THE DEMAND FOR REAL MONEY BALANCES IN NIGERIA: EVIDENCE FROM A PARTIAL ADJUSTMENT MODEL

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ABSTRACT

This study examined the demand for real money balances in Nigeria over the period 1971 to 2012. Using the partial adjustment model, the study showed that the transaction and precautionary motives for holding money, and the speculative motive are all important determinants of real money demand in Nigeria in the short run. The partial adjustment coefficient indicates that 4.1 percent of the discrepancy between desired and actual real money demanded is eliminated each year in the short run. Furthermore, in the steady state, after the adjustment process is complete, when the desired and actual money demanded are equal it is only the speculative motive that is an important driver of the demand for real money balances. The estimated money demand function is stable, indicating the absence of structural breaks in the demand for real money balances in Nigeria. The overall model was statistically significant and robust to serial correlation, even at the lag five (5). The study therefore concluded that in the short-run both real income and interest rates are important determinants of real money balances in Nigeria but it is interest rate that is important in the long – run, which therefore suggests the need to distinguish between short- and long-run monetary policy targets.

Keywords: Real Money Balances, Partial Adjustment, Expected Demand for money, Actual demand for money, speculative motive, precautionary motive, transactions motive.

INTRODUCTION

The importance of the demand for real balances in any economy can be hardly overemphasized. Monetary policy transmission is possible when this function is stable and therefore predictable over the years. The Nigerian economy has gone through years of political instability, ad hoc macroeconomic policies and more recently, the global financial crisis. All these have their impacted not only on economic growth both also on monetary aggregates and other macroeconomic variables. Against this backdrop various studies have been carried out across the globe, most of which are not pertaining to Nigeria. Majority of studies relating to Nigeria have serious methodological setbacks ranging from micronumerousity to wrongly applied techniques of analysis. For example Nduka (2013) used 26 data points pertaining to annual time series from 1986 – 2011 which of course, going by the central limit theorem is too short to generate meaningful estimates. Aiyedogbon, et al (2013) covered 1986 – 2010 and Babatope–Obasa, (2004), chose a start date of 1987 but failed to report the terminal date. Although the work of Adesoye (2012) did not suffer micronumerousity but he went ahead with Johansen's

cointegration test ignoring the fact that some of the series were level stationary and others became stationary after differencing once. The problem with this is that the model will be dynamically unstable and therefore may not be robust. Omanukwue (2010) and Odularu and Okunrinboye (2009) employed the Engle – Granger approach in the presence of more than two variables without ascertain that there exist a single cointegrating vector. The issue with this is that if there are more than one cointegrating vectors governing the long run relationship between the variables the Engle – Granger approach breaks down and the Johansen's technique becomes more useful. Therefore, there are gaps still existing in the body of knowledge concerning the Nigerian real money demand function, hence this study is embarked upon. To fill the identified gaps this study used annual time series pertaining to Nigeria starting from 1971 to 2012 the study adopts the partial adjustment model and the Ordinary Least Squares technique to analyze the long – and short – run demand for real money balances in Nigeria. The study also employs the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) analysis to test for structural stability in the function during the period of review.

LITERATURE REVIEW

Empirical Literature

Hall, et al (2012) explained the ECB's monetary policy strategy and showed the considerable influence of Milton Friedman's contributions on the formulation of that strategy. They also showed new evidence on the stability of euro area money demand. Following a conjecture made by Friedman (1956), the authors assign a role to uncertainty in the money demand function. They find that although uncertainty is nonstationary and subject to wide swings, it is nonetheless mean reverting and has substantial effects on the demand for money. Valadkhan and Alauddin (2003) examined the major determinants of the demand for real money balances in eight developing countries. Pooling cross-country and time series data for the 1979-1999 period and employing the seemingly unrelated regression (SUR) estimation technique, they modeled a standard money demand function. They found that the demand for money positively responded to an increase in real income and negatively to a rise in the interest rate spread, the rate of inflation and the US long-term interest rate and therefore come to the conclusion that disequilibrium in the money market can exacerbate inflation and widen the output gap. Ozturk and Acaravci (2008) were concerned with the long-run determinants of the demand for money in ten transition countries. Using panel data for the 1994-2005 period they showed that all the variables were stationary and thus employed the feasible generalized least squares (FGLS) technique. They found that the demand for money in the long-run positively responds to real GDP and inversely to the inflation and the real effective exchange rate. They also found a near unity long-run income elasticity.

