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Impact of Private Sector Credit on Economic Growth in Nigeria

Emmanuel O. Olowofeso, Abiola O. Adeleke and Anthony O. Udoji[1]

Motivated by the need to avoid possible parameter bias associated with previous works, we examined the impacts of private sector credit on economic growth in Nigeria using the Gregory and Hansen (1996) cointegration test that accounted for structural breaks and endogeneity problems. The method was applied to quarterly data spanning 2000:Q1 to 2014:Q4, while the fully modified ordinary least squares procedure was employed to estimate the model coefficients. We found a cointegrating relationship between output and its selected determinants, albeit, with a structural break in 2012Q1. Amongst others, findings from the error correction model confirmed a positive and statistically significant effect of private sector credit on output, while increased prime lending rate was inhibiting growth. In view of the financial intermediation roles of deposit money banks, the paper supports the ongoing efforts of the Central Bank of Nigeria (CBN) in promoting a sound and real-sector-friendly financial system. Also, the commitment of the CBN to the gradual reduction in interest rates is meaningful for the country's growth objectives.

Keywords: Private sector credit, Economic growth, Cointegration, Structural break

JEL Classification: C01, C32, E44, G17, G21, O16

1.0 Introduction

The debate on the role of finance in economic development has been an ongoing one, especially in developing countries. This dates back to the work of the likes of Schumpeter (1911) who advocated the concept of finance-led growth. The financial intermediation role is generally performed by the financial sector, which channels savings into productive investment. Deposit-taking institutions in particular are well recognised for performing the crucial role of sourcing finance to support private sector consumption and investment in Nigeria. Credit to private sector refers to financial resources provided to the private sector, such as loans and advances, purchases of non-equity securities, trade credits and other accounts receivable, which establish a claim for

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repayment. In this regard, credit can be viewed from two angles; namely: trade or commercial credit and banking system credit. According to Freear (1980), trade credit refers to transactions which involve the supplier handing over goods or performing a service without receiving immediate payment. However, this study focuses on banking system credit to private sector, which involves the direct provisioning of loans and overdrafts to the private sector by institutions, such as deposit money banks, non-interest banks and merchant banks in Nigeria.

Economic growth is the endless improvement in the capacity to satisfy the demand for goods and services, resulting from increased production scale, and improve productivity (innovations in products and processes) which is usually measured over a certain period of time. In other words, it is the measurement of annual percentage increase in real GDP over a certain period of time. There are different conceptions of economic growth and ways of measuring it, but the primary definition is in terms of growth in the long-run productive capacity of the economy, typically measured by real growth in Gross Domestic Product (GDP). GDP Growth can be measured in terms of demand (total expenditure on goods and services), or supply (total goods and services produced). Long term growth is driven primarily by productivity. According to Paul Krugman (1994), "Productivity isn't everything, but in the long run it is almost everything". Over the longer term, economic growth will be determined primarily by the factors which determine productivity. The drivers of economic growth (such as access to credit facilities, labour, level of technology, etc.) are factors which either improves the quality of outputs, or the efficiency with which inputs are transformed into outputs.

Several empirical studies have shown that the efficient provisioning of credit has a positive and significant effect on output and employment opportunities while a low level of financial development and its attendant inefficient private sector credit system distorts economic growth. A strong and inclusive financial system; and availability of investable funds play vital roles in financing economic project and activities that would promote economic growth and development. This is because access to credit enhances the productive capacity of firms and enhances their potential to grow. However, studies such as Soderbom (2000) and Loening *et al*. (2008) showed that a number of small and medium manufacturing firms in Africa are credit-

constrained due to the underdeveloped nature of the continent's financial system, relative to those of more advanced nations. In view of their importance in driving the real sector, monetary authorities worldwide strive to ensure that their financial system is sound and vibrant. Indeed, it is well established that a vibrant, dynamic, and well-functioning financial sector leads to a host of improved economic outcomes (Levine, 1997; Demirguc-Kunt and Levine, 2008).

In recent years, private sector credit and economic growth linkage has been a major issue in economic discourse all around the world and empirical literature has been inconclusive on this issue. However, balance of evidence seems to favour a positive relationship between private sector credit and economic growth. This belief has led the Nigerian government through the Central Bank of Nigeria to continue to build a robust and inclusive financial system to fast track economic growth and to serve as a growth catalyst to other emerging economies in Africa. During the years 2000 – 2005, the average ratio of private sector credit to output was 0.45 and more than doubles to 1.03 during the period 2006 – 2010. This further increased to an average of 1.35 during the period 2011 – 2014 (Figure 1). In view of this growing ratio, several empirical studies have been conducted to evaluate the impact of private sector credit on the country's output.

