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Is there any relationship between monetary policy tools and external credit-growth nexus in Nigeria?

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Abstract: The Nigerian economy attracts abundance of foreign capital inflows and credit supply; hence, an adverse external credit shock might lead to a large decrease of external inflows due to global credit tightening, which may leave the domestic economy in deep recession. In this case, domestic monetary policy tools should be preferred to mitigate the external adverse effect on the domestic economy and stimulate investment. As a result, an important issue of concern in this study is how can the use of monetary policy tools mitigate the effect of external credit shocks on economic growth in Nigeria? In answering this question, this study attempted to assess the influence of monetary policy tools on external credit and economic growth nexus in Nigeria, using annual data covering 36 years for the period 1980–2015. The study adopted the Cobb–Douglas production function and estimated a specified model using autoregressive distributed lag cointegration approach. The study found out that cash reserve requirement, which is credit policy easing, is significant in growing the Nigerian economy, as compared to monetary policy rate. The implication of this is that, if credit policy easing is properly implemented, it could be efficient in offsetting adverse external credit shocks.

Subjects: Development Studies; Sustainable Development; Development Policy; Development Theory; Economics and Development; Environment & the Developing World; Economics; Environmental Economics; History of Economic Thought; Finance

ABOUT THE AUTHOR

The corresponding author writes on African economic development issues and other related topics in Economics. The current article is an extraction from the recently concluded Ph.D thesis of the lead author under the supervision of the other two following co-authors. The particular focus of the thesis was to assess how the Nigerian economy responds to both domestic and external economic disturbances and how the Nigerian monetary policy can mitigate the negative effects of these disturbances. This is an important issue because the Nigerian economy was not spared from the negative effects of the last global financial crisis of 2007–2009, due to the financial and economic linkages with the developed economies.

PUBLIC INTEREST STATEMENT

Given that domestic savings in Nigeria, like in any other developing economy, are inadequate to address savings–investment gap, so as to bring about the needed investments for required steady growth in the economy, there is need for increasing external capital inflows to boost economic activity, while a decline of it may negatively impact the economic activity; for instance, the experience of global financial crisis of 2007–2009. As a result of this, the study demonstrates how domestic monetary policies in Nigeria can mitigate the negative effects of dwindling external capital inflows. By implication, cash reserve requirement, which is credit policy easing, is significant in growing the Nigerian economy as compared to monetary policy rate.

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1. Introduction

Financial sector plays an important role in the growth and development of all economies of the world. Its effectiveness and efficiency in the performance of this role depends largely on the level of development of the financial system, which intermediates between the surplus and the deficit units of the economy (Adediran, George, & Alege, 2017a). As a result, financial sector is expected to bring the needed change so as to stabilize a modern financial system that is capable of acting as a catalyst in allocating the economy's financial resources to the most productive sectors among competing investment activities. An attempt at ensuring its soundness could have made the financial sector to be the likely most regulated and controlled sector of the Nigerian economy (Adediran, George, & Alege, 2017b). Hence, the financial sector in Nigeria has been faced with structural and institutional changes in form of different reforms and development measures. However, despite the fact that the sector has undergone series of reforms and other development activities with the aim of strengthening the sector's ability to deliver efficient services, the sector is still facing certain issues: inefficiency in allocating enough funds to the real sector, decline in domestic credit by the financial firms to the private sector, lack of long-dated funding and a considerable liquidity mismatch in the Nigerian economy. Therefore, this sector which is the major provider of the bulk of financial liabilities to the private sector is still vulnerable to credit supply shocks, which can be influenced by both domestic and external shocks.

In the same vein, recent evidence has clearly shown that Africa is increasingly connected with the rest of the world through trade and financial linkages. This is evident where Africa's real export value has quadrupled between 2000 and 2010, with Europe, the United States and China as the main destinations. In 2012, 60% of the African countries have export to GDP ratio of 30% or more, while 80% of them have export to GDP ratio of more than 20%. Moreover, Africa's financial linkage through foreign direct investment (FDI), remittances, private capital flows and official development assistance has also increased significantly during the last decade (Gurara & Ncube, 2013), with Nigeria having the highest share as the biggest economy in Africa. The external financial flows hit a record high of over US$ 200 billion in 2012. This growing economic linkage has raised the important issues of susceptibility of African economies to the adverse changes in advanced economies. Historically, Africa's growth pattern is highly linked with the world economic growth. The last global financial crisis demonstrated the strength of the linkage. This is evident, where average economic growth was slashed from an average of around 6% in 2006–2008 to 2.5% in 2009, as a result of the global economic crisis. Although it later peaked at 4.6% in 2014 but slowed down at 3.7% in 2015, which is the lowest since 2009 (Zamfir, 2016).

