



## CASH RESERVE REQUIREMENT AND CREDIT TO SMES IN NIGERIA: AN ARDL BOUNDS TEST APPROACH



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### ABSTRACT

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This study estimated the impact of Cash Reserve Requirement on Credit to SMEs in both short run and long run in Nigeria. ARDL model was used to capture both objectives. The variables used were annual data from 1981-2017. The study found that Cash Reserve Ratio has an insignificant impact on Credit to SMEs in both short run and long run in Nigeria. Secondly, it was found that Lending Interest Rate has a negative but significant impact on Credit to SMEs. The study therefore suggested that banks and government should not concentrate on the use of Cash Reserve Ratio only in a bid to increase credit to SMEs in Nigeria. However, there is need to regulate the commercial banks' asset base to increase their Liquidity Ratio so as to increase access to credit by the SMEs. Again, government as a matter of necessity should appropriate and monitor the judicious disbursement of interest-free loans/credit to the SMEs in Nigeria as these would boost productivity and the Nigerian economy in the long run.

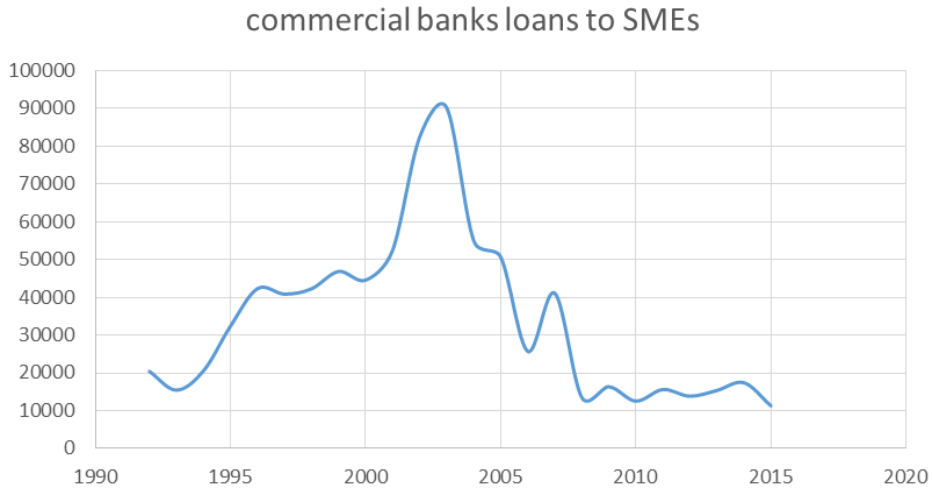
**Contribution/ Originality:** This study contributes to existing literature by investigating the relationship between cash reserve ratio and SMEs in Nigeria using the ADRL approach.

### 1. INTRODUCTION

The importance of Small and Medium Scale Enterprises (SMEs) has been recognised as a driver of employment and the eradication of income poverty. Evidence from different countries of the world according to the World Bank indicates that SMEs provide effective means of stimulating indigenous entrepreneurship, enhancing greater employment opportunities per unit of capital invested and aiding the development of local technology.

Despite the numerous advantages of SMEs, contribution of this sector to the overall development of Nigeria has over the years remained low (Ayeni-Agbaje & Osho, 2015). For more than five decades since the independence of Nigeria, it has suffered from many economic fluctuations that has left the country under-developed.

Loans to the SMEs operative in Nigeria has over time been found to dwindle. The Figure below reveals that the peak period for commercial bank loans to SMEs was in 2003, a value of about ₦90.2 billion while the SMEs were recorded to have received an all-time low of about ₦11.3 billion in 2015 (Central Bank of Nigeria, 2015). The relationship between these distinctively different periods is lucid in the percentage of loans to the SMEs of the total loans granted by commercial banks. The Figure 1 reveals both relationships respectively over time.



**Figure-1.** Credit to SMEs from commercial banks.

Source: Authors' computation based on data from Central Bank of Nigerias (2017).

Thus, in order for an economy to function properly, it must have a well-developed and healthy deposit money banks. One of the functions of deposit money banks is lending to the public in which the SMEs are included. SMEs need to borrow money to start businesses and subsequently build formidable and innovative businesses which constitute the launching pad for meaningful growth in developing countries (Uzonwanne, 2015). This therefore entails that the liquidity and possible sophistication of the deposit money banks have a huge impact on access to credit of the SMEs. It is also worthy of note as established, that deposit money banks liquidity is primarily affected by monetary policy of the Central Bank of Nigeria (CBN). This study thus seeks to examine the relationship between the Cash Reserve Ratio (CRR) which is a monetary policy tool and credit to SMEs in Nigeria.

This study is important in order to add to the body of knowledge as found in the literature. For example, most of the studies reviewed argued that monetary policy tools were crucial in accounting for the availability of credit to SMEs in Nigeria as studies like Uzonwanne (2015) Ndugbu and Okere (2015), Ayeni-Agbaje and Osho (2015) all used monetary policy tools in their study. Again, majority of these studies as with others reviewed failed to account for the stationarity of the series used and could not ascertain the long run status of their variables. These pose a serious limitation to inferences from a time series analysis. This study intends to account for these characteristics of the variables and an appropriate model as recommendable by the characteristics of the variables used (such as the Autoregressive Distributed Lag model).

Our specific objective is to examine the long run and short run relationships between Cash Reserve Requirement and Credit to SMEs in Nigeria over the period of 1981-2017.

