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Demand for Real Cash Balance in Nigeria: Stock Adjustment Model (SAM) Technique

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Abstract
This study investigated the impact of income and interest rates on future demand for real cash balance in the Nigerian economy. Narrow money represented demand for money as dependent variable and national income (real GDP) and interest rate (proxy of lending rate and deposit rate) stood as independent variables. Quarterly time series data were sourced from the Central Bank of Nigeria between 1986q1 and 2019q4. Stock Adjustment Model (SAM) technique was employed for analysis. Findings from the analysis revealed that real GDP and lending interest rate had positive significant impact on future demand for real cash balance, while deposit interest rate had negative and insignificant effect on demand for real cash balance. It is therefore suggested that monetary authority still has a lot of work to do by stimulating the economy through prioritising both short run and long run monetary policies that will guarantee cash balance for economic use for all economic agents.
Keywords: Demand for Real Cash Balance, Deposit Rate, Lending Rate, Stock Adjustment Model

1.0 Introduction

Demand for money, which is mostly represented by the narrow money supply in advanced, emerging and developing economies, informs government of the rate at which transaction takes place and, thus, economic activity. In any case, when economic activity is high, the narrow money will be more in the system, therefore, measuring the level of activity within the economy. Fine tuning some key indicators within the monetary framework could spur such economic upturn, which is indicated by the demand for money. When an economy has large cash balance in circulation, it tends to demand for more goods and services. As such, when this balance does not commensurate with quantity of goods and services, there will be gap in the system, which could lead to either inflationary or deflationary pressure, and that could further have impact on some other macroeconomic variables. Thus, there is need to investigate what the future or expected cash balance will be when there is adjustment in national income and interest rate as suggested by Keynes (1936). This gave rise to adequately investigate the impact of income and interest rates on

future real cash balance in Nigeria. Demand for money is a study that has been handled by several researchers in the past.

The demand for money is the desire to hold liquid assets in the form of cash and stock for transaction, speculative and precautionary reasons (Jhingan, 2010). Money in the bank (demand deposits) and outside the bank (i.e. cash in populace hands) refer to narrow money (M1) (Bassey, 2012) and the monetary policy can be sustained without stability of which demand function for money relies upon. A stable demand function for money is a critical tool to formulate a sound efficient and reliable monetary policy (Nachega, 2001). A stable demand function for money is necessary for a good understanding of monetary policy transmission mechanism. Transmission monetary policy is feasible when its function is economically stable and foreseeable over the years. Money demand function links money and other real economic variables and, thus, plays an important role in the decision-making process of central bank in dealing with monetary and other macroeconomic policies (Ogunsakin, 2019).

The Nigerian economy had witnessed several years of political turmoil, mostly under military eras down to civilian rules because of failed monetary policy, including the global pandemic (COVID-19) crisis. All these have substantial impacts on monetary aggregates and many other related variables. Therefore, the specific objectives of this study are: to examine the impact of real income on real cash balance; and to determine the effect of interest rate disaggregated into lending and deposit rates on real cash balance in the Nigerian economy. The rest of this study is organised into the following sections: section two showcases relevant literature review, section three explains the methodology of the study, section four presents results of findings while sections five and six focus on discussion of results and conclusion respectively.

2.0 Literature Review

2.1 Conceptual Review

Narrow Money (M1) comprises of currency with the people outside banks and demand deposits with banks. Currency includes coins, paper notes and cash on hand with banks. Demand deposits includes savings bank accounts and current accounts in banks from which depositors can withdraw cheques by any amount lying in their accounts (Jhingan, 2010). Interest rate is rate charged by a lender of money or credit to a borrower. From the borrower's point of view, it is the 'cost' of borrowing while from lender's point of view it is the reward for lending. In short, interest is the price of money. This is because when a loan or credit is made, the lender loses 'liquidity', and the rate of interest can be seen as the compensation for parting with liquidity, thereby, losing the ability to allocate funds to consumption (Yakubu, Ogunleye, Sunday & Ahmadu, 2016).

Gross Domestic Product (GDP) indicates all production or economic activities within the boundary of the economy. This includes rewards to factors of production (wages/salaries, interests and profits) accruing to non-residents (Jhingan, 2010).

