NEXUS BETWEEN POINT OF SALE, AUTOMATED TELLER MACHINE, MOBILE BANKING AND CURRENCY IN CIRCULATION IN NIGERIA: ARDL BOND TEST COINTEGRATION APPROACH

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Abstract
This paper examines the nexus between point of sale (POS), automated teller machine (ATM), mobile banking (MBK) and currency in circulation in Nigeria. Quarterly data were sourced from Central Bank of Nigeria from January 2009- September 2020. Unit root, ARDL bond test cointegration were employed as techniques of analysis. The findings reveal that, there is significant and long run relationship between the ATM, POS MBK and currency in circulation. ARDL bound test cointegration shows that, there exists a long run cointegrating relationship between the variables under investigation. The estimated coefficient of the error correction term suggests that the system (economy) may correct its previous period disequilibrium by about 49% annually. The paper recommended that Government through the CBN should formulate and improve monetary policies (cashless policy) aimed at encouraging and improving E-payment system in order to actualize the objective of cashless policy in Nigeria. Also Government, monetary authorities (CBN, Ministry of finance,) and commercial banks should educate and enlighten the people on the Advantages of using POS, MBK, ATM and CCHEQ in their day to day activities in Nigeria in other to reduce currency in circulation and improve economic performance.

Key words: ATM, POS, MBK, ARDL, Bond Testing

1.0. Introduction

The Nigerian payments system has evolved over the past few decades. The modern payments system started being completely paper-based with the use of banks notes, payment orders, and chaque. In 1996, the payments system was modified to include card-based e-payment products. This was followed by the introduction of pay card in 1997. By 1999, card based payment products assumed an open platform with authorization from the CBN for the floating of two card service companies by a consortium of over 20 banks. In 2003, the CBN, in collaboration with the Bankers Committee, launched the first major initiative to modernize the payment system, granting approval to a number of banks to introduce international money transfer products, telephone banking, and online banking via the internet on a limited scale. Today, virtually all banks have introduced electronic funds transfers , debit and credit cards, internet banking, mobile banking and deployed Automated Teller Machines (ATM). The Nigerian payments system was coin by introduction of the Payments System in Vision 2020, launched in 2007 to facilitate a wider range of electronic payment methods such as POS terminals, mobile banking,

internet banking, etc. which were promoted by greater number of service providers. (CBN, 2016)

Meanwhile, the central bank of Nigeria strategic plan on e-payment system is to make sure that a greater percentage of currency in circulation is captured within the financial system, thereby facilitating the effectiveness and efficacy of monetary policy operations and measures to stabilize economy through monetary and fiscal policies. E-payment product such as Automated Teller Machine (ATM), web transaction, credit and debit cards and Point of Sale (POS) and Mobile banking have drastically reduce the amount of cash transactions and the flow of cash in circulation in the Nigeria economy. These e-payment products provide a better audit trail than transactions which involve physical cash and thus reduce the amount of currency in circulation (Adeoti & Oshotimehin, 2012).

However, despite rapid increase in usage and acceptability of E-payments product, there are number of challenges that affected their efficiency and effectiveness. Some of the challenges identified by donga and Ismaila (2021) who examine the effect of e-payments on performance of commercial activities are: high bank operational charges, cyber security, poor infrastructural that facilities and aid e-payments product, lack of enlightenment to customers, un-reconcile transaction on time. Ayodele (2014), opine that some of the challenges of E-payments system are: constant power failure, failure of links from service providers and electronic transactions at a point. According to Oladayo and Adeniyi (2014), un-reconciled interbank transactions such as cash dispense error, inability to track down fraudsters at the ATM points, computer hackers are among the challenges that hinders the effective use of various payment instruments such as ATM, POS online banking, mobile banking, through e-banking. Though government and monetary authority has taking a lot of measures to curtail the challenges but it those not yield more positive result.

However, regardless of the challenges attributed to the use of e-payments system of product, it is of paramount importance, Olugbade and Osotimehin (2012) concluded that consumers were satisfied with the speed of transaction, level of service provided by the merchants, awareness, and security. On the other hand, The study by Joan (2018). Concluded that mobile banking adoption positively influences SMEs performance in the county of Nairobi. In the same vain, Jamgun and miroga (2018) revealed that there was negative relationship between cost of mobile banking services and financial performance of SMEs. In order to contribute to the existing literature, this study is poised to examine the nexus between POS, ATM, mobile banking and currency in circulation in Nigeria.

