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DOES FINANCIAL SECTOR REFORMS AFFECT AGRICULTURAL INVESTMENTS IN NIGERIA? A COINTEGRATION AND VAR APPROACH

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Abstract

The paper evaluates the effect of financial sector reforms on agricultural investments in Nigeria from 1970-2009 using a cointegration and vector error correction model (VECM) in a long time series analysis. The descriptive analysis shows that the mean agricultural investments of ₦88,101.83 million during financial sector reforms period was higher than ₦538.78 million of the pre-financial sector reforms period and was significantly different at 5 percent (tcal>ttab at P=0.5) while the mean growth rate of 36.36 percent for the pre-financial sector reforms period was higher than 34.25 percent of the financial sector reforms period and was not significantly different at 5 percent in the two periods. The result also reveals that financial sector reforms significantly affect agricultural investments in Nigeria both in the long and short-run. It is recommended that the Nigerian government should adopt strong macroeconomic policies, thereby encouraging investments in the agricultural sector of the country.

Key Words: *Agricultural Investments, Cointegration, Financial Sector Reforms, Vector Autoregressive Approach*

1. Introduction

In recent times, the role of agriculture as the mainstay and driver of growth of the Nigerian economy has been recognized through government initiated policies to increase investment in food and agricultural production (Uniamikogbo, 2006). Such policies include the National Accelerated Food Production Programme (NAFPP) of 1972, the Operation Feed the Nation (OFN) of 1976 and the Green Revolution (GR) of 1980, among other agriculture related programmes aimed at boosting agricultural production. These were the River Basin Development Authorities (RBDAS) and the Agricultural Development Project (ADP) (Ekpo, Ndebbio, Akpakpan & Nyong, 2004).Government has also attempted to increase investment in Nigerian agriculture through budgetary allocations and through the provision of cheap and readily available credit facilities. The indications are that government budgetary allocation has become an important determinant of agricultural production in Nigeria (Nwosu, 1995). Yet, government budgetary allocation to agriculture is not without limitations. The first is the relatively low allocation to the agricultural sector. The second is the actual expenditure which often falls short of budgeted expenditure and the high rate of under spending which is usually higher for agriculture than for other economic sectors. The third is the vast proportion of the funds allocated to agriculture which does not go directly to farmers (Nwosu & Akpokodje, 1993).

Besides the above constrains, scholars are of the opinion that the existing financial institutions in the country never induced the much needed process of industrialization and modernization, advancing reasons such as the existing of foreign banks, inaccessible and insufficient loans with high interest rate, and indigenous negative mentality on investment, inconsistent government policies, volatile inflation, unguided government borrowing, and uncertainty about borrowers' prospect (Ikhide, 1996). These were some of the obvious reasons that prevented financial institutions from granting long term loans to intending borrowers. These situations made the Nigerian government to seek for an easy way out with the compelling desire to use financial sector in financing investment projects for the purpose of distributing resources and incomes to project with high social returns.

To revamp high growth in the economy and to come out of the prolong macroeconomic instability and fiscal imbalances caused by wide fiscal deficits to Gross Domestic Product (GDP) of 7.7 percent in 1994; 8.9 percent in 1999; 4.0 percent in 2001; 3.4 percent in 2005 and 2.9 percent in 2006 with increase inflationary rate, low investment in productive public sector, overhang debt and expenditure driven due to changes in international oil prices (Babalola, 2008). It was therefore pertinent to attain export oriented, private sector-led economic growth by means of market-based system (World Bank, 1994). This gave rise to financial sector reforms as a component of economic reform (The Structural Adjustment Programme) in August, 1987 with the deregulation of interest rates (Ikhide, 1996). This economic reform programmes which included financial sector reforms were established by the government to achieve high and sustainable growth that would impact on the real sector such as agriculture. This is due to the crucial role played by the financial sector in the mobilization of financial resources as well as conduit for monetary policy actions to the real economy.

Various theoretical and empirical literatures have link between finance/financial sector, investment and growth and by extension growth in agricultural investments. Proper and timely reforms policies in the financial sector would enhanced investment in any sector such as agriculture since finance is postulated as important determinant of investment which culminant in growth. It is therefore argued that the liberalization of financial markets lead to greater investment efficiency and mobilization of greater financial resources to finance investment (Nnanna, Englaina, & Odoko,2004). According to Mckinnon (1973) and Shaw (1973), finance/financial sector is very critical to investments. They posited that the major function of financial sector is to mop up funds and channel same in the form of credit, loans or invested capital to business sectors that most need these funds for investments. (New Encylopedia Britannica, 2003 as cited by Nnanna et al, 2004). For growth to take place, financial institutions must pool savings and direct them to viable investments since financial sector facilitates investment of an economic sector (Copeland & Weston, 1980). This emphasizes the role of financial institutions in agricultural investment process which could be through sound and effective financial sector reforms. While it can be argued that financial sector reforms may have helped to build and foster competitive and healthy financial systems, it is however still debatable, if the structure of portfolio investment has the capacity to support the desired economic development aspiration of the proponent considering the catalytic role it plays in stimulating the desired growth of any economy. It is against this background that this paper seeks to evaluate the effects of financial sector reforms on agricultural investments both in the long and short run in Nigeria. This paper is structured as follows: Section 2 review theoretical and empirical literature. Section 3 is the materials and methods under which the data sources and analytical techniques are discussed. The results and discussion are presented in section 4 and it is concluded in section 5.

