International Journal of Economics, Commerce and Management
United Kingdom ISSN 2348 0386 Vol. 11, Issue 1, Jan 2023

https://ijecm.co.uk/

MONEY DEMAND FUNCTION AND EXPECTATIONS FOR NIGERIA

Felix Obioesio
Statistics Department, Central Bank of Nigeria, Nigeria
felixobioesio@yahoo.com

Nsikak Joshua
Statistics Department, Central Bank of Nigeria, Nigeria

Chizoba Didigu
Statistics Department, Central Bank of Nigeria, Nigeria

Robert Taenyi
Statistics Department, Central Bank of Nigeria, Nigeria

Glory Alalibo
Statistics Department, Central Bank of Nigeria, Nigeria

Onyinyechi Uche
Statistics Department, Central Bank of Nigeria, Nigeria

Abstract

This study seeks to provide further empirical insights to the debate on the money demand function in Nigeria within the framework of the theoretical models. Consequently, the empirical insights analyzed both the Keynesian and Friedman specifications of the money demand function and then provided some comparative review of their outcome. The study adopts unit root test and the DOLS estimation technique to obtain the long-run cointegration relationship while the OLS error correction model was employed to extract the short-run parameters. The empirical outcome shows that the expectation specified money demand function is stable and well behaved for Nigeria. Specifically, the income elasticity of money demand takes on

appropriate signs and magnitude while that of deposit interest rate only reports weak linkage with money demand. The outcome for interest may be attributed to the weak substitutability of financial assets in the country. Interestingly, the result shows that the Friedman's specification out-performs its Keynesian counterpart for Nigeria. On the overall, it can be concluded that the result obtained here are in line with the empirical regularities and theoretical expectations.
Keywords: Money Demand, Expectations, Unit Root Test, Cointegration Dynamic OLS, Structural Breaks

INTRODUCTION

The question concerning the superiority of the different money demand functions developed in the theoretical literature has been a subject of immense debate among economists in general and monetary economists in particular. Specifically, it has been argued that a money demand function that focuses attention on the ability of the growth rate of nominal money to predict the opportunity cost of money (in terms of inflation, exchange rate and output gap) provides the most robust empirical approximation. Hence, understanding the predictability of the money demand function is seen as a requisite to effective monetary policy formulation in both developed and developing economies.

It is argued that for both developed and developing countries disequilibrium in the demand for money (defined as the difference between the real money stock and the long-term equilibrium real money stock) may affect the efficacy of interest rate policy in the long run via its impact on output gap and/or inflation. There are a number of studies that highlight the importance of the demand for money in developed countries because the "real money gap" (the resulting residuals from the money demand function) helps to forecast future changes in the output gap and/or inflation (Gerlach and Svensson, 2002, and Siklos and Barton, 2001).

In Nigeria, the literature on the demand for money function has been a topical issue and has remained an active subject of research and debate over the years that have attracted the most attention in the literature for economists. The pioneering works on the subject by Tomori (1972), Ajayi (1974), Teriba (1974), Ojo (1974) and Odama (1974) laid the empirical foundation for this subject with regard to Nigeria. The discussions and debates drew increasing attention in both academic and policy circles at that time and earned the acronym 'TATOO' debate. Since then, new entrants into the discussion for Nigeria have tended to build on these pioneering works.

Recent studies on the money demand function in Nigeria have provided significant and rigorous empirical evidence linking money demand to variables as postulated in the models of

the theoretical literature. For instance, Tule, Okpanachi and Usman (2018) in their empirical analysis of money demand in Nigeria reported an existence of a stable long-run relationship between broad money demand (M2) and its determinants including GDP, stock prices, foreign interest rates and real exchange rate. The authors also report a significant and positive effect of stock prices on the broad money demand in the long-run. Similarly, Kumar, Webber and Fargher (2013) also provided empirical evidence showing that the canonical specification of the money demand function is well explained by the theoretically inspired variables and that the money demand function is stable for Nigeria.

The preceding discussion in the literature on money demand in Nigeria provides clear path of research that has been followed in the subject. Evidently, very few studies have attempted to provide empirical comparability of the different money demand functions for Nigeria. In particular, few studies have attempted to seek which of the theoretical models would most appropriately explain the dynamics of money demand in Nigeria. Similarly, the continued progress in financial innovation and the increasing integration of the Nigerian financial market has raised the need to explore and modify the money demand function to capture these dynamics.