2.2 Theoretical Review

Early economists centered their thoughts for demand for money solely on the medium of exchange as transaction motive, which transformed to "transactions theories" on money demand. The popular Fisher's (1911) equation of exchange is as follows:

$$MV = PT \quad (1)$$

where, M is the total amount of cash in people's hands, T is the entire quantity of goods and services bartered for cash (transaction) and the price level of articles traded. The right side of the above equation PT denotes the demand for cash balance which, in fact, depends upon the worth of the dealings to be undertaken in the economy, and is equivalent to a constant part of those dealings. MV denotes the supply of cash balance, which is assumed to be at equilibrium/equal to the demand for cash. Cambridge approach as:

$$M^d = kP_y \quad (2)$$

where, Md is the demand for cash, which must be equivalent to the supply of cash, i.e., M^d=M^s in equilibrium, k is the part of the real money income (P_y), which people wish to hold in cash and demand deposit.

Modern view of theory of money demand of Keynes theory, which considers demand functions for cash, depends on interest rate and income. Keynes (1936) states the function as follow:

$$M^d = f(Y, r) \quad (3)$$

where the demand for cash balances is a function of income (Y) and interest rates (r). This money demand function has become the bone of contention between researchers in analysing the demand for cash balance up to the present period. Post Keynesian economists derived demand function for money equation as follows:

$$M_D = \frac{1}{2}\sqrt{\frac{2bY}{r}}.P \quad (4)$$

where M_D is demand for money and P is general price level, r is interest rate, b is brokerage fees and Y is income. Tobin (1956), another Post Keynesian economist, in his own portfolio selection theory derived his own equation as:

$$R = B(r + \mathrm{g}) \quad \text{where} \quad 0 \leq B \leq 1 \quad (5)$$

where r is current interest rate on bonds, g is expected return on capital, which can either be gain or loss and R is the return on portfolio. The portfolio consists of money, M and bond, B sum all equivalent to unit and they do not have negative value.

Friedman (1956), which is the basis of theoretical framework of this study, takes the motive for holding money for granted as an assumption that money is a durable good, which yields a flow of unobservable services. Friedman's demand for money function is simplified as:

$$\frac{M^d}{p} = f(y, w, rm, rb, re, \frac{1}{p}, \frac{dp}{dt}, u) \quad (6)$$

where, M^D is demand for money, y is the permanent income, w is ratio of non-human to human wealth, rm is expected return on money rb is expected return on bonds, re is expected return on equities, $\frac{1}{p}, \frac{dp}{dt}$ is expected rate of return on real assets and u is other factors expected on income. But later reduced as:

$$\frac{M^d}{p} = f(y, r) \quad (7)$$

From above equation (6), functional relationship of demand for real cash balance spells out as:

$$Y_t = \beta_0 + \beta_1 X_t^e + u_t \quad (8)$$

$$X_t^e - X_{t-1}^e = \gamma(X_t - X_{t-1}^e) = \quad X_t^e = \gamma X_t + (1-\gamma)X_{t-1}^e \quad (9)$$

where, $\frac{M^d}{p}$ =Y_t= demand for real cash balance, X_t^e is expected interest rate and is not directly observable, u_t is error term while others are parameters. Cagan (1956)

introduces the model of adaptive expectation in his hypothesis as in equation (9). When it is incorporated into equation (8), we have:

$Y_t = \beta_0 + \beta_1\gamma X_t + \beta_1(1-\gamma)X_{t-1}^e + u_t$ (10)

Lastly, $Y_t = \gamma\beta_0 + \gamma\beta_1 X_t + \beta_1(1-\gamma)Y_{t-1} + v_t$ (11)

From equation (6), assumed functional relationship of demand for real cash balance is as follows:

$Y_t^* = \beta_0 + \beta_1 X_t + u_t$ (12)

$Y_t - Y_{t-1} = \gamma(Y_t^* - Y_{t-1}) = Y_t = \gamma Y_t^* + (1-\gamma)Y_{t-1}$ (13)

where, $\frac{M^d}{p}$ =Y_t^*= desired level of demand for real cash balance, X_t is interest rate, u_t is error term while others are parameters. Nerlove (1963) introduces the model of stock adjustment hypothesis in equation (13). When it is incorporated into equation (12), we have:

$Y_t = \gamma(\beta_0 + \beta_1 X_t + u_t) + (1-\gamma)Y_{t-1}$ (13b)

$Y_t = \gamma\beta_0 + \gamma\beta_1 X_t + \beta_1(1-\gamma)Y_{t-1} + \gamma u_t$ (14)

Lastly, $Y_t = \gamma\beta_0 + \gamma\beta_1 X_t + \beta_1(1-\gamma)Y_{t-1} + v_t$ (15)

The equation (15) is Stock Adjustment Model (SAM), which this empirical work employed to run its regression analysis. $\gamma u_t = v_t$ in this model with OLS estimation techniques.