2. Theoretical and Empirical Literature

Literature has indicated that the reforms of the financial sector is anchored on the need to develop a sound and efficient financial system aimed at ensuring that the banks as financial intermediaries can contribute to the agricultural sector through sound allocation of resources. Campel (1982) identified the banking and non-banking institution like cooperative societies, commercial bank and merchant banks as sources established by the government to fund agricultural sector. Liang andTeng (2006) observe that there was a remarkable economic growth in China since the outset of the reform program in the early 1980s, while Marjit (2004) explains that the financial sector reforms in India helped in streamlining the financial market, which provided resources for fresh investments.Hasan, Akhan, and Ali (1996)hold that financial sector reforms are necessary as it attracts greater savings due to higher interest rate. This would make available more loan-able funds to investors for investments and faster economic growth. However, low interest ceiling is noted to discourage savings that are supposed to make credit available to investor for investment.

Demetriades and Luintel (1997) submit that the policy of credit rationing in financial market hinders economic development as it reduces the volume of loan-able funds. Also Ozmen (2007) opines that the link between external savings and domestic investment funding can be restricted by an underdeveloped financial sector. In the views of Mckinon (1973) and Shaw (1973), economic growth is severely hindered by low level of savings rather than by lack of investment opportunities in a repressed financial system. Furthermore, it was observed that there is a negative relation between investments and effective real rate of interest on loans yet, positively related to the rate of growth of the economy.

Evidence from empirical literature has indicated a strong relationship between financial sector reforms of any country and its economic performance. This has agreed with the common notion that the scarcity of long term finance in developing countries is the major impediments to higher investments and output growth in the sub-sectors (for example, agriculture) of these economies. In Nigeria, records reveal that finance (measured by private sector credit) grew by 65.4 percent in 1975 declined to a growth a growth rate of 4.8 percent in 1984. With the introduction of comprehensive financial sector reform in 1987, private sector credit grew from 26.9 percent in 1986 to 46.7 percent in 1987. However, with the recent structural reforms in the financial sector, which have deepened the financial system, finance has been on a steady increase from 30.9 to 43.5 percent in 2000 and 2001 respectively (Nnanna et al. 2004). This could be attributed to the renewed confidence of investors in the economy due largely to the introduction of democratic government. The availability of finance was found to support output as some periods of growth in private sector credit also witnessed growth output.

In a study conducted by Das and Ghosh (2006) to assess the performance of Indian commercial banking sector during the post reform periods of 1992-2002. They evaluated several efficiency estimates of individual banks using nonparametric Data Environment Analysis (DEA). The results reveals that medium-sized public sector banks performed considerably well and were more likely to operate at higher levels of technical efficiency. Reinhart and Tokatlidis (2003) investigate the extent to which policy reforms has affected savings, consumption and investment in Sub-Sahara Africa countries (SSA). Cross section data used for the study was drawn from Uganda, Kenya and Tanzania. The results show that financial liberalisation had delivered higher real interest rates, financial deepening and savings mobilization but SSA had not accessed international capital markets as expected.

3. DataSources and Analytical Techniques

3.1. Data Sources

The study made use of data from secondary sources obtained from Central Bank of Nigeria (CBN), Statistical Bulletin, Annual Report and Statements of Account of Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS) and National Population Commission. The data covered the period of 1970-2009 because of long-term time-series data.

3.2. Analytical Techniques

The study was carried out using econometric model which expresses:(i) Agricultural investments as dependent on financial sector reforms (ii) Agricultural growth as dependent on financial sector reforms. The relationships were specified as follows:

$$AGINV \quad = \quad f(FSRGDP1) \tag{1}$$

$$AGRGDP1 = \quad f(FSRGDP) \tag{2}$$

Where:

$AGRINV$ = Agricultural Investments (represented by Foreign Investment plus Domestic Investment. The Foreign Investment was proxied for Foreign Private Investment (FPI) in agricultural sector while Domestic Investment was proxied for Credit to agriculture).
$AGRGDP1$= Agricultural Growth (proxy for Growth Rate of Agricultural Sector Real Gross Domestic Product).
$FSRGDP$ = Financial Sector Real Gross Domestic Product
From economic theory, other policy variables such as savings, income, output, interest rate and exchange rate also affect agricultural investments while agricultural investment, labour in agriculture, exchange rate and interest rate also affect agricultural growth. Therefore, we have:

$$LNAGINV = f(LNFSRGDP, LNSAV, LNAGRGDP1, LNPCI, LNER, LNIR) \tag{3}$$
$$LNAGRGDP1 = f(LNFSRGDP, LNAGINV, LNLFA, LNER, LNIR) \tag{4}$$
$LNSAV$ = Log of Total Savings
$LNPCI$= Log of Per Capita Income
$LNLFA$= Log of Labour Force in Agriculture
$LNER$= log of Exchange Rate
$LNIR$= log of Interest Rate
$(AGINV, AGRGDP1, FSRGDP)$ are as defined in equations 1 and 2.