For instance, Emecheta and Ibe (2014) employed the reduced Vector Autoregresion approach using annual data for the period 1960-2011 to investigate the relationship between bank credit and economic growth in Nigeria. Amidst some methodological inadequacies (such as his failure to harmonise the different base periods for the real Gross Domestic Product data used and the fact that he ignored the possibility of structural breaks effects in his modelling approach), he found a significant positive relationship between bank credit and economic growth during his sample period. Studies with similar findings, but susceptible to the methodological flaws observed in Emecheta and Ibe (2014) include Akpansung and Babalola (2012) using annual data for 1970-2008, Oluitan (2012) using annual data for the period 1970-2005, Onuorah and Ozurumba (2013) using annual data for 1980 – 2011, and Yakubu and Affoi (2014) using annual data for 1992-2012.

While these studies are unanimous in their findings regarding a positive relationship between bank credit and economic growth in Nigeria, they failed to accommodate structural breaks in their modelling approaches, even though

their estimation samples spanned relatively long periods. The consequence of ignoring structural breaks when they actually do occur in economic relationships includes parameter bias resulting from model misspecification. Secondly, the studies used annual series even though the need for higher frequency analysis is of significant policy imperative. Lastly, the studies combined RGDP series with different base periods without harmonizing them appropriately.

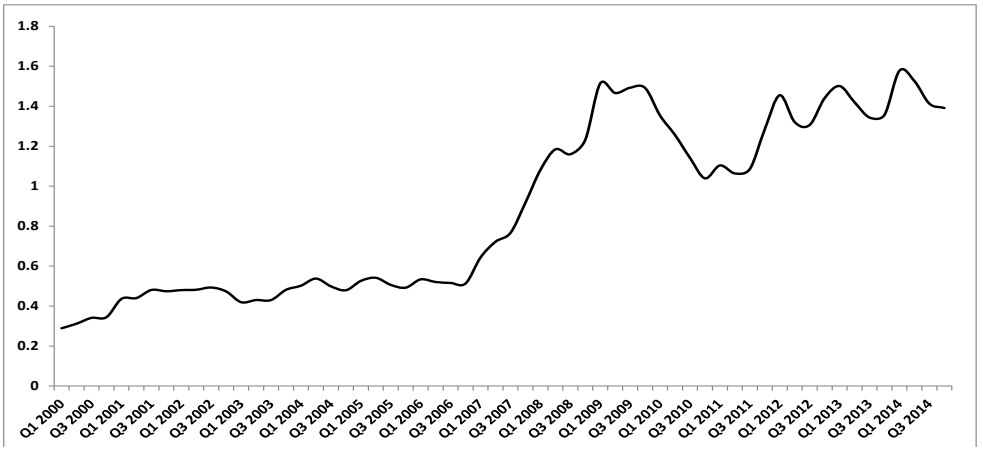

Fig 1: Credit to Private Sector as a Ratio of Nominal GDP

This study attempts to contribute to the existing body of literature on the relationship between private sector credit and economic growth in Nigeria by addressing the three shortcomings of previous works identified above. Therefore, the objective of this study is to investigate the impact of private sector credit on economic growth by applying the Gregory and Hansen (1996) cointegration test with structural break to quarterly data for Nigeria, including the rebased RGDP series.

The remaining sections of the paper are as follows: section two presents a brief review of empirical literature; the details of data and methodology used in this paper are presented in section three; the empirical results and their economic interpretation are discussed in section four; and section five concludes with some policy recommendations.

2.0 Review of Empirical Literature

The relationship between private sector credit and economic growth has attracted wide spread attention in the past decades and there have been a large

number of studies in this area which articulated theoretical and empirical ways in which private credit contributes to economic growth. Starting from Schumpeter (1911), several authors have pointed out the productivity and growth enhancing effects of a developed financial sector. Their opinion was based on the fact that financial intermediaries play a crucial role in fostering technological innovation and economic growth by providing basic services such as mobilizing savings, monitoring managers, evaluating investment projects, managing and pooling risks, facilitating transactions and access to credit. However, empirical evidence on the exact impact of credit on economic growth, especially in developing countries, has been mixed.

