TESTING THE VALIDITY OF KEYNESIAN LIQUIDITY PREFERENCE THEORY AND VELOCITY OF MONEY DEMAND FUNCTION IN NIGERIA

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Abstract
The essence of this study is to test the validity of Keynesian Liquidity Preference theory as well as the velocity of money demand in Nigeria using annual time-series data covering between 1970 and 2014. The stationarity of the data was ascertain using both Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, and the result reveal that apart from interest rate, all the variables are stationary at first difference. Data were analyzed using Ordinary Least Squares (OLS) estimation technique. Cumulative Sum (CUSUM) and Cumulative Sum of Recursive Residuals Squares (CUSUMSQ) were also employed to test the velocity of money demand function. The result shows that interest rate, inflation and official exchange rates significantly influence the demand for money while income has no significant effect. All the variables conform to a priori expectations thereby validating the Keynesian liquidity preference theory in Nigeria. The result from the stability test shows a constant velocity of money demand function in Nigeria. Monetary authorities should therefore adopt appropriate policies that place interest rate, inflation and official exchange rates at an acceptable level to ensure optimal demand for money to spur income through private investments in the real sector.

Keyword
Demand for Money function, Interest Rate, Inflation, Constant Velocity, and Keynesian Liquidity Preference Theory.
JEL: E12, E41, E51, E60

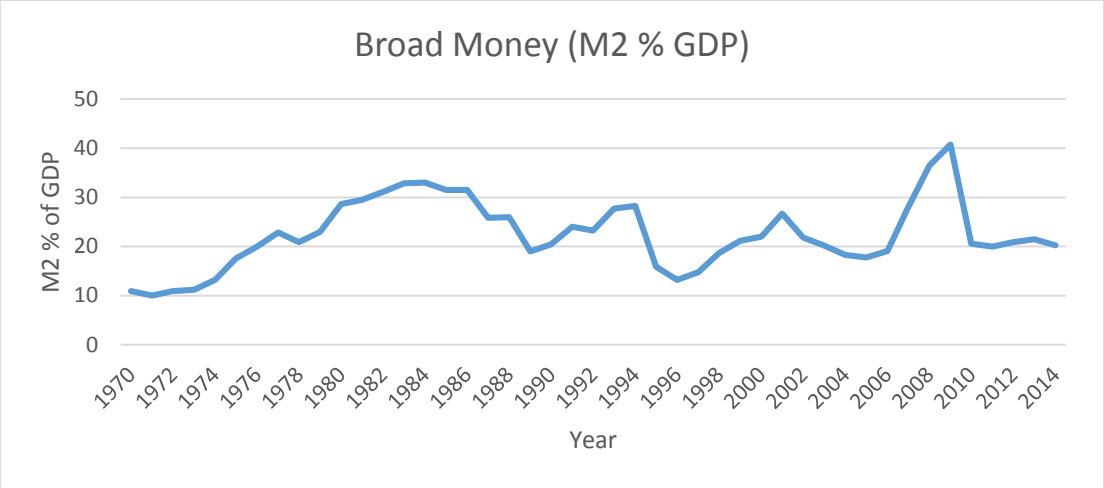
1. Introduction

John Maynard Keynes in his edge-cutting work titled, *"The General Theory of Employment, Interest, and Money"* in 1936 provided a different paradigm that shifted the view of classical economists from a constant velocity of money demand to the critical role of interest rate in determining demand for money in an economy (Mishkin, 2007). The demand for money can be described as the amount of cash balances that individuals in the economy want to hold for transactions and the services rendered instead of holding assets. It is on this basis that Keynes propounded the liquidity preference theory. This theory adduce that individuals desire to hold money to enable them meet immediate needs and their ability to do so depends on level of income. This is the major crux of the money demand theory.

