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Deposit Money Banks' Credit to Private-Public Sectors and Economic Development Nexus in Nigeria: A Toda-Yamamoto Approach

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Abstract: This study investigated the nexus between deposit money banks' credit to private-public sectors and economic development in Nigeria between the 1970 to 2016 periods. The study adopted per capital income as the dependent variable, while credits to private sectors, credits to government sectors, money supply, and lending interest rate are the independent variables. It employed the Ng-Perron, Augmented Dickey Fuller Breakpoint Unit Root Tests and Toda-Yamamoto augmented Granger causality test in its analysis. The unit root tests were employed to check for the presence of unit root and determine the order of integration of the series– I(d) in the presence of structural break in each series respectively. Hence, taking account of the effect of structural break, credits to government sectors and lending interest rates were stationary series at $p < 0.01$. The T-Y Granger causality results, in its overall sense provided evidence to support the feedback hypothesis in Nigeria. The feedback hypothesis holds that banks' credit and economic development granger cause each other. It was recommended, among other things, that the monetary authorities should regulate the activities of deposit money banks to ensure that they gear up the growth of credits to private sectors by examining factors, such as lending interest rate which can possibly undermine lending to the private sectors, that serves as key engine of economic development in any developing economy.

Keywords: private-public sectors; economic development in Nigeria; recurrent expenditures of the government

JEL Classification: G24

1. Introduction

The leading role played by bank financial institutions in a developing economy cannot be undermined, hence, they perform the most crucial role in the development of the economy. In the last decade, bank financial institutions in Nigeria have significantly increase institutional credits to the private and public sectors for private investment purposes, helping to build up infrastructural facilities, capital project backing and meeting recurrent expenditures of the government respectively. However, the incidence of non-performing loans have also increase in the last decade, the increase indicates that most of the banks' credit may have gone into wrong hands. This happens whenever individual and/or institutional borrowers' defaults in repaying the principal and interest accrued on a loan facility. Several factors, such as lack of commitment, political instability, unrealistic investment projects, incessant policy changes, industrial unrest, and energy crisis to mention a few are responsible for the loan(s) default. One cannot help but wonder whether the bank credits irrespective of wherever channeled, would give rise to the

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activities that stimulates growth effect which would propel the economy forward and bring about economic growth and/or development.

Deposit Money Banks (Hereafter, DMBs) as bank financial institutions generally act as lenders of short- and medium term loans to both private and public sector borrowers, hence they create the money they lend out to customers. They are also known as commercial banks in most developing countries, and with different names in other parts of the world. Wherever they are and by whatever name they are known for, they have a general and similar characteristics and as well similar to but in many cases different from non-bank financial institutions. Korkmaz (2015) asserted that in developing countries, bank financial institutions are expected to play important roles in financing economic projects and related activities, hence their contributions in ensuring sustainable economic growth and/or development should be unqualified. Generally, DMBs assume an intermediary role between the surplus units (those who are willing to lend to others by savings with the DMBs) and the deficit unit (whose who needs funds kept with the DMBs). Ideally, the key function of bank financial institutions in an economy is to facilitate credit extension in such an efficient manner that will ensure an increase in investments and enhance output growth of the economy. However, a repressed banking sector can retard economic growth and development, while a liberalized banking sector can stimulate the growth in an economy. DMBs experience challenges in ensuring that their funds to the productive sectors of the economy have a significant impact on them in a positive way. In spite of the perceived roles played by these bank financial institutions in smoothing and keeping the Nigerian economy on the path of growth and development, several factors inhibits their functions. This study provides an answer to the question on the causal link between deposit money banks' credit to public-private sectors and economic development in Nigeria.

However, the debate of the direction of causality between economic development and financial deepening variables is age-longed, and prior studies have found evidence to support either the supply-leading hypothesis, demand-following hypothesis, feedback hypothesis, or the neutral hypothesis. The direction of causality between these variables has remained a controversial and contentious issue, with studies relating to the subject matter producing mixed results across countries, using different data sets, study periods and methodologies. In Nigeria, the two main strands are the supply-leading and demand-following views. The motivation for this study emanates from the diverse results obtained by prior studies in Nigeria, and the need to also investigate an unpopular belief that banking sector reforms in Nigeria since the beginning of the new millennium may have been precipitated to support the supply-leading hypothesis. This study contributes new knowledge in that it finds the feedback hypothesis relevant for the Nigerian situation, in resonance with the empirical studies conducted in developed economies. This implies that Nigeria's financial sector drives economic development, and the latter also reciprocate by promoting the status of the Nigerian financial sector to a developed state. To the best of our knowledge, Agu and Chuwkwu (2008) is the only prior study that found the mutual interdependence hypothesis applicable to Nigeria also by adopting the Toda-Yamamoto approach, but the study lacks current relevance, while the choice of variables also differs, hence this current study is able to bridge these gaps by including credits to government sector as one of the features because of its alignment to the study's objective and also by updating the study's scope.