Levine (1997) argued that the efficient allocation of capital within an economy fosters economic growth and noted that there has been growing recognition for the positive impact of financial intermediation on the economy since the early 1990s. A number of empirical works have applied various analytical approaches to investigate the relationship between private sector credit and economic growth. For instance, King and Levine (1993) applied a cross country growth regression; Demetriades and Hussein (1996) applied time-series analysis while Rioja and Valev (2003) adopted panel techniques.

In a study conducted using data for 77 countries, King and Levine (1993) found that banking sector development can spur economic growth in the long run. In their cross country growth regression, they used the ratio of M2 to GDP and growth rate in per capita real money balances as indicators of financial development and found a positive and statistically significant impact of growth rate in per capita real money balances on real per capita GDP growth. Cappielo *et al* (2010) did a similar study for the Euro area and found that the supply of credit, both in terms of volumes and in terms of credit standards applied on loans to enterprises, have significant effects on real economic activity. In other words, a positive change in loan growth has a positive and statistically significant effect on GDP. Other studies with similar findings include Chang *et al.* (2008) who used branch panel data to examine bank fund reallocation and economic growth in China and Vazakidis and Adamopoulos (2009) who employed a Vector Error Correction Model (VECM) to investigate the relationship between credit market development and economic growth for Italy for the period 1965-2007. Were *et al.* (2012) conducted a sectoral panel data analysis for Kenya by examining the effects of bank credit to the different sectors of the economy. They found that bank

credit had positive and significant impact on sectoral gross domestic product measured as real value added.

On the other hand, some studies have failed to confirm a positive relationship between private sector credit and output growth. For instance, Dey & Flaherty (2005) examined the impact of bank credit and stock market liquidity on GDP growth using two-stage least squares regression model and found that bank credit is not a consistent determinants of GDP growth. A number of studies have also found similar outcomes based on causality test. Shan and Jianhong (2006) examined the impact of financial development on economic growth in China by using a Vector Autoregression (VAR) approach. They found that financial development comes as the second force (after the contribution from labor input) in leading economic growth in China. In addition, they found a two-way causality between financial development and economic growth, similar to the findings by Hondroyiannis *et al*. (2005) for Greece. However, Muhsin and Eric (2000) found unidirectional causality running from growth to financial sector development. The study of Mukhopadhyay and Pradhan (2010) examined the causal relationship between financial development and economic growth of seven Asian developing countries (Indonesia, Malaysia, the Philippines, China, Thailand, India and Singapore), using multivariate VAR model. The study failed to reach any consensus on the finance-growth relationship in the context of developing countries.

In Nigeria, there are diverse opinions as to whether finance is the major constraint to economic growth and development. A number of studies have adopted the VAR-based granger causality test approach to investigate the phenomenon. Odedokun (1989), for instance, tested the causality between financial variables and economic development. Among others, he found a rather weak unidirectional causation running from RGDP to broad money. Onuorah and Ozurumba (2013), in their approach disaggregated total bank credit to components such as Total Production Bank Credits (TPTBKC), Total General Commerce Bank Credits (TGCBKC), Total Services Bank Credit (TSCBKC), and Other Banks Credit (OTHBKC) and also found that none of the components granger caused RGDP while RGDP exerted significant influence on the different components. On the other hand, Oluitan (2012) observed that credit granger caused output.

Akpansung and Babalola (2012) examined the relationship between banking sector credit and economic growth in Nigeria over the period 1970-2008 using the two-stage least squares approach. They found evidence that private sector credit impacted positively on economic growth during the sample period while lending rate impeded economic growth. In a similar study, Anthony (2012) found a positive relationship between lagged values of total private savings, private sector credit, public sector credit, interest rate spread, exchange rates and economic growth. The study of Aliero *et al.* (2013) examined the relationship between private sector and economic growth in Nigeria using autoregressive distributed lag (ARDL) approach and concluded that a long run equilibrium relationship exists between private sector credit and economic growth. They found a significant relationship between the duo and recommended comprehensive policies and strong legal framework to facilitate the disbursement and recovery of private sector credit. Emecheta and Ibe (2014) also confirmed a positive effect of bank credit on economic growth using a VAR methodology.

A review of relevant literature showed that the results regarding the effects of private sector credit on output has been mixed. While some studies found empirical support for a positive effect, others failed to. In terms of direction of causality, some of the reviewed works confirmed unidirectional causality running from private sector credit to economic growth while others found the direction of causality running from economic growth to bank credit. The third group found empirical support for a bi-directional causality between the two variables. These mixed findings imply that there is yet no consensus on the size and direction of relationship between private sector credit and economic growth, especially in Nigeria. We reason that model misspecification errors arising from failure to account for structural breaks and endogeneity problems in the models estimated by past works could be possible reasons for the mixed findings. To the best of our knowledge, no study has addressed these two methodological issues in their modeling strategy, especially using the rebased real gross domestic product numbers recently released by the National Bureau of Statistics (NBS). Our current effort is directed towards bridging these gaps.

