Financial Sector Development and Domestic Savings in Nigeria: A Bounds Testing Co-Integration Approach

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ABSTRACT

This study examines the long-run relationship between financial sector development and domestic saving in Nigeria for the period 1980 to 2012 using time series data. It employs bounds tests cointegration approach also known as autoregressive distributed lag estimation due to mixed integration order of the variables and small sample size. The study made use of a composite index constructed from the three alternative financial development indicators measures. The econometric results provide evidence of long run relationship between financial sector development and domestic saving in Nigeria. The constructed composite index of financial development has a positive and significant impact on domestic savings likewise each of the respective three components of this index has a positive impact on domestic saving. Government should therefore consolidate on past financial sector reforms to improve domestic saving mobilization to reduce the dependence of Nigeria on foreign savings to finance domestic investment.

Keywords: Financial Sector Development, Domestic Saving, Cointegration, ARDL, Composite Index.

JEL Classification: G00, 016

INTRODUCTION

While there is an extensive literature on the relationship between financial development and growth, the literature on the impact of financial development on domestic resource mobilization is scanty. In view of the critical role that domestic resource mobilization plays in facilitating pro-poor growth, this issue has attracted the attention of researchers and policy makers in recent times (Ang, 2011). Savings is critical in the development process, and the financial system must be robust to generate the needed savings to finance investment activities that will accelerate the rate of growth and development.

The saving rate is a crucial determinant of a country's long-run per capita income. The neoclassical exogenous growth model (Solow, 1956) suggests that the higher the rate of saving, the richer the country in per capita income. Similarly the endogenous theory pioneered by Romer(1986) and Lucas (1988) predict that the saving rate determines long-run growth as a higher saving rate leads to a higher economic growth rate.

The global financial crises in 2008 and its impact on the financial sector of many developed and developing countries including Nigeria questioned the critical role that McKinnon (1973) and Shaw (1973) envisioned for a market based competitive financial system.

Financial development connotes improvements in the functioning of the financial sector. These include increased access to financial intermediation, greater diversification opportunities, improved information quality, and better incentives for prudent lending and monitoring (Ewetan&Okodua, 2013; Alege&Ogunrinola, 2008; Akinlo and Egbetunde, 2010; Ewetan& Ike, 2014).The purpose of this paper is to examine the relationship between financial development and domestic saving rates in Nigeria empirically. This study is motivated by the conflicting findings in the empirical literature on the nature of the relationship between financial development and the saving rate for different countries, and also the need to shed additional light on this issue by focusing on Nigeria.

LITERATURE REVIEW

The literature has extensively explored the relationship between financial sector development and saving with mix results. Theoretically, financial intermediaries and financial markets mitigate the costs of acquiring information, enforcing contracts, and making transactions, changes the incentives and constraints facing economic agents through production information and allocating capital, monitoring firms and exerting corporate governance, with positive effects on economic growth (Ewetan& Ike, 2014; Akinlo & Egbetunde, 2010; Khan, 2001; King & Levine, 1993).

A number of scholars found a statistical relationship between financial development and the saving rate. For example, King and Levin (1993) find that higher levels of financial development are associated with faster capital accumulation. Loayza, Schmidt and Serven (2000) and Horioka and Yin (2010) find a negative correlation. Park and Shin (2009) find the impact of financial development to be insignificant. Horioka and Hagiwara (2010) use data from 12 economies in developing Asia countries during 1996 – 2007 and find that the relationship between financial development and saving rate is nonlinear and hump-shaped. Granville and Mullick (2002) used an auto-regressive distributed lag (ARDL) model to examine the effect of pension reforms on domestic savings in the UK. They found a positive and significant correlation between domestic savings and pension savings with no substantial evidence that aggregate savings increase considerably as a result of privately funded pension schemes. Nyanzi and Kaberuka (2013), in a study on the effect of financial sector liberalization on private financial savings in Uganda used the Granger and Engel framework and structural change analysis and found a positive relationship between financial liberalization and private financial savings. Iganiga (2010) used the least square technique to evaluate the Nigerian financial sector reforms within the framework of a behavioral model and found that financial reforms had a positive and significant impact on domestic savings. Mathew and Olowe (2011) in a study on the impact of liberalized financial system on savings, investment and growth in Nigeria found that financial liberalization had a positive and significant impact on savings.