It is evident that managing an economy challenged by a multitude of economic shocks requires effective macroeconomic tools, given the policy options available. This necessitated several attempts by successive governments in Nigeria to reverse the adverse effects of different economic outcomes on the welfare of the citizenry through various macroeconomic policies. The objectives of these policies were commendable as they were directed at low inflation, full employment, high and sustainable rate of economic growth and balance of payments equilibrium. However, short-run gains at the expense of long-run growth coupled with inaccurate and inadequate data base could have accelerated economic fluctuations in Nigeria. Therefore, efforts to correct these fluctuations by the successive federal authorities have therefore prompted the government to adopt various economic policy measures including stabilization policy, 1981–1983; structural adjustment programme, 1986–1992; Medium Term Economic Strategy, 1993–1998; National Economic Empowerment and Development Strategy, 1999–2007 and other successive economic reforms, given that such policy actions can promote economic growth in the long run.

This was eventually the driving force behind various financial policy reforms of the financial sector in Nigeria. With these developments, the possible influence of structural changes of the external economy, potential dynamic and long-run impact of monetary policy tools on Nigerian economy has not been fully addressed. This is because, credit policy easing through monetary policy tools could play a significant role during a global credit crisis. For instance, with Nigeria, attracting abundance of foreign capital inflows and credit supply, an adverse external credit shock might bring a large decrease of external inflows due to global credit tightening, which may leave the domestic economy in deep recession. In this case, monetary policy tools may be more preferred to stimulate investment. However, an important issue of concern in this study is how does monetary policy mitigate the effect of external credit shocks on economic growth in Nigeria? In answering this question, it was imperative for the study to assess the influence of monetary policy tools on external credit and economic growth nexus in Nigeria.

In achieving this task, this paper is divided into six sections. Section 1 forms the introduction, the second section is the literature review, the third section is the theoretical framework, the forth section is the model specification, the fifth section is the estimation technique and the sixth section demonstrates the empirical results and discussion of findings, policy implications and conclusion.

2. Brief literature review

The theoretical strand through which external credit affects economic growth of developing economies has been studied extensively. Such studies include Adediran et al. (2017a, 2017b), Emecheta and Ibe (2014), Fapetu and Obalade (2015), Isibor, Ojo and Ikpefan (2018), Léon (2018), Li (2017), Ogun and Akinlo (2010), Olowofeso, Adeleke and Udoji (2015), Oluitan (2012) and Song and Ryu (2016) to mention a few. However, there is no consistency in the findings of these studies for developing economies as could be found in developed economies (Aysun, 2016; Bernanke & Gertler, 1989; Gilchrist & Zakrajsek, 2012; Kim & Sohn, 2017; Meeks, 2009). Thus, the great recession that followed the last global financial crisis has increased interest in assessing the real effects of changes in external credit. This creates a gap, which generates incentive for more enquiries into the impact of external credit on emerging economies. This study, therefore, seeks to examine the short- and long-run effects of flow of external credit on economic growth in Nigeria, which may have important policy implications for designing stable economic plan for both Nigeria and other proximate economies.

In the reviewed literature in Nigeria, although many studies assessed the relationship between credit shocks and economic growth, however, different sample periods and choice of variables gave different results. Several of these studies did not account for the effect of the external credit shocks which has a major role to play in economic growth. For example, Akpansung and Babalola (2010) examined the relationship between banking sector credits and economic growth in Nigeria within the sample period of 1970–2008. Granger causality test and two-stage least squares techniques were employed to empirically examine this relationship. They find a unidirectional relationship between GDP and private sector credits as well as industrial production index and GDP. Their empirical results showed that private sector credit impacted positively on economic growth, while lending rate had a negative effect on growth. Though the study suggests more credit to be allocated to the private sector with minimal interest rate to enhance economic growth, the study did not account for the fact that increase in money supply without effective policy initiative can trigger inflation.

Onuorah and Anayochchukwu (2013) investigated the relationship between bank credit and economic growth between 1980 and 2011 using the vector autoregressive (VAR) model and causality test. They find that all the variables are integrated of order 1 and that a long-run relationship exists amongst the variables in the study. The study also shows that a unidirectional relationship exists amongst all the measures of bank credits and GDP with the direction of causality running from GDP to total production, bank credit, total general commerce bank credit,

total services bank credit and other banks credit. The result shows that a short-run relationship exists between measures of bank credits and GDP. Hence, the study recommends supervision of banks and the total overhaul of the bank credit activities to encourage new investors and to stimulate economic growth. There are still controversies surrounding stationarity test when using VAR, while the study failed to demonstrate the impulse response function, basing their findings only on VAR which is atheoretic might have biased the results.

