Government Expenditure on Agriculture and Economic Growth: Cointegration and Causality Approach

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Abstract

Economic growth, which can be defined as sustainable growth in real GDP, is the overriding objective of Nigeria in their effort to minimise poverty levels and achieve sustainable economic development. It follows that to achieve accelerated economic growth and sustainable development, government spending should be such that it creates a conducive environment for the private sector development and repairs market failures. Therefore, this study examines government expenditure on agriculture and its impact on economic growth in Nigeria over the period of 1981 to 2014, using Johansen cointegration and Granger causality approach to cointegration analyses. Three widely measures of government fiscal tools (capital expenditure, recurrent expenditure and credit facilities) are used. The results show that there exists long-run relationship between government expenditure on agriculture (capital and recurrent), and agricultural contribution to GDP (output). Normalizing the long-run cointegration equation, the study found a very strong negative and significant government expenditure on economic through agricultural activities. In addition, the causality results reveal that Granger causality test records evidence of unidirectional causal relationships between the RGDPC and CAPEX variables. On the other hand, it demonstrates that there is a uni-directional causality running from current expenditure on agriculture to GDP per capita and also a uni-directional causality from facilities (Loan) to GDP per capita. The findings of this study have some important policy implication for the public and private sectors in Nigeria and other developing countries in Nigeria.

Keywords: Cointegration, Causality, Recurrent Expenditure, Capital Expenditure, Economic Growth, Inflation Loan.

1.0 Introduction

The basic necessity of life is to provide a sufficient warfare of life, adequate food, clean water, safe shelter and energy, a healthy and secured environment, an educated public, and satisfying job for this and future generations. Of all these necessities, the first and most basic to human life and survival is enduring food security; which may be defined as a situation in which majority of the populace of a country have access to domestically produced food at affordable prices at all times (Akinboyo 2008). It is worth saying that the growth and development of any nation depend, to a large extent, on the development of agriculture. Therefore, the relationship between government expenditure on agriculture and economic growth has been debated in academic arena. A central question is whether or not government spending increases the long run steadily state growth rate of the economy. Some researchers are of the opinion that government expenditure, notably on physical infrastructure and agriculture can be growth enhancing although the financing of such expenditures can be growth retarding in the short run. There are mainly two views regarding the relationship government spending and economic growth. The Keynesian model, which indicates that during recession, a policy of budgetary expansion should be taken to increase the aggregate demand in the economy thus boosting the gross domestic product (GDP). Increase in government spending translates into increased employment in the public sector and increased orders of products from suppliers and firms in the business sector. In other words, employment rises, income and profits of suppliers and firms increase, and they, too, can hire more employees to produce the goods and services ordered by the government. On the other hand, the law of the expanding state role, proposed by Adolph Wagner in (1890), suggests that government spending is endogenous factor or an outcome, not a cause of economic development.

Another part of interest to scholars is the level of government spending on agriculture and productivity in Nigeria. Literature has that government spending on agriculture have continued to increase over the years while empirical evidence have revealed that the performance of the agricultural sector has been inadequate (Ekerete, 2000). There was a sharp decline in export crop production, while food production increased only marginally. Thus, domestic food supply had to be augmented with large imports. Presently, in Nigeria, there has been a conflicting view about spending on agriculture; the performance of the agricultural sector had fared better than it was before independence. Theoretically, input-output theory in economics posits that input determines output, which is needed to increase government spending in order to boosts economic growth. Therefore there is need to examine the extent to which

government expenditure as an input has affected agricultural production which in turn boosts economic growth. It is on this background that there is need to investigate the impact of government expenditure on agricultural sector on economic growth in Nigeria is important. Problems particular to the economy of Nigeria include; excessive dependence on imports for consumption and capital goods, dysfunctional social and economic infrastructure, unprecedented fall in capacity utilization rate in industry and neglect of the agricultural sector, among others. These have resulted in fallen incomes and devalued standards of living amongst Nigerians (Anyanwu, 2004).

Also, controlling for the possible influence of inflation, this study seeks to uncover the long run and the direction of causality between government spending and economic growth in Nigeria, using the Johansen cointegration and granger causality approach to cointegration approach. By examining the effects of government expenditure on agriculture and its impact of economic growth, this study contributes to the existing studies that explored the relationship between economic growth and government expenditure on agriculture. The remaining of this paper is organized with literature review; where some empirical works of other scholars are reviewed, Methods of analysis, analysis and interpretation and lastly, recommendation and policy implication of the study.

2.0 Literature Review

2.1 Conceptual Framework

Conceptually, agriculture is the art and science of crop and livestock production. In its broadest sense, agriculture comprises the entire range of technologies associated with the production of useful products from plants and animals, including soil cultivation, crop and livestock management, and the activities of processing and marketing. In this light, agriculture encompasses the whole range of economic activities involved in manufacturing and distributing the industrial inputs used in farming: the farm production of crops, animals and animal products, the processing of their materials into finished products and the provision of products at a time and place demanded by consumers. Agriculture was the key development that led to the rise of human civilization, with the husbandry of domesticated animals and plants (i.e., crops) creating food surpluses that enabled the development of more densely populated and stratified societies. Therefore, government expenditure on agricultural facilities has a great role to play in form of stimulating the economy.

