An Empirical Analysis of Real Deposits in Nigeria

Mohammed Shuaibu
Department of Economics, Ahmadu Bello University
Zaria Kaduna, Nigeria
mohammed_shuaibu@yahoo.com

Abstract: *The difference between estimated parameters of money supply and currency-deposit ratio is used to examine the behaviour of real deposits in Nigeria between 1960 and 2012. This is done using unrestricted error correction modelling within the bounds testing approach to cointegration proposed by Pesaran et al. (2001). Our findings revealed that inflation, real income and interest rates remain major factors influencing real deposit dynamics in Nigeria. Interestingly, financial innovation measured by the ratio of credit to the private sector and GDP was found to increase real deposits by 0.014% while the shadow economy accounted for the 0.96% fall in real deposits recorded. While interest rate and inflation remain quantitatively important in explaining long-run real deposit behaviour in Nigeria, our finding further underscores the need for monetary authorities to mainstream the informal sector into the financial system given the significant negative influence the shadow economy exerted on real deposits.*

Keywords*: Money Demand; Currency-Deposit Ratio; Real Deposit; Cointegration; Error Correction Model;*

JEL Classification*: E41, E51, G21*

Article History
Submitted: 15 October 2014
Resubmitted: 7 November 2014
Resubmitted: 23 January 2015
Accepted: 9 April 2015

http://dx.doi.org/10.14706/JECOSS15522

Introduction

A requisite component of economic growth and development is a well-functioning financial system characterised by a banking sub-sector that efficiently intermediates between surplus and deficit holders of funds. In a developing economy like Nigeria where the non-bank component of the financial sector is limited, problems in deposit money banks (DMBs) are instantly transmitted to the rest of the economy (Olofin and Afangideh, 2008). This is in view of the fact that commercial banks facilitate a bulk of financial transactions. Nevertheless, banking dominance of the Nigerian financial system has, however, dropped as controlled financial system assets fell from 90.5% in 2006 to 78.6% in 2011 (IMF, 2013).

The main sources of the banking liquidity in Nigeria are public and private sector deposits which DMBs transmit to deficit holders of funds. However, growth rate of deposits have been lopsided in recent times as the rate fell from 65% in 2008 to -11.3% and -1.6% in 2010 and 2012, respectively (International Monetary Fund, 2013). It follows therefore that a negative shock to the depositary base will inhibit the flow of credit, constrain development of domestic industries and adversely affect economic growth. Therefore, factors influencing savings' decisions of households and firms become important determinants of a stable banking sector with particular reference to its intermediation role.[i]

An assessment of real deposits has gained ample attention in the literature (See Tvalodze and Tchaidze, 2011 for Georgia; Kibet, Mutai, Ouma, Ouma and Owuor, 2009 for Kenya; Dadkhah and Rajen, 1988 for India; Felmingham and Qing, 2001 for Australia; Hasan, 2001 for China; Mutluer and Yasemin, 2002 for Turkey; Lucas, 1988 for US; Vega, 1998 for Spain). Similarly, the behaviour of real deposits has been analysed within the context of currency deposit ratio. In this regard, Khaskeli, Ahmed and Hyder (2013) analysed the behaviour and determinants of the currency deposit ratio in Pakistan based on the notion that an increase in currency in circulation reduces deposits and invariably, loanable funds. This is because an increase in the volume of currency in circulation implies that deposits are being withdrawn from the banks, which restrict their ability to meet investors' credit demand.

Research on the factors affecting real deposit creation in Nigeria is scanty, as inadequate attention has been given to the behaviour of real deposits with specific reference to the dynamic interaction of money supply and currency in circulation. The dominant strand of literature has focused on estimating the determinants and behaviour of real deposits (See Nwachukwu and Odigie, 2009; Odemero, 2012; Uneze, 2013; Nwachukwu and Egwaikhide, 2007, Nwachukwu, 2011) while some others have inferred real deposit behaviour on the basis of money demand models (See Aschani, 2010; Kumar, Webber and Fargher, 2010; Chukwu, Agu and Onah, 2010; Omotor, 2010; amongst others). It is against this background that this study departs from the literature by examining the behaviour of the real deposits in Nigeria by considering the difference between estimated broad money balance (money supply) and currency deposit ratio.[ii]

An investigation of the behavioural patterns of real deposits in Nigeria is expected to play a pivot role in formulating and fine-tuning financial sector and monetary policies, respectively. Notably, a major component of such policy considerations is increased transmission of funds to the real sector; particularly geared towards stimulating non-oil sector growth that has remained at the forefront of government's policy objectives over the years. For an emerging economy like Nigeria with high savings and investment gaps, enhanced real deposit is critical for sustained "trickle-down" growth. This is further exacerbated by the crucial role of domestic saving mobilisation in the sustenance of domestic saving-investment-growth chain in developing economies (Nwachukwu, 2011). Moreover, the level of domestic saving and its determinants will not only help ascertain the policy variables that should be considered in macroeconomic policy formulation, but stimulate the much needed credit for real sector development.

The empirical analysis is premised on annual data between 1960 and 2012. We utilise the bounds testing approach to cointegration, developed by Pesaran*et al.* (2001) within an autoregressive distributed lag (ARDL) framework, to test for a long-run level relationship. The bound testing approach has certain advantages in comparison to other cointegration procedures (such as Engle and Granger, 1987; Johansen and Juselius, 1990). Firstly, endogeneity problems and inability to test hypotheses on the estimated coefficients in the long-run associated with the Engle-Granger (1987) method are avoided. Secondly, the long and short-run parameters of the model in question are estimated simultaneously. Lastly, the approach is relieved of the burden of establishing the order of integration amongst the variables and of pre-testing for unit root. The study is organised as follows: Section two examines the trend and behaviour of real deposits in Nigeria while Section three discusses the related literature. Analytical framework and estimation techniques are explored in Section four while Section 5 concludes and highlights policy implications.

Facts about Real Deposits and its Potential Determinants

A remarkable development in the Nigerian financial sector that is directly related to real deposits formation is the recent increase in electronic (e-card transactions). The value and volume increased accordingly from 195,525,568 and N1,072.90 billion in 2010 to 355,252,401 and N1,671.4 billion in 2011, reflecting an increase of 81.5% and 55.8%, respectively. A plausible explanation for this jump is the increased confidence in electronic card payments. Data on various e-payment channels indicated that ATMs remained the most patronised, accounting for 97.8%, followed by web payments, 1.0 percent, Point-of-Sale (POS) terminals, and mobile payments, 0.6% each (Central Bank of Nigeria, 2011). Likewise, in value terms, ATMs accounted for 93.4%, web 3.5%, Point of Sale (POS) 1.9% and mobile payments, 1.2% (*ibid.*).