Yakubu and Affoi (2013) analysed the impact of commercial bank credits on economic growth in Nigeria using ordinary least square (OLS) within the period 1992–2012. They discover that commercial bank credits had a significant effect on economic growth in Nigeria and, therefore, recommend that a better and stronger credit culture should be promoted and sustained, among others. Similarly, Balago (2014) examined the relationship between financial sector development and economic growth in Nigeria using time series data from 1990 to 2009 and various econometric techniques. He finds that development in financial sector variables like banking sector credits, total market capitalization and FDI positively affect the economic growth. The sample period of less than 30 years as used by Yakubu and Affoi (2013) and Balago (2014) when not using autoregressive distributed lag (ARDL) cointegration approach might have biased their findings under valid econometrics assumptions.

Emecheta and Ibe (2014) investigated the impact of bank credits on economic growth in Nigeria between 1960 and 2011 using reduced form of VAR technique. The results show that bank credits to the private sector and broad money were positively related with economic growth within the period of study and were also significant. According to the study, the behaviour of the other explanatory variables was relevant in forecasting the trend of economic growth, this means that bank consolidation and recapitalization exercise was a welcome development. Therefore, further steps should be taken to ensure the stability of the banking sector. Akujuobi and Chimaijemr (2012) investigated the effect of commercial bank credit to the sub-sectors of the production units on growth within the period 1960–2008. They find that there is a long-run relationship amongst the variables. More so, the study revealed that credits to agriculture, forestry and fishery, manufacturing, as well as real estate and construction are inversely related with growth and also insignificant. Credit to the mining and quarrying sub-sector has a significant positive effect on growth. According to their results, there exists a weak as well as strong significant relationship between commercial bank and merchant bank lending on economic growth.

Baskaya, Giovanni, Kalemli-Ozcan, Peydro and Ulu (2017) examine the role of the international credit channel in Turkey over 2005–2013. The study shows that larger and more capitalized banks with higher non-core liabilities increase credit supply when capital inflows are higher. This result is stronger for domestic banks relative to foreign banks and survives during the crisis period of post-2008, when foreign banks in general stop lending in emerging markets and retreat to their home countries. By decomposing capital inflows into bank and non-bank flows, the study shows the importance of domestic banks' external borrowing for domestic credit growth.

Alberola and Benigno (2017) examine the response of a three-sector commodity-exporter small open economy to a commodity price boom. When the economy has access to international borrowing and lending, a temporary commodity price boom brings about the standard wealth effect that stimulates demand and has long-run implications on the sectoral allocation of labour. If dynamic productivity gains are concentrated in the traded good sector, the commodity boom crowds out the traded sector and delays convergence to the world technology frontier. Financial openness, by stimulating current demand, amplifies the crowding out effect and may even lead to a growth trap, in which no resources are allocated to the traded sector. From a normative point of view, the analysis of the study suggests that capital account management policies could be welfare improving in those circumstances.

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Fernandez, Schmitt-Grohe and Uribe (2017) use SVAR models that include a single world price. The study predicts that world shocks explain a small fraction of movements in domestic output typically less than 10%. This study further presents an empirical framework in which multiple commodity prices transmit world disturbances. Estimates on a panel of 138 countries over the period 1960–2015 indicate that world shocks explain on average 33% of output fluctuations in individual economies. This figure doubles when the model is estimated on post-2000 data. The findings reported here suggest that one-world-price specifications significantly underestimate the importance of world shocks for domestic business cycles. This finding is consistent with Fernandez et al. (2017), who estimate that a country-specific commodity price measure explains about 50% of aggregate fluctuations in Brazil, Chile, Colombia and Peru over the period 2000–2014. It is also consistent with the findings of Shousha (2015), who documents that in a group of advanced and emerging commodity exporters, world price shocks played a major role in driving short-run fluctuations since the mid-1990s.

Giordani, Ruta, Weisfeld and Zhu (2017) focus on the coordination problem among countries imposing controls on capital inflows. In a simple model of capital flows and controls, the study shows that inflow restrictions distort international capital flows to other countries and that, in turn, such capital flow deflection may lead to a policy response. It then tests the theory using data on inflow restrictions and gross capital inflows for a large sample of developing countries between 1995 and 2009. The estimation yields strong evidence that capital controls deflect capital flows to other countries with similar economic characteristics. Notwithstanding these strong cross-border spillover effects, the study does not find evidence of a policy response.

