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Restructuring rural financial market for agricultural growth in Nigeria

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Abstract. All developing economies require a sophisticated financial system, which incorporates both the financial institutions and financial market. These institutions and market exist to mediate between those who wish to save or lend and those who wish to borrow or invest. This basic rationale seems complex, since offering new types of financial instruments which can reduce transaction cost in the face of highly risky and challenging agricultural business coupled with the urgent quest for revitalization of agricultural sector for meaningful growth and development is needed. This paper searches the missing link between financial sector and agricultural growth in Nigeria between 1996Q1 and 2017Q4. The study adopts Autoregressive Distributed Lag (ARDL) Bounds testing approach developed by Pesaran, Shin and Smith (2001) in estimating the relevant relationship. The results of the long run estimates show that agricultural credit, money markets, capital markets, exchange rate have positive relationship with agricultural growth in Nigeria, while expected inflation has negative impact on agricultural growth in the long run. The results of the short run dynamics of (one lagged) of variables shows negative impacts on agricultural growth, whereas the lagged two of the variables shows positive impacts on agricultural growth in the short run. The study recommends that the policy makers need to restructure the financial sector to influence agricultural credit as mandate to rescue the agricultural sector from this unimpressive growth.
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1. Introduction

Till date, agriculture remains an important sector in the Nigeria economy, employing a good percentage of the labour and contributing significantly to the Gross Domestic Product (GDP). Specifically, it contributes nearly 25% of the national GDP, sustains livelihood of about two third of the growing population and accounts for 62% of the national workforce forming the backbone of the Nigeria agric-based industry in Nigeria (CBN, 2017). Besides, agriculture is a social sector where non-trading concerns like food and nutritional security, employment, income generation and poverty reduction still play significant roles in the overall national development (OECD, 2012). In times of economic sanctions and other political upheavals, the contribution of agriculture to national security

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and strengthening of national sovereignty is never in doubt; its potential to enhance stability in the exchange rate is also well recognized (IFC, 2013; Karlan, *et al.,* 2012). Despite its place of importance in the socio-economic and political well-being and prosperity of the nation, the sector remained yet, so far neglected, unorganized and inadequately financed/funded.

While the potential of the agricultural sector in never in doubt, the level of it development and contribution to the overall growth of the Nigerian economy have been unimpressive. Analysis and studies have shown that that one of the fundamental problems that demand urgent attention in the sector is constraint with access to finance. There is therefore no arguing the need for the restructuring and rescue of the sector, especially in financing and access to funds by farmers and other stakeholders within the sector. First, most farmers are small farm holders who do not have adequate capital to expand their scale of operation. The relatively few who have access to finance complain that loan disbursement by Deposit Money Banks (DMBs) are often disbursed late after the planting season, with actual disbursement falling short of loan approvals (CBN, 2010). Excuses by lending banks showed that credit are curtailed or delayed because of rising incidence of defaults in loan payment (Nwokoma, 2006). Ngozi (2015) claimed that poor monitoring of agricultural projects by lending banks also contributed to non-performing loan.

The federal government continues to support the development of the agricultural sector with not so much achievements in recent past. Some of these interventions are in financing and access to funds especially by small-hold farmers, who encounter lots of difficulties in accessing funds to procure and acquire modern equipment in the face of unstructured financial markets and macroeconomic uncertainties, which have hindered their effective contribution to the growth process. Importantly, one of the main objectives of the agricultural policies over the years has been to make adequate credit available at the right time and at affordable cost to stimulate agricultural growth. Some of these policy measures that have been implemented include: The Agricultural Credit Guarantee Scheme Fund (ACGSF), Trust Fund Model (TFM), Drawback Programme (IDP), Small and Medium Enterprises Investment Scheme (SMEEIS), Nigeria Agricultural Cooperative and Rural Development Bank (NACRDB), People Bank and Macro-finance bank. There are other efforts made by Surrogate Banks to encourage farmers to engage in income generating activities to aid income generation for debt settlement and saving to invest in their agricultural venture.

As it were, these policies/initiatives had good foundation but lacked good execution and monitoring frameworks. For instance, the ACGSF which was meant to support agricultural activities was poorly managed by the CBN as efforts to minimize risk exposures on agricultural credit sent wrong signal to lending banks. In 2018, the Commercial Agricultural Credit Scheme (CACs), Large Scale Agricultural Credit Scheme (LASACS), Referencing Credit Support Scheme (RRF) and Nigeria Incentive Based and Risk Sharing System for Agricultural Lending (NIRSAL), were reviewed by the CBN to determine the level of their performance in stimulating growth within the agricultural sector. As part of the efforts to deepen access to finance and reduce exclusion rate, the CBN also revisited the existing CACs guidelines to include Non-Interest Rate Financial Institution (NIFLS).