With several theories on the relationship between financial sector reforms and economic growth, various variables of interest such as $(LNAGINV, LNAGRGDP1, LNFSRGDP, LNSAV, LNPCI, LNLFA, LNER, LNIR)$ were jointly determined. The empirical investigation into the relationships among these variables was conducted using a cointegration and vector autoregressive (VAR) model. The merit of the VAR technique of analysis is that it treats all variables as potentially endogenous and also facilitates investigation of the related concept of causality in the Granger's sense of it (Granger, 1969). Causality in Granger's sense is inferred when values of a variable say X_t have explanatory power in a regression of Y_t on lagged values of Y_t and X_t. The vector

autoregression (VAR) model has become one of the leading approaches employed in the analysis of dynamic economic relationships (Barsky & Kilian, 2004; Killian, 2009; Ozlale & Pekkurnaz, 2010; Chuku *et al*., 2010) like the ones specified in equations 3 and 4 respectively. This study follows suit by specifying a VAR model that assess the long and short-run relationship of the impact of financial sector reforms on agricultural investment and growth in Nigeria.

The VAR representation of the model with lag order *k* is thus:

$$Y_t = C_0 + \sum_{i=1}^{k} A_i Y_{t-i} + \mu_t \quad (5)$$

Where:

$$= (LNAGINV, LNAGRGDP1, LNFSRGDP, LNSAV, LNPCI, LNLFA, LNER, LNIR) \text{ is a}$$

8X1 vector of endogenous variables or Integrated Variables

$$(6)$$

$C_0 = (C_1, C_2 \dots C_n)$ the C intercept vector of the VAR model.

$A_i =$ matrix coefficients estimated of autoregressive coefficient vector Y_{t-i}, for $i = 1, 2 \dots k$. Thus, A_i is 8 x 8 coefficient matrices.

$\mu_t = (\mu_{1t}, \mu_{2t,} \dots \mu_{nt})$ vector of independent and identically distributed error terms (I.I.D).

k = the number of lagged terms.

The VAR estimations are very sensitive to structure of lag variables and sufficient lag length does help to reflect the long term impact of variables on others. However, including longer lag lengths will lead to multicollinearity problems and will increase the degrees of freedom (DOF) (Wooldridge, 2006). From equation (6), it was expanded as follows:

$$\Delta LNAGINV$$
$$= \varphi_0 + \varphi_1 \sum_{i=1}^{k} \Delta LNAGRGDP1_{q,t-i} + \varphi_2 \sum_{i=1}^{k} \Delta LNFSRGDP_{q,t-i} + \varphi_3 \sum_{i=1}^{k} \Delta LNSAV_{q,t-i}$$
$$+ \varphi_4 \sum_{i=1}^{k} \Delta LNPCI_{q,t-i} + \varphi_5 \sum_{i=1}^{k} \Delta LNLFA_{q,t-i} + \varphi_6 \sum_{i=1}^{k} \Delta LNER_{q,t-i}$$
$$+ \varphi_7 \sum_{i=1}^{k} \Delta LNIR_{q,t-i}$$
$$+ \mu_{1t} \quad (7)$$

$$\Delta LNAGRGDP1$$
$$= \theta_0 + \theta_1 \sum_{i=1}^{k} \Delta LNAGINV_{q,t-i} + \theta_2 \sum_{i=1}^{k} \Delta LNFSRGDP_{q,t-i} + \theta_3 \sum_{i=1}^{k} \Delta LNSAV_{q,t-i}$$
$$+ \theta_4 \sum_{i=1}^{k} \Delta LNPCI_{q,t-i} + \theta_5 \sum_{i=1}^{k} \Delta LNLFA_{q,t-i} + \theta_6 \sum_{i=1}^{k} \Delta LNER_{q,t-i} + \theta_7 \sum_{i=1}^{k} \Delta LNIR_{q,t-i}$$
$$+ \mu_{2t} \quad (8)$$

$\Delta \text{LN} FSRGDP$

$$= \lambda_0 + \lambda_1 \sum_{i=1}^{k} \Delta LNAGINV_{q,t-i} + \lambda_2 \sum_{i=1}^{k} \Delta LNAGRGDP1_{q,t-i} + \lambda_3 \sum_{i=1}^{k} \Delta LNSAV_{q,t-i}$$

$$+ \lambda_4 \sum_{i=1}^{k} \Delta \text{LN} PCI_{q,t-i} + \lambda_5 \sum_{i=1}^{k} \Delta LNLFA_{q,t-i} + \lambda_6 \sum_{i=1}^{k} \Delta LNER_{q,t-i}$$

$$+ \lambda_7 \sum_{i=1}^{k} \Delta LNIR_{q,t-i}$$

$$+ \mu_{3t} \tag{9}$$

$\Delta \text{LN} SAV$

$$= \beta_0 + \beta_1 \sum_{i=1}^{k} \Delta LNAGINV_{q,t-i} + \beta_2 \sum_{i=1}^{k} \Delta LNAGRGDP1_{q,t-i}$$

$$+ \beta_3 \sum_{i=1}^{k} \Delta LNFSRGDP_{q,t-i} + \beta_4 \sum_{i=1}^{k} \Delta LNPCI_{q,t-i} + \beta_5 \sum_{i=1}^{k} \Delta LNLFA_{q,t-i}$$