Qayyum (2005) estimated a dynamic demand for money (M2) function in Pakistan by employing cointegration analysis and error correction mechanism. He found the rate of inflation to be an important determinant of money demand in Pakistan. Also, his analysis revealed that the rates of interest, market rate, and bond yield are important determinants of the long-run money demand behaviour. Azim, et al (2010) estimated the demand for money in Pakistan using Autoregressive Distributed Lag (ARDL) approach to cointegration analysis and showed a unique cointegrated long-run relationship among M2 monetary aggregate, income, inflation and exchange rate. The income elasticity and inflation coefficients were positive while the exchange rate elasticity was negative. They also showed a stable M2 money demand function between 1973 and 2007. Anwar

and Asghar (2012) attempted to analyze the long-run relationship between demand for money, real income, inflation rate and exchange rate using ARDL approach in Pakistan. Their results revealed that M2 is cointegrated with its determinants and its long-run relationship with its determinants is stable. They therefore, suggested that monetary authorities and policy makers should focus only on long-run stabilization policy in Pakistan.

Komárek and Melecký (2001) presented a somewhat internationalized view of demand for money as applied to the Czech Republic. They extended the traditional money demand function, consisting purely of domestic variables, to include certain foreign determinants that probably affect the demand for money in a small open transition economy. Using the Johansen procedure, ARDL, DOLS and ADL they found that liquidity gap has significant influence on both prices and output. Narayan and Narayan (2008) estimated Fiji's money demand function for the period 1971-2002 based on the bounds testing approach to cointegration, which is applicable irrespective of stationarity status of the underlying variables. They estimated models with and without a time trend and for lag lengths ranging from 1-3. They found no evidence for a long-run relationship and the Fuji's money demand function was unstable, this was attributed to events, such as coups; the implementation of policies, such as devaluations and value added tax; and the onset of trade liberalization policies over the last two decades.

Dagher and Kovanen (2011) adopted the bounds testing procedure developed by Pesaran et al. (2001) to test the stability of the long-run money demand for Ghana. Their results provided strong evidence supporting the presence of a stable, well-identified long-run money demand during a period of substantial changes in the financial markets, which points to complex dynamics between money demand and its determinants while suggesting that deviations from the equilibrium are rather short-lived. Adam, et al (2010) developed an econometric model of the demand for M2 in Tanzania, using quarterly data from 1998 to 2009. They showed that the continuous decline in the velocity of money from late 1990s is associated with a transformation of economic activity that has cumulatively increased the monetary intensity of GDP. They also showed that portfolio behavior also responded to expected inflation and exchange rate depreciation, with weaker effects from interest rates. The components of M2 responded to opportunity costs as expected, with currency being more sensitive to expected inflation and deposits more sensitive to the interest rate on government securities. Kjosevski (2013) examined the long and short-run determinants and stability of money demand (M1) in the Republic of Macedonia using monthly data from January 2005 to October 2012. The Johansen cointegration technique and VECM model were used. His empirical results showed that exchange rate and interest rate payable on denar time deposits up to one month explains the most variations of money demand in the long-run, while interest rate is significant only in short-run. Long-run money demand function is estimated to indicate slow speed of adjustment towards equilibrium. He also found that real money demand M1 in the Republic of Macedonia was stable in the period under review. Kjosevski therefore recommended that the National Bank should carefully monitor the exchange rate and inflation as two most important indicators of monetary policy, because these two determinants are the main drivers of demand for money in both the short and long run. Rutayisire (2008) estimated a long and short run demand for money function in Rwanda. Using the Johansen (1988) procedure, they established a stable long run relationship between the demand for money and its determinants, which are income, rate of return on foreign financial assets and expected depreciation of the domestic currency (Rwanda franc or Rwf). They