According to Chidinma and Kemisola (2012) the mechanism in which the government spending on agriculture is expected to affect the pace of economic growth depends largely upon the precise form and size of total public expenditure allocated to economic and social development projects in the economy. When government expenditure is incurred, by itself, it may be directed to particular investments or may be able to bring about re-allocation of the investible resources in the private sector of the economy. This effect, therefore, is basically in the nature of re-allocation of resources from less to more desirable lines of investment. An importance way in which government expenditure can accelerate the pace of economic growth is by narrowing down the difference between social and private marginal productivity of certain investments. Here, public expenditure on social and economic infrastructural like education, health, transport, communication, water disposal, electricity, water and sanitation etc., has the potential of contributing to the performance of the economy based on promotion of infant industries in the economy; Reduction in the unemployment rate; Stabilization of the general prices in the economy; Reduction in the poverty rate and increase the standard of living of the people; Promotes economic growth by attracting foreign investment; and Promotes higher productivity.

2.2 Expenditure-Led Growth Models

The nature of relationship between public expenditure and economic growth via agricultural sector performance has stimulated series of theoretical and empirical studies. Major theoretical work was done by Barro (1988), Barro and Salai-martin (1995), Devarajan (1996). In his seminar work, Barro developed a simple endogenous growth model of government spending. In this model, he finds a non-linear relationship between public expenditures, which are complementary inputs to private production, and a negative relationship between government expenditure and growth of the economy. Another interesting expenditure-led growth model is the development models. In this model, government expenditure growth are best represented by the works of Musgrave and Rostows. Their model is based on different historical trends of developed economies. In the early stages of economic growth and development, public sector investment as a proportion of the total investment of the economy is found to be high since public capital formation is of particular importance at this stage. The public sector is therefore seen to provide social infrastructure overheads such as roads, transportation systems, sanitation systems, law and order, health and education and other investments. This public sector investment, it is argued, is necessary to increase productivity and to gear up the economy for take-off into the middle stages of economic and social development. In the middle

stage of growth, the government continues to supply investment goods but this time public investment is complementary to the growth in private investment.

During all the stages of development, market failures and information asymmetry exist which can frustrate the push towards maturity, hence the increase in government involvement in order to deal with these market failures. Rostow's claims are that once the economy reaches the maturity stages the mix of public expenditures will shift from expenditures on infrastructure to increasing expenditures on education, health and welfare services. In the mass consumption stage, income maintenance programs, and policies designed to redistribute welfare, will grow significantly relative to other items of public expenditure and also relative to GDP (Brown and Jackson, 1996). According to the Solow (1956) model, other things being equal; saving/investment and population growth rates are important determinants of economic growth. Higher saving / investment rates lead to accumulation of more capital per worker and hence more output per worker. On the other hand, high population growth has a negative effect on economic growth simply because a higher fraction of saving in economies with high population growth has to go to keep the capital labour ratio constant. The principal conclusion of Solow (1956) model is that the accumulation of physical capital cannot account for either the vast growth over time in output per person or the vast geographic differences in output per person. The model predicted technological progress typically assumed to grow at a constant 'steady state' is what determines most output growth.

2.3 Empirical Study

A number of empirical studies have attempted to find a non-linear relationship between government expenditure and growth of the economy using various methodology. Notable literatures in the likes of Loto (2011), Korman and Bratimasrene (2007), Devarajan et al.(1993), Barro's (1990), Bleaney et al (2001), Fan and Rao (2003), Donald and Shuanglin (1993), (Tomori and Adebiyi, 2002), among others, there results are mixed. Loto (2011) found government spending on security, transport and communication was found to have positive but insignificant effect on economic growth. Spending on agriculture though was found to be significant and negatively related to economic growth. The findings, unlike those by Korman and Bratimasrene (2007), showed that expenditure on education had a negative and insignificant relationship with economic growth, while on the other hand health expenditure was found to be positively and significantly related to economic growth. Further, Fan and Rao (2003) analyzed the effect of different types of government expenditure on overall economic growth across 43 developing countries between 1980 and 1998 using OLS method and found mixed result. In Africa, government spending on agriculture and health was particularly strong on promoting economic growth. Among all types of government expenditures, agriculture, education, and defense contributed positively to GDP growth in Asia. In Latin America, health spending had a positive Growth promoting effect. Structural adjustment programs had a positive growth promoting effect in Asia and Latin America, but not in Africa.