2.0. Literature Review

E-payment system plays a vital role on the Nigerian economy and the financial system. It is a service whereby customers use their mobile device to send and receive monetary value, that is, to transfer or exchange money electronically from one person to the other using a mobile phone. On the other hand Point of Sale Terminal is an electronic device that were issued by the service providers or commercial bank to their agents which are used in different areas to conduct business with their customers. Customers use their electronic cards through the POS in order to make payments for purchases of goods or services instead of using physical cash. Since the POS terminals are typically online real time, the customer's account is expected to be debited immediately with amount of monetary value of purchases made. Additionally, POS terminals allows merchants to

access card payments available to be purchased of other products and services like airtime recharge cards, charge payments (including service charges), lottery tickets, etc.. ATM refers to the machine mounted into the wall of a bank or other building, allowing people to withdraw money from their ledger by using a special card called an ATM card. They are used more frequently to make a variety of online payments like service charges, subscription payments, airtime, and information recharges etc. Customers are consistently advised by their banks to keep their ATM cards safe and never to expose their ATM card pins. Kanu, Ikechi, Chinonso, and Anthony(2020).

Theoretically, this study adopted the technology Acceptance Model (TAM) developed in 1989 by Fred Davis. The model was designed to forecast people's acceptance of Information Technology and its applicability in an organizational setting. The model postulates that that user acceptance is determined by perceived usefulness and perceived ease of use. Perceived usefulness is defined as the extent to which a person believes that adopting technology will help her/his job performance, while perceived ease of used refers to the degree to which a person believes that using a technology will be free from effort (Davis, 1989). The theory argues that the individuals attitude towards adopting and using new technology is influenced by perceived usefulness and perceived ease of use.

2.1. Empirical review

In other to assess the nexus between point of sales, automated teller machine and mobile banking in Nigeria, A number of related empirical studies were considered. Using ex-post facto research design and least square regression, Kanu, Chinonso, Anthony, Ikechukwu (2020) ascertain the relationship between the use of e-payment products and the value of currency in circulation in Nigeria. Their study Revealed that Remita and Webpay have significant negative relationship with currency in circulation in Nigeria. While, the use of automated teller machine (ATM) and point of sales (POS) has a positive and significant relationship with currency in circulation in Nigeria. In relation to use of point of sales (POS), Olugbade and Osotimehin (2012) examined the Adoption of Point of Sale Terminals in Nigeria, and concluded that consumers were satisfied with the speed of transaction, level of service provided by the merchants, awareness, and security. In a related study, Akerejola (2017) assess the determinants and adoption of Point of Sales of selected business organizations in the banking, Oil and Gas, retail and airline sectors of Lagos State. He concluded that availability of infrastructure; POS security; customer trust; customer education and customer motivation had significant and positive relationship with adoption of POS in the selected business organizations who are SMEs in Lagos State Nigeria.

On the other hand, The study by Joan (2018). Concluded that mobile banking adoption positively influences smes performance in the county of Nairobi. In the same vain, Jamgun and miroga (2018). revealed that there was negative relationship between cost of mobile banking services and financial performance of smes. Similarly, Bagudu , Mohd Khan, and Abdul-Hakim (2017). Investigate the mobile banking effects on Commercial Banks financial performance in Nigeria. Simple random techniques were employed in this study in selecting 22 commercial banks. concludes that mobile banking positively and significantly affects the financial performance of commercial banks in Nigeria. Also, Habib and Anaekwe (2017) asses the impact of mobile banking on traditional banking in Nigeria. Their findings revealed that the real picture of Nigerian technological domain, that, though the customers are having good knowledge about the devices, access to mobile banking, their convenience and satisfaction of usage are very low

3.0. METHODOLOGY

Model specification and Sources of Data.

In order to study the nexus between POS, ATM, MBK and CIC in Nigeria, quarterly data were sourced from Central Bank of Nigeria from 2009Q1- 2020Q4. However, to indulge this study, the model by Ikechukwu, et (2020) was adopted and modified in to ARDL bound test cointegration test as a techniques of analysis. The choice of ARDL is necessary because it capture the series of different order, I(0), I(1) and shows the long run relationship between variable under investigation. Pesaran *et. al.* (2001). The study uses POS, ATM, MBK and VCHEQ as explanatory variable while CIC is used as Dependent variable. The Ikechukwu, et (2020) model is express as:

CIC = f (RTGS, NIP, NEFT, MOPAY, ATM, REMITA, POS, WEBPAY)

CIC = ao +a1RTGS +a2NIP +a3NEFT+ a4Mopay +a5ATM +a6REMITA +a7POS+ a8Webpay +e……(1)

However, the modified model for this study is specified as follows:

CIC = f (POS, MBK ATM, VCHEQ)

$CIC_t = \beta_0 + \beta_1 POS_t + \beta_2 MBK_t + \beta_3 \log ATM_t + \beta_4 \log VCHEQ_t + e_t$…….(3.2)

CIC_t = Currency in circulation at time t.

