To investigate the presence of long-run relationships among the variables, bounds testing under Pesaran et al. (2001) procedure were used. The bounds testing procedure is based on the F-test. The F-test is a test of the hypothesis of no co-integration among the variables against the existence of co-integration among the variables (Dritsakis, 2011. p. 5). This is denoted as:

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$ i.e there is no cointegration among these variables.

Ha: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 = 0$ i.e there is cointegration among these variables.

The ARDL bound test is based on the Wald-test (F-statistic). The asymptotic distribution of the Wald-test is non-standard under the null hypothesis of no cointegration among the variables. Two critical values are given by Pesaran et al. (2001) for the cointegration test. The lower critical bound assumes all the variables are 1(0) meaning that there is no cointegration relationship between the examined variable. The upper bound assumes that all variables are 1(1) meaning that there is cointegration among the variables. When the computed F-statistic is greater than the upper bound critical value, then the H0 is rejected (the variables are cointegrated). If the F-statistic is below the lower bound critical value, then the H0 cannot be rejected (there is no cointegration among the variables). When the computed F-statistic falls between the lower and upper bounds, then the results are inconclusive. According to Kremers, Ericsson and Dolado (as cited in Kiptui, 2014. p. 852), the F-test is considered a stage one test-the more powerful test is the significance of the lagged error correction term in the short-run model.

Next step is the estimation of the long-run relationship based on the appropriate lag selection criterion. The model based on Schwarz Bayesian Criterion (SBC) was selected since it uses the smallest possible lag length which makes it the parsimonious model (Mansaray and Swaray, 2012). Based on the long-run coefficients, the estimation of dynamic error correction was carried out using formulation of Equation (4).

The error correction model is thus defined as:

$$\Delta \text{ Log } M2/P_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta \text{ Log } M2/P_{t-1} + \sum_{i=1}^{n} \alpha_{2i} \Delta \text{ Log } RGDP_{t-1} + \sum_{i=1}^{n} \alpha_{3i} \Delta \text{ Log } DIR_{t-1} + \sum_{i=1}^{n} \alpha_{4i} \Delta \text{ Log } INF_{t-1} + \sum_{i=1}^{n} \alpha_{5i} \Delta \text{ Log } EX_{t-1} + \sum_{i=1}^{n} \alpha_{6i} \Delta \text{ Log } FIR_{t-1} + EC_{t-1} + U_t \quad (4)$$

Where ג is the speed of adjustment parameter.

EC is the residuals that are obtained from the estimated cointegration model of Equation (3).

3.2. Stability Test

Laidler; Bahmani–Oskooee (as cited in Akinlo, 2006. p. 448) pointed out that some of the problems of instability could stem from inadequate modeling of the short-run dynamics characterizing departures from the long-run relationship. Hence, it is expedient to incorporate the short-run dynamics in testing for constancy of long-run parameters. In view of this, the CUSUM and CUSUMSQ tests proposed by Brown et al. (1975) was applied. Specifically, the CUSUM test makes use of the CUSUM based on the first set of n observations and is updated recursively and plotted against break points. If the plot of CUSUM statistics stays within the critical bounds of 5% significance level represented by a pair of straight lines, the null hypothesis of coefficient constancy cannot be rejected. If either of the lines is crossed, the null hypothesis that all coefficients in the error correction model are stable can be rejected at the 5% level of significance. A similar procedure is used to carry out the CUSUMSQ test, which is based on the squared recursive residuals (Bhatta, 2013. p. 19). These tests are commonly used by researchers who explore the demand for money (Akinlo, 2006; Dritsakis, 2011; Mansaray and Swaray, 2012; Bhatta, 2013).

3.3. Data Sources and Techniques of Analysis

This study employed quarterly time series data from 1991:Q1 to 2014:Q4. Secondary data was sourced from statistics portal of the CBN which is available at http://statistics.cbn.gov.ng/cbn-onlinestatsand retrieved on November 2, 2015, the CBN's statistical bulletins and the International Financial Statistics website. The statistical technique employed in the study is the ARDL modeling to cointegration. This deals with single cointegration and is applicable on small-sized samples. The bounds testing procedure has certain econometric advantages in comparison to other methods of cointegration which are the following: (a) All variables of the model are assumed to be endogenous. (b) This procedure is being applied irrespective of whether the variables are stationary or integrated of order 1. (c) The short-run and long-run coefficients of the model are estimated simultaneously. (d) The procedure allows that the variables may have different optimal lags, while it is impossible with conventional cointegration procedures. (e) This procedure employs only a single reduced form equation, while the conventional cointegration procedures estimate the long-run relationships within a context of system of equations (Bhatta, 2013. p. 10).

Given these features, the bounds testing procedure was selected to identify the determinants of money demand in Nigeria, then, the stability tests were adopted to see if the demand for money remains stable over time. The cumulative sum test is useful for detecting systematic changes in the regression coefficients whereas the cumulative sum of squares test is useful in situation where the departure from the constancy of regression coefficients is abrupt and sudden. Among the prominent works that used the ARDL modeling to cointegration are: Akinlo (2006) for Nigeria, Dagher and Kovanen (2011) for Ghana, Dritsakis (2011) for Hungary, Mansaray and Swaray (2012) for Sierra Leone, Bhatta (2013) for Nepal, Imimole and Uniamikogbo (2014) for Nigeria, Kiptui (2014) for Kenya and Özcalik (2014) for Turkey.

4. EMPIRICAL RESULTS

The quantum values and the logged values of the selected variables are shown in appendix A1 and appendix A2 respectively. Correlation matrix and the heteroscedasticity test for the first hypothesis are indicated in appendix A3 and A4 respectively while the autocorrelation test is displayed in appendix A5. The unit root test for M2 money demand function is shown in appendix A6.

We conducted stationarity tests to ensure that none of the variables are integrated of order higher than one. We thus begin by testing for the presence of unit roots in the variables. The ADF unit root test is used to determine the order of integration. The results are presented in the Table 1.