3.0 Data and Estimation Procedure

3.1 Data

This study makes use of quarterly data spanning 2000:Q1 to 2014:Q4 on the following macroeconomic variables: real gross domestic product (rgdp), credit

to private sector (cps), real gross fixed capital formation (rgfc), nominal exchange rate (ner), total government expenditure (gexp) and prime lending rate (plr). Data on the variables were obtained from the Central Bank of Nigeria Statistical Bulletin and various publications of the National Bureau of Statistics. RGDP is used as a proxy to measure the overall economic activity in Nigeria, while CPS captures deposit money banks' credit to the private sector as a proportion of nominal GDP. GEXP, NER and PLR are proxies for fiscal, exchange rate and monetary policies, respectively.

3.2 Estimation Procedure

In order to investigate the effect of private sector credit growth on output, we specify a growth model with five covariates. In other words, we model output as a function of five independent variables, including credit to the private sector as follows:

$$LRGDP_t = \propto_0 + \beta_1 CPSG_t + \beta_2 LRGFC_t + \beta_3 LNER_t + \beta_4 LGEXP_t - \beta_5 PLR_t + \varepsilon_t \quad (1)$$

where LRGDP is the log of RGDP; CPSG is growth in credit to private sector; LRGFC is the log of RGFC; LNER is the log of NER; LGEXP is the log of GEXP; and PLR is as earlier defined. The parameters to be estimated are α_0 (constant) and β_i (i=1,2,…,5), which are the slope parameters. ε_t is an error term that is identically and independently distributed with zero mean and constant variance σ^2. In order to account for possible long run endogeneity in the included variables of equations (1), the parameters are estimated using the Fully Modified Ordinary Least Squares (FM-OLS) method of Phillips and Hansen (1990). This method allows for the estimation of cointegrating relations directly by modifying the traditional OLS with non-parametric corrections that take account of serial correlation caused by unit roots and system endogeneity caused by cointegration. The meat of this paper relates to testing the statistical significance of β_1, which is the coefficient of CPSG.

3.3 Stationarity Test

The Augmented Dickey-Fuller (ADF) unit root test is applied to the variables listed above in order to avoid the spurious regression problem. The ADF test conducted on each of the variables is based on the null hypothesis of non-

stationarity and failure to reject the null implies the need for appropriate differencing to induce stationarity.

3.4 Bai and Perron (1998) Test for Structural Breaks in the Included Variables

The Bai and Perron (1998) test procedure is employed to investigate the presence of possible multiple structural breaks in the growth equation. According to Carrion-i-Sylvestre and Sans´o (2006), this procedure provides an appropriate tool for endogenously detecting breakpoints in economic time series in that it minimizes the sum of squared residuals from Dynamic Ordinary Least Squares (DOLS) regressions over a closed subset of break fractions and detects unknown break dates in the variables endogenously by testing the null hypothesis of 'M' breaks against an alternative of 'M+1' number of breaks in a sequential manner. The Bai and Perron test is based on a multiple linear regression with 'M' number of breaks given as:

$$y_t = x_t'\beta + z_t'\delta_j + \mu_t \qquad (2)$$

With $t = T_{j-1} + 1, \dots, T_j, for\ j = 1, \dots., m + 1$. In the equation above, Y_t is the explained variable, x_t and z_t are the *(p x 1)* and *(q x 1)* vectors of the covariates, β and δ_j *(j=1, ..., m+1)* are the vectors of coefficients for the covariates and μ_t is the error term. The *x* variables are those whose parameters do not vary across regimes while the *z* variables have regime specific coefficients, implying a partial structural change model. Treating the breakpoints as unknown, Bai and Perron estimated the break points (i.e. the indices $T_1, \dots, T_m$) alongside the unknown regression coefficients based on least squares estimation method given that T observations are available on the variables y_t, x_t and z_t. Thus, for each m-partition, *(i.e.* $T_1, \dots, T_m$*)* denoted as $\{T_j\}$, the coefficients β and δ_j are estimated by minimizing the sum of squared residuals in the expression below:

$$\sum_{i=1}^{m+1} \sum_{t=T_{i-1}+1}^{T_i} [y_t - x_t'\beta - z_t'\delta_i]^2$$

and the resulting estimates are $\hat{\beta}(\{T_j\})$ and $\hat{\delta}(\{T_j\})$. Substituting the resulting parameters into the objective function and denoting the resulting sum of squares as $S_T(T_1, \dots, T_m)$, the estimated breakpoints $(\widehat{T_1}, \dots, \widehat{T_m})$ are such that:

$$(\widehat{T_1}, \ldots, \widehat{T_m}) = argmin_{T_1,\ldots\ldots,T_m} S_T\,(T_1, \ldots\ldots, T_m),$$

and the minimization is effected over all partitions $(T_1, \ldots, T_m)$ such that $T_i - T_{i-1} \geq q$. This framework is used as the basis for several breakpoint tests[2]. For the purpose of this study, the sequential *M+1* break versus *M* test specification, which examines the relevance of the *M+1* structural break after establishing *M* number of breaks, is adopted.

3.5 Gregory-Hansen (1996) Cointegration Test with Structural Breaks

In view of our intention to accommodate structural break in our modelling approach, we adopted the Gregory and Hansen approach to cointegration test. This approach is superior to the Engle and Granger (1987) approach to testing for co-integration which tends to under-reject the null of no co-integration if there is a cointegration relationship that is susceptible to structural breaks at some (unknown) time. The Gregory and Hansen (1996) procedure is an extension of the Engle and Granger (1987) approach and it involves testing the null hypothesis of no cointegration against an alternative of cointegration with a single regime shift in an unknown date. The implementation of the Gregory and Hansen approach involves estimating four different models with different assumptions regarding the nature of the break. These are models of: (i) intercept shift, C (GH-1); (ii) intercept shift with trend, C/T (GH-2); (iii) intercept and slope shifts, C/S (GH-3); and (iv) intercept, slope and trend shifts, C/S/T (GH-4). Decisions regarding whether a cointegrating relationship exists or not is made based on three test types; namely: ADF (*ADF-)*, Z_α and Z_t test types. The implied Gregory and Hansen models for our growth model are specified respectively as[3]:

$$LRGDP_t = \alpha_{11} + \alpha_{12}D_t + \beta_{11}CPSG_t + \beta_{12}LRGFC_t + \beta_{13}LNER_t + \beta_{14}LGEXP_t - \beta_{15}PLR_t + \varepsilon_{1t} \quad (3)$$

$$LRGDP_t = \alpha_{21} + \alpha_{22}D_t + \varphi_{21}t + \beta_{21}CPSG_t + \beta_{22}LRGFC_t + \beta_{23}LNER_t + \beta_{24}LGEXP_t - \beta_{25}PLR_t + \varepsilon_{2t} \quad (4)$$

[2] See Bai and Perron (1998) for details

[3] Due to software limitations, only equations the first three Gregory Hansen models were estimated.

$$LRRGDP_t = \alpha_{31} + \alpha_{32}D_t + \beta_{31}CPSG_t + \beta_{31}^d CPSG_t D_t + \beta_{32}LRGFC_t + \beta_{32}^d LRGFCD_t + \beta_{33}LNER_t + \beta_{33}^d LNER_t D_t + \beta_{34}LGEXP_t + \beta_{34}^d LGEXP_t D_t - \beta_{35}PLR_t - \beta_{35}^d PLR_t D_t + \varepsilon_{3t} \quad (5)$$

$$LRRGDP_t = \alpha_{41} + \alpha_{42}D_t + +\varphi_{41}t + \varphi_{41}^d tD_t + \beta_{41}CPSG_t + \beta_{41}^d CPSG_t D_t + \beta_{42}LRGFC_t + \beta_{42}^d LRGFCD_t + LNER_t + \beta_{43}^d LNER_t D_t + \beta_{44}LGEXP_t + \beta_{44}^d LGEXP_t D_t - \beta_{45}PLR_t - \beta_{45}^d PLR_t D_t + \varepsilon_{4t} \quad (6)$$

where the left and right hand side variables are as earlier defined, t is a time trend, parameters α_{i1} and $(\alpha_{i1} + \alpha_{i2})$ *for i=1,……,4* are the respective intercept terms before and after the break in equations (3) - (6), φ_{21} and φ_{41} are the coefficients of the trend variable before the break in equation (4) and (6) while φ_{41}^d is the coefficient of the trend variable after the break in equations (6), coefficients β_{ij} *for i=1,2* and *j=1,……5* are the respective coefficients of the covariates in equations (3) – (4), $\beta_{i,j}$ and $\beta_{i,j}^d$ *for i=3 and 4* and *j=1,……5* are the respective coefficients of the covariates before and after the structural break in equations (5) - (6), and ε_{it} are the respective disturbance terms *for i=1, …, 4* in equations (3) - (6). D_t is a dummy variable of the form:

$$D_t = \begin{cases} 0, if\ t \leq [T\tau] \\ 1, if\ t > [T\tau] \end{cases} \quad (7)$$