concluded that the economic reforms implemented in Rwanda during the period under review did not fundamentally alter the stability of the relationship between the demand for money and its determinants and that monetary targeting for macroeconomic stabilization purposes in Rwanda is appropriate. Lungu, et al (2012) analyzed the money demand function for Malawi during the period of 1985-2010 using monthly data. Cointegration test results showed a long-run relationship amongst real money balances, prices, income, exchange rate, Treasury bill rate and financial innovation. While all variables significantly influenced money demand in the long-run, short-run policy must be directed at increasing financial innovation, open market activities and improving the productivity of the economy to provide higher return on alternative investments.

Iyoboyi and Pedro (2013) estimated a narrow money demand function for Nigeria from 1970 to 2010 using the autoregressive distributed lag bounds test approach to cointegration. They found cointegration relations among narrow money demand, real income, short term interest rate (STIR), real expected exchange rate (REER), expected inflation rate (EIR), and foreign real interest rate (FRIR) in the period under investigation. Although they showed that real income was a more significant factor in both the short and long term other evidences showed that Nigeria was not immune from external shocks originating from capital flight due to changes in REER and FRIR. Babatope–Obasa, (2004), investigated the empirical relationship between broad definition of money, real income, interest rates, expected inflation and expected exchange rate and examined the constancy of this relationship in the light of economic reforms that had taken place in Nigeria since 1987. The study confirmed a long-run relationship between real balances, income, interest rates, and inflation. His results also showed the presence of currency substitution. Nduka, et al (2013), examined the long-run demand for real broad money function and its stability in Nigeria for the period of 1986 to 2011. Employing the Augmented-Dickey Fuller (ADF) and Phillips-Perron (PP) tests for unit root, Engle-Granger (1987) approach to cointegration, and CUSUM and CUSUMSQ tests for stability they showed a stable and long-run relationship between demand for real broad money and its determinants: income, domestic real interest rate, expected rate of inflation, expected foreign exchange depreciation, and foreign interest rate. Further results showed the income elasticity and foreign interest rate coefficients to be positive while, the domestic real interest rate, inflation rate, and exchange rate depreciation coefficients were negative, respectively. They therefore concluded that the apex bank in Nigeria can target broad money (M2) aggregate to achieve monetary policy objectives.

Aiyedogbon, et al (2013), investigated the stability of real cash balances through money supply in Nigeria for the period1986 – 2010. Employing tests for co-integration and stability, and estimating a vector error correction model they showed that in the long run interest rate, inflation rate and openness had negative impact on real money demand while the impact of gross capital formation, exchange rate and government expenditure were positive. They also showed that in the short run, lagged money demand, gross capital formation, interest rate and exchange rate had negative relationship with current money demand on the other hand, the impact of inflation rate and openness were positive. They finally, showed a stable money demand function for Nigeria using the CUSUM and CUSUMSQ analysis. Adesoye (2012) examined the cointegration causality between price, monetary aggregate and real output in Nigeria from the period 1970 to 2009 using the inflationary gap model that emanates from the quantity theory of money. He showed that money and price gaps were stationary at level, while real output was found stationary at first difference. The Johansen cointegration test revealed presence of one

cointegrating vector and causality runs from money supply to price. Other results suggested that inflation is a monetary phenomenon and previous price and output gap are strong indicators of controlling monetary aggregate in Nigeria. Also, price was found to be more responsive to its own shocks, monetary and output shocks in the log-run. Bassey, et al (2012), investigated the effect of monetary policy on demand for money in Nigeria. Employing the Ordinary Least Squares technique, they showed an inverse relationship between interest rate and money demanded, expected inflation rate and money demanded and between exchange rate and money demanded in Nigeria.