$$+ \beta_6 \sum_{i=1}^{k} \Delta LNER_{q,t-i} + \beta_7 \sum_{i=1}^{k} \Delta LNIR_{q,t-i}$$

$$+ \mu_{4t} \tag{10}$$

$\Delta \text{LN} PCI$

$$= \gamma_0 + \gamma_1 \sum_{i=1}^{k} \Delta LNAGINV_{q,t-i} + \gamma_2 \sum_{i=1}^{k} \Delta LNAGRGDP1_{q,t-i}$$

$$+ \gamma_3 \sum_{i=1}^{k} \Delta LNFSRGDP_{q,t-i} + \gamma_4 \sum_{i=1}^{k} \Delta LNSAV_{q,t-i} + \gamma_5 \sum_{i=1}^{k} \Delta LNLFA_{q,t-i}$$

$$+ \gamma_6 \sum_{i=1}^{k} \Delta LNER_{q,t-i} + \gamma_7 \sum_{i=1}^{k} \Delta LNIR_{q,t-i}$$

$$+ \mu_{5t} \tag{11}$$

$\Delta \text{LN} LFA$

$$= \psi_0 + \psi_1 \sum_{i=1}^{k} \Delta \text{LN} AGINV_{q,t-i} + \psi_2 \sum_{i=1}^{k} \Delta LNAGRGDP1_{q,t-i}$$

$$+ \psi_3 \sum_{i=1}^{k} \Delta LNFSRGDP_{q,t-i} + \psi_4 \sum_{i=1}^{k} \Delta LNSAV_{q,t-i}$$

$$+ \psi_5 \sum_{i=1}^{k} \Delta \text{LN} PCI_{q,t-i} \, \psi_6 \sum_{i=1}^{k} \Delta LNER_{q,t-i} + \psi_7 \sum_{i=1}^{k} \Delta LNIR_{q,t-i}$$

$$+ \mu_{6t} \tag{12}$$

$$\Delta \text{LN}ER$$
$$= \sigma_0 + \psi_1 \sum_{i=1}^{k} \Delta LNAGINV_{q,t-i} + \sigma_2 \sum_{i=1}^{k} \Delta LNAGRGDP1_{q,t-i}$$
$$+ \sigma_3 \sum_{i=1}^{k} \Delta LNFSRGDP_{q,t-i} + \sigma_4 \sum_{i=1}^{k} \Delta LNSAV_{q,t-i} + \sigma_5 \sum_{i=1}^{k} \Delta LNPCI_{q,t-i}$$
$$+ \sigma_6 \sum_{i=1}^{k} \Delta LNLFA_{q,t-i} + \sigma_7 \sum_{i=1}^{k} \Delta LNIR_{q,t-i}$$
$$+ \mu_{7t} \tag{13}$$

$$\Delta \text{LN}IR$$
$$= \phi_0 + \phi_1 \sum_{i=1}^{k} \Delta LNAGINV_{q,t-i} + \phi_2 \sum_{i=1}^{k} \Delta LNAGRGDP1_{q,t-i}$$
$$+ \phi_3 \sum_{i=1}^{k} \Delta LNFSRGDP_{q,t-i} + \phi_4 \sum_{i=1}^{k} \Delta LNSAV_{q,t-i} + \phi_5 \sum_{i=1}^{k} \Delta LNPCI_{q,t-i}$$
$$+ \phi_6 \sum_{i=1}^{k} \Delta LNLFA_{q,t-i} + \phi_7 \sum_{i=1}^{k} \Delta LNER_{q,t-i}$$
$$+ \mu_{8t} \tag{14}$$

It is worthy to note that while it is easier to measure other variables described above, measuring financial sector reforms often poses a challenge to researchers in their effort to assess the impact of financial intermediation on real economic activity. The reason is because commonly used bank measures such as the ratio of monetary aggregates (like M2) to GDP, the ratio of liquidity liabilities to GDP and the ratio of bank credit to the private sector to GDP are considered as poor indicators of financial sector reforms (Levine *et al.*, 2000; Arestis & Luintel, 2001; Liang & Teng, 2006;Ghirmay, 2009). As such, financial sector RGDP or GDP is regarded by far a better measure of financial sector reforms in that: (i) it represents a broader measure of financial reforms. (ii) it represents all the activities of a financial system; that is, all financial transactions "involving the creation, liquidation, or change in ownership of financial assets and/or facilitating financial transactions".(iii) it is invariant to the structural changes within the financial sector.(iv) it does not underestimate the level of financial sector in Nigeria's economy, where a significant financial development, Investment, Productivity and economic growth or innovation occurs in the real sector. Based on the above assertions, financial sector RGDP (Real Gross Domestic Product) was utilized as indicator for financial sector reforms.

The VAR model is known for establishing the relationship among variables based on the assumption of stationarity of the variables that make up the vector autoregressive.If the time series are non-stationary at levels, the stability condition of VAR is not met; this implies that the usual statistical techniques of coefficient evaluation will not be valid. In such condition, the cointegration and vector error correction (VECM) techniques would be employed to examine the relationship among non-stationary variables (Wooldridge, 2006). Thus, it became necessary to conduct preliminary diagnostic on the time series properties of the variables before further evaluation.