Khan and Hasan (1998) in a study on financial liberalization, savings, and economic development in Pakistan found that financial liberalization had a positive and significant impact on savings. Quartey (2005) in a study on financial sector development, savings mobilization and poverty reduction in Ghana, used a multivariate VAR and vector error correction model and found that there is no relationship between financial sector development and savings mobilization. Asamoah (2008) examines the impact of financial sector reforms on savings, investments and gross domestic product in Ghana and found a positive and significant relationship between financial reforms and savings. Nair (undated) examines the impact of financial sector liberalization on household savings in India using a financial sector liberalization index and found that financial development impacts negatively on household saving rate. Ang (2011) examines savings mobilization, financial development and liberalization in Malaysia using the auto-regressive distributed lag (ARDL) model. He finds two contradictory results, a positive relationship between financial deepening and private savings on one hand, and a negative relationship between financial liberalization and private savings on the other hand. Wang et al (2011) employed an incomplete-market model featuring heterogeneous households and heterogeneous firms and found a hump-shaped empirical relationship between financial development and the national saving rate across 102 countries.

The literature reveals mixed evidence supporting either a positive or negative relationship between financial sector development and saving rates. This study is therefore another attempt to shed more light on the links between financial development and savings in Nigeria.

METHODOLOGY AND DATA

The study investigates the existence of a long-run dynamic interaction among the study variables using annual time-series data from 1980 to 2012.Empirical models are first specified to capture the hypothesized relationships in the study. These are then estimated using appropriate estimation techniques. Data for all variables were obtained from the Central Bank of Nigeria (CBN) Annual Statistical Bulletin (2013) edition. Data for the study is analyzed using the econometric software, MICROFIT 4.1.Stata

Model Specification

In modeling the relationship between financial sector development and domestic savings, current period savings is assumed to be influenced by past domestic savings rate itself as well as current and past values of key financial sector development indicators in the economy. The baseline model estimated for this study relates the domestic savings to financial development and other determinants used as control variables is first specified in the form below:

$$DSAV_t = \alpha + \beta FD_t + \gamma X_t + \varepsilon_t \tag{1}$$

Where DSAV is domestic sector saving, expressed as a percentage of gross domestic disposable income, FD is an indicator of financial development, X_t is a vector of control variables, which affect the domestic saving, ε_t is the random error term, and t is time or trend variable. The control variables employed include logarithm of real per capita disposable income (LRGDP), government budget deficit as percentage of GDP, real discount rate (RDRT), which is used as a proxy for real interest rate, credit to private sector as a percentage of real GDP (CREP), and inflation rate computed from the consumer price index

Equation (1) is a long-run level relationship and provides the basis for the models estimated in this study. The major objective of this study is to investigate the existence of levels relationship in equation (1) and the impact of financial development indicators on domestic savings. The paper employs three measures of financial development: ratio of deposit money bank assets to GDP (FD1), ratio of liquid liabilities to GDP (FD2), and ratio of private credit by deposit money banks and other financial institutions to GDP (FD3).

Since these three measures of financial development are highly correlated and our data contains only 33 observations, these three measures are converted into an index of financial development using principal component analysis. Let X be a matrix defined as: X = [FD1 FD2 FD3]. The principal components are obtained using the eigenvalues and eigenvectors of the X'X matrix, where X is the 33 × 3 matrix of 33 annual observations on three measures of financial development, i.e. FD1, FD2, and FD3. First the paper derives the eigenvalues $\lambda_1 > \lambda_2 > \lambda_3$ of the X'X matrix and corresponding eigenvectors A= [q_1, q_2, q_3]. Using the eigenvector corresponding to the largest eigenvalue λ_1, the financial development index Z is obtained as Z=Xq_1. Z forms the index henceforth referred to as FD1X and used in the empirical analysis as an indicator of financial development. If the estimate of β is positive and significant this will support the hypothesis that financial development leads to increased domestic saving.

Model Estimation Technique

The paper employs the bounds testing cointegration procedure also known as auto-regressive distributed lag (ARDL) method proposed by Pesaran et al. (2001) to test the existence of the levels relationship in equation (1) and in particular the long-run relationship between financial sector development and domestic savings. The strength of this estimation technique has to do with its ability to handle relationships irrespective of whether the regressors are I(0) or I(1). The ARDL can also avoid the pre-testing problems associated with the traditional cointegration analysis which requires the classification into I(1) and I(0). The bounds testing procedure involves two stages. The first stage is to establish the existence of a long-run relationship. Once a long-run relationship has been established, a two-step procedure is used in estimating the long-run relationship based on the auro-regressive distributed lag (ARDL) approach of Pesaran and Shin (1999).

