Agricultural Growth and Macroeconomic Disparities in Nigeria: An ECM Approach

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Abstract: **This study examined the effect of macroeconomic disparities on agricultural growth in Nigeria between 1985 to 2020. The macroeconomic variables adopted for the study include—exchange rate (EXR, inflation rate(INF), interest rate (INT) and government expenditures (GEX) on agricultural growth. The study utilized Error Correction Model (ECM) in the analysis of the short and long run coefficients. To prevent spurious regression, Augmented –Dickey Fuller (ADF) and Phillip Peron Tests were carried out on each of the variables to determine their level of stationarity. All variables were found to be integrated of order one I(1). Since all variables have unit root at levels, the long run relationship among the variables was tested using Augmented Engle-Granger test. The test showed cointegration. The results of the analyses of short run model showed that macroeconomic variables interest rate, exchange rate exerts significant impact on agricultural growth in both the short run and the long run. Though government expenditures on agriculture was significant in the short run, it was not in the long run. Inflation was not significant in both short and long run. Diagnostic tests such as Normality, autocorrelation and heteroscedasticity tests were carried out on the model output to establish the robustness or otherwise of the models. It was found that the residuals were normally distributed, free from autocorrelation and homoscedastic, lending credence to the robustness of the work and its ability to make correct forecast. The study recommendations that government should devise means of giving soft loans to farmers who may not be able to afford the cost of borrowing in any financial institution.**

Keywords: **Agriculture, macroeconomic variable, Error correction model, Interest rate, exchange rate, government expenditure**

I. INTRODUCTION

Efficient agriculture and agricultural sector play a central role in achieving economic development of any country and particularly developing country like Nigeria. According to Ojo and Akanji (1996), agriculture is the most important single sector that employed about 70% of the population, inspite of the predominance of the petroleum sector in recent times, thus, agriculture remains a major source of economic resilience. In earlier time, agriculture played a critical role in advancing economic development in Nigeria through the provision of the needed foreign exchange earning for capital development projects. With reference to the earlier trade in palm oil, agricultural export grew to include cocoa beans and palm kernel. As such, the sector contributed to over 75% of total annual export in Nigeria (Ekpo and Egwaikhide 1994). Consequently, with the discovery of crude oil, the sector has been grossly neglected. Though series of government has made impressive attempt to arrest the situation, still not much impact from those attempts by the government tshas yield any significant result. Available statistics by the National Bureau of Statistics (NBS, 2021), showed that Nigeria food price inflation rose to 22.95 percent, from 14.86 percent in April 2016.

Efficient agriculture is a product of sustained agricultural investment. As such, the long neglect of the sector by the government, accompanied by macroeconomic disparities summed the influencing factor affecting agricultural investment. Incidentally, macroeconomic environment constitutes one of the major pillars for the growth of any enterprise in a country. While at present, Nigeria has lost its modest role as one of the world's leading major exporters of agricultural commodities. Researchers and economist held that macroeconomic disparities could exert significant influence on agricultural economy. In this study, the macroeconomic variables utilized include-interest rate, exchange rate, inflation and price of commodity.

In line with the foregoing, some studies have examined macroeconomic disparities and agricultural growth. Top of the list is Schuh (1974), he argued that tight monetary policy increases rate of interest, inducing capital inflows which causes the exchange rate to depreciate, hence, this circumstances ruin agricultural growth. The currency depreciation would raise agricultural prices, increase interest rate and decrease credit availability. More so, Loho (2014) held that exchange rate influences macroeconomic variables such as interest rate and inflation. As such, each exchange rate regime has its own strength and weakness with respect to economic output. However, study by (Pash and Fatima, 1998) showed that inflation and interest rate have a causal relationship. As interest rate is lowered, agricultural sector will have more money to invest, causing the sector to grow and inflation to rise. On the other hand, as interest rate is increased, agricultural sector will have less money to invest. With less investment, the sector's growth will slow, inflation decreases and less labour are hired.

