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Trivariate Analysis of the Flow of Loan-Able Funds to Agricultural Sector in Nigeria

Akpaeti, Aniekan. J.

Department of Agricultural Economics and Extension, Akwa Ibom State University, Ikot Akpaden, Mkpat Enin, P.M.B. 1167, Uyo, Akwa Ibom State, Nigeria

Abstract: The study investigates the effects of financial sector reforms on the flow of loanable funds from commercial banks to agricultural sector in Nigeria. Secondary data was collected from Central Bank of Nigeria covering the period from 1970-2009 and analyzed using trivariate Granger causality approach which is more reliable than the bivariate model. The result reveals that financial sector was not a major contributing factor in the disbursement of funds. This further highlights the fact that financial institutions like the commercial banks have always found an alternative portfolio investment more lucrative than lending to the agricultural sector. The study also revealed that there were no causal (directional) relationship between financial sector reforms and the flow of loanable funds in Nigeria. This provides a clue to the characterization of what may be obtainable in most developing countries with fragile financial sector and open economies. It therefore recommended that 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 with strong macroeconomic policies targeted to bring meaningful growth in the agricultural and financial sector. These financial and fiscal incentives when provided would encourage investments and output growth in the agricultural sector of the country.

Key Words: Trivariate; Financial Sector Reforms; Loanable Funds; Agricultural Sector; Granger Causality; Nigeria.

1. Introduction

The financial system has been acknowledged to play an important role in economic growth and development. Several theoretical and empirical studies at the international, national and provincial levels demonstrate that the financial sector could be a catalyst of economic growth if it is developed and healthy (Goldsmith, 1955; Cameron, 1967; Mckinnon, 1973 and Shaw, 1973; Chen and Feng, 2000; Chow and Li, 2002). While Marjit (2004) opines that economic growth is significantly related to growth in agriculture. This confirmed the works of Johnston and Mellor (1961), who stated that agriculture has important linkages and interrelationship with the rest of the economy. This interaction is highly vulnerable to changes in other sector especially macroeconomic policies not specially targeted at agriculture (Oyejide, 1986). World Bank (1989) also reported that in most other developing countries where agriculture is a large sector of the economy, no other sector of the economy is large enough to serve as an engine of economic growth in the next decade. This is because a large proportion of the Gross Domestic Product (GDP) comes from the agricultural sector.

Roubini and Sala-i-Martin (1992) in a cross country framework provides additional evidence linking improved functioning of financial systems to faster rates of economic growth. Therefore, reforming weak banking sectors can have direct impact on savings, as weak banks tend to have higher loan-to-deposit spreads and thereby discourage savings and investment. The implication is that a more open and well regulated financial sector is efficient, robust and acts as an "engine of growth" for the entire economy. All other sectors like agriculture rely on the financial intermediation for growth. Government, over the years, has almost been the sole provider of financial and other capital resources to support agriculture. She has 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 and Akpokodje, 1993).

According to Balogun (2007), he asserted that despite the rapid increase in financial lending to the economy, the share of production sectors of the economy especially agriculture and mining remained low and declined proportionally over time suggesting that the new monies may have been channeled into miscellaneous activities. Yet, agriculture is known to contribute a major share to the GDP even under conditions that it is not getting enough funds. A significant proportion of the production loans go to manufacturing, probably to finance imports of raw materials, machineries and component assembly activities. This further highlights the fact that financial institutions like commercial banks have always found an alternative portfolio investment more lucrative than lending to the agricultural sector.