The rest of the paper is structured as follows: section two discusses the review of literature. Section three entails data issues and pre-estimation analyses, while section four presents the estimation results and discussion. Section five concludes and make policy recommendations.

2. Literature Review

2.1. Conceptual Literature

This section of the study covers every clarification as regards the concepts and notions in the study.

Deposit Money Banks (DMBs) and Economic Development

Deposit money banks (DMBs) play an important role in the growth and development of an economy. The principal role performed by deposit money banks is to ensure there is adequate flow of money to service deficit sectors of the economy and facilitate the movement of funds amongst economic units. Deposit money banks perform series of functions to stimulate the development of an economy. They satisfy the financial needs of sectors such as agriculture, industry, trade, communication, and other productive sectors, hence they play a very significant role in the process of meeting economic needs of private-public sectors. The functions performed by deposit market banks, recently, are becoming customer-centered and are widening their primary and secondary functions. The development of banking institutions and the growth of modern economies seems inseparable. Not until the late seventh century, there had existed no modern banking institution anywhere in the world, since there had also been no modern developed economy. The availability of natural resources endowment, technical know-how, supply of skilled labour and, of course, capital are factors that determine the level of development of an economy. Capital is a critical factor required in the process of economic development, both real or financial capital are important for any meaningful economic development, this therefore underscores the importance of banking institutions, most especially the deposit money banks. DMBs serve as an intermediary between the savers side and the spenders' side in any economy that intends to channel the funds acquired to investment opportunities that open doors for economic development.

Therefore, these banks pool together the funds of scattered savers, and make it available for the users of funds, that are ready for investment. Consequently, investment in large physical projects is possible because qualified investors have access to the substantial stock of funds in temporary residence with these banks. This intermediation function of the banks facilitates development as it encourages savings and investments both of which are economically very rewarding. Banks also influence the quantum of purchasing power available for the investment and consumption expenditures. However, these banks do this through their power to expand or contract credit, and by their policies, they also affect the direction of funds to alternative uses, through the prices of the various financial claims. They also determine whether credit will be available for financing investment in agriculture, industry or consumption, and how they perform this role affects the pace and pattern of development in different sectors of the economy. DMBs are very different from other financial intermediaries, in that they have a "high degree of liquidity" against their demand deposits. They also have the ability to "create" and "destroy" money. In a modern economy, the greater proportion of the money supply is created by the DMBs from the customers' deposit with them. These banks, as a group, therefore constitute the principal supplier of the

medium of exchange in an economy. However, deposits money banks face a myriad of problems that may impede their contributions to economic development in a nation, and these problems can be classified into problems that create internal and external threats to their survival. To mention a few are bad management, board room crisis, risk asset portfolio, weak capital bases, unstable economic and political environment, legal problems, international financial crisis, and financial distress among others. This assertion is supported by

2.2. Theoretical Review

There are several theories in economics and finance literature that offers theoretical explanation on the link between deposit money banks' credit and economic development. These theories are discussed as below:

Savings Mobilization Theory

Mobilization of savings is one of the major functions of financial institutions. By mobilizing the savings of millions of savers in an economy and the channelling of same to the deficit spending units, the funds or capital needed for economic growth and development is enhanced. Saint-Paul (1992) identified capital accumulation as a major determinant factor in the development process in relating the growth rate of an economic output to that of its capital stock. He pointed out the dual role of capital as creating productive capacity and effective demand.

In their model, capital stock (investment) was assumed to be equal to saving that is I = S. According to Harrod (1939), who viewed an increase in capital stock as synonymous with investment, is a dependent factor of the rate of growth of income, which determines the level of savings.

Financial Repression Hypothesis

This theory is usually associated with the works of (Cameron et al., 1973; McKinnon, 1973; Shaw, 1973), and it holds that financial development would contribute most significantly to economic growth if the authorities were not to interfere in the operations of the financial institutions. Poor performance by banks and other financial institutions is thus often attributed to interest rate regulation, ceilings on deposit and loan rates and official guidelines pertaining to lending operations. Such interference results in a low and often negative real rate of return on financial assets and therefore, in deficient savings being mobilized and channeled into investment projects (Agu, 1988).