Hence, this study aims at contributing to the money demand literature in Nigeria within a twofold objective. First, it applies the money demand specification of the Keynesian and Friedman model to Nigeria and provides empirical test of the comparative robustness of the models in explaining the money demand function in Nigeria. Second, the study employs recent data and provides recent evidence on the long run and short run dynamics of the money demand function as well as modifications in the traditional variables which have been used as proxies for the opportunity cost of holding money.

The rest of the paper is structured into five sections. Immediately following section one, is section two which discusses the empirical evidence and theoretical framework from recent studies. Section three discusses the methodology employed for the study. The presentation and discussion of empirical results is reported in section four while the concluding remarks and implication of findings are contained in section five.

REVIEW OF THE LITERATURE

The empirical literature for money demand is vast. Several studies have offered empirical evidence of the money demand function with regard to its stability, both long run and short determinants of money demand and other related studies. However, the result from these studies have remained largely conflicting. In particular while some studies find statistically

significant and economically robust short run and long run stability in money demand function, others report very negligible results.

For instance, Dagher and Kovanen (2011) adopted the bounds testing procedure to test the stability of the long-run money demand for Ghana. The results provided strong evidence for the presence of a stable, well-identified long-run money demand during a period of substantial changes in the financial markets and any deviation from the equilibrium are rather short-lived. Vindicating the long-run smoothening of the money demand function. Their result is quite plausible in view of the fact that during the long run every disturbance in the money demand function would have been adjusted to their equilibrium values thereby bringing the model to stable values. Similar results with very slight divergence have also been reported by studies such as Mansaray and Swaray (2012), Dharmadasa and Nakanishi (2013), Bhatta (2013).

On the other hand, Dritsaki and Dritsaki (2012) reports an opposing outcome. They authors applied cointegration and error correction models to examine the stability of money demand function in Turkey from January 1989 to May 2010 under the economic reforms and financial crises and found there existed a well-determined instability for the demand for narrow money and its dynamics and concludes from the estimation of the impulse response functions that interest rate caused the largest shift in money demand as well as in the industrial production market activities and improving the productivity of the economy to provide higher returns on alternative investments. A study by Sheefeni (2013) also provide evidence supporting the above.

In Nigeria, several studies have been carried out in this subject and found varied linkage and stability of the money demand function. For instance, Iyoboyi and Pedro (2013) using ARDL bounds test approach to cointegration estimated a narrow money demand function of Nigeria from 1970 to 2010 and found cointegration relations among narrow money demand, real income, short-term interest rate, real expected exchange rate, expected inflation rate and foreign real interest rate. Similar results have also been reported by Imimole and Uniamikogbo (2014) who showed the existence of a long run relationship in the money demand function and its determinants and thus reported a remarkably stable money demand function. Interestingly also, Tule, Okpanachi and Usman (2018) in their empirical analysis of money demand in Nigeria reported an existence of a stable long-run relationship between broad money demand (M2) and its determinants including GDP, stock prices, foreign interest rates and real exchange rate. The authors also report a significant and positive effect of stock prices on the broad money demand in the long-run. A more recent study by Nkalu, C. (2020), investigates demand for real money balances in Africa using panel time series data from Nigeria and Ghana between 1970 and

2014. His results conform to the liquidity preference theory, with all the variables – inflation, real interest rates, and official exchange rates are statistically significant except real income.

In summary, the empirical literature provides evidence showing that the demand for money function is predictable and stable in Nigeria and that income, inflation rate, and other proxies of opportunity cost (equity yield, real discount rate, expected exchange rate depreciation) generally perform well in money demand functions using Nigerian data. In passing, it can be noted that there seem to be a convergence of results on income as an appropriate scale variable and stability parameters of the money demand function. Interestingly, it is evident that the income elasticity of money demand tends to be higher when a broader definition of money is used, sometimes even higher than unity (see for example Owoye and Onafowora (2007) and Nwude, et. al. (2018)).

Finally, the empirical evidence varies with different economic environment, thus indicating that the predictability of money demand function cannot be generalized for every country and episodes. Similarly, the proxies used to capture key variables such as the opportunity cost of holding money and the estimation techniques employed can significantly influence the outcome of the empirical analysis.

It can be argued that for developing countries like Nigeria characterized by structurally less sophisticated financial system where financial assets are not exactly of sufficiently profitable substitutes for holding money, the determinants of the behavior of real balances are likely to be income and expected inflation. In this variation, money demand is not only conditional on current variables but on expected variables such as expected inflation and expected or permanent income. Thus, understanding the appropriate functional specification of the money demand model is the main contribution of this study to the existing literature on this subject.