Prior-savings theory has it that an increase in savings leads to an increase in investment if the investible (loanable) funds from savings are translated into actual investment. The increase in investment leads to a further increase in savings. The continuous increase in investment, resulting from increased savings leads to increased economic growth. In this case, economic growth will continue to increase until savings and investment ratios stabilize. This eventually leads to a steady and self-sustained increase in national income and economic development (Odhiambo, 2007). Although the positive relationship between savings and economic growth has been widely supported by a number of schools of thought, the causal relationship between the two variables remains controversial, especially from an empirical stand point. Some of the studies that have attempted to empirically examine the causal relationship between savings and economic growth include those of Konya (2004),

Irandoust and Ericsson (2005), Mohan (2006), and Sinha and Sinha (1998), amongst others. In a separate study, Agrawal (2001) examines the direction of causality between savings and growth in seven Asian countries using the Engle and Granger Vector Error Correction Model (VECM) and VAR procedures. Unfortunately, the majority of these studies are mainly based on the bivariate causality test. Yet, it is now clear that a bivariate causality test may be very unreliable, as the introduction of a third important variable can change both the inference and the magnitude of the estimates (Caporale & Pittis, 1997; Odhiambo, 2009). This therefore calls for the use of trivariate model in the current study.

In an attempt to address this shortcoming, the current study incorporates the savings variable as an intermittent variable in the trivariate causality model between financial sector reforms and loanable funds. The choice of savings as an intermittent variable in this case has been largely influenced by the theoretical links between savings and financial sector, on the one hand, savings and loan-able funds on the other. According to the prior-savings theory, higher savings lead to higher investment, which in turn leads to higher economic growth. In this way savings play an important role in the process of economic development. This is particularly critical for a developing country like Nigeria where the demand for loan-able funds is assumed to exceed the supply, and where the constraint on investment is the supply rather than the demand for loan-able funds (McKinnon, 1973 and Shaw, 1973). Against this backdrop, this paper examines the effects of financial sector reforms on the flow of loan-able funds from commercial banks to the agricultural sector in Nigeria.

2. Materials and Methods

2.1. Study Area

The study was carried out in Nigeria. Nigeria has a total area of 923,768 square kilometers constituting land area of 910768 square kilometers and water area of

13000 square kilometers respectively. It has coaster lines of 853 square kilometers and is located on the Gulf of the Guinea in West Africa. It lies within the tropical zone between latitudes 4^0 1^1 and 13^0 9^1N and longitudes 2^0 21^1 and 14^0 30^1 E. It is bounded on the West by the Republics of Benin and Niger; on the East by the Republic of Cameroon; on the North by Niger and Chad Republics and on the South by Atlantic ocean on the Gulf of Guinea. It is one of the eight most populous countries in the world with a population of about 140 million (National Population Commission, 2006) with six geopolitical zones: North-East, North-West, North-Central, South-East, South-West and South-South.

Nigeria has financial service sector comprising of the banking system, financial institutions and financial markets with the Central Bank of Nigeria (CBN) as the apex bank. The CBN has responsibility for the promotion of a sound financial system that would ensure effective conduct of monetary policy. This is necessary for mobilization of resources for investment, economic growth and development (CBN, 2009). This mobilization covers all sectors including agriculture which depends on the financial intermediation for growth because of the large proportion of the Gross Domestic product (GDP) that comes from agriculture. The climate varies with Equatorial in South, Tropical in Centre and in the North. There are two seasons – the wet season (April-October) and the dry season (November-March). The type of vegetation is grassland savannah in the North and forest in the south. This vegetation has made agriculture the major employer of labour in the country.

2.2. Data Collection: The study made use of data from secondary sources obtained from Central Bank of Nigeria (CBN), Statistical Bulletin, Annual Report and Statements of Account and of Central Bank of Nigeria (CBN), Federal Ministry of Agriculture and Natural Resources, National Bureau of Statistics (NBS) and Food and Agriculture Organization (FAO). The data covered the period of 1970-2009 because of long-term time-series data.