The unit root test is conducted on the log values of the dependent and independent variables. The results show that all the variables were stationary at first difference except real money demand and real GDP that are stationary at level. Our dataset thus comprehend a mixture of 1 (0) and 1 (1) processes, which provides necessary theoretical support for the use of the ARDL methodology and guarantees the suitability of the ARDL approach. Table 2 provides the result of the multiple regressions.

The coefficient on the real income variable indicates that the long run income elasticity for real broad money is 0.2111. This means that a 1% increase in real income increases the demand for real money balances by 0.21%. The long run income elasticity of less than one supports the argument of several studies that financial development and liberalization, technological improvements in payment system, creation of money substitutes and improved economic stability should decrease the income elasticity of money demand (Owoye and Onafowora, 2007; p.8). This result is in conformity with the findings of Nduka et al. (2013), Iyoboyi and Pedro (2013) for Nigeria and Mansaray and Swaray (2012) for Sierra Leone.

The results show that the interest rate coefficient carries a negative sign and is statistically significant. This implies that in the long run, the demand for broad money balances remain dependent on the domestic interest rate. Thus, the interest rate is a good proxy of the opportunity cost of holding money and has a significant effect on the demand for broad money in Nigeria. The coefficient of the domestic interest rate follows Friedman's quantity theory of money and is consistent with the contributions of Nduka et al. (2013) and Akinlo (2006) for Nigeria. This result is in contrast to Imimole and Uniamikogbo (2014), Onafowora and Owoye (2008) for Nigeria, Kapingura (2014) for South Africa and Abdulkheir (2013) for Saudi Arabia whose empirical results showed that the coefficient of domestic interest rate is positively related to real money demand.

The inflation rate elasticity is negative (−0.0218) and significant, supporting Friedman's theoretical expectations. This means that the higher the inflation rate, the lower the demand for broad money in Nigeria i.e a 1% increase in inflation decreases demand for real money balances by 0.02% in the long run. Inflation growth will lead to increased return on alternative forms of assets such as equity holding (shares), investment in land and real estate and commodities, which will reduce demand for naira. This suggest that

Table 1: ADF unit root tests from M2 money demand function

Variables	At level with constant, no trend		At first difference with constant, no trend	
	ADF statistics	5% critical value	ADF statistics	5% critical value
LOGM2P	−3.83	−2.9980	−1.0429	−3.0048
LOGRGDP	−3.13	−2.9980	−0.7476	−3.0048
LOGDIR	−2.02	−2.9980	−5.3786	−3.0048
LOGINF	−2.38	−3.0048	−4.6004	−3.0048
LOGEX	−2.06	−2.9980	−4.6551	−3.0048
LOGFIR	2.44	−3.0299	−3.3833	−3.0048

Source: Researcher's Eview result. ADF: Augmented Dickey Fuller

Table 2: Regression result

Dependent variable: M2P				
Method: Least squares				
Sample: 1991Q1–2014Q4				
Included observations: 96				
Variable	Coefficient	Std. error	t-statistic	Prob.
C	176.5896	55.76911	3.166441	0.0053
RGDP	0.211143	0.000565	373.7244	0.0000
DIR	−6.334513	2.079549	−3.046099	0.0070
INF	−0.021800	0.528999	−0.041210	0.0476
EX	0.015178	0.256238	0.059235	0.0134
FIR	−23.02143	5.587963	−4.119825	0.0006
R^2	0.899885	Mean dependent var		725.0583
Adjusted R^2	0.869853	SD dependent var		2887.932
S.E. of regression	35.00580	Akaike info criterion		10.16122
Sum squared resid	22057.31	Schwarz criterion		10.45574
Log likelihood	−115.9347	F-statistic		31304.14
Durbin-Watson stat	1.901229	Prob (F-statistic)		0.000000

Source: Researcher's Eview result

the hedging effect of inflation on money demand is greater than the investment effect. This finding is in consonance with many studies like Mansaray and Swaray (2012) for Sierra Leone, Imimole and Uniamikogbo (2014) for Nigeria, Kjosevski (2013) for Macedonia, Dritsakis (2012) for Hungary and Sharifi-Renani (2007) for Iran. The result is at variance with Abdulkheir (2013) for Saudi Arabia whose findings indicated a positive and statistically significant long run relation between the inflation rate and money demand.

There is also a positive and statistically significant effect of exchange rate on real broad money demand supporting the wealth effect argument in the literature. This is consistent with theory that predicts that an increase in exchange rate can be perceived as an increase in wealth, leading to a rise in the demand for domestic money. Depreciation of the exchange rate increases the external value of the domestic currency in foreign assets. Thus, wealth holders who perceive this as an increase in their wealth tend to convert a portion of their foreign assets to domestic assets in a bid to maintain a fixed share of their wealth that are invested in domestic currency (Mansaray and Swaray, 2012. p. 81). The positive coefficient of exchange rate in Nigeria is in conformity with the findings of Akinlo (2006), Imimole and Uniamikogbo (2014) for Nigeria, Sharifi-Renani (2007) for Iran and Mansaray and Swaray (2012) for Sierra Leone. It also contradicts the findings of Kapingura (2014) for South Africa, Onafowara and Owoye (2004), and Nduka et al. (2013) for Nigeria as they attributed the negative coefficient of the exchange rate depreciation to the existence of currency substitution in Nigeria.

The foreign interest rate coefficient is negative and statistically significant. A 1% rise in foreign interest rate may lead to 23.02% fall in the demand for real money balances. This result is supportive of the portfolio balance argument of capital mobility and highlights the importance of foreign effects in explaining the demand for real broad money in Nigeria during the sample period. This finding is in consonance with the studies of Onafowora and Owoye (2008) and Imimole and Uniamikogbo (2014) for Nigeria. The result is in contrast to Nduka et al. (2013) who did not support the argument of capital mobility because the coefficient of foreign interest rate was positively related to real money demand for the period of 1986–2011 in Nigeria.

To investigate the presence of long run relationship among the variables, bounds testing procedure was used (Table 3).