Incidentally, conducive macroeconomic environment stimulates the productivity and growth of agricultural sector which can propel them to a stage where they can access financing projects for sustained growth. High lending rate tends to discourage farmers from borrowing for expansion, thus growth is retard. Moreover, high inflation is an indication of economic instability and lack of budget control. As such,

the high volatility that results from relative prices, occasioned by inflation subverts the efficiency of the price mechanism in the factor input allocation. Accordingly, if money should be allowed to serve as a factor of production, it reduces productivity and if that happens agricultural growth would be decimated.

Paradoxically, efficient agriculture is a measure of the extent to which the other components of the sector is effectively utilized. It is also expected that the agricultural growth would have a positive linkage with other sectors, especially the manufacturing sector and other industrial sub-sector. This study aims at evaluating the effect of macroeconomic disparities on agricultural growth in Nigeria. The hypothesis is stated in null form as H0: macroeconomic disparities does not influence agricultural growth in Nigeria.

II. LITERATURE REVIEW

2.1 Theoretical Literature

It is necessary to review relevant literatures so as to place our argument and discussions in proper theoretical and empirical perspective. As such, the objective of most economies of the world has focused on the achievement of a sustainable and inclusive. As a result of this, lots of attention has been generated among the various schools of thought starting from the Classical to the Neo-classical. In the debate regarding growth theory, the neo-classical exogenous growth theory climaxed the school of thought for decades. The prepotent of the theory is the Solo-swan growth theory. This explains the illustrates the long run growth rate of output based on two exogenous variables. As such, the theory postulate that output growth can be influenced by technical progress and growth of capital and labour input. This theory is found inertly relevant to this study because the growth rate of agriculture can be hinged on the growth rate of technical progress and growth rate of capital and labour input. Where these factor inputs are in short supply, the growth rate of agriculture would slow. Moreover, this theory offers limited channels for macro-policy stimuli. Therefore, the technical progress is implicitly exogenous (Jhingan M.L, 2010). Therefore, in solow's formulation, economic growth is a function of capital accumulation, an expansion of labour force and exogenous factor, technological progress which makes physical capital and labour more productive. That is: $Y_t = (K_t, A_t, L_t)$

Incidentally, a variant model or theory to exogenous theory by Solow-Swan was propounded by Romer (1986) and Lucas (1988). Therefore, endogenous growth theory attempt to illustrate steady growth rate of output based on endogenous factors. The theory held that technical changes can be endogenous and that changes in the stock of capital (human and non-human) might trigger positive externalities. However, most policy implications are mainly microeconomic in nature, as such, the theory did not ascribe any explicit role to macroeconomic policies. Nevertheless, evidences based on the experiences of the 1970s and 1980s, made many economists to shoulder that sound macroeconomic policies are sufficient and necessary for the achievement of a long-run sustainable growth. Macroeconomic policies are tools through which government of an economy tries to regulate economic affairs of a country in line with set objectives. This can be either monetary or fiscal. Monetary policy involves government control of the money supply in an economy using certain instruments. In other words, monetary policy is a deliberate attempt to control money supply and credit condition through manipulation of interest rate for achieving certain broad economic objectives like economic growth, stability in the rate of inflation and exchange rate as well as employment, Rightsman (1976). Monetary policy can be either expansionary or contractionary. It is contractionary if it aimed at reducing the size of money supply or raising the interest rate, while for an expansionary policy the reverse is the case. Fiscal policy on the other hand involves the use of government expenditure, taxes and subsidies inform of reliefs to promote growth. Consequently, the theoretical framework for this study is anchored on Solow growth theory.

2.2 Empirical Literature

Oyetade, Sheri and Azam (2016) examined the impact of macroeconomic variables influencing agriculture in Nigeria between 1981 to 2013. The study utilized multivariate cointegration approach for investigating their relationship. The found that a long run relationship between the agricultural output and the explanatory variables (commercial bank loan on agriculture, interest rate, inflation rate, exchange rate, food import value, unemployment rate). The study concluded that commercial bank loan, interest rate, food import value are significant variables that affect agricultural output in Nigeria. Whereas, exchange rate, inflation rate and unemployment rate are insignificant. The study recommended that adequate financing of agriculture will improve the sector.

