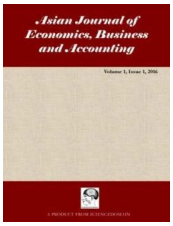

Asian Journal of Economics, Business and Accounting
1(2): 1-11, 2016, Article no.AJEBA.29411

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Financial Deepening Indicators and Economic Growth in Nigeria: A Causality and Impact Analysis

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Authors' contributions

This work was carried out in collaboration between all authors. Author JUJO designed the study. Author IGO managed the literature searches and the background of the study. Author EHC analyzed, interpreted and prepared the draft manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJEBA/2016/29411
Editor(s):
(1) Ioannis A. Makedos, Economic Science, University of Macedonia, Thessaloniki, Greece.
Reviewers:
(1) Safdar Husain Tahir, Government College University, Pakistan.
(2) Mária Bohdalová, University in Bratislava, Slovakia.
Complete Peer review History: http://www.sciencedomain.org/review-history/16750

Original Research Article

Received 9th September 2016
Accepted 17th October 2016
Published 2nd November 2016

ABSTRACT

This paper is a causality and impact study on financial deepening and economic growth in Nigeria for a-33-year period covering 1981 – 2013. The study used the Phillips-Peron test for unit root to ascertain whether the variables are stationary or not. The VEC residual normality test and the Histogram-Normality test were utilized in other to determine if the data set were normally distributed. Test for a long run relationship was conducted with the aid of the Johansen cointegration test. The Error Correction Model as well as the Granger causality test was also employed. The findings revealed that there is a long run relationship between economic growth, broad money supply and private sector credit, with high speed of adjustment towards long run equilibrium. The results also revealed that while broad money has positive and non-significant impact on economic growth, private sector credit has negative and non significant impact on growth. The Granger causality test results showed that neither broad money supply nor private sector credit is granger causal for economic growth and vice versa. The study therefore recommends that private sector friendly policies should be implemented to ensure that investors do not only have access to

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credit but such credit should be at affordable cost, i.e. at a relatively low interest rate. Monetary and fiscal policies should be harmonized in other to achieve the economic goal of sustained growth and stability.

Keywords: Financial deepening; economic growth; error correction model; granger causality.

JEL Classifications: C12, F43, O16.

1. INTRODUCTION

Economic development experts often use the term financial deepening to refer to a condition of sufficient liquidity and smooth financial intermediation. Even though there is general consensus among researchers that financial deepening stimulates economic growth, the direction of causality between the two has proven more problematic to ascertain. Meanwhile, the path of causality may be either through the supply-leading hypothesis, which proposes that financial development stimulates growth, or demand-following hypothesis, which states that growth drives financial development and demand for financial services. [1,2,3] among other studies, maintain that, in line with theoretical expectation, financial development promotes growth. In other words, finance has positive relationship with economic growth.

The role of financial system in economic growth vis-à-vis financial development cannot be overstretched. Thus, globally, financial system has been found to be critical to the development of any economy. It provides huge support to economic activities. [4] opine that financial system development contributes to economic growth. The existence of a financial system is not enough though. Hence, for an accelerated growth in economic activities, a sound and efficient financial system must be in place to effectively engender financial integration. Quite evidently, every developed economy of the world has a developed financial system.

In facilitating financial intermediation, funds are transferred from net savers to net borrowers. The net savers are classified as the surplus unit (investors), with substantial amount of idle funds. Net borrowers on the other hand are categorized as the deficit unit (borrowers) in the economic chain; they have opportunities but do not have the required finances to exploit them. Left on their own, these units would find it difficult, if not impossible to figure out the complementary role they need to play. Therefore, to save cost and time, the financial system (banking institutions and non-banking institutions) intermediates, channeling funds from investors to borrowers.

In the process, money supply and other price indices constitute financial deepening indicators. [5] define financial deepening as an increase in assets and the provision of needed financial services to the economy. [6] posits that an optimal measure of financial deepening must include the total amount of banking and non-banking financial assets including domestic credit to the private sector, liquidity liabilities, stock and bond market capitalization, Treasury bill etc. In his study, [7] maintains that financial deepening indicator constitutes the ratio of private sector credit to gross domestic product (GDP). [8] equally considers ratio of private sector credit to GDP as a primary financial deepening measure, but also selected the money supply relative to GDP as an alternative indicator.