The rest of the paper is structured as follows; section two contains brief theoretical background; section three examines the empirical literatures related to the variables of interest; in section four, the approach and methods of the study are presented; in section five, the analysis of the results from the econometric software is presented; then conclusions and policy implications are presented in the last section.

## 2. THEORETICAL OVERVIEW

Supply leading theory postulates that the existence of financial institutions like deposit money bank and the supply of their financial assets, liabilities and related financial services in advance of demand for them would provide efficient allocation of resources from surplus units to deficit units, thereby leading the other economic sectors in their growth process (Uzonwanne, 2015). This theory is said to perform in a way of promoting and stimulating entrepreneurial response in the modern sector.

The proponents of this theory believe that the activities of the financial institutions serve as a useful tool for increasing the productive capacity of the SMEs in the economy. This theory also provides a valid linkage between the banking sector liquidity which is most likely affected by monetary policy and SMEs. Hence, according to this theory, the higher the deposit banks' liquidity, the more credit available to the SMEs. In other words, there should be an inverse relationship between Cash Reserve Requirement and Credit to SMEs since high cash reserve reduces banks' liquidity and capacity to make loans.

However, aside from cash reserve, there are other economic variables that have significant impacts on the volume of credit to SMEs. They include Financial deepening (FIN), Lending Interest Rate (IRT), Inflation Rate (INF), Financial Development (FD) and these can be demonstrated in a functional relationship as a mathematical equation.

$$SME = F(CRR + FIN + IRT + INF + FD) \quad (1)$$

According to theory, it is expected that FIN and FD should have a positive relationship with SMEs; but IRT and INF should have a negative relationship with SMEs.

## 3. EMPIRICAL LITERATURE

Some empirical studies have been done to unravel the relationship between banking sector variables and the economic performance in Nigeria but no study to the best of our knowledge has been done specifically on the relationship between cash reserve ratio and SMEs in Nigeria using the ADRL approach. For example, Ndugbu and Okere (2015) investigated the impact of monetary policy on the performance of deposit money banks in the Nigerian Economy (1993-2013). Ordinary Least Square was used to analyse the data. The findings revealed that bank deposit rate has significant relationship though inverse relationship with total deposit mobilized by all deposit money banks. These findings did not account for a verification of the long run possibility of the relationship, thus inferences might be subjected to criticisms.

Uzonwanne (2015) did a study on "deposit money banks and financing of small and medium scale enterprises in Nigeria" from 1995-2012. Data used were collected from the statistical bulletin of Central Bank of Nigeria ranging. The paper employed the descriptive method. The findings revealed that deposit money banks in Nigeria have been lacking in this aspect. The study's non-use of empirical strategies creates oversight in the structural behaviour of the data, its stationarity and reliability of influence observed. These create limitations to the findings of the study by Uzonwanne (2015).

Anigbogu, Okoli, and Nwakoby (2015) investigated the effect of financial intermediation on small and medium enterprises performance in Nigeria using an econometric model of the Ordinary Least Square (OLS). Findings reveal that with the exception of bank interest rate to SMEs, all other variables - financial intermediation, commercial bank loans and advances to SMEs, bank lending rate to SMEs, exchange rate and monetary policy - have a positive and significant influence on small and medium enterprises performance in Nigeria.

Ayeni-Agbaje and Osho (2015) examined the role of commercial banks in financing small scale enterprises in Ado Ekiti, Ekiti State. The primary purpose of their study is to examine how SMEs can be developed through the intervention of the banking sector. Questionnaires were used as an instrument of primary data collection. Purposive sampling technique was used to select the sample; correlation analysis was employed using chi-square. Findings revealed that there is a positive correlation between loans grants by banks and the growth and development of SMEs in Ekiti State. The authors though did not account for the significance of the correlation coefficient even as a positive correlation was found.

Mbanasor, Nwachukwu, Agwu, and Onwusiribe (2015) examined the influence of monetary policy variables on banks' credit supply to small and medium scale enterprises (SMEs) in Nigeria. Time series data which were collected on quarterly basis were elicited from the Central Bank of Nigeria (CBN) Statistical bulletin and financial statements for five deposit money banks. The data covered a period of 1995-2010 and were analysed using fully Modified Least Squares (FMOLS). The result of the FMOLS indicated that policies on interest rate and liquidity ratio were negatively and positively significant at 1 percent probability level respectively. In another study, Rahji and Apata (2008) attempted deciphering the Credit Supply Decisions of Banks under the Small and Medium Enterprises Equity Investment Scheme in Nigeria. The study adopted Tobit model in the analysis of cross sectional data, collected from lending banks' staff. The findings of this analysis may be misleading considering that credit supply to SMEs may not respond to short run interest rate changes based on cross sectional data but on long run changes and time series approach.

Ajayi and Atanda (2012) studied the effects of monetary policy instruments on banks' lending disposition. The Engle-granger two step co-integration approach was adopted based on the regression model that regress banks total loan and advances on minimum policy rate, cash reserves ratio, liquidity ratio, inflation and exchange rate. The empirical estimates indicated that bank rate, inflation rate and exchange rate are total credit enhancing, while liquidity ratio and cash reserves ratio exert negative effect on banks total credit.