Doguwa, et al (2014) estimated the money demand function for Nigeria in the aftermath of the recent global financial crisis and examines whether its underlying properties has changed over the years. Specifically, they showed the existence of a stable long-run demand for money function during the period 1991:Q1-2013:Q4, while accounting for the possible structural breaks during the period. Using the Gregory-Hansen residual based test for cointegration they detected both intercept and regime shifts in 2007:Q1. They also showed a stable money demand function before and after the crisis using the CUSUMSQ test. They therefore came to the conclusion that since the relationship among the variables holds over a fairly long period of time, the estimated money demand model provides important foundations for monetary policy settings in Nigeria. Omanukwue (2010) examined the modern quantity theory of money using quarterly time series data from Nigeria for the period 1990:1-2008:4. The study used the Engle-Granger two –stage test for cointegration to examine the long-run relationship between money, prices, output and interest rate and ratio of demand deposits/time deposits (proxy for financial development) and finds convincing evidence of a long-run relationship in line with the quantity theory of money. Restrictions imposed by the quantity theory of money on real output and money supply do not hold in an absolute sense. He also showed a uni-directional causality running from money supply to core consumer prices and established that improvements in real output and financial sector development dampened inflationary pressures in Nigeria. Also, Odularu and Okunrinboye (2009) attempted to analyze the impact of the financial innovations in Nigeria after the Structural Adjustment Programme of 1986 on the demand for money using the Engle and Granger Two-Step Cointegration technique. Though the study revealed that demand for money conforms to the theory that income is positively related to the demand for cash balances and interest rate has an inverse relationship with the demand for real cash balances, it was also discovered that the financial innovations introduced into the financial system have not significantly affected the demand for money in Nigeria.

The literature reviewed so far depicts the problems underlying the studies pertaining to Nigeria. It particularly, indicates that the debate on the determinants and stability of the Nigerian real money demand function is open to further contributions.

Theoretical Underpin

Over the years economists have sought to answer the question of what influences the decision concerning the amount of money balances people want to hold in an economy. Some of the famous works include those of Irvin Fisher, the Classical Cambridge Economists, John Maynard Keynes, and Milton Friedman. However, this study is anchored on the Keynes Liquidity Preference theory.

Keynes, in his famous book *The General Theory of Employment, Interest, and Money*, published in 1936 developed the liquidity preference theory. He was interested in explaining why people would want to hold money in cash and not in bonds and vice versa. Keynes, unlike the classical school believed that the velocity of money is not constant, at least in the short run and laid emphasis on the importance of interest rates in the demand for money. He gave three reasons (motives) behind the demand for money. These include the transactions motive, the precautionary motive, and the speculative motive.

Keynes emphasized that the transaction motive of the demand for money is primarily driven by the level of current transactions people want to make. The transactions demand for money arises due to the lag in timing between receipts and payments. In other words, people are not likely to get paid at the exact instant they need to make a payment, so between the time of one receipt and another people keep some amount of money in order to facilitate payments. Like the classical school, Keynes believed that the transactions component of the demand for money is proportional to income. He also recognized that people hold money not only to meet current transaction needs but also as cushion against unexpected needs. This arises because people are not always certain about the payments they might want or would have to make in the next moment. When people do not have money to make these payments when they arise, they incur losses but when you are holding some balances for precautionary purposes, you can take advantage of the opportunity. The amount of money people hold for this purpose he called the precautionary demand for money.

Again, like in the transactions component of the demand for money, Keynes believed that the amount of precautionary balances people want to hold is determined primarily by the level of future expected transactions and that these transactions are proportional to income. Hence, he considered the demand for precautionary money balances as being proportional to income. The transactions and the precautionary motives for holding money emphasized the medium–of-exchange function of money or what is today, called the scale variables, for each refers to the need to have money on hand to make payments.

Like the Classical Cambridge Economists, Keynes believed that money is a store of wealth and people hold money for this reason. He referred to the holding of money for this reason the "speculative" motive. He also reasoned that since wealth is closely related to income, the speculative component of money demand would be related to income as well. Keynes therefore, believed that interest rates play an important role in influencing decisions concerning the amount of money to hold as a store of wealth.