This study is relevant in three-fold: First, anomalies with respect to lending for investments in agriculture become a critical issue of concern given the relative importance of the sector for sustenance of the growth population. Second, the need to reduce transaction cost on the farmer to enable the country to meet the demand for export product. Third, this study will be helpful in analyzing how the impact of interest rate liberalization on investment in agriculture in Nigeria has been before the regime of interest rate deregulation and after the regime. It also investigates the interest rate deregulation and investment relationship by taking into consideration the transmission mechanism through which interest rate affect investment in

agricultural sector. In addition, the issues of macroeconomic uncertainty affecting fluctuation in market price as well as unstable exchange rate affecting farmer's ability to import modern equipment are equally considered. The pertinent concern of this paper is to examine the impact of financial market restructuring on agricultural growth in Nigeria. The paper inquires whether financial market reform and macroeconomic uncertainty matter for agricultural growth in Nigeria. While several interesting variables have emerged to test various hypotheses to prescribe strategies to enhanced agricultural progress, this paper hopes to also contribute to the existing literature on financing agricultural credit for meaningful productivity by analyzing the three dimensions in the Nigeria context. First, we looked at the scenario for accessing the present financial market and how it can act as catalyst for stimulating accelerative growth without creating risk for the financial industry; the second scenario adopted appropriate dataset using the Autoregressive Distributed Lag Model Dynamic econometric techniques to analyze empirical results and options for a long-term Agricultural development. The remaining part of this paper is broken into five segments. Next it starts with segment two provides a synopsis of the literature review. Following is the theoretical framework and methodological approaches in part three. Results of the study are presented and discussed in part four while section five contains the conclusion including policy suggestions.

2. Literature review

2.1. Conceptual framework

In developing countries, the basic rational for setting up the financial market is bringing together those who have accumulated excess money and wish to save with those who have requirements to borrow to finance investment (Fiebig, 2001; Kendall, 2010 and Mayer, 2013). Mediation is necessary because lenders and borrowers have unique needs in term of maturity of liquidity and yield (Grossman & Tarazi, 2014). This process arguably helps to better utilized scarce resources, increase productive efficiency and ultimately raise the standard of living. Obviously, a well-functioning financial market, along with well-designed institutions and regulatory system, foster economic development through private initiatives (Chen & Faz, 2015; Lumpkin, 2009; Nwokoma, 2006; Mayer, 2013; Christen, Anderson & Calice, 2016). As it is, the financial market is often classified into the money and financial markets. The money market is the financial market that deals with short term financial assets and liabilities (Nwokoma, 2006; Jayanty, 2012). The main instruments of the money market include certificate of deposit, treasury bills, treasury certificate and short-term bond. The capital market deals with transfer of medium and long-term fund from surplus to deficit sectors (Kemp, 2017; Lowder, Skoet & Raney, 2016; Babcock, 2015). The institutions in the capital market include insurance, pension funds, merchant banks and specialized financial institutions. The Nigerian Stock Exchange (NSE) and Securities Exchange Commission (SEC) act as superintendents in the capital market. The main instrument traded in the capital market are stock and shares, debentures, financial assets of development institution and so on.

On the other hand, Suberu *et al.,* (2015) define agriculture as involving the cultivation of land, raising and rearing of animals for the provision of food for human consumption, raw material for industrial usage. Anyanwu (1997) stated that agricultural development can promote the development of an undeveloped nation by increasing food sovereignty, relaxing the exchange rate, and providing employment for the growing population among others. Although the link between financial market theory and agricultural growth finds it root in agricultural financing, agricultural financing is defined as the provision of financial services in both short, medium and long term in form of credit scheme or bank facilities to stimulate the development of agricultural sector. Clearly, the role of agricultural financing in promoting agricultural productivity cannot be over-emphasized.

2.2. Theoretical issues

The theoretical build up on the existing relationship between financial market and agricultural growth have been dominated by four major and sometimes competing strands of thought: (1) the linear stages of growth model, (2) Classical view, (3) the Keynesian theory, (4) Harrod-Domar model, and (5) Dual gap model.

The journey of this intellectual debate begins with theorists of the 1950s and 1960 viewed on the process of development as a series of successive stages of economic growth through which all countries must pass. The most influential and outspoken advocate of this theory was the America economic historian Walt W. Rostow (Todaro & Smith, 2010). It was primarily an economic theory of development in which the right quantity and mixture of investment, saving and foreign aid were all that was necessary to enable the system to proceed to growth path that had been followed by many developed countries (Saibu & Keke, 2014 and Fasanya & Onakoya, 2012). The classical economists believe in the existence of fully employ economy where saving and investment always equal. This is based on the premise that an increase in interest rate will lead to increase in saving while investment will fall (Todaro, 2010). This earlier assumption was attacked by Keynes who criticized the classical view about the saving and investment equality on the following ground (Saibu & Keke, 2014). Keynes does not agree with the classical view that the equality between saving and investment is brought about through the mechanism of interest rate (Allen & Gale, 2000). Keynes asserted that it is a change in income, which bring the two to equality, rather than the rate of interest. Keynes put forth two views regarding the saving-investment equality: the first is the accounting definitional equality; the second is the functional equality (Levine 2002; Beck & Maimbo, 2013). One principal strategy advocated by these theories is the economic mechanism by which more investment can lead to more growth, which is the hallmark of Harrod Domar growth model. To set the stage on the link between investment and output growth, Chenery & Bruno (1962) integrated the Keynesian aggregate demand function and the Harrod Domar growth model to determine the constraint facing development of an economy popularly known as the dual gap model, the author identify saving and investment gap as a domestic constraint while the exchange rate constraint as the external factor influencing growth in an economy.

