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THE IMPACT OF FINANCIAL INNOVATION ON THE DEMAND FOR MONEY IN NIGERIA

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ABSTRACT
The study investigated the impact of financial innovation on the money demand in Nigeria. The study used quarterly data for a period of forty-four quarters that is from 2010Q1 to 2020Q4, covering broad money supply, interest rate, gross domestic product, value of ATM, POS, Mobile banking and Web transactions as proxies for financial innovations. The OLS estimation technique, correlation matrix as well as the stability test was used in analyzing the data. Findings from the study reveal that VATM, VMOB and VWEB positively impact the money demand in Nigeria. VPOS transactions negatively impact the demand for money in Nigeria. Only VMOB transactions was found to be significant and positively impact money demand in Nigeria, money demand was also found to be stable based on the CUSUM and CUSUMQ tests. Therefore the study sees financial innovations as key in the development of the Nigerian monetary sector through the money demand. The study therefore recommend based on the findings that government should initiate policies and reforms that emphasizes more on the use of financial innovations mediums for transactions in Nigeria.
KEYWORDS: *Financial Innovation, ATM, POS, mobile banking, Demand for Money.*

INTRODUCTION

The money demand function is a fundamental anchor on which policy makers' hinge in formulating policies to address key macroeconomic distortions such as unemployment, inflation, output growth, BOP deficit etc. The money demand function is a mathematical representation of the different factors affecting the demand for money. It is assumed that the money demand function is used as a means of identifying medium term growth targets. An understanding of the money demand function enables policy-makers to forecast money demand and determine the optimum growth rate of money supply that ensures a moderate level of inflation. The demand for money function is also relevant, as it plays a vital role in the transmission process of both monetary and fiscal policies (Khan and Ali, 1997). The search for a stable demand for money function has been a contentious issue since the great intellectual debates of the 1960s and 1970s between the Keynesians and Monetarists, as no demand for money model set forth by any of these two schools of thought as well as their contemporaries has stood the test of time. The stability of the money demand function has important implications for the conduct of monetary policy, hence the much attention it has received both in developed and developing countries. These include, Snellman et al (2001), Ireland (1995), Cho and Miles (2011), Arrau and De Gregorio (1992), Aliha et al (2017), Cziraky and Gillman (2004), Bilyk (2006), Melnick (1994), Yilmazkuday and Yazgan (2009), Aliha et al (2018), amongst others for developed countries and Hamid and Hosein (2007), Kasekende (2016), Shidhika (2015), Yu Hsing (2007), Blankson and Belnye (2004), Qamruzzaman and Jianguo (2017), Qazi (2009), Qayyum (2005), Bahmani-Oskooee and Sahar (2015), amongst others for developing countries.

In Nigeria, like other countries considerable effort has been made in estimating money demand functions. For example Tomori (1972), Anoruo (2002), Nwaobi (2002), Oludaru and Oladapo (2009), Orubu and Oriavwote (2010), Aiyedogbon et al., (2013), Kumar et al., (2013), Nduka and Chukwu (2013), Doguwa et al., (2014), Apere (2017), Okpara (2017), Nakorji and Asuzu (2019), Nsikak, Idaka and Eja, (2020), Ujunwa, et al., (2022) and Ovat, et al., (2023) have estimated money demand functions by using alternative specifications. There is a general consensus in

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the literature that monetary aggregate (M2) has a long run relationship with income and interest rate. Their findings, as regard the scale and the opportunity cost for holding money variable with the expected sign, is in line with the money demand theories.

Based on the foregoing, the main objective of the study is to ascertain the impact of financial innovation on the demand for money function in Nigeria. The specific objectives are to:

i. To access the impact of the value of ATM transactions on the demand for money in Nigeria.
ii. To access the effect of value of POS transactions on the demand for money in Nigeria.
iii. To access if mobile banking transactions have any impact on the demand for money in Nigeria.
iv. To access if there exist any impact of internet banking on the demand for money in Nigeria.
v. To examine the impact of income and interest rate on the demand for money in Nigeria.