2.3. Analytical Techniques

An Ordinary Least Square (OLS) technique was estimated for this analysis while a trivariate Granger causality technique adopted by Odhiambo (2009) was used to examine if there are causal relationship between variables. The advantage of the Granger causality approach over other approaches is because of its favourable response to both large and small samples. The OLS model was specified as follows:

$$LNLOFUN_t = \alpha_0 + \alpha_{1i}\sum_{i=1}^{m} LNLOFUN_t + \alpha_{2i}\sum_{i=1}^{n} LNFSRGDP_t + \alpha_{3i}\sum_{i=1}^{m} LNSAV_t + \varepsilon_t \quad (1)$$

A trivariate Granger causality model between financial sector reforms, savings and loan-able funds was specified. Thus:

$$LNLOFUN_t = \eta_0 + \eta_{1i}\sum_{i=1}^{m} LNLOFUN_{t-i} + \eta_{2i}\sum_{i=1}^{n} LNFSRGDP_{t-1} + \eta_{3i}\sum_{i=1}^{m} LNSAV_{t-1} + \varepsilon_t \quad (2)$$

$$LNFSRGDP_t = \zeta_0 + \zeta_{1i}\sum_{i=1}^{m} LNLOFUN_{t-1} + \zeta_{2i}\sum_{i=1}^{n} LNFSRGDP_{t-1} + \zeta_{3i}\sum_{i=1}^{m} LNSAV_{t-1} + \varepsilon_t \quad (3)$$

$$LNSAV_t = \vartheta_0 + \vartheta_{1i}\sum_{i=1}^{m} LNLOFUN_{t-1} + \vartheta_{2i}\sum_{i=1}^{n} LNFSRGDP_{t-1} + \vartheta_{3i}\sum_{i=1}^{m} LNSAV_{t-1} + \varepsilon_t \quad (4)$$

Where: $LOFUN_t$ stands for log of loanable funds from commercial bank; SAV_t stands for log total savings and $FSRGDP_t$ stands for the log of Financial Sector Real Gross Domestic Product. α_0, η_0, ζ_0 and ϑ_0 are the respective constants for the four equations and α_i, η_i, ζ_i and ϑ_i are the coefficients for the variables estimated while ε_t is the error term.

The *apriori* expectations for all the η_i parameters are expected to assume positive signs. This is because influx of these loanable funds can be seen to be positively related to the rate of economic growth which enhances agricultural production and productivity, leads to higher incomes and better quality life for the rural people (Ijere, 1975). All the ζ_i parameters are also expected to assume positive signs. This follows the theoretical arguments that financial sector reforms have significant and positive effects on long-term economic growth through a number of channels such as raising investments level and enhancing efficient capital allocation. All the ϑ_i parameters are also expected to assume positive signs. This follows the simple Keynesian hypothesis which states that individual's savings, and hence national savings is a function of income. That is, the higher the income, the higher will be the savings rate in an economy.

To carry out this analysis, unit root test was conducted on the data using two specifications of the Augmented Dickey Fuller (ADF) unit root test (i) intercept (ii) trend and intercept. 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. This is in accordance with Green (2003) who stated that almost all empirical macroeconomic studies carried out involve non-stationary and trending variables in time series macroeconomic variables and this make them not amenable to regression analysis without some form of transformation.

After testing for stationarity, further test was conducted to check whether the time series variables were co-integrated. The Co-integration test conducted using the Johansen Co-integration approaches (Trace and Maximum Eigenvalue) were to examine the existence of long-run impact of financial sector reforms on the flow of loan-able funds from the commercial banks to the agricultural sector. The choice of the Johansen approaches was informed by its superiority over the Augmented Engle Granger approach and Durbin-Watson test of co-integration. However, in the short-run, there may be deviations from the long-run impact and this deviation

could be tracked and corrected using an error-correction model. This technique forms the underpinning for the models specified in equation 3.

3. RESULTS AND DISCUSSION

3.1. The Effects of Financial Sector Reforms on Loanable Funds

Table 1 presents the results of unit root test. The Augmented Dicker-Fuller (ADF) unit root test was applied on all the data series. 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 by carrying out the test under two different assumptions: (i) with intercept and (ii) with trend and intercept. The results indicated that all the variables possessed unit-roots at one percent levels of significance and became stationary only after transforming them to their first differences for both intercept and when trend specification was included.