The Central Bank of Nigeria (CBN) annual report and statement of accounts 2011 revealed that the number of Automated Teller Machines (ATMs) stood at 9,640, while the volume and value of transactions amounted to 347,569,999 and N1,561.75 billion, at end-December 2011, respectively. According to the report, these figures reflected increases of 86.7% and 63.7%, respectively, over the volume and value of186,153,142

and N954.04 billion, in 2010.Likewise, the volume and value of mobile payments increased by 215.6 and 185.8% from1,156,553 and N6.7 billion to 3,649,374 and N19.0 billion, respectively, at end-December 2011.

The level of financial innovation may have accounted for the increased deposits recorded. Illustratively, aggregate financial savings rose by N427.9 billion or 6.7% to N6,858.5 billion, compared with N6,430.6 billion in 2010. The ratio of financial savings to GDP was 18.8%, compared with 32.9% in 2010. The DMBs remained the dominant depository institutions within the financial system and accounted for 95.2% of the total financial savings, compared with 92.6% in the preceding year. Other savings institutions, namely, the PMBs, life insurance funds, the pension funds, the Nigerian Social Insurance Trust Fund (NSITF), and microfinance banks accounted for the balance of 4.8%.

The depth of the financial system (M2 to gross domestic product ratio) fell to 36.4% down from the 42.7% and 39.5% recorded in 2009 and 2010, respectively while the ratio of private sector credit to gross domestic product (GDP) (bank financing of the economy) stood at 53.1% compared with the 58.8% observed in 2010. In addition, the intermediation efficiency indicator, as measured by the ratio of currency outside banks to broad money supply, at 9.4%, remained the same as at 2010.The ratio of financial savings to GDP declined to 17.9%, from 20.2% in the preceding year. The ratio of CIC to GDP (volume of cash in circulation) declined slightly to 4.3% from 4.7%recorded in 2008, 2009 and 2010. Similarly, the size of the DMBs' assets relative to the size of the economy, indicated by the ratio of DMBs total assets to GDP, declined slightly from 58.8% at end-December 2010 to 53.1% in 2011.

Figure 1. Monetary Aggregates and Measures of Financial/Banking Developments

Aggregates (N' Billion)	2006	2007	2008	2009	2010	2011
Nominal GDP	18,709.6	20,657.3	24,296.3	24,712.7	29,108.0	36,531.9
Broad money (M2)	4,027.9	5,809.8	9,166.8	10,767.4	11,488.7	13,300.3
Quasi Money (Savings)	1,747.3	2,693.6	4,309.5	5,763.5	5,954.3	6,531.9
Currency in circulation (CIC)	779.3	960.8	1,155.3	1,181.5	1,378.0	1,565.8
Currency Outside banks (COB)	650.9	737.9	892.8	927.2	1,082.2	1,244.8
Credit to Private Sector (CPS)	2,650.8	5,056.7	8,059.5	10,206.1	9,703.7	12,934.3
DMBs Assets	7,172.9	10,981.7	15,919.6	15,522.9	17,331.6	19,396.6
CBN Assets	10,034.5	8,689.0	10,204.0	8,898.4	8,767.7	15,796.1
Banking System Assets	17,207.4	19,670.7	26,123.5	27,726.8	26,230.0	28,164.3

Monetary Ratio (%)						
M2/GDP	21.5	28.1	37.7	43.6	39.1	36.4
CIC/ M2	19.3	16.5	12.6	11.0	12.0	11.8
COB/ M2	16.2	12.7	9.7	8.6	9.4	9.4
Quasi Money/ M2	43.4	46.4	47.0	53.5	51.7	49.1
CIC/GDP	4.2	4.7	4.8	4.8	4.7	4.3
CPS/GDP	14.3	24.5	33.2	41.3	58.8	53.1
CPS/Non-Oil GDP	13.7	38.5	55.4	67.2	50.2	58.7
DMBs Assets/GDP	22.1	53.2	65.5	70.9	58.8	53.1
CBN's Assets/GDP	38.3	48.6	35.8	41.3	30.2	24.0
BSA/GDP	23.6	95.2	107.5	112.2	88.9	77.1
FS/GDP	92.0	12.9	17.5	22.8	20.2	17.9

Source: Central Bank of Nigeria Annual Report and Statement of Account (2008, 2011)

Although the Nigerian financial sector has particularly in the last decade evolved, many questions regarding real deposit formation and its underlying determinants remain unanswered. Although banking reforms undertaken in 2004 (banking sector consolidation) and the progress made subsequently in the regulatory framework with respect to enhanced risk management have led to a stable financial sector, real deposits have remained relatively low recording only marginal increments. Stable growth as well as improvement in governments' fiscal position has mitigated the economy's exposure to risks. This has resulted in the financial sector being a major driver of the Nigerian economy even in the absence of requisite credit to finance real sector funding deficit.

Review of Related Literature

There is a huge pool of studies relating to money demand and currency-deposit that to assess their determinants. Some authors have focused on estimating money demand functions such as Odularu and Okunrinboye (2009), Achsani (2010), Kumar, Webber and Fargher (2010), Chukwu, Agu and Onah (2010), Omotor (2011), Tvalodze and Tchaidze (2011)found an the existence of a stable money demand functions. However, efforts by Nwachukwu and Odigie (2009), Uneze (2013), Odemero (2012), Kibet*et al.* (2009), Nwachukwu and Egwaikhide (2007), Khaskheli*et al.* (2013) and Nwachukwu (2011) have also estimated deposit equations to ascertain its driving factors.

Nwachukwu and Egwaikhide (2007) examined the determinants of private saving in Nigeria by comparing estimation outcomes of an error correction model with results from partial adjustment, growth rate and static models. Based on their findings, they conclude that the error correction model performs better than the other models. Its results reveal that saving rate rises with the level of disposable income but falls with

the rate of growth of disposable income. The real interest rate on bank deposits has a significant negative impact while public saving did not crowd-out private saving. Furthermore, external terms of trade, inflation rate and external debt service ratio had a positive impact on private saving.