Younus and Akhtar (2009) examined the significance of cash Reserve Requirement (CRR) as a monetary policy instrument in Bangladesh. Using descriptive analysis techniques (trend analysis and summary statistics), they found CRR has experienced frequent changes and past evidence has shown that reduction in CRR produced positive impact on bank credit and investment especially prior to the 1990s. Cash Reserve Requirement (CRR) was found to be significant tools in lending to small and medium businesses, thus creating a significant relationship with banks' lending behaviour to funding of SMEs.

Azende (2011) in an empirical evaluation of the performance of small and medium scale Enterprises, Equity Investment Scheme (SMEEIS) in Nigeria used Benue and Nassarawa states as case studies. Using total credit to SMEs as a percentage of Banks' total credit for the period 1993 to 2008, the T-test conducted to determine the extent of relationship between bank loans before and after the introduction of SMEEIS indicated no significant difference between loans disbursed by banks to SMEs.

Adefeso and Mobolaji (2010) conducted an empirical study that analysed the impact of Small and Medium Enterprises (SME) on economic development in Nigeria for the period 1980-2008. The paper employed a time series econometric approach to assess this impact. The study finds that though SME is a catalyst for development, its impact on the development path in the country is still negligible. This dismal performance may reflect the phase and stage of our economic development, and suggests that the country is still a factor-driven economy. This performance may also be due to several reasons such as poor funding facilities, low level of education and weak government support amongst others.

Olokoyo (2011) investigated the determinants of Commercial Banks' Lending behaviour in Nigeria employing multiple regression analysis. The study suggests that minimum cash reserve ratio has positive functional relationship with commercial banks loans and advances. This indicates that stipulated cash reserve requirement ratio of commercial banks may not necessarily translate into poor lending performance or lower proportion of commercial banks' funds available for lending respectively.

Safriyu and Njogo (2012) employed primary data instruments to study the impact of small and medium scale enterprises on employment generation in Lagos state, Nigeria. The results of simple percentages and Chi-Square ( $\chi^2$ ) tests conducted show that small and medium scale enterprises and sustainable development of Nigerian economy are positively related, just as promotion of SMEs and improvements in employment generation are positively related and significant. Availability of finance has been widely viewed as a constraint to the growth of SMEs.

#### 4. METHODOLOGY

Two variables are co-integrated when they have a long term or equilibrium relationship between them (Gujarati, 2003). The selected Supply Leading theory suggests that a long run relationship between SMEs and CRR. Hence, the need for a co-integration analysis but in this case using the Auto Regressive Distributed Lag Model (ARDL) bounds test approach.

The ARDL approach will be used because it eliminates the problem of the order of integration. More so, most of the conventional multi-variate co-integration tests which are most appropriate for large samples, the ARDL bounds test is suitable for a small sample size. Finally, according to Pesaran, Shin, and Smith (2001) ARDL generally provides unbiased estimates of the long run model and valid t-statistic even when some of the regressors are endogenous. Other studies that have also adopted this model include; Anthony-Orji, Orji, Ogbuabor, and Nwosu (2019), Anthony-Orjis, Orji, Ogbuabor, and Nwosu (2018) and Orji, Ogbuabor, and Anthony-Orji (2016). Equation 1 can be modified into an economic model as shown below:

$$SME_t = \alpha_0 + \alpha_1 CRR_t + \alpha_2 FIN_t + \alpha_3 IRT_t + \alpha_4 INF_t + \alpha_5 FD_t \quad (2)$$

Econometrically, Equation 2 could be modified as thus;

$$SME_t = \alpha_0 + \alpha_1 CRR_t + \alpha_2 FIN_t + \alpha_3 IRT_t + \alpha_4 INF_t + \alpha_5 FD_t + \mu_t \quad (3)$$

However, Equation 3 can further be modified into the general form of Auto-Regressive Distributed Lag model, i.e. ARDL (p, q) as shown in Equation 4, where p is the maximum lag of the dependent variable and q is the maximum lag of the independent variables. This can be illustrated below:

$$SME_t = \alpha_0 + \sum_{i=1}^p \delta_i SME_{t-i} + \sum_{k=0}^q \beta_k CRR_{t-k} + \sum_{f=0}^q \epsilon_f FIN_{t-f} + \sum_{l=0}^q \gamma_l IRT_{t-l} + \sum_{m=0}^q \varphi_m INF_{t-m} + \sum_{p=0}^q \Psi_p FD_{t-p} + \mu_t \quad (4)$$

Next is to test for cointegration using bounds test. The bounds testing under Pesaran et al. (2001) procedure is based on the F-test. The F-test is actually a test of the hypothesis of no cointegration among the variables against the existence or presence of cointegration among the variables.

To perform the bounds test for cointegration, the conditional ARDL (p,q1,q2,q3,q4,q5) model with 6 variables would have the following hypotheses:

$$H_0: \delta_i = \beta_k = \epsilon_f = \gamma_l = \varphi_m = \psi_p = 0 \equiv \text{there is no cointegration}$$

$$H_1: \delta_i = \beta_k = \epsilon_f = \gamma_l = \varphi_m = \psi_p \neq 0 \equiv \text{there is cointegration}$$

It is worthy of note to state here that the bounds test method of cointegration has certain econometric advantages in comparison to other methods of cointegration which includes the following:

- All variables of the model are assumed to be endogenous.
- Bounds test method for cointegration is being applied irrespective of the order of integration of the variable. There may be either integrated first order I (1) or I (0).
- The short-run and long-run coefficients of the model are estimated simultaneously as shown and specified in Equations 5 and 6.