Given that all the series were non-stationary at the levels but at integrated of order one, this suggests the possibility of the presence of cointegrating relations among the variables. Accordingly, tests for the existence of at least one cointegrating vector were conducted. The Johansen co-integration test procedure was utilized and both the Trace statistic criterion and the Maximum Eigenvalue criterion were used to determine the conclusion about the hypotheses of the rank of the cointegrating relationships.

Table 1 Result of ADF Unit root test

	Levels		1st Difference		
Variable	Intercept	Trend + Intercept	Intercept	Trend + Intercept	Conclusion
LOFUN	-2.130[0]	-1.143[0]	-5.817[0]***	-6.347[0]***	*I(1)*
FSRGDP	-2.819[0]	-2.392[0]	-5.935[0]***	-4.157[0]***	*I(1)*
SAV	1.130[0]	-0.771[0]	-4.661[0]***	-4.735[0]***	*I(1)*

Source: Computed from Central Bank of Nigeria (CBN) data of various years. Notes: *** indicates significance at 1% level while 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.

Both the Unrestricted Cointegration Rank test using the Trace statistic and the Maximum Eigenvalue test statistic gave the same result of no cointegrating relation among the variables as presented on Tables 2 and 3 respectively. This implies that there were no long-run relationship among financial sector real gross domestic product, loanable funds and total savings. From these results, it is concluded that financial sector reforms had no long-run impact on the flow of loan-able funds. This could be attributed to large amount of public sector funds that was withdrawn from the banks by Central Bank of Nigeria in 1989, a measure which resulted in relative scarcity of loan-able funds, as the large reservoir of credit which would have gone to agriculture were diverted to other sector. This situation only succeeded in inducing major hike in production costs and food prices (Odu, 1996).

Table 2 Johansen Cointegration Trace Test

Null Hypothesis	Alternative Hypothesis	Test Statistic	Critical Value 0.05	P- value
r = 0	r = < 1	20.542	29.797	0.387
r = 1	r = < 2	10.284	15.495	0.260
r= 2	r= < 3	2.082	3.842	0.150

Source: Computed from Central Bank of Nigeria (CBN) data of various years.
Notes: r indicates the number of co-integrating vector. P-values are obtained using response surfaces in Mackinnon *et al.,* (1999).

Table 3 Johansen Cointegration Maximum Eigenvalue Test

Null Hypothesis	Alternative Hypothesis	Test Statistic	Critical Value 0.05	P-Value
r = 0	r = 1	10.258	21.132	0.720
r = 1	r = 2	8.202	14.265	0.359
r = 2	r = 3	2.082	3.842	0.149

Source: Computed from Central Bank of Nigeria (CBN) data of various years.
Notes: r indicates the number of co-integrating vector. P-values are obtained using response surfaces in Mackinnon *et al.,* (1999).

In estimating the effect of financial sector reforms on loanable funds as presented in Table 4, autoregressive distributive lag model was specified to check the problem of autocorrelation because the variables in the model were not stationary at levels. The pure explanatory variables were estimated at lag one. The lead equation showed that 98 percent of the variation in the dependent variable was explained by the independent variables contained in the model. Durbin Watson statistic was used to test for autocorrelation and it showed that there was no significant autocorrelation in the model.

From the result, the previous loanable fund is significantly different at one percent level and positively related to the present loanable fund. The result further reveals that the coefficients of other two variables (financial sector real gross domestic product and savings) were not significantly different from zero. This implies that previous loanable funds positively determine the present flow of loanable funds from commercial bank to agricultural sector while the previous financial sector real gross domestic product and savings do not significantly affect the present financial sector real gross domestic product and savings. Thus, an increase in the previous volume of loanable funds would result in an increase in the present level of loanable funds from commercial bank to the agricultural sector. On the contrary, the result in Table 4 also shows that financial sector real gross domestic product and savings were not major contributing factors in the disbursement of loan as opposed to the finding of Ijere (1975) that loanable funds can be seen to be positively related to the rate of economic growth which enhances agricultural production and productivity, leads to higher incomes and better quality life for the rural people. This result confirms the weak financial system in the Nigerian economy and the known attitudinal behaviour of financial institutions toward granting of loans to agricultural sector.