Devarajan et al (1993) employed panel data for 14 developed countries (19701990) and using OLS method, 5 year moving average. They took various functional types of expenditure (health, education, transport, and others) as explanatory variables and found that health; transport and communication have significant positive effect while education and defense have a negative effect on economic growth. Using panels of annual and period averaged data for 22 Organizations for OECD countries during 1970 95, Bleaney et al (2001) studied the effect of government expenditure on GDP growth. Applying OLS and GLS methods, they found that productive expenditures enhance growth, but non-productive spending does not, in accordance with the predictions of Barro's (1990) model. Kalio (2000) examined the effect of different components of government expenditures on GDP growth using OLS method for a sample of time data (1970-1992) on Kenya. The study concluded that government expenditure on education, defense, and agriculture had a positive effect on GDP growth and that of health and transport and communication were negatively related to economic growth. Donald and Shuanglin (1993) studied the differential effects of different levels of expenditure on economic growth for 58 sampled countries. They came up with the result that government expenditure on education and defense has positive effect on economic growth and that of welfare was insignificant and negative.

Bose et al (2003) examined the growth effect of government expenditure for a panel of thirty developing countries over the decades of the 1970s and 1980s, with a particular focus on sectoral expenditures. Their primary results are twofold. Firstly, the share of government capital expenditure in GDP is positively and significantly correlated with economic growth, but current expenditure is insignificant. Secondly, at the sectoral level, government investment and total expenditures on education are the only outlays that are significantly associated with growth once the budget constraint and omitted variables are taken in to consideration. Akpan (2005) employed disaggregated approach in order to determine the components of government expenditure that stimulate GDP growth. The study

concluded that there was no significant relationship between most components of government expenditure and economic growth in Nigeria. The empirical studies concerning the effect of government expenditure on defense have led to inconclusive results. Some studies argued that military spending has a negative effect on economic growth such as (Tomori and Adebiyi, 2002). However, others found a positive relationship between them (Diamond, 1989).

Ogwuma (1981), studied on public expenditure in agricultural sector using econometric analysis. Based on his report, agricultural financing in Nigeria shows positive relationship between interest rate and loanable funds on the level of agricultural output. Using time series data, Lawal (2011) attempted to verify the amount of federal government expenditure on agriculture in the thirty year period 1979 to 2007. Significant statistical evidence obtained from the analysis showed that government spending does not follow a regular pattern and that the contribution of the agricultural sector to the GDP is in direct relationship with government funding to the sector. Adofu et al (2012) in their work; effects of government budgetary allocation to agricultural output in Nigeria (1995-2009) show that the percentage, degree or amount of budgetary allocation to agricultural sector has a positive relationship with the total agricultural production in the country. This implies that the more the public spending on agricultural sector, the more the improvements in the performance of the agricultural sector. Also, a large degree of change in agricultural output is accounted for by change in budgetary allocation to agricultural sector. Thus, budgetary allocation to agriculture has a large impact on agricultural output. Akpokodjie and Nwosu (1993) in their study stressed that government allocation to agriculture is relatively low and that actual expenditure falls short of budgeting expenditure and the rate of under spending is usually higher for agriculture than for other economic sectors. Omanukwue (2005) reported that a large proportion of the funds allocated to agriculture does not go directly to farmers

3.0 Data and Model Specification

3.1 Data

This study uses annual data covering the period from 1981 to 2014. Two widely used component of public sector expenditure are employed: recurrent expenditure on agriculture and capital expenditure agriculture. Inflation is included in the study to control for the influence of other component of the economic growth or determinant. These factors have been identify among the most significant determinants and proxies for public sector expenditure on agriculture. Table 1 provides additional information on all the variables.

Table 1: List of Variables

Variable	Definition	*Unit*	Sources
RGDPC	Represents the Real Gross Domestic Product per capita. It is derived by dividing the real GDP by total population. It captures economic growth of Nigeria 'from 1981-2014. This is consistent with the study by Iganiga and Unemhilin (2011).	*lnRGDP*	CBN Statistical Bulletin (2014)
LOAN	Credit facilities in form of loan to famers	lnLOAN	CBN Statistical Bulletin (2014)
INFLA	It is the consumer prices (annual %). It is the frequent fluctuations in the level of prices (inflation) reflects instable macroeconomic environment in a country.	$lnINFLA$	CBN Statistical Bulletin (2014)
CAPEX	Represents public sector capital expenditure which includes capital expenditure on administration, economic services, social and community services, transfers etc. In consistent with Chidinma and Kemisola (2012).	$lnCES$	CBN Statistical Bulletin (2014)
CUREX	Represents public sector recurrent expenditure on administration. Economic services, social and community services, transfers etc. In consistent with Chidinma and Kemisola (2012).	$lnCUREX$	CBN Statistical Bulletin (2014)

Source: Author's Design.

3.2 Model Specification

In spirit with Rivera-batiz (2004), and N'Zue (2011), assuming the author augment the neo classical cobb-Douglas production by incorporating recurrent, capital expenditure and loan and inflation .Therefore, the Neo classical Cobb-Douglas production could be re-written to give the model as thus;

$$rgdpc = f(CAPEX, CUREX, LOAN, INFLA) \quad \text{----------(1)}$$

Where RGDPC is economic growth measured by real GDP per capita and also captures the performance of agricultural output which could be measured by its contribution to Gross Domestic Product (see Iganiga and Unemhilin, 2011), inflation captures the degree of macroeconomic stability in the economy. Boyd et al (2001) opine that high inflation discourage incentives for private sector activities and demand for credit facilities. In line with market fundamentals, it expected that government expenditure on agricultural sector should have a positive relationship with economic growth (RGDPC). Therefore, all their coefficient is expected to have positive sign (see Chidinma and Kemisola, 2012; Loto, 2011; Korman and Bratimasrene, 2007; Devarajan et al, 1993; Barro, 1990; Bleaney et al, 2001; Fan and Rao, 2003; Donald and Shuanglin, 1993; Tomori and Adebiyi, 2002 and Gisore et al, 2014).