Where the unknown parameter $\tau \in (0, 1)$ denotes the relative timing of the change point and [ ] denotes integer part. As stated earlier, the relevant statistics[4] are the GH-ADF (τ), GH-$Z_\alpha(\tau)$ and GH-$Z_t(\tau)$.

3.6 Error Correction Model

Having found an appropriate Gregory and Hansen equation that best describe the data, the next step involves estimating a corresponding error correction model for economic growth. The error correction model captures both the long-run equilibrium to which output converges over time and the rate of adjustment following disequilibrium; and it is of the form:

[4] See Gregory and Hansen (1996) for further details on these statistics

$$\Delta LRGDP_t = \alpha_0 + \sum_{i=0}^{4} \beta_i \, \Delta X_{t-i} + \sum_{j=1}^{4} \gamma_j \, \Delta LRGDP_{t-j} + \rho \varepsilon_{t-1} + \mu_t \qquad (8)$$

where Δ is the first difference operator, $\mathcal{E}_t$ is the estimated residual from the selected Gregory and Hansen cointegration equation, *LRGDP* is as earlier defined while X_t is the vector of exogenous variables, including CPSG, LRGFC, LNER, PLR and GEXP. For a stable system, the coefficient ρ, which measures the speed of adjustment of the dependent variable to the value implied by the long run equilibrium relationship) will be negative and statistically significant.

3.0 Empirical Results

4.1 Tests for Unit Root

The results of the ADF unit root test conducted on the included variables are presented in Table 1. All the variables are integrated of order one, except private sector credit growth, implying that they are I(1) and differencing them once would make them stationarity. Thus, the I(1) variables entered into the error correction model in their differenced form while CPSG was included in its level form.

Table 1: Results of Augmented Dickey-Fuller Unit Root Test

Variables	Level		First Difference		Decision
	ADF^c	ADF^{ct}	ADF^c	ADF^{ct}	
LRGDP	-0.3299	-1.7138	-7.6371	-7.5664	I(1)
CPSG	-4.8285	-4.9456	-11.1627	-11.0614	I(0)
LRGFC	-1.2327	-2.7051	-7.4847	-7.4393	I(1)
LNER	-1.7318	-2.2290	-6.3015	-6.2915	I(1)
LGEXP	-1.3539	-1.3565	-8.8653	-8.9339	I(1)
PLR	-1.6303	-2.3254	-8.2127	-8.1338	I(1)

ADF^c represents unit root test with constant

ADF^{ct} represents unit root test with constant and trend

**MacKinnon (1996) critical values with constant are: -3.5576(1%) -2.9166(5%) and 2.5961(10%)*

**MacKinnon (1996) critical values with constant and trend are: -4.1373(1%) -3.4953(5%) and 3.1766(10%)*

4.2 Structural Breaks in the Long Run Model

In order to gain insight into the presence of structural breaks in the output model, equation (1) was subjected to the Bai and Perron (1998) procedure for multiple structural breaks and the results are presented in Table 2. We found

evidence of significant structural breaks in the model at 2003Q4 and 2012Q3. The coefficient of our focal variable (CPSG) across the three regimes showed that the relationship between private sector credit and output was strongest during the period 2012Q3 – 2014Q4. The other right hand side variables also recorded varying coefficients in the different regimes. These results are indicative of the need to accommodate structural breaks in our modelling approach.

Table 2: Bai-Perron Regression with Structural Breaks

	2000Q2 - 2003Q3 -- 14 obs		2003Q4 - 2012Q2 -- 35 obs		2012Q3 - 2014Q4 -- 10 obs	
Variable	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
CPSG	0.0090	0.0348	0.0019	0.1850	0.0345	0.1599
LRGFC	-0.0159	0.5989	0.1513	0.0000	0.2380	0.3765
LNER	1.1606	0.0000	0.6140	0.0003	6.6914	0.1152
LGEXP	-0.1540	0.0947	0.0809	0.0053	0.2632	0.1597
PLR	-0.0062	0.5705	-0.0263	0.0064	0.1650	0.4008
C	12.4785	0.0000	11.1076	0.0000	-26.1682	0.2989
	R-squared: 0.9723;		Adjusted R-squared: 0.9608			
	F-statistic: 84.5478;		Prob(F-statistic): 0.0000			

4.3 Cointegration Test

The results of the Gregory-Hansen cointegration test conducted using on equations (3) – (5) are presented in Table 3. At the 5 per cent significance level, the Z_t* statistics provided evidence of cointegration amongst the included variables, albeit with a structural break in the intercept at 2012Q1. All the parameters in the model with intercept shift (GH-1) were significant and correctly signed, making it the most plausible specification for the data.