Suppose the theory predicts that there is a long-run relationship among the variables DSAV, FD, and X. Without having any prior information about the direction of the long-run relationship among the variables, the bounds testing approach estimates an unrestricted conditional error-correction model (UECM) taking each of the variables in turn as dependent variables. For instance, UECM when when DSAV is dependent variables takes the following form:

$$\Delta DSAV_t = a_0 + a_1 t + \theta_1 DSAV_{t-1} + \theta_2 FD_{t-1} + \sum_{j=1}^{k} \theta_{j+1} X_{j,t-1} + \sum_{j=1}^{p} \lambda_j \Delta DSAV_{t-j} \tag{2}$$

$$+ \sum_{j=0}^{p} \omega_j \Delta FD_{t-1} + \sum_{i=1}^{k} \varphi \sum_{j=1}^{p} \theta_{ij} \Delta X_{i,t-j} + \varphi' D_t + u_t$$

Where D_t is a vector of exogenous variables such as the structural change dummies. The first stage in bounds testing approach is to estimate equation (1) by ordinary least square (OLS) and obtain the vital

F-statistic from a Wald restriction test. The applicable hypothesis at this stage is the null of non-existence of a long-run relationship stated as follows:

$H_0 : \theta_1 = \theta_2 = \ldots = \theta_{k+2} = 0$ (no long-run relationship)

$H_1 : \theta_1 \neq \theta_2 \neq \ldots \neq \theta_{k+2} \neq 0$ (a long-run relationship exists)

The existence of a long-run relationship provides the green light to proceed with the analysis. The asymptotic distribution of the F-statistics are non-standard under the null hypothesis of levels relationship among the variables in the UECM in equation (2), irrespective of whether variables are I(0), I(1), fractionally integrated, or mutually cointegrated.

If there is evidence of a long-run relationship between the variables in the first stage, a two-step procedure is used in estimating the long-run relationship in the ARDL approach. In the first step, a conditional ARDL($p_1, q_1, q_2, \ldots, q_k$) long-run model for FD can be estimated as:

$$DSAV_t = a_0 + \sum_{j=1}^{p1} \alpha_j DSAV_{t-j} + \sum_{j=0}^{q1} \vartheta_{1j} FD_{t-j} + \sum_{i=1}^{k} \vartheta \sum_{j=0}^{qi+1} \vartheta_{i+1,t-j} + \varphi^! D_t + u_t \tag{3}$$

where all variables are as defined above and the lag lengths $p_1, q_1, q_2, \ldots, q_k$) relating to five variables in the model are selected using the Akaike (AIC) or Schwarz or Bayesian (SBC) information criterion. The second step of the second stage of bounds testing ARDL approach involves estimating a conditional ECM model specified as follows:

$$\Delta DSAV_t = \mu + \sum_{j=1}^{p} \lambda_j \Delta DSAV_{t-j} + \sum_{j=0}^{p} \vartheta_{ij} \Delta FD_{t-j} + \sum_{i=1}^{k} \vartheta \sum_{j=0}^{p} \vartheta_{i+1,j} \Delta X_{i,t-j} + \sigma ECM_{t-1} + \varphi^! D_t + u_t \tag{4}$$

where λ_j, and ϑ_{ij} are short-run parameters, σ is the speed of adjustment, which determines model's convergence to equilibrium, and the error-correction term ECM_t is defined as:

$$ECM_t = DSAV_t - \breve{\alpha}_0 - \breve{\alpha}_1 FD_t - \sum_{j=1}^{k} \breve{\alpha}_{j+1} X_{j,t-1} \tag{5}$$

The long-run parameters $\breve{\alpha}_i$ in (5) are obtained from the OLS estimates of the conditional ARDL model in equation (3) as follows:

$$\breve{\alpha}_0 = \grave{a}_0 /(1 - \sum_{k=1}^{p} \beta_0) \qquad \breve{\alpha}_1 = (\sum_{j=0}^{q1} \theta_0) /(1 - \sum_{k=1}^{p} \beta_k), \quad i = 1, 2, 3, 4 \tag{6}$$

The standard errors of $\breve{\alpha}_1$ are computed using the Delta-method.

RESULTS AND DISCUSSIONS

Using principal component analysis the paper derived the index of financial development. Defining X as 33×3 matrix formed by X=[FD1 FD2 FD3], the eigenvalues and eigenvectors are obtained as reported in Table 1.