He distinguished between two categories of assets that can be used to store wealth: (i) money and (ii) bonds. He was curious to know why individuals would decide to hold their wealth in the form of money and not bonds. To quench this curiosity Keynes made the assumption that the expected return on money was zero during his time but for bonds, there are two components of the expected return: the interest payment and the expected rate of capital gains. When there is a rise in interest rates, the price of bonds fall. Therefore if one expects that interest rates will rise, he also expects the price of the bonds to fall and therefore suffer negative capital gains (capital loss). In this case, people would want to store their wealth as money because its expected return is higher; its zero return exceeds the negative return on the bond.

To Keynes, individuals believe that interest rates hover around some normal value. Thus, when interest rates are below the normal value, people expect the interest rate on bonds to rise in the future and therefore also expect capital loss. Therefore, people will prefer holding their wealth in money but not bonds, therefore increasing the demand for money. On the contrary, they will be more likely to hold bonds than money, and the demand for money will fall. Therefore, Keynes posited that money demand is negatively related to the level of interest rates.

In his analysis, Keynes distinguished between nominal quantities and real quantities. He reasoned that people want to hold a certain amount of real money balances (an amount that the three motives indicated) and would be related to real income, Y and to interest rates, i. He thus developed the demand for money theory, which is referred to as the liquidity preference theory. The liquidity preference theory states that the demand for real money balances Md/P is a function of income, Y and interest rate, i. this can be stated mathematically as:

$$M^d = f(Y, i) \quad . \quad . \quad . \quad (1)$$

Where M^d is the demand for real money, Y is real income and I interest rate. Because Keynes postulates a positive relationship between income and the demand for real money balances and a negative relationship between interest rate and the demand for real balances the liquidity preference theory may be stated as:

$$M^d = aY - bi \quad . \quad . \quad . \quad (2)$$

where othere variables remain as defined, a and b are the income and interest rate elesticities, respectively. Prior to the work of Keynes, Irving Fisher and American economist had developed the transaction –based theory of the demand for money. He postulated a positive relationship between the demand for and income. He however, argued that real money balances are not insensitive to interest rate movements, which is one of the main thrust of the quantity theory of money. He thought the velocity of money is fairly constant in the short run and that nominal income is solely determined by movements in the quantity of money. He emphasized technological factors and ruled out any possible effect of interest rates on the demand for money in the short run.

The Cambridge money demand equation is identical to that of Fisher. The classical Cambridge school tried to answer the question of how much money people want to hold. They often treat the velocity of money as a constant and agreed with Fisher's position that nominal income is determined by the quantity of money. Both Irving Fisher and Cambridge economists developed a classical approach to the demand for money in which the demand for money is proportional income. However, the two approaches differ in that fisher's emphasized technological factors and ruled out any possible effect of interest rates on the demand for money in the short run, whereas the Cambridge approach emphasized individual choice and did not rule out the effects of interest rates.

John Maynard Keynes extended the Cambridge approach by suggesting three motives for holding money. His liquidity preference theory views the transaction s and precautionary component of money demand as proportional to income; he reasoned that the speculative motive would be negatively related to the level of interest rates. However, the speculative component of money demand is viewed as sensitive to interest rate as well as to expectations about the future movements of interest rates.

Keynes's model of the demand for money has the important implication that velocity is not a constant but instead is positively related to interest rates, which fluctuate substantially. Keynes rejected the constancy of velocity, thought the velocity is unstable. The Keynes's liquidity preference theory casts doubt on the classical quantity theory that nominal income is determined by movements in the quantity of money.

Milton Friedman used a similar approach to that of Keynes and the Cambridge economists in his money demand theory. Friedman treated money like any other asset; he used the theory of asset demand to derive a demand for money that is a function of the expected return on money and permanent income. In contrast to Keynes, Friedman viewed money and goods as substitutes, people choose between them when deciding how much money to hold. The assumption that money and goods are substitutes indicates that changes in the quantity of money may have direct effect on aggregate spending. Friedman did not take the expected return on money to be a constant as Keynes did. Unlike the Keynes's theory, Friedman's theory suggests that changes in interest rates should have little effect on the demand for money, and random fluctuations in the demand for money are small and that the demand for money can be predicted accurately by the money demand function. He believed that the demand for money is stable and insensitive to interest rate movements (see Keynes, 1936 for detailed discussion of the liquidity preference theory).