If we accept  $H_0$  (i.e. there is no cointegration, the ARDL (p,q1,q2,q3,q4,q5) will be specified as:

$$\Delta SME_t = \alpha_{01} + \sum_{i=1}^p \delta_{01} \Delta SME_{t-i} + \sum_{i=0}^q \beta_{1i} \Delta CRR_{t-i} + \sum_{i=0}^q \beta_{2i} \Delta FIN_{t-i} + \sum_{i=0}^q \beta_{3i} \Delta IRT_{t-i} + \sum_{i=0}^q \beta_{4i} \Delta INF_{t-i} + \sum_{i=0}^q \beta_{5i} \Delta FD_{t-i} + \mu_t \quad (5)$$

But if we do not accept  $H_0$  (i.e. there is cointegration), then we estimate the Unrestricted Error Correction Model (UECM) thus:

$$\begin{aligned} \Delta SME_t = & \alpha_{01} + \sum_{i=1}^p \delta_{01} \Delta SME_{t-1} + \sum_{i=0}^q \beta_{1i} \Delta CRR_{t-i} + \sum_{i=0}^q \beta_{2i} \Delta FIN_{t-i} + \sum_{i=0}^q \beta_{3i} \Delta IRT_{t-i} \\ & + \sum_{i=0}^q \beta_{4i} \Delta INF_{t-i} + \sum_{i=0}^q \beta_{5i} \Delta FD_{t-i} + \lambda_1 SME_{t-1} + \lambda_2 CRR_{t-1} + \lambda_3 FIN_{t-1} \\ & + \lambda_4 IRT_{t-1} + \lambda_5 INF_{t-1} + \lambda_6 FD_{t-1} + \mu_t \end{aligned} \quad (6)$$

Where the expressions  $(\lambda_1 - \lambda_6)$  on the right hand side correspond to the long run relationship. While the remaining expressions on the right hand side with the summation sign  $(\beta_{1i} - \beta_{5i})$  denote the short run dynamics of the model. Alternatively, all the long run components can be simply represented by the Error Correction Term with the coefficient lambda  $(\lambda)$ . This is illustrated in Equation 7:

$$\begin{aligned} \Delta SME_t = & \alpha_{01} + \sum_{i=1}^p \delta_{01} \Delta SME_{t-1} + \sum_{i=0}^q \beta_{1i} \Delta CRR_{t-i} + \sum_{i=0}^q \beta_{2i} \Delta FIN_{t-i} + \sum_{i=0}^q \beta_{3i} \Delta IRT_{t-i} \\ & + \sum_{i=0}^q \beta_{4i} \Delta INF_{t-i} + \sum_{i=0}^q \beta_{5i} \Delta FD_{t-i} + \lambda ECT_{t-1} + \mu_t \end{aligned} \quad (7)$$

Where;  $\Delta$  denotes the first difference operator while all components with summation signs represent the short run relationship.

$ECT_{t-1}$  = the error correction term (i.e. the long run relationship), while  $\lambda = (1 - \sum_{i=1}^p \delta_i)$ , the speed of adjustment parameter (also known as the long run multiplier or the long run elasticity) which must have a negative sign (thus,  $-\frac{\theta}{\phi}$ ) to show that there is convergence in the long run, otherwise, the model is explosive, i.e. no convergence in the long run meaning that whatever policy change that may occur will not have a sustainable impact on the target variable because there is no long run relationship. Here, it is also important to clearly state that this parameter is usually of great interest for policy-makers who often want to know the eventual effects of their policy changes in various areas.

$\beta_{1i}, \beta_{2i}, \beta_{3i}, \beta_{4i}, \beta_{5i}$ , are the short run dynamic coefficients of the model's adjustment to long-run equilibrium.

$$\mu_t \sim iid(0, \delta^2)$$

That is to say that the stochastic error term  $(\mu_t)$  is independently, identically and normally distributed with zero mean and constant variance  $(\delta^2)$ . Also,  $\alpha_{01}$  and  $\mu_t$  represent the drift component and the white noise respectively.

## 5. RESULTS AND DISCUSSION

In this section, the regression results are presented. The objectives and hypothesis stated earlier evaluated based on the findings in this section. Note also that these findings shall be subjected to economic interpretation, especially as it relates to the present day realities. We present the results in line with the objectives it (they) seek(s) to address. Before the table of econometric analysis, we first present a descriptive statistics of all the variables employed in the study.

### 5.1. Descriptive Statistics of the Study Variables

It is necessary to report the statistical analysis of the study before the time series econometric analysis. As shown by the Table 1, the data set of this study comprises of 37 years of annual observations ranging from 1981-2017. The Table 1 also shows that the average amount of Credit to SMEs in Nigeria annually is #15.08b. The average for Lending Interest Rate is 17.75%. The average rate of Inflation is 19.4% while the average of Financial Openness is -1.010043. The average for Financial Deepening is 10.90270. The average ratio of Cash Reserve Requirement is 0.747448.



Table-1. Statistical analysis of study variables.