The value of our F-statistic is 4.44 and we have (K+1) = 6 variables (M2/P, RGDP, DIR, INF, EX and FIR) in our model. The lower and upper bounds for the F-test statistic at 5% significance levels are 2.81 and 3.76 respectively (Pesaran et al., 2001. p. 300). We did not constrain the intercept of our model and there is linear trend term included.

As the F-statistic value of 4.44 exceeds the upper bound of 3.76 at the 5% significance level, we can conclude that there is cointegrating relationship between real money demand, real GDP, domestic interest rate, inflation rate, exchange rate and foreign interest rate in Nigeria. The calculated F-statistics clearly rejects null hypothesis of no cointegration at 5% level of significance. This is consistent with several studies like Bhatta (2013) for Nepal and Dritsakis (2011) for Hungary. This findings is at variance with Akinlo (2006) over the period 1970:1–2002:4 for Nigeria whose result showed that there is no strong evidence of cointegration and Sheefeni (2013) who found that there is no cointegration between real money balances and the selected macroeconomic variables in Namibia. Table 4 shows the ARDL error correction model.

The presence of a cointegrating relationship among real money balances and its explanatory variables validates the estimation of a short run dynamic model. The coefficient of the error correction term, ECT_{t-1} is negative and significant. The ECT measures the speed of adjustment towards equilibrium. The coefficient of the feedback parameter is −0.3669. This means reversion speed is relatively high. This implies that if there are departures from equilibrium in the previous period, the departures are reduced by about 36% in the current period. When real broad money balances deviate in the short run from real income, domestic interest rate, inflation rate, exchange rate and foreign interest rate, its speed of adjustment to long run equilibrium is about 36% per quarter and is statistically significant.

This correction speed of adjustment is comparatively more consistent than the findings in other studies such as: 31% in Vietnam, 16% in Iran (Sharifi-Renani, 2007), 13% in Greece (Dritsakis, 2011), 6% in Nigeria (Owoye and Onafowora, 2007) and 4.9% in Cambodia.

The goodness of fit for the short run ARDL model is 68% and the adjusted R^2 is 44%. The adjusted R^2 of the error correction model is rather low but it does not significantly affect our results since

Table 3: Wald test for cointegration

Test statistic	Value	df	Probability
F-statistic	4.448360	(6, 50)	0.0011
Chi-square	26.69016	6	0.0002
Null Hypothesis: C(32) =C(33) =C(34) =C(35) =C(36) =C(37)=0			
Null hypothesis summary:			
Normalized restriction (=0)		**Value**	**Std. Err.**
C(32)		−0.187774	0.112056
C(33)		1.517708	0.554523
C(34)		0.049145	0.080016
C(35)		−0.110713	0.037096
C(36)		0.107764	0.071908
C(37)		0.020125	0.017424

Source: Researcher's Eview result

Table 4: Error correction model result

Dependent variable: D(M2P)				
Method: Least squares				
Sample (adjusted): 1992Q3–2014Q4				
Included observations: 86 after adjustments				
Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
C	−2.803392	1.093712	−2.563191	0.0136
@TREND	−0.008966	0.003658	−2.450996	0.0179
D(RGDP)	0.333423	0.455225	0.732436	0.4675
D(DIR)	0.116207	0.105407	1.102451	0.2758
D(INF)	−0.058979	0.050908	−1.158547	0.2524
D(EX)	0.037015	0.090408	0.409418	0.6841
D(FIR)	−0.052366	0.035685	−1.467463	0.1488
D(M2P(−1))	−0.282641	0.218390	−1.294200	0.2018
D(RGDP(−1))	−1.067328	0.750953	−1.421297	0.1617
D(DIR(−1))	−0.014691	0.102648	−0.143116	0.8868
D(INF(−1))	0.031540	0.035265	0.894364	0.3756
D(EX(−1))	−0.131470	0.084338	−1.558852	0.1256
D(FIR(−1))	−0.000131	0.040327	−0.003237	0.9974
D(M2P(−2))	−0.140406	0.156290	−0.898370	0.3735
D(RGDP(−2))	−0.832480	0.713168	−1.167298	0.2489
D(DIR(−2))	−0.073428	0.104087	−0.705446	0.4839
D(INF(−2))	0.066014	0.036124	1.827406	0.0739
D(EX(−2))	−0.242753	0.103751	−2.339755	0.0235
D(FIR(−2))	−0.040243	0.040214	−1.000713	0.3220
D(M2P(−3))	−0.162527	0.143134	−1.135492	0.2618
D(RGDP(−3))	−0.402507	0.612308	−0.657361	0.5141
D(DIR(−3))	−0.075225	0.105636	−0.712115	0.4798
D(INF(−3))	0.062082	0.037498	1.655632	0.1043
D(EX(−3))	−0.202955	0.129347	−1.569068	0.1232
D(FIR(−3))	−0.038980	0.039076	−0.997541	0.3235
D(M2P(−4))	0.127876	0.135116	0.946415	0.3487
D(RGDP(−4))	−0.046899	0.522875	−0.089695	0.9289
D(DIR(−4))	0.281096	0.101316	2.774434	0.0079
D(INF(−4))	0.081807	0.035341	2.314803	0.0249
D(EX(−4))	−0.290660	0.121404	−2.394144	0.0206
D(FIR(−4))	−0.039823	0.041665	−0.955796	0.3440
M2P(−1)	−0.170285	0.116019	−1.467741	0.0487
RGDP(−1)	1.659446	0.623052	2.663414	0.0105
DIR(−1)	0.042550	0.086098	0.494207	0.6234
INF(−1)	−0.129451	0.043463	−2.978427	0.0045
EX(−1)	0.120151	0.073791	1.628248	0.1100
FIR(−1)	0.018468	0.018081	1.021355	0.0122
ECT(−1)	−0.366896	0.273263	−1.333805	0.0077
R^2	0.688847	Mean dependent var		0.010937
Adjusted R^2	0.448999	S.D. dependent var		0.054407
S.E. of regression	0.040386	Akaike info criterion		−3.280080
Sum squared resid	0.078290	Schwarz criterion		−2.195601
Log likelihood	179.0435	Hannan-Quinn criter.		−2.843628
F-statistic	2.872021	Durbin-Watson stat		2.030615
Prob (F-statistic)	0.000333			

Source: Reseacher's Eviews result

the variables are in the difference form. Durbin Watson statistic of 2.03 is indicative of the absence of autocorrelation.

