EFFICIENT PAYMENTS SYSTEM AND FINANCIAL DEVELOPMENT: AN ANALYSIS OF THE ELECTRONIC PAYMENTS SYSTEM IN NIGERIA

TURAKPE, **MORRISON JOSCO, PhD.**
Department of Banking and Finance, Ken Saro-Wiwa Polytechnic
Bori, Nigeria

ALOBARI, **COLLINS MENELENU, PhD.**
Department of Banking and Finance, Ken Saro-Wiwa Polytechnic
Bori, Nigeria

And

AZOROH, **BARILEDUM JOB**
Department of Banking and Finance
Abia State University, Uturu, Nigeria

Abstract

This study examines the relationship between payments system and financial development, with particular reference to the electronic payments system in Nigeria. Counteraction, Autoregressive Distributed Lag (ARDL) and Pairwise Granger causality estimation techniques were employed in analyzing data drawn from the Central Bank of Nigeria (CBN) Statistical Bulletin, Annual Financial Stability Reports, NDIC Quarterly Reports, National Bureau of Statistics publications and the Global Financial Data base, for the period 2012 to 2017. The findings of the study reveal that the overall electronic payments system (EPS) has significant impact on all financial development indicators. Particularly, Internet Payments (INT) has significant positive impact on Financial Depth (FDN), while Mobil Payments (MOB) and Point of Sale (POS) have significant impact on Financial Access (FAS). Also, Interbank Payments (NIB), INT and POS all establish significant relationship with Financial Efficiency (FEF). The Granger Causality test reveals unit-directional relationships running from all independent variables to FDN. On the other hand, none of the variables has causality on FAS, although causality is found to run from FAS to NIB; while only NIB exerted causality on FEF. Evidently, the study reveals that the efficiency of electronic payments system can determine to a large extent, the level of financial development in the country. Thus, the study recommends aggressive enlightenment programs to be carried out by the CBN, especially in the rural and remote areas where the mass media cannot effectively reach, so as to increase the awareness and benefits of electronic payments instruments in the country. The CBN in collaboration with the government and financial institutions should take urgent steps to improve on the existing financial infrastructure in the country which have significant implication on the level of financial development.
Key Words: Electronic payments system, Financial Development, Financial Efficiency, Financial Depth, Financial Access

Introduction

The concept of financial development, as emphasized in literature, has gained wide recognition across the globe as a result of its role in promoting sustainable economic growth. The World Economic Forum (2012) in its report defines financial development as "the factors, policies, and institutions that lead to effective financial intermediation and markets, as well as deep and broad access to capital and financial services". Financial development is critical to economic growth; since financial intermediaries facilitate

intermediation and exchange among key economic agents – individuals, firms and government, thereby enhancing economic efficiency.

To achieve the economic growth objective, financial institutions mobilize and allocate savings, produce information, monitor investments, diversify and manage risk, as well as promote exchange of goods and services. Due to their competitive advantage in reducing information asymmetries, transaction and monitoring costs, financial institutions are able to mobilize and channel financial resources to their most productive uses. Financial sector development therefore fosters economic growth through more efficient resource allocation (Beck, Levine and Loayza, 2000). Thus, countries with better developed financial systems experience faster economic growth because they intermediate more efficiently (Beck, 2006).

An important pillar in measuring financial development is the business environment, which aggregates the human capital, infrastructural framework and overall operational costs for financial intermediaries (World Economic Forum, 2012). Owing to globalization, integration and regionalization, technological infrastructure, especially those that deliver data and facilitate the exchange of goods and services, play critical role in determining the efficiency of a financial system. The Bank Negara Malaysia (2011) notes that "payment system is a critical component of the economic and financial infrastructure of a country having a pivotal role in facilitating the circulation of money in the economy, enabling the conduct of trade, commerce and other economic activities and having a payment system that facilitates the efficient movement of funds is therefore highly important for financial development and the growth of the economy".

Payments system facilitates the transfer of funds, which enhances economic activities. Pereira (2013) acknowledged that payment and settlement systems facilitate access to financial services and the safe transfer of funds, and can mitigate financial crises by reducing settlement risks. Payments and payment services are, in their own right, an important part of the overall package of financial services; and are critical to those services' efficient provision (BIS and WBG, 2016). In recent time, the payments system in many countries has undergone significant changes, as a result of the need to enhance their resilience and to integrate them into the international payments system. More central banks are leveraging on their countries' payments system to boost the development of their financial systems. The Central Bank of Nigeria (CBN, 2011), notes that "an efficient payments system minimizes liquidity, settlement, systemic, credit and operational risks which are inherent in financial transactions". Consequently, the Payments System Vision 2020 was adopted to facilitate economic activities by providing safe and efficient mechanisms for making and receiving payments with minimum risks to the Central bank, payment service providers and end users.