Kibet*et al*. (2009) also investigated the underlying factors that influence savings among groups- teachers, entrepreneurs and farmers- in rural parts of Nakuru District of Kenya. The sample comprised of 359 teachers, entrepreneurs and farmers which, were selected through multi-stage sampling technique from seven rural administrative divisions of the district. Using least squares method the study found that type of occupation, household income, age and gender of household head, level of education, dependency ratio, service charge determine household saving, transport costs and credit access.

Finger and Hesse (2009) examined the determinants of commercial bank deposits in Lebanon. They found that domestic factors such as economic activity, prices, and the interest differential between the Lebanese pound and the U.S. dollar are significant in explaining deposit demand, as are external factors such as the economic and financial conditions of developed countries as well as variables that measure the availability of funds in the Gulf. Impulse response functions and variance decomposition analyses underscore the relative importance of the external variables.[iii]

Nwachukwu and Odigie (2009), predicated on the life cycle hypothesis, examined the determinants and trend of private saving in Nigeria during the period 1970 – 2007 by considering the effects of a group of policy and non-policy variables on private saving (income growth, interest rate, fiscal policy, and financial development). Relying on error correction modelling approach, the results revealed that saving rate rises with both the growth rate of disposable income and real interest rate on bank deposits. However, public saving seems not to crowd-out private saving while the degree of financial depth was found to have a negative but insignificant impact on saving.

Odularu and Okunrinboye (2009) tried to ascertain whether financial innovations that occurred in Nigeria after the SAP of 1986 affected the demand for money in Nigeria using Engle and Granger two-step cointegration technique. While the study revealed that income is positively related to the demand for cash balances and interest rate inversely related to demand for real cash balances, it also showed that the financial innovations have not significantly affected demand for money in Nigeria. This may be attributed to the fact that a financial innovation does not directly affect money demand and the expected channel of effect is through real deposits. This issue was addressed by Tvalodze and Tchaidze (2011) in their study of deposit formation in Georgia. The authors modelled the demand for the real broad money balances and the cash-deposit ratio between the period 1996 and 2009. Their findings suggested that the main factors that affected deposits were income, development of the financial sector and changes in the tax burden, while changes in the interest rate and inflation played a minor role. The results also showed that geopolitical events affect banking sector confidence.

Nwachukwu (2011) discusses the trend in Nigerian saving behaviour and reviews policy options to increase domestic saving. It also examined the determinants of private saving in Nigeria during the period1970–2010. Employing error correction modelling, the study revealed that saving rate rises with both the growth rate of disposable income and the real interest rate on bank deposits. The result also revealed that public saving did not crowd out private saving; suggesting that government policies aimed at improving the fiscal balance has the potential of bringing about a substantial increase in the national saving rate. The degree of financial depth had a negative but insignificant impact on saving behaviour in Nigeria.

Odemero (2012) investigated the dual determinants of savings mobilisation among agri-business entrepreneurial self- help groups in Edo state, Nigeria and data for the study was based on questionnaires issued to 96 agro-allied businesses. The data was analysed using descriptive statistics (percentages, mean, and other statistical tools) and inferential statistics (multiple regression analysis). The result showed that interest rate, farm income and age distribution of savers significantly (5%) contributed to saving mobilisation.

Uneze (2013) assessed how socio-economic factors of farmer-members of cooperative in agricultural group lending scheme influence their decisions to make financial savings with their cooperatives. The focus of the study was on Anambra state and data was sourced from 296 farmer-members of cooperative societies randomly selected from National Programme for Food Security (NPFS) and Rural Finance Institution Building Programme (RUFIN) agricultural group lending schemes. The study relied on descriptive statistics such as frequency distribution, percentages and means to analyse the data. The results showed that about 43.1% of the total variation in deposit mobilisation was explained by the 10 socio-economic variables included in the model. The significant variables affecting deposit mobilisation in cooperatives by farmers in the group leading scheme were value of assets, off-farm income, age of household head, level of farm diversification and total value of farmer's loan.

Khaskheli et al. (2013) assessed the driving factors underlying the significant increase in currency deposits ratio since. The authors found a negative relationship between currency and total private sector deposits which confirmed that an increase in currency depletes deposits, which in turn inhibits economic growth by restricting supply of loanable funds. Digging further, using graphical analysis, they attempt assess determinants of currency deposits ratio and revealed that inflation, government budgetary borrowing, industrial production index, investment in national saving schemes, remittances inflow, and wheat procurement were found to be the prominent factors behind increasing currency deposits ratio.

Nwankwo, Ewuim and Asoya (2013) assessed the effect of cooperatives on the savings behaviour of members in Oyi LGA of Anambra State Nigeria with data from 195 randomly selected members of various credit cooperatives. Utilising descriptive and multiple regression analysis the study showed that cooperative membership had a positive impact on savings behaviour of members. The study found that older members

had more savings than newer members. The marginal propensity to save (MPS) of 9.3% was significant as it showed that rural dwellers were more inclined towards saving. Length of membership in cooperative was also found to be an important determinant of savings thus confirming that older members saved more.

Methodology

Analytical Framework and Model Specification

Economic theory gives no a priori specification as to the correct functional form of the demand for money relation (Mills, 1978). Nevertheless, the foundation of money demand functions is rooted in the simple money demand model which postulates that demand for money depends on income and is algebraically expressed as:

$$M_i = M_i(Y)$$

Invoking the Keynesian approach and including interest rate (r) as a measure of the implicit cost of holding real cash balances rather than a wide range of interest-bearing assets as well as income (Y), as a measure of the transaction demand for money yields;

$$M_i = M_i(Y, r)$$

Taking the logarithm results in

$$lnM_i = ln\alpha_0 + ln\alpha_1 Y\text{-}ln\alpha_2 \mathrm{r}$$

This implies that the demand for real balances (M) is a function of income and interest rate. Apriori, $\frac{\partial M}{\partial r} < 0$ and $\frac{\partial M}{\partial Y} > 0$

While this approach has been adopted in various studies, it independently and explicitly fails to account for factors affecting households' savings decisions which are important determinants of overall financial system stability. As noted by Tvalodze and Tchaidze (2011), decisions made by households and firms on allocation of financial resources are significantly affected by the country's economic conditions and subsequently, depositors' behaviour based on these decisions, impacts on liquidity available to DMBs. This invariably affects the stability of the financial sector. Ezema (2009) noted that in the Nigerian monetary policy framework, although the currency-deposit ratio is a function of the cash preferences of the economic agents, it may be sensitive to interest rate movements. In this regard, Cagan (1965), Boughton and Elmus (1979), Dadkhah and Rajen (1988), Hasan (2001) examined the behaviour of currency-deposit ratio considering the role of interest rates and income..