Akujuobi and Chimaijemr (2012) and Fapetu and Obalade (2015) made significant attempt to examine the impact of sectoral credits allocation on economic growth. While the study by Akujuobi and Chimaijemr adopted cointegration approach and also considered the impact of merchant bank lending in their study within the period 1960–2008, Fapetu and Obalade (2015) segmented the impact of these credit periods of intensive regulation, deregulation and guided deregulation regimes between 1960–1985, 1986–1995 and 1996–2010, respectively, using OLS method. Against this background, this study adopts a multivariate model framework called ARDL approach, as proposed in Pesaran, Shin and Smith (2001) to assess the influence of monetary policy on external credit and economic growth nexus in Nigeria.

3. Theoretical framework

The study adopts the Cobb–Douglas production function, where output is a function of inputs. This provides the theoretical foundation for the study as it links capital input to economic activities. Such specification has earlier been applied by Lucas (1988), Kiyotaki and Moore (1997) and Bernanke, Gertler and Gilchrist (1999) and is specified as follows:

$$Y_t = A_t K_t^{\alpha_1} L_t^{\alpha_2} X_t P_t \qquad (3.1)$$

where Y_t is the output, A is the total factor productivity, K is the capital stock, L is the labour input, X_t is a row vector, P_t is a row vector and α_1 and α_2 are the elasticities. Following the mathematical linearization of Equation (3.1), the model becomes

$$\ln rgdp_t = \alpha_0 + \alpha_1 \ln kap_t + \alpha_2 \ln lfpr_t + \sum_{i=3}^{4} \alpha_i \ln(X_t) + \sum_{j=5}^{6} \alpha_j \ln(P_t) + \varepsilon_t \qquad (3.2)$$

where $rgdp_t$ is the growth rate of real GDP, kap_t is the stock of capital, $lfpr_t$ is the labour force participation rate which is the proxy for labour input, X_t is a row vector, such that $X_t = (mpr_t, crr_t)$, and P_t is a row vector, such that $P_t = (tsoc_t, tfoc_t)$.

where expression (3.2) can be explicitly written as

$$\ln rgdp_t = \alpha_0 + \alpha_1 \ln kap_t + \alpha_2 \ln lfpr_t + \alpha_3 \ln mpr_t + \alpha_4 \ln crr_t + \alpha_5 \ln tsoc_t + \alpha_6 \ln tfoc_t$$
$$+ \varepsilon_t \qquad (3.3)$$

where the variables in expression (3.3) are described as follows:

(1) Real gross domestic products (rgdp): Literature evidence suggests that countries experience cycles that can be tracked by annual growth rate of real GDP. Hence, the growth of economy, measured by growth of real GDP, gets the attention of researchers and policy-makers for its provision of broader coverage of the economy. Economy growth is achieved through increased production of goods and services resulting from increased demand for resources.

(2) Capital input (Kap): Gross fixed capital formation is the proxy for capital input (cap). The empirical study of Chandran and Krishnan (2008) emphasises the relevance of capital input to economic growth. For high long-run growth to occur along external shocks (as witnessed in Nigeria) requires the ability of both the government and private sectors to investment more in capital input at all time.

(3) Labour force participation rate (lfpr) is the proxy for labour input. Since the model is a production function, the inclusion of this variable is necessary due to its importance as a factor input in total production which is GDP.

(4) Monetary policy rate (mpr): This measures the rate at which the central bank lends to the commercial banks. The monetary policy rate as proxy for interest rate is the basic rate upon which other rates revolve in a mixed country like Nigeria and is a proxy rate for short-term interest. An increase in interest rate is expected to have negative impact on banks asset quality as lending becomes more expensive to borrowers, this reduces their debt servicing ability. This rate further affects the rate at which commercial banks are willing to lend to the non-bank public. This interest rate affects the cost of credit for investment in an economy and hence, the money supply.

(5) Cash reserve requirement (crr): This is a specified minimum fraction of the total deposits of customers, which commercial banks have to hold as *reserves*, either in *cash* or as deposits with the central bank. It is a credit policy instrument that can play an important role during a global credit crisis, most especially for emerging economies like Nigeria. Emerging economies attract abundant foreign investment in the form of FDI portfolio investment and other inflows. In the period of adverse external credit shock, there might be a "sudden stop" of these inflows in the country (Calvo, Izquierto, & Mejia, 2004), or larger outflows due to the global tightening, leaving the economy in recession. Thus, it can be used to increase the quantity of credit, stimulate investment and reduce adverse effect of credit shocks.