2.3 Empirical Review

Ogunsakin (2019) examined the relationship among money demand function, financial innovation and currency substitution in African countries with panel data between 1980q1 and 2016q2. He adopted Panel ARDL estimation method. His finding showed cointegration in the model. Income at lag 2 and effective exchange rate were statistically significant at 10% level at lag 1, but foreign interest rate, savings deposit rate and inflation rate were not statistically significant at 10% level.

Akpansung (2018) observed money demand function and its stability in Nigeria from 1970 to 2016. They employed Robust Least Squares (RLS) regression method for the estimation of money demand function, while CUSUM and CUSUMSQ were used to observe the stability of money demand function. Multiple Breakpoints test method was adopted to investigate structural breakpoints. The study revealed real income, interest rate, inflation rate, foreign interest rate as significant determinants of money demand in Nigeria during the period reviewed. Stability test revealed unstable money demand function and evidence of structural breaks in 1986, 1987, 1995, 1999, 2002, 2005, 2007 and 2008. Edet (2017) examined demand for money models in Nigeria from 1986-2013. They adopted the Augmented Dickey Fuller (ADF) and Phillips-Peron (PP) tests for unit root, Engle-Granger (1987) Co-integration and error correction modelling technique as well as the Chow test of stability. The ADF findings showed that only real income, real interest rate, Treasury bill rate and inflation rate were stationary at levels while others were stationary at first difference. Findings further showed that while income (Y) enhances the desire to hold money, interest rate (RT) and expected inflation rate (EXINF) inversely impacted on money demand. Real interest rate and inflation rate are not significantly explaining the variation in demand for money in Nigeria for the period reviewed.

Karimo and Apere (2014) studied the demand for real cash balances in Nigeria between 1971 and 2012 using partial adjustment model. Their finding showed that adjustment parameter was 4.1% of the change between desired and actual real cash

demanded, which is removed in each period in the short run observations. All regressors are significantly at 10% level. Real demand for money has positive relationship with national income while interest rate has negative relation to their findings. Despite all these good outlook outcomes, the result was spurious because of the present of unit root in the series involved.

Other old empirical studies on this topic are those of Kjosevski (2013), Champika and Nakanishi (2013), Nduka, Chukwu, and Nwakaire, (2013), Iyoboyi and Pedro (2013), Lungu, Simwaka, Chiumia, Palamuleni, and Jombo, (2012), Adesoye (2012), Dagher and Kovanen (2011), Omanukwue (2010), Ozturk and Acaravci (2008) Narayan and Narayan (2008), Valadkhan and Alauddin (2003), Komarek and Melecky (2001), Ball (2001), and Stock and Watson (1993).

3.0 Materials and Methods

To fix the acknowledged areas of loopholes, this empirical work adopted Stock Adjustment Model (SAM). The reasons for this are: error term (v_t) satisfies a vital assumption of OLS of non-serial-correlation between the regressors and the stochastic disturbance term; error term is also serially independent from lagged value of dependent variable; and the OLS estimation result from SAM will yield consistent result (Gujarat, 2004). These facts will make it (error term) more applauded over Adaptive Expectation Model (AEM). The only way SAM results can be biased is when the sample is small. To avoid this in this work, we used quarterly data of Nigeria spanning from 1986q1 to 2019q4 to run robust regression and employing SAM to analyze the long-run and short-run demand for real money balances in Nigeria. The work employed Augmented Dickey-Fuller Test to check for stationarity with a view to avoiding spurious regression, and the CUSUM and CUSUM squares analysis developed by Brown, Durbin and Evans (1975) to test for structural stability of the model within the stipulated period of analysis. Breusch-Godfrey Test developed by Breusch (1978) was applied to test for serial correlation and Breusch-Pagan-Godfrey Test developed by Breusch (1979) and also employed test for heteroscedastic presence in the model. Lastly, on this, we made use of two interest rates: lending and deposit interest rates as they affect cash balance from the angle of demand and supply of money for this analysis.