POS_t = point of sales at time t

MBK_t = Mobile Banking at time t

ATM_t= Automated Teller Machine at time.t.

$VCHEQ_t$ = Volume of chaque transactions at time.t.

e = error term.

t = time

ARDL specification

The ARDL, representation of relationship between the variables in the model are given as:

The Δ is the first-difference operator, and (CIC, POS,ATM, MBK and VCHEQ) are the four variables selected in the study. Accordingly, a joint significance test that implies no co-integration hypothesis, (H0: $\gamma 1 = \gamma 2 = \gamma 3 = \gamma 4 = \gamma 5 = 0$), is tested against the alternative hypothesis, (H1: $\gamma 1 \neq \gamma 2 \neq \gamma 3 \neq \gamma 4 \neq \gamma 5 \neq 0$) denoted by F (CIC, POS,ATM, MBK,VCHEQ) terms ε1 – ε4 are mutually uncorrelated white noise error terms. Two sets of critical values are reported in Pesaran and Pesaran (1997) as well as in Pesaran *et. al.* (2001). The assumption is that all variables are *I* (0) and the other set assumes they are all *I* (1). If the computed F-statistic exceeds the upper critical bounds value, then the H_0 is rejected. If the F-statistic falls in between the bounds, then the test becomes inconclusive. Lastly, if the F-statistic is below the lower critical bounds value, it implies no co-integration.

4.0. EMPIRICAL RESULT AND DISCUSSION OF MAJOR FINDINGS

Unit root Tests

Unit root Tests in the table 4.3. below gives the result of Augmented Dickey Fuller (ADF) test and Phillips-Peron test at level and at first difference unit for the variables under investigation. Thus, the variables are a combination of I(0) and I(1). Hence, this provides the basis for conducting ARDL test.

Table 4.1. Augmented Dickey Fuller (ADF) test and Phillips-Peron test I(0) and I(1)

Variables	ADF I(0) t-statistics	ADF I(1) t-statistics	Phillips-Peron I(0) t-statistics	Phillips-Peron I(1) t-statistics
CIC	-6.047923**	-12.64829**	-4.523622***	-9.206299**
POS	1.055567	-11.13278**	0.382734	-30.09612**
ATM	0.274602	-11.14924**	-2.328451	-24.73424**
MBK	-3.476887**	-3.899667***	-3.512567**	-18.24816**
VCHEQ	-1.396246**	-10.32862**	-1.004265	-12.13844**

Note (**) (***) indicates statistical significant at 1% and 5% respectively
Source: *Authors computation using E-views 10*

Having found the variables are mixture of I(0) and I(1) from unit root test in Table 4.1 above. ARDL bound test approach was adopted to takes care of the series with a mixture of I(0) and I(1) to know the long run relationship between the variables under investigation.

Lag Length Selection Criteria

Table 4.2 below, gives the result of lag section criteria which is a pre-requisite for conducting the ARDL bound test . The appropriate lag order was selected before the ARDL bounds test approach for cointegration. The result in the table 4.2. Shows that lag order is 2 based on the minimum value AIC (**13.43749***). Thus, appropriateness of lag order avoids the spuriousness of ARDL bounds testing approach to cointegration results.

Table 4.2: Lag Length Selection

variables: CIC, POS , ATM, MBK, VCHEQ

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-346.1309	NA	239341.4	15.22308	15.38210	15.28265
1	-304.0624	74.99176*	40154.07*	**13.43749***	13.63626*	13.51195*
2	-303.6479	0.720722	41215.59	13.46295	13.70147	13.55230

Source: *Authors computation using E-views 10*

Table 4.3: ARDL Bound Testing for Cointegration

Model. No.	Variables	F-statistic	Per cent	Decision rule
1	CIC=F(POS,ATM,MBK,VCHEQ)	3.798706	5%	Reject
	Critical value	Lower Bound I(0)	Upper Bound I(1)	
	10%	2.2	3.09	
	5%	**2.56**	**3.49**	
	1%	3.29	4.37	

Source: *Author Computation Using E-views 10*

The ARDL result in table 4.3 , shows that the calculated F-statistic of (3.798706) falls above the upper bound (3.49) of the critical value 95% level of significance (5%), this implies that there exist a cointegration and long run relationship between the variables under investigation. Hence the null hypothesis of no cointegration is rejected.