The Analytical Framework

The preceding discussion in the empirical literature provides the variables that determine money demand but does not specify the particular form of the money demand function. The analysis of the demand for money in the preceding sections implied that this demand depends on an income or wealth variable, often also called the “scale variable,” and on the rates of interest. With this simplification, and using actual income as the simplest form of the scale variable, the money demand function is given as;

$$M_d = m_d(y, r) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where,

M_d money demand, y is income measured by real GDP per capita and r is real interest rate.

To specify the equation in an estimable form, start by considering the following simple specific forms of the money demand function, with μ as the random term.

$$m_d = \phi_0 + \phi_1 r_t + \phi_2 y_t + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

$$\phi_1 < 0, and\ \phi_2 > 0$$

Equation 2 stipulates the theoretically expected signs of the money demand elasticity. Proceeding further with the money demand function in 2, in a world where commodities and money are substitutes money demand will also depend upon the rate of inflation π_t, so that 2 would be modified to;

$$m_d = \phi_0 + \phi_1 r_t + \phi_2 y_t + \phi_3 \pi_t + \Omega x_t' + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)^1$$

Other variables, such as the expected exchange rate depreciation and the risk of holding non-money assets to take account of currency substitution in the open economy, as is done in previous literature, is introduced in the model by the vector x_t' on the right-hand side of equation (3). The money-demand functions are often estimated in a log-linear form.

The money-demand functions specified in equation 3 is the most general and simplistic money demand function, However, different specifications can be built to capture the impact of expectation formation on the money demand function. The most general of these relationships has been developed by Friedman. In doing this, equation is modified such that y_t and π_t are stated in terms of expectations, thus we have;

$$M_d = \phi_0 + \phi_1 r_t + \phi_2 y_t^e + \phi_3 \pi_t^e + \Omega x_t' + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

Since the expected income and inflation are not easily observed and known, they can be expressed in terms of the observable income and inflation.

$$y_t^e = \lambda[y_t + (1-\theta)y_{t-1} + (1-\theta)^2 y_{t-2}] \dots\dots\dots.. (5)$$

$$\pi_t^e = \gamma[(\pi_t + (1-\theta)\pi_{t-1} + (1-\theta)^2 \pi_{t-2}] \dots\dots\dots (6)$$

In equations 5 and 6, λ and γ are the income and inflation expectations elasticities respectively. It is assumed that these elasticities die down and becomes insignificant after the first two or three period lag[2]. Thus ignoring the nth lag is of no significant consequences. In addition, equations 3 and 4 will be referred to as baseline regression model, the money demand relation in equation 4 is based on alternative specifications about the formation of expectations.

[1] Notice that π_t as expressed here is the rate of change in the price level over time. Thus $\pi_t = \frac{dp_t}{dt}$. Equation 7 is the most commonly estimated model in empirical literatures. All the variables are in their current value.

[2] Note that if expectation λ or γ is equal to 0.40, a weight often cited as approximating reality for annual time series data, the weights decline in the pattern 0.4, 0.24, 0.144, 0.0864, …, so that income more than three or four years earlier can be effectively ignore.

RESEARCH METHODOLOGY

The discussions in Section 2 lay the foundation for which the empirical analysis in this study is built. While the diversity of circumstances exist in the literature, they may not obscure the observation of basic uniform behavior of the money demand function. Furthermore, it is pertinent to mention that there may be problems in terms of the nature of time series data employed for analysis. Similarly, the application of the appropriate estimation technique utilized could well inform the outcome of the empirical exercise.

Thus, this section discusses the empirical strategy and estimation technique to be utilized in this study. To begin with, econometric literature has provided robust data evaluation techniques to examine the time series properties as well as the consistency and reliability of data to avoid spurious empirical results.

Estimation Technique

The linear combination that reveals cointegrating relationship will characterize the long-run relationship between variables as in 2 and 3. If no cointegrating relationship is revealed, the estimation will proceed using DOLS technique. The OLS technique ignores the long run information in the series, hence may not be appropriate in this study. The DOLS estimator is asymptotically unbiased. This method corrects for the problems due to the long run correlation between the cointegrating equation and the stochastic regressors innovation.

Data Issues

In this study, money is defined conventionally as broad money M3. The inflation rate is specifically the rate of change of the cost of general prices of consumables. The yields on all financial assets are represented by the interest rates on financial claims. Income data are taken in real terms. Exchange rate is a measure of the likelihood of substitution of money balances for foreign assets. All the data employed for the study are obtained from the World Bank WDI database for the period 1980 to 2021. The times series data covers a period of 41 years which allows for examining long run relationship and structural breaks analysis.

EMPIRICAL RESULTS AND DISCUSSION

The presentation of the empirical results begins with an examination of the descriptive properties of the time series variables followed by the unit root test. The result of the unit root test gives a pointer whether the cointegration test is to be conducted or not[3].