The proponents of this hypothesis therefore advocate a positive real interest and financial liberalization. Free market forces would then ensure an optimal financial structure for development and eliminate the fragmentation of markets that is financial dualization and all the attendant distortions of the proper operation of the market mechanism. According to the financial repression hypothesis, government legislation and policies may distort the operation of the market mechanism in determining the "prices" of financial resources. As the major effects of such repression are limited savings because of interest ceilings, the hypothesis can be ultimately reduced to official interest rate policies. It is however, recognized that other forms of financial repression might result from such other factors as portfolio regulation and oligopolistic financial markets (Galbis, 1982). The financial repression hypothesis also focuses attention on the level of interest rates on the savings instruments available to the public in

relation to the rate of inflation. If real rates of interest have been positive over a period of time, it may be said that there has been no financial repression, but financial deepening.

Supply-Leading Hypothesis

Schumpeter (1911) is the leading proponent of the supply-leading hypothesis, and supported by Gurley and Shaw, 1967; McKinnon, 1973; King and Levine, 1993; Calderon and Liu, 2003. The hypothesis asserts that economic growth and/or development is positively affected by financial development. The hypothesis holds that the effect runs from financial development to economic growth and it is caused by an improvement in the efficiency of the capital accumulation or an increase in the rate of savings as well as the investment rate. The tenet of the hypothesis is that as entrepreneurs have new access to the supply-leading funds, their expectations increase and new horizons (possible alternatives) open up, thereby making them to "think broadly".

Demand-Following Hypothesis

The demand-following hypothesis was pioneered by Robinson (1952). This Keynesian theory states that financial development responds to changes in the real sector. The theory asserts that financial deepening occurs due to an expansion in government expenditure, hence it is believed that by injecting money into the economy through increase in government expenditure is a way of reaching full employment. These increase in government expenditure would increase aggregate demand and income, thereby raising demand for money (Mckinnon, 1973). Robinson, 1952 reveals that it is the necessity from high economic growth that creates demand in the financial sector. Thus, in this view, it is the improvements in the economy that drive higher demand for the use of money, which consequently promotes financial development. In other words, financial markets develop and progress as a result of increased demand for their services from the growing real sector. Causality runs from economic growth to financial development, that is, an increase in economic growth causes a rise in demand for financial services and this results in the expansion of the financial sector (Goldsmith, 1969; Jung, 1986; Kar & Pentecost, 2000; Lucas, 1988; Ndlovu, 2013; Omotor, 2007; Robinson, 1952).

But in between the supply-leading hypothesis and demand-following hypotheses, there are two other strands. Firstly, the feedback (mutual dependence or interdependence) hypothesis which was championed by Patrick (1966), and which states that there exist a mutual effect between financial development and economic growth, hence it is reciprocal. Secondly, the neutral hypothesis expressed most prominently by Lucas (1988), and which asserts that there is no relationship between financial development and economic growth.

2.3. Empirical Review

By adopting Toda-Yamamoto augmented Granger causality test, Karimo and Ogbonna (2017) examined the direction of causality between financial deepening and economic growth in Nigeria for the periods from 1970 to 2013. The results showed that the financial deepening-growth nexus in Nigeria follows the supply-leading hypothesis, which means that it is financial deepening that leads to growth and not growth leading financial deepening. Over the periods from 1981 to 2014, Okafor, Ezeaku and Ugwuegbe (2016) evaluated the causal relationship between deposit money bank credit and economic growth in Nigeria. By employing the Vector autoregressive (VAR) Granger causality test, the study found that a

financial development is sine-qua-non for economic growth, hence unidirectional causality running from private sector credit and broad money supply to economic growth.

In Saba (2016), the causal effect of bank activities on economic growth was investigated in Pakistan from 1961 to 2013. The study which employed co-integration and Granger causality test in its analysis revealed that bank activities have no impact on economic growth, and that saving and lending activities result in no significant benefits. James and Ikwuagwu (2016) studied the effect of sectorial credits from deposit money banks (DMBs) on the economic growth in Nigeria within the periods of 1985 to 2014. The regression results revealed that credits to the agricultural and manufacturing sectors have positive effect, while those to commerce and trade show an inverse relationship with economic growth.