Aroriode, O.R, Ogunbadejo, H.K (2014) examined the impact of macroeconomic policy on agricultural growth in Nigeria. They utilized timeseries data and econometric analysis in the study. The results show that Gross Domestic Product (GDP), Credit Loan to Agriculture (CLA) and exchange rates are significant with positive influences. Income elasticity of agricultural growth was low at 0.939 percent indicating the income inelastic nature of agricultural commodities. The result also showed that there is a positive relationship between the dependent variable (Agricultural Output) and the independent variable (GDP). More so, money supply exerts an inverse relationship (negative influence) on agricultural production which is contrary to expectations. The interest rate is positive but insignificant which can be explained by the restrictive monetary policies. Equally, a restrictive monetary policy can cause farm incomes to fall

Yaqub [2010] on the sectoral analysis of the impact of exchange rate on output in Nigeria, using seemingly unrelated regression estimation technique found that exchange rate had a significant contractionary effect on Agricultural output; hence existing structures do not support an expansionary

depreciation argument. In a related study by Adetoun (2010), using the descriptive statistical analysis, his result reveals that change in monetary policy instruments cause changes in agricultural output with a long-run equilibrium relationship between the monetary policy variables and growth in output. The study further recommended that enlightening the farmers on how monetary policy changes affect agricultural output.

Iganiga and Unemhilin (2011) examined the effect of federal government farming spending on agricultural yield coupled with other factors like aggregate commercial credits to agriculture, annual average rainfall, and growth rate of population, inflation rate, food importation and GDP growth rate. Co-integration and ECM were used for analyzing long and short- run effects of the variables on the agricultural yield. It was concluded that savings in the agriculture is vital and ought to be accompanied with supervised credit facilities. In addition, food importation should be ban in order to encourage local production.

Adofu and Agama (2012), studied "Government Budgetary Allocation to the agricultural sector and its effect on agricultural output in Nigeria", using government budgetary allocation to the agricultural sector and commercial bank credit to the agricultural sector as our explanatory variables. They examined the effect of government budgetary allocation to the agricultural sector on the output of the agricultural sector. Data were obtained from CBN's Statistical Bulletin and NBS's Annual Abstract of Statistics. Employing the OLS regression technique, the results revealed that budgetary allocation to agricultural sector has significant effect on agricultural production in Nigeria and that the relationship between them was strong, positive and significant.

Sunday, Ini-mfon, Glory, and Daniel, (2012), investigating the short-run and long-run elasticity of agricultural productivity with respect to some key macro-economic variables, using the techniques of co-integration and error correction models. Their result revealed that in the short and long-run periods, the coefficients of real total exports, external reserves, inflation rate and external debt have significant negative relationship with agricultural productivity in the country, whereas industry's capacity utilization rate and nominal exchange rate have positive association with agricultural productivity in both periods.

III. METHODOLOGY

3.1 Model Specification

The neo-classical Solow model was used in this work. According to Solow (1956), economic growth is a function of capital accumulation, an expansion of labour force and exogenous factor, technological progress which makes physical capital and labour more productive. Thus, Solow's formulation is given as:

$Y_t = (K_t, A_t, L_t)$ ……..3.1

WhereY_t = Aggregate real output.K = Capital stockA = Efficiency factort = Time dimensionL = Labour

The relationship between the output of agriculture and these variables can be expressed in the form of a production function:

Y= f (K, L,T)..... 3.2

Where Y= Aggregate Output, K= Capital stock, L= Labour Supply and T= The scale of technological progress

The production function then takes the following form:

Y= f (K, L).....3.3

Based on Solow theory upon which this model is based, labour and capital are substitutable for each other; hence, the modified model can therefore be expressed as:

Y= f (K) 3.4

By representing the model in a stochastic form, we have

$Y_t = \alpha + \alpha K_t + u_i$..... .....3.5

Given that K=I…….3.6

Therefore,

$Y_t = \alpha + \alpha I_t + u_i$.....3.7

Where I = Investment, since capital (K) equals investment; investment itself is determined by macroeconomic variables, hence

I= *f* (INT, EXR, INF and GEX) ..……3.8

By substituting equation 3.8 into equation 3.7 and replacing Y_t with AQ (replacing total national output with agricultural output), which is the focus of this work, we have,

$AQ=\alpha_0+\alpha_1 INT+\alpha_2 EXR+\alpha_3 INF+\alpha_4 GEX + \boldsymbol{u_i}$....3.3.9

For estimation purpose, equation (3.9) is re-specified in a log-linear functional form in order to linearize non-linear variables.

$Log\ AQ=\alpha_0+\alpha INT+\alpha_2 EXR+\alpha_3 INF+\alpha_4 LogGEX + \boldsymbol{u_i}$……...3.10

Where

AQ represent annual growth rate of agricultural output.

INT represents interest rate

EXR represent exchange rate

INF represent inflation rate

GEX represent government expenditure

u_i represent Stochastic Error term

The apriori expectation of how those explanatory variables influence the agricultural sector is:

$\alpha_1<0;\ \alpha_2<>0;\ \alpha_3<>0;\ \alpha_4>0;$

The above sign ($\alpha>0$) implies a positive relationship between agricultural sector productivity and the coefficients of the explanatory variables, while on the other hand ($\alpha<0$) denotes a negative relationship. The symbol ($\alpha<>0$) means that the coefficient could either be positive or negative.

3.2 Estimation Procedure

To avoid spurious regression result, all the series are tested for stationarity by using Augmented Dickey-Fuller (ADF). The model for the test is stated thus:

$$\Delta Yt = \alpha + \beta Yt_1 + \sum_{t=1}^{n} \beta j \Delta Yt_{-1} + \varepsilon i \ldots\ldots\ldots\ldots\ldots\ldots 3.11$$

$$\Delta Yt = \alpha + Yt + \beta Yt_{-1} + \sum_{t=1}^{n} \beta j \Delta Yt_{-1} + \varepsilon i \ldots\ldots\ldots\ldots 3.12$$

Where εi= pure white nose error term

Δ = difference operator
t = Trend
ε_i=Pure white noise.
The hypothesis is stated thus:

H_0: β=0 (the time series is non-stationary i.e. there is a unit root)

When compared ADF test statistic with the Mackinon criterion at a 5% level of significance. If ADF test statistic is greater than the Mackinon criterion or the P-value is less than 0.05, we reject the null hypothesis and conclude that the time series is stationary otherwise we do not reject H_0. If the variables are integrated of order zero I(0), the model will be estimated at levels i.e. without differencing otherwise, they are estimated at whatever level of integration they assume.

More so, to further avoid scenario of spurious regression, the augmented Engle-Granger (AEG) test was used to test for cointegration. This is preferred to Engle-Granger (EG) because it takes care of possible autocorrelation among the variables. In econometrics, two variables are cointegrated if they have a long term or equilibrium relationship between them (Gujarati and Poter 2009). If the generated residuals are stationary at level form or integrated of order zero i.e. I(0), then, the variables are cointegrated. The AEG test is specified as:

$$\Delta\mu_t = \delta\mu_{t-1} + \alpha_1 \sum_{i=1}^{n} \Delta\mu_{t_{-i}} + V_t \qquad ...3.13$$

Where:
μ_t=error term from cointegrating regression
μ_{t-1}= lagged value of the generated error term.
n = lag length
v_t = white noise error.
Hypothesis to be tested here is:
H_o:□ =0 (no cointegration)

If at 5% level of significance, Augmented Dickey-Fuller test or tau(τ)value is greater in absolute term than the critical value or it is more negative than the critical value, we reject the H_o and conclude that the variables are cointegrated otherwise we do not reject the H_o(Gujarati and Poter, 2009) the satisfaction of the above condition led to the adoption and utilization of Error Correction Model (ECM). The justification for ECM is that it shows how fast the system returns to long run equilibrium any time there is disequilibrium in the system. The a priori expectation is that the ECM coefficient must be negative and significant for errors to be corrected in the long run. The higher the coefficient of ECM, the faster the speed of adjustment towards the long run equilibrium will be.