Table 4 Estimated Results of Effect of Financial Sector Reforms on Loanable Funds

Variable	*Coefficient*	*Std. Error*	*T-Statistic*	*Probabilty*
C	*-0.314*	*0.686*	*-0.458*	*0.650*
LNLOFUN(-1)	*0.832*	*0.104*	*8.011****	*0.000*
LNFSRGDP(-1)	*0.169*	*0.125*	*1.357*	*0.184*
LNSAV(-1)	*0.049*	*0.105*	*0.465*	*0.645*
R^2	*0.984*			
R^{-2}	*0.983*			
F-Ratio	*738.673****			
D.W	*1.970*			

Source: Computed from Central Bank of Nigeria (CBN) data of various years. Regression Analysis for Loanable Funds. Note: *** =1% significant levels respectively. DW= Durbin-Watson Statistic.

A dynamic Pairwise Granger Causality test was performed to examine the direction of relationship between variables as presented in Table 5 presents. The test was conducted with two lags of the variables in the model. The first hypotheses tests for causality were between financial sector reforms and loan-able funds which was stated in the null hypothesis that financial sector real gross domestic product (FSRGDP) does not Granger cause loanable funds (LOFUN). The result obtained was not robust to reject the null hypothesis with an F-statistic of 0.809 and a probability value of 0.920 .This implies that financial sector reforms in the Nigerian economy was not a significant factor in attracting the flow of loanable funds from commercial banks to the agricultural sector.

The reverse hypothesis that loan-able funds does not Granger Cause financial sector real gross domestic product in Nigeria was not also rejected by the F-test. The result in Table 5 has an F-statistic of 1.571 with a probability value of 0.223. This implied that the flow of loan-able funds was not also a significant contributor to financial sector reforms in relation to agricultural sector in Nigeria. This is very plausible given the weak financial system in Nigeria economy and the known

attitudinal behaviour of financial institutions toward granting of loans to agricultural sector. The same result was also applicable between savings and loanable funds; savings and financial sector real gross domestic product and vice versa as presented in Table 5. The result from the causality test generally indicates no directional relationship between the variables.

Table 5 Dynamic Pairwise Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Probability
FSRGDP does not Granger Cause LOFUN	38	0.809	0.454
LOFUN does not Granger Cause FSRGDP		1.571	0.223
SAV does not Granger Cause LOFUN	38	1.663	0.205
LOFUN does not Granger Cause SAV		0.989	0.383
SAV does not Granger Cause FSRGDP	38	0.932	0.404
FSRGDP does not Granger Cause SAV		5.659	0.524

Source: Computed from Central Bank of Nigeria (CBN) data of various years.

4. Conclusion and Recommendations

The result of the effect of financial sector reforms on flow of loan-able funds indicated that the previous loanable fund was significantly different at one percent level and positively related to the present loanable fund. The result further revealed that financial sector real gross domestic product and savings were not major contributing factors in the disbursement of loan. This confirms the weak financial system in the Nigerian economy and the known attitudinal behaviour of financial institutions toward granting of loans to agricultural sector. This implies that financial sector reforms in the Nigerian economy were not a significant factor in attracting the flow of loanable funds from commercial banks to the agricultural

sector. This further highlights the fact that financial institutions like the commercial banks have always found an alternative portfolio investment more lucrative than lending to the agricultural sector. The study also revealed that there were no causal (directional) relationship between financial sector reforms and the flow of loanable funds in Nigeria. This provides a clue to the characterization of what may be obtainable in most developing countries with fragile financial sector and open economies.

The result of this findings revealed that financial sector reforms did not significantly impact on the flow of loan-able funds in agricultural sector as such 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 with strong macroeconomic policies targeted to bring meaningful growth in the agricultural and financial sector. These financial and fiscal incentives when provided would encourage investments and output growth in the agricultural sector of the country.

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