Iwedi, Igbanibo and Onuegbu (2015) examined the impact of bank domestic credits on the economic growth of Nigeria. Using time series data for the periods of 1980 to 2013, the Co-integration result should a poor long run relationship between bank domestic credit indicators and gross domestic product in Nigeria. The study recommended that the monetary authorities should fashion out appropriate policies that will enhance the bi-directional flow of influence between the banking sector where investable funds are sourced and the real sector of the economy where goods and services are produced. In Akakabota (2015), the effect of financial sector reform on economic growth in Nigeria over the period from 1986 to 2012 was examined. The regression technique employed show that credit claims of deposit money banks affects economic growth in a positive way while interest rate charge by banks for lending has negative relationship with economic growth.

Fapetu and Obalade (2015) also investigated the impact of sectoral allocation of banks' credit on economic growth in Nigeria for the periods of intensive regulation, deregulation and guided deregulation. The ordinary least square technique employed for the three regimes revealed that credits allocated to private and public institutions have significant positive contributions on economic growth during period of intensive regulation, but otherwise in the deregulation era. Neelam (2014) studied the impact of bank credit on economic growth in Nepal for the periods from 1975 to 2013. The analysis done via Johansen approach to co-integration approach and error correction model showed that bank credit to the private sector has positive effects on the economic growth in Nepal in the long run.

In a study for the effect of deposit money banks intermediation role on economic growth in Nigeria for the 1973 to 2011 periods, Samson and Tarila (2014) found that credit allocation to the production sector has significant impact on economic activity. Balago (2014) examined the link between bank credit and economic growth in Nigeria for the periods from 1983 to 2012 by establishing VEC models. The result of the study showed that causality runs from bank credit to the GDP.

Employing regression technique, Samson and Abass (2013) examined the role of banks deposit money in the growth of Nigerian economy for the 1974 to 2010 periods. The study found a long-run relationship between economic growth and role of banks in the Nigerian economy. Taking 10 banks as sample, Auranzeb (2012) investigated the contributions of banking sector to economic growth of Pakistan for the periods from 1981 to 2010. The regression results indicated that banks deposits, investments, advances, profitability and interest earnings have significant positive impact on economic growth of Pakistan. The study also confirmed a bidirectional causal relationship of deposits, advances and profitability with economic growth, and a unidirectional causal relationship running from investments and interest earnings to economic growth.

The association between credit in banking sector and economic growth in Nigeria was examined by Akpansung and Babalola (2012) for the period from 1970 to 2008 utilizing the two-stage least squares approach and Granger causality test. The study establishes evidence that credit in private sector positively affected on economic growth while lending rate slows down economic growth., while evidence of unidirectional causal relationship from GDP to private sector credit (PSC) and from industrial production index (IND) to GDP. Okwo, Mbajiaku and Ugwunta, (2012) investigated the effect of bank credit to the private sector on economic growth in Nigeria for the periods from 1981 to 2010. The co-integration result of the study showed that bank credit to private sectors has a strong positive and significant relationship with economic growth.

3. Theoretical Basis, Data Issues and Preliminary Analyses

This study adopts an econometric methodology in the analysis of the link between deposit money banks' credit and the development of an economy, taking Nigeria as a case study. The focus of this study is to adopt a technique that provide evidence for the direction of causality between the two variables of interest. This study complied data on per capital income, bank credits to private sector, bank credits to government sector, money supply, and lending interest rate for the periods from 1970 to 2016, and these data which were transformed to their natural logarithms was collected from the Central Bank of Nigeria statistical bulletin, National Bureau of Statistics Fact Book and the World Bank Development Indicator Database. The model built for this study specifies economic performance (measured with per capital income) as a function of credit from DMBs to private sectors, credit from DMBs to government sectors, money supply and lending interest rate.

3.1. Descriptive Statistics

Table 3.1 of descriptive statistics, presents the descriptive properties of the transformed logarithmic values of PCI, CPS, CGS, MS and LIR. From Table 3.1, the mean value of ln(PCI) is greater than that of any other series. It can also be observed that there is a wide margin between the maximum and minimum values of each of the series, this indicates that there is large variance present in all the series. All the series except ln(LIR) are positively skewed, and this means that there is every tendency of obtaining negative extreme values than positive extreme values for ln(LIR). This further implies that all other series have a symmetric distribution. For all the series, the Kurtosis statistic indicates a platykurtic (low-peaked and thin-tailed) probability distribution. The Jarque-Bera statistic supports the rejection of the null hypothesis of normal distribution for all the series.