This study is predicated on the following identity:

RD = RBM - CDR (1)

Where denotes real deposits while RBM and denote real money balances and curren-

cy-deposit ratio, respectively. Real broad money balance (is modelled as a decreasing function of interest rate (r) and an increasing function of income (Y) and is presented as;

$$RBM = F(Y, r);\ F_Y > 0, F_r > 0^{iv} \quad (2)$$

However, we adopt the specification of Tvalodze and Tchaidze (2011) by augmenting equation 2 with inflation which represents the opportunity costs of holding money with respect to real assets and is expected to have a negative coefficient.

$$RBM = \phi_0 + \phi_1 Y_t + \phi_2 r_t + \phi_3 \pi_t + \varepsilon_t \quad (3)$$

Other variables are as earlier defined while and represent inflation rate and the error term (assumed to be white noise), respectively. In the literature, the currency-deposit ratio is modelled as a function of income growth (Hasan, 2001), opportunity cost of holding currency or nominal interest rate (Dadkhah and Mookerjee, 1988), inflation (Tvalodze and Tchaidze, 2011), financial sophistication (Cagan, 1965) and spread of the shadow economy (Mathews, 1982). The cash-deposit ratio model is specified as follows;

$$CDR = \phi_0 + \phi_1 Y_t + \phi_2 r_t + \phi_3 T_t + \phi_3 \Gamma_t + \varepsilon_t \quad (4)$$

All variables are as earlier defined. and denote the effective tax burden measure and level of financial innovation. As income (Y) rises, the share of deposits increase and thus, the ratio fall. Likewise the increase in nominal interest rate (r) reduces the attractiveness of holding currency relative to deposits and invariably reduces the currency-deposit ratio. Inflation is also an indirect function of the ratio while an increase in the range of available liquid financial assets reduces domestic demand for currency. Lastly, transactions in the informal economy tend to be in form of cash since bank records could lead to detection by the tax authorities. Thus, it is expected that the demand for cash will vary directly with the average rate of tax, which, stimulates the shadow economy.

The following dynamics of the model is rooted in the work of Tvalodze and Tchaidze (2011). Recall from equation 1; a real deposit is the difference between real broad money balances and real currency. Assume equations 3 and 4 are re-expressed as follows;

$$\ln(RBM) = F(v) \Rightarrow RBM = e^{F(v)} \quad (5)$$

$$\ln(CDR) = E(\zeta) \Rightarrow RCIC = RDe^{E(\zeta)} \quad (6)$$

Where is a vector of independent variables in the real broad money equation while is a vector of explanatory variables in the currency-deposit ratio equation. RCIC and RD refer to real currency in circulation and real deposits, respectively. Recall from equation 1 that $RD = RBM - CDR$ and therefore,

$$RD = RBM - RCIC * RD \tag{7}$$

Substituting equations 5 and 6 into equation 7 results in;

$$RD = e^{F(v)} - RDe^{E(\zeta)} \tag{8}$$

$$e^{F(v)} = RD + RDe^{E(\zeta)} \tag{9}$$

$$e^{F(v)} = RD\left(1 + e^{E(\zeta)}\right) \tag{10}$$

$$RD = \frac{e^{F(v)}}{1 + e^{E(\zeta)}} \tag{11}$$

Log-linearising equation 11 results in;

$$ln(RD) = F(v) - \ln\left(1 + e^{E(\zeta)}\right) \approx F(v) - e^{E(\zeta)} \approx F(v) - E(\zeta) - 1 \tag{12}$$

Estimation Technique

Deposit formation is calibrated using a three-step procedure: (i) estimation of the money demand function (ii) estimation of the currency-deposit ratio; and (iii) real deposits is characterised on the basis of the output of (i) and (ii) above. We propose to use the bounds testing approach to co integration proposed by Pesaran*et al.* (2001).[v]

This approach has several advantages over other cointegration techniques. It eliminates the burden of having to establish the order of integration amongst the variables and/or pre-testing for unit roots. The ARDL approach to testing for the existence of a long-run relationship between the variables in levels is applicable irrespective of whether the underlying regressors are purely *I*(0), purely *I*(1), or fractionally integrated. Also, the approach is applicable to studies using data with limited time coverage. The ARDL representation of equation (3) and (4) are:

$$\Delta \ln \frac{\varphi_t}{\rho_t} = \phi_0 + \sum_{i=1}^{m} \phi_{1i} \Delta \ln Y_{t-i} + \sum_{i=0}^{m} \phi_{2i} \Delta r_{t-i} + \sum_{i=0}^{m} \phi_{3i} \Delta \pi_{t-i} + \phi_4 \ln Y_{t-1} + \phi_5 r_{t-1} + \phi_6 \pi_{t-1} \tag{13}$$

$$\Delta \ln \frac{\theta_t}{\varphi_t} = \phi_0 + \sum_{i=1}^{m} \phi_{1i} \Delta \ln Y_{t-i} + \sum_{i=0}^{m} \phi_{2i} \Delta r_{t-i} + \sum_{i=0}^{m} \phi_{3i} \Delta T_{t-i} + \sum_{i=0}^{m} \phi_{4i} \Delta \ln \Gamma_{t-i} + \phi_5 \ln Y_{t-1} + \phi_6 r_{t-1} + \phi_7 T_{t-1} + \phi_8 \Gamma_{t-1} \tag{14}$$

Where $\Delta \ln \frac{\varphi_t}{\rho_t}, \Delta \ln \frac{\theta_t}{\varphi_t}, \Delta lnY, \Delta lnr, \Delta ln\pi, \Delta lnT, \Delta ln\Gamma$ represent the first differences of real money balances, currency in circulation, income, interest rate, inflation, effective tax burden

and financial innovation respectively. The bounds test is a Wald Test (or F-test) in which the joint significance of coefficients for lagged variables is tested with F-statistics calculated based on the null hypothesis. The distribution of the test statistics under the null is non-standard, in which critical values depend on the order of integration of variables involved. The joint significance test with respect to equations (13) and (14) is conducted based on the following hypothesis:

$$H_0: \phi_4 = \phi_5 = \phi_6 \text{and} H_1: \phi_4 \neq \phi_5 \neq \phi_6$$
$$H_0: \phi_5 = \phi_6 = \phi_7 = \phi_8 \text{and} H_1: \phi_5 \neq \phi_6 \neq \phi_7 \neq \phi_8$$