This model with 4 period lags based on SBC was selected since the SBC is parsimonious as it uses minimum acceptable lag while selecting the lag length and avoids unnecessary loss of degrees of freedom (Bhatta, 2013. p. 14). The lag selection result is displayed Table 5.

Finally, the stability of the long run coefficients together with the short run dynamics was examined. The CUSUM and the CUSUMSQ tests were applied (Figures 1 and 2).

Finally, the CUSUM and CUSUMSQ indicate that the estimated short run dynamics and long run parameters of the money demand function are stable, since the plots of these graphs are confined within the 5% critical bounds of parameter stability. Thus, a stable real broad money demand function exists in Nigeria over the entire period of the analysis.

5. CONCLUSIONS

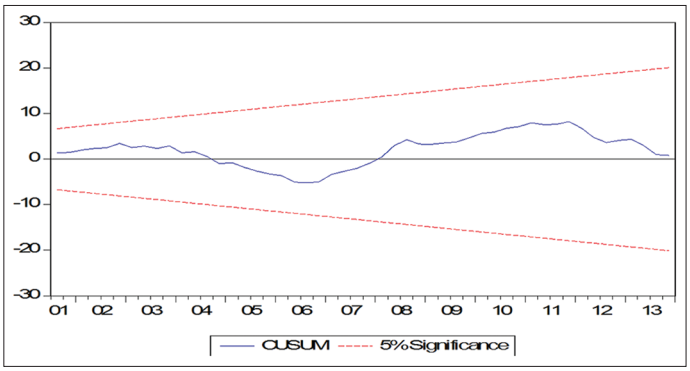
Given the importance attached to money demand and its stability in the success or failure of monetary policy the results of this study reveal that a cointegrating relationship exist between the

Table 5: Lag selection result

VAR lag order selection criteria						
Endogenous variables: D(M2P)						
Exogenous variables: C (M2P(-1)) D(RGDP(-1)) D(DIR(-1)) D(INF(-1)) D(EX(-1)) D(FIR(-1))						
Sample: 1991Q1–2014Q4						
Included observations: 79						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	116.7427	NA	0.003640	−2.778295	−2.568344	−2.694182
1	118.2558	2.719806	0.003594	−2.791286	−2.551342	−2.695157
2	119.6633	2.494376	0.003558	−2.801603	−2.531666	−2.693458
3	120.3597	1.216365	0.003587	−2.793915	−2.493985	−2.673754
4	126.7108	10.93367*	0.003134*	−2.929388*	−2.599465*	−2.797211*
5	127.0553	0.584226	0.003188	−2.912792	−2.552875	−2.768598
6	127.6435	0.982796	0.003224	−2.902366	−2.512457	−2.746156
7	127.6793	0.058933	0.003306	−2.877956	−2.458054	−2.709730
8	128.9018	1.980733	0.003290	−2.883589	−2.433693	−2.703347
9	129.2756	0.596219	0.003346	−2.867736	−2.387848	−2.675478
10	129.5565	0.440897	0.003412	−2.849531	−2.339650	−2.645257
11	130.1028	0.843740	0.003456	−2.838046	−2.298172	−2.621756
12	130.2465	0.218179	0.003536	−2.816366	−2.246499	−2.588060

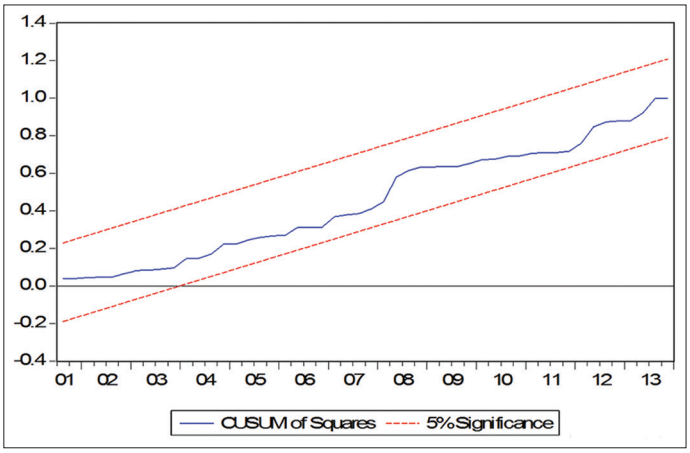
*Indicates lag order selected by the criterion. LR: Sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion. Source: Researcher's Eview result

Figure 1: Plot of cumulative sum of recursive residuals



Source: Researcher's Eview result

Figure 2: Plot of cumulative sum of squares of recursive residuals



Source: Researcher's Eview result

real broad money, real income, domestic interest rate, inflation rate, exchange rate and foreign interest rate. Furthermore, the CUSUM and CUSUMSQ test also confirmed the stability of the long-run money demand function. However, monetary targeting is still relevant in setting monetary policy framework in Nigeria.

REFERENCES

Abdulkheir, A.Y. (2013), An analytical study of the demand for money in Saudi Arabia. International Journal of Economics and Finance, 5(4), 31-38.

Achsani, N.A. (2010), Stability of money demand in an emerging market economy: An error correction and ARDL model for Indonesia. Research Journal of International Studies, 13, 83-91. Available from: http://www.pascaie.ipb.ac.id›doc›jurnal7.

Akinlo, A.E. (2006), The stability of money demand in Nigeria: An autoregressive distributed lag approach. Journal of Policy Modeling, 28(4), 445-452.

Bhatta, S.R. (2013), Stability of money demand in Nepal. Banking Journal, 3(1), 1-27.

Brown, R.L., Durbin, J., Evans, J.M. (1975), Techniques for testing the constancy of regression relations over time. Journal of the Royal Statistical Society, 37, 149-192. Available from: http://www.ftp.uic.edu›brown_durbin_evans.