(6) Total stock of external credit (tsoc): This is an important variable for economic output, it is related to the stock of capital, which in turn determines the level of potential real GDP in an economy. The gap of domestic savings and investment is lagged behind and external inflows of credit play an important role in economic growth. However, focusing basically on credit stock may miss the developments in credit flow, which is important for understanding credit shocks.

(7) Total flow of external credit (tfoc): Real GDP growth is expected to be more related to changes in credit flow rather than credit flow. The focus of the study is on changes in credit flow relative to economic activity, due to the fact that the behaviour of credit flow can differ from changes in credit stock.

Having expressed a link between external credit shocks and domestic real economic activity, using the variant of neoclassical model, the study made use of ARDL modelling approach to situate the case of Nigeria.

4. Model specification

Arising from the theoretical foundation of the study which demonstrates the link between capital input and economic activities, the study further used ARDL cointegration approach to explain and assess the influence of monetary policy tools on external credit and economic growth nexus in

Nigeria. This approach is also called bounds test as proposed in Pesaran et al. (2001). This cointegration test is more reliable as compared to Johansen and Juselius (1990) and OLS among other methods, as it does not pose a strict classification of regressors to be of the same order of integration. Following Pesaran et al. (2001), the study characterized the production function for the general framework for the ARDL model as

$$rgdp_t = f(kap_t, lfpr_t, mpr_t, crr_t, tsoc_t, tfoc_t) \tag{4.1}$$

where *rgdp* represents the Nigerian real GDP growth rate, *kap* is the capital input, *lfpr* is labour force participation rate, which is labour input, *mpr* is the monetary policy rate, *crr* is the cash reserve requirement, *tsoc* is the total stock of external credit to Nigeria and *tfoc* represents total flow of external credit to Nigeria. Although analysing the influence of some other variables including financial depth and institutional development could be interesting, but quality and reliable data from World Development Index and Nigerian Statistical Bulletin on the series of the variables used proved sufficient. Hence, from Equation (4.1), the explicit form of the specification can be written as an ARDL [*p,q,r,s,v,w,x*] model such as

$$
\begin{aligned}
\Delta \ln rgdp_t = {} & a_0 + \sum_{i=0}^{p} a_{1i}\Delta \ln rgdp_{t-i} + \sum_{i=0}^{q} a_{2i}\Delta \ln kap_{t-i} + \sum_{i=0}^{r} a_{3i}\Delta \ln lfpr_{t-i} \\
& + \sum_{i=0}^{s} a_{4i}\Delta \ln mpr_{t-i} + \sum_{i=0}^{v} a_{5i}\Delta \ln crr_{t-i} + \sum_{i=0}^{w} a_{6i}\Delta \ln tsoc_{t-i} \\
& + \sum_{i=0}^{x} a_{7i}\Delta \ln tfoc_{t-i} + c_1 \ln rgdp_{t-i} + c_2 \ln kap_{t-i} + c_3 \ln lfpr_{t-i} \\
& + c_4 \ln mpr_{t-i} + c_5 \ln crr_{t-i} + c_6 \ln tsoc_{t-i} + c_7 \ln tfoc_{t-i} + \varepsilon_t
\end{aligned}
\tag{4.2}
$$

where Δ is the first difference operator and $\ln$ is for the natural logarithm of the respective variables in the model. From Equation (4.2), it was tested if $\ln rgdp$ is co-moving with the regressors. In the ARDL model, the study tested if real GDP growth rate is co-moving with the independent variables. To test the absence of a long-run relationship between $\ln rgdp$ and the regressors, the study restricted the coefficients of $c_1, c_2, c_3, c_4, c_5, c_6$ and c_7 to be zero against the alternative by conducting a restricted *F*-test. Therefore, the null and alternative hypotheses are expressed as follows:

$H_0 : c_1 = c_2 = c_3 = c_4 = c_5 = c_6 = c_7 = 0$ (no long-run relationship between $\ln rgdp$ and the regressors)

$H_1 : c_1 \neq c_2 \neq c_3 \neq c_4 \neq c_5 \neq c_6 \neq c_7 \neq 0$ (there is long-run relationship between $\ln rgdp$ and the regressors)

Drawing from Pesaran et al. (2001), the asymptotic distribution of the test statistics is non-standard irrespective of whether the variables are integrated of order (0) or integrated of order (1). As a result of this, they computed two sets of asymptotic critical values where the first set assumes variables to be *I*(0) and the other *I*(1) which are regarded as lower-bound (LCB) and upper-bound (UCB) critical values, respectively. Decisions on whether cointegration exists between $\ln rgdp$ and its independent variables were then made based on the following criteria: Computed *F*-statistics > UCB: reject the null hypothesis; computed *F*-statistics < LCB: fail to reject the null hypothesis and computed *F*-statistics value between LCB and UCB: results are inconclusive (Chandran & Krishnan, 2008).