Table 3.1. Results of Descriptive Statistics

Statistics	Ln(PCI)	Ln(CPS)	Ln(CGS)	Ln(MS)	Ln(LIR)
Mean	6.275582	4.828997	3.479701	5.154563	2.626115
Median	6.080702	4.845132	3.022374	5.108004	2.820783
Maximum	8.032788	9.956209	8.289720	9.980804	3.454738
Minimum	5.030932	-0.798508	-1.560648	-0.105361	1.791759
Std. Dev.	0.850446	3.179770	3.192125	3.120170	0.468416
Skewness	0.727626	0.147225	0.166766	0.024394	-0.437465
Kurtosis	2.477024	1.763082	1.582737	1.757474	1.828933
Jarque-Bera	4.682895	3.165971	4.151425	3.028075	4.184764
JB P-Value	0.096188	0.205361	0.125467	0.220020	0.123393
Observations	47	47	47	47	47

Source: Authors' Computation, 2017

3.2. Unit Root Test

The presence of a unit root may occurs due to the non-stationary property of most times-series data. Ng-Perron (NP) modified and Augmented Dickey Fuller (ADF) breakpoint unit root tests were employed to check for the presence of unit root and determine the order of integration of the series – I*(d)* in the presence or absence of structural break in each series respectively. However, the T-Y Granger non-causality test does not consider the presence of unit root in time-series data. The Ng-Perron test consists of four individual test statistics namely MZa, MZt, MSB and MPT, but this study make use of the MZa and MZt test statistics. The rejection of the null hypothesis that a series has a unit root was done by comparing in absolute terms, the test statistics and critical values, hence, test statistics must be greater than the critical values. An automatic maximum lag length selection based on the Schwarz Information Criterion, set the optimal lag length at 9. The ADF breakpoint unit root test was performed in an Innovative Outlier (IO) model so as to determine the order of integration of each series in the presence of structural changes. The summary of the unit root tests result was reported in *Table 3.2A and 3.2B* below as.

Table 3.2. Unit Root Test Results

3.2A: Ng-Perron Unit Root Test					
	Level		First difference		
Series	MZa Statistics	MZt Statistics	MZa Statistics	MZt Statistics	I(*d*)
lnPCI	-3.04186[b]	-1.19247[b]	-18.4906*[a]	-3.03881*[a]	I(1)
lnCPS	-13.9786[b]	-2.62663[b]	-11.4437**[a]	-2.32755**[a]	I(1)
lnCGS	-11.7210[b]	-2.38670[b]	-82.4144*[a]	-6.41606*[a]	I(1)
lnMS	-14.5494[b]	-2.62465[b]	-16.9427*[a]	-2.90817*[a]	I(1)
lnLIR	-3.36987[b]	-1.19536[b]	-22.4834*[a]	-3.35270*[a]	I(1)
3.2B: Augmented Dickey Fuller Breakpoint Test					
	Level		First difference		
Series	Break Date	Coefficient	Break Date	Coefficient	I(*d*)
lnPCI	1982	-3.341824[b]	1993	-7.416466‡[b]	I(1)
lnCPS	1982	-3.875698[b]	1993	-5.832344‡[a]	I(1)
LnCGS	1998	-6.072790‡[b]	----------	----------	I(0)
LnMS	1990	-3.003639[a]	2008	-5.031801‡[a]	I(1)
LnLIR	1986	-5.028239‡[a]	----------	----------	I(0)

Source: Authors' Computation, 2017

Notes: * and ** imply series has no unit root at 1% and 5% asymptotic critical value respectively and [a] and [b] indicate intercept only and trend and intercept respectively. Also, ‡, † and • denotes p-value less than 1%, 5%, and 10% respectively. We deduced from the Table 3.2 that the maximum order of integration (d_{max}) among the series is 1 whether structural break is ignored or not in the unit root test. All the series were non-stationary series without considering the presence of structural break, but in the presence of structural break, only lnCGS and lnLIR are stationary series at $p < 0.01$.

3.3. Model Specification

The model built for this study specifies per capital income as a function of bank credits to private sector, bank credits to government sector, money supply, and lending interest rate. It can be depicted in its econometric form as:

$$lnPCI_t = \alpha_0 + \alpha_1 lnCPS_t + \alpha_2 lnCGS_t + \alpha_3 lnMS_t + \alpha_4 lnLIR_t, + \mu_t) \ldots\ldots\ldots\ldots\ldots (1)$$

Equation 1 above, is an empirical model where PCI is a measure for economic development, which is, obtained by dividing real GDP by the total population; CPS is credit from DMBs to private sectors; credit from DMBs to government sectors; MS is money supply; LIR is lending interest rate; and μ is the disturbance error term.