Based on Monte Carlo simulation, Pesaran*et al.* (2001) tabulates asymptotic critical values, depending on whether or not drift and/or time trend terms are included as well as the number of independent variables. Given the number of independent variables, if all variables are I(0), the critical value approaches a minimum and, if they are all I(1), the corresponding critical value becomes a maximum. In the case of a mixture of integrating order, the critical value falls between a minimum and a maximum. Therefore, if the calculated F-statistics under the null is located outside the maximum, the null hypothesis of no cointegration is rejected, while if it is located inside the minimum, the null is not rejected. Finally, if the test statistics falls between them, one cannot draw a conclusive decision. In this case, further investigation based on more information about orders of integration is required to reach a definite conclusion. Finally, the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) stability tests based on the recursive regression residuals are carried out to determine the stability of the model.

Data Issues

Annual dataset between 1960 and 2012 is utilised. The data is sourced from the Central Bank (CBN) of Nigeria statistical bulletin (2011) and various issues of the annual report and statement of account. The price level CPI (INF) is used to capture inflation while real GDP is used to capture real income (RGDP). Money supply defined as sum of money outside banks and deposits denominated in local and foreign currency is used (RBM). The nominal rate of return of broad money is captured by nominal interest rate (NIR). Financial sophistication of the economy is captured by the credit to the private sector-GDP ratio (CPGR) since more appropriate measures such as debit and credit cards in circulation, automated teller machines, point of sale machines etc are not readily available over a long period of time (CPGR). The shadow economy effect is captured by the ratio of tax revenues to the nominal GDP (TRGR). All the variables excluding ratios and rates are in logarithmic form.

Empirical Analysis and Discussion of Results

The summary statistics and correlation analysis of variables used in the estimation are presented in Tables 2 and 3. The average values of the nominal rate of return on deposit (NIR), inflation (INF), log of real broad money (lnRBM) and log of real GDP (lnRGDP)

during the period used in the study are 9.38%, 16.38%, 9.44 and 12.12 respectively. Currency-deposit ratio (CDR), nominal interest rate (NIR), total revenue-GDP ratio (TRGR) and private sector credit-GDP ratio (CPGR) recorded mean values of 0.85, 9.4, 0.1 and 14.72, respectively. During the period under review, the minimum and maximum values of inflation were -3.37% and 72.84% which was significantly above values recorded for other variables. The lowest minimum and maximum values were observed for tax revenue-GDP ratio with 0.04 and 0.24, respectively.

Table 2. Descriptive Statistics of Variables used in Estimation

	INF	**lnRBM**	**lnRGDP**	**CDR**	**NIR**	**TRGR**	**CPGR**
Mean	16.38	9.44	12.12	0.85	9.38	0.09	14.72
Median	11.58	9.58	11.14	0.72	8.00	0.07	12.46
Maximum	72.84	11.22	17.33	1.84	26.00	0.24	51.66
Minimum	-3.73	7.82	7.71	0.20	3.46	0.04	4.78
Std. Dev.	16.27	0.93	3.25	0.44	5.44	0.05	9.67
Skewness	1.80	-0.05	0.19	0.64	0.80	1.57	2.01
Kurtosis	5.73	2.48	1.66	2.58	2.90	4.06	7.31
Jarque-Bera	45.06	0.62	4.32	3.99	5.62	24.27	76.69
Probability	0.00	0.73	0.12	0.14	0.06	0.00	0.00
Sum	868.14	500.10	642.29	45.18	497.02	4.62	780.15
Sum Sq. Dev.	13771.73	44.68	548.00	9.92	1539.97	0.15	4860.07
Observations	53	53	53	53	53	53	53

Table 3. Correlation Analysis of Variables used in Estimation

	CDR	**CPGR**	**INF**	**NIR**	**lnMS**	**lnRGDP**	**TRGR**
CD	1.00	-0.63	-0.11	-0.23	-0.75	-0.71	0.70
CPSG	-0.63	1.00	-0.02	0.04	0.66	0.60	-0.28
INF	-0.11	-0.02	1.00	0.47	0.19	0.19	-0.36
IR	-0.23	0.04	0.47	1.00	0.54	0.55	-0.38
MS	-0.75	0.66	0.19	0.54	1.00	1.00	-0.54
RGDP	-0.71	0.60	0.19	0.55	1.00	1.00	-0.53
TRG	0.70	-0.28	-0.36	-0.38	-0.54	-0.53	1.00

Long-run and Contemporaneous Dynamics

In order to ascertain the existence of a long run relationship among the variables in equations (13) and (14), the F-statistic (Wald test) for the bounds test was computed. The F-statistic and critical bounds values for testing the null hypothesis of no cointegrating relationship are reported in Table 4. The computed F-statistics of 5.40 and 4.30 in both models were found to exceed the lower and upper bounds critical

values at the 5% significance level using the critical values provided by Pesaran*et al*. (2001). Therefore, the null of no cointegration is rejected. This implies that the variables in equations 13 and 14 are cointegrated.

Table 4. Bound Testing for Cointegration[vi]

	Critical Bound			
	F-stat	**Lower**	**Upper**	**k**
Model 1 (Equation 13)	5.40	3.47	4.45	3
Model 1 (Equation 14)	4.30	3.03	4.06	4

The long run coefficients are presented in Table 5. In the case of model 1, the estimated long run elasticities for interest rate (NIR) and income (RGDP) are 0.532 and -0.015 respectively. Both estimated elasticities have the expected signs but only real income was statistically significant at the 5% level of significance. For example, our results suggest that a 1% increase in real income (RGDP) will increase real broad money (RBM) by 0.53% while an increase in the opportunity cost of holding money will reduce real money demand (RBM) by 0.015%. Unexpectedly, our results also showed that a 1% increase in inflation engenders an infinitesimal 0.008% decrease in money demand. Nevertheless, inflation was found to be insignificant in explaining money demand. The currency deposit equation expressed in model 2 revealed that the degree of responsiveness of the currency-deposit ratio (CD) to income and interest rate are 0.493% and 0.107% and are both statistically significant. The financial innovation measure, captured by credit to the private sector to GDP ratio (CPSG) was positive and statistically significant at the 5% level. The measure of the shadow economy (TRG) was also positive but statistically insignificant.