In the extant finance literature, there are two major theoretical issues on the extent to which the financial sector may affect the development of an economy, which are bank and market-based views. As it were, banks perform intermediation mostly on the balance sheets. They take in saving typically as deposit and provide funding primarily in form of loans, often through relationship with borrowers (Demirguc-Kunt *et al.,* 2017 and Levine 2012). Market based, by contrast, keep savers and investor at arm's length, by serving as a forum where debt and equity securities are issued and traded (Boyd & Smith, 1998; Allen & Gale, 2000). The origin of the debate on market based began with the intellectual argument embedded on the drawback observed in traditional application of one dimensional investment criteria of net present value which led to its replacement factored in expected return and risk often defined as standard deviation on return distribution (Markowitz, 1952, 1991; Love, Martinez Peria & Sigh, 2013). A further step was made by Morgan (1989) who developed a portfolio model, which could measure and explain the fear of risk often identified in the early literature (Hollinger, 2011).

Much later, the Capital Asset Pricing Model (CAPM) theory emerged to explain the reason why all investors can lend and borrow at a risk-free interest rate and absence of transaction cost (Roll, 1977; Dugger & Sberro, 2016). The theory was later attacked by several studies which subjected it to empirical investigation due to its complexity. The interest rate structure theory was latter introduced following the discovered weakness in the CAPM, since it explains why owners of bond portfolio are expose to many risks. The interest rate further gained support based on the relevant types of risk interest rate presented by it supporters (Keynes, 1936; Muth,

1961 and Vasiek, 1977). The relevant types of risk are: interest rate risk, inflation risk, default risk and currency risk among others.

2.3. Empirical review

There is along and inconclusive literature on the financial market theory and agricultural growth which was hampered by limited data and considerable intellectual debate about the specification and mechanism by which financial market would affect agricultural growth in Nigeria.

The recently celebrated study of Olorunsola *et al.,* (2017) which investigated the relationship between credit to agriculture and agricultural output in Nigeria by employing the Nonlinear Autoregressive Distributed Lag (NARDL) model with a dataset from 1992Q1 and 2015Q4 brought much to fore on the subject under consideration. The authors' results/conclusion show no evidence of asymmetry in the impact of credit to output growth in the agricultural sector (positive and negative changes observed) in the short run but; different equilibrium relationships exist in the long run. The dynamic adjustments show that the cumulative agricultural output growth is mostly attracted by the positive change in credit to agriculture with a lag in four quarter of the prediction horizon.

On the contrary, Nnamocha & Eke (2015) investigated the effect of bank credit on agricultural output via Error Correction Model (ECM) using yearly data source from the CBNStatistical Bulletin between 1970 and 2013. The authors' results showed that in the long run, bank credit and agricultural output contribute effectively to the Nigeria economy. Similarly, Ngozi (2015) evaluated the impact of agricultural loan on food production and suggested the need for increase and sustained amount of credit disbursed to the sector to increase productivity. Also, Fakun & Evbuomwam (2017) searched the link between agricultural financing policy programmes and initiatives and sustainable development in Nigeria between 1990 and 2014. The authors found that commercial agricultural output to bank credit were relatively lower than expected. Udoka *et al.,* (2016) examined the effect of commercial bank credit on agricultural output in Nigeria. Their estimated results showed that there was a positive and meaningful relationship between agricultural credit and agricultural productivity in Nigeria.

Considering the revealing episodes of how academic papers on financial theory and financial market influenced actual agricultural growth in Nigeria, one will be tempted to suggest that the intellectual debate is capable of generalization, but the evidence documented, and conclusions reached from these previous studies trigger more problems that demand urgent inquiries. Therefore, judging from the existing literature, the question of convergence in the potential of financial market for agricultural growth remains scarce.

3. Methodology

3.1. Theoretical architecture

The theoretical foundation of this study is based on the Harrod-Domar growth model, Keynesian aggregate demand model and the Dual gap model presented by Chenery & Bruno (1962) combine with the financial market theory of bank and market-basedhypothesis as used by Saibu & Keke (2014) and Asteriou (2009). The justification for this consideration is that it provides several explanations while investment becomes a necessary condition to output (see Demirguc-Kunt *et al.,* 2017 and Levine, 2012).

3.2. Analytical framework

Drawing from our earlier discussion, the starting point of this analytical framework is the similar studies by Harrod and Dormar model, that independent derive and explains the implication of investment on output growth (Harrod, 1939; Domar, 1946) as presented below:

$$Y_t = \frac{\alpha}{g} I_t \qquad (1)$$

Where Y_t = output growth at period t, αI_t = investment at period t, $\frac{1}{g}$ = incremental capital output. the study assumed that capital and labour are employed in fixed proportion and there is sufficient amount of labour to ensure that no constraint to output growth. Harrod-Domar model equally assumed that investment is change in capital stock, that is $I_t = \Delta K_t$, where, $\Delta K_t = K_t - K_{t-1}$.

The implication of equation (1) in their model is that a change in investment is a necessary condition for output growth.