The above equation can be written in economic model in equation 1 can be transformed into econometrics model and in their respective natural log form as thus;

$$lnrgdpc = \alpha_0 + \beta_1 lncapex + \beta_2 lncurex + \beta_3 lninfla + \beta_4 lnloan + \varepsilon_t \text{ ---------- (2)}$$

Where $lnrgdpc$ is log of real gdp per capita, lnrex is log of recurrent expenditure, lncapex is log of capital expenditure, *lnloan* is the log of credit facilities in form of loan to famers, $lninfla$ is the log of inflation, ε_t is the error term and α_0 is the intercept.

3.3 Empirical Methodology

3.3.1 Unit Root Test

In time series analysis, before running the cointegration test the variables must be tested for stationarity. For this purpose, we use the conventional ADF tests, the Phillips–Perron test following Phillips and Perron (1988) .Therefore, before applying this test, we determine the order of integration of all variables using unit root tests by testing for null hypothesis $H_o: \beta = 0$ (i.e β has a unit root), and the alternative hypothesis is $H_1: \beta < 0$. All the variables should be integrated at first order difference I(1) so as to avoid spurious result.

3.3.2 Cointegration

This study adopts a dynamic vector autoregressive regression (VAR) which explores cointegration. The essence is to capture the causal dynamics relationship between government expenditure and economic growth, and at the same time to observe the long run and short dynamics. For instance, given a VAR with possible long run cointegration amongst a set of variables.

Therefore, we start with the Johansen co-integration equation which starts with the vector auto regression (VAR) of order p is given by:

$$y_t = \mu + A_1 y_{t-1} + \ldots\ldots\ldots + A_p y_{t-P} + \varepsilon_t \quad \text{----------(3)}$$

Where y_t is a $(n \times 1)$ vector of variables under considertion in log form that are integrated at order one- commonly denoted 1(1), n=5 A_P are the parameters to be estimated, ε_t are the random errors. This (VAR) can be re-written as;

$$\Delta y_t = \mu + \prod y_{t-1} + \sum_{i=1}^{p=1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \text{ ----------(4)}$$

Where, $\Pi = \sum_{i=1}^{p} A_i - 1$ and $\Gamma_i = -\sum_{j=i+1}^{p} A_j$ ----------(5)

If the coefficient matrix Π has reduced rank $r < n$, then there exist $n \times r$ matrices of α and β each with rank r such that

$$\Pi = \alpha\beta' \quad \text{----------(6)}$$

Where r is the number of co-integrating relationship, the element is α is known as the adjustment parameters in the vector error correction model and each column of β is a cointegrating vector. It can be shown that, for a given r, the maximum likelihood estimator of β define the combination of y_{t-1} that yield the r largest canonical correlations of Δy with y_{t-1} after correcting for lagged differences and deterministic variables when present. The two different likelihood ratio test of significance of these canonical correlations are the trace test and maximum eigenvalue test, shown in equation 5 and 6 respectively below

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n}\ln(1-\widehat{\lambda_i}) \quad \text{----------(7)}$$

and

$$\lambda_{max}(r, r+1) = -Tln(1-\hat{\lambda}_{r+1}) \quad \text{----------(8)}$$

Here, T is the sample size and $\hat{\lambda}_i$ is the i^{th} ordered eigenvalue from the Π matrix in equation 2 or largest canonical correlation. The trace tests the null hypothesis that the number of r co-integrating vector against the alternative hypothesis of n co-integrating vector where n is the number of endogenous variables. The maximum eigenvalue tests the null hypothesis that there are r cointegrating vectors against an alternative of $r+1$ (see Brooks, 2002). After testing for cointegration among the variables, the long run coefficients of the variables are the estimated. This study uses Akaike information criteria for selected the optimal lag length. The existence of cointegration between the variables implies that causality exists in at least one direction. The short run equilibrium relationship is tested using vector error correction model (VECM). VECM is restricted VAR that has cointegration restriction built into the specification. The VECM analysis in this study is based on equation 2 and it involves five cointegrating vector as thus:

$$\Delta lnrgdp_t = \alpha_0 + \sum_{i=1}^{n}\beta_{1i}\Delta lnrgdp_{t-1} + \sum_{i=0}^{n}\beta_{2i}\Delta lncapex_{1_{t-1}} + \sum_{i=0}^{n}\beta_{3i}\Delta lncurex_{2_{t-1}} + \sum_{i=0}^{n}\beta_{3i}\Delta lninfla_{2_{t-1}} +$$

$$\sum_{i=0}^{n}\beta_{3i}\Delta lnloan_{2_{t-1}} + \lambda_1 ecm_{t-1}\mu_t \quad \text{---------- (9)}$$

ecm_{t-1} is the error correction term obtained from the cointegration model. The error coefficients (λ_1) indicate the rate at which the cointegration model corrects its previous period's disequilibrium or speed of adjustment to restore the long run equilibrium relationship. A negative and significant ecm_{t-1} coefficient implies that any short run movement between the dependant and explanatory variables will converge back to the long run relationship.