LITERATURE REVIEW

Nsikak, Idaka and Eja, (2020) examined the impact of financial innovation on money demand in Nigeria, using quarterly time series for the period 2009-2019. They found that financial innovation has mixed impact on money demand in Nigeria during the period of analysis. Okpara (2017) investigated empirically the relationship between financial innovations and demand for money in Nigeria for the period between 1981 and 2014 employing various techniques of econometric analysis. From the result of the VAR, they found a positive relationship between demand for money (DM), financial innovations (FI), interest rate (INT) and liquidity ratio (LR). Nakorji and Asuzu (2019) examined the behaviour of money demand in the conduct of monetary policy using quarterly data from 2010Q1 to 2018Q2 which was estimated with the ARDL methodology. The results revealed that exchange rate, financial innovation, and growth rate of real GDP have positive short-run impacts on real money demand, while treasury bills rate and lags of growth rate of real GDP influenced it negatively. Odularu and Oladapo (2009), carried out a study on the impact of financial innovation on demand for money in Nigeria using the Engle and Granger Two-Step cointegration technique and using SAP as a dummy for financial innovation, they found that the financial innovation introduced into the financial system have not significantly affected the demand for money in Nigeria. Aiyedogbon et al (2013), in their study empirical analysis of money demand function in Nigeria with data from 1986-2010 applying test for cointegration and vector error correction model found that broad money has been growing faster than other monetary variables such that M2 has in most times overshoot target of the monetary regulating authority. Also their stability test showed that real money demand function in Nigeria is stable as neither the CUSUM nor the CUSUMQ plots cross the 5percent critical boundaries.

METHODOLOGY

This study adopts a historical research design that talks about the collection and evaluation of data related to past events. Secondary quarterly time series data from 2010Q1 to 2020Q4 was used for the study. All data used in the study were sourced from the Central Bank of Nigeria Statistical Bulletin. Broad Money Demand (M2) was adopted as dependent variable, while gross domestic products, value of ATM transactions, Mobile Money transactions, Internet Banking (web), POS transactions and Interest Rate are used as independent variables. The ARDL-bound test approach to cointegration as well as the Error Correction Model (ECM) and the Autoregressive Distributed Lag (ARDL) Model will be applied to estimate the model of the study.

The model used in the study is presented below in the functional form as:

$M2 = f(RGDP, INTR, VATM, VPOS, VMOB, VWEB)$

The Econometric form of the model is given as;

$$M2=\beta_0+\beta_1 RGDP+\beta_2 INTR+\beta_3 VATM+\beta_4 VPOS+\beta_5 VMOB+\beta_6 VWEB+\varepsilon_1$$

A convention ECM for cointegrated data is in the form:

$$\Delta LM2 = \beta_0 +\beta_1 \Delta LM2\ (-1) +\beta_2 \Delta LRGDP +\beta_3 \Delta LINTR +\beta_4 \Delta LVATM +\beta_5 \Delta LVPOS +\beta_6 \Delta LVMOB\ \beta_7 \Delta LVWEB +\beta_8 ECM\ (-1) + \varepsilon_1$$

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RESULTS

Descriptive Statistics

Table 1 Augmented Dickey-Fuller Test Results

	M2	INTR	RGDP	VATM	VMOB	VPOS	VWEB
Mean	59693381	35.65341	6089.110	1038.225	417.9171	296.9905	49.86820
Maximum	1.10E+08	42.00000	43564.01	1832.550	2723.096	1140.482	221.5200
Minimum	32262332	18.00000	100.0000	62.59000	0.870000	1.870000	3.370000
Std. Dev.	20218756	7.239109	13446.22	533.5522	716.9742	360.0195	56.87445
Observations	44	44	44	44	44	44	44

Source: *Author's computation (2022)*

From table 1 above the descriptive statistics presented, will be discussed briefly. The variables of the study are analysed to show their features. The money demand (M2) which is the dependent variable has a mean value of ₦59693381billion, median value ₦56782642billion as well as a maximum and minimum value of ₦1.1billion and ₦32262332billion respectively signifying the average money in circulation for a quarter. The deviation of M2 from its mean value in a quarter is ₦20218756billion. The mean values of the interest rate is 35.65341 percent which implies that on average about 36 percent is charged on loan in a quarter, its median rate was 36 percent. For real gross domestic product the average is ₦6089.110billion. The financial innovation proxies like the value of ATM transactions (VATM) have an average value of ₦1038.225billion which is the highest with the lowest been value of web transactions (VWEB) with an average value of ₦49.86820billion. Value of mobile transactions (VMOB) have the highest deviation from the mean amongst the financial innovation variables with value of web transactions (VWEB) accounting for the least.

Unit Root Test

It is important to conduct the test for stationarity for the variables especially given the fact that we are working with time series data. The use of non-stationary variables leads to spurious regression.