Table1. Eigenvalues of Eigenvectors used to form Financial Development Index

Eigenvalues		
λ_1	λ_2	λ_3
36.3265	0.1362	0.05391
Eigenvectors		
q_1	q_2	q_3
0.8437	0.363746	0.042411
0.18363	-0.48785	-0.66367
0.11248	-0.43325	0.845334

We use the eigenvector in the first column which corresponds to the largest eigenvalue 36.32646242. The first principal component accounts for over 84 per cent of the total variation in the variables.

The second step is to carry out a unit root test to determine whether the variables are I(0) or I(1), to justify the choice of ARDL cointegration technique as the appropriate technique of estimation. Expectedly, results in Table 2 below reveal that the variables comprise of a mix of I(0) and I(1) series thus making the ARDL technique a most suitable estimation technique of choice for this study.

Table2. ADF Unit Root Test for Stastionarity of Series

Variable	Test Statistic		95% critical value		Lag Order	Order of Integration
	Level	1st Difference	Level	1st Difference		
DSAV	5.0124	1.7436	2.9798	-2.9850	1	I(0)
FDIX	1.1431	-4.2814	-2.9798	-2.9850	1I(1)	
FD1	1.0214	-5.1261	-2.9798	-2.9850	1I(1)	
FD2	0.7482	-3.6243	2.9798	-2.9850	2I(1)	
FD3	1.3456	-5.7182	-2.9897	-2.9850	1	I(1)
LRGDP	-2.6371	-3.4256	-2.9897	-2.9850	2	I(1)
RDRT	-2.5126	-4.8824	-2.9897	-2.9850	1	I(1)
CREP	-2.1426	-3.8638	-2.9897	-2.9850	2	I(1)
INF	-1.8946	-4.2436	-2.9897	-2.9850	1	I(1)

Test Assumption: Test includes an intercept and trend

Source: Computed by the Authors using Microfit 4.1

We proceed to estimate equation (2) by OLS in order to test for the existence of a long-run relationship among the variables. We estimate the conditional ECM in equation (2) by taking each one of the variables as the dependent variable. The linear trend term in the ECM model may be a misspecification when the data is not indeed trending. To ensure robustness against misspecification we further estimate each model with or without a linear deterministic trend. Before estimating the conditional ECMs we need to specify the lag length p for each model to be estimated. In order to determine p we use AIC and BIC. For each lag length, we also test the first and fourth order residual autocorrelation using Breuch-Pagan Langrange Multiplier (LM) statistics, which are distributed as $\chi^2(1)$ and $\chi^2(4)$, respectively. We estimate AIC, SBC, and LM tests for each model.

Optional lag lengths and corresponding AIC and SBC values as well as the LM tests with their p-values are reported in Table 3. The lag lengths of AIC and SBC are not the same. In order to ensure robustness against the lag length choice, bounds tests are performed at p values chosen by both AIC and SBC.

Table3. Statistics for Selecting Lag Length in Bounds Tests Equation with Constant

p	AIC	SBC	$X^2(1)$	p-val $X^2(1)$	$X^2(4)$	p-val $X^2(4)$
1	4.763242	5.321674	4.543864	0.0362	33.24537	0.0000
2	3.643923	4.762983	12.32643	0.0001	24.45276	0.0000
3	3.762468	5.452387	11.57326	0.0001	22.76238	0.0000
Lag length selected by AIC: 3						
Lag length selected by SBC: 2						

We use three variants of the bounds test in Pesaran et al (2001) when a linear deterministic trend is present. These are (a) F-iv, which is the F-statistics for testing $\theta_1 = \theta_2 = \cdots = \theta_{k+2} = 0$ and $a_1 = 0$ in equation (2), (b) F-v, which is the F statistics for testing $\theta_1 = \theta_2 = \cdots = \theta_{k+2} = 0$ in equation (2), and (c) t-v, which is the t-statistics for testing $\theta_1 = 0$ in equation (3). When the linear trend is excluded from equation (2) there are two additional tests we report. These are (d) F-iii, which is the F-statistics for testing $\theta_1 = \theta_2 = \cdots = \theta_{k+2} = 0$ in equation (2) with a_1 set equal to 0, and (e) t-iii, which is the t-statistics for testing $\theta_1 = 0$ in equation (2) with a_1 set equal to 0.

For brevity we only report the bounds test result when DSAV is the dependent variable. According to the results presented in Table 4, all bounds tests indicate that there is a long-run relationship among the variables at the 5 percent significance level. These variables are treated as the long-run explanatory variables of DSAV.