3.1 Model Specification

The study adapted the Stock Adjustment Model (SAM) as adopted in Gujarati (2004) and Subrata (1995). In line with liquidity preference theory of Keynes (1936), the simple demand function was derived as follows:

$$M_t = f(L_r, D_r, Y_t) \quad (16)$$

The simple reason for equation (16) is known if demand for money is assumed as a rationally stable function of the variables and whether the function can be empirically stated with rational accuracy with further manipulation, we obtain:

$$M_t^* = \alpha Y_t^{b_1} L_t^{b_2} D_t^{b_3} \varepsilon_t^{\mu_t} \quad (17)$$

where M_t^* is the desired level of real money demand; Y_t is real income; L_t is lending interest rate; D_t is deposit interest rate and μ_t is the random error term. $b_i's$ are elasticity parameters.

Equation (17) states that the desired level of money demanded at a current time, t is a function of real income, Y, lending interest rate, L, deposit interest rate, D, and a random shock, μ_t and that this relationship is nonlinear. Since the relation takes the Cobb–

Douglas form, taking the natural logarithm of both sides yields the following long – run demand for money:

$$\ln M_t^* = \ln a + b_1 \ln Y_t + b_2 \ln L_t + b_3 \ln D_t + \mu_t \quad (18)$$

The stock adjustment hypothesis can be written as:

$$\frac{M_t}{M_{t-1}} = \left(\frac{M_t^*}{M_{t-1}}\right)^{\rho} \quad (19)$$

Equation (19) postulates that a constant proportion (ρ) of the discrepancy between the actual and desired real cash balances will be eliminated within a single period, where M_t is aggregate actual real money demanded at time t, M_{t-1} is aggregate actual real money demanded at time $(t-1)$t-1), ρ is the stock adjustment parameter $(0 < \rho \ll)$. Taking the natural logarithm of (4), it gives the following:

$$\ln M_t - \ln M_{t-1} = \rho(\ln M_t^* - \ln M_{t-1}) \quad (20)$$

Substituting (18) into (20) we have:

$$\ln M_t - \ln M_{t-1} = \rho[(\ln a + b_1 \ln Y_t + b_2 \ln Lr_t + b_3 \ln Dr_t + \mu_t) - \ln M_{t-1}] \quad (21)$$

$$\ln M_t - \ln M_{t-1} = \rho \ln a + \rho b_1 \ln Y_t + \rho b_2 \ln Lr_t + b_3 \ln Dr_t + \rho \mu_t - \rho \ln M_{t-1} \quad (22)$$

$$\ln M_t = \rho \ln a + \rho b_1 \ln Y_t + \rho b_2 \ln Lr_t + \rho b_3 \ln Dr_t + \ln M_{t-1} - \rho \ln M_{t-1} + \rho \mu_t \quad (23)$$

$$\ln M_t = \rho \ln a + \rho b_1 \ln Y_t + \rho b_2 \ln Lr_t + \rho b_3 \ln Dr_t + (1-\rho) \ln M_{t-1} + \rho \mu_t \quad (24)$$

Therefore, equation 24 can be represented as follows:

$$\ln M_t = \beta_0 + \beta_1 \ln Y_t + b_2 \ln Lr_t + b_3 \ln Dr_t + \beta_4 \ln M_{t-1} + v_t \quad (25)$$

where, $\beta_0 = \rho \ln a$, $\beta_1 = \rho b_1$, $\beta_2 = \rho b_2$, $\beta_3 = \rho b_3$, $\beta_4 = (1-\rho)$ and $v_t = \rho \mu_t$

Equation (25) represents the short-run demand for money and the explanatory variables coefficients are the short-run elasticities with respect to income, Y and deposit interest rate, Dr_t and lending interest rate Lr_t. The adjustment parameter, according to Asteriou and Hall (2007), ρ is resulting from observing $\beta_4 = (1-\rho)$, therefore, $\rho = (1 - \beta_4)$. When equation (25) is divided by the adjustment coefficient ρ, it yields the long-run future demand for money, which is the long-run elasticities, since the variables are logged. Equation 25 is the econometric model for short-run regression analysis.