[3] The condition for conducting a cointegration test stipulates that the all the times series must be integrated of the same order. That is all the variables in the model must be I(1) variables. (see Baltagi Econometrics 2nd edition)

Descriptive Evidence

Table 1 presents the descriptive statistics of the series. The table shows that other series except income and exchange rate have relatively low standard deviation values.

Table 1: Descriptive Statistics

Variable	Abbreviation	Mean	St Dev.	Skewness	Prob.	Obs.
Money Demand	MD	16.0544	5.68789	0.6899	0.0897	39
Real Interest Rate	RI	0.10055	14.6023	-2.5921	0.0000	39
Interest on Deposits	RD	11.2768	3.99211	0.8323	0.0736	39
Real GDP Per Capita	YT	1766.34	436.727	0.6069	0.0926	39
Inflation	IN	19.0839	17.0923	1.7830	0.0000	39
Exchange rate	EX	154.053	121.720	1.7122	0.0000	39
Risk	RI	6.63922	2.54921	1.2441	0.0000	39

The high standard deviation values of income and exchange rate implies significant variability in the series. Thus, these two variables will be demeaned by taking their logarithm in the regression equation to avoid the problem of heteroscedasticity. The table also shows that only real interest rate is negatively skewed among the series. Other series in the model maintain positive statistically significant degree of Skewness at least at the 10% level of significance, thus indicating an upward trend in the variables overtime for most of the periods under study.

Pearson Pairwise Correlation Analysis

Table 2 below reports the correlation matrix of the time series employed in this study. It shows the degree and direction of the unconditional relationship between the variables in the model. Surprisingly, the table reports a negative correlation coefficient between interest rate and money demand as well as with inflation and exchange rate. On the other hand, income assumes a positive and significant correlation coefficient.

Table 2: Pearson Pairwise Correlation Matrix

		1	2	3	4	5	6	7
		MD	RT	RD	YT	IN	EX	RI
1	MD	1.000						
2	RT	0.362*	1.000					
3	RD	-0.334*	0.550*	1.000				
4	YT	0.847*	0.288	-0.134	1.000			
5	IN	-0.279*	-0.106	0.454*	-0.366*	1.000		
6	EX	-0.223*	-0.199	-0.204	-0.277	-0.147	1.000	
7	RI	0.0991	0.015	-0.483*	0.176	-0.010	0.057	1.000

*indicates statistical significance at 5% level

Similarly, the table also shows the correlation coefficients between the regressors in the model. For instance, the real interest rate and interest on deposits is significant at 0.55 percent may be signaling the need for the variables to enter the regression equation separately. However, the correlation coefficeints reported in table 2 above does not provide the sufficient conditions to attach any structural interpretation to this relationship since there are only unconditional correlations which only say something about the association between the variable.

Unit Root Test Result

The empirical analysis starts with testing for the unit root or stationarity of the time series. The outcome of the unit root exercise in turn informs the specific variables to be entered in the regression equation.

Table 3 below contains the result for the unit test exercise. The table shows the results from the three different approaches utilized in this analysis. In particular, the study adopts the Augmented-Dickey Fuller (ADF) test statistic, the Phillip Perron (PP) test statistic and the Dickey-Fuller GLS (DF-GLS) test statistic. The choice of using three different approaches for this test is to provide sufficient evidence to arrive at the appropriate conclusion concerning the order of integration of the variables.

Table 3: Unit Root Test Result

	ADF TEST		PP TEST		DF-GLS TEST		
	LEVEL	**IST DIFF**	**LEVEL**	**IST DIFF**	**LEVEL**	**IST DIFF**	**DECISION**
MD	-2.4341	-7.6284*	-4.9038*	-9.7601*	-1.9993*	-3.6905*	I(1)
	(0.3571)	(0.0000)	(0.0017)	(0.0000)			
RT	-4.5111*	-12.6898*	-5.5887*	-12.5569*	-5.6079*	-6.1753*	I(0)
	(0.0009)	(0.0000)	(0.0003)	(0.0000)			
RD	-3.2217	-3.8484*	-2.8101	-7.7188*	-1.5551	-3.9673*	I(1)
	(0.0967)	(0.0259)	(0.2026)	(0.0000)			
YT	-2.2744	-3.5647*	-4.0261*	-3.9567*	-1.8408	-3.6562*	I(1)
	(0.4364)	(0.0479)	(0.0161)	(0.0193)			
IN	-3.6651*	-5.6719*	-2.957*	-11.4828*	-3.1245	-5.7209*	I(1)
	(0.0377)	(0.0002)	(0.1572)	(0.0000)			
EX	-2.7098	-4.15374*	-2.1655	-4.4892*	-1.9527	-4.7355*	I(1)
	(0.2387)	(0.0118)	(0.4943)	(0.0051)			
RI	-4.1537*	-7.7626*	-4.1967*	-20.2064*	-4.0617*	-7.4085*	I(0)
	(0.0118)	(0.0000)	(0.0106)	(0.0000)			

*indicates asymptotic significance at the 5% level. Values in the parenthesis (.) are the p-values denoting the exact level of significance of the variables. The critical value of the DF-GLS approach is 3.19.