As such, the estimated model is specified thus:

$$\Delta LogAQ = \alpha_0+\alpha_1\Delta LogINT+\alpha_2\Delta LogEXR+\alpha_3\Delta LogINF+\alpha_4\Delta LogGEX + ECM_{t-i} + \mu_{t-i} \ldots\ldots\ldots 3.14$$

IV. PRESENTATION AND ANALYSIS OF REGRESSION RESULT

4.1 Stationarity Test

Table 1: Unit Root Test Statistics (Augmented Dickey-Fuller and Phillips-Perron tests)

Variables	Adf Value (Constant And Trend Included)			PP Value (Constant And Trend Included)			--
---	LEVELS	1ST DIFF.	P-value	LEVELS	1ST DIFF.	P-value	I(d)
Log(AQ_t)	-3.178	-6.326*	0.0001	-3.135	-11.002*	0.0000	I(1)
Log(INT_t)	-1.593	-4.098*	0.0033	-2.154	-10.941*	0.0000	I(1)
Log(EXR_t)	-2.212	-5.269*	0.0008	-2.212	-5.266*	0.0008	I(1)
Log(INF_t)	-2.740	-5.349*	0.0001	-2.613	-8.583*	0.0000	I(1)
Log(GEX_t)	-2.748	-6.882*	0.0000	-2.638	-18.043*	0.0001	I(1)
Critical values (5%)	-3.548	-3.558	--	-3.548	-3.552		

Source: Author's Computation. Eviews 9.0, 2021

Table 1 shows both the ADF and PP unit root tests summary. All the variables at levels are non-stationary at 5 percent level of significance because the P-values are all greater than the 5% (0.05) level of significance for all the variables for both ADF and PP criteria. The null hypothesis of non-stationary time series i.e. there is a unit root cannot be rejected. At first difference, however, all the variables are stationary because the P-values are all less than the 5% (0.05) level of significance. In this case, the null hypothesis of non-stationarity is rejected and hence, all variables are integrated of order one I(1) thus paving the way for cointegration test, which measures the long run relationship among the variables.

4.2: Cointegration Result

Table 2: Cointegration Test (Unit Root Test on Residuals)

Variable	Augmented Dickey-Fuller (ADF) Test	Critical Value at 5%	Order of Integration
ECM (U_{t-1})	-3.256507	-1.951000	I(0)

Source: Author's computation. Eviews 9.0, 2021

Augmented Engle Granger cointegration test requires that, a long run regression is carried out on the model to generate the series' residuals; unit root test is then conducted on the residuals at levels and if the residuals are integrated of order zero I(0), thenthe variables are said to be cointegrated. That is, they have long run relationship (Gugarati and Porter, 2009). If two variables Y and X are cointegrated, the relationship between the two can be expressed as ECM. Consequently, the null hypothesis of no cointegrationis rejected and thus, conclude that the variables are cointegrated. This is because, the ADF value is greater than the 5% (0.05) critical value in absolute term at levels i.e. order of integration is zero, I(0). The result provides evidence for the long run relationship among the variables and hence, validates its efficiency for prediction, forecast and policy recommendations. As such, the cointegration result paved way for the adoption and utilization of ECM.