2. EMPRIRICAL REVIEW

Admittedly, there are a number of studies that have focused on financial deepening and economic growth across various economies. Such discourses give insights on the subject while the eventual hindsight thereof reveals gaps in knowledge and reason for further studies. The following are some empirical studies related to the subject:

Against the backdrop of the imperatives of finance in enhancing economic growth and development especially in developing economies like Nigeria, [9] investigated whether financial structure has positive and significant impact on economic growth and development in Nigeria. The findings support existing literature that total financial structure has positive and significant impact on economic growth. However, while some sectors exert more influence (banking and market), other sectors (such as insurance) were found to have non-significant impact on economic growth.

[10] investigated the long-run growth effects of financial development in Ghana and argue that

the growth effect of financial development is responsive to the choice of proxy. The study hence indicated that the ratio of credit to the private sector to GDP and total domestic credit contribute to growth, while the broad money supply to GDP ratio does not promote growth. The indexes created from principal component analysis indexes validated the sensitivity of the effect to the choice of proxy. The findings here suggested that regardless the financial development outcome, growth is a function of the indicator utilized as proxy for financial development.

[11] reviewed the main characteristics of the banking and financial sector in ten new European Union (EU) members, and then examined the relationship between financial development and economic growth in these countries. The study estimated a dynamic panel model over the period 1994 to 2007. The evidence suggested that the stock and credit markets are still underdeveloped in these economies, and that their contribution to economic growth is inadequate owing to lack of financial depth. Conversely, a more efficient banking sector was found to have accelerated growth. Furthermore, Granger causality test indicated a causality running from financial development to economic growth, but not in the opposite direction.

Using the Ordinary Least Square technique, [12] examined the relationship between financial development indicators and economic growth with reference to India and Taiwan within the period 1997–2005. The research discussed and compared the determinants of growth in India and Taiwan, and as well investigated the influences of financial development on economic growth in line with the research purpose. The study revealed that financial development indices pose incredible unidirectional influences on economic growth rather than bidirectional relations in India and Taiwan. In the mutual influence of financial deepening indicators on growth in India and Taiwan, only broad money stock/GDP and stock market value/GDP have remarkable positive direction influences on India and Taiwan.

In his paper, [13] empirically analyzed the argument on the relationship between the finance and growth, using the data from 21 Sub-Saharan African countries and by employing the dynamic panel GMM technique. The result showed that there lies a positive link between financial development and economic growth. This link is strong for the subject of the financial system in Sub-Saharan Africa. On the other hand, an outcome highlighting the link between foreign direct investment and economic growth was favourable.

[14] investigated the causality between financial development and economic growth in Nigeria over the coverage period 1961-2012. A bootstrap rolling window estimation was used to evaluate Granger causality between financial deepening and economic growth over different time periods. The results revealed that there was no causality between the two series. The tests further revealed that while financial deepening has predictive influence for economic growth at some periods, economic growth has predictive control for financial deepening at some periods.

In his paper, [15] analyzed the key aspects of the financial deepening in ten European transition economies (ETE) with period extending from 2000 to 2010using vector error correction model (VECM).The results showed that countries with lower GDP per capita seem to benefit significantly from financial deepening in the short-run and financial deepening indicators Granger cause real output in the long-run, while highlighting that, overall, there is strong evidence of positive impact in all ETE.

Similarly, [16] analysed financial deepening in low, middle and high income economies. The authors used financial variables in the liberalized economies of Sierra Leone, Nigeria and South Korea as low, medium and high income countries respectively between 2000 and 2008. The Ordinary Least Squares and Multiple Regression model estimation technique were employed to examine the causality between financial deepening and economic growth, and to find out their impact with emphasis also on whether the time series data are stationary or not for the countries under review. The empirical results suggested that financial sector development and economic growth are positively co-integrated, with signs for stability in long-run specifically on equilibrium relationship present within “bank-based” financial deepening determinants. The results generally support the view that, financial deepening is a crucial causal factor of economic growth.