4. Estimation and Results

This study employed an Augmented Granger non-causality test, which was developed by Toda and Yamamoto (1995) in its analysis. Toda and Yamamoto (T-Y) approach is superior to the Pairwise Granger causality test, in that it overcomes the condition that all series must be integrated in the order of one- I(1). Also, the existence of co-integration and stationarity of series are not recognized as pre-conditions for the test. However, T-Y approach requires a maximum order of integration (d_{max}) to determine the number of extra lag to be added to each of the variables; hence this justifies the reason for performing unit root test on the series. From the unit root test, d_{max} is 1. A multivariate causality test was performed in a Vector Autoregressive (VAR) system which treats all variables as endogenous. This test is based on a modified Wald statistic which allows valid parameter estimates to be produced even when variables are not co-integrated. Therefore, the T-Y VAR models for this study are stated as follows:

$$\begin{aligned} lnPCI_t = \omega &+ \sum_{j=1}^{k} \beta\, lnPCI_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, lnPCI_{t-p} + \sum_{j=1}^{k} \rho\, lnCPSL_{t-j} + \sum_{p=k+1}^{k+d_{max}} \sigma\, lnCPS_{t-p} \\ &+ \sum_{j=1}^{k} \partial\, lnCGS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, lnCGS_{t-p} + \sum_{j=1}^{k} \emptyset\, lnMS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \theta\, lnMS_{t-p} \\ &+ \sum_{j=1}^{k} \varphi\, lnLIR_{t-j} + \sum_{p=k+1}^{k+d_{max}} \gamma\, lnLIR_{t-p} + \varepsilon_t \qquad \ldots.(1) \end{aligned}$$

$$lnCPS_t = \omega + \sum_{j=1}^{k} \rho\, lnCPS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \sigma\, lnCPS_{t-p} + \sum_{j=1}^{k} \beta\, lnPCI_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, lnPCI_{t-p} + \sum_{j=1}^{k} \partial\, lnCGS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, lnCGS_{t-p} + \sum_{j=1}^{k} \emptyset\, lnMS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \theta\, lnMS_{t-p} + \sum_{j=1}^{k} \varphi\, lnLIR_{t-j} + \sum_{p=k+1}^{k+d_{max}} \gamma\, lnLIR_{t-p} + \varepsilon_t \quad \ldots.(2)$$

$$lnCGS_t = \omega + \sum_{j=1}^{k} \partial\, lnCGS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, lnCGS_{t-p} + \sum_{j=1}^{k} \rho\, lnPCI_{t-j} + \sum_{p=k+1}^{k+d_{max}} \sigma\, lnPCI_{t-p} + \sum_{j=1}^{k} \beta\, lnCPS + \sum_{p=k+1}^{k+d_{max}} \alpha\, lnCPS_{t-p} + \sum_{j=1}^{k} \emptyset\, lnMS + \sum_{p=k+1}^{k+d_{max}} \theta\, lnMS_{t-p} + \sum_{j=1}^{k} \varphi\, lnLIR_{t-j} + \sum_{p=k+1}^{k+d_{max}} \gamma\, lnLIR_{t-p} + \varepsilon_t \quad \ldots.(3)$$

$$lnMS = \omega + \sum_{j=1}^{k} \emptyset\, lnMS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \theta\, lnMS_{t-p} + \sum_{j=1}^{k} \partial\, lnPCI + \sum_{p=k+1}^{k+d_{max}} \alpha\, lnPCI_{t-p} + \sum_{j=1}^{k} \rho\, lnCPS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \sigma\, lnCPS_{t-p} + \sum_{j=1}^{k} \beta\, lnCGS + \sum_{p=k+1}^{k+d_{max}} \alpha\, lnCGS + \sum_{j=1}^{k} \varphi\, lnLIR_{t-j} + \sum_{p=k+1}^{k+d_{max}} \gamma\, lnLIR_{t-p} + \varepsilon_t \quad \ldots.(4)$$

$$lnLIR_t = \omega + \sum_{j=1}^{k} \varphi\, lnLIR_{t-j} + \sum_{p=k+1}^{k+d_{max}} \gamma\, lnLIR_{t-p} + \sum_{j=1}^{k} \partial\, lnPCI_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, lnPCI_{t-p} + \sum_{j=1}^{k} \rho\, CPS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \sigma\, lnCPS_{t-p} + \sum_{j=1}^{k} \beta\, lnCGS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, lnCGS_{t-p} + \sum_{j=1}^{k} \emptyset\, lnMS_{t-j} + \sum_{p=k+1}^{k+d_{max}} \theta\, lnMS_{t-p} + \varepsilon_t \quad \ldots.(5)$$