Table 3: Gregory-Hansen Cointegration Test with Structural Breaks

Model	ADF*	Break Date	Z_t*	Break Date	Z_α*	Break Date
GH-1 (Constant)	-2.8832	2011Q4	**-7.1978**	**2012Q1**	-56.5164	2012Q1
GH-2 (Constant and Trend)	-5.0356	2009Q1	-7.6219	2011Q4	-58.9462	2003Q2
GH-3 (Constant and Slope)	-7.2706	2012Q1	-7.3549	2012Q2	-56.9350	2012Q2

**The 5 per cent critical values for ADF (and Z_t) are: -5.56(GH-1), -5.83(GH-2) and -6.41(GH-3)*

**The 5 per cent critical values for Z_α are: -59.40(GH-1), -65.44(GH-2) and -78.52(GH-3)*

4.4 Long Run Estimates

Table 4 reports the results of the long run output models without structural break (model 1) and with structural break (model 2) estimated using the fully

modified OLS regression. It is quite revealing that the model with structural break outperformed the one without structural break as it recorded a higher adjusted R^2, implying that model 1 was mis-specified. The coefficient of private sector credit growth in model 1 was underestimated and not statistically significant. This implies that, in the long run, failure to account for structural breaks would underestimate the effect of CPSG on output. However, model 2 found empirical support for a significant and positive effect of private sector credit growth on output. In other words a unit increase in private sector credit growth leads to a 0.005 increase in output.

Table 4: Fully Modified OLS Long Run Elasticity Estimates of the Naira RER Model

Depended Variable: LRGDP

Variable	Model 1 (without Break)		Model 2 (with Break)	
	Coefficient	Prob.	Coefficient	Prob.
CPSG	0.0031	0.1588	0.0046	0.0034
LRGFC	0.0047	0.8502	0.0300	0.0878
LNER	0.9276	0.0000	0.7299	0.0000
PLR	0.2020	0.0000	-0.0075	0.2312
LGEXP	-0.0135	0.1371	0.1828	0.0000
C	9.2108	0.0000	10.0483	0.0000
@TREND>51-2			0.1330	0.0000
R-squared	**0.8964**		**0.9230**	
Adjusted R-squared	**0.8865**		**0.9139**	
S.E. of regression	**0.0905**		**0.0788**	
Unit root test on residuals:	**-1.627808**	**0.4617**	**-2.746076**	**0.073**

Other significant determinants of output in the preferred model (model 2) included nominal exchange rate (LNER) and government expenditure (LGEXP). A stationarity test conducted on the obtained residuals from the two models indicated linear combination of the included variables would be non-stationary (i.e. no cointegration) if the effects of structural breaks are ignored. This corroborates the results of the Gregory and Hansen cointegration test.

4.5 Error Correction Model

Table 5 presents the results of the error correction model estimated based on the residuals obtained from Model 2. These coefficients are FMOLS estimates of the parsimonious error correction output model. At the 5 per cent significance level, four of the right hand side variables were significant

determinants of output in the short run. These were private sector credit (CPSG), gross fixed capital formation (LRGFC), government expenditure (LGEXP) and the prime lending rate (PLR). Credit to private sector entered the model in its 4th lag, implying that the effects of shocks to private sector credit growth manifests in output after three quarters. At 0.0021, the estimated coefficient indicates that a unit increase in CPSG would lead to a 0.002 increase in output at the fourth quarter. The sign of the coefficient is in line with *a priori* expectations and findings from similar studies that used different modelling approaches, such as Oluitan (2010), Abu-Bader and Abu-Qarn (2008), Rajan and Zingales (1998), Guiso *et al*. (2004), among others.