Recently, there has been a migration to electronic payments in Nigeria which involves the transfer of funds through electronic-enabled devices, such as electronic cards – debit or credit, mobile phones, Automated Teller Machines (ATMs), Point of Sale (POS) terminals, etc. The advancement in technology and customer sophistication have made the electronic payments system (EPS) more preferred to the traditional payments system, which rely on negotiable instruments such as cheese, drafts, letters of credit, money orders, etc. The cashless policy in Nigeria was therefore adopted in order to migrate from the current cash-dominated environment to an electronic payments market (Sansui, 2013).

Existing literature on payments system do not adequately focus on financial sector development. For example, Pereira (2013), EFInA (2010) and Ricochet (2004) stressed that efficient payments system enhance financial stability, while other studies like BIS and WBG (2016) and Malaguti (2015) subscribe to a relationship between payments system and financial inclusion. Financial stability and financial inclusion are outcomes of financial development and the payments system is an integral component of the financial system; thus the efficiency of payments can, to a large extent, determine the level of financial development.

On the other hand, many studies on financial development have tended to establish a causal relationship between financial development and economic growth; with causality running from financial development to economic growth, leaving the link between payments system and financial sector development still uninvestigated. Thus, an investigation of the relationship between payments system efficiency and financial development, with empirical evidence; which is the thrust of this study, is important. Specifically, the study aims at determining the relationship between Mobile Payments efficiency, Web payments efficiency, Point of Sale payments efficiency and Interbank settlement efficiency, all variables of electronic payments system; and Financial depth, Financial access and Financial efficiency which are indicators of financial development in Nigeria.

Expectedly, the rest of the paper is divided into four sections: section two reviews relevant literature. Section three focuses on the methodology while section four is on data analysis and discussion of findings of the study. The paper is rounded up with the summary and conclusion in section five.

Review of Related Literature
Conceptual Overview

Payments system refers to the institutional, legal, regulatory and operational frameworks as well as the instruments that enable the transfer of money and monetary resources between parties with mutual obligations. Pereira (2013) describes it as the infrastructure established to facilitate the transfer of monetary value between parties while CBN (2011) sees it as the established infrastructures (comprising institutions, people, set of instruments, rules, procedures, standards and computer networks) through which financial obligations are discharged by economic agents. Thus, payments system is an integration of physical, organizational and informational structures that facilitate the exchange of monetary value among parties with mutual obligations.

Payments system comprises of both paper-based and paperless sub-systems. The paper-based system provides the mechanism for settlements of cash, cheese, drafts, money and postal orders, etc. while the paperless system (better known as electronic payments system) drives electronic commerce transactions. The system is further classified into retail or small and large-value or wholesale payments systems. The former deals with payments, usually of small values, initiated by individuals and non-financial corporations, and are usually of higher volume. Retail payment instruments are cash, ATMs, Point of Sale (POS), Internet and Mobile payments, etc. The large value payments system however, consists of large value payments between financial institutions using such instruments as the Real Time Gross Settlement (RTGS) System and the Society for Worldwide Inter-bank Financial Telecommunication (SWIFT).

The payments system remains the main channel for inter-sector, inter-industry, inter-company and interpersonal financial resources flow, thus promoting economic growth

and it is the major foundation of the modern market economy (CBN, 2011). The CBN identified four roles of the payment system as: financial Intermediation, facilitation of transactions settlement, risk minimization, and provision of necessary framework for monetary stability.

The Electronic Payments System (EPS)

The EPS comprises the infrastructure that enables monetary settlements using electronic devices. It is a paperless system that is comprised of varied channels, such as ATMs, POS, RTGS, etc. The payments system is classified mainly into small/retail and large/wholesale payment systems but several typologies exist. However, that of this study is based upon instrumentation; and includes the following:

Electronic Card Systems: According to European Central Bank - ECB(2010), a card scheme is a technical and commercial arrangement set up to serve one or more card brands which provides the organizational, legal and operational framework necessary for the functioning of the services marketed by the brand. It refers to the use of electronic cards, such as credit, debit and smart cards, to effect monetary transactions. ECB (2010) stressed that a card scheme, among other things: determines the standards to be applied for POS terminals and ATMs; decides where liability lies in the event of fraud; and deals with issues related to the technical infrastructure. Card schemes are usually owned by credit institutions or banking associations.

Account-Based Systems: This allows transactions to be initiated based on the credit balances of an account holder. It relies on the use of tokens or special codes created by the bank to enable a customer pay selected bills, make credit transfers, and even buy recharge cards; which are settled by directly debiting the customer's account, with the cost and charges of such transactions.