Dagher, J., Kovanen, A. (2011), On the Stability of Money Demand in Ghana: A Bounds Testing Approach. IMF Working Paper, WP/11/273 No. 1-18. Available from: https://www.imf.org›pubs›2011.

Dharmadasa, C., Nakanishi, M. (2013), Demand for Money in Sri Lanka: ARDL Approach to Co-integration. Proceedings of the 3rd International Conference on Humanities, Geography and Economics, Bali, Indonesia: Planetary Scientific Research Centre. p143-147. Available from: http://www.psrcentre.org›images›extraimages.

Doguwa, S.I., Olowofeso, O.E., Uyaebo, S.O., Adamu, I., Bada, A.S. (2014), Structural breaks, cointegration and demand for money in Nigeria. CBN Journal of Applied Statistics, 5(1), 15-33. Available from: http://www.cenbank.org.

Dritsakis, N. (2011), Demand for money in Hungary: An ARDL approach. Review of Economics and Finance, 1, 1-16.

Dritsaki, C., Dritsaki, M. (2012), The stability of money demand: Evidence from Turkey. The IUP Journal of Bank Management, 9(4), 7-28. Available from: http://www.ssrn.com.

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. Available from: http://www.iiste.org›JEDS›article›viewfile.

Iyoboyi, M., Pedro, L.M. (2013), The demand for money in Nigeria: Evidence from bounds testing approach. Business and Economics Journal, 2013(76), 1-13. Available from: http://www.astonjournals.com/bej.

Kapingura, F.M. (2014), The stability of the money demand function in South Africa: A VAR-based approach. International Business and Economics Research Journal, 13, 1471-1482. Available from: http://connection.ebscohost.com›article.

Kiptui, M.C. (2014), Some empirical evidence on the stability of money demand in Kenya. International Journal of Economics and Financial Issues, 4(4), 849. Available from: http://www.econjournals.com›viewFiles›pdf.

Kjosevski, J. (2013), The determinants and stability of money demand in the Republic of Macedonia. Proceedings of Rijeka faculty of economics. Journal of Economics and Business, 31(1), 35-54.

Kumar, P. (2014), The determinants and stability of money demand in India. Online International Interdisciplinary Research Journal, 4, 80-92. Available from: http://www.oiirj.org›nov2014-special-issue.

Kumar, S., Webber, D.J., Fargher, S. (2010), Money Demand Stability: A Case Study of Nigeria. MPRA Paper 26074, University Library of Munich, Germany. Available from: https://www.mpra.ub.uni-muenchen.de/id/eprint/26074.

Lungu, M., Simwaka, K., Chiumia, A., Palamuleni, A., Jombo, W. (2012), Money demand function for malawi-ımplications for monetary policy conduct. Banks and Bank systems, 7(1), 50-63. Available from: https://www.rbm.mw.

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. Available from: http://www.wami-imao.org›files›journals.

Mishkin, F.S. (2010), The Economics of Money, Banking and Financial Markets. New York: Addison-Wesley Publishing Company.

Nduka, E.K., Chukwu, J.O., Nwakaire, O.N. (2013), Stability of demand for money in Nigeria. Asian Journal of Business and Economics, 3(3.4), 1-11. Available from: http://www.onlineresearchjournals.com.

Omer, M. (2010), Stability of Money Demand Function in Pakistan. SBP Working Paper Series, 36, 1-30. Available from: http://www.sbp.org.pk.

Onafowora, O., Owoye, O. (2008), Exchange rate volatility and export growth in Nigeria. Applied Economics, 40(12), 1547-1556.

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. Available from: https://www.econbiz.de.

Özcalik, M. (2014), Money demand function in Turkey: An ARDL approach. Journal of Socialand Economic Research, 14 (27), 360-373. Available from: http://www.sead.selcuk.edu.tr.

Pesaran, M.H., Shin, Y., Smith, R.J. (2001), Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16, 289-326.

Sharifi-Renani, H. (2007), Demand for Money in Iran: An ARDL Approach. Available from: http://www.mpra.ub.uni-muenchen.de/8224/MPRA Paper No.8224,posted 16. [Last accessed on 2008 April 02].

Sheefeni, J.P.S. (2013), Demand for money in Namibia: An ARDL bounds testing approach. Asian Journal of Business and Management, 1(3), 65-71. Available from: http://www.ajouronline.com›journal=AJMB.

Sober, M. (2013), Estimating a function of real demand for money in Pakistan: An application of bounds testing approach to cointegration. International Journal of Computer Application, 79(5), 32-50.

Suliman, S.Z., Dafaalla, H.A. (2011), An econometric analysis of money demand function in Sudan, 1960 to 2010. Journal of Economics and International Finance, 3(16), 793-800.

