_t + b_3 Ininf_t + b_4 lnmss_t + e_t$..(13)

Where *In* = natural logarithm; $b_0 - b_9$ = parameters to be estimated; *Agrth* = is the annual aggregate agricultural contribution to GDP in millions of naira; *forex* = exchange rate measured as annual average exchange rate of Nigeria naira to one US dollars; *i_rate*= interest rate measured as weighted average of prime lending rate of commercial banks *infl* = inflation rate measured as the percentage change in the general price of all goods and services (%); mss = money supply measured as the total money in circulation broad money (M2 in ₦); $pcnstr_{t-1}$ = lag of policy instruments; e_t = is a stochastic error term that satisfies the normal classical regression assumptions. Macroeconomic policies that resulted in price distortion, promotion of market incentives associated with highly valued domestic currency may favor sustainability of resources through agricultural investment, increased labor productivity, utilizing land, labor and other resources. However, it may also lead to over-application of high external inputs, over-exploitation of resources depending on the level of utilization and the level of technology or other related factors. A priori, we assume that the interest rate is negatively related to agricultural growth while exchange rate could be positive or negative depending on the prevailing situation.

IV. RESULTS

4.1 Pre-Estimation Test :Unit Root Test

Table 2 reports the Unit root test results for Annual real Exchange rate in percent (*forex)* Prime lending rate of commercial rate (%)(*i_rate*); Money supply M2=broad money (*mss*) and Annual inflation rate-CPI for all items (*N_fla*).

Table 2: Results of augumented Dickfuller Unit root test

Variable	ADF Statistics Z(t)	Mackinnon critical value@5%	differenced level	P-value Z(t)	Remarks
Agrth	-3.668	-1.688	1(0)	0.003***	Stationary
Forex	-2.072	-1.688	1(0)	0.023**	Stationary
i_rate	-6.088	-1.688	1(0)	0.000***	Stationary

http://dx.doi.org/10.22161/ijeab.4437 *ISSN: 2456-1878*

N_fla	-5.070	-1.688	1(0)	0.000***	Stationary
Mss	-4.723	-1.688	1(1)	0.000***	Stationary

Source: Computed from secondary data, 2018

Note: *** significant at 1%; ** significant at 5% and * significant at 10%.

The results are summarized in the table 2. From the table, most the variables are stationary at order I (0) except money supply(*mss*) which is stationary at first difference. Therefore the null hypothesis of non-stationarity is rejected at 5% level of significance.

4.2 Granger Causality Test between Policy Instruments and Agricultural Growth

The result of the pair wise granger causality test between policy instruments and agricultural growth is presented in table 3.

Table 3: Granger pair wise causality test between policy instruments and agricultural growth

Null Hypothesis	Df	Chi2- Statistics	Probability	Decision
i_rate does not granger cause *agrth*	3	32.342	0.006***	Rejected
agrth does not granger cause *i_rate*	3	5.331	0.149	Not rejected
lnforex does not granger cause *Agrth*	3	20.497	0.000***	Rejected
Agrth does not granger cause *inforex*	3	5.307	0.151	Not rejected

Source: Computed from secondary data, 2018

Note: *** significant at 1%; ** significant at 5% and * significant at 10%.

The result showed that there exist a unidirectional relationship between interest and agricultural growth on the one hand and exchange rate and agricultural growth on the other*:* (P=0.000<0.01) and (P=0.000<0.01) respectively which imply that change in exchange rate and interest rate policy instruments will affect agricultural growth just in Nigeria. Therefore the null hypothesis was rejected while the alternative hypothesis was not rejected. The implication is that all the variables indicated are causes changes in agricultural growth in Nigeria.

4.3 Instantaneous and Compound Growth Rate of Policy Instruments, Agricultural growth Rate and Sustainability Indicators

The result from trend analysis of agriculture output (*agrth*); Exchange rate (*forex); interest* rate (%)(*i_rate*); Money supply M2=broad money (*mss*); is presented in table 4.From the table the trend of policy instrument showed that there was acceleration in the growth in policy instruments but deceleration in money supply (mss) with no recorded stagnation during the period under review. The instantaneous growth rate (at a point in time) for agriculture (P=0.000<0.01) was 5.9%. This means that the relative change in agricultural output with respect to absolute change in the trend variable was 5.9% while the compound (over the period under review) rate of growth amounted to 6.08%.The implication is that there was a general improvement in the agricultural growth process in Nigeria during this period even though the growth may not be as expected. There was acceleration in growth for exchange rate (P=0.000<0.01), interest rate (P=0.198>0.1) with instantaneous and compound growth rate of 17.5%, 18.55%; 0.61%, 0.62%; respectively.