[17] examined the empirical relationship between financial development and economic growth within the period 1973 to 2012. Results obtained using the Generalized Method of Moments

(GMM) dynamic panel show that credits granted by the financial system to the private sector has a negative influence on growth. Meanwhile, the measure that underscores the financial deepening of the economy appears to depend positively on economic growth for developing countries but negatively for developed country.

[18] examined the impact of financial sector development on economic growth in Nigeria. The OLS method of the regression analysis was used; the financial development was proxied by ratio of money stock to GDP (M2/GDP), real interest rate (INTR), ratio of credit to private sector to GDP (CP/GDP) while the economic growth was measured by the real GDP (RGDP). The study revealed that only the real interest rate is negatively related to growth, while all the explanatory variables were statistically non-significant. Though the overall statistic indicated that the independent variables were able to explain 74 percent variation in the dependent but contrary to theoretical expectation, it is not statistically significant.

[1] examined the effects of financial deepening on Economic Growth in Ghana using the Johansen Co-integration analysis. The paper empirically examined the causal link between financial sector development and economic growth in Ghana using a quarterly time series data set on Ghana over period (2000–2009). The Johansen Co-integration technique and bivariate vector auto-regressive framework were utilized for the regression. The result of the study reveals the existence of statistically positive and significant relationship between the financial sector development and economic growth in Ghana.

[19] employed a hypothetical-deductive theoretical approach, which is complemented by an empirical investigation in both static and dynamic panel data, as they attempted to investigate the effects of financial deepening dynamics with regards to financial policy coordination in the case of the WAEMU sub-region. The underlying dynamics is apparent in the sub-region and entails that after five years, financial policies coordination would have considerable favourable impact. The study highlighted that monetary policy targeting has indirect effect on financial depth in the region.

[20] empirically examined financial deepening and economic development in Nigeria within the period 1986-2007. The theoretical foundation was that accelerated growth is a function of high level of financial deepening in an economy. The study used secondary data, sourced for a-22-year period. At the end of the study, it was found that financial deepening index was low in Nigeria during the period covered by the study. The authors concluded that the financial system was unable to sustain an effective financial intermediation, particularly in credit allocation and efficient monetization of the economy.

In the work of [3], the authors investigated the relationship between financial development and economic growth in Cameroon using time series data sourced between 1970 and 2005. As in [21], The Johansen method of co-integration analysis was utilized while also taking into consideration the various measures of financial development. The results showed that financial development has a positive effect on economic growth in the long run. The study also indicated that there is long term causal relationship leading from financial development to economic growth.

Using the dynamic-panel GMM estimation, [22] analyzed the effects of financial sector deepening on economic growth in Turkey using a province-level data set from 1996-2001. The results indicated a strong negative relationship between financial deepening and economic growth.

In their paper, [23] examined the causal relationship between financial development and economic growth in Malawi. The study employed the autoregressive distributed lag (ARDL) approach. Results revealed that there is positive and significant relationship between financial development and economic growth in the long-run. Granger causality tests showed a unidirectional causality and hence showed that economic growth drives financial development without feedback effects, thus financial development has no causal effects on economic growth. Similar to the findings in [24], private sector credit as a ratio of GDP and private sector credit as a percentage of domestic credit as indicators cause economic growth, there was evidence of a weak relationship between economic growth and bank deposits as a ratio of GDP. These results therefore imply that economic growth is critical for development of the financial sector in Malawi. The authors attributed the absence of causality of financial development on economic growth to the relatively less developed financial sector in Malawi.