Money demand theory forms the basis for the conduct of monetary policy vis-à-vis other macroeconomic policies in an economy. As asserted by (Goldfeld, 1994), among these policies, the theory of demand for money have attracted many debates amongst monetary economists and in academic circle dating back to the earlier quantity theory of money by Irving Fisher. The liquidity preference theory as postulated by Keynes seeks to inquire more on the major determinant and causes of money demand, that is, why people prefer to hold cash instead of investing in real assets that will yield greater returns in the near future. It has also been argued in some models of developmental economics that for growth to occur in an economy, investment from savings plays a crucial role. But it should be noted that amount to be set aside for investment is dependent on the level of income and the prevailing interest rate.

Meanwhile, available data from the World Development Indicators (2014) show that the demand for money in Nigeria which is represented by broad money (M2) decreased from 10.9 percent in 1970 to 10 percent in 1971, after which it increased steadily to 22.9 percent in 1977. In 1978, the M2 deceased slightly to 20.9 percent before rising to 22.9 percent in 1979 and continued hovering at 13.2 percent and 36.4 percent between 1980 and 2008. In 2009, M2 increased sharply to 40.8 percent and start decreased steadily to 20.6 percent in 2010. It peaked at 21.5 percent in 2013. This scenario is further depicted in Figure 1 below.

Figure 1.1: Trends of Broad Money (M2) in Nigeria (1970 – 2014)
Data Source: Researchers' computations from World Dev. Indicators (WDI) (2014)



In the liquidity preference theory, interest rate, inflation and income are considered as the major factors that determines money demand. When related to monetary policy management framework, the major objective of the policy is to stabilize prices so as to avoid a continuous rise in the general price level. A continuous rise in the general price level is a monetary phenomenon which the central bank uses some policy instruments to manage and hence the targets on money supply growth as a method of targeting inflation. Arising from the above, this study seeks to empirically test the validity of the liquidity preference theory and velocity of money demand using Nigerian data.

2. Literature Review

In the empirical front, there exist a number of studies in this area but a critical perusal shows that none has systematically tested the validity of liquidity preference theory as well as the velocity of money demand in Nigeria. Studies so far conducted paid attention on stabilization of money demand, short and long run demand test for money demand and the relationship between money demand and economic growth. For instance, Okonkwo, Ajudua and Alozie (2014) empirically analyzed the money demand stability in Nigeria using annual time series data between 1980 and 2012. The study employed error correction model (ECM) and Johansen cointegration test to ascertain if a long run relationship exists between demand for money (M2) and interest rate. The study equally tested for stability of money demand function using CUSUM and CUSUMSQ using capital formation, interest rate, inflation rate and exchange rate. The outcome of the error correction model (ECM) reveals that money demand has ability to recovery at 18 percent whenever there is disequilibrium. The stability test equally shows that M2 money demand is stable at 5 percent using both CUSUM and CUSUMSQ. This outcome collaborates further the findings of Kumar, Webber and Fargher (2010). The study investigated the stability of money

demand in Nigeria from 1960 to 2008 using annual time series data. The results from the estimated model show that although money demand function was stable, there was a structural break in 1986. The implication of this finding is that the supply of money can be used as a veritable monetary policy tool to stabilize an economy.

Rutayisire (2010) conducted a short and long term demand for money function in Rwanda adopting time series data for the period 1980 to 2005. The study employed the maximum likelihood method by Johansen (1988), and the result reveal a stable money demand function in both the short and long run. The findings equally show that the rate of adjustment of cash in hand together with the long run equilibrium is relatively low which highlights a recurrent disequilibrium in the Rwandan economy.

Leaning on Kallon (2009) methodology, Rutayisire (2010) also investigated the demand for money in Sierra Leone using annual data on real money balances, consumer price index, exchange rate, real GDP and US Treasury bill rates for the period 1964 to 2005. Employing the Johansen methodology to cointegration, the study outcome shows that the estimated income elasticity of long-run money demand is not significantly different from unity having a numerical value of 1. 519. Thus suggesting that there are no economies of scale in money-holding in Sierra Leone.