Electronic Cash Systems: It is similar to regular cash, and enables transactions between customers without the need for banks or other third parties. This payment system complements credit, debit, and charge cards and adds additional convenience and control to everyday customer cash transactions. E-cash usually operates on a smart card system or online cash system. When used, e-cash is transferred directly and immediately to the participating merchants and vending machines. Electronic cash is a secure and convenient alternative to bills and coins.

Electronic Wallet Systems: Electronic wallet is very useful for frequent online shoppers and is commercially available for pocket, palm-sized, hand-held, and desktop PCs. E-wallet stores personal and financial information such as credit cards, passwords, PINs, and much more. It allows you to keep track of your billing and shipping information so that it can be entered with one click at participating merchants' sites. E-wallets can also store e-checks, e-cash and your credit-card information for multiple cards. It offers a secure, convenient, and portable tool for online shopping.

Electronic Check (E-Check) Systems: E-check (Cheese) uses the same legal and business protocols associated with traditional paper cheese. It is a new payment instrument that combines high-security, speed, convenience, and processing efficiencies for online transactions. It shares the speed and processing efficiencies of all-electronic payments. However, its acceptability is quite limited.

Interbank Fund Transfer Systems: An interbank funds transfer system is a payment system in which banks or credit institutions initiate funds transfers between themselves for their own accounts on behalf of their customers. Examples include the RTGS, SWIFT, and Automated

Clearing Systems, etc. Through these means, monetary values are transferred between banks, credit institutions, etc., which are eventually credited or debited to/from the customers' accounts.

Generally, the above e-payment systems are usually made through various channels, such as the internet/web, mobile or fixed telephones, POS terminals and ATM Machines as well as merchants' vending machines. They provide convenient, efficient and cost-effective means of payments.

The Evolution and Development of Electronic Payments System in Nigeria

Oyewole, El-Maude, Abba and Onu (2013) as well as Briggs and Brooks (2011) traced the history of electronic payments system in Nigeria to the introduction of the Nigeria Automated Clearing System (NACS) by the CBN in 2002. This was followed by the introduction of guidelines to electronic-banking, Automated Teller Machine (ATM) and establishment of Inters witch in 2003. Interoperability of shared ATM/POS terminals was achieved in 2004 as well as the adoption of new settlement framework for cheese clearing. In 2006, the Real Time Gross Settlement (RTGS) system was introduced followed by the development of Payments System Vision 2020 and inauguration of the Vision's Work Group in 2007; as well as migration to new uniform accounting system (NUBAN) in 2010.

The adoption of the universal banking system in 2001 and the recapitalization policy that followed in 2004 – with its web of mergers and acquisitions, increased competitiveness among banks in Nigeria; which led to the adoption of emerging technological innovations by Nigerian banks. Consequently, some banks significantly enhanced their ATM services, which were followed by mobile and internet banking services from 2009 and 2010.

As part of the CBN's 13-Point Agenda to develop and deepen the financial sector, and transform it into a growth catalyst, the Financial System Strategy (FSS) 2020 initiative was introduced in order for Nigeria "to be the safest and fastest growing financial system among emerging market countries" (FGN, 2007). It was designed to ensure that efficiency and safety are not compromised in the financial system; which is very dynamic in nature. In pursuance of this vision, the second phase of the CBN re-engineering and restructuring process initiated in 1999 was embarked upon with a view to promoting efficiency, safety, transparency, and migration to cashless modes of payments; among others. It is against this background that the CBN initiated its cashless policy in April, 2011; which led to the enhanced development of the electronic payments infrastructure in Nigeria.

In recognition of the role of well-developed payments system infrastructure in enhancing financial efficiency, financial inclusion and financial stability, the CBN launched the Payment Systems Vision 2020, with the aim of increasing the resilience of the payments system infrastructure and work-streams to encourage the usage of electronic payment methods. Since then, there has been remarkable improvement in the e-payments infrastructure in Nigerian.

Empirical Literature

Several studies exist on the financial development – economic growth nexus as well as payments system – economic growth, but very few, if any, of these studies focused on payments system and financial development. For example, Turakpe, Alobari and Fiiwe (2017) investigated the financial development and economic growth nexus in Nigeria for the period 1981 – 2015, employing the OLS technique to analyze the data and Pair-Wise Granger causality test to establish the direction of causality of the variables. Their findings show that financial development and economic growth does not impact on each other, indicating that the finance – growth relationship is not important and is only been "over-

stressed" by economists. In another study, Hasan, Renzis and Schmiedel (2012) examined the fundamental relationship between retail payments and overall economic growth, using data from across 27 European markets over the period 1995-2009. They adopted the Arellano Bond dynamic panel Generalized Method of Moments (GMM) estimation method.