Table 4: Instantaneous and Compound Growth Rate

	Instantaneous growth rate%	Compound growth rate%	P-value
Agrth	5.90	6.08	0.000***
Inforex	17.02	18.55	0.000***
i_rate	0.619	0.62	0.198
Mss	-1.109	-1.02	0.000***

Source: Computed from secondary data, 2018

Note: *** significant at 1%; ** significant at 5% and * significant at 10%.

Although efforts were made through the use of monetary and fiscal policies to improve macro-economic stability and stimulate growth (Oluwatobi and Ogunrinola 2011) the growth rate of exchange rate and interest rate may well suggest failure of policy instruments application in this regard. The implication of the empirical results is that the targets sets by the government of Nigeria are not achievable since government has not utilized macroeconomic policy instruments such that revenue generation is increased through the productivity of resources to meet national objective for agricultural growth and resource sustainability given the pressure on natural resources.

4.4 Impact of Exchange Rate and Interest Rate Policy Instruments on Agricultural Growth

The result of the impact of exchange rate and interest ratepolicy instruments on agricultural growth from finite distributed lag model is presented in Table 5. From the table, the intercept term has a coefficient of -32.0484 this implies that without the use of policy instruments, agricultural growth will be negative, -32.05% (P=0.049<0.05). The value of the R^2 was 0.8898. This means that 88.98% of the variation in agricultural growth is accounted for by exchange rate (*forex*), interest rate (*i_rate)* and inflation rate (*N_fla*). The F-statistics (P=0.000<0.01) was statistically significant at 1% indicating that all the variables included in the model jointly exert significant impact on agricultural growth. This further shows that monetary policy tools are indispensable tool of agricultural development. The coefficient of exchange rate (*forex*) policy instrument was 1.50 and (P=0.049<0.05) therefore statistically significant at 5%. This implies that the devaluation of exchange rate policy instrument resulted in 1.5% increase on agricultural growth on the average. This is rather surprising because it is expected that increase in exchange rate will increase the cost of inputs and hence decline in agricultural productivity and growth but the result has indicated otherwise. This is likely due to fact that the exchange rate in Nigeria has largely been fixed, relatively stable without a drastic increase except in 2015 when policy makers devalued the naira, N365 /1US$ from N197/1US$ as depicted in the graph of exchange rate. It is also an indication that exchange rate stimulated investment and hence growth.

Table 5 showing estimate of both monetary policy instruments from Finite Distributed Lag Model

Variables		B-Coefficient	Standard error	T-value	P-value
Lnforex		1.5001	0.72711	2.06	0.049**
i_rate		-1.8278	0.71398	-2.56	0.016**
i_ratesq		0.0431	0.01758	2.45	0.021**
N_nfla		-1.3623	4.40567	-3.08	0.005***
agrth_1		0.3833	0.14005	2.74	0.011**
_cons		-32.048	31.379	-1.02	0.016**
Number of obs	=		38		
F(10, 27)	=		21.79		
Prob > F	=		0.000		
R-squared	=		0.8898		
Adj R-squared	=		0.8489		
Root MSE	=		1.1647		

Source: Computed from secondary data, 2018

Note: *** significant at 1%; ** significant at 5% and * significant at 10%.

This result is in agreement with Agénor (1995) who opined that real exchange rate depreciation actually boosted output growth. Mireille (2007) argues that overvaluation of exchange rates have constituted a major setback in the recovery process of Nigeria and Benin Republic. In addition, the author suggests that devaluation accompanied with well-targeted measures alongside an upward adjustment in the domestic price of tradable goods, could restore exchange rate equilibrium and improve economic performance. The finding is also in agreement with Ajisafe and Folorunsho (2002) who posited that foreign exchange appreciation is negatively related to agricultural growth and depreciation of exchange rate can be beneficial in some instances. For example, India in the 1990s devaluated its currency and in 1994 countries such as Côte d'Ivoire, Senegal and Mali devaluated their currencies. For instance, in narrowing the gap between its official and parallel exchange rates, Ghana carried out a step-wise devaluation of its official nominal exchange rate concurrently with fiscal reforms in order to reduce the deficit. But Sierra Leone met with great difficulties in trying to close the gap between the official and parallel market exchange rates, they faced a major problem of fiscal imbalance (World Bank, 2007). Edwards (1989) found that long-term effect of

a real devaluation was more mixed; but as a whole it was suggested that the initial contractionary effect was not reversed subsequently. In the long run however, it is not possible to achieve real growth by continuously devaluing the domestic currency (Cafiero, 2003).