The analysis further considers the Keynesian aggregate demand function that identifies the two constraints to output growth as the gap between domestic saving and investment constraint and the deficit in import and export constraint as presented below.

$$Y_t = C_t + I_t + G_t + (X - M) \quad (2)$$

$$I_t - S_t = X_t - M_t = EXC_t \quad (3)$$

Where, Y_t= output growth, C_t = consumption, G_t = government, X_t= export, S_t= savings.

The implication of equation (3) is that it identifies two main constraint to output growth in an economy as domestic and external constraints.

Following the Dual gap hypothesis as presented by Chenery & Bruno (1963) we combine the Harrod Domar model in equation (1) and Keynesian aggregate demand in equation (3), we have:

$$\Delta Y_t = \frac{\alpha}{g} I_t + EXC_t \quad (5)$$

Where, EXC_t is the external constraint often regarded as exchange rate risk/ restriction.

To achieve the objective of this study, we consider the investment in agriculture through the financial market from two varied approach known as the bank and market based. Therefore, the model of this study is specified as:

$$agdp = \alpha + \beta_1 ac_t + \beta_2 nr + \beta_3 i + \beta_4 P^e{}_t + \beta_5 x_t + \mu_t \quad (6)$$

The study proxies the money market with two variables which are: agricultural credit through the deposit money bank, (ac_t) and concessionary interest rate to agricultural sector proxies as (i), while the capital market variable is captured with new issue ratio to agricultural value-added proxies as (nr), agricultural growth proxies as agricultural value added, nominal exchange proxies with (x_t) (Captured: external constraint/ shocks), *INF* is inflation rate measured as Consumer Price Index (CPI) but proxies with $(P^e{}_t)$ (Captured: macroeconomic uncertainty); t is time; $\alpha$is intercept or constant; β_{1-5}parameters of the explanatory variables; and μ is error term.

The a priori expectation provides expected signs and significance of the values of the coefficient of the parameters under review on the part of the empirical evidence and theoretical assertions. All the selected indicators are theoretically expected to contribute to agricultural growth positively, excluding inflation which is expected to retard agricultural growth negatively.

Equation (6) can then be specified using a general dynamic process called Autoregressive Distributed Lag (ARDL) model of order k as follows:

$$\Delta agdp_t = \tau_0 + \sum_{j=1}^{n} \tau_{1j} \Delta agdp_{t-j} + \sum_{j=0}^{n} \tau_{2j} \Delta ac^s{}_{t-j} + \sum_{j=0}^{n} \tau_{3j} \Delta nr_{t-j} + \sum_{j=0}^{n} \tau_{4j} \Delta p^e{}_{t-j} + \sum_{j=0}^{n} \tau_{5j} i_{t-j} \quad (7)$$

$$\sum_{j=0}^{n} \tau_{6j} \Delta x_{t-j} + \varepsilon_t$$

All these variables do is to add 1 through k of the dependent variables and all independent variables to the original model. Lags of the dependent variable start at j, and lag of the independent variable start at $j = 0$ because of the need to include contemporaneous values in equations as at equation (17). This equation can be rewritten to obtain the error correction representation which is of this form:

$$\Delta agdp_t = \tau_0 + \sum_{j=1}^{n} \tau_{1j} \Delta agdp_{t-j} + \sum_{j=0}^{n} \tau_{2j} \Delta ac^s{}_{t-j} + \sum_{j=0}^{n} \tau_{3j} \Delta nr_{t-j} + \sum_{j=0}^{n} \tau_{4j} \Delta p^e{}_{t-j} + \sum_{j=0}^{n} \tau_{5j} i_{t-j} + \sum_{j=0}^{n} \tau_{6j} \Delta x_{t-j}$$

$$-\psi p_{t-1} + \sigma_1 ac^s{}_{t-1} + \sigma_2 nr_{t-1} + \sigma_3 p^e{}_{t-1} + \sigma_4 i_{t-1} + \sigma_5 x_{t-1} + v_t \quad (8)$$

Where; Δ is the first difference operator; the parameters j , where $j = 1, 2, 3, 4, 5, 6$ are the respective long-run multipliers; the parameters $\tau_1, \tau_2, \tau_3, \tau_4, \tau_5, \tau_6$ are the short run dynamic coefficients of the underlying ARDL model in the equation; and v_t denotes the white noise error term. The Bounds cointegration test involves estimating the above equation and restricting the parameters of the lag level variables to zero. Based on this equation, we tested the following null and alternative hypotheses.

The null hypothesis;

$$[H_0 : j_0 = j_1 = j_2 = j_3 = j_4 = j_5 = j_6 = j_7 = 0]$$

$$H_1 : not\ H_0$$

Data Description and Sources

$agdp$ = agricultural growth measures as agricultural value added.

ac = agricultural credit measure as total credit to agricultural by deposit money banks.

nr = new issue ratio measure as the ratio of new issue in the stock market to agricultural value added.

p^e = expected change in inflation measured as the difference of log the current price was used as approximate expected inflation in the empirical analysis. In exact literature, two major factors necessitated this approach of calculating for expected inflation. One consisted of rational and adaptive expectation hypothesis as noted by D'Acunto *et al.,* (2015). Two, inflation cannot be filtered as in the case of Hodrick-Prescott filter in the generation of potential output.

i= concessionary interest rate in our empirical analysis.

x = real effective exchange rate is used as a measure by the nominal effective exchange rate (a measure of the value of a currency against the weighted average of several currencies) divided by a price deflator of index cost.