APPENDIX

Table A1: Quantum values of selected variables

Year	M2	P	M2/P	RGDP	DIR	INF	EX	FIR
1991–1	71.0	146.34	48.52	82.9	14.5	6	9.42	6.02
1991–2	80.1	165.90	48.28	82.03	12.5	10.1	9.47	5.56
1991–3	81.2	165.13	49.17	81.7	13.5	14.5	10.87	5.38
1991–4	87.5	186.64	46.88	82.73	17.5	20.1	9.87	4.54
1992–1	102.7	234.31	43.83	84.53	17.5	29.2	12.47	3.89
1992–2	114.9	259.30	44.31	84.12	17.5	42.7	18.48	3.68
1992–3	121.6	256.27	47.45	83.97	17.5	53.9	18.76	3.08
1992–4	129.1	288.14	44.80	84.68	17.5	51.2	19.5	3.07
1993–1	146.6	282.33	51.93	85.92	24.5	53.5	22.33	2.96
1993–2	159.5	318.34	50.10	85.42	28.5	57.6	22.09	2.97
1993–3	176.1	319.33	55.15	85.35	25	56.5	21.87	3
1993–4	198.5	352.51	56.31	85.84	26	60.2	21.87	3.06
1994–1	208.2	349.73	59.53	86.36	13.5	55.4	21.87	3.24
1994–2	228.3	405.65	56.28	86.15	13.5	45	21.87	3.99
1994–3	242.8	412.31	58.89	86.19	13.5	54.4	21.87	4.48
1994–4	266.9	454.00	58.79	86.53	13.5	71	21.87	5.28
1995–1	254.5	771.47	32.99	88.34	13.5	79.2	21.87	5.74
1995–2	290.7	823.67	35.29	88.06	13.5	87.9	21.87	5.6
1995–3	301.9	824.84	36.60	88.11	13.5	75.2	21.87	5.37
1995–4	318.8	877.90	36.31	88.14	13.5	55.7	21.87	5.26
1996–1	328.7	1,045.19	31.45	92.12	13.5	44.3	21.87	4.93
1996–2	354.0	1,096.84	32.27	91.73	13.5	30.5	21.87	5.02
1996–3	351.9	1.095.85	32.11	91.73	13.5	26.6	21.87	5.1
1996–4	370.3	1,154.68	32.07	91.63	13.5	19.8	21.87	4.98
1997–1	409.9	1,039.73	39.42	94.72	13.5	13.8	21.87	5.06
1997–2	410.6	1,107.59	37.07	94.44	13.5	13.8	21.87	5.05
1997–3	425.5	1,113.14	38.23	94.45	13.5	7.5	21.87	5.05
1997–4	4 429	1,174.94	36.57	94.22	13.5	8.2	21.87	5.09
1998–1	468.0	930.82	50.28	97.53	13.5	8	21.87	5.05
1998–2	477.3	930.82	46.46	97.12	14.58	5.3	21.87	4.98
1998–3	527.0	1,045.36	50.41	97.13	15	7.6	21.87	4.82
1998–4	525.0	1,105.20	47.56	96.69	14.56	10.6	21.87	4.25
1999–1	609.0	1,108.99	54.91	98.1	18	14.1	86.32	4.41
1999–2	634.9	1,188.39	53.43	98.39	18	10.4	93.25	4.45
1999–3	655.6	1,198.41	54.71	98.55	19	2.3	94.88	4.65
1999–4	699.7	1,265.47	55.29	98.07	17	0.5	96.32	5.04
2000–1	795.5	1,602.57	49.64	103.2	13.5	-1.9	99.87	5.52
2000–2	904.2	1,623.01	55.71	103.18	13.5	2.7	101.12	5.71
2000–3	962.7	1,602.90	60.06	103.23	13.5	11.7	103.52	6.02
2000–4	1,036.1	1,684.57	61.51	102.71	13.5	15.7	103.9	6.02
2001–1	1,274.0	1,514.05	84.15	108.1	13.5	18.1	110.62	4.82
2001–2	1,263.2	1,594.28	79.23	108.09	15	20.7	113.25	3.66
2001–3	1,327.6	1,602.70	82.84	108.08	14.56	18.9	111.72	3.17
2001–4	1,315.9	1.677.06	78.46	107.5	14.58	17.8	112.18	1.91
2002–1	1,423.3	1,651.66	86.17	112.63	20.5	18	114.76	1.72
2002–2	1,502.1	1,720.62	87.30	113.33	20.5	11.7	117.06	1.72
2002–3	1,605.4	1,737.85	92.38	113.1	18.5	12.6	125.31	1.64
2002–4	1,599.5	1,791.97	89.26	112.73	16.5	9.8	126.76	1.33
2003–1	1,918.9	1,968.68	97.47	124.04	16.5	7.9	127.18	1.16
2003–2	2,124.3	1,999.36	106.25	123.93	16.5	10.3	127.62	1.04
2003–3	1,981.1	2,000.26	99.04	123.78	15	14.5	128.08	0.93
2003–4	1,985.2	2,042.75	97.18	123.26	15	22.9	134.54	0.92
2004–1	2,106.2	2,295.68	91.75	114.62	15	23.2	135.22	0.92
2004–2	2,113.3	2,095.56	100.85	123.7	15	17.1	133.09	1.08
2004–3	2,156.8	2,096.98	102.85	142.37	15	10.9	132.82	1.49
2004–4	2,263.6	2,179.98	103.84	146.88	15	10.3	132.86	2.01
2005–1	2,568.1	2,640.27	97.27	120.05	13.00	12.30	132.85	2.54
2005–2	2,691.3	2,640.16	101.94	126.78	13.00	17.80	132.85	2.86
2005–3	2,773.0	2,549.65	108.76	153.93	13.00	26.20	132.30	3.36
2005–4	2,814.8	2,561.98	109.87	159.19	13.00	15.00	130.59	3.83
2006–1	3,307.7	3,100.24	106.69	128.58	13.00	11.20	129.53	4.39
2006–2	3.911.8	3,267.96	119.70	135.44	14.00	10.50	128.46	4.70

(Contd...)