3. METHODOLOGY

This study is examining events that have already taken place. In other words, it is an *ex-post facto* research design. The annualized time series data from 1981 to 2013 were collected from the Central bank of Nigeria statistical bulletins and annual reports. Our data will be subjected to diagnostic tests in other to improve the reliability of our result and ensure they will not be spurious. We shall employ the VEC Residual Normality Tests, which will be complimented with a group Histogram-Normality test. Checks for stationarity will be conducted using the Phillips-Perron unit root test. Johansen cointegration test will be utilized to find out if our variables are cointegrated while the Error Correction Model will be employed to ascertain the speed of adjustment towards equilibrium, and direction and magnitude of impact. The pairwise Granger causality test will be adopted to ascertain the causal relationships among our variables.

3.1 Model Specification

This study will be patterned after the model adopted by [18] while carrying an empirical study on capital market, financial deepening and economic growth in Kenya. The model employed by the researchers is of the form;

$$g_y = f(FD) = \lambda_0 + \lambda_1(FD_t) + \varepsilon_t \quad (1)$$

Where g_y is growth in per capita; $\lambda_0 = \alpha_0+\beta_0$; $\lambda_1 = \alpha_1+\beta_1$; *FD* is financial sector development and ε_t is the error term with the usual properties.

This study will modify the above model for our purpose thus;

$$GDPGR_t = \beta_0 + \beta_1 M2GDP_t + \beta_2 CPSGDP_t + \beta_3 MCGDP_t + \varepsilon_t \quad (2)$$

Where,

$GDPGR_t$ = *Gross domestic product growth.*
$M2GDP_t$ = *Ratio of broad money to gross domestic product.*
$CPSGDP_t$ = *Ratio of private sector credit to gross domestic product.*
$MCGDP_t$ = *Ratio of market capitalization to gross domestic product.*
β_o = *Constant term.*
β_1- β_3 = *Parameter estimates.*
ε_t = *Error term.*

MCGDP is a conditioning variable and controls for the perceived influence of market capitalization in explaining growth.

There are three stages to our estimation. First we test our variables for stationarity using the Phillip-Perron unit root test. Time-series data is stationary if its mean and variance are constant over time [25]. The Phillip-Perron is based on the following model:

$$\Delta Y_t = \mu + \alpha_{t-1} t + \sum_{i=1}^{n} \gamma_i \Delta \gamma_{t-1} + \varepsilon_t \quad (3)$$

Where t = linear time trend, μ = constant, Δ = differencing operator, and ε_t = error term. If the variables are stationary and integrated at order zero, 1(0), we can utilise the Ordinary least square. However, if our variables are integrated of order one then, we will have the basis to run the Johansen co-integration test.

This second stage enables us find out if long run relationship exist among the variables. If at this point our variables are co-integrated, we then move on to the third stage where we the run the Error Correction model (ECM) by modifying our baseline equation thus:

$$\Delta GDPGR_t = \beta_0 + \sum_{i=0}^{n} \beta_1 \Delta GDPGR_{t-1} + \sum_{i=0}^{n} \beta_2 \Delta M2GDP_{t-1} + \sum_{i=0}^{n} \beta_3 \Delta CPSGDP_{t-1} + \sum_{i=0}^{n} \beta_4 \Delta MCGDP_{t-1} + \beta_5 ECT_{t-1} + \varepsilon_t \quad (4)$$

Where ECT_{t-1} is the lagged value of the error correction term.

4. RESULTS AND ANALYSIS

4.1 Unit Root Test

Carrying out a regression analysis on non-stationary time series data will lead to spurious regression results. To check against such unfavourable outcome, the Phillips-Perron unit root test will be used to ascertain the stationarity of the data as presented Table 1.

The result of the unit root test in Table 1 reveals that there was the presence of stationarity at 1%, 5% and 10% critical values for independent variable (*GDPGR*) as well the independent variables *M2GDP* and *CPSGDP*, and the control variable *MCGDP*. It can be seen that the calculated value is less than critical values for each of the variable tested, which confirms their stationarity, all at first difference (1(1)). Moreover, to confirm the reliability of this result, the Durbin Watson statistic value at each point is substantial and approximately 2.0. This also implies that there is no problem of autocorrelation in the time series data.

4.2 Normality Test

Normality tests is often used to determine if a data set is well-modeled by a normal distribution and to figure out how possible it is for a random variable that made up the data set to be normally distributed.