Table 5. Estimated Long-run Coefficients

Model 1 (Dep. Var.: RBM			**Model 2 (Dep. Var.:CD**		
Variable	**Coefficient**	**Prob.**	**Variable**	**Coefficient**	**Prob.**
Constant	1.220	0.081	**Constant**	-2.246	0.035
Trend	0.120	0.000	**Trend**	-0.163	0.001
lnRGDP	0.532	0.000	**lnRGDP**	0.493	0.005
NIR	-0.015	0.170	**NIR**	0.107	0.000
INF	-0.008	0.843	**CPSG**	0.037	0.008
			TRG	0.480	0.753

Notes: ARDL (2,0,0,1) selected based on Schwarz Bayesian Criterion.

The estimates of the error correction model are presented in models 1 and 2 of Table 6. Evidently, the results of the long-run estimates are not supported except for inflation whose coefficient was negative and statistically significant. From model 1, the coefficient of the first difference of income and real money demand were both statistically significant with coefficient values of 0.141% and -0.004%, respectively. In

the short run, the effect of the first difference of inflation is significant and negatively related to money demand as a 1% increase in price will reduce money demand by 0.003% in Nigeria.

In model 2, the short run estimates of the currency-deposit equation are presented. While the first difference of real income is found to be negatively related to currency deposit ratio, interest rate was found to be positively related to currency deposit ratio. Both findings were statistically significant. However, a pertinent observation is the negative effect of the first difference of the one period lagged value of nominal interest rate which was found to be negative and statistically significant. However, contrary to expectation, financial deepening or innovation did not have the expected negative effect on currency-deposit ratio as the Nigerian financial system, despite significant deepening, is faced with high currency in circulation and less deposits.[vii] In other words, a 1% increase in the depth of the financial sector induced a 0.004% increase currency-deposit ratio.

The error correction terms ect(-1) in both models are negative and statistically significant, thus corroborating the results of the cointegration tests which suggested the existence of a long run relationship between the variables. The error correction value of -0.265 in model 1and -0.359 in model 2 indicates that 26.5%and 35.9% of the previous year's deviation from long run equilibrium will be restored within a year.

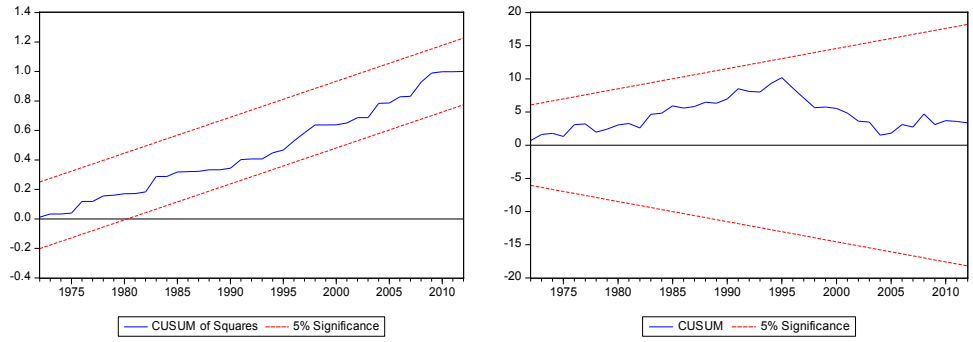
Table 6. Error Correction Representation of ARDL Model

Model 1 (Dep. Var.: D(RBM))			Model 2 (Dep. Var.: D(CD))		
Variable	Coefficient	T-Ratio (Prob.)	Variable	Coefficient	T-Ratio(Prob.)
C	0.323	1.161(0.114)	C	-0.805	-2.338(0.024)
@TREND	0.032	3.331(0.002)	@TREND	-0.058	-3.804(0.000)
D(lnRGDP)	0.141	4.102(0.000)	D(lnRGDP)	-0.041	-3.364(0.718)
D(NIR)	-0.004	-1.311(0.196)	D(NIR)	0.001	0.320(0.750)
D(INF)	-0.003	2.751(0.009)	D(NIR(-1))	-0.024	-3.319(0.002)
ect(-1)	-0.265	-5.241(0.000)	D(TRG)	-0.96	-1.735(0.090)
			D(CPSG)	0.014	3.600(0.001)
			ect(-1)	-0.359	-4.070(0.000)
R-Squared	0.67		R-Squared	0.5	
Adj R-Squared	0.62		Adj R-Squared	0.38	
S.E. of Regresion	0.08		S.E. of Regresion	0.1	
F-Statistic	14.58		F-Statistic	5.8	
Prob. (F-Statistic)	0.00		Prob. (F-Statistic)	0.00	
DW-Statistic	2.09		DW-Statistic	2.44	

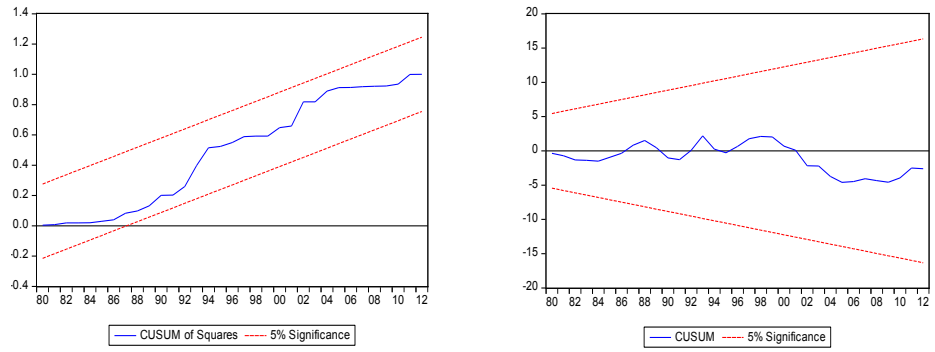
Notes: 51 observations (1962-2012) were used and ARDL (1,1,2,1,0) was selected based on Schwarz Bayesian Criterion.

The diagnostic tests of our model revealed no evidence of serial correlation. The model passes the Jarque-Bera normality tests suggesting that the errors are normally distributed. The RESET test indicates that the model is correctly specified while the F-forecast test indicates the predictive power of the model. Finally, the adjusted R-square of 0.67 (model 1) and 0.56 (model 2) indicate that 67% and 56% of the variation in broad money and currency-deposit ratio is explained by the independent variables in the respective models. Also, the Durbin-Watson statistic in both models is approximately 2. The outcome of these statistical diagnostic tests suggests the model is well behaved. The model also satisfies the stability test- the CUSUM of recursive residuals (Figure 1) and the CUSUMQ of recursive residuals tests (Figure 2) of structural stability. Both figures show that the parameters of the model are stable during the sample period.