Table 2: ADF Unit Root Test Result

Variables	ADF Test Stat Level	Critical Values @ 5%	ADF Test Stat first diff	Critical Values @ 5%	Order of Integration	Prob. Value
LM2	0.613105	-2.935001	-4.846474	-2.935001	I(1)	0.0003
LRGDP	0.101437	-2.931404	-6.535242	-2.933158	I(1)	0.0000
INTR	-2.890617	-2.604867	-	-	I(0)	0.0549
LVATM	-5.017068	-2.931404	-	-	I(0)	0.0002
LVMOB	-1.060737	-2.933158	-9.969469	-2.933158	I(1)	0.0000
LVPOS	-1.385048	-2.933158	-8.581157	-2.933158	I(1)	0.0000
LVWEB	-0.297415	-2.936942	-4.443371	-2.936942	I(1)	0.0010

Source: *Author's computation with EVIEWS*

The result of the Augmented Dickey Fuller test is presented in table 2 above. From the result it can be observed that INTR and LVATM are stationary at levels I(0) while the other variables are stationary at first difference that is they are integrated at order one I(1). This is based on the absolute value of ADF test statistics been greater than absolute value of the critical values at the 5% level. The outcome from the unit root test makes the ARDL approach the best technique for analysis, this is so since there's mixed order of integration. The next step is to check for the existence of long run relationship among the variables using the ARDL Bounds test to cointegration technique.

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Cointegration Test

Table 3: Result of the ARDL (Bounds) Test for Cointegration

F-Bounds Test		**Null Hypothesis: No levels relationship**	
Test Statistic	Value	K	
F-statistic	5.364796	6	
Critical Value Bound			
Significance		I0 Bound	I1Bound
10%		1.99	2.94
5%		2.27	3.28
2.5%		2.55	3.61
1%		2.88	3.99

Source: Author's Computation

The ARDL-bound test approach to cointegration proposed by Pesaran et al (2001) was applied because of the mixed order of integration. The ARDL-bound test approach to cointegration makes it possible to check for long run equilibrium relationship both for the I(0) and I(1) integrated variables by conducting an F-test for the joint significance of the coefficients of the variables. The result is presented in table 3 above and confirms the existence of the long run relationship (i.e cointegration) between the dependent and independent variables of the study. That is the F-statistics of 5.364796 falls above the upper bound of critical value of 2.88 and 3.99 at the 1 percent level of significance.

Long-run Model Estimates

Table 4: Long-run Model Estimates

Dependent Variable: LM2				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.854193	1.412500	0.604738	0.5493
LM2(-1)	0.940774	0.083593	11.25420	0.0000
LRGDP	0.002077	0.004087	0.508242	0.6145
INTR	-0.003373	0.002308	-1.461348	0.1528
LVATM(-1)	0.050770	0.024168	2.100725	0.0429
LVMOB	0.014278	0.012544	1.138282	0.2627
LVPOS	-0.025095	0.018639	-1.346395	0.1868
LVWEB	0.015128	0.014389	1.051405	0.3003
	R-squared= 0.992921		F-statistics= 701.3540	
D-W Stat.= 1.41	Adjusted R-squared= 0.991506		Prob.(F-statistics) 0.0000	

Source: *Author's computation (2022)*

Table 5: Error Correction Model

Dependent Variable: LM2				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.003197	0.013252	-0.241252	0.8109
D(LM2(-1))	1.133423	0.394098	2.875994	0.0070
D(LRGDP)	0.003513	0.008416	0.417434	0.6791
D(INTR)	-0.003592	0.002322	-1.547036	0.1314
D(LVATM(-1))	0.039204	0.027431	1.429157	0.1624
D(LVMOB)	0.019362	0.012217	1.584916	0.1225
D(LVPOS)	-0.046080	0.017884	-2.576650	0.0146
D(LVWEB)	0.019068	0.014734	1.294088	0.2046
ECM(-1)	-0.896292	0.427570	-2.096246	0.0438
	R-squared= 0.335543		F-statistics= 2.083079	
D-W Stat.= 1.68	Adjusted R-squared= 0.174463		Prob.(F-statistics) 0.066402	