To ascertain the order of integration of the variables, a preliminary step analysis was carried to test for the presence of unit-roots using two specifications of the augmented Dickey-Fuller (ADF) test: (i) Intercept (ii) trend and intercept. The later was used for confirmation test. The essence of the test was to show whether the time series have a

stationary trend and if non-stationary, to show the order of integration at which they become stationary.

The hypothesis for the unit root test is:
- H_0: $\infty = 1$
- H_1: $\infty < 1$

To ensure that the results obtained was not spurious (Maddala, 2002), cointegration test was carried out. Economically speaking, two variables are co-integrated if they have a long-term or equilibrium relationship (Gujarati, 2003). To test for the presence of a long-run relationship, the maximum likelihood method developed by Johansen (1988 and 1991) was utilized. Using the Johansen approach, two test statistics can be used in testing the number of cointegrating vectors: the Trace and the Maximum Eigenvalue statistics. The null hypothesis for the trace test was that there are at most r cointegrating vectors, while for the Max Eigenvalue test, the null of $r = 0$ was tested against the alternative that $r = 1$; $r = 1$ was tested against the alternative that $r = 2$ and so on. The Schwarz Information Criterion (SIC) was used to select the optimal lag length for the cointegration test.

To examine the short-run impacts of financial sector reforms on agricultural investments in Nigeria, an error correction modeling (ECM) analysis was conducted. Several alternative methods of testing for Causality in Cointegrated VAR have emerged in literature. The popular approach has been to re-parameterize the model into the equivalent vector error correction model (VECM) and to conduct Causality tests following either the residual-based Engle-Granger two-stage method or the Johansen-Type Error.

4. Results and Discussion

4.1. Stylized Fact of Financial Sector Reforms and Agricultural Investment in Nigeria

To aid understanding of the nature and characteristics of financial sector reforms and investments variables used for the analysis, a detailed stylized fact of trend of agricultural investments and its growth rates before and after financial sector reforms in the study periods (1970-2009) of the two variables is presented in Table 1. From the table, the descriptive statistics reveals that during the pre-financial sector reforms period, agricultural investments in Nigeria increased from ₦18.2 million in 1970 to ₦24.5 million in 1971 with positive growth rate of 34.62 percent. It is further observed that agricultural investments increased progressively till the end of the period (1986). The highest growth rate was 110.94 percent in 1977 and the lowest was 3.15 percent in 1973 as presented in Table1, Figures 1 and 2. The mean agricultural investments for the pre-financial sector reforms period was ₦538.78 million with a corresponding mean growth rate of 36.36 percent. The positive growth rates recorded during 1970-1986 pre-financial sector reforms period though fluctuating are an indication that there might have been genuine investors who were still investing in agricultural sector in spite of the heavy dependence of the economy on oil. According to Ekpo and Umoh (2000), revenue from oil represented almost 90 percent of foreign exchange earnings and 85 percent of total exports. It should be noted that the oil wind fall in the country provided government with huge revenue but caused serious structural defects in the economy that gave rise to a comprehensive financial sector reforms in 1987.

In the financial sector reforms period, investments in agriculture increased progressively from ₦2556 million in 1987 to ₦34473.1 million in 1996 with fluctuating growth rates of 31.24 percent to 30.15 percent. Investments in agriculture during the financial sector reforms period experienced negative growth rates in 1997, 1998, 2006 and 2009 with the highest growth rate of 322.8 percent in 1999 as shown in Table 1; figure 1 and 2 respectively. The

mean agricultural investments during the financial sector reforms period was ₦88,101.83 million with mean growth rate of 34.25 percent. The result further reveals that the mean agricultural investments of ₦88,101.83 million during financial sector reforms period was higher than ₦538.78 million of the pre-financial sector reforms period and was significantly different at 5 percent (tcal>ttab at P=0.5). On the other hand, the mean growth rate of 36.36 percent for the pre-financial sector reforms period was higher than 34.25 percent of the financial sector reforms period and was not significantly different at 5 percent (tcal<ttab at P=0.5) between the growth rates of the two periods. This implies that the financial sector reforms favoured agricultural investments while the growth rates were the same in both periods.

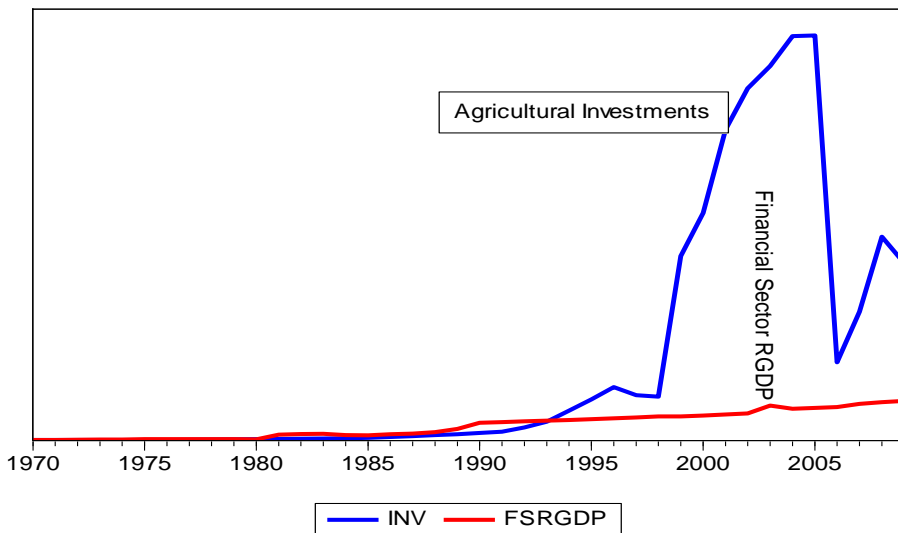**Figure 1: Trend of Agricultural Investments during Financial Sector Reforms Period**