In an effort to determine the nature of money demand within short period, Sriram (2009) employed quarterly data ranging from 1988:1 to 2007:2 from Gambia and employed Error Correction Model (ECM) methodology. The findings from the study indicated that there exist a long run nexus amongst real money balance, real GDP, interest rates on deposits at the commercial banks, yields on Treasury bill, and expected inflation; though the relationship was unstable. This outcome supports the assertion that that foreign interest rates and expected depreciation variables have no significant influence on demand for money.

Apart from specific country studies, some other studies were conducted on comparative basis. One study in this category is Hamori (2008) who used cross-sectional annual data from 35 countries from Sub-Saharan Africa to analyze the demand function of money from 1980 to 2005. The study was able to further establish that a relationship exist amongst the demand for money function within the period covered by the study irrespective of whether broad money or narrow money is used as a measure of money supply. In a similar study, Narayan and Seema (2009) studied demand for money function using panel data of 5 South Asian countries spanning from 1980 to 2000 and found that equilibrium nexus are evidenced amongst M2 and its determinant for the specific countries and there exist stability in money demand function in all the countries with the exception of Nepal. Also Valadkhani (2008) was able to estimate both the short and long run demand for money determinants of six (6) Asian-Pacific region using panel data from 1975 – 2002. The study affirms that long run income elasticity is above unity and that both capital and currency substitution hypotheses exist in the long run scenario.

In a different strand, Owoye and Onafowora (2007) studied broad money targeting, money demand and real GDP growth in Nigeria using quarterly data from 1986:1 to 2001:4. Utilizing both the CUSUM and CUSUMSQ approach, the study confirms the stability of both short and

long run parameters in the demand for money function. However, the estimated result revealed that the stability of the real money demand function give further credence on the adoption of intermediate target by the Central Bank in the of management of inflation as well as in the stimulation of economic activities.

Kallon (1992) investigated demand for money function in Ghana with quarterly data covering from 1966:1 to 1986:4. The empirical result reveal that money demand functions for the economy is stable under the period of review. Andoh and Chappell (2002) equally estimated money demand in Ghana as well as test for structural break using annual time series data. The finding shows that the demand for money function of the economy experienced a structural break in year 1983.

In the estimation of demand for money in Nigeria, Tomori (1972) employed ordinary least square (OLS) technique with annual data from 1960 to 1970. From the result, it was ascertain that income is a veritable instrument that explains the variability of money demand irrespective of the definition of money adopted. The study equally shows that this relationship is stable by running a separate estimation from 1960 to 1966, and by weighing the coefficients against the coefficients obtained from the full sample. It was however Akinlo (2006) who employed Autoregressive Distributed Lags Model (ARDLM) to estimate a cointegrating relationship amongst broad money, income, interest rates and exchange rates in Nigeria using annual data from 1975 to 2000. The study equally tests the stability of the money demand function and found that money demand function is somewhat stable in Nigeria regardless of different monetary policies adopted within the period of the study coverage.

3. Methodology and Data

The major focus of this study is to test the validity of the Keynesian Preference theory and velocity of money demand in Nigeria. Flowing from literature and soundness of analysis, the variables of interest are demand for broad money, domestic price level, demand for real broad money balances, real income, real interest rate, inflation rate and official exchange rate. In our analysis that follows, demand for real money is treated as the dependent variables and its relationships with other explanatory variables can be stated functionally as:

$$M_2d/_P = \int(\text{RGDP}, \text{RIR}, \text{INF}, \text{OER}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

Linearly, the functional relationship in equation (3.1) can be expressed as:

$$\left(M_2d/_P\right)_t = \beta_0 + \beta_1\text{RGDP}t + \beta_2\text{RIR}t + \beta_3\text{INF}t + \beta_4\text{OER}t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.2)$$

Taking the logarithm of the equation (3.2) yields equation (3.3) as shown below:

$$\ln\left(M_2d/_P\right)_t = \beta_0 + \beta_1\text{RGDP}t + \beta_2\text{RIR}t + \beta_3\text{INF}t + \beta_4\text{OER}t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

where: In = natural logarithm, $\square_2\square$ = demand for broad (M2) money, P = domestic price level proxied by Consumer Price Index (CPI), $\square_2\square/\square$ = demand for real broad (M2) money balances, RGDP = real gross domestic product proxy of real income, RIR = real interest rate, INF = inflation rate, OER = official exchange rate, ε = white noise disturbances term, t = time trend, βs = constant term and parameters. The demand for real money balances was however derived by taking the ratio of money demand.