Statistical description	SME	IRT	INF	FIN	FD	CRR
Mean	15.08967	17.75415	19.40722	-1.010043	10.90270	0.747448
Median	13.52085	17.58500	12.35727	-0.832388	8.200000	0.752324
Maximun	38.38656	31.65000	72.83550	0.564200	20.80000	1.200000
Minimun	8.709660	8.916667	5.382224	-1.894798	5.900000	0.233675
Skewness	2.492552	0.210777	1.707820	-0.118986	0.972212	-0.200995
Kurtosis	9.573586	3.615949	4.686872	2.980137	2.146618	3.613178
Jarque-Bera	104.9309	0.858865	22.37287	0.087913	6.951448	1.272645
Probability	0.000000	0.650878	0.000014	0.956996	0.030939	0.660745
Observations	37	37	37	37	37	37

Furthermore, all the variables are right skewed except FIN and CRR which are negatively skewed. Kurtosis statistic of the variables shows SME, IRT, INF and CRR are leptokurtic (long tailed or higher peak) while FIN and FD are platykurtic (short tailed or lower peak). Also, the probability of Jarque-Bera test shows that the residuals of SME, INF and FD are not normally distributed while all other variables are normally distributed.

### 5.1. Stationarity, Lag Length Criteria and Bounds Test

In order for us to determine the order of integration of the variables and to ensure that the series are integrated of order I(0) and I(1) but definitely not I(2), a unit root test was carried out using the Kwiatkowski-Phillip-Schmidt-Shin (KPSS) test for stationarity as shown in Table 2.

### 5.2. Unit Root Test

Null hypothesis: Series is stationary. Decision is made about the test result and conclusion drawn would be to not reject the null if the LM cal < LM tab, that is, the test statistic < the critical value.

Table-2. Unit root test (result).

Variable	KPSS test at level	5% Critical value at level	KPSS test at 1 <sup>st</sup> d	5% Critical value at 1 <sup>st</sup> d	Integrton order
sme	0.174119	0.463000	0.500000	0.463000	i(0)
irt	0.196578	0.463000	0.186238	0.463000	i(0)
inf	0.292754	0.463000	0.500000	0.463000	i(0)
fin	0.533670	0.463000	0.230884	0.463000	i(1)
fd	0.567811	0.463000	0.197904	0.463000	i(1)
crr	0.208390	0.463000	0.500000	0.463000	i(0)

Table-3. Optimal lag selection criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-101.1941	NA	38.97129	6.496614	6.768706	6.588165
1	-97.63062	5.615220	33.44537	6.341250	6.658691	6.448059
2	-95.02779	3.943682	30.44980	6.244109	6.606898	6.366176
3	-92.36369	3.875063*	27.64757*	6.143254*	6.551392*	6.280580*
4	-92.28163	0.114385	29.39001	6.198887	6.652374	6.351471

Table 3 presented, shows the optimal lag selection criteria. From the table above, it can be seen that almost all the criteria selected lag three (3) as the optimal lag length, but for the purpose of this study, the Akaike Information Criterion (AIC) is adopted, hence, lag order of three (3) remains the optimal lag selected for the ARDL model. It is worthy to note that the results of long run relationship are sensitive to lag-length selected in the model. Thus, we proceed for the ARDL Bounds test for cointegration.

**Table-4.** ARDL bounds test for cointegration (Result).

F-statistic	5% sig. at I0 bound	5% sig. at I1 bound
16.42020	2.62	3.79

Table 4 presents the result of computed F-statistic to test for the long run relationship among the variables of study the model. According to Pesaran et al. (2001) with lag order of 3, the lower and upper values at 5% degree of freedom are 2.62 and 3.79 respectively. Hence, the table above shows that the computed value of F-statistic (16.42020) is obviously greater than the upper bound value of 3.79 and this implies that the coefficients of the long run equation are not equal to zero. This helps us reject the null hypothesis of no long run relationship. Therefore, we can now conclude that there is a long run relationship among the variables. Based on this conclusion, this study employed the Autoregressive Distributed lag (ARDL) model and Error Correction Model (ECM) which account for the short run and long run dynamics to capture the two objectives.

**Table-5.** Error correction model results.

(ARDL, 3, 2, 0, 3, 3, 0).  
Short run model results.

Variable	Coefficient	Std. error	T-statistic	Prob.
D(SME(-1))	0.009659	0.142756	0.067662	0.9479
D(SME(-2))	0.212263	0.128409	1.653025	0.1423
D(SME(-3))	0.232770	0.126497	1.840130	0.1083
D(IRT)	-0.240212	0.270950	-0.886553	0.4047
D(IRT(-1))	-0.411032	0.220887	-1.860823	0.1051
D(IRT(-2))	-0.299705	0.256992	-1.166204	0.2817
D(INF)	-0.112141	0.036418	-3.079252	0.0178
D(FIN)	-0.840074	1.277855	-0.657409	0.5319
D(FIN(-1))	2.277352	2.616271	0.870457	0.4129
D(FIN(-2))	2.277352	2.993472	0.821261	0.4386
D(FIN(-3))	4.174917	1.671977	-2.496994	0.0412
D(FD)	2.754478	0.281690	9.778410	0.0000
D(FD(-1))	1.487135	0.408276	3.642479	0.0083
D(FD(-2))	1.453451	0.454523	3.197746	0.0151
D(FD(-3))	0.946543	0.423614	2.234447	0.0606
D(CRR)	1.884249	3.260312	0.577935	0.5814
ECM(-1)	-1.853646	0.314992	-5.884744	0.0006
Constant			21.204246	
R-square			0.977956	
Adjusted R-square			0.911822	
F-statistic			14.78763	
Prob(F-stat)			0.000265	
Durbin-Watson stat			2.354948	

Table 5 shows the short run model which measures the short run dynamics of the parameters alongside the error correction term. The error correction term which shows the speed of adjustment in the long run, has a negative sign which corresponds with apriori. The ECM value of -1.85 shows high speed of adjustment back to equilibrium at the rate of 185% per annum if there is a shock in the system.