METHODOLOGY

Model specification

The study adopted the partial adjustment model as espoused in Astrous and Hall (2007). Following the liquidity preference theory the model for estimation is derived as follows:

$$M_t^* = aY_t^{\beta_1} R_t^{\beta_2} e_t^{u_t} \quad . \quad . \quad . \quad (3)$$

Where M_t^* is the desired level of real money demand; Y_t is real income; R_t is interest rate; and u_t is the random error term. β_i's are elasticity parameters.

Equation (3) states that the desired level if money demanded at a current time, t is a function of real income, Y, interest rate, R and a random shock, u_t and that this relationship is nonlinear. Since the relation takes the Cobb – Douglas form, taking the logarithm yields the following long – run demand for money:

$$lnM_t^* = lna + \beta_1 lnY_t + \beta_2 lnR_t + u_t \quad . \quad . \quad . \quad (4)$$

The partial adjustment hypothesis can be written as:

$$\frac{M_t}{M_{t-1}} = \left(\frac{M_t^*}{M_{t-1}}\right)^{\varphi} \quad . \quad . \quad . \quad (5)$$

Where M_t is the actual money demanded and φ the partial adjustment coefficient. Taking the logarithm of (5) gives the following

$$lnM_t - lnM_{t-1} = \varphi(lnM_t^* - lnM_{t-1}) \quad . \quad . \quad . \quad (6)$$

Substituting (4) into (6) we have:

$$lnM_t - lnM_{t-1} = \varphi(lna + \beta_1 lnY_t + \beta_2 lnR_t + u_t - lnM_{t-1}) \quad . \quad . \quad . \quad (7)$$

$$lnM_t = \varphi lna + \varphi\beta_1 lnY_t + \varphi\beta_2 lnR_t + \varphi u_t + lnM_{t-1} - \varphi lnM_{t-1} \quad . \quad . \quad . \quad (8)$$

$$lnM_t = \varphi lna + \varphi\beta_1 lnY_t + \varphi\beta_2 lnR_t + (1-\varphi)lnM_{t-1} + \varphi u_t \quad . \quad . \quad . \quad (9)$$

we may rewrite (9) as

$$lnM_t = \alpha_0 + \alpha_1 lnY_t + \alpha_2 lnR_t + \alpha_3 lnM_{t-1} + v_t \quad . \quad . \quad . \quad (10)$$

Where: $\alpha_0 = \varphi lna;\ \alpha_1 = \varphi\beta_1; +\alpha_2 = \varphi\beta_2;\ \alpha_3 = (1-\varphi); and\ v_t = \varphi u_t$

Equation (10) is the short – run demand for money and the parameters are the short – run elasticities with respect to income, Y and interest rate, R. The adjustment coefficient, φ is derived by noting that $\alpha_3 = (1 - \varphi)$ therefore $\varphi = (1 - \alpha_3)$. It therefore follows that dividinsg equation (10) or (9) by the adjustment coefficient, φ yields the long – run demand for money and the various elasticities in (4) therefore equation (10) is the econometric model for estimation.

Estimation and Analysis Techniques

Equation (10) was estimated using OLS. However, because of the inclusion of lagged dependent variable as an explanatory variable, the Breusch – Godfrey technique was employed to test for serial correlation. The study also generated standard errors for the long –run elasticities using bootstrapping technique.

The CUSUM and CUSUMSQ analysis were used to test for structural stability in the model. The CUSUM and CUSUMSQ tests were first proposed by Brown et al (1975). The test is applied on the residuals of the OLS regression model (figures 1 & 2). If the plots of the CUSUM statistics lie within the critical bound of the 95% level of significance, represented by a pair of straight lines drawn at the 95% confidence level the null that all the coefficients are constant over time cannot be rejected, however, if some portions of the plots lie outside the 95% confidence bound, the null is rejected and the conclusion is that the model is dynamical unstable. Similar interpreted is applicable to the CUSUMSQ analysis.