4. Empirical results

4.1. Statistical analysis

The descriptive statistics for the designated variables are indicated in table 1. A glance through the table reveals disparities in the trend of statistics in the characteristics (both measure of central tendencies and dispersion) of each of the variables.

Table 1a. *Pre- Test Descriptive Statistics*

Variables	Details	Mean	Max	Min	Std. Dev.	Obs.
Agdp	% Agric to gdp	8.93	10.23	6.77	1.01	84
Ac	Total credit to agric	0.63	2.04	0.018	0.54	84
Nr	New issue ratio	3.73	6.07	2.31	0.72	84
Pe	Expected inflation	4.67	7.37	3.67	1.26	84
I	Interest rate	30.15	36.06	24.07	2.76	84
X	Exchange rate	0.68	1.01	0.48	0.16	84

Source: Authors' computation (2018).

Table 1b presents the correlation matrix for the nature of relationships among the variables. The relationship between agricultural output and all other variables is positive except for expected future inflation and credit to agriculture, which exhibits negative association.

Table 1b. *Pre-Test: Correlation Matrix*

	Agdp	*Ac*	*Nr*	*Pe*	*i*	*X*
Agdp	1	0.55075	0.69997	0.48897	0.55093	0.75946
Ac		1	0.42254	-0.20645	0.61260	0.89129
Nr			1	0.07995	0.28488	0.52392
Pe				1	0.03560	0.04708
I					1	0.64270
X						1

Source: Authors' computation (2018).

4.2. Econometric Analysis

4.2.1. Unit Roots Test

The unit root estimates were based on Dickey Fuller- GLS test with the result presented in table 2. From the table, it was observed that all the variables were I (1) and I (0) series.

Table 2: *Pre-Test A: DF-GLS Unit Root Test*

Dickey Fuller-GLS (DF-GLS) Test			
Variable	Level	1st Difference	Status
Agdp	-0.0120	-3.1532*	I(1)
Ac	-0.3680*	-5.1927**	I(0)
Nr	-1.4720	-7.4096*	I(1)
Pe	-0.6433	-5.8967*	I(1)
I	-2.6695	-5.0013*	I(1)
X	-02261	-6.1213*	I(1)

Note: *=1% and ** = 5% significance level.
Source: Author Computation, 2018.

4.2.2. Autoregressive Distributed Lag (ARDL) Results

Econometric literature argued that regressing a stationary series on non-stationary series has severe implications in drawing policy inference. The data series provides evidence for the use of Autoregressive Distributed Lag (ARDL) technique of analysis. As posited by Pesaran *et al.,* (2001), ARDL is more suitable for variables at different order of integration. The F-statistics estimate for testing the existence of long-run relationship between rural financial market instruments and agricultural growth in Nigeria are presented below:

Table 3. *ARDL Bounds Test for Cointegration*

Variables	F– Statistics	Cointegration
F (*agdp/ ac, nr, pe, i, x*)	11.69518	Cointegration Exist
Critical value	Lower Bound	Upper Bound
1%	2.03	3.13
5%	2.32	3.50
10%	2.60	3.84

Source: Authors' computation (2018).

The estimated F-statistics of the normalized equations (F_{arb} = 11.69518) is greater than the lower and upper critical bound at 5% significance level as in Table 3. It implies that the null hypothesis of no long-run relationship is rejected at 5% significance level. The implication of the above estimation is that agricultural growth *(agdp),* agricultural credit *(ac),* expected change in inflation*(pe),* interest rate (*i*), and exchange (*x*) rate, new issue ratio (*nr*), all have equilibrium condition that keep them together in the long-run.

Having established the existence of cointegration from table 3 above, the conditional ARDL for the long run relationship can be estimated given the model as thus;

$$\ln(agdp_t) = \tau_0 + \sum_{j=1}^{p} \tau_{1j} \ln(agdp_{t-j}) + \sum_{j=0}^{q_1} \tau_{2j} \ln(ac^s{}_{t-j}) + \sum_{j=0}^{q_2} \tau_{3j} \ln(nr_{t-j}) + \sum_{j=0}^{q_3} \tau_{4j} \ln(p^e{}_{t-j})$$
$$+ \sum_{j=0}^{q_4} \tau_{5j} \ln(i_{t-j}) + \sum_{j=0}^{q_5} \tau_{6j} \ln(x_{t-j}) + \varepsilon_t \qquad (9)$$

Where all variables are as previously defined, the order of the ARDL $(p, q_1, q_2, q_3, q_4, q_5)$ model in six variables are selected by using AIC equation (19) is estimated using the ARDL (1,0,0,0,0,0,0) specification.

The table 4 below reveals the long-run estimates between financial market and agricultural growth in Nigeria.

Table 4. *long-run Coefficients Estimates and Granger causality tests*

Variables	Coefficients	t-Statistic	Prob.
Ac	15.32107	6.23522	0.0086
Nr	2.410645	2.38630	0.0056
Pe	-5.427279	-3.43124	0.0042
I	0.167640	-2.89980	0.0226
X	2.259705	6.60112	0.0071
C	4.617504	3.27506	0.0057

Notes: **(*)indicate 1%, 5% level of significance respectively
Source: Authors' computation (2018).