The specification used for all the test approaches follows the linear and trend specification. The test is conducted using the logarithm of income and exchange rate.

On the overall, the results show that apart from the real interest rate and risk on non-money assets, the study is not able to reject the null hypothesis of a unit root at the 5% critical value for all the other variables at levels; log of money demand, log of GDP per capita, log of real effective exchange rate, inflation and interest on deposits all fail to assume stationarity at their levels. Stationarity is, however, induced when the first difference transformations of these variables are used for the unit root test.

Long-Run Cointegrating Relations

The results of the three approaches utilized for the unit root tests, provides evidence on the unit root properties of the times series. Since all the series are not integrated of the same order, the study cannot proceed to testing the cointegration of the series.

Table 4: Estimates of Long run parameters

Estimation of long run parameters by DOLS						
	Model 1			**Model 2**		
	1	**2**	**3**	**1**	**2**	**3**
Constant ϕ_0	-4.7527*	-5.8699	-6.1603	-8.1799**	-8.3235*	-8.8112
	(0.0423)	(0.3272)	(0.4504)	(0.0025)	(0.0368)	(0.0572)
RT	0.0235*			0.0401**		
	(0.0486)			(0.0018)		
RD		-0.1762			-0.0265	
		(0.7452)			(0.3951)	
RI			0.0224			0.0092
			(0.4504)			(0.8262)
YT	0.9713**	0.2522*	0.2110**	0.9559**	0.3217**	0.3198*
	(0.0051)	(0.0215)	(0.0009)	(0.0064)	(0.0051)	(0.0201)
IN	0.0070	0.0048	0.0017	0.0347*	0.0220	0.0174
	(0.1982)	(0.4431)	(0.7772)	(0.0039)	(0.1469)	(0.2768)
EX	0.0152	-0.0907	-0.0708	0.6263**	0.2093	0.2554
	(0.9064)	(0.7353)	(0.6611)	(0.0006)	(0.2598)	(0.2224)
R-squared	0.8797	0.8396	0.8243	0.9242	0.8406	0.7745
Adj. R-squared	0.7784	0.7046	0.6763	0.7784	0.7046	0.6763

**and * denotes statistical significance at 1% and 5% respectively. Variables in parenthesis (.) p-values that gives the exact level of significance of the parameter.

However, an estimation of long run parameters becomes instructive to further investigate the nature of the long-run relations in the model. The long run parameters are obtained from the DOLS technique. In passing, the variables for real interest rate, interest on deposits and risk are entered separately in the regression equation to avoid multicollinearity.

The result shows that real interest rate has a positive and statistically significant long-run effects on money demand, this result is not in line with the theoretical stipulation. However, the result for the long run parameter for interest deposits is consistent with the *apriori* expectation.

Specifically, the result shows a negative and statistically insignificant result for interest on deposits. This result implies that only the long-run elasticity of interest on deposits conform to the theoretical expectations. Although the signs of the parameters for risk on other assets and inflation assumes positive values, as expected, they are not significantly different from zero. The sign and the magnitude of the income elasticity is appropriate.

The only slightly puzzling result is that of the real exchange rate variable, although there are no theoretical stipulations about the expected sign of this variable; results from previous related empirical works in this subject have often shown that this variable positively affects money demand, see for examples, Nwude (2018) and Sheefeni (2013). Hence, the positive elasticity of the real exchange rate conforms to empirical regularities.

Interestingly, though the sign of the parameters of the variables in both model 1 and 2 converges, the size and magnitude of the parameters in the expectations specification in model 2 is slightly larger than that of model 1 indicating that the money demand function could be better explained by the Friedman's specification. For instance, comparing the estimates, one will notice that in the two models of demand for money relationships, elasticity of expected real income is consistently higher than that of current income. Hence, in terms of the comparative behaviour of both models it can be inferred that model 2 which captures the role of expected income, inflation, and exchange rate reports a more robust long run result.