3.2 Data, Sources and Transformation

Data were source from the Central Bank of Nigeria's Statistical Bulletin, and online websites. The dataset are quarterly time series spanning from the period 1986q1 – 2019q4. Nominal GDP, Y and (narrow) M1, in billions of Naira, were divided by the price level (inflation rate index) to transform them to real income and real cash balances respectively. This is done in compliance to liquidity preference theory. The interest rate used includes deposit rate and lending rate to determine the influence on future or expected demand for money in the Nigerian economy.

4.0 Results of Findings

4.1 Descriptive Statistics

The descriptive statistics of the variables are presented in Table 1. The average real GDP was 4.87 while that of demand for real cash, deposit rate, and lending rate were 4.47, 2.42, and 2.92 respectively. This implies that on average, real GDP had the highest impact on economy, followed by demand for real cash and lending rate, then deposit rate during the sample period. There is no evidence of dispersion in the distribution of the series since the mean value of each series was greater than the standard deviation. The implication of this is that one of the necessary conditions for utilizing the Ordinary Least Squares method is fulfilled.

Table 1: Descriptive Statistics

	LRGDP	LM1	LNDR	LNLR
Mean	4.872996	4.469195	2.424578	2.917038
Median	4.912403	4.841933	2.446288	2.884889
Maximum	5.258640	6.900021	3.255529	3.551531
Minimum	4.400433	0.866123	1.525331	2.272126
Std. Dev.	0.251792	1.946628	0.332070	0.207404
Skewness	-0.322248	-0.367278	-0.175091	-0.156151
Kurtosis	1.792093	1.805425	3.199295	5.146409
Jarque-Bera	10.62168	11.14397	0.919962	26.65942
Probability	0.004938	0.003803	0.631296	0.000002
Sum	662.7274	607.8105	329.7427	396.7172
Sum Sq. Dev.	8.558899	511.5635	14.88649	5.807224
Observations	136	136	136	136

Source: Author's Extract from E-Views 9.0.

However, not all the series are normally distributed. This is evidenced in the probability values of the Jarque-Bera outcome, which indicated that only deposit rate normally distribution cannot be rejected while real GDP, demand for real cash and lending rate normal distribution were rejected.

4.2 Correlation Matrix

Before proceeding to the analysis of stationarity, it is important to establish the association between various pairs of the series. This is done for the reason that an analysis of pairwise correlation will provide information about the association of these variables and, hence, show whether there is any evidence of multicollinearity or not. In the event that there is multicollinearity, the use of OLS method will be avoided.

Table 2 Correlation Matrix

Probability	LNM1	LNGDP	LNLR	LNDR
LNM1	1.000000			
t-stat	-----			
Prob	-----			
LNGDP	0.994986	1.000000		
t-stat	115.1573	-----		
Prob	0.0000	-----		
LNLR	-0.161794	-0.168580	1.000000	
t-stat	-1.897902	-1.979788	-----	
Prob	0.0599	0.0498	-----	
LNDR	-0.559485	-0.554243	0.665789	1.000000
t-stat	-7.813929	-7.708043	10.32925	-----
Prob	0.0000	0.0000	0.0000	-----

Source: Author's Extract from E-Views 9.0.

As shown on Table 2, demand for real cash had very strong relationship with real GDP, very weak inverse relationship with lending rate, moderate inverse relationship with deposit rate. Only demand for real cash had problem of multicollinearity others were not. Real GDP had very weak inverse relationship with lending rate and moderate inverse relationship with deposit rate. Lastly lending rate had strong relationship with deposit rate.

4.3 Test of Stationarity

Before we proceed on running regression analysis by using SAM techniques, it is important to test for stationarity in order to avoid the plunder committed by earlier researchers like Karimo-James, 2014 and Asif (2014) when their regression result was spurious. The technique adopted was Dicky-Fuller (1979,1981) which is upgraded to Augmented Dicky-Fuller (ADF) (1982) to test for unit root in the model. Below is the test result in Table 3.