4.3: Short Run Model Estimation Result

Table 3.Short-run Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002426	0.031250	0.077645	0.9387
D(LOG(INT))	-0.312871	0.118357	-2.953653	0.0344
D(LOG(EXR))	0.109341	0.013242	1.982370	0.0417
D(LOG(INF))	-0.000658	0.038600	-0.017044	0.9865
D(LOG(GEX))	0.455572	0.041405	0.756841	0.0238
ECM(-1)	-0.315191	0.148865	-2.117303	0.0432
R^2 =0.81; Adj R^2=0.77; F-Statistics 13.11 (P-value 0.028)				

Source: Author's Computation. Eviews 9.0 , 2021

The output of table 3 is result of Error Correction Model (ECM). From the table, the R^2 of 0.81 shows that about 81 percent of the explained variable, D(LOG(AQ) is explained by the explanatory variables while the remaining are exogenous to the model. The F-statistics of 13.11 with corresponding probability statistics of 0.028 indicates that the entire model is statistically significant. That is, all independent variables have joint significant impact on the dependent variable. The Akaike Information Criterion (AIC) was used in the selection of the lag length, which was zero lag.

The result shows D(LOG(INT) has negative and statistically significant impact on the D(LOG(AQ) in the short run, based on the p-value of about 0.034, which is less than the usual critical value of 0.05(5%) level of significance. This negative coefficient agrees with the apriori expectation of inverse relationship between agricultural output and interest rate. The coefficient -0.33 of D(LOG(INT) shows the elasticity of agricultural output with respect to interest rate in the short run. If interest rate goes up by 1%, holding other independent variables constant, agricultural output falls by about 0.31% This implies that, as interest rate rises, farmers will reduce their application for loans and hence reduce investment and subsequently, a fall in output. Exchange rate D(LOG(EXR)also have positive and significant impact on agricultural outputD(LOG(AQ). This is because; the p-value of about 0.04 is less than the 5% critical value.The coefficient 0.10 of D(LOG(EXR) shows the elasticity of agricultural output with respect to exchange rate in the short run. If exchange rate goes up by 1%, holding other factors constant, agricultural output increases by about 0.10%. the reason for this may be because, a fall in the value of the country's currency may make the export cheaper, hence more foreign buyers, which encourages the farmers to produce more, all things being equal.

Though inflation complies with apriori expectation of negative coefficient, it is however not significant in the short run in affecting agricultural output. This is because its p-value of 0.98 is greater than the acceptable critical value of 0.05. Government expenditures on agriculture D(LOG(AQ) complies with apriori expectation of positive coefficient and at the same time is significant. This is because the P-value of about 0.02 is less than the 5% rule of thumb level of significance; hence, we conclude that government spending on agriculture has significant impact on the D(LOG(AQ)in the short run. Therefore, the coefficient 0.45 of D(LOG(GEX) shows the elasticity of agricultural output with respect to government expenditures on agriculture in the short run. If D(LOG(GEX) goes up by 1%, ceteris paribus, agricultural output increases by about 0.45%.

The ECM coefficient of (-0.31) complies with apriori expectation of negative sign and it is also statistically significant since its p-value 0.043 is also less than the critical value of 5% (0.05). The implication of this is that, whenever the system is out of equilibrium, it is corrected with a speed of about 31% annually. This percentage shows that the system quickly corrects itself and returns to equilibrium. The coefficient also shows that there is a long run causality running from all the explanatory variables to the dependent variables in the short run since it is negative and significant.

4.4 Diagnostic Checking

Table 4: Autocorrelation Test Result

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.914671	Prob. F(2,25)	0.1684
Obs*R-squared	4.383321	Prob. Chi-Square(2)	0.1117

Source: Author's Computation. Eviews 9.0

From the result obtained from table 4, since the p-value of observed R-squared (0.11) is greater than 5% (0.05) level of significance, we cannot reject the null hypothesis of no serial/autocorrelation; hence, we conclude that the error terms are not serially correlated. This lends credence to the robustness of the work and its forecast ability.