Once there is an evidence of cointegration among the variables, then $\ln rgdp$ and its independent variables have a stable long-run relationship. As a result, the study used the two-step strategy of the ARDL approach as proposed in Pesaran and Shin (1997) to estimate the long- and short-run coefficients (elasticities) of the specified model. Hence, the long-run estimation follows this ARDL [*p,q,r,s,v,w,x*] model:

$$\ln rgdp_t = a_0 + \sum_{i=0}^{p} a_{1i} \ln rgdp_{t-i} + \sum_{i=0}^{q} a_{2i} \ln kap_{t-i} + \sum_{i=0}^{r} a_{3i} \ln lfpr_{t-i}$$
$$+ \sum_{i=0}^{s} a_{4i} \ln mpr_{t-i} + \sum_{i=0}^{v} a_{5i} \ln crr_{t-i} + \sum_{i=0}^{w} a_{6i} \ln tsoc_{t-i} \qquad (4.3)$$
$$+ \sum_{i=0}^{x} a_{7i} \ln tfoc_{t-i} + \delta_t$$

Constructing an error correction mechanism (ECM) of the above equation to derive the short-run elasticities:

$$\Delta \ln rgdp_t = a_0 + \sum_{i=0}^{p} a_{1i} \Delta \ln rgdp_{t-i} + \sum_{i=0}^{q} a_{2i} \Delta \ln kap_{t-i} + \sum_{i=0}^{r} a_{3i} \Delta \ln lfpr_{t-i}$$
$$+ \sum_{i=0}^{s} a_{4i} \Delta \ln mpr_{t-i} + \sum_{i=0}^{v} a_{5i} \Delta \ln crr_{t-i} + \sum_{i=0}^{w} a_{6i} \Delta \ln tsoc_{t-i} \qquad (4.4)$$
$$+ \sum_{i=0}^{x} a_{7i} \Delta \ln tfoc_{t-i} + \psi ECM_{t-i} + \lambda_t$$

where the bs are the elasticities relating to the short-run dynamics of the convergence to equilibrium and ψ is the measure of the speed of adjustment. To estimate the model, the study used different lag length. To avoid the loss of degree of freedom, the maximum selection of lag did not exceed three. The akaike information criterion (AIC) was used to choose the appropriate lag length for the ARDL model.

5. Estimation technique
In the same vein, this study adopted the ARDL-bounds test approach popularized by Pesaran and Shin (1997) and Pesaran et al. (2001) to estimate the specified models and empirically analysed the long-run relationship and the dynamic interactions among the relevant variables. This approach, based on error correction model (ECM) technique, involves estimating the ARDL model by OLS in order to test for the existence of a long-run relationship among the relevant variables. This is done by estimating the ECM and testing whether the lagged levels of the variables in each equation are statistically significant or not. This further explains whether the null hypothesis of no long-run relationship is accepted or rejected.

6. Empirical results and discussion of findings
The estimation procedure began by conducting unit root test on the variables in the model. This enabled us to examine the time series property of the variables. There are several ways of testing for the presence of a unit root as proposed in macroeconomic literature. However, the study adopted the Phillips–Perron (PP) test. The PP test is sensitive to the structural change in the mean of a stationary variable which is captured in the test, in order to avoid bias in the usual unit root test towards non-rejection of the null of unit root (Phillips & Perron, 1988). Using the PP method, all the series became stationary at first difference $I(1)$, as the series were not all stationary at level $I(0)$. Table 1 presents the summary of PP unit root test of the series.

The results as indicated in Table 1 show that not all the variables were stationary at levels since the absolute values of the PP test did not exceed the critical value at 5% level of significance except for *lcrr* and *lrgdp*, but the same became stationary at first differencing, which is the main procedure for using ARDL.