Model 1 Stability Test



Model 2 Stability Test



In order to obtain the final specification for real deposits, invoking equation 1, we combine two equations as stipulated in the identity represented by equation 1. The resulting equation yields;

$$\mathrm{RD} = 1.128c + 0.09@trend + 0.182\Delta lnRGDP_t + 0.003\Delta NIR - 0.003\Delta INF - 0.024\Delta NIR_{t-1} - 0.96\Delta TRG_t + 0.014\Delta CPSG$$

This equation reveals that the degree of responsiveness of real deposits to changes in income is 0.182%. This implies that people increase their deposits as the economy expands. Unexpectedly, interest rates and its one period lagged value were found to be negatively related to real deposits while inflation, in line with theoretical expectation was found to negatively affect deposits. The effect of financial innovation is marginal but positive as increased financial sophistication spurred deposits. The reason for this outcome may be the growing financial innovations provided by DMBs and the cashless policy pursued by the central bank of Nigeria, which increases the attractiveness of deposits relative to cash. Another plausible explanation for the very low coefficient observed is that in Nigeria, security of e-banking and e-payment services remains an issue of concern to depositors as it would take time to adjust to such technological changes and innovations in the banking sector. Notably, the shadow economy had a negative effect on deposit formation in Nigeria.

Conclusion

The paper assessed the formation of real deposits in the Nigerian banking sector between 1960 and 2012. Real deposit was modelled as an identity that captures the difference between an estimated money demand and currency-deposit ratio models. The ARDL bounds testing approach to cointegration and unrestricted error correction model was used to ascertain the long- and short-run relationships. Our findings showed that inflation, real income, money supply and financial depth where negatively related to depositary base. This implies that if prices are high, real deposits will fall while higher incomes, contrary to theory led to a fall in deposits. A deeper financial system characterised by innovations increases the incentive to save. The one-period lagged value of the currency-deposit ratio and interest rate where found to be positive functions of real deposits. In other words, higher interest rates enhance saving behaviour. Evidently, financial innovation, domestic price and interest rate play a significant role in real deposit behaviour. The effect of income did not conform to theory as it exerted a negative effect on depositary base and we expected that higher incomes should enhance savings. However, this was not the case in Nigeria and this may be partly explained by the general increase in prices and low purchasing power occasioned by high inequality and poverty which negatively affects real deposit behaviour of households. A major implication of our finding is the need to increase access to financial services as a deepened financial system was found to significantly influence depositors' saving behaviour even though the coefficient was low. In addition, reducing the financial transactions through the informal sector may spur real deposits as our measure of the shadow economy negatively affected real deposit formation. Also, government may consider the pursuit of labour-intensive policies that create wealth thereby increasing disposable incomes and encouraging deposits.

References

Achsani, N. A. (2010). Stability of money demand in an emerging market economy: An error correction and ARDL model for Indonesia. *Research Journal of International Studies*, 13, 54.-62.

Ajayi, I. S. (1977).Some empirical evidence on the demand for money in Nigeria. *The American Economist*, 21(1), 51-54

Boughton, J. M. & Elmus R. W. (1979). The behavior of the currency-deposit ratio during the great depression," *Journal of Money, Credit and Banking* 2(4), 405-18.

Cagan, P. (1965). Demand for currency relative to the total money supply, *Journal of Political Economy*, 66, 303-329.

Central bank of Nigeria (CBN) (2009). Annual report and statement of account

Central bank of Nigeria (CBN) (2011). Annual report and statement of account

Central bank of Nigeria (CBN) (2011). Statistical bulletin online version (www.cenbank.org)

Chukwu, J. O. (2010). Cointegration and structural breaks in Nigeria log-run money demand function, *International Research Journal of Finance and Economics* 38, 49-56.

Chukwu, J. O., Agu, C, C. &Onah, F. E. (2010).Cointegration and structural breaks in Nigerian long-run money demand function, *International Research Journal of Finance and Economics*, 38, 48-56.

Dadkhah, K. M. & Mookerjee, R. (1988).The behaviour of the currency-deposit ratio in India, 1870-1982, *Journal of Developing Areas*, 22(3), 359-72.

Engle, R.F. & C.W.J. Granger (1987).Cointegration and error correction: Representation, estimation and testing, *Econometrica*55: 251-76.

Ezema, C. C. (2009). Monetary policy framework in Nigeria: Formulation and implementation challenges, African Institute of Applied Economics Monthly Seminar Series.

Felmingham, B. & Qing Z. (2001). The long run demand for broad money in Australia subject to regime shifts, *Australian Economic Papers*, 40(2), 146-55.

Finger, H. & Hesse, H. (2009). Lebanon- determinants of commercial bank deposits in a regional financial center, International Monetary Fund (IMF) *Working Paper* No.

195, IMF Washinghton.

Hasan, M. (2001). The behaviour of the currency-deposit ratio in Mainland China, *Applied Financial Economics*, 11, 659-68.

International Monetary Fund (IMF) (2013). Nigeria: Financial Sector Stability Assessment, IMF Country Report No. 13/140.

Johansen, S. (1988). Statistical analysis of cointegrating vectors, *Journal of Economic Dynamics and Control* 12: 231-54.

Johansen, S. & K. Juselius (1990). Maximum likelihood estimation and inference on Cointegration: With applications to the demand for money, *Oxford Bulletin of Economics and Statistics* 52, 169-210.

Khaskhheli, G.H Ahmed, A. & Hyder, K. (2013).The behaviours and determinants of the currency-deposit ratio in Pakistan, *SBP Research Bulletin* 9(1), 82-101.

Kibet, L. K., Mutai, M. K., Ouma, D. E., Ouma, S. A. &Owuor, G. (2009). Determinants of household saving: a case study of smallholder farmers, entrepreneurs and teachers in rural areas of Kenya, *Journal of Development and Agricultural Economics,* 1 (7), 137-143.

Kumar, S., Webber, D. J. & Fargher, S. (2011). Money demand stability: a case study of Nigeria, Department of Economics Auckland University of Technology Working Paper No. 2.

Lucas, R. E. (1988). Money Demand in the United States: A Quantitative Review," *Carnegie-Rochester Conference Series on Public Policy*, 29, 137-67.