4.5 Test of Heteroscedasticity

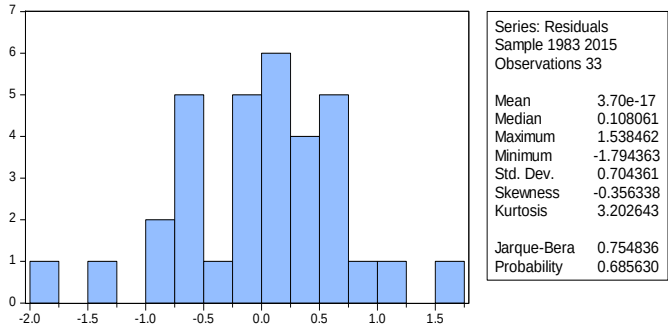
Tale 5 Breusch-Pagan-Godfrey Heteroscedasticity Test			
F-statistic	0.614534	Prob. F(2,25)	0.6897
Obs*R-squared	3.371768	Prob. Chi-Square(2)	0.6429

Source: Author's Computation. Eviews 9.0 , 2021

From the result obtained from table 4.5, since the p-value of observed R-squared (0.64) is greater than 5% (0.05) level of significance, we cannot reject the null hypothesis of no heteroscedasticity; hence we conclude that the variance of the error terms are homoscedastic. This lends credence to the robustness of this work.

4.6 Normality Test

Fig.1



Source: Author's Computation. Eviews 9.0 , 2021

Form the result of normality test, JB –statistics of 0.75 and the corresponding P-value of 0.68 is greater than the 5% (0.05) level of significance, hence, we cannot reject the null hypothesis we conclude that the error terms are normally distributed. This is also good for this work.

4.7 Long Run Model Estimation Result

Table 6: Result of Long-run Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.524921	0.472658	20.15183	0.0000
LOG(INT)	-0.626831	0.220017	-2.849018	0.0078
LOG(EXR)	0.301081	0.126217	2.385424	0.0236
LOG(INF)	-0.041950	0.069550	-0.603168	0.5509
LOG(GEX)	0.032384	0.078311	0.413526	0.6822
R^2=0.86 Adj R^2=0.84; F-Stat= 47.89P-value (0.0000)				

Source: Author's Computation. Eviews 9.0, 2021

The output of table 6 is result of long run model. From the table, the R^2 of 0.86 shows that about 86% of the explained variable, LOG(AQ) is explained by the explanatory variables while the remaining are exogenous to the model. The F-statistics of 47.89 with corresponding probability statistics of 0.000 indicates that the entire model is statistically significant. That is, all independent variables have combined significant impact on the explained variable, LOG(AQ). The result shows D(LOG(INT) has negative and statistically significant impact on the LOG(AQ) in the long run, based on the p-value of about 0.000, which is less than the usual critical value of 0.05(5%) level of significance. This negative coefficient agrees with the apriori expectation of inverse relationship between agricultural output and interest rate. This result was also arrived at in the short run model

The coefficient -0.62 of LOG(INT) gives the elasticity of agricultural output with respect to interest rate in the long run. If interest rate goes up by 1%, while other independent variables remain unchanged, agricultural output falls by about 0.62%. This implies that, the impact of interest rate rise is more in the long term than in the short term. By implication, farmers will have less capital for operations and subsequently a fall in output. Exchange rate LOG(EXR)also has positive and significant impact on agricultural outputLOG(AQ) in the long run. This is because; the p-value of about 0.02 is less than the 5% significant level.

The coefficient 0.30 of LOG(EXR) gives the elasticity of agricultural output with respect to exchange rate in the long run. If exchange rate goes up by 1%, all things being equal, agricultural output increases by about 0.30%. The reason for this may be because; depreciation/devaluation of the country's currency may make the export cheaper, hence more foreign buyers, which encourages the farmers to produce more. The response of agricultural output to exchange rate is however higher in the long term than in the short term with the respective coefficients of 0.3% an0.1%. Inflation like in the short-term dynamic model has negative coefficient and at the same time is insignificant in the long run in affecting agricultural output. This is because its p-value of 0.55 is greater than the acceptable critical value of 0.05. Government expenditures on agriculture LOG(AQ) though complies with apriori expectation of positive coefficient is insignificant. This is because the P-value of about 0.68 is greater than the 5% level of significance; hence, we conclude that government spending on agriculture has no significant impact on the LOG(AQ)in the long run. In the long run, output of agricultural sector is not government expenditure elastic. The reason for this may not be explained away from corruption where government expenditures are always seen on papers but not in actuality. People, the peasant farmers who constitute the bulk of activities in the agricultural sector, do not actually mostly do not benefit from government programs on agriculture, hence no long run impact.