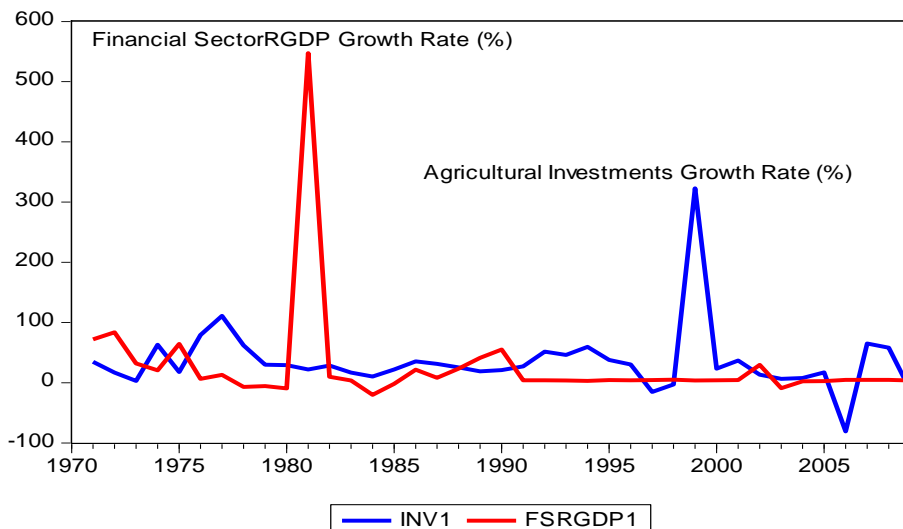**Figure 2: Growth Rates of Agricultural Investments during Financial Sector Reforms Period**

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Table 1. Growth of Agricultural Investments before and after Financial Sector Reforms

FSRGDP			AGINV		
YEAR (PRE-FSR)	AMOUNT (₦'Million')	GROWTH RATE (%)	YEAR (PRE-FSR)	AMOUNT (₦'Million')	GROWTH RATE (%)
1970	69.3	-	1970	18.2	-
1971	119.227	72.10	1971	24.5	34.62
1972	219.97	83.84	1972	28.6	16.74
1973	289.3	31.93	1973	29.5	3.15
1974	349.3	20.74	1974	48.1	63.05
1975	573.9	64.30	1975	56.6	17.67
1976	610.5	6.37	1976	101.5	79.32
1977	690.6	13.10	1977	214.1	110.94
1978	641	-7.18	1978	346.6	61.89
1979	605.9	-5.48	1979	450.4	29.95
1980	548.3	-9.51	1980	582.7	29.37
1981	3549.2	547.31	1981	711.1	22.04
1982	3899.7	9.88	1982	914.4	28.55
1983	4037	3.52	1983	1068.9	16.9
1984	3229.3	-20.00	1984	1178.1	10.22
1985	3171.7	-1.78	1985	1438.4	22.01
1986	3859.8	21.69	1986	1947.6	35.4
Mean	**1556.67**	**51.93**	**Mean**	**538.78**	**36.36**
Post-FSR			FSR		
1987	4168.4	7.99	1987	2556	31.24
1988	5138.6	23.28	1988	3201.5	25.25
1989	7261	41.30	1989	3805.2	18.86
1990	11260	55.07	1990	4604.2	21.00
1991	11710.45	4.00	1991	5399.1	27.27
1992	12178.8	3.99	1992	8193.8	51.76
1993	12641.6	3.80	1993	11961.5	45.98
1994	13020.9	3.00	1994	19097.8	59.66
1995	13567.8	4.20	1995	26487.7	37.7
1996	14110.5	3.99	1996	34473.1	30.15
1997	1473.1	4.19	1997	29148.3	-15.45
1998	15438.2	4.99	1998	28317.7	-2.85
1999	15978.6	3.50	1999	119727.3	322.8
2000	16601.8	3.90	2000	147713.5	23.38
2001	17348.8	4.49	2001	202065.2	36.8
2002	22452.8	29.42	2002	228826.6	13.24
2003	20377.3	-9.24	2003	243394.7	6.37
2004	20866.7	2.40	2004	262767.7	7.96
2005	21430.3	2.70	2005	263214.5	17.00
2006	22451.7	4.76	2006	50602.4	-80.78
2007	23531.7	4.81	2007	83540.95	65.09
2008	24609.9	4.58	2008	132227	58.28
2009	25543.4	3.79	2009	115016.4	-13.02
Mean	**15626.23**	**9.34**	**Mean**	**88101.83**	**34.25**

Source: Data from CBN and Computed by Author, 2011. FSR (Financial Sector Reforms).Naira (₦) represents Nigerian currency and is issue by the Central Bank of Nigeria (CBN). A Naira is equivalent to 163 US Dollar according to Central Bank of Nigeria.