3.3.3 Diagnostic Test

To ensure the goodness of fit of the model, diagnostic and stability tests are conducted. Diagnostic tests examine the model for serial correlation, functional form, non-normality and heteroscedasticity. The stability test is conducted by employing the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) suggested by Brown et al. (1975). The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the break points. If the plots of the CUSUM and CUSUMSQ statistics stay within the critical bonds of a 5 percent level of significance, the null hypothesis of all coefficients in the given regression is stable and cannot be rejected. To ensure the goodness of fit of the model, diagnostic tests are conducted. Diagnostic tests examine the model for serial correlation, and heteroscedasticity.

4.0 Data Analysis and Interpretation

Table 2: Summary of Descriptive Statistics

	GDPPC	CAP_EXP	CUR_EX	INFL	LOAN
Mean	242442.7	5479.485	129817.0	20.02927	2482106.
Median	208563.7	801.4500	24752.95	12.54679	233770.4
Maximum	383023.4	57879.00	653990.1	72.83550	12997004
Minimum	172402.7	56.40000	127.6989	5.382224	24654.90
Std. Dev.	66230.23	12535.14	180187.5	18.10726	3797814.
Skewness	0.882826	3.076217	1.450003	1.582425	1.401087
Kurtosis	2.259473	11.74764	4.201665	4.222870	3.562349
Jarque-Bera	5.193369	162.0294	13.95988	16.30822	11.57192
Probability	0.074520	0.000000	0.000930	0.000288	0.003070
Sum	8243052.	186302.5	4413777.	680.9952	84391604
Sum Sq. Dev.	1.45E+11	5.19E+09	1.07E+12	10819.81	4.76E+14
Observations	34	34	34	34	34

Source: Author's Computation

In Table 2, the presents the summary descriptive statistics for the variables in the model. GDP per capita (GDPPC) has a mean value of 242442.7 and a standard deviation of 66230.23 while Capital Expenditure (CAPEXP) has a mean value of 5479.48 and standard deviation of 12535.14. Current Expenditure (CUREXP) has a mean value of 129817 and standard deviation of 180187.5. For the control variable, inflation (INFL), the mean value is 20.03 with a standard deviation of 18.107 and for Facilities to Agricultural sector (LOAN) the mean value is 2482106 and standard deviation of 3797814. In addition, the p-values of the Jarque-Bera statistic for all the series are all significant indicating that all the variables are not normally distributed.

Table 3: Correlation Matrix

Variables	LGDPPC	LCAP_EXP	LCUR_EX	LINFL	LLOAN
LGDPPC	1.000000	-0.689323	0.555938	-0.378347	0.815010
LCAP_EXP	-0.689323	1.000000	-0.088909	0.216538	-0.388065
LCUR_EX	0.555938	-0.088909	1.000000	-0.222209	0.883143
LINFL	-0.378347	0.216538	-0.222209	1.000000	-0.321432
LLOAN	0.815010	-0.388065	0.883143	-0.321432	1.000000

Source: Author's Computation

Table 3 presents the correlation matrix of the variables in the model. There is evidence of negative correlation of -0.6893 and -0.3783 between GDPPC and CAPEXP and between GDPPC and INFL respectively. While there are relatively high positive correlation of 0.5559 and 0.815 between GDPPC per capita and CUREXP and between GDPPC and LOAN respectively.

4.1 Level Series OLS Multiple Regression Result

The results of the estimated level series multiple regression model using E-Views are as depicted in Table 4. From the estimated model, CAPEXP, CUREXP and LOAN are found to be statistically significant while INFL is not. In addition, CAPEXP, CUREXP and LOAN were found to have a negative relationship with GDDPC while INFL is positively related to GDPPC.

Table 4: Level Series OLS Multiple Regression Results

Dependent Variable: LGDPPC
Method: Least Squares
Date: 01/01/08 Time: 01:09
Sample: 1981 2014
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.44713	0.274941	41.63482	0.0000
LCAP_EXP	-0.040757	0.011915	-3.420685	0.0019
LCUR_EX	-0.030122	0.016474	-1.828459	0.0778
LINFL	-0.024889	0.026219	-0.949271	0.3503
LLOAN	0.119107	0.025455	4.679063	0.0001

R-squared	0.851698	Mean dependent var	12.36577
Adjusted R-squared	0.831243	S.D. dependent var	0.253208
S.E. of regression	0.104018	Akaike info criterion	-1.553452
Sum squared resid	0.313773	Schwarz criterion	-1.328987
Log likelihood	31.40868	Hannan-Quinn criter.	-1.476903
F-statistic	41.63676	Durbin-Watson stat	0.854355
Prob(F-statistic)	0.000000		

Source: Author's Computation

However, given the D.W statistic value of 0.854355 which suggests the presence of autocorrelation in the variables, more robust econometric techniques employing unit root tests were applied to examine the time-dependent characteristics of the variables.