Table 3: Unit Root Test of Variables

Variables	At levels I(0)				At first difference I(1)				
	Critical values	1%	5%	10%	Critical values	1%	5%	10%	Remarks
lnM1	1.54	-4.03	-3.44	-3.15	-4.66*	-4.03	-3.44	-3.15	I(1)
LnY	-1.69	-4.03	-3.44	-3.15	-7.70*	-4.03	-3.44	-3.15	I(1)
lnDr	-4.54*	-4.03	-3.44	-3.15	-8.01*	-4.03	-3.44	-3.15	I(0)
LnLr	-3.70**	-4.03	-3.44	-3.15	-10.86*	-4.03	-3.44	-3.15	I(0)

*, **, and *** are 1%, 5% and 10% are statistically significant level respectively

Source: Author's Extract from E-Views 9.0.

From ADF test, the results have presented a situation that both lnM1 and lnY are integrated of order one, i.e. I(1) series while both lnDr and lnLr are integrated of order zero, i.e. I(0) series. Equation (16) was estimated by OLS *ceteris paribus* argument techniques.

4.4 Short-run Analysis

Table 4 indicated empirical results for the short-run analysis for cash demand function for Nigeria. As expected, all the variables including $D(\ln Y_t), D(\ln Lr_t)$, and $D(\ln M1(-1))$ have positive signs except $D(lnDr_t)$ that has negative sign. All other things being equal, the income elasticity of 0.244 indicates that if real income, Y_t increases by a percent, the quantity of real cash balance people hold increases by 0.244% in the future. $D(\ln Y_t)$, $D(\ln Dr_t)$, $D(\ln Lr_t)$ and $D(\ln M1(-1))$ were statistically significant at 5%, 10%, 1%and 1% levels respectively. This result shows that real income, lending and deposit interest rate are important determinants of real money demand in Nigeria in the short run period. The closeness in the values of R^2 and R^2 adjusted explains the absence of redundant variable in the model, and these coefficients explain that about 65% variation in demand for real cash balance is explained by the independent variables. Also, the Durbin-Watson statistics (1.98) indicates the absence of first order autocorrelation as its value is approximately 2.

Table 4: Short-run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.162499	0.469889	-2.473985	0.0147
D(LNDr)	-0.034562	0.019062	-1.813192	0.0721
D(LNLr)	0.093497	0.026508	3.527141	0.0006
D(LNY)	0.244431	0.107003	2.284332	0.0240
D(LNM1(-1))	0.960754	0.013972	68.76039	0.0000
R-squared	0.650519	Akaike info criterion		-3.419556
Adjusted R-squared	0.650504	Schwarz criterion		-3.311953
S.E. of regression	0.042986	Hannan-Quinn criter.		-3.375829
Sum squared resid	0.240212	Durbin-Watson stat		1.982727
Log likelihood	235.8200			
F-statistic	67480.61			
Prob(F-statistic)	0.000000			

Source: Author's Extract from E-Views 9.0.

4.5 Long-run Analysis

From the results showed on Table 4, we can obtain an estimate for the partial adjustment coefficient (ρ) by using the fact that $\beta_4 = 1 - \rho$. Since ρ is 0.96, we have that $1 - 0.96 = 0.04$. This tells us that 4% of the difference between the desired (expected) and actual demand for money is eliminated in each quarter of a year in the short run. The adjustment parameter ρ measures the speed of adjustment and lies between 0 and 1. The closer it is to 1 the faster the speed of adjustment. To estimate for the long run parameters, we need to divide coefficients in the short run model by $\beta_4(0.04)$. Therefore, our estimated long run model becomes:

$$\ln M_t = -29.05 + 6.11\ln Y_t - 0.864\ln Dr_t + 2.34\ln Lr_t \quad (26)$$

From equation 26 estimated model, we can conclude that the economy is at steady state (long-run) in Nigeria after the adjustment process is completed, when the desired and actual money demanded are equal, a percentage increase in Y_t, on the average, increases the demand for real cash balance by 6.11%, a percentage increase in lending interest rate encouraged people to hoard cash balance by over 2.34% to invest in bonds, commercial paper and other money market instruments in future, while a percentage increase in deposit interest rate discouraged people from demanding for real cash balance by over 0.86%.