Table 5: Results of the Error Correction Model for Output (With Structural Break)

Dependent Variable: LRGDP

Variable	**Coefficient**	**Prob.**
CPSG(-4)	0.0021	0.0256
D(LRGFC)	0.0660	0.0004
D(LGEXP)	0.0548	0.0013
D(PLR(-1))	-0.0179	0.0014
ECM(-1)	-0.6075	0.0000
C	-0.0091	0.2918
R-squared	***0.5927***	
Adjusted R-squared	***0.5502***	
S.E. of regression	***0.0538***	
Model Diagonistics (Normality Test of Resduals):		
Jarque Bera	0.5891	0.7449

An increase in gross fixed capital formation (LRGFC), a proxy for investment also impacts positively on output as the coefficient was positive. Also, expansionary government expenditure increases output in the short run. However, an increase in the prime lending rate impacts negatively on output as the coefficient was negative (-0.0179) and significant. At 55.02 per cent, the adjusted R^2 obtained was satisfactorily high, implying that the model explains about 55.0 per cent of the variation in output.

The coefficient of the error correction term was found to be negative and significant at 0.5 per cent level, further providing evidence of a long-run cointegrating relationship among the variables. At -0.6075, the magnitude of the error correction coefficient implied a high speed of convergence of output

to its long run equilibrium as about 60.8 per cent of disequilibrium in the real exchange rate is corrected within a quarter (Table 5). The Jarque Bera test for normality in the residuals of the estimated error correction term provided no evidence to reject the null hypothesis of normality of the errors. This indicates that the model is adequate for inference.

Table 6: Results of WALD Test on CPSG

Test Statistic	Value	df	Probability
t-statistic	2.3044	48	0.0256
F-statistic	5.3103	(1, 48)	0.0256
Chi-square	5.3103	1	0.0212

The results of the WALD test conducted on the coefficient of CPSG are presented in Table 6. It confirmed that CPSG is a key determinant of output performance in Nigeria as its coefficients was significantly different from zero.

5.0 Concluding Remarks

In spite of the increasing literature on financial development and economic growth, empirical research works that examine the impacts of private sector credit on economic growth in Nigeria are limited with most of them failing to account for structural breaks in their modelling approaches. This is capable of leading to biased parameter estimates. Besides, none of the works used the rebased RGDP numbers in their estimation. This study was motivated by the need to avoid parameter bias arising from possible model mis-specification as well as the need to reexamine the impact of private sector credit on output using the rebased RGDP numbers. Using quarterly time series data, we examined the short- and long-run relationships between output and private sector credit in Nigeria.

We found empirical support for a significant structural break (occurring at 2012Q1) in the intercept of the cointegrating relationship between output and its selected determinants, which are private sector credit growth, prime lending rate, gross fixed capital formation (a proxy for investment), government expenditure and the nominal exchange rate. This identified breakpoint was accommodated in the estimated short- and long-rum output

models. In order to avoid possible endogeneity problems between output and the right hand side variables, we estimated the models using the fully-modified OLS approach.

The results of the long run model confirmed a significant and positive impact of private sector credit growth on output. We also found that failure to account for structural break in our output model led to the underestimation of the effect of private sector credit on output. The model with structural break further indicated that nominal exchange rate and government expenditure were significant determinants of output in the long run. The identified structural break dummy was also highly significant. The obtained residuals from the estimated long run model with structural break were used to estimate the error correction model.

The results of the estimated error correction model showed that private sector growth four quarters ago affects current output positively. At 0.0021, the coefficient of the fourth lag of CPSG was positive and statistically significant. The results of the WALD coefficient test conducted on CPSG further showed that the CPSG coefficient was significantly different from zero. Also, the coefficients of gross fixed capital formation and government expenditure were significant and correctly signed. In other words, increase in the two variables would impact positively on output in the short run. On the other hand, the prime lending rate impacts negatively on output in line with a priori expectation. The error correction term was significant and negative, implying that the model is stable. Besides, it revealed that 60.8 per cent of disequilibrium error is corrected within a quarter, indicating a substantial speed of adjustment.

Overall, the findings of this study reinforces the findings of previous works on the fact that the provision of private sector credit to major sectors of the economy holds great potential for promoting economic growth in Nigeria. The banking sector, which is the main source of credit to the private sector, is an important channel of financial intermediation through which financial resources can be mobilized for productive investment. Our empirical analysis also found support for a significant negative relationship between prime lending rate and output, indicating the need to keep interest rates at levels that are conducive for the growth objectives of the nation. In this regards, we recommend that policies towards deepening the financial sector and enhancing the health status of banks should be vigorously pursued. Also, the

current commitment by the Central Bank to the gradual reduction in interest rate is laudable.

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