Table A1: ***(Continued)***

Year	M2	P	M2/P	RGDP	DIR	INF	EX	FIR
2006–3	4,320.7	3,068.63	140.80	162.50	14.00	4.30	128.33	4.91
2006–4	4,027.9	3,051.16	132.01	169.30	10.00	7.50	128.29	4.90
2007–1	4,798.3	3,491.67	137.42	135.77	10.00	6.70	128.23	4.98
2007–2	5,116.2	3,399.92	150.48	142.76	8.00	5.10	127.65	4.74
2007–3	5,672.6	3,192.04	177.71	173.07	8.00	4.40	126.58	4.30
2007–4	5,809.8	3,032.71	191.57	182.62	9.00	5.40	120.87	3.39
2008–1	7,998.2	3,896.61	205.26	142.07	9.50	8.10	118.04	2.04
2008–2	7,948.4	3,791.71	209.63	150.86	10.25	10.00	117.84	1.63
2008–3	8,960.3	3,518.04	254.70	183.68	9.75	13.10	117.75	1.49
2008–4	9,166.8	3,363.27	272.56	195.59	9.75	14.80	120.65	0.30
2009–1	8,997.8	3,660.24	245.83	149.19	9.75	14.30	146.88	0.21
2009–2	9,077.0	3,622.86	250.55	162.10	8.00	12.50	147.76	0.17
2009–3	9,458.5	3,353.10	282.08	197.08	6.00	10.80	150.90	0.16
2009–4	10,780.6	3,253.72	331.33	210.60	6.00	12.60	149.97	0.06
2010–1	11,023.3	4,638.18	237.66	160.12	6.00	14.90	149.94	0.11
2010–2	10,845.5	4,603.11	235.61	174.73	6.00	14.00	150.13	0.15
2010–3	11,224.8	4,256.03	263.74	212.77	6.25	13.40	150.47	0.16
2010–4	11,525.5	4,135.99	278.66	228.71	6.25	12.60	150.65	0.14
2011–1	11,653.6	4,994.57	233.33	171.27	7.50	12.00	152.00	0.13
2011–2	12,172.1	5,028.32	242.07	187.83	8.00	11.30	154.42	0.05
2011–3	12,618.1	4,314.28	292.47	228.45	9.25	9.60	153.28	0.02
2011–4	13.303.5	3,877.04	343.14	246.45	12.00	10.40	155.75	0.01
2012–1	13,271.0	5,020.25	264.35	181.12	12	12.2	157.95	0.07
2012–2	13,483.1	4,924.26	273.81	199.83	12.00	12.8	157.35	0.09
2012–3	14,065.3	4,508.40	311.98	243.26	12.00	11.9	157.38	0.1
2012–4	15,483.8	4,017.67	385.39	263.68	12.00	12	157.32	0.09
2013–1	15,669.2	4,892.10	320.30	194.06	12.00	9	157.3	0.09
2013–2	15,593.2	4,809.46	324.22	212.18	12.00	8.8	157.31	0.05
2013–3	14,362.5	4,297.28	334.22	259.84	12.00	8.3	157.32	0.03
2013–4	15,689.0	4,060.20	386.41	284.03	12.00	7.9	157.32	0.06
2014–1	17,732.9	130.64	13,573.87	15438.68	12.00	7.8	157.3	0.05
2014–2	16,171.6	135.13	11,967.44	16084.62	12.00	8	157.29	0.03
2014–3	16,814.5	131.20	12,815.93	17479.13	12.00	8.3	157.29	0.03
2014–4	18,927.8	133.36	14,193.01	18150.36	13	8	162.33	0.02

Sources: Central Bank of Nigeria Statistical Bulletin, December, 2014. IMF World Economic Outlook Database, April, 2015 and Researcher's Computations. M2: Nominal M2 money stock, P: Implicit price deflator, M2/P: Real M2 money balances (N' Billion) is the dependent variable, RGDP: Real income (N' Billion), DIR: Domestic interest rate (%), INF: Inflation rate (%), EX: Expected exchange rate (N/$1.00), FIR: Foreign interest rate (%) are the independent variables. 2014 rebased gross domestic product and implicit price deflator figures at 2010 constant basic prices

Table A2: Logged values of selected variables

Year	LOGM2P	LOGRGDP	LOG(DIR)	LOGINF	LOGEX	LOGFIR
1991–1	1.69	1.92	1.16	0.78	0.97	0.78
1991–2	1.68	1.91	1.10	1.00	0.98	0.75
1991–3	1.69	1.91	1.13	1.16	1.04	0.73
1991–4	1.67	1.92	1.24	1.30	0.99	0.66
1992–1	1.64	1.93	1.24	1.47	1.10	0.59
1992–2	1.65	1.92	1.24	1.63	1.27	0.57
1992–3	1.68	1.92	1.24	1.73	1.27	0.49
1992–4	1.65	1.93	1.24	1.71	1.29	0.49
1993–1	1.72	1.93	1.39	1.73	1.35	0.47
1993–2	1.70	1.93	1.45	1.76	1.34	0.47
1993–3	1.74	1.93	1.40	1.75	1.34	0.48
1993–4	1.75	1.93	1.41	1.78	1.34	0.49
1994 –1	1.77	1.94	1.13	1.74	1.34	0.51
1994–2	1.75	1.94	1.13	1.65	1.34	0.60
1994–3	1.77	1.94	1.13	1.74	1.34	0.65
1994–4	1.77	1.94	1.13	1.85	1.34	0.72
1995–1	1.52	1.95	1.13	1.90	1.34	0.76
1995–2	1.55	1.94	1.13	1.94	1.34	0.75
1995–3	1.56	1.95	1.13	1.88	1.34	0.73
1995–4	1.56	1.95	1.13	1.75	1.34	0.72
1996–1	1.50	1.96	1.13	1.65	1.34	0.69
1996–2	1.51	1.96	1.13	1.48	1.34	0.70
1996–3	1.51	1.96	1.13	1.42	1.34	0.71
1996–4	1.51	1.96	1.13	1.30	1.34	0.70
1997–1	1.60	1.98	1.13	1.14	1.34	0.70
1997–2	1.57	1.98	1.13	1.14	1.34	0.70
1997–3	1.58	1.98	1.13	0.88	1.34	0.70
1997–4	1.56	1.97	1.13	0.91	1.34	0.71
1998–1	1.70	1.99	1.13	0.90	1.34	0.70
1998–2	1.67	1.99	1.16	0.72	1.34	0.70
1998–3	1.70	1.99	1.18	0.88	1.34	0.68
1998–4	1.68	1.99	1.16	1.03	1.34	0.63
1999–1	1.74	1.99	1.26	1.15	1.94	0.64
1999–2	1.73	1.99	1.26	1.02	1.97	0.65
1999–3	1.74	1.99	1.28	0.36	1.98	0.67
1999–4	1.74	1.99	1.23	–0.30	1.98	0.70
2000–1	1.70	2.01	1.13	0.28	2.00	0.74
2000–2	1.75	2.01	1.13	0.43	2.00	0.76
2000–3	1.78	2.01	1.13	1.07	2.02	0.78
2000–4	1.79	2.01	1.13	1.20	2.02	0.78
2001–1	1.93	2.03	1.13	1.26	2.04	0.68
2001–2	1.90	2.03	1.18	1.32	2.05	0.56
2001–3	1.92	2.03	1.16	1.28	2.05	0.50
2001–4	1.89	2.03	1.16	1.25	2.05	0.28
2002–1	1.94	2.05	1.31	1.26	2.06	0.24
2002–2	1.94	2.05	1.31	1.07	2.07	0.24
2002–3	1.97	2.05	1.27	1.10	2.10	0.21
2002–4	1.95	2.05	1.22	0.99	2.10	0.12
2003–1	1.99	2.09	1.22	0.90	2.10	0.06
2003–2	2.03	2.09	1.22	1.01	2.11	0.02
2003–3	2.00	2.09	1.18	1.16	2.11	–0.03
2003–4	1.99	2.09	1.18	1.36	2.13	–0.04
2004–1	1.96	2.06	1.18	1.37	2.13	–0.04
2004–2	2.00	2.09	1.18	1.23	2.12	0.03
2004–3	2.01	2.15	1.18	1.04	2.12	0.17
2004–4	2.02	2.17	1.18	1.01	2.12	0.30
2005–1	1.99	2.08	1.11	1.09	2.12	0.40
2005–2	2.01	2.10	1.11	1.25	2.12	0.46
2005–3	2.04	2.19	1.11	1.42	2.12	0.53
2005–4	2.04	2.20	1.11	1.18	2.12	0.58
2006–1	2.03	2.11	1.11	1.05	2.11	0.64
2006–2	2.08	2.13	1.15	1.02	2.11	0.67
2006–3	2.15	2.21	1.15	0.63	2.11	0.69
2006–4	2.12	2.23	1.00	0.88	2.11	0.69
2007–1	2.14	2.13	1.00	0.83	2.11	0.70