Data, Sources and Transformation

Data for the study were drawn from the Central Bank of Nigeria's Statistical Bulletin, 2007 and Annual report and Statement of Accounts for the year ended December, 2012. The dataset are annual time series spanning the period 1971 - 2012. Nominal GDP and M2 were divided by the consumer price index, CPI to transform them to their respective real terms (real income and real money balances, respectively). This is in accordance to the liquidity preference theory. The interest rate used is the monetary policy rate, which affects all other rates through interbank lending and discount houses financial transactions.

RESULTS AND DISCUSSION

Empirical results for the short – run money demand function for Nigeria is presented on table 1. As expected all the variables showed the right signs with $\ln Y_t$ and $\ln M_{t-1}$ being positive and $\ln R_t$ being negative. All things being equal, the income elasticity of 0.1679 indicates that if real income, Y_t increases by 1 percent the quantity of money people would want to hold (real money balance) increases by 0.17 percent. This is because as real income increases the purchasing power of individuals also increases. Furthermore, a percentage increase in interest rate reduces money balances by 0.34 percent. This is not surprising because increase in interest rate increases the risk to invest in bonds, this in turn means higher returns to investment and so people will prefer investing in bonds to holding excess cash balances. $\ln Y_t$ and $\ln R_t$ were statistically significant at 10 and 5 percent levels respectively. This indicates that real income and interest rate are important determinants of real money demand in Nigeria in the short run. The R^2 of 0.9906 is very high but this should be taken with a grain of salt because of the inclusion of

lagged M_t, M_{t-1} in the model. However, the Breusch – Godfrey LM test statistic for serial correlation of 8.403 for five (5) lags has a probability value of 0.135, it is therefore statistically not significant indicating the absence of serial correlation at the lag five (5). This means that the empirical results are robust to serial correlation and are therefore appropriate for policy analysis.

Table 1: Results for the Nigeria Short – run Money Demand Function
Dependent Variable: LOG(M)
Included observations: 41 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.967891	1.249843	-0.774411	0.4436
LOG(Y)	0.167878	0.093766	1.790395	0.0816
LOG(R)	-0.343200	0.141125	-2.431897	0.0200
LOG(M(-1))	0.958739	0.031838	30.11304	0.0000
R-squared	0.990587	Mean dependent var		0.924986
Adjusted R-squared	0.989824	S.D. dependent var		2.300362
S.E. of regression	0.232048	Akaike info criterion		0.008727
Sum squared resid	1.992320	Schwarz criterion		0.175905
Log likelihood	3.821099	F-statistic		1297.975
Durbin-Watson stat	1.696832	Prob(F-statistic)		0.000000

The partial adjustment coefficient, $\varphi = (1 - 0.9587) = 0.0413$ indicates that every year 4.1 percent of the discrepancy between desired and actual money demanded is eliminated in the short run. The results for the long – run Nigeria money demand in table 3 revealed that in the long – run (the steady state), after the adjustment process is complete, when the desired and actual money demanded are equal a percentage increase in Y_t increases the demand for real money by over 4 percent while a percentage increase in interest rate retards the demand for real money by over 8.3 percent. However, the bootstrap standard error based z-statistics revealed that it is only interest rate (the speculative motive) that is an important driver of the demand for real money balances in Nigeria in the long – run. The cumulative sum (CUSUM) and cumulative sum of squared (CUSUMSQ) recursive residuals showed that the estimated money demand function for Nigeria during the period 1971 to 2012 has been stable. This is indicated by the CUSUM and CUSUMSQ plots which are within the 5% level of significance. They showed there are no structural breaks in the demand for real money balances in Nigeria.