Source: *Author's computation (2022)*

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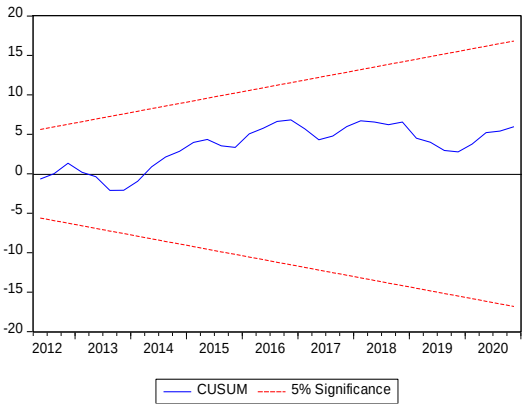
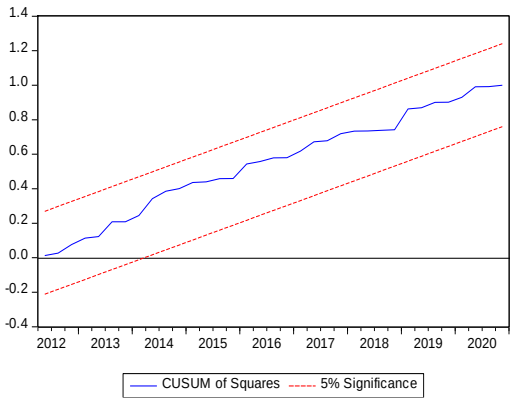
Table 6: Test for Heteroskedasticity and Autocorrelation

Test	F-Statistics	P-value
Heteroskedasticity	0.538611	0.7992
Serial correlation LM Test	3.661277	0.0641
Normality Test	3.252026	0.196712

Source: *Author's Computation (2022)*

Figure 1: Stability Test- CUSUM **Figure 2: Stability Test- CUSUMQ**





DISCUSSION OF FINDING

From table 4 above, the output of the OLS estimates for the long run model is presented, it can be observed that the constant term have a positive sign which implies an increase on the dependent variable when the independent variables are held constant. The lagged value of the dependent variable (LM2) have a positive sign which signifies an increase on the current value of dependent variable. LRGDP has a positive sign which is in line with economic theory, while LVATM, LVMOB and LVWEB has a positive sign which signifies an increase on LM2. INTR and LVPOS both have a negative sign. The constant term magnitude of 0.854193 shows the level of change that may occur in LM2 when all the independent variables are held constant. The lagged dependent variable will change LM2 by 0.940774, which means that a 1% change in the past value of LM2 influences its current value to the tune of ₦0.940774billion. LRGDP with a magnitude of 0.002077 implies that a 1% change in LRGDP increases LM2 by about ₦0.002077billion. INTR has a magnitude of -0.003373 which means that it a 1% change in INTR changes LM2 by -0.003373 percent. LVATM, LVMOB and LVWEB with magnitudes of 0.050770, 0.014278 and 0.015128 means that LM2 will be increased by ₦0.050770billion, ₦0.014278billion and ₦0.015128billion respectively due to a 1% change. LVPOS on the other hand with a magnitude of -0.025095 means that a 1% change in LVPOS reduces LM2 by N0.025095billion.

The constant term have a direct impact on LM2. The lagged value of LM2 has a direct impact on the dependent variable (LM2), there is also a direct impact on LM2 from LRGDP, LVATM, LVMOB, and LVWEB. Only LVPOS and INTR has indirect impact with LM2. All of the variables of the study are statistically insignificant except LM2 and LVATM. From the Prob(F-statistic) value there exist a joint significance at the 1% level, there is no autocorrelation from the Durbin-Watson stat of approximately 1.4. The model has high explanatory and predictive power as evidenced by the R-squared and the adjusted R-squared values respectively. The Adjusted R-squared value suggests that about 99% of the systematic variations in Industrial output can be explained by LRGDP, INTR, LVATM, LVMOB, LVWEB and LVPOS. The Error Correction Model estimation result is presented in table 5 above. From the output of the OLS estimates, the error correction term (ECM) is negative and statistically significant at the 1% level which is in line with econometric theory. This implies that last period deviation from equilibrium, is corrected in the current period by about 90 percent.

CONCLUSION

This study investigated the impact of financial innovation on money demand in Nigeria. The findings from the study reveal that VATM, VMOB and VWEB positively impact the money demand in Nigeria. VPOS transactions negatively impact the demand for money in Nigeria. Only VMOB transactions was found to be significant and positively impact money demand in Nigeria. Therefore the study sees financial innovations as key in the development of the Nigerian monetary sector through the money demand. Based on the findings, there is need for the government to initiate policies and reforms that can improve the financial innovations mediums in Nigeria and that also emphasize its use for transactions. The stability condition of the demand for money means that the policies should be sustained and improved upon tactically. Furthermore, the government should increase the drive for a cash less economy propelled by financial innovations, ensure that the demand for money in Nigeria is stable. In addition, interest rates should be carefully deployed as a tool for monetary policy as the money demand is quite sensitive to it.

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