4.2 Unit Root Test

Unit root test has become a popular test of the stationarity or otherwise of time series data in many econometric studies given the time-dependent nature of many economic variables. The most popular tests for unit root are the Augmented Dickey-Fuller (ADF) test.

Table 5: ADF Unit Root Test Results

Variables	Level ADF Test statistics	1st Diff. ADF Statistic	Order of Integration
GDPPC	1.1369	-4.15596	1(1)
CAPEX	-0.805379	-7.1883	1(1)
CUREX	1.77517	-7.09195	1(1)
INFL	-0.77667	-6.39287	1(1)
LOAN	3.977087	-3.18518	1(1)
Critical Values: 1% -3.4952; 5% -2.8897; 10% -2.5816.			

Source: Author's computation

From Table 5, it is evident that using the ADF technique, all the variables are integrated of order one. This implies that a linear combination of 1(1) series could be 1(0) if series are cointegrated. Therefore, the author proceeds to test for cointegration of the series.

4.3 Co-Integration Test

Having established the order of integration of the variables in the model, the proceeds to show in Table 6 that there is only one long run co-integrating equation among the government expenditure variables on agriculture and GDP per capita using the Johansen co-integration test. The test is conducted assuming a linear deterministic trend with a lag interval of 1 to 2 (see Appendix 1). Both the Trace and the Maximum Eigenvalue Unrestricted Co-integration Rank tests confirm the existence of one co-integrating equation at the 5% level of significance using the MacKinnon-Haug-Michelis (1999) p-values. This suggests that there is one long-run stationary steady state relationship between the dependent variables and independent variable within the sample period.

Table 6: Johansen Co-integration Test Results

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.656138	83.52643	69.81889	0.0027
At most 1	0.560333	49.36594	47.85613	0.0358
At most 2	0.385911	23.07030	29.79707	0.2426
At most 3	0.156510	7.466631	15.49471	0.5241
At most 4	0.061173	2.019982	3.841466	0.1552
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.656138	34.16050	33.87687	0.0463
At most 1	0.560333	26.29564	27.58434	0.0724
At most 2	0.385911	15.60367	21.13162	0.2488
At most 3	0.156510	5.446650	14.26460	0.6847
At most 4	0.061173	2.019982	3.841466	0.1552
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: Author's Computation

Nevertheless, the normalized cointegration equation shown in the table 7 presents the impact of capital expenditure on expenditure, recurrent expenditure, and credit facilities (loan) on real GDPC in Nigeria in the long-run while controlling for the influence of inflation rate.

$$lnrgdpc = -0.0248 - 0.0248lncapex - 0.0243lncurex - 0.0073lninfla + 0.139lnloan + \varepsilon_t$$

The normalised equation shown above reveals that the coefficient of capital and recurrent expenditure on agriculture to negative and statistical significant at 5% level which is not in line with the a priori expectations. Therefore, with a coefficient of 0.0248 and 0.0243 indicate that a 1% increase in government expenditure will cause the volume of economic growth to decrease by 0.0248 and 0.0243 respectively in the long run and vice versa. This is an indication linkages of funds. Omanukwue (2005) reported that a large proportion of the funds allocated to agriculture does not go directly to farmers. This findings are in contrast with Chidinma and Kemisola (2012), Loto (2011), Korman and Bratimasrene (2007), Devarajan et al (1993), Barro (1990), Bleaney et al (2001), Fan and Rao (2003), Donald and Shuanglin (1993), Tomori and Adebiyi (2002) and Gisore et al (2014). Inflation is found to be negative and insignificant. Interestingly, credit to farmers in form loan is found to be positive and significant thereby confirming with a priori expectations. Hence, with 0.139 indicates that 1% increase in loan to farmers will cause the economic growth to increase by 0.139 in the long run and vice versa.

4.4 Error Correction Mechanism (ECM)

Given the existence of a long run relationship among the variables, the author apply the error correction mechanism to examine the dynamic behavior of the model when confronted with short run shocks. Table 7 presents the results of the error correction model estimated within an ARDL framework on 31 observations after adjusting endpoints. The ECM coefficient is significant and appropriately signed at lag one showing that the dynamic government expenditure-GDP per capita model is capable of restoring its level of equilibrium at a speed of approximately 52% per annum response to any short run innovations. The adjusted R-squared of the model is 35.2% which means that 35.2% of the variations in stock prices in GDP per capita are explained by the independent variables.