4.6 Post Estimation Tests

4.6.1 Residual Diagnostic Test

The result of Breusch-Pagan-Godfrey tests for heteroscedasticity and serial autocorrelation in the model. Below are test results in Table 6:

Table 6: Residual Diagnostic Test

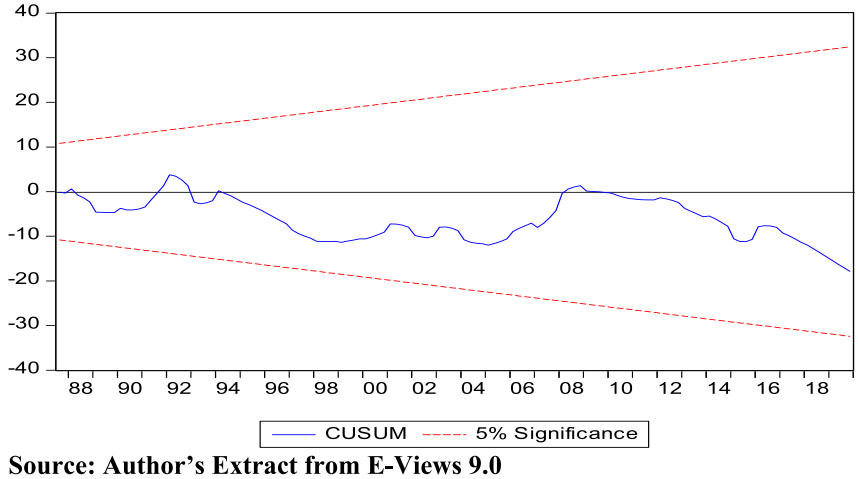
Diagnosis	Name of the Test	Stat. Value	Prob.
Breusch-Godfrey Serial Correlation	**F-Stat. of LM**	1.2993	0.2763
Heteroskedasticity	**F-Stat of ARCH**	0.9996	0.3709
Wald Test	**F-statistic**	992257.7	0.0000

Source: Author's Extract from E-Views 9.0.

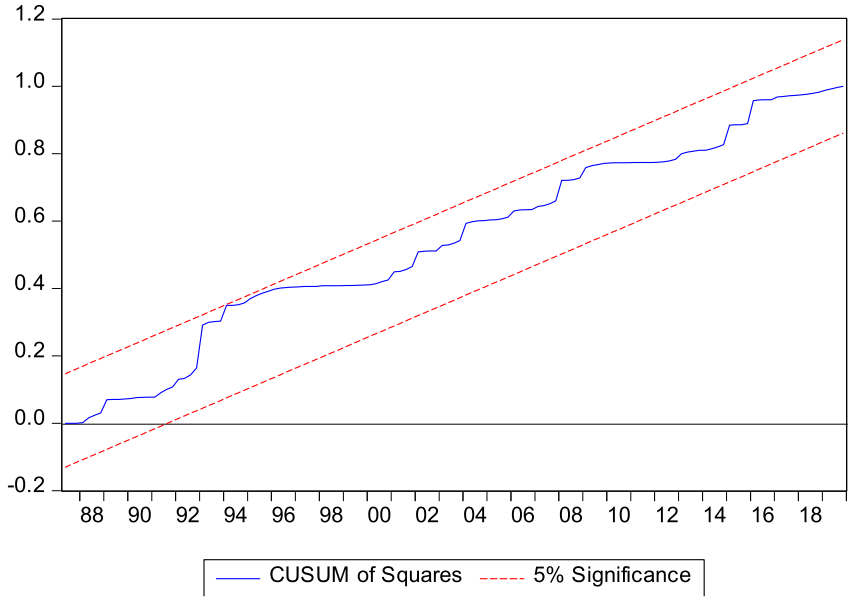
From Table 6, it is clear that the model is devoid of serial correlation and heteroscedasticity problem, while Wald statistical test showed that all regressors (lending rate, Lr, deposit rate, Dr, and income level, Y) coefficients are highly relevant/significant in explaining behaviour regressand (demand for cash balance).

4.6.2 Stability Test

Two tests to check for structural stability of the parameters analysed are the CUSUM and CUSUMSQ. The results are showcased in figures 1 and 2 respectively, of which the graphical representations showed that the model is structurally stable at 5% significant boundary from 1986q1 to 2019q4 since the blue line is within the red lines for both figures in the demand for real cash balances in Nigeria. It implies that the variables do not change arbitrarily or suddenly.



Source: Author's Extract from E-Views 9.0
Figure 1: CUSUM Test



Source: Author's Extract from E-Views 9.0
Figure 2: CUSUM Square Test.