The long-run estimates suggested that agricultural credit (ac), new issue ratio, interest rate (i) exchange rate and all have positive impact on agricultural growth (agdp) in Nigeria and all these conform with theoretical expectation except expected inflation (p^e). Specifically, a 1%-point increase in agricultural credit (ac), new issue (nr), interest rate (i), and exchange rate ratio will lead to 15, 2.4, 0.16 and 2.2 percent increase in agricultural growth respectively, in the long run. However, the table revealed expected inflation (p^e) had negative impact on agricultural growth (agdp) in Nigeria. Precisely, 1% -point decrease in expected inflation (p^e) will lead to 5.4 percent increase in agricultural growth, in the long run. Meanwhile, the long run estimation has shown that all the variables were statistically significant in influencing agricultural growth at 5 and 10 percent respectively. This situation has left inflation rate to a persistent two digit with 15.905 as the current standing rate putting the economy at risk in all ramification.

4.3. Short run estimate using ARDL approach

Making inferences from the studies conducted by Odhiambo (2009) and Narayan, & Smyth (2008) and Mounir (n.d.), we further estimate the short-run parameters through the error correction model in relation to the long-run parameters estimates. The stated hypothesis of no cointegration which is associated with the vector error correction model is stated as thus:

$$D(\ln(agdp_t)) = \tau_0 + \sum_{j=1}^{p}\tau_{1j}D(\ln(agdp_{t-j})) + \sum_{j=0}^{q}\tau_{2j}D(\ln(ac^s{}_{t-j})) + \sum_{j=0}^{q}\tau_{3j}D(\ln(nr_{t-j})) + \sum_{j=0}^{q}\tau_{4j}D(\ln(p^e{}_{t-j}))$$
$$+ \sum_{j=0}^{q}\tau_{5j}D(\ln(\Delta i_{t-j})) + \sum_{j=0}^{q}\tau_{6j}D(\ln(\Delta x_{t-j})) + \alpha ECT_{t-1} + \varepsilon_t \quad (10)$$

$$D(\ln(ac^s{}_t)) = \tau_0 + + \sum_{j=0}^{p}\tau_{1j}D(\ln(ac^s{}_{t-j})) + \sum_{j=1}^{q}\tau_{2j}D(\ln(agdp_{t-j})) + \sum_{j=0}^{q}\tau_{3j}D(\ln(nr_{t-j})) + \sum_{j=0}^{q}\tau_{4j}D(\ln(p^e{}_{t-j}))$$
$$+ \sum_{j=0}^{q}\tau_{5j}D(\ln(i_{t-j})) + \sum_{j=0}^{q}\tau_{6j}D(\ln(x_{t-j})) + \varepsilon_t \quad (11)$$

$$D(\ln(nr_t)) = \tau_0 + \sum_{j=1}^{p}\tau_{1j}D(\ln(nr_{t-j})) + \sum_{j=0}^{q}\tau_{2j}D(\ln(agdp_{t-j})) + \sum_{j=0}^{q}\tau_{3j}D(\ln(ac_{t-j})) + \sum_{j=0}^{q}\tau_{4j}D(\ln(p^e{}_{t-j}))$$
$$+ \sum_{j=0}^{q}\tau_{5j}D(\ln(i_{t-j})) + \sum_{j=0}^{q}\tau_{6j}D(\ln(x_{t-j})) + \varepsilon_t \quad (12)$$

$$D(\ln(p^e{}_t)) = \tau_0 + \sum_{j=1}^{p}\tau_{1j}D(\ln(p^e{}_{t-j})) + \sum_{j=0}^{q}\tau_{2j}D(\ln(ac^s{}_{t-j})) + \sum_{j=0}^{q}\tau_{3j}D(\ln(agdp_{t-j})) + \sum_{j=0}^{q}\tau_{4j}D(\ln(nr_{t-j}))$$
$$+ \sum_{j=0}^{q}\tau_{5j}D(\ln(i_{t-j})) + \sum_{j=0}^{q}\tau_{6j}D(\ln(x_{t-j})) + \varepsilon_t \quad (13)$$

$$D(\ln(i_t)) = \tau_0 + \sum_{j=1}^{p}\tau_{1j}D(\ln(i_{t-j})) + \sum_{j=0}^{q}\tau_{2j}D(\ln(ac^s{}_{t-j})) + \sum_{j=0}^{q}\tau_{3j}D(\ln(agdp_{t-j})) + \sum_{j=0}^{q}\tau_{4j}D(\ln(nr_{t-j}))$$
$$+ \sum_{j=0}^{q}\tau_{5j}D(\ln(p^e{}_{t-j})) + \sum_{j=0}^{q}\tau_{6j}D(\ln(x_{t-j})) + \varepsilon_t \quad (14)$$

$$D(\ln(x_t)) = \tau_0 + \sum_{j=1}^{p}\tau_{1j}D(\ln(x_{t-j})) + \sum_{j=0}^{q}\tau_{2j}D(\ln(ac^s{}_{t-j})) + \sum_{j=0}^{q}\tau_{3j}D(\ln(agdp_{t-j})) + \sum_{j=0}^{q}\tau_{4j}D(\ln(nr_{t-j}))$$
$$+ \sum_{j=0}^{q}\tau_{5j}D(\ln(p^e{}_{t-j})) + \sum_{j=0}^{q}\tau_{6j}D(\ln(i_{t-j})) + \varepsilon_t \quad (15)$$

Where $(\tau_1, \tau_2, \tau_3, \tau_4, \tau_5, and\, \tau_6)$ are short-run dynamic coefficients of the model 's convergence to equilibrium and α is the speed of adjustment. Equation (10)–(15) are estimated using the OLS regression separately.