Table 4.4. ARDL Error Correction Model Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.

D(MBK)	0.009727	0.071589	0.135866	0.8926
D(VCHEQ)	0.010514	0.070261	0.149637	0.8818
CointEq(-1)*	-0.490869	0.096801	-5.070928	0.0000

Source: Author Computation Using Eviews 10

The results of the ECM estimation in table 4.4 shows that, The estimated coefficient of the error correction term (-0.490869,) is significantly different from zero at 5 per cent level and with the appropriate negative signs and suggests that, the system (economy) may corrects its previous period disequilibrium by about 49% annually.

Table 4.5. ARDL RESUL

VARIABLE	COEFFICIENT	STD.ERROR	T-STATISTIC	PROB
CIC(-1)	0.509131	0.129128	3.942827	0.0003
ATM	-0.016427	0.094768	-0.173339	0.0033
POS	0.089856	0.065227	1.377588	0.0062
MBK	0.009727	0.084203	0.115513	0.9086
MBK(-1)	0.307710	0.085148	3.613840	0.0009
VCHEQ	0.010514	0.081465	0.129057	0.8980
VCHEQ(-1)	-0.130125	0.080736	-1.611737	0.1151
C	869.5571	237.7913	3.656807	0.0008
R-squared	0.876691		D.W.STATISTICS	1.998306
Adjusted R-squared	0.854559			
F-statistic	39.61132			
Prob(F-statistic)	0.000000			

Source: Author Computation Using Eviews 10

ARDL results in table 4.5. Reveals that there is positive relationship between point of sales (POS), mobile banking (MBK) volume of chaque transaction (VCHEQ) and currency in circulation (CIC). While there is negative relationship between ATM and currency in circulation(CIC). This implies that one unit increase in POS, MBK and CHEQ would increase CIC by 0.089856(8.9%, 0.009727 (0.9 %) and 0.010514(1.0%) while, one unit increase in ATM would decrease CIC by -0.016427(1.6%). Meanwhile, ATM,POS and MBK(-1) are found statistically significant at one per cent as indicated by its probability values of 0.0033,0.0062 and 0.0009, thus the null hypothesis were rejected. On the other hand, VCHEQ is found to be found statistically insignificant as indicated by their probability value of 0.8980 thus the null hypothesis were accepted.

The F-statistics value of 39.61132 which measured the joint significant of the parameter estimates was found to be statistically significant at one per cent level as indicated by the corresponding probability value of 0.00000. This implies that all the variables of the model were jointly and significantly. The R^2 value of 0.876691 (87.6%) implied that 87.6.7 per cent total variation in CIC in Nigeria was explained by explanatory variable.

The Durbin-Watson statistic 1.998306 was found to be higher than R^2 (0.876691) indicating that the model is non-spurious (meaningful).

5.0. Conclusion and Recommendations

The major objective of this paper is to examine the nexus between point of sale (POS), automated teller machine (ATM), mobile banking (MBK) and currency in circulation in Nigeria. Quarterly data were sourced from Central Bank of Nigeria from January 2009-

September 2020. Unit root, ARDL bond test cointegration and pier wise granger causality were employed as techniques of analysis. The findings reveals that, there is significant and long run relationship between the ATM,POS MBK and currency in circulation . ARDL bound test cointegration shows that, there exist a long run cointegrating relationship between the variables under investigation because F-statistic of (3.798706) falls above the upper bound (3.49) of the critical value 95% level of significance which implies that there exist a cointegration and long run relationship between the variables under investigation.

The estimated coefficient of the error correction term (-0.490869,) is significantly different from zero at 5 per cent level and with the appropriate negative signs and suggests that, the system (economy) may corrects its previous period disequilibrium by about 49% annually. However, from the findings of the paper following recommendations are made:

i. Government through the CBN should formulate and improve monetary policies (cashless policy) aimed at encouraging and improving E-payment system in order to actualize the objective of cashless policy in Nigeria.
ii. Government, monetary authorities (CBN, Ministry of finance,) and commercial banks should educate and enlighten the people on the Advantages of using POS, MBK, ATM and CCHEQ in their day to day activities in Nigeria in other to reduce currency in circulation and improve economic performance.
iii. Generally government and service providers should secure the e-payments system in order to encourage people to use it.

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