(Contd...)

Table A2: ***(Continued)***

Year	LOGM2P	LOGRGDP	LOG(DIR)	LOGINF	LOGEX	LOGFIR
2007–2	2.18	2.15	0.90	0.71	2.11	0.68
2007–3	2.25	2.24	0.90	0.64	2.10	0.63
2007–4	2.28	2.26	0.95	0.73	2.08	0.53
2008–1	2.31	2.15	0.98	0.91	2.07	0.31
2008–2	2.32	2.18	1.01	1.00	2.07	0.21
2008–3	2.41	2.26	0.99	1.12	2.07	0.17
2008–4	2.44	2.29	0.99	1.17	2.08	−0.52
2009–1	2.39	2.17	0.99	1.16	2.17	−0.68
2009–2	2.40	2.21	0.90	1.10	2.17	−0.77
2009–3	2.45	2.29	0.78	1.03	2.18	−0.80
2009–4	2.52	2.32	0.78	1.10	2.18	−1.22
2010–1	2.38	2.20	0.78	1.17	2.18	−0.96
2010–2	2.37	2.24	0.78	1.15	2.18	−0.82
2010–3	2.42	2.33	0.80	1.13	2.18	−0.80
2010–4	2.45	2.36	0.80	1.10	2.18	−0.85
2011–1	2.37	2.23	0.88	1.08	2.18	−0.89
2011–2	2.38	2.27	0.90	1.05	2.19	−1.30
2011–3	2.47	2.36	0.97	0.98	2.19	−1.70
2011–4	2.54	2.39	1.08	1.02	2.19	−2.00
2012–1	2.42	2.26	1.08	1.09	2.20	−1.15
2012–2	2.44	2.30	1.08	1.11	2.20	−1.05
2012–3	2.49	2.39	1.08	1.08	2.20	−1.00
2012–4	2.59	2.42	1.08	1.08	2.20	−1.05
2013–1	2.51	2.29	1.08	0.95	2.20	−1.05
2013–2	2.51	2.33	1.08	0.94	2.20	−1.30
2013–3	2.52	2.41	1.08	0.92	2.20	−1.52
2013–4	2.59	2.45	1.08	0.90	2.20	−1.22
2014–1	4.13	4.19	1.08	0.89	2.20	−1.30
2014–2	4.08	4.21	1.08	0.90	2.20	−1.52
2014–3	4.11	4.24	1.08	0.92	2.20	−1.52
2014–4	4.15	4.26	1.11	0.90	2.21	−1.70

Source: Researcher's computations

Table A3: Correlation matrix

	M2P	RGDP	DIR	INF	EX	FIR
M2P	1.000000					
RGDP	0.941963	1.000000				
DIR	−0.412069	−0.243983	1.000000			
INF	−0.325986	−0.262345	0.269213	1.000000		
EX	0.623110	0.429846	−0.436834	−0.477309	1.000000	
FIR	−0.796329	−0.645755	0.470939	0.196478	−0.595517	1.000000

Source: Researcher's Eview result

Table A4: Heteroscedasticity test for the first hypothesis

White heteroskedasticity test			
F-statistic	0.929882	Probability	0.618034
Obs*R^2	20.66630	Probability	0.417002

Source: Researcher's Eview result

Table A5: Autocorrelation test

Breusch-Godfrey serial correlation LM test			
F-statistic	2.953030	Probability	0.080993
Obs*R^2	6.470604	Probability	0.113480
Durbin-Watson stat	1.901229		

Source: Researcher's Eview result

Table A6: ADFF unit root tests from M2 money demand function

Variables	At level with constant, no trend		At first difference with constant, no trend	
	ADF statistics	5% critical value	ADF statistics	5% critical value
LOGM2P	−3.83	−2.9980	−1.0429	−3.0048
LOGRGDP	−3.13	−2.9980	−0.7476	−3.0048
LOGDIR	−2.02	−2.9980	−5.3786	−3.0048
LOGINF	−2.38	−3.0048	−4.6004	−3.0048
LOGEX	−2.06	−2.9980	−4.6551	−3.0048
LOGFIR	2.44	−3.0299	−3.3833	−3.0048

Source: Researcher's Eview result. ADF: Augmented Dickey Fuller

Author Queries???
AQ1:Kindly provide author details in the reference list