In testing for the validity liquidity preference theory, the ordinary least squares (OLS) estimation technique is adopted after testing for the stationarity of the time-series data using both the Augmented Dicky-Fuller (ADF) and Phillip-Perron (PP) tests due to its best linear unbiased estimation (BLUE) properties. Also the cumulative sum of recursive residuals (CUSUM) and cumulative sum of recursive residuals squares (CUSUMSQ) was employed to test for constant velocity of the money demand function. The justification of the model is based on the necessity to establish the link between demand for real money balances and its determinants.

The data for this study were collected from the World Development Indicators (2014), Central Bank of Nigeria Statistical Bulletin and Annual Reports 2011, 2012 and Central Bank of Nigeria, 2008, 2012. The data spanned from 1970 to 2014 and the E-Views Version 8 software package used was for estimation.

4. Result and Discussion

The stationarity of the data was ascertained using both Augmented Dickey-Fuller and Phillips-Perron tests and the result is presented in Table 1 below.

Table 1: Results of the Stationarity Tests

Augmented Dickey–Fuller (ADF)test for unit root				**Phillips–Perron (PP)test for unit root**		
Variables	**At Level**	**At First Difference**	**Order of Integration**	**At Level**	**At First Difference**	**Order of Integration**
Real M2 (i.e. M_2^d/P)	-1.1633 (-3.5155)	-8.6459** (-3.5180)	I(1)	-1.1016 (-3.5155)	-8.4753** (-3.5180)	I(1)
RGDP	-1.5844 (-3.5155)	-3.7230** (-2.9484)	I(1)	-1.6558 (-3.5155)	-6.3468** (-3.5180)	I(1)
RIR	-7.1388** (-3.5155)	-7.8218 (-3.5207)	I(0)	-7.5439** (-3.5155)	-43.355 (-3.5180)	I(0)
INF	-3.3021 (-3.5155)	-6.6670** (-3.5207)	I(1)	-3.1149 (-3.5155)	-13.4944** (-3.5180)	I(1)
OER	-1.8716 (-3.5155)	-6.1391** (-3.5180)	I(1)	-1.8996 (-3.5155)	-6.1391** (-3.5180)	I(1)

**Significant at 1%, **Significant at 5%, ***Significant at 10%*

Source: *Stationarity test results computed using EViews 8*

From Table 1, it can be observed that Real Money Balances is not stationary at the level form but became stationary after the first difference. The calculated value for the output real at first difference is -1.163 in absolute value and it is greater than the absolute value of the critical value of -3.516 at 5 percent level of significance. This outcome is also justified by the Phillips–Perron test which indicates that the real was not stationary at the level form. Other variable such as real interest rate was stationary at level form at 5 percent level of significance. The Phillips–Perron test also confirms this at the same levels of significance. Consequently, the stationarity test for income by both Augmented Dickey–Fuller and Phillips-Perron show that it is not stationary at the level form at 5 percent level of significance. Furthermore, inflation with absolute values of the critical value for the 5 percent level of significance is greater than that of the calculated value, which implies that inflation is non-stationary at the level form. The Phillips–Perron test also confirms the Augmented Dickey–Fuller test. Also official exchange rate is stationary at first difference in both Augmented Dickey–Fuller test and Phillips–Perron tests at 5 percent level of significance.