Matthews, K. (1982). Demand for currency and the black economy in the U.K., *Journal of Economic Studies*, 9, 3-22.

Mills, T. C. (1978). The functional form of the U.K. demand for money, *Journal of the Royal Statistical Society* Series C (Applied Statistics), 27(1), 52-57.

Mutluer, D. & Yasemin, B. (2002). Modeling the Turkish broad money demand," *Central Bank Review*, 2(2), 55-75.

Narayan, P. K., & Smyth, R. (2005). The residential demand for electricity in Australia: An application of the bounds testing approach to cointegration. *Energy Policy* 33, 457–464.

Nwachukwu, T. (2011). Determinants of private saving Nigeria, *Journal of Monetary*

and Economic Integration 11(2) 85-106.

Nwachukwu, T. & Egwaikhide, F. O. (2007). An error correction model of the determinants of private saving in Nigeria, A Paper presented at the African Economic Society (AES) Conference, Cape Town, South Africa, July 2007.

Nwachukwu, T. E. & Odigie, P. (2009). What drives private saving in Nigeria, A Paper Presented at the Centre for the Study of African Economies (CSAE) Conference, University of Oxford, March 2009.

Nwankwo, F., Ewuim, N., &Asoya, N. P. (2013).Effect of cooperatives on the savings behaviours of members in Oyi local government area Anambra State Nigeria, *African Research Review* 7 (1) 209-227.

Odemero, A. F. (2013). Dual determinants of saving mobilization among agribusiness enterpreneurial groups in Edo State, Nigeria, *Experimental Agriculture and Horticulture* 2(1), 14-22.

Odularu, G. O. & Okunrinboye, O. A. (2009). Modelling the impact of financial innovation on the demand for money in Nigeria, *African Journal of Business Management* 3(2), 039-051.

Omotor, D. G. (2011). Structural breaks, demand for money and monetary policy in Nigeria, *EkonomskiPregled,* 62 (9-10) 559-582.

Pesaran, H., Y. Shin & R.J. Smith (2001). Bounds testing approaches to the analysis of level relationships, *Journal of Applied Econometrics* 16(3): 289–326.

Tvalodze, S. & Tchaidze, R. (2011). Deposit formation in Georgia, International Monetary Fund (IMF) Working Paper No. 78. IMF Washington DC.

Uneze, C.U, (2013). Socio-economic determinants of savings in cooperatives by farmers of Selected agricultural group lending schemes in Anambra state, Nigeria, *Greener Journal of Agricultural Sciences* 3(5), 384-390.

Vega, J.L. (1998). Money demand and stability: Evidence from Spain*, Empirical Economics*, 23(3), 387-400.

Appendix

Table A1: Autoregressive Distributed Lag Estimates

Model 1[viii]			Model 2[ix]		
Variable	Coefficient	T-Stat (Prob)	Variable	Coefficient	T-Stat (Prob)
c	0.323	1.612 (0.114)	c	-0.805	-2.338(0.024)
@trend	0.032	3.331(0.002)	@trend	-0.058	-3.804(0.000)
MS(-1)	1.156	9.329(0.000)	CD(-1)	0.641	7.278(0.000)
MS(-2)	-0.421	-3.811(0.000)	RGDP	-0.04	-0.364(0.718)
RGDP	0.141	4.102(0.000)	RGDP(-1)	0.218	2.089(0.043)
IR	-0.004	-1.312(0.197)	IR	0.002	0.320(0.750)
INF	0.003	2.751(0.009)	IR(-1)	0.013	1.826(0.075)
INF(-1)	-0.003	-3.099(0.003)	IR(-2)	0.024	3.319(0.002)
			TRG	-0.96	-1.735(0.091)
			TRG(-1)	1.132	2.353(0.024)
			CPSG	0.013	3.600(0.001)
Diagnostic Tests					
R-Squared	0.99		R-Squared	0.95	
Adj. R-Squared	0.99		Adj. R-Squared	0.94	
S.E. Regression	0.08		S.E. Regression	0.10	
F-Stat.	13.90		F-Stat.	76.25	
Prob. (F-Stat.)	0.00		Prob. (F-Stat.)	0.00	
DW-Statistic	2.09		DW-Statistic	2.44	
	LM Version	F Version		LM Version	F Version
Serial Correlation	0.300(0.58)	0.249(0.621)	Serial Correlation	3.993(0.046)	3.313(0.076)
Functional Form	2.859(0.09)	2.495(0.122)	Functional Form	3.892(0.049)	3.222(0.080)
Normality	1.131(0.57)	na	Normality	50.978(0.000)	na
Heteros.	0.093(0.76)	0.089(0.766)	Heteros.	8.435(0.004)	9.710(0.003)

[i] This stability is affected as liquidity of DMBs is influenced by depositors' saving and investment decisions which, are in turn influenced by domestic macroeconomic conditions and external shocks.

[ii] This is further reinforced by the effectiveness of money demand and currency deposit ratio parameters in explaining real deposit behavior (See Tvalodze and Tchaidze, 2011 for a lucid exposition of the linkages).
[iii] At the micro level, the authors also found that bank-specific variables such as perceived riskiness of individual banks, liquidity buffers, loan exposure, and interest margins significantly influence demand for deposits.
[iv] It is pertinent to note that inflation and real interest rate enter the model independently in a bid to distinguish between two effects: the interest rate on deposit is the rate of return on broad money with an expected positive sign, while inflation represents the implicit cost of holding money relative to real assets with an expected negative sign.
[v] Also, the Engle and Granger (1987) co-integration test and the Johansen (1988) and Johansen and Juselius (1990) co integration test, which may not may not be appropriate, especially when a small sample size is considered (see, Narayan and Smyth 2005).
[vi] No trend and intercept were considered in models 1 and 2. Table C1.v: Case V with unrestricted Intercept and unrestricted trend Pesaran *et al.* (2001).
[vii] There are at least two economic costs of currency in circulation that need to be highlighted. First, an increase in currency in circulation implies a decline in deposits and consequently a decrease in the availability of loanable funds for investment by restricting credit creation which is crucial for economic growth. Second, a rise in currency in circulation signals inflationary pressures (Khaskheli *et al*. 2013).
[viii] ARDL(2,0,0,1) selected based on Schwarz Bayesian Criterion.
[ix] ARDL (1,1,2,1,0) selected based on Schwarz Bayesian Criterion.