The study discovers that current, one and two previous values of interest rate have negative but insignificant impacts on credit to SMEs in the short run. This result corresponds to apriori expectation since interest rate, based on theory, has an inverse relationship with credit to SMEs holding other factors constant. However, these negative impacts are insignificant in the short run because the transmission mechanism from interest rate to credit to SMEs might not be completed in the short run. The result also shows that current inflation rate has a negative and



significant impact on credit to SMEs in the short run. This implies that a 1% increase in inflation rate will decline credit to SMEs by 0.11% in the short run. This result is in line with the apriori expectation since contractionary monetary policy follows in a high inflation rate in order to reduce the volume of money in circulation through high lending interest rate.

Furthermore, throughout the period of study, only the 3<sup>rd</sup> previous value of financial openness that have a significant impact on credit to SMEs in the short run, while the impacts of current, 1<sup>st</sup> and 2<sup>nd</sup> previous values of financial openness on credit to SMEs are quite insignificant. This result suggests that if we widen financial openness by 1%, it will take three years for credit to SMEs to rise by 4.17%. This is as well in line with theory because financial openness increases access to credit by the SMEs.

The results of the study also show that the current, two and three previous values of financial deepening have both positive and significant impacts on the credit to SMEs in the short run. To be specific, if we raise current financial deepening by 1%, credit to SMEs will rise by 2.75% while it takes one and two years to increase credit to SMEs by 1.48% and 1.45% respectively.

More so, it is discovered that cash reserve ratio has a positive but insignificant impact on credit to SMEs in the short run. This is similar to the result gotten from the long run model. The result is in violation of apriori expectation, though, it is in line with previous studies such as Ayeni-Agbaje and Osho (2015) who examined the effects of CRR on banks' lending to the SMEs in Nigeria and the results of their regression analysis show that there is no significant relationship between CRR and the volume of loans to the SMEs.

Table-6. Long run model results.

ARDL (3, 2, 2, 1, 2, 3).

Variable	Coefficient	Std. error	T-statistic	Prob.
SME(-1)	0.071900	0.106765	0.673439	0.5109
SME(-2)	0.429738	0.108340	3.966564	0.0012
SME(-3)	-0.546365	0.096694	-5.650470	0.0000
CRR	-3.556273	3.022495	-1.176602	0.2577
CRR(-1)	1.810438	2.969998	0.609575	0.5513
CRR(-2)	-7.554054	2.963161	-2.549322	0.0222
FD	2.591148	0.246312	10.51976	0.0000
FD(-1)	-1.474743	0.375134	-3.931246	0.0013
FD(-2)	-0.939338	0.318069	-2.953251	0.0099
FIN	1.328307	1.373262	0.967264	0.3488
FIN(-1)	-1.959319	1.683733	-1.163675	0.2627
INF	-0.091186	0.032868	-2.774351	0.0142
INF(-1)	0.144095	0.039169	3.678789	0.0022
INF(-2)	-0.106615	0.043231	-2.466159	0.0262
IRT	-0.454842	0.148370	-3.065589	0.0078
IRT(-1)	-0.153077	0.160351	-0.954637	0.3549
IRT(-2)	1.032403	0.163877	6.299874	0.0000
IRT(-3)	-0.602393	0.134059	-4.493482	0.0004
C	22.74696	3.703684	6.141713	0.0000
R-square			0.961985	
Adjusted R-square			0.916367	
F-statistic			21.08773	
Prob(F-statistic)			0.000000	
Durbin-Watson stat			2.603767	

The result in Table 6 is Auto Regressive Distributed Lag (ARDL) model which shows the long run elasticities.

The study found that current and one previous values of Lending Interest Rate have negative but significant and insignificant respective impacts on the Credit to Small and Medium

Scale Enterprises in the long run. 1% increase in the current value of Interest Rate would lead to 0.45% decrease in the Credit to SMEs while 1% increase in one previous value of Interest Rate would cause Credit to SMEs to decline by 0.15%. This result implies that the amount of credit to SMEs will significantly decline if interest rate is increased. This result conforms to apriori expectation because interest rate is the cost of borrowing to finance businesses. Hence, if interest rate rises, the cost of borrowing rises, thus, entrepreneurs avoid borrowing so as not to run into loss.

Again, the study also discovered that current value of inflation rate has a negative but significant impact on Credit to SMEs while previous values of inflation rate have positive and significant impact on Credit to SMEs in the long run. In other words, while increases in the previous values of inflation rates will have positive and significant impact on credit to SMEs, if current inflation rate is increased by 1%, credit to SMEs will decrease by 0.09% in the long run. This result is also in line with the apriori expectation because if Inflation Rate increases, government will embark on a contractionary monetary policy through an increase in lending interest rate. This will reduce the volume of money in circulation in order to save the currency from further devaluation. This result also agrees with [Omondi and Gor \(2014\)](#) who investigated the effects of inflation rate on commercial banks' lending in Kenya. The findings show that a rise in inflation rate increases interest rate and hence, reduces credit to SMEs.