Table 5. *Vector Error Correction Model Selected Model: ARDL (3, 2, 2, 1, 3, 2)*

	Model 10	*Model* 11	*Model* 12	*Model* 13	*Model* 14	*Model* 15
C	0.207211*	0.089881	-0.031290*	0.009809	-0.031173*	0.115134*
$\Delta\,(agdp(-1))$	-0.11030*	0.404776*	0.027868*	-0.060656*	0.163107*	0.034503
$\Delta(agdp(-2))$	0.58418*	-0.452633*	-0.075015	-0.147497	0.065051	-0.05933*
$\Delta(agdp(-3))$	0.43218*	-0.32001*	-0.055328*	-0.127021*	0.042872*	-0.0328*
$\Delta\,(ac(-1))$	-0.23301*	0.535281*	-0.00930*	-0.023321	0.019380	0.009650*
$\Delta\,(ac(-2))$	-0.00970*	-0.188215	0.004719	0.117776*	-0.036203	-0.007025
$\Delta\,(i(-1))$	-1.02155*	-1.433267*	0.094959*	2.770757	0.245097*	-0.206131
$\Delta\,(i(-2))$	0.1497*	1.280287	-0.08710*	3.00994*	0.893183	0.052239*
$\Delta(nr(-1))$	-0.18119*	0.859032	0.019906	0.054412	-0.113734	-0.023824
$\Delta\,(p^e(-1))$	-0.05521*	1.111117*	0.139218	-0.513526*	0.073441	0.078211*
$\Delta\,(p^e(-2))$	0.83235*	-1.129312	0.056177	0.107984	0.683886	-0.282500
$\Delta\,(p^e(-3))$	0.06951*	0.225122	0.020026	0.140113*	-0.044461	-0.024264

$\Delta(x(-1))$	-0.35243*	1.915526	0.283854*	1.279262	-0.194250	0.115772
$\Delta(x(-2))$	1.11319*	-4.074770	-0.06243*	-1.364770	0.727142	-0.256466*
$ECM(-1))$	-0.3850*	-0.4133*	- 0.3652*	-0.4512*	-0.1121*	-0.4023*
R^2	0.797	0.633	0.717	0.676	0.705	0.66
$Adj.R^2$	0.737	0.587	0.608	0.598	0.600	0.502
$F-stat$	[16.603]	[11.456]	[15.916]	[12.163]	[12.360]	[18.883]

Notes: **(*) indicate 1%, 5% level of significance respectively
Source: Authors' computation (2018).

The results of the short run dynamics associated with the ARDL models are reported in the table. The coefficient of the ECM (-1) showed the speed of adjustment from short run to the long run for all the models. The results in table shows that error correction models are statistically significant with negative signs as expected. Explicitly, the coefficient of the lagged error correction model is (-0.3850) is negative and statistically significant. The magnitude of the coefficient implies that 38 percent of the disequilibrium caused by the previous quarters shock converges back to the long run equilibrium in the current quarters in model 10. In the same vein, the error correction models of 2, 3, 4, 5 and 6 conform to existence of a stable long run relationship and cointegrated relationship among the variables. Precisely, the coefficients of the lagged of ECM for the model 2, 3, 4, 5 and 6 are (-0.4133), (- 0.3652), (-0.4512), (-0.1121) and (-0.4023) respectively. This suggests fast adjustment process among the variables. Nearly, 41, 36,40,11 and 40 percent of the disequilibrium of the previous shocks adjust back to the long run equilibrium in the current quarters.

Further examination of the short run model 1 for agricultural gross domestic product (agdp) shows that changes in previous (one lagged) of agricultural credit (ac), new issue ratio, interest rate (i), expected inflation and exchange rate are negatively related to change in agricultural gross domestic product (agdp), whereas the lagged two of the variables shows positive impacts on agricultural growth in the short run. The implication of this is that 1% increase in previous (one lagged) period of agricultural growth (agdp (-1)),agricultural credit (ac(-1)), new issue ratio (nr(-1), interest rate (i(-1)), expected inflation(p^e)(-1)) and exchange rate (x(-1))bring about 0.11, 0.23, 0.18, 1.02, 0.05 and 0.35 decrease in agricultural growth (agdp) in the short run, respectively. the results however, not conform with theoretical expectation. It is noteworthy that negative effects of expected inflation (p^e) and exchange rate (x) on agricultural growth reflects the reality that the unimpressive record of agricultural sector can be attributed to poor exchange rate management and inability of the monetary authorities to curtail inflationary pressure which are essential for stable macroeconomic environment. With respect to exchange rate, the results show that when there is a depreciation, the positive benefits from increase in export is less than negative in terms of price of imports. Obviously, this should not come as a surprise bearing in mind that most of our farm implement and inputs are imported which exposes the sector to external shocks. The implication of this is that, in the short run depreciation may have adverse effects on agricultural growth but in the long run it is likely to generate a positive gain.