Table 1. Phillips-perron unit root test

Variable	Phillips-Perron test statistic	1% critical value	5% Critical value	10%critical value	Order of integration	Durbin-Watson stat
GDPGR	-21.85409	-3.661661	-2.960411	-2.619160	1(1)	2.308764
M2GDP	-5.657252	-3.661661	-2.960411	-2.619160	1(1)	1.985412
CPSGDP	-8.343172	-3.661661	-2.960411	-2.619160	1(1)	1.968130
MCGDP	-6.235732	-3.661661	-2.960411	-2.619160	1(1)	2.066150

Source: Author's 2016

Table 2. Normality test

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: Residuals are multivariate normal
Date: 09/21/15 Time: 07:57
Sample: 1981 2013
Included observations: 30

Component	Skewness	Chi-sq	df	Prob.
GDPGR	0.554406	1.536831	1	0.2151
M2GDP	-0.255894	0.327408	1	0.5672
CPSGDP	0.487887	1.190168	1	0.2753
MCGDP	1.484955	11.02546	1	0.0009
Joint		14.07987	4	0.0070
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
GDPGR	3.738035	0.680869	1	0.4093
M2GDP	3.202521	0.048747	1	0.2253
CPSGDP	4.209066	1.827300	1	0.1764
MCGDP	6.684694	16.97121	1	0.0000
Joint		19.52813	4	0.0006
Component	**Jarque-Bera**	**df**	**Prob.**	
GDPGR	2.217700	2	0.3299	
M2GDP	0.376156	2	0.8286	
CPSGDP	3.017468	2	0.2212	
MCGDP	27.99667	2	0.0000	
Joint	33.60800	8	0.0000	

Source: Authors' 2016

Table 2 presents normality test for the relevant variables underlying the sourced data set. As revealed by the skewness of *GDPGR,* it had a positive skewness of 0.55. This indicates that the degree of departure from the mean of the distribution is positive and that, overall, there was a consistent increase in *GDPGR* between 1981 and 2013. From the second panel, the kurtosis for the variable is 3.74, 3.20, 4.21 and 6.68 respectively. Since each of the normal/standard value is greater than 3.0, the implication is that the degree of peakedness within the period under study was normally distributed since as most of the values clustered around the mean. The third panel shows that the p values of JB-statistic are all greater than the critical value of 0.05 except for *MCGDP* which is less than 0.05. Therefore, we accept the null hypothesis that our variables are normally distributed.

Fig. 1 confirms that our data set are normally distributed as the probability of Jarque-Bera statistic is jointly greater than the critical value of 0.05, which proves that the model passed the goodness of fit test.

4.3 Johansen Cointegration Test

Considering that our variables are integrated of the same order (and are stationary at first difference), we can go ahead to determine whether a long run relationship exists between the dependent variable and the independent variables. This we will achieve by using the Johansen cointegration test.