Furthermore, this study goes further to discover that current and previous values of financial openness do not have any significant impact on credit to SMEs. Over the period of study, financial openness in the current year, has a positive but insignificant impact on credit to SMEs. This contradicts the apriori expectation as more the financial openness of the economy, the more businesses should be able to access credit from commercial banks. This violation of apriori could be attributed to institutional bottlenecks found in the Nigeria banking sector.

Again, it is discovered that financial deepening, proxied as the ratio of Credit to Private Sector to GDP which measures financial development as a percentage of GDP, has a significant impact on Credit to SMEs in the long run. The current value of financial deepening has a positive and significant impact on Credit to SMEs such that an increase of 1% in current financial deepening would lead to an increase in Credit to SMEs by 2.59% in the long run. While 1% increase in one and two previous values of financial openness would cause Credit to SMEs to decline by 1.47% and 0.93% in the long run respectively. However, the positive and significant impact of current value of financial deepening on Credit to SMEs is in line with the apriori expectation since the more financial development we have, the wider the access to Credit by the SMEs.

The findings of this study show that both current and one previous values of Cash Reserve Ratio have insignificant impact on Credit to SMEs. This contradicts the apriori expectation but in line with previous studies such as [Ayeni-Agbaje and Osho \(2015\)](#) who examined the effects of CRR on banks' lending to the SMEs in Nigeria and the results of their regression analysis show that there is no significant relationship between CRR and the volume of loans to the SMEs.

### 5.3. Diagnostic Tests

The post estimation test that will be analyzed in this section includes the Breusch-Godfrey Serial Correlation LM Test, Heteroskedasticity Test, Normality Test, and CUSUM Stability Test.

**Table-7.** Breusch-godfrey serial correlation LM test.

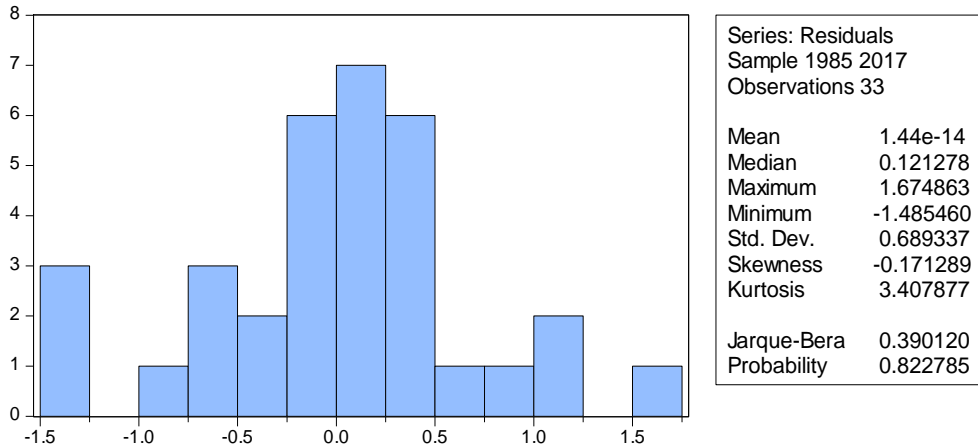
F-statistic	0.289061	Prob. F(2,25)	0.8320
Obs*R-squared	4.877471	Prob. chi-square(2)	0.1810

Table 7 displays the Breusch-Godfrey LM serial correlation shown in table. As shown, the Prob. F(2,25) is 83.2% and is greater than 5% level. This implies rejection of the null hypothesis, and acceptance of the alternative that there is no serial correlation among the residuals in the model and we are just happy. Hence, we proceed to test for heteroscedasticity.

**Table-8. Heteroscedasticity test: Breusch-pagan-godfery.**

F-statistic	0.587723	Prob. F(25,7)	0.8591
Obs*R-squared	14.06178	Prob chi-square(25)	0.7251
Scaled explained SS	3.548593	Prob chi-square(25)	0.9999

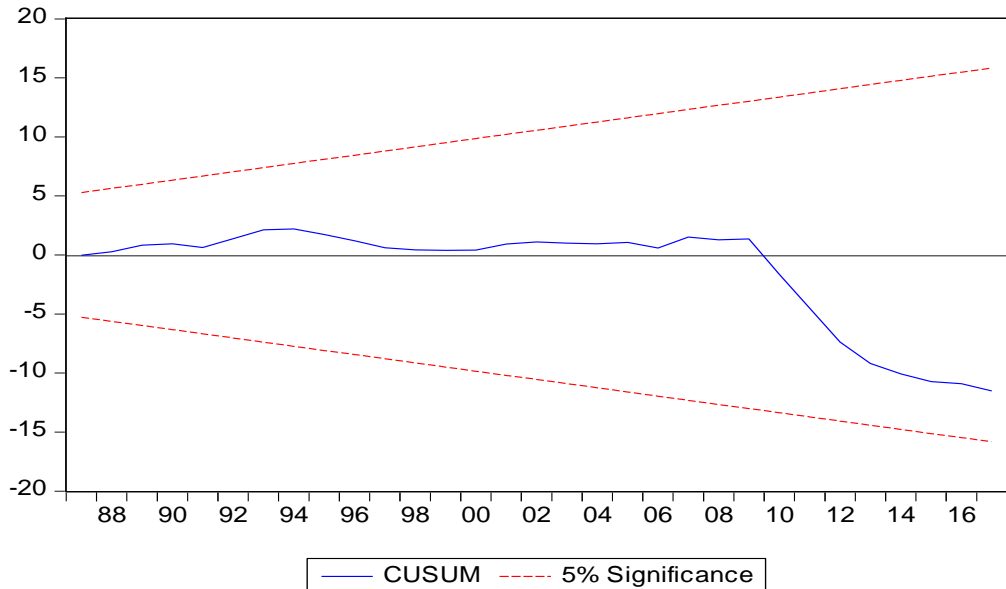
Table 8 shows that residuals are not heteroscedastic given that the Probability value of Obs\*R-squared is 72.5% which is greater than 5%. Hence, we reject the null hypothesis and conclude that the residuals are homoscedastic. This is good, hence we proceed to normality test.