The optimal lag length (*k)* was determined using the VAR lag length selection criteria with the maximum lag set at 6, as derived based on Final Prediction Error (FPE), Alkaike Information Criterion (AIC) and Hannan-Quinn Information Criterion (HQ). Table 4.1 reports the VAR optimal lag length selection by the different criteria.

Table 4.1. VAR Lag Length Selection Results

Lag	LR	FPE	AIC	SC	HQ
0	NA	0.000363	6.267295	6.476267	6.343391
1	380.5673	2.35e-08	-3.386545	-2.132712*	-2.929968
2	42.45797*	2.05e-08	-3.582299	-1.283605	-2.745241
3	28.85628	2.54e-08	-3.517038	-0.173483	-2.299499
4	30.65089	2.55e-08	-3.830070	0.558346	-2.232051
5	35.75427	1.46e-08	-4.994176	0.439101	-3.015676
6	26.17616	1.16e-08*	-6.392280*	0.085858	-4.033299*

Source: Authors' Computation, 2017

Notes: * indicates lag length selected by criterion. Also, each test is performed at 5% significance level.

After estimating the VAR model with a *k* of 6, VAR residual serial correlation test was performed and AR Roots graph was plotted so as to ensure that the VAR model is ideal for this study. The null hypothesis for the VAR residual serial correlation test is that there is no serial correlation at lag length *k*.

Table 4.2. VAR Residual Serial Correlation Test Result

K	LM-Stat	*p*-value
1	42.86181	0.0145
2	33.00058	0.1311
3	31.54382	0.1716
4	37.81717	0.0482
5	8.768537	0.9989
6	20.22280	0.7350

Source: Authors' Computation, 2017

It can be seen from Table 4.2 that the null hypothesis of no serial correlation was accepted at the selected optimal lag length of 6, but could be rejected at lag length 1 and 4. Also, the AR Roots graph shows that the VAR model satisfies the stability condition, exhibits good fit and not wrongly specified because no roots lie outside the unit circle. Fig. 1 below depicts the graph of the AR Roots.

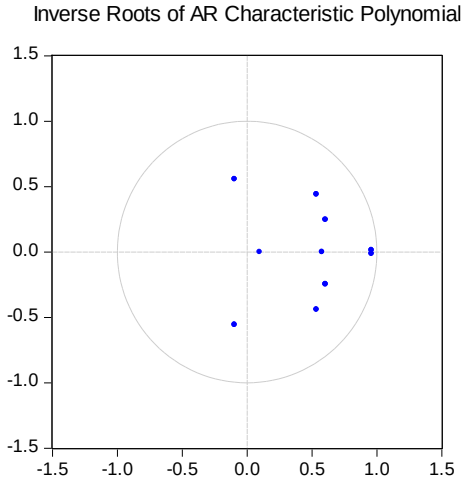

Figure 1. AR Roots Graph

Source: Authors' Computation, 2017

The T-Y Granger non-causality test null hypothesis is that there is no causality. The T-Y test uses k + d_{max} as its optimal length; hence the optimal lag length for the T-Y VAR models is 2. *Table 4.3* reports the result of the T-Y Granger non-causality test based on a modified Wald (MWALD) statistic.

Table 4.3. T-Y Granger non-Causality Test Result

Dependent Variables	Independent Variables					
	lnPCI	lnCPS	lnCGS	lnMS	lnLIR	**All**
lnPCI	DV	{9.418314}	{6.225774}	{8.131695}	{2.872139}	{34.76854}
		[0.1514]	[0.3984]	[0.2286]	[0.8247]	[0.0578]***
lnCPS	{1.834777}	DV	{5.293574}	{6.933813}	{3.137404}	{34.75810}
	[0.9342]		[0.5067]	[0.3270]	[0.7914]	[0.0721]***
lnCGS	{11.83364}	{11.74473}	DV	{19.83668}	{16.54602}	{43.94610}
	[0.0658]***	[0.0679]***		[0.0030]*	[0.0111]**	[0.0077]*
lnMS	{7.981318}	{4.091230}	{12.79896}	DV	{7.443478}	{36.96626}
	[0.2395]	[0.6643]	[0.0463]***		[0.2818]	[0.0441]**
lnLIR	{14.99038}	{3.253552}	{10.03572}	{8.114185}	DV	{36.13985}
	[0.0203]**	[0.7764]	[0.1232]	[0.2299]		[0.0532]***