Table 2: Breusch – Godfrey LM test for Autocorrelation
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.649937	Probability	0.175311
Obs*R-squared	8.403473	Probability	0.135357

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/17/14 Time: 07:10

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.061733	1.254813	-0.049197	0.9611
LOG(Y)	-0.000686	0.092256	-0.007440	0.9941
LOG(R)	0.019559	0.143741	0.136071	0.8926
LOG(M(-1))	0.009629	0.032956	0.292180	0.7720
RESID(-1)	0.078891	0.181404	0.434888	0.6666
RESID(-2)	-0.289264	0.177757	-1.627303	0.1135
RESID(-3)	-0.040808	0.191067	-0.213579	0.8322
RESID(-4)	-0.315784	0.176855	-1.785547	0.0837
RESID(-5)	-0.222842	0.183946	-1.211457	0.2346
R-squared	0.204963	Mean dependent var		-2.15E-16
Adjusted R-squared	0.006203	S.D. dependent var		0.223177
S.E. of regression	0.222484	Akaike info criterion		0.023263
Sum squared resid	1.583969	Schwarz criterion		0.399413
Log likelihood	8.523109	F-statistic		1.031211
Durbin-Watson stat	2.026714	Prob(F-statistic)		0.433640

Note: Ho: No serial correlation at lag order p

Table 3: Results for the Nigeria Long – run Real Money Demand Function with Bootstrap Normal Based Standard Errors

lnM_t^*	Coefficient	Standard Error	z-statistic	p>|z|
lnY_t	4.0653	2.8814	1.41	0.158
lnR_t	- 8.3099	2.9594	-2.81	0.005

Source: Author's Computation

CONCLUSION AND POLICY IMPLICATION

The major conclusion that can be drawn from this study is that both real income and interest rates are important determinants of real money balances in Nigeria but interest rate is more important, indicating that the speculative motive drives the demand for real money balances in Nigeria more than the transactions and precautionary motives at least in the short – run. This therefore conforms to the liquidity preference theory. However, in the long – run it is only the speculative motive that drives the demand for real balances. This therefore suggests that there is the need to distinguish between short- and long-run monetary policies. Finally, the Nigeria's demand for real money balances function is stable in spite of the 1986 structural adjustment program, the 1999 shift from military to civil rule and the 2007 global financial crisis that lasted at least for two years.

Findings from this study, in showing the existence of a long – run relationship between the demand for real money balances and, real income and interest rate and a stable demand for real money function is similar to that of Babatope–Obasa, (2004), Nduka, et al (2013) and Aiyedogbon, et al (2013). In showing a negative relationship between interest rate and the

demand for real money balances, this study is similar to that of Bassey, et al (2012). However, findings from this study are more robust since it covers more than 30 observations which is the benchmark for satisfying the central limit theorem of large sample size. It is also robust to serial correlation and endogeneity bias. These characteristics make this study similar to that of Doguwa, et al (2014) and Odularu and Okunrinboye (2009).

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Figure 1: Cumulative Sum (CUSUM) of recursive residuals of the Nigerian Money Demand function, 1971 – 2012

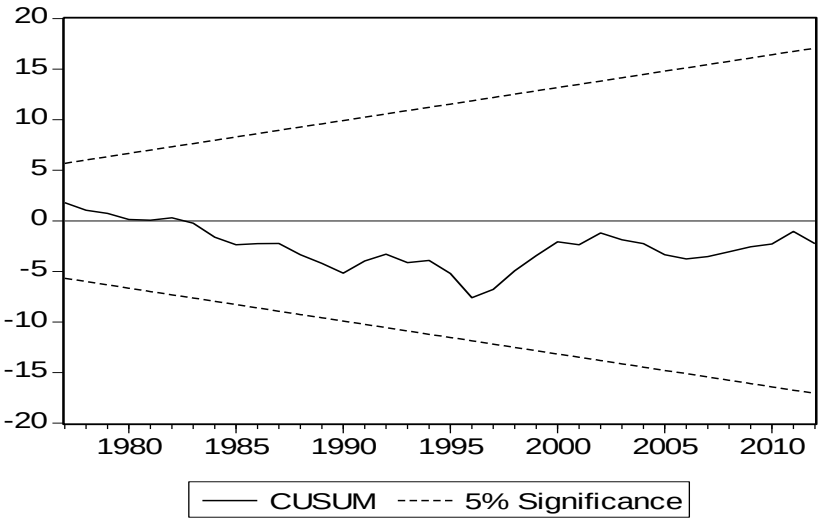

Figure 2: Cumulative Sum of Squared (CUSUMSQ) recursive residuals of the Nigerian Money Demand function, 1971 – 2012