**Figure-2. Test for normality.**

Source: Researchers' computation using eviews 9.0.

Figure 2 shows the Jarque-Bera normality test. According to the results, the Jarque-Bera Probability value is 82.27% which is greater than 5% level. Thus, we accept the null hypothesis which says that the residuals of the model follow a normal distribution. We are happy, hence, we proceed to test for the stability of the model.



**Figure-3. CUSUM stability test.**

Source: Eviews 9.0.

Figure 3 shows the CUSUM Stability test results. The results imply that the model is relatively stable given that the blue line entirely lies within the 5% boundaries indicated by the two straight red lines.

This suggests that there is no evidence of autocorrelation and heteroskedasticity, the residual is normally distributed and the model is stable in the model at the 5% significance level, therefore we are happy about the result.

## 6. SUMMARY

This study was to estimate the relationship between Cash Reserve Ratio and Credit to Small and Medium Scale Enterprises in Nigeria. The ARDL model and Error correction model were applied during the study period of 1981 to 2017. Unit root test was carried out using the Kwiatkowski-Phillip-Schmidt-Shin (KPSS) on these variables; Cash Reserve Ratio (CRR), Credit to SME (SME), Financial Openness (FIN), Financial Deepening (FD), Inflation Rate (INF), and Lending Interest Rate (IRT). Financial Openness and Financial Deepening were integrated of order one, i.e.  $I(1)$  while other four variables were found to be integrated of order zero, i.e.  $I(0)$ . The study used the Akaike Information Criterion to choose the appropriate lag order of the model. The result of the ARDL bounds test of cointegration shows that there is the presence of cointegration among the variables in the model. The Error Correction Model was also found to be statistically significant, confirming the existence of a long run relationship in the model. The findings of this study show that both current and one previous values of Cash Reserve Ratio have positive but insignificant impact on Credit to SMEs.

This contradicts the apriori expectation but in line with previous studies such as Ayeni-Agbaje and Osho (2015). While the current, one and two previous values of Lending Interest Rate have negative but significant impacts on the Credit to Small and Medium Scale Enterprises both in the short run and the long run. This conforms to apriori expectation as interest rate is the cost of borrowing to finance businesses.

On the other hand, the current value of inflation rate has a negative but significant impact on Credit to SMEs while previous values of inflation rate have insignificant impact on Credit to SMEs in the long run. This too, corresponds with economic theory. It is discovered that financial deepening, proxied as the ratio of Credit to Private Sector to GDP which measures financial development as a percentage of GDP, has a significant impact on Credit to SMEs in the long run but insignificant in the short run. The model was stable, there was no serial correlation, no heteroskedasticity and the residuals were normally distributed.

## 7. CONCLUSION

This is a country specific study centred in Nigeria. The focus of the study is on the impact of Cash Reserve Ratio on Credit to SMEs in Nigeria. This is because such information will reveal how to increase access to credit by SMEs in Nigeria. The two objectives of the study have also been addressed very appropriately.

The study in general is a time-series analysis employing both the auto regressive distributed lag (ARDL) and error correction model (ECM). The study discovered that Cash Reserve Ratio has an insignificant impact on Credit to SMEs in both short and long run in Nigeria.

## 8. POLICY IMPLICATION AND POLICY RECOMMENDATIONS

A study such as this has so many policy implications which, if carefully identified and treated appropriately, could contribute to economic prosperity. To this effect, the following policy recommendations emanating from the findings of this study are in order:

1. Since Cash Reserve Ratio has an insignificant impact on Credit to SMEs both in the short run and long run, the study recommends that the government should not concentrate on the use of Cash Reserve Ratio only in a bid to stimulate or increase the volume of credit to SMEs in Nigeria.
2. Since the study discovered that Lending Interest Rate has a high negative but significant impact on Credit to SMEs in both the short run and the long run, government should review its monthly monetary policy in favour of the commercial

banks so as to stimulate drastic decline in the commercial banks' lending rate. This would significantly increase the volume of credit accessed by the SMEs in Nigeria.

3. Beyond the use of Cash Reserve Ratio and Lending Interest Rate to stimulate credit to SMEs, government as a matter of necessity should appropriate and monitor the judicious disbursement of interest-free loans/credit to the SMEs in Nigeria.

If these recommendations outlined above are adhered to by the government, the volume of credit accessed by the SMEs would experience a tremendous increase.

This would strengthen more businesses and productivity would drastically increase. Given that supply creates its own demand, more productivity would create more demand. This would further increase employment and reduce the already high unemployment rate in Nigeria. In the long run, the Nigerian economy would be lifted from recession to economic boom.

Furthermore, the results of this study will be quite resourceful to the world of research as it provides a guide for further researchers.

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