Table 7: Vector Error Correction Estimates

Vector Error Correction Estimates
Date: 01/01/08 Time: 01:40
Sample (adjusted): 1984 2014
Included observations: 31 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1				
LGDPPC(-1)	1.000000				
LCAP_EXP(-1)	0.024899				
	(0.00979)				
	[2.54447]				
LCUR_EX(-1)	0.024383				
	(0.01183)				
	[2.06160]				
LINFL(-1)	0.007334				
	(0.01755)				
	[0.41779]				
LLOAN(-1)	-0.139801				
	(0.02244)				
	[-6.23044]				
C	-10.94851				
Error Correction:	D(LGDPPC)	D(LCAP_EXP)	D(LCUR_EX)	D(LINFL)	D(LLOAN)
CointEq1	-0.525661	-10.19344	-1.867627	-0.637464	0.459761
	(0.17193)	(3.06090)	(2.56243)	(2.24190)	(0.97250)
	[-3.05733]	[-3.33021]	[-0.72885]	[-0.28434]	[0.47276]

Source: Author's computation

4.5 Granger Causality Test

As discussed earlier, if the co-integration exists among the variables, then there has to be either unidirectional, bidirectional or neutral causality among these variables. The Granger causality test according to Granger (1969) is used for testing the short run direction of causality between variables say Y and X. The test is based on estimating the following bivariate regressions. Table 8 indicates the results of the Granger causality test recorded evidence of unidirectional causal relationships between the RGDPC and CAPEX variables. On the other hand, it demonstrates that there is a uni-directional causality running from current expenditure on agriculture to GDP per capita and also a uni-directional causality from facilities (Loan) to GDP per capita. This is in support of Adolph Wagner (1890), who suggests that government spending is endogenous factor or an outcome, not a cause of economic development .The Granger causality test results do not support any directional causality between GDP per capita and the other variables-inflation, capital expenditure respectively.

Table 8: Granger Causality Test

Pairwise Granger Causality Tests			
Date: 01/01/08 Time: 02:11			
Sample: 1981 2014			
Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
LCAP_EXP does not Granger Cause LGDPPC	33	1.85902	0.1829
LGDPPC does not Granger Cause LCAP_EXP		13.9912	0.0008
LCUR_EX does not Granger Cause LGDPPC	33	9.19867	0.0050
LGDPPC does not Granger Cause LCUR_EX		0.05032	0.8240
LINFL does not Granger Cause LGDPPC	33	1.17053	0.2879
LGDPPC does not Granger Cause LINFL		2.23510	0.1454
LLOAN does not Granger Cause LGDPPC	33	16.0280	0.0004
LGDPPC does not Granger Cause LLOAN		1.19063	0.2839
LCUR_EX does not Granger Cause LCAP_EXP	33	0.27982	0.6007
LCAP_EXP does not Granger Cause LCUR_EX		0.04189	0.8392
LINFL does not Granger Cause LCAP_EXP	33	0.15507	0.6965
LCAP_EXP does not Granger Cause LINFL		0.37411	0.5454
LLOAN does not Granger Cause LCAP_EXP	33	2.30955	0.1391
LCAP_EXP does not Granger Cause LLOAN		0.92100	0.3449
LINFL does not Granger Cause LCUR_EX	33	0.10900	0.7436
LCUR_EX does not Granger Cause LINFL		0.66231	0.4222
LLOAN does not Granger Cause LCUR_EX	33	0.88242	0.3550
LCUR_EX does not Granger Cause LLOAN		2.85285	0.1016
LLOAN does not Granger Cause LINFL	33	1.31647	0.2603
LINFL does not Granger Cause LLOAN		0.81990	0.3724

Source: E-views 9 Output

4.6 Diagnostic and Stability Test

Table 9: Serial Correlation

VEC Residual Serial Correlation LM T...
Null Hypothesis: no serial correlation a...
Date: 05/27/16 Time: 10:38
Sample: 1981 2014
Included observations: 31

Lags	LM-Stat	Prob
1	28.33707	0.2926
2	22.89651	0.5836

Probs from chi-square with 25 df.

Source: Author's Computation

Decision Rule

The rejection of the null hypothesis of no serial correlation shall be based on the p-value as the null hypothesis is rejected if p-value < 0.05.

From Table 9 above, reported that LM-Stat on lag 2 is 22.89651 and p-value 0.5836, therefore the null hypothesis of no serial correlation cannot be rejected. Hence, the model is free from the presence of serial correlation.

4.7 Heteroskedasticity Test

Table 10: VEC Residual Heteroskedasticity Test

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 05/27/16 Time: 10:42
Sample: 1981 2014
Included observations: 31

Joint test:

Chi-sq	df	Prob.
359.3004	330	0.1284

Source: Author's Computation

Decision Rule

The rejection of the null hypothesis Homoskedasticity shall be based on the p-value as the null hypothesis is rejected if p-value < 0.05.

From table 10 above, reported chi-square to 359.3004 and p-value 0.1264, therefore the null hypothesis of homoscedasticity cannot be rejected. Hence, the model is free from the presence of heteroscedasticity.