The coefficient of interest rate (*i_rate*) was -1.828 withP=0.016<0.05 which is also statistically significant at 5%. This means that a proportionate increase in interest rate resulted in -1.83% average decreases in agricultural growth ceteris paribus. The implication is that raising interest rate will have negative impact on agricultural growth. According to Agosin and Meyer (2000) macroeconomic stability actually stimulates inflows hence, aggregate level of growth in agriculture. Therefore, interest rate may have affected the cost of borrowing; the funds used to finance investment expenditures for capital goods and consumption expenditures for durable goods and became a disincentive to borrowing for agricultural activities. Inflation rate (*N_fla*) as a control variable had coefficients of -1.362 (P=0.005<0.01) this means that a proportionate rise in inflation resulted in -1.83% average decrease in agricultural growth ceteris paribus. This was expected. Although the institutions including political, financial and administrative - could also be major determinants of agricultural growth, the finding showed that monetary policy instruments are major requirement for agricultural and economic growth.It should be noted however that the impact of the change in the monetary policy instruments on the agricultural growth may also depend on the total policy package.

Diagnostics Test

Ramsey (1969) regression specification-error test (RESET) for omitted variables, Table 6. *estat ovtest* performs two versions of the test. This test amounts to fitting y=xb+zt+u and then testing t=0. If option rhs is not specified, powers of the fitted values are used for z. If rhs is specified, powers of the individual elements of x are used.

Model Specification Error Test

Table 6: Ramsey RESET test using powers of the fitted values of agrth

F-value	Df	Prob >F	Decision
0.296	3	0.133	Not rejected

Ho: model has no omitted variables

Source: Computed from secondary data, 2018

Note: *** significant at 1%; ** significant at 5% and * significant at 10%.

From the result (P=0.133>0.1) so the null hypothesis is not rejected. Diagnostic tests carried out above indicate that estimated models have correct functional form, there is no omitted variable and no irrelevant variable is included. The implication is that the model for monetary policy instruments and agricultural growth is correctly specified and no serious error of misspecification. It should be noted however that this testis a limited tool to detect specification errors just as any other tools. This is because RESET loses statistical power rapidly as powers of estimated y are added.

Autocorrelation and Multicollinearity

Multicollinearity is not a problem among the variables because Stata does this automatically by removing perfect collinearity. The command *estat bgodfrey in STATA* performs three versions of the Breusch-Pagan (1979) and Cook-Weisberg (1983) test for autocorrelation. The result of Breusch-Godfrey LM test for Autocorrelation is shown in table 7.

Table 7: Breusch-Godfrey LM test for Autocorrelation

Lags(1)	Chi2	df	P>chi2	Decision
1.396	1.483	1	0.2233	Not rejected

H0: no serial correlation

The result from the table indicated (P=0.2233>0.1). The result showed that the model has no serial correlation since the null hypothesis of no-serial correlation is not rejected at all levels of significance.

Heteroscadasticity

The result of Breusch-Pagan / Cook-Weisberg test for heteroskedasticity is presented in table 8

Table 4.12. Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Variables:	Chi2	df	P>chi2	Decision
fitted values of agrth	1.65	1	0.3251	Not rejected

Ho: Constant variance

Source: Computed from secondary data, 2018

Note: *** significant at 1%; ** significant at 5% and * significant at 10%.

The result from the table indicated (P=0.3251>0.1) therefore the null hypothesis of constant variance is not rejected at all levels of significant. According to Adkins and Hill (2008) the least square estimator can be used to estimate linear model even when the errors are heteroscadastic because the estimates will still be unbiased

and consistent especially with time series data. The only problem will be that the variance –covariance matrix is not precise. However the use of robust variance-covariance estimator (VCE) in stata corrected the problem.

V. CONCLUSION

The findings revealed that agricultural growth adjusted fairly to the dynamics of monetary policy instruments in Nigeria. The instantaneous growth rate for agricultural output was 5.9% while the compound rate of growth amounted to 6.08%. There was acceleration in growth exchange rate and interest rate policy instruments with instantaneous and compound growth rate of 17.5%, 18.55%; and 0.61%, 0.62% respectively. There exist a unidirectional relationship between exchange rate and interest rate with agricultural growth. Interest rate yielded a negative impact of -1.83% on agricultural growth while exchange rate produced positive impact of 1.5%. Therefore unfavorable macroeconomic policies driven by unstable interest rate among others impacted negatively on agricultural growth. It is recommended that interest rate as a policy instruments needs to be stabilized to sustain investors' interest for increased growth in agriculture. Additionally narrowing of the foreign exchange gap is essential since its relative price influences other prices and the devaluation of the naira led to higher domestic prices. These may help government of Nigeria to achieve the desired growth in agriculture with possible positive results in key economic indices such as real GDP growth, growth in foreign reserves, and downward trend in inflation and reduced unemployment rate.

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