4.7 Discussion of Results and Implication of Findings

The study researched on the impact of income and interest rate on expected demand for money in Nigeria between 1986Q1 and 2019Q4, employing stock adjustment model (SAM) to analyse data collected from the CBN. Bearing this objective in mind, the first task was to examine the impact of real income on expected demand for money. From the result of correlation matrix, real income had a very strong positive and significant relationship with demand for money (M1). The SAM result revealed that in both short and long run periods, real income had a positive and significant impact on expected M1. While this outcome is quite in line with theory, it is not different from the findings of Ogunsakin (2019) and Karimo and Apere (2014) and the findings of Valadkhan and Alauddin (2003), who investigated the key factors of the demand for real cash balances across eight (8) developing nations. The reason for this is because as real income increases, the purchasing power of individuals also increases.

The positive relationship between real income (real GDP) and demand for real cash balance is in line with Transaction Hypothesis of Keynes (1936) for holding cash, which says active balance is an increase function of income and supported by (Akinola, 2006; Busari, 2004) and (Gbadebo & Adedapo, 2008), and contrary to findings of Sanya and Awe (2013). When a percentage increase in lending rate is made 0.093%, there is an increase in quantity of money people hoard. The fact is that people prefer to hoard cash in anticipatory motive to invest on treasury bills, commercial paper and other short-term money market instruments. According to liquidity preference theory of money, the positive relationship between demand for real cash balance and lending rate this is in line with Speculative Hypothesis of Keynes for holding on cash, which says people hold enough cash balance for transaction and precautionary purposes like to make a speculative gain by investing in bonds (Jhingan, 2010). On the other hands, when there is a percentage

increase in deposit rate, the demand for real cash by populace declined by 0.035%. This is simply because increase in deposit rate makes people keep their money in deposit bank for higher return than to hold at home where there will be no return. This negative relationship between demand for real cash balance and deposit rate is in line with Transaction Hypothesis of Keynes for holding on cash which showed inverse relationship between the two, which was also supported by Ogunsakin (2019) and Oloyede (2000) but contrary to Champika and Nakanishi (2013). However, the probability indicated that the relation was not significant.

The second objective was to determine the impact of interest rate (lending rate) on expected real cash balance in Nigeria. Result of SAM showed that in both short and long run, the impact of lending rate on expected real cash balance was positive and significant. This is not in line with the theory though, it could be due to the need of some desperate individuals who needed money by all means like the politicians. The finding is actually in line with the results of Nduka et al (2013) and Karimo and Apere (2014)

Finally, the objective of the study was to examine the impact of deposit rate on expected real cash balance in Nigeria. Result of correlation matrix revealed that there existed a negative association between both. SAM finding indicated that the impact of deposit rate on real cash balance was negative and insignificant in both short and long run periods. Though the insignificant nature of deposit rates could be because of the infinitesimal amount placed on deposit which could not drive people to deposit but rather hold cash, the negative result is as expected and in line with the findings of Valadkhan and Alauddin (2003), Qayyum (2005), Dagher and Koyanen (2011); Karimo and Apere (2014).

The implication of finding is that when real national income expands, the expectation will be that the quantity of money people will hold will also increase and this is likely to erupt inflation if not backed with a commensurate increase in goods and services. On the lending rate, which positively impacted on cash balance, though not in line with theory, it implies that a high lending rate will increase expected demand for money because high lending rate will discourage investors to borrow money; they will rather wait till a future period when the rate goes down before obtaining loan. However, politicians still demand for loan despite the high lending rate. The deposit rate result implies that when deposit rate increases, people will prefer to deposit their money in banks than to hold it (cash balance), as such money in circulation will reduce.

5. Conclusion and Recommendations

This empirical work investigated long-run equilibrium relationship of real demand for cash balance and its short run dynamics. Real income and lending interest rates are very significant factors of real cash balances in Nigeria for monetary authority, while deposit rates are not. Interest rate is more important, based on this result, indicating that the transaction and speculative motive drives the demand for real cash balances in Nigeria in the short-run. As been propounded by the liquidity preference theory, only the long-run speculative motive drives the demand for real balances. Monetary authority still has a lot of work to do by stimulating economy through prioritizing both short-run and long-run monetary policies that will guarantee cash balance for economic use for all economic agents. By allowing market rate of interests, price and wages stand and interference is only required when there is abnormality in the system.

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