4.8. Long-Run Diagnostic Checking

Table 7: Autocorrelation Test Result

Breusch-Godfrey Serial Correlation LM Test:			P-value
F-statistic	2.279284	Prob. F(2,28)	0.1210
Obs*R-squared	4.900397	Prob. Chi-Square(2)	0.0863

Source: Author's Computation. Eviews 9.0, 2021

In the result above, since the p-value of observed R-squared (0.12) is greater than 5% (0.05) level of significance, we cannot reject the null hypothesis; hence, we conclude that the error terms are not serially correlated. This lends credence to the robustness of the work and its forecast ability.

4.9. Test of Heteroscedasticity

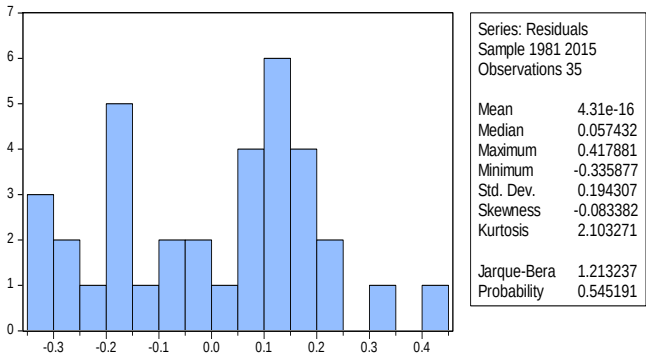
Tale 8: Breusch-Pagan-Godfrey heteroscedasticity Test			
F-statistic	1.562175	Prob. F(2,25)	0.2099
Obs*R-squared	6.033445	Prob. Chi-Square(2)	0.1967

Source: Author's Computation. Eviews 9.0, 2021

In the above result, since the p-value of observed R-squared (0.19) is greater than 5% (0.05) level of significance, we cannot reject the null hypothesis of no heteroscedasticity; hence we conclude that the variance of the error terms are homoscedastic. This lends credence to the robustness of this work.

4.10. Normality Test

Fig 2



Source: Author's Computation. Eviews 9.0, 2021

Form the result of normality test, JB –statistics of 1.21 and the corresponding-value of 0.54 is greater than the 5% (0.05) level of significance, hence, we cannot reject the null hypothesis we conclude that the error terms are normally distributed. This is also good for this work.

V. CONCLUSION AND RECOMMENDATIONS

This study examines the effect of macroeconomic imbalances on agricultural growth in Nigeria. The study was intended to determine the effect such variables as; interest rate, exchange rate, inflation and government expenditures have on the growth of agricultural sector both in the short and in the long run. Unlike most of the previous works, which have come out with the result of inverse relationship between exchange rate and agricultural growth, this study has empirically established a positive relationship between both variables in the long and in the short run, implying that, depreciation or devaluation of the Naira is not all together bad for the Nigerian agricultural sector but has rather shown that it encourages the purchase of the agricultural raw materials which become cheaper, and therefore encourages more production in the sector. Both in the short and in the long run, inflation does not affect the growth of agricultural sector in Nigeria within the period under consideration. This is actually a surprising departure from the norm. Government expenditures are actually more effective in the short run but with the passage of time, it lapses into insignificance on agricultural sector. Interest rate, however, maintains all time inverse relationship with agricultural output, meaning government can at any time use the interest rate to vary output of the sector as it is interest rate elastic. As such, it is recommended that government should re-engineer the channels of advancing soft loans to farmers at a reasonable interest rate, particularly small-scale farmers who may not have the capacity to attract credit, while loans and advances to non-agro business should be controlled to check inflation.

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