Short Run Dynamics and Equilibrium Relationships

The preceding subsection provides plausible empirical insights into the long run relationships between the money demand and its fundamental determinants. As is conventional in the empirical literature, the next step is to investigating the nature of the short run dynamics in the money demand function and how disequilibrium in the established long-run relationships is corrected in the short run. Specifically, an estimation of the error correction models is conducted, which in addition to showing how the structural determinants affect the money demand, also shows the speed of adjustment back to the equilibrium relationship.

The results for the short run relations are presented in columns (1) to (6) reports of table 5. The results for the short-run determinants employ exactly the same variables and specifications that are employed in the long run from Models 1 and 2 in Table 4.

One thing is immediately apparent in table 5; that is; in almost all the cases the signs of all the variables in the short run parameters do not significantly deviate from their long run counterparts. Thus, suggesting that there may be some underlying stability in the money demand relations.

The additional term in the regression is the error correction term (ECM) that is used to capture the speed of adjustment and correction of short-term deviations to their long run values. The ECM term is extracted from the residuals of the DOLS regression result. The ECM term is theoretically expected to be negative and significant.

Table 5: Estimates of Short Run parameters

Estimation of short run parameters by adjusted Error Correction Model						
	Model 1 $m_d = \phi_0 + \phi_1 r_t + \phi_2 y_t + \phi_3 \pi_t + \Omega x_t' + \mu_t$			**Model 2** $m_{dt} = \phi_0 + \phi_1 r_t + \phi_2 y_t^e + \phi_3 \pi_t^e + \Omega x_t' + \mu_t$		
	1	**2**	**3**	**1**	**2**	**3**
Constant ϕ_0	-0.0153	-0.0131	-0.0113	-0.0356	-0.0438	-0.1606
	(0.5635)	(0.7031)	(0.7275)	(0.2691)	(0.2113)	(0.2041)
RT	0.0178**			0.0056**		
	(0.0000)			(0.0021)		
RD		-0.0015			-0.0175	
		(0.8968)			(0.1255)	
RI			-0.0124			0.0015
			(0.2888)			(0.8993)
YT	0.5587*	0.3184*	0.5882*	0.6891*	0.7781**	0.8778**
	(0.0354)	(0.0406)	(0.0350)	(0.0159)	(0.0041)	(0.0007)
IN	0.0039*	0.0001	0.0374	0.0010	0.0030	0.0047
	(0.0474)	(0.9614)	(0.0871)	(0.6481)	(0.2581)	(0.1431)
EX	-0.1187	-0.0892	0.0802	-0.0099	-0.0474	-0.0663
	(0.1164)	(0.3832)	(0.3814)	(0.8213)	(0.3271)	(0.1826)
ECM	-0.5543*	-0.6055*	-0.6637**	-0.5952	-0.6428*	-0.5828*
	(0.0267)	(0.0372)	(0.0097)	(0.1062)	(0.0227)	(0.0141)
R-squared	0.5588	0.2662	0.3424	0.5253	0.4427	0.4511
Adj. R-squared	0.4853	0.1439	0.2328	0.4374	0.3395	0.3494
F-stats	7.6007**	2.1770	3.1242*	5.9758**	4.2905**	4.4384**
	(0.0001)	(0.0832)	0.0218	(0.0007)	(0.0053)	(0.0044)
DW	1.6599	1.7490	1.8324	1.9432	1.5149	1.7872

**and * denotes statistical significance at 1% and 5% respectively. Variables in parenthesis (.) p-values that gives the exact level of significance of the parameter.

One of the fascinating results obtained from the short run estimation reported in Table 6 is that the effect of a depreciation of the exchange rate on money demand seems to be switching from positive in the long-run, (see Table 5), to negative in the short-run.

In particular, the value of the short-run exchange rate elasticity ranges from 0.0802 to 0.1187 and 0.0099 to 0.0474 for model 1 and 2 respectively. Thus, implying that depreciation in exchange rate reduces money demand in the short run. In essence it can be inferred that the influence of the exchange rate depreciation on the money demand function is stronger in model 1 than in model 2.

The result for real interest rate maintains same sign and statistical significance as that reported in the long run estimates. Both income and interest on deposits are appropriately signed with the expected elasticities taking up positive and negative values respectively. The non-significant elasticity of interest on deposits denotes that interest on deposits may play very negligible role in the money demand function for Nigeria. The result can be explained by the fact that for structurally less developed financial system as that in Nigeria where financial assets may not be important substitutes for money, interest on deposits may have no telling effect on money demand.