The result of the determinants of demand for money is presented in Table 2 below

Table 2: Results of the Determinants of Demand for Money

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Constant	33.30311	7.690195	4.3306	0.0001
RGDP	4.91E-13	3.75E-13	1.3085	0.1982
RIR	-0.481146	0.190245	-2.5291	0.0155
INF	-0.633166	0.155936	-4.0604	0.0002
OER	-0.334409	0.079333	-4.2153	0.0001
Observations = 45 R^2: 0.61 Adjusted R^2: 0.57 F-Statistic = 15.4				

Source: *EViews Software Output*

The result from the estimation output in Table 2 depicts income is statistically insignificant at 5 percent level. The coefficient shows that a percentage change in income will have a no corresponding change in the demand for real money balances. This suggests that although a positive relationship exist between income and demand for real money balances, but contemporaneously do not cause the money demand. This is however at variance with the Keynesian liquidity preference theory which posits positive relationship between income and demand for money. Moreover, the nature of the relationship between real interest rate and real money demand is positive and statistically significant at 5 percent level. Similarly, inflation and official exchange rates are positively related with the real money demand and are also statistically

significant. Impliedly, a simultaneous rise in both inflation and official exchange rates will automatically raise real demand for money in Nigeria.

The velocity of real money demand function using both Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Recursive Residuals Squares (CUSUMSQ) is presented Figure below

Figure 2: Plots of Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Recursive Residuals Squares (CUSUMSQ)

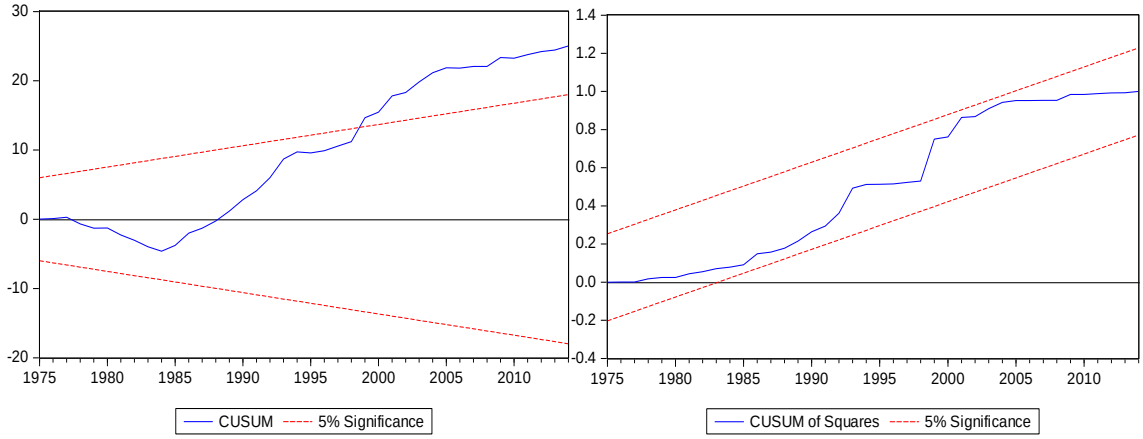


Figure 2 above shows the graphs of CUSUM and CUSUMSQ. Empirically, it is imperative that both CUSUM and CUSUMSQ statistics lie in-between the 5 percent critical red lines. But as can be observed in the CUSUM graph, real money demand function deviated from the 5 percent critical red line from 1999 and returned to the line for CUSUMQ. Furthermore, the plot of CUSUMSQ clearly indicates stability in the demand function of the real money balances as it lies within 5 percent critical red lines. This implies that demand for real money balances has undergone instability, but became stable in CUSUMSQ an indication that the velocity of money demand is not constant. This therefore supports the Keynesian liquidity preference theory.

5. Policy Recommendations

From the estimated result, it is evidenced that interest rates, inflation and exchange rates are the loudest variables that determines the demand for money in Nigeria. Beside, the CUSUMSQ and CUSUM tests has equally demonstrated that the velocity of demand for real money balances in Nigeria is not constant in Nigeria over the period. It is the imperative that these variables be properly guided and well managed by monetary authorities by adopting appropriate policies that stabilizes them within an acceptable level consistent with optimal demand for real money balances that can spur income in the economy through private investments in the real sector.

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