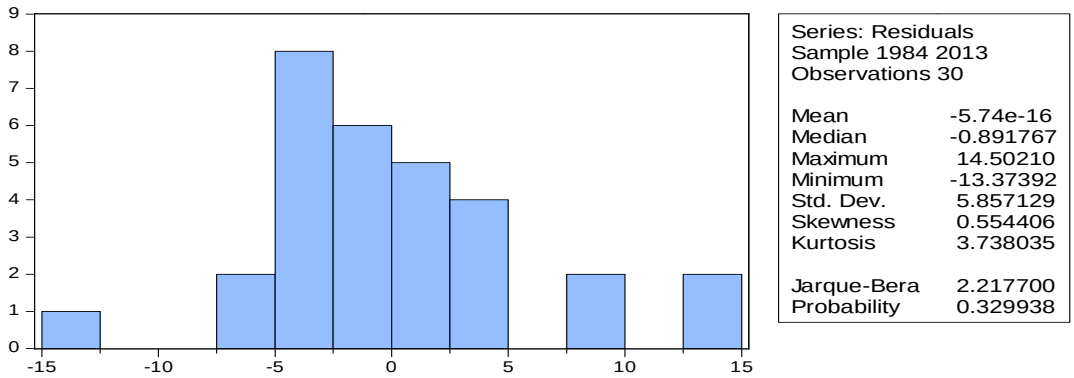

Fig. 1. Histogram-Normality test for GDPGR
Source: Authors' 2016

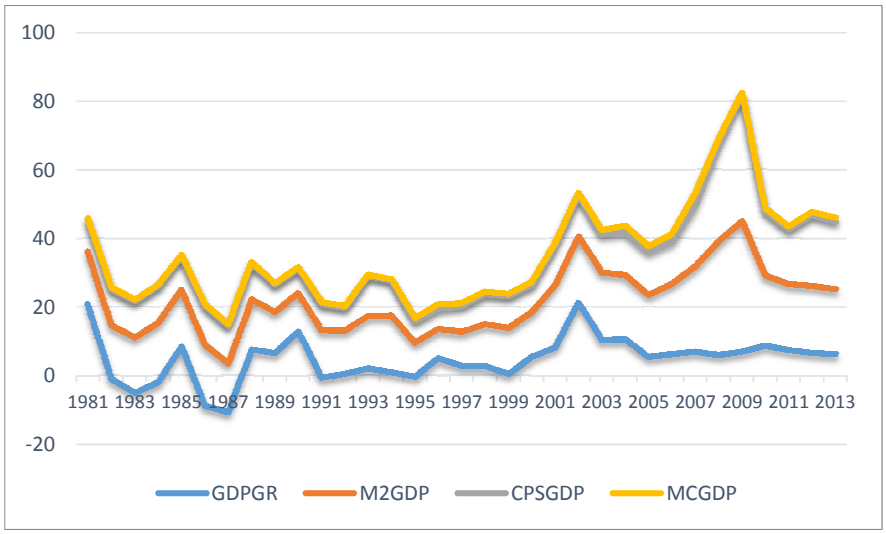

Fig. 2. Graphical representation of model proxies
Source: Authors' 2016

Table 3. Johansen test for cointegration result

Date: 09/21/15 Time: 06:20
Sample (adjusted): 1984 2013
Included observations: 30 after adjustments
Trend assumption: Linear deterministic trend
Series: GDPGR M2GDP CPSGDP MCGDP
Lags interval (in first differences): 1 to 2
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace statistic	0.05 critical value	Prob.**
None *	0.610261	50.76514	47.85613	0.0260
At most 1	0.314277	22.49676	29.79707	0.2717
At most 2	0.243013	11.17832	15.49471	0.2008
At most 3	0.089901	2.826055	3.841466	0.0927

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis (1999) p-values*

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.610261	28.26838	27.58434	0.0408
At most 1	0.314277	11.31844	21.13162	0.6155
At most 2	0.243013	8.352267	14.26460	0.3440
At most 3	0.089901	2.826055	3.841466	0.0927

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level,
** denotes rejection of the hypothesis at the 0.05 level,*
***MacKinnon-Haug-Michelis (1999) p-values*

The first two panels of Table 3 show the results for the trace statistic and max-eigen statistics respectively. The second column in each case presents the ordered Eigenvalues. The trace statistic of 50.76 exceeds the critical value (of 47.86). But, besides, the probability of the trace statistic (0.0001) is less than 5%; therefore, the null of no cointegrating vectors is rejected. If we then move to the next row, the traces statistic (of 22.50) is less than the critical value (of 29.80) so that the null of atmost one cointegrating vector is also accepted. A look at the second panel, which presents the Max-eigen statistic test, confirms this result that the variables are cointegrated. Hence, there is a long run relationship between the dependent variable and the independent variables.