, ** and * denote rejection of null hypothesis at 1%, 5% and 10% significance level respectively. DV indicates Dependent Variable, MWALD statistic in { } and p-value in [ ].*

Source: Authors' Computation, 2017

The results of the Toda-Yamamoto augmented Granger causality test are reported in Table 4.3. At a 10% significance level, the augmented Granger causality test reveals that all the financial deepening variables in the model jointly have a causal effect on economic development, but not individually (as "lnCPS, lnCGS, lnMS, lnLIR" do not Granger cause "lnPCI" individually).

The results also shows that the null hypothesis of no causal direction from lnPCI, lnCPS, lnMS and lnLIR to lnCGS is rejected at 10% significance level in the case of LnPCI and lnCPS, at 5% for lnLIR and 1% for lnMS and there is a reverse causality from lnCGS to only lnMS because its *p*-value of the modified Wald statistic (MWALD) is lesser than 0.1. This result suggests that the economic development, credits to private sectors, money supply and lending interest rate drives the volume of DMBs' credit to government sectors in Nigeria. The feedback effect from credits to government sectors to money supply implies that these two variables can predict each other. Furthermore, causality runs from lnPCI to lnLIR at 5% significance level, but with no feedback effect from lnLIR.

Further assessment reveals that economic development do not have an individual causal effect on credits to private sectors and *vice versa*. Also, credits to government sector does not cause economic development individually, hence the former is not led by the latter. However, it can be inferred that economic development predict credits to government sectors, since the result indicates that a unidirectional causality runs from economic development to credits to government sectors. There is also a feedback effect from credit to government sector and lending interest rate to economic growth. Overall, the causality results supports the view that causality runs from DMBs' credit to private-public sector to economic development and *vice versa*, thus implying that in the Nigeria situation, the feedback hypothesis prevails. Therefore, banks' credit and economic development in Nigeria have mutual effect, as the overall results of the T-Y Granger causality test provides evidence to this. However, attention must be given to DMBs major activities, which are deposit taking and lending, as what are needed to boost the level of economic development in Nigeria. Lending interest rate is also a fundamental variable

that have a unidirectional causality with economic development, however it cannot be ignored when it comes to DMBs lending. In Nigeria, the findings of this study varies with that of Karimo and Ogbonna 2017; Okafor et al, 2017, Akpansung and Babalola, 2012 whose studies found that the supply-leading hypothesis prevails, but in tandem with Agu and Chukwu (2008) who also found evidence to support that both demand-following and supply-leading hypotheses are mutually existing (feedback effect), hence it is important to note that the choice of financial deepening variables employed can inform the results obtained. This study is among the few that have found a feedback effect for Nigeria. In other developing countries, Aurangzeb (2012) confirms bi-directional causality between finance and economic growth for Pakistan. For developed economies, Shan and Jianhong (2006) found a two-way causality for China.

5. Conclusion and Recommendations

This study investigates the nexus between deposit money banks' credit to private-public sectors and economic development in Nigeria over the 1970 to 2016 periods. The causal links between the variables were established using the Toda and Yamamoto Granger non-causality test. The results of the analysis indicate that DMBs' credit to government sectors leads economic development in Nigeria. The study draws conclusion that the relationship between economic development and credits to private-public sectors by DMBs' lend credence to the "feedback hypothesis" and not the "demand-following", "supply-leading", or "neutral hypotheses". Among other things, this study recommends that the monetary authorities should regulate the activities of deposit money banks to ensure that they gear up the growth of credits to private sectors by examining factors, such as lending interest rate which can possibly undermine lending to the private sectors, which serves as key engine of economic development in any developing economy. Also, issues relating to non-performing loans can be dealt with by strengthening the policy which established the Asset Management Corporation of Nigeria (AMCON) to that it can hedge the DMBs against the financial risk that ensues as a result of loans default. In addition, the regulatory authorities should implement policy that will stimulate DMBs operations in the economy, while setting up committees that will monitor the implementation of formulated policies is also of great importance.

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