Though the magnitude of the income elasticity of money demand is consistently statistically significant and in line with the expected sign in both models 1 and 2 within the long run and short run specifications, however, the size of the elasticity is larger for expected income ranging from 0.3198 to 0.5882 and 0.6891 to 0.8778 in both the models 1 and 2 respectively. Hence, expected income rather than current income may be the appropriate argument in the money demand function. The result shows individuals demand for money is better explained by the expected or permanent income. The overall consistent significance of the income elasticity in the money demand function shows that the transactionary and precautionary motives for holding money is stronger and is the case for typical developing countries where household income is relatively low with the accompanying high propensity to consume.

The results for inflation both current and expected are statistically remote implying that inflation has limited influence on money demand. The limited influence of inflation in the money demand function may be explained by the fact that inflation movement is reflected in the market interest rate movement. Alternatively, it can also be plausibly explained by the narrowly diversified sectorial activities where the yield of financial and real assets moves together. Similar conclusion can be reached for risk.

The result for disequilibrium adjustment mechanism, shows that the coefficient of the error correction term is negative and significant for all the models. This coefficient averages at

0.607 and implies that every year, approximately 61 percent of the disequilibrium money demand function of the previous year is corrected. Similarly, the model fit is quite robust as evidenced in the high R-squared and adjusted R-squared.

Model Diagnostic and Stability Test

Having provided the empirical evidence for the study, it is pertinent to carry out some diagnostic test to evaluate the adequacy of the specified model and the estimation technique. The result for this exercise is presented in table 6 below. The test is based on the short run estimation technique.

To begin with, the result shows that all the specified regression equations except equation 1 in model 1 fails to pass the LM serial correlation test. In other words, the null hypothesis of no serial correlation cannot be rejected for equation 1 in model 1. The result for the B-P-G test for heteroscedasticity suggests that the residual terms from the six specifications have zero mean and constant variance.

Table 6: Model Diagnostic Test

Test	Model 1			Model 2		
	1	2	3	1	2	3
LM Serial	4.0037*	0.5415	0.2290	1.8114	0.7221	1.0595
Correlation Test	(0.0311)	(0.5885)	(0.7969)	(0.1842)	(0.4955)	(0.3617)
B-P-G Test	0.5995	2.3786	0.3984	0.2642	0.9770	1.0991
Heteroscedasticity	(0.7010)	(0.0653)	(0.0775)	(0.9287)	(0.4495)	(0.3838)
Ramsey Reset	3.9272*	1.9837	1.1914	1.9015	3.7038*	1.7847
Test	(0.0421)	(0.1286)	(0.1626)	(0.1143)	(0.0401)	(0.1021)

*denotes statistical significance at the 5% level and hence rejection of the null hypothesis. Values in the parenthesis (.) are the p-values.

Finally, the Ramsey Reset test is employed here to test for model misspecification and stability of the model. In this case the result shows that equation one in model 1 and equation 2 in model 2 fail this test. However, equations 2 and 3 in model 1 and equations 1 and 3 in model 2 all pass the three diagnostic tests.

Table 7: Chow Test for Structural Breaks and Model Stability

Period	Model 1			Model 2		
	1	2	3	1	2	3
1980-1987	1.4051	7.7638**	7.0036**	1.4341	3.8151*	4.3379**
	(0.2590)	(0.0002)	(0.0003)	(0.2486)	(0.0100)	(0.0053)

1988-1999	2.1559	0.6899	0.3589	0.5714	1.2084	0.9803
	(0.0892)	(0.6601)	(0.8965)	(0.7485)	(0.3407)	(0.4629)
2000-2007	0.8937*	0.1734	0.2817	0.7798	0.0947*	0.0709
	(0.5173)	(0.9811)	(0.9392)	(0.5949)	(0.9962)	(0.9983)

Table 7…

** and * significance at 1% and 5% respectively. Number in parenthesis (.) are p-values.

Hence, on the overall, the results for these specifications in this study can be adjudged to be statistical meaningful and economically sensible and thus, the money demand specification is stable for Nigeria.

Having established the empirical outcome of the money demand function in Nigeria, the study proceeds to examine the stability property of the estimated model. This is done with the aid of the Chow structural break test. The structural break periods selected here are based on major events, first the structural adjustment program of 1986, the transition to democracy of 1999 and the global financial crisis of 2007. The succeeding period or immediate aftermath is chosen to capture the lag in transmission of effect. The result from the stability test shows that the null hypothesis of no structural breaks cannot be rejected for the period (1988-2000) and (2001-2008) across the 6 specifications. However, it turns out that the null hypothesis is only not rejected for model 1 in 1980-1987.