4.4 Regression Result: Error Correction Model (Equation 4)

Table 4 presents the ECM regression result. Having found that the error correction term *(ECT),* which is the residual of the short run regression, is stationary, this is the justification for employing the ECM. The stationarity of the residual is an indication that a long run relationship runs from the dependent variable to the independent variables. The results show that the overall regression model is significant. This is evidenced by the probability of F-statistic (0.002), which is less than 0.05. It is also important to note that the error term (ECT) is negative and significant. This indicates a movement towards attainment of long-run equilibrium in our model, explaining that long run causality runs from economic growth to broad money supply and credit to the private sector. Sequel to this, the residual (ECT) coefficient (-0.81), which is the speed of adjustment, shows that 81% of the errors in the long-run is corrected each year.

As observed from the result above, the coefficient of *CPSGDP* is negative and does not have a statistically significant impact on GDPGR. *M2GDP* has a positive and non-significant impact on *GDPGR* over the period of this study while *MCGDP* positive and non-significant effect on economic growth.

As revealed by Table 5, broad money supply does not Granger cause economic growth (*P Value = 0.63*), and there is also no feedback from economic growth to broad money supply. Likewise, credit to the private sector does not granger cause economic growth, no causality

Table 4. ECM regression result

Dependent Variable: D(GDPGR)				
Method: Least Squares				
Date: 09/21/15 Time: 21:16				
Sample (adjusted): 1982 2013				
Included observations: 32 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.392678	1.082078	-0.362893	0.7195
D(M2GDP)	0.525774	0.659775	0.796899	0.4325
D(CPSGDP)	-0.562404	0.625764	-0.898747	0.3767
D(MCGDP)	0.818312	2.221759	0.368317	0.7155
ECT(-1)	-0.805613	0.167027	-4.823241	0.0000
R-squared	0.466495	Mean dependent var		-0.457437
Adjusted R-squared	0.387458	S.D. dependent var		7.733371
S.E. of regression	6.052530	Akaike info criterion		6.581431
Sum squared resid	989.0943	Schwarz criterion		6.810452
Log likelihood	-100.3029	Hannan-Quinn criter.		6.657345
F-statistic	5.902184	Durbin-Watson stat		1.644271
Prob(F-statistic)	0.001512			

Source: Authors' 2016

Table 5. Granger causality test

Pairwise Granger Causality Tests			
Date: 09/22/15 Time: 00:02			
Sample: 1981 2013			
Lags: 2			
Null Hypothesis:	**Obs**	**F-Statistic**	**Prob.**
M2GDP does not Granger Cause GDPGR	31	0.46781	0.6315
GDPGR does not Granger Cause M2GDP		0.50745	0.6079
CPSGDP does not Granger Cause GDPGR	31	0.45001	0.6425
GDPGR does not Granger Cause CPSGDP		0.34008	0.7148
MCGDP does not Granger Cause GDPGR	31	0.53766	0.5905
GDPGR does not Granger Cause MCGDP		1.13169	0.3379

Source: Authors' 2016

runs from economic growth to private sector credit. Finally, the third panel explains that market capitalization is not granger causal for economic growth and vice versa.

5. IMPLICATIONS, CONCLUSION AND RECOMMENDATIONS

This study explored relevant statistical techniques in the quest to determine the effects of financial deepening indicators on economic growth, and also examine causality underlying our variables. The Johansen cointegration test showed that there exists a long-run relationship between economic growth and broad money supply, and private sector credit. The Engel and Granger residual based result further confirmed that there is a long-run causality running from GDP to broad money and private sector credit. The results of the error correct model revealed that although broad money have positive impact on growth, the impact is non-significant. On the other hand, it was found that deposit money bank credit to the private sector has no negative and non-significant impact on economic growth. This implies that, other things being equal, money supply exerted positive influence of growth but the impact was not significant. From the *a priori* point of view, credit is believed to drive growth. But the study has revealed that between 1981 and 2013, private sector credit have not positively impacted on economic growth. Pairwise Granger Causality test conducted showed that GDP does not granger causes neither money supply nor private sector credit, and vice versa. Based on the findings, the study recommends that private sector friendly policies should be implemented to ensure that investors do not only have access to credit but such credit should be at a affordable cost, i.e. at a relatively

low interest rate. Monetary and fiscal policies should be harmonized in other to achieve the economic goal of sustained growth and stability.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/16750