The negative effects of the change in interest rate on agricultural growth, in the short run, show that the outcome of monetary policy over the years have a negative impact on agricultural growth. This is expected, given the oligopolistic structure of the banking system, which encourage collusion by big banks, has undermine the transmission of monetary impulse through the money market, thereby denied the existing and prospective farmers the ability to secure credit to expand agricultural produce. A deliberate policy to reduce the size of the banks would lead to emergence of strong and effective financial institution that are more competitive to rescue the agricultural sector rather than the present banks that compete for customer's deposit. Also, the negative impact of capital market variable (nr) to agricultural growth, clearly shows that financial need to be restructured to factor in the agricultural sector, for meaningful contribution to national growth.

4.4. Post test: Residual diagnostic results

The estimated ARDL model is tested for heteroscedasticity, serial correlation, functional form misspecification, parameter stability and normality. The results from these tests are shown in;

Table 6. *Residual Diagnostic based test on component of ARDL models*

Equations	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
Autocorreletion test						
LM(6)	22.20	21.26	30.49	0.681	31.01	21.64
p-balue	0.248	0.354	0.152	0.124	0.153	0.143
Normality Test						
Jarque-bera x^2 (2)	2.567	10.341	7.556	7.931	8.31	10.245
P-valuee	0.177	0.126	0.214	0.130	0.121	0.231
ARCH Test						
LM-statistics (6)	0.365	1.66	1.54	0.691	0.781	0.685
p-value	0.112	0.225	0.148	0.201	0.281	0.110

Notes: **(*)indicate 1%, 5% level of significance respectively
Source: Authors' computation (2018).

The coefficient of LM estimated statistically conforms to absence of serial correlation. Similarly, the probability value of the heteroscedasticity test show that the variance is not time dependent and so, it is homoscedasticity for all outcome of the estimated equations. In all, the results revealed that the estimated models in functional form was adequatelyspecified and robust for policy analysis.

4.5. Granger causality test

Causality, as discussed below, is a critical issue when testing cointegration and in general macroeconomic model building. Below is the Pairwise Granger test that determine whether the agricultural growth (agdp) is caused by the fundamentals.

Table 7. *Summary of Granger Causality Test*

Bidirectional	Unidirectional	No Causality
AC ⟷ AGDP	I → AGDP	NR — AC
P ⟷ I	NR → AGDP	P — AC
	AGDP → P	X — NR
	X → AGDP	
	I → AC	
	X → AC	
	I → NR	
	I → X	
	X → P	

Source: Author's Compilation.

The Table 7 above affirmed that bidirectional relationship exist between AC and AGDP, which implies that AC can enhance AGDP and as well AGDP can trigger AC. Also, the analysis further reveal that bidirectional link exists between P and I. In the same vein, there is a unidirectional existence between AGDP, I, NR, and X, which suggests that the variable in the model can enhance and propel AGDP in the economy for period. More so, the study further elucidates the unidirectional relationship exist between AC, I and X. Also, there is the existence of unidirectional relationship between I, P, X and NR. Further result affirms no causality exist between AC, NR, P and X.

5. Conclusion and recommendations

As noted at the beginning, it is not an overstatement to suggests that the issue related to the effects of financial market on agricultural growth, its evolution over time and its position relative to growth inclusiveness now occupy a vital role in academic and policy debate on financial economics as catalyst for long term agricultural growth and development strategies. This study contributes to this literature by estimating the long run cointegration equilibrium on financial markets

and it relative impact on agricultural output fundamentals. The quarterlies' annual data series sourced from the Central Bank of Nigeria, (CBN) was analysed, using the Autoregressive Distributed Lag (ARDL) methodology developed by Pesaran *et al.,* (2001). The results of the cointegration test based on the bound testing approach shows that the variables are mutually cointegrated, which suggests that long run relationship exists among the financial market and agricultural growth fundamentals. The results of the short run dynamics show that change in the previous (lagged one) period of the variables have a negative impact on agricultural growth, while change in the (lagged two) period of the fundamental variables have a positive impact on agricultural growth.

Drawing on the results above, the study recommends that the CBN should monitored the time lagged on the loan disbursement to farmers by deposit money banks (DMBs), since the timely access to credit has potential for improving the performance of the sector. On a second thought, the need to integrate agricultural credit as mandate for both money and capital market is urgent require for realizing the potential of the agricultural sector. In all, the negative implication of interest rate, exchange rate and expected inflation need to be corrected using conventional monetary policy in other to create a stable and sound macroeconomic environment for restoring the lost glory of the sector.

Summing up evidence suggests that productivity in the agricultural sector can benefit from the better access to financial market and financial instrument tailored to the need of farmers and agribusiness. Policy maker can take series of steps to make this happen. First, investing in rural financial infrastructure can overcome the information asymmetries that discourage financial providers from serving the agricultural sector. Second, strengthening the macroeconomic environment to enable the farmers have access to the market and contribute effectively to growth processes.

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