6.1. Cointegration test using bounds test approach
Having conducted the unit root test as indicated in the previous subsection, the study rests on the assumption that the variables are $I(0)$ and $I(1)$ as indicated in Table 2. Hence, to estimate the bounds test model, appropriate maximum lag length of 2 was chosen to avoid loss of degree of freedom. The lag length was chosen using AIC. Based on the bounds test result in Table 2, the computed F-statistic of 7.22 exceeds the upper-bound critical value of 3.61 at 5% significance

Table 1. Unit root @ 5% level of significance with constant

Variable	Log level				Log first difference			
	PP observed values	PP critical values	Order of integration	Remark	PP observed values	PP critical values	Order of integration	Remark
Lrgdp	−14.186	−12.500	I(0)	Stationary	–	–	–	–
Ltsoc	−8.529	−12.820	I(0)	Non-stat.	−24.989	−12.788	Stationary	I(1)
Lmpr	−11.367	−12.788	I(0)	Non-stat.	−38.346	−12.756	Stationary	I(1)
Lcrr	−19.442	−12.820	I(0)	Stationary	–	–	–	–
Ltfoc	−2.0875	−2.9484	I(0)	Non-stat.	−4.3122	−2.9511	Stationary	I(1)
Lkap	−3.569	−12.788	I(0)	Non-stat.	−22.844	−12.756	Stationary	I(1)
Llfpr	−5.214	−12.788	I(0)	Non-stat.	−24.100	−12.756	Stationary	I(1)

Note: The optimal lag length was chosen using Newey–West (1994) automatic lag selection, and non-stat.: non-stationary.

Source: Authors' computation.

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Table 2. Cointegration test based on bounds test				
Test statistic	**Value**	**K**		
F-statistic	7.221392	6		
Critical value bounds				
Significance	I0 bound	I1 bound		
10%	2.12	3.23		
5%	2.45	3.61		
2.5%	2.75	3.99		
1%	3.15	4.43		

Source: Authors' computation.

level. This indicates the rejection of the null hypothesis of no cointegration between *lrgdp* and the regressors. This established the fact that there is a strong indication that *lkap, llfpr, lmpr, lcrr, ltsoc* and *ltfoc* serve as the long-run forcing variables in explaining the growth of the Nigerian economy.

6.2. Estimated long-run coefficients using ARDL approach
Table 3 shows the estimated long-run coefficients for ARDL model. In the long-run, capital input (KAP) at 10.33 *t*-statistic value was found to have a positive value on the economic output of Nigeria. In the same vein, labour force participation rate (LFPR) which is used to measure labour input has a significant positive impact on the economic output with a value of 3.70 at 5% level of significance. Monetary policy rate (MPR) was found to be positively related to economic growth but is not statistically significant, while cash reserve requirement (CRR) is positively and statistically significant at 1.99. The contribution of total stock of credit (TSOC) towards economic growth is positive and statistically significant at 5% level of significance. This is unlike total flow of credit (TFOC) which has a negative impact on economic output but was statistically significant.

In Table 4, the statistically significance of the ECM at −0.23 confirms the presence of long-run equilibrium between economic growth and the independent variables namely KAP, LFPR, LMPR, CRR, TSOC and TFOC. This also confirms the previous ARDL cointegration analysis results. It is found that the ECM value is between 0 and −1 and is statistically significant at 5% level of significance. This implies that error correction mechanism converges to the equilibrium path slowly.

6.3. Summary of findings
Economic growth of developed economies can be relatively determined by some endogenous factors, which include capital market stability and economic buoyancy. This by extension has positive impact on associated developing economies. This is not surprising as economic buoyancy of developed economies may normally transmit certain economic benefits, as well as economic disturbances, to their developing partners. This is related to the previous studies by Han (2012),

Table 3. Estimated long-run coefficients @ 5% level of significance				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
LOG(KAP)	1.117323	0.108196	10.326848	0.0000
LOG(LFPR)	−64.71322	17.450040	3.708835	0.0100
LOG(LMPR)	0.078795	0.883909	0.089144	0.9319
LOG(CRR)	0.591486	0.315713	1.993493	0.1001
LOG(TSOC)	0.975861	0.360047	2.710374	0.0351
LOG(TFOC)	−0.490972	0.155810	−3.151087	0.0198
C	224.159264	65.074763	3.444642	0.0137

Source: Authors' computation using E-views 9.