4. Result and Discussion

4.1. Effect of Financial Sector Reforms on Agricultural Investments

Table 2 shows the results of unit root test. Augmented Dicker-Fuller (ADF) unit root test was applied on all the data series in their log forms. Schwarz Information Criterion (SIC) was used for the selection of the optimal lag length to a maximum of 9. For robustness checks, specification of the ADF model was varied. Specifically, the test was run in under two different assumptions: (i) with intercept and (ii) with trend and intercept. The results indicate that all the variables possessed unit-roots at one percent level of significance and become stationary only after transforming them to their first differences for both intercept and when trend specification was included except for agricultural output growth that suggested that the series were stationary at level, that is, *I(0)*.The unit root test provides information on how to integrate the variables in the vector error correction model. Following the results, agricultural investments (LNAGINV), financial sector reforms (LNFSRGDP), total savings (LNSAV), per capita income (LNPCI), labour force in agriculture (LNLFA), exchange rate (LNER) and interest rate (LNIR) were fed into the model at their first-differences, while agricultural growth (LNAGRGDP1) enters at its level.

Table 2. Result of ADF Unit root test

Variable	Level		1st Difference		Conclusion
	Intercept	Trend + Intercept	Intercept	Trend + Intercept	
LNAGINV	-1.701[0]	-1.157[0]	-5.890[0]***	-6.161[0]***	*I(1)*
LNAGRGDP1	-6.039[0]***	-5.972[0]***	____	____	*I(0)*
LNFSRGDP	-2.819[0]	-2.392[0]	-5.935[0]***	-4.157[0]***	*I(1)*
LNSAV	1.130[0]	-0.771[0]	-4.661[0]***	-4.735[0]***	*I(1)*
LNPCI	-2.492[0]	-1.962[0]	-5.702[0]***	-6.046[0]***	*I(1)*
LNLFA	0.613[0]	-1.371[0]	-5.650[0]***	-5.856[0]***	*I(1)*
LNER	0.125[0]	-2.163[0]	-5.023[0]***	-4.995[0]***	*I(1)*
LNIR	-2.189[0]	-2.929[0]	-9.239[0]***	-9.162[0]***	*I(1)*

Source: Computed by Author. Notes: *** indicates significance at 1% level. The values in bracket [ ] for the ADF test shows the optimal lag length selected by the SIC within a maximum lag of 9 .Variables are in log forms.

Given the fact that most of the variables became stationary after first differencing, another test was conducted to examine whether the non-stationary variables were co-integrated. In other words, we tested the hypotheses about the rank of the cointegrating relationships that existed among the variables. The results from the Johansen cointegration tests are presented in Tables 3 and 4 respectively. The test assumption specified allowed for a linear deterministic trend in the data series and an intercept in the cointegrating equation. From Tables 3 and 4, it is observed that both the Trace and the Maximum Eigenvalue tests indicated the presence of two (2) and one (1) cointegrating vectors respectively. Thus, there are evidences of the existence of a long-run relationship among financial sector reforms, agricultural investment and other policy variables in Nigeria. Consequently, applying the vector error correction model (VECM) would enable us to track the long-run relationship among the variables and tie it to deviation that may occur in the short-run (Lorde, Jackman, & Thomas, 2009).

Table 3. Johansen Cointegration Trace Test

Null Hypothesis	Alternative Hypothesis	Test Statistic	Critical Value 0.05	P-Value
r = 0	r = < 1	198.682	159.530***	0.000
r = 1	r = <2	134.750	125.615**	0.012
r = 2	r = <3	91.215	95.754	0.099
r = 3	r = <4	62.088	69.819	0.177
r = 4	r = <5	38.263	47.856	0.291
r = 5	r = <6	23.603	29.797	0.218
r = 6	r = <7	10.765	15.494	0.226
r = 7	r = <8	1.447	3.842	0.229

Source: Computed by Author. Notes: r indicates the number of co-integrating vector. ***, ** are the significance level at 1% and 5% respectively. P-values are obtained using response surfaces in Mackinnon *et al*., (1999).

Table 4. Johansen Cointegration Maximum Eigenvalue Test

Null Hypothesis	Alternative Hypothesis	Test Statistic	Critical Value 0.05	P-Value
r = 0	r = 1	198.682	52.363***	0.002
r = 1	r = 2	134.750	46.231	0.095
r = 2	r = 3	91.215	40.078	0.483
r = 3	r = 4	62.088	33.877	0.468
r = 4	r = 5	38.263	27.584	0.775
r = 5	r = 6	23.603	21.132	0.467
r = 6	r = 7	10.765	14.265	0.261
r = 7	r = 8	1.447	3.842	0.229

Source: Computed by Author. Notes: r indicates the number of co-integrating vector. *** is the significance level at 1%. P-values are obtained using response surfaces in Mackinnon *et al*., (1999).