Table4. ARDL Technique for Determination of Long-Run Relationship

Without Deterministic Trends			
P	F-iii	t-iii	
2	12.32413*	-5.634278*	
With Deterministic Trends			
P	F-iv	F-v	t-v
2	10.36215	11.56416	-5.436236

Notes: F-iv is the F-statistics for testing $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$ and $a_1 = 0$ in equation (3). F-v is the F-statistics for testing $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$ in equation (3). F-iii is the F-statistics for testing $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$ in equation (3) with a_1 set equal to 0. t-v and t-iii are the t-ratios for testing $\delta_1 = 0$ in equation (3) with and without a linear deterministic trend respectively.

The estimates of the long-run coefficients based on the ARDL model specified in equation (3) are reported in Table 5. The results reveal that there is a significant positive impact of FDIX, LRGDP, and RDRT on domestic savings. The coefficients of these variables are all significant at 5 percent significance level. However, CREP and INF have negative impact on domestic savings but not statistically significant.

Table5. Estimates of the Long-Run Coefficients based on ARDL Model

Dependent variable: DSAV			
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
FDIX	0.824162	0.302324	2.726009	0.0002
LRGDP	0.213551	0.049879	4.281381	0.0013
RDRT	0.176324	0.056112	3.142358	0.0001
CREP	-0.021335	0.054675	-0.390215	0.7463
INF	-0.042510	0.246754	-0.289264	0.8215
C	-0.167864	0.173456	-0.967761	0.0984

In Table 6 we report the impact of FD1, FD2, and FD3 on domestic saving, which are obtained using the first eigenvectors in Table 1. FD1 has the highest impact on savings with a coefficient of 0.75, while FD2 and FD3 have smaller effects on savings with coefficients of 0.19 and 0.24, respectively.

Table6. Impact of Financial Development Indicators on Domestic Saving

Variable	FD1	FD2	FD3
Coefficient	0.75	0.19	0.24

The estimates of the error correction model associated with the long-run estimates presented in Table 5 are reported in Table 7. The estimated error is selected using AIC and this provides information on the short-run relationship among the variables. These variables are reported in their (lagged) differences. Interestingly, the variables are individually statistically significant (except for the INF) indicating that meaningful short-run impact is also exerted by these explanatory variables on DSAV. The error correction coefficient ecm(-1) has expected negative sign and lies between the usual range of 0 and 1. Precisely, the speed of adjustment is -0.37586 suggesting that about 38 percent of errors generated in each period is automatically corrected by the system in the subsequent period.

Table7: Error Correction Representation for the ARDL Model

Dependent variable: dDSAV			
Variables	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
dDSAV	0.231252	0.087548	2.641431	0.0024
FDIX	0.182150	0.046328	3.931748	0.0003
LRGDP	0.132356	0.052215	2.534827	0.0023
RDRT	0.191321	0.073461	2.604388	0.0013
CREP	-0.529887	0.092313	-5.7401120.0000	
INF	-0.211532	0.057685	-3.667019	0.0011
C	-0.375862	0.092453	-4.065438	0.0001
R-Squared = 0.95264				
R-Bar-Squared = 0.91582				
S.E. of Regression = 0.063261				
F-stat.F(6, 20) = 39.1840[.000]				
DW-statistic = 2.2654				
Source: Computed by the Authors using Microfit 4.1				

CONCLUSIONS AND POLICYs IMPLICATIONS

The study examined the relationship between financial sector development and domestic saving in Nigeria using the bounds testing cointegration approach and generated a number of findings. First, significant evidence supports the existence of a long-run relationship between financial development and domestic saving in Nigeria. Second, the composite index of financial development (FDIX)

constructed, has a positive and significant impact on domestic savings, and similarly each of the respective three components of the index (FD1, FD2, FD3) had a positive impact on domestic saving. Third, in conformity with the apriori expectation the estimated effect of the ratio of private sector credit to GDP is negative but highly insignificant indicating that financial development failed to significantly solve the problem of liquidity constraint in Nigeria. Fourth, inflation has a negative but insignificant impact on domestic savings. Fifth, the estimated coefficient of domestic saving with respect to real interest rate is positive and highly significant.

This study has shown the critical role that financial sector development can play in generating domestic finance for a sustainable economic growth, particularly with the recent global economic crises that led to capital flow reversals and its attendant negative impact on many developing countries including Nigeria. Therefore mobilization of domestic savings should be one of the priorities of any growth strategy in a developing country. This suggests that government should further consolidate on past financial sector reforms to improve domestic saving mobilization to reduce the dependence of Nigeria on foreign savings to finance domestic investment.

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