CONCLUDING REMARKS

This study attempts to provide empirical insights to the analysis of the money demand function in Nigeria. Precisely, to empirically explore which specification of the money demand function most appropriately approximates the money demand function for Nigeria.

The money demand function specified here allows for expectations with respect to both income and to the rate of inflation. Thus, desired real balances are related to current and expected interest rate, income and inflation. An adaptive expectations model that permits direct investigation of the manner in which expectations are formed is used to relate the "expected" variables to observables.

On the overall, the result obtained in this study supports the empirical regularities and theoretical stipulations of the expected relationship between money demand and its determinants. In particular the income and deposit interest rate elasticities take on expected sign. Whereas real interest rate performs poorly and fails to support the *apriori* expectations.

In view of the preceding result, some implications can be drawn. First, the stability of the money demand function as reported in the test shows the predictability of response to and outcome of monetary policy. Secondly, the outcome also shows that the recurrent application of the Keynesian specification in all economic environments may amount to unintended

generalization. For instance, as shown in this study, the model of expectation seems to provide more consistent prediction and outcome to the estimation. Consequently, an examination of the Friedman's proposition can provide refreshing insights to the debate on the money demand function in Nigeria.

REFERENCES

Ajayi, S. I. (1974). The demand for money in the Nigerian economy: Comments and extensions. *Nigerian Journal of Economic and Social Studies*, *16*(1), 165-173.

Bhatta, S. R. (2013). Stability of Money Demand Function in Nepal. *Banking Journal*, *3*(1), 1-27.

Dagher, J. C., & Kovanen, A. (2011). On the stability of money demand in Ghana: A bounds testing approach. *IMF Working Papers*, 1-18.

Dharmadasa, C., & Nakanishi, M. (2013). Demand for money in Sri Lanka: ARDL approach to co-integration. In *3rd International Conference on Humanities, Geography and Economics (ICHGE'2013). Bali (Indonesia)* (pp. 143-147).

Dritsaki, M., Dritsaki, C., & London, W. (2012). The stability of money demand: Evidence from Turkey. *The IUP Journal of Bank Management*, *11*(4), 1-22.

Gerlach, S., & Svensson, L. E. (2003). Money and inflation in the euro area: a case for monetary indicators?. *Journal of Monetary Economics*, *50*(8), 1649-1672.

Imimole, B., & Uniamikogbo, S. O. (2014). Testing for the stability of money demand function in Nigeria. *Journal of Economics and Sustainable Development*, *5*(6), 123-130.

Iyoboyi, M., & Pedro, L. M. (2013). The demand for money in Nigeria: Evidence from bounds testing approach. *Business and Economics Journal.*

Kumar, S., Webber, D. J., & Fargher, S. (2013). Money demand stability: A case study of Nigeria. *Journal of Policy Modeling*, *35*(6), 978-991.

Mansaray, M., & Swaray, S. (2012). Financial liberalization, monetary policy and money demand in Sierra Leone. *Journal of Monetary and Economic Integration*, *12*(2), 62-90.

Odama, J. S. (1974). The demand for money in the Nigerian economy: A comment. *Nigerian Journal of Economic and Social Studies*, *16*(1), 175-178.

Ojo, O. (1974). The demand for money in the Nigerian economy: Some comments. *Nigerian Journal of Economic and Social Studies*, *16*(1), 149-152.

Owoye, O., & Onafowora, O. A. (2007). M2 targeting, money demand, and real GDP growth in Nigeria: do rules apply. *Journal of Business and Public affairs*, *1*(2), 1-20.

Sheefeni, J. P. S. (2013). Demand for money in Namibia: an ARDL bounds testing approach. *Asian Journal of Business and Management (ISSN: 2321-2802)*, *1*(03), 65-71.

Siklos, P., & Barton, A.. (2001). Monetary aggregates as indicators of economic activity in Canada: empirical evidence.*Canadian Journal of Economics/Revue canadienne d'économique*, *34*(1), 1-17.

Teriba, O. (1974). The demand for money in the Nigerian economy: some methodological issues and further evidence. *Nigeria Journal of Economic and Social Studies*, *16*(1), 153-164.

Tomori, S. (1972). The demand for money in the Nigerian Economy. *The Nigerian Journal of Economic and Social Studies*, *14*(3), 337-345.

Tule, M. K., Okpanachi, U. M., Ogiji, P., & Usman, N. (2018). A reassessment of money demand in Nigeria. *CBN Journal of Applied Statistics*, *9*(1), 47-74.

Nkalu, C. N. (2020). Empirical analysis of demand for real money balances in Africa: Panel evidence from Nigeria and Ghana. *African and Asian Studies*, *19*(4), 363-376.