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Table 4. Autoregressive distributed lag (ARDL)—ECM				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
DLOG(RGDP(−1))	−0.529857	0.223132	−2.374637	0.0552
DLOG(RGDP(−2))	−0.389578	0.179828	−2.166392	0.0734
DLOG(KAP)	0.077508	0.041338	1.874994	0.1099
DLOG(KAP(−1))	0.046005	0.033796	1.361257	0.2223
DLOG(KAP(−2))	−0.111478	0.042964	−2.594678	0.0410
DLOG(LFPR)	3.299557	1.296022	2.545912	0.0437
DLOG(LFPR(−1))	4.556530	2.015643	2.260584	0.0645
DLOG(LMPR)	−0.017426	0.049759	−0.350205	0.7382
DLOG(LMPR(−1))	0.125397	0.064866	1.933163	0.1014
DLOG(LMPR(−2))	−0.128049	0.052638	−2.432619	0.0510
DLOG(CRR)	−0.120602	0.042981	−2.805908	0.0309
DLOG(CRR(−1))	−0.054696	0.024652	−2.218691	0.0683
DLOG(CRR(−2))	0.049811	0.022764	2.188153	0.0713
DLOG(TSOC)	0.127117	0.027112	4.688589	0.0034
DLOG(TSOC(−1))	0.055343	0.035268	1.569213	0.1676
DLOG(TFOC)	−0.013196	0.003019	−4.370914	0.0047
DLOG(TFOC(−1))	0.014597	0.005797	2.517872	0.0454
DLOG(TFOC(−2))	0.014740	0.005642	2.612487	0.0400
Ecm_{t-1}	−0.231089	0.038895	−3.370314	0.0150

Ecm_{t-1} = LOG(RGDP) − (1.1173 × LOG(KAP) − 64.7193 × LOG(LFPR) + 0.0788 × LOG(LMPR) − 0.5915 × LOG(CRR) + 0.9759 × LOG(TSOC) − 0.4910 × LOG(TFOC) + 224.1593

R-squared	0.967320	Mean dependent var	0.050193	
SE of regression	0.014618	Akaike info criterion	−5.662151	
Sum squared resid	0.001282	Schwarz criterion	−4.471240	
Log likelihood	116.5944	Hannan–Quinn criter	−5.267398	
F-statistic	7.103872	Durbin–Watson stat	2.248597	
Prob (*F*-statistic)	0.010728			

Source: Authors' computation.

Helbling, Huidrom, Kose and Otrok (2011) and Obafemi and Ifere (2015), although those studies are centrally on developed economies.

In addition, the results obtain by this study have demonstrated the capacity of the Nigerian economy to accommodate and attract external credit and capital inflow to address the saving–investment gap in the economy. This is also expected, as the expansion of the external economy has the tendency to induce real output growth in Nigeria. In view of the above findings and explanations, it is remarkable to justify that the study has provided evidence to support the argument that external economy has the tendency to transmit credit shocks to a small open economy. Elekdag and Han (2015) reported similar situation for some Asian economies.

6.4. Policy implications and conclusion
The study corroborates theoretical evidences and charts a new course for empirical macroeconomic researches in intimating stakeholders in Nigeria and emerging economies on the consequences of adverse effect of external credit shocks on economic growth. Hence, Nigeria and other emerging economies should be able to mitigate the adverse effects of external credit shocks using appropriate monetary policy tools, especially cash reserve requirement. This is consistent with

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studies like Han (2012) and Elekdag and Han (2015), which explain that the effects of adverse external credit shocks can be mitigated by domestic credit policy easing.

The Nigerian economy attracts abundant foreign investments including portfolio and FDI. In the case of an adverse credit shock, emanating from their foreign trade and financial partners, there could be a sudden stop or huge reduction of foreign investments in an economy or large capital outflows due to global credit tightening, which may leave the host economy in recession, as experienced by many economies during the last global financial crisis. As a result of this, interest rate policies might not work well, simply because, if the monetary authority tries to stimulate investment by lowering MPRs, there could be larger capital outflows. On the other hand, if the monetary authority eases the credit policy through cash reserve requirement, this can reduce credit constraint and expand domestic credit supply. These would make up for the decreased external capital and stimulate investment, leaving the domestic economy less affected. Also, when the economy is overheating, the monetary authority could restrict quantity of credit quantity supplied.

Therefore, cash reserve requirement, which is credit policy easing, is significant in growing the Nigerian economy, as compared to other monetary policy tools. However, stakeholders should be rather cautious in implementing the suggested credit policy easing. Directly increasing the quantity of credit might be associated with the problem of moral hazard. For instance, Nigeria commercial banks are often accused of having large amount of non-performing loans. Hence, it would be imperative for the regulatory authority to concentrate more on their oversight functions, so as to help financial institutions improve their management and risk evaluation. Nevertheless, in the period of economic crises, if credit policy easing is properly implemented, it could be effective to offset adverse external credit shocks.

The results arising from this study would assist in policy formulation of structural economic policies that are capable of mitigating the adverse effect of external credit shocks on economic growth in developing and emerging market economies. Hence, the study provides useful insights on the effect of some policy options and how they can help stabilize economic growth and address economic disturbances.

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