From the Johansen co-integration results, a VECM (2) with at least two cointegrating vectors was estimated and to ascertain that the estimated VECM was not spurious, the residual auto correlation and correlogram tests were also conducted. The results show that the residuals of the estimated VECM were appropriately uncorrelated, indicating that the estimated VECM was correctly specified or unbiased and the parameters estimated were consistent. This was because the spikes from the correlograms revealed the relative correlation of the error terms in the VECM equations and the closer the spikes are to the zero line, the more uncorrelated the error terms.

To examine whether there is a significant short-run relationship between financial sector reforms and the macroeconomic variables, an error correction modeling (ECM) analysis was conducted as shown in Table 5. From the results of the final parsimonious estimated, it shows that explanatory variables explain well about 65% of the variations of agricultural investments in the model. This is adjudged by the value of the coefficient of determination, R-squared. The Durbin Watson Statistic of 2.03 indicates that it fell within the accepted bound while the probability of the F-Statistic of 1.98 (P<0.05) suggests that the model has a very good fit. This result support the previous one that the variables constitute cointegrated set. In term of significance of the variables, it was observed that financial sector reforms

(LNFSRGDP), labour force in agriculture (LNLFA);previous value of agricultural output growth (LNAGRGDP1), savings (LNSAV), exchange rate (LNER) and interest rate (LNIR) were the significant determinants of agricultural investments in Nigeria for the period under reviewed. The coefficients of other variables like per capita income were not significantly different from zero. The result reveals that financial sector reforms, labour force in agriculture with previous agricultural output growth, savings, exchange rate and interest rate significantly increase the present financial sector reforms, labour force in agriculture, agricultural output growth, savings, exchange rate and interest rate while that of other variables like per capita income do not significantly affect agricultural investments in Nigeria. The agricultural investment ECM coefficient in the short run was negative and statistically significant at 5 percent levels with a value of -0.3781. This implies that 37.81 percent of the disequilibrium in the long-run relationship was corrected in the current year and it would take (1/0.3781) or two years and six months for full restoration back to the equilibrium after a short-run distortion. Therefore, correcting any deviations from the long-run equilibrium. This implies that financial sector reforms had impact on agricultural growth in the short-run.

Table 5. Error Correction Model for Short-run Impact

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	0.200899	0.234156	0.857969	0.4022
D(LNAGRGDP1)	0.072364	0.037385	1.935622	0.0688
D(LNAGRGDP1(-1))	0.744135	0.422085	1.762998	0.0949
D(LNAGRGDP1(-2))	-0.023529	0.019805	-1.188038	0.2503
D(LNFSRGDP)	-1.061277	0.567344	-1.870606	0.0777
D(LNFSRGDP(-2))	0.330427	0.323212	1.022325	0.3202
D(LNSAV(-1))	-1.990163	0.660831	-3.011608	0.0075
D(LNSAV(-2))	1.004002	0.569513	1.762912	0.0949
D(LNPCI)	0.349168	0.400395	0.872058	0.3947
D(LNLFA)	0.920854	0.407966	2.257185	0.0367
D(LNLFA(-1))	0.264899	0.280078	0.945804	0.3568
D(LNER)	-0.308035	0.383229	-0.803787	0.4320
D(LNER(-2))	0.538957	0.250856	2.148473	0.0455
D(LNIR)	0.377141	0.271471	1.389248	0.1817
D(LNIR(-1))	0.546724	0.246218	2.220487	0.0395
D(LNIR(-2))	0.206868	0.173753	1.190590	0.2493
D(LNAGINV(-1))	0.173408	0.174531	0.993568	0.3336
ECM(-1)	-0.378109	0.153993	-2.455367	0.0245
R-squared	0.652124	Mean dependent var		0.229679
Adjusted R-squared	0.323574	S.D. dependent var		0.424412
S.E. of regression	0.349059	Akaike info criterion		1.039699
Sum squared resid	2.193153	Schwarz criterion		1.831458
Log likelihood	-0.714574	Hannan-Quinn criter.		1.316044
F-statistic	1.984856	Durbin-Watson stat		2.033792
Prob(F-statistic)	0.079452			

Source: Computed by Author. Note: ***, ** and * indicate 1% and 5% and significant levels respectively.

5. Conclusion and Recommendations

The study examines the effect of financial sector reforms on agricultural investments in Nigeria from 1970-2009.The cointegration and vector error correction model (VECM) approach result reveals that financial sector reformsproxy by financial sector RGDP significantly affect agricultural investments in Nigeria both in the long and short-run. It is therefore recommended that Government should adopt strong macroeconomic policies targeted to bring meaningful growth in the agricultural and financial sector against foreign-based economic policies since financial sector reforms significantly impact on agricultural investments in Nigeria both in the long and short-run. This could be done by creating a well secured bank-based financial system through strong financial regulation, good supervision, regular and sustainable institutional reforms. The current restructuring in the financial institutions should be seriously addressed with appropriate regulatory frameworks instituted to prevent future recurrence.

Financial sector should be motivated to supply the funds needed for this activity while the government should provide the enabling environment conducive for farming as a business through concessionary interest rates, tax free and import duty concessions. These financial and fiscal incentives when provided would encourage investments and output growth in the agricultural sector of the country. There should be proper formulation of a suitable and harmonized regulatory framework that is capable of sustaining a liberalized economy. This is because a liberalized economy is capable of expanding the growth of the business sector which would in turn encourage investments in the agricultural sector through a strong and healthy financial sector.

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