4.8 Stability Test

Figure 1: CUSUM TEST

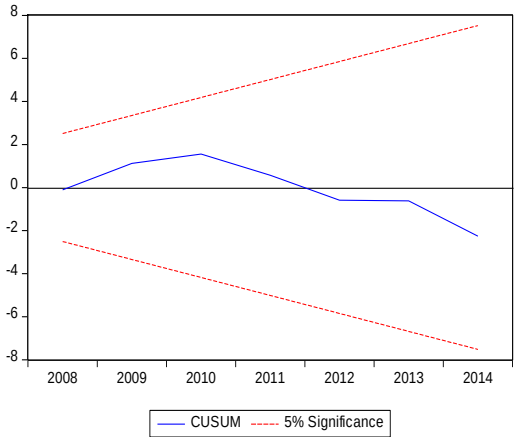
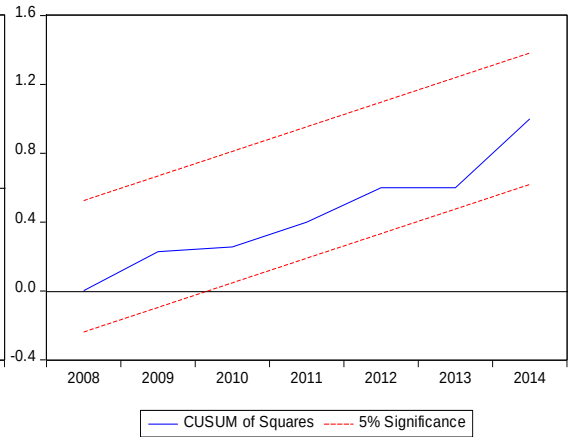


Figure 2: CUSUMQ



Decision Rule

The rejection of the null hypothesis perfect parameter stability shall be based on the p-value as the null hypothesis is rejected if p-value<0.05.

This section provides qualitative information which give visual expression of how stable the parameters appear. CUSUM and CUSUM test are applied and is based on normalized version of cumulative sum of residuals. The decision is made under the null hypothesis as stated above, where the CUSUM statistic is zero. However, many residual are included in the sum (because the expected value of a disturbance is always zero). Since the line in figure 1 and 2 are within confidence bands, the conclusion would be that the null hypothesis is not rejected. Therefore the parameters are stable within the time frame of this research work.

5.0 Conclusion and Policy Implications

Controlling for the influence of inflation, this study examines the long run relationship and the direction causality between economic growth and government expenditure on agriculture in Nigeria using Johansen co-integration and Granger causality approach over the period of 1981 to 2014. The study examines stochastic characteristics of each time series by testing their stationarity using Augmented Dickey Fuller (ADF) and Philips-Perron test. The results

show that fiscal instrument such as government capital and recurrent expenditure are deemed to be essential in creating opportunities for widening the base at which developing countries. Then, the relationship between government expenditure on agriculture and agricultural contribution to GDP (output) is examined using Pairwise Granger causality tests. The results from the Test indicate that there exists long-run relationship between government expenditure on agriculture (capital and recurrent), and agricultural contribution to GDP (output). Normalizing the long-run cointegration equation, it a very strong negative and significant of government expenditure on economic through agricultural activities. In addition, the causality results reveal that Granger causality test records evidence of unidirectional causal relationships between the RGDPC and CAPEX variables. On the other hand, it demonstrates that there is a uni-directional causality running from current expenditure on agriculture to GDP per capita and also a uni-directional causality from facilities (Loan) to GDP per capita.

Indeed, economic growth, which can be defined as sustainable growth in real GDP, is the overriding objective of Nigeria in their effort to minimize poverty levels and achieve sustainable economic development. It follows that to achieve accelerated economic growth and sustainable development, government spending should be such that it creates a conducive environment for the private sector development and repairs market failures. In this case, the empirical study of the effects of government spending on economic growth has paramount importance to draw important policy implications. Programmes should also be monitored and their efficacies evaluated in terms of a specific geographical impact of that programme. This provides a highly useful approach for gauging the direct and indirect impact of different programmes and project interacting simultaneously. Policy makers/planners should also identify and evaluate alternative or different intervention programmes in terms of both their immediate and long term impacts and of their implications to the communities and society at large. The philosophy of policy/programme consistency should be adopted in Nigeria. This is the easiest way to streamline, direct and focus to agricultural development. This philosophy should be a critical issue our future policies and programmes should address. Government should provide enabling environment for private sectors involvement in agricultural development especially in areas like processing, preservation, exportation, tourism, recreational and environmental services.

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Appendix 1

VAR Lag Order Selection Criteria

Endogenous variables: LGDPPC LCAP_EXP LCUR_EX LINFL LLOAN

Exogenous variables: C

Date: 01/01/08 Time: 01:26

Sample: 1981 2014

Included observations: 30

Lag	LogL	LR	FPE	AIC	SC
0	-163.3912	NA	0.051654	11.22608	11.45961
1	-46.32770	187.3015	0.000115	5.088514*	6.489711*
2	-10.92925	44.83805*	6.67e-05	4.395283	6.964145
3	15.31221	24.49202	9.49e-05	4.312519	8.049046
4	73.17490	34.71761	3.06e-05*	2.121673	7.025864

Source: E-views Output