The results of the study confirm that migration to efficient electronic retail payments stimulates overall economic growth, consumption and trade. Among different payment instruments, this relationship is strongest for card payments, followed by credit transfers and direct debits while cheese payments were found to have a relatively low macroeconomic impact. They recommended the adoption of policies promoting a swift migration to efficient and harmonized electronic payment instruments.

Oyewole, El-Maude, Abba and Onuh (2013) also explored the relationship between e-payment system and economic growth as means of reviewing current transition to cashless economy in Nigeria. Data was analyzed using OLS and TSLS methods over a 7-year period from 2005 to 2012. The result indicated a significant positive relationship between e-payment system and economic growth in term of real GDP per capita and trade per capita. Only ATMs was found to positively contribute to economic growth while other e-payment channels contribute negatively.

Al-Adwan, Al-Zyood and Ishfaq (2013) evaluated the impact of electronic payments system on banks' profitability in Saudi Arabia, using selected e-payment and bank profitability pillars. They adopted standardized estimation coefficients (beta) and the coefficient of determination (R^2) to determine the degree of relation between e-payment and profitability pillars. It was revealed that banks' profitability predominantly capitalizes on e-payment pillars, comprising: convenience, choices verities, cost reduction, speedy payments, security, and accessibility.

RTC Advisory Services Ltd. (2013) also investigated the impact of electronic payments on economic growth in Nigeria based on a survey conducted in five major Nigerian cities-Lagos, Abuja, Kano, Ibadan and Port Harcourt, with 851 respondents completing survey questionnaires, it was found that e-payments has contributed to employment generation in terms of transport/delivery, administrative/operational, ICT and production workers. Thus, e-payments have positive impact on economic growth in Nigeria. Tijani and Ilugbemi (2015) also explored the impact of electronic payment channels (EPC) on national development. They conducted a survey with the administration of 120 questionnaires on six banks in Ado-Ekiti metropolis, using chi-square to analyze the data. The study reveals that electronic payment channels (EPC) have contributed positively to national development (ND). Thus, the Central Bank of Nigeria (CBN) should embark on intensive campaign for complete adoption of e-payment products especially at the grassroots level.

Luwabelwa (2009) investigated the contribution of payments system to the development of the financial sector in Zambia. Using the instrumentation of questionnaire and interview administered on 50 respondents drawn from employees and clients of banks, the study revealed that technological advancement has played a significant role in the development of the payments system in Zambia; while the contribution of the payments system to the development of the financial sector has been positive. He advocated that improved funding as well as good financial and technical management of the payments system would enhance affordability of payments services.

SCL Partners (2013) investigated the relationship between electronic payments and economic development using data for a group of 62 developed and emerging economies. Cross-sectional regression analysis and the GMM system estimation techniques were used to regress electronic payments penetration against GDP per capita. The study found that a positive relationship exists between them. They also established that a 1% increase in electronic payments penetration increases per capita GDP by 0.03%.

The World Bank and International Finance Corporation (2009) investigated the impact of payments system infrastructure on financial development. Based on survey conducted in 142 countries, of which 96 are developing countries. It was established that payments system development and reforms directly impact the efficiency and cost of remittances. More so, payment and securities settlement systems in particular have a strong bearing on financial stability. Thus, a sound payment system can mitigate financial crises by reducing or eliminating settlement risks related to financial markets transactions, in particular credit, liquidity and operational risks.

Balago (2014) examined the relationship between financial sector development and economic growth in Nigeria. Time series data from 1990-2009 were fitted into the regression equation using various econometric techniques such as Augmented Dickey Fuller (ADF) test, Johansen Multivariate Co-integration Test, Ordinary Least Square Regression and Vector Error Correction Model (VEC). The result showed that development in financial sector variables viz: banking sector credits, total market capitalization and foreign direct investment positively affect economic growth variable – Real Gross Domestic Product.

Omoruyi and Ede (2014) empirically examined the short-run and long-run relationships between financial system development and economic growth in Nigeria. The study adopted a multivariate OLS analysis for the estimation process, counteraction analysis for long-run equilibrium relationship and the associated error correction model to determine the short-run impact of the variables. Granger Causality Test was also used to determine the direction of causality among the variables. The findings of the study established that financial development (measured by banking system and stock market development) positively influenced economic growth in Nigeria; and that causality runs from finance to growth.

Methodology

The quarterly data used in this study is derived from the CBN Statistical Bulletins, Annual Financial Stability Reports, Nigeria Deposit Insurance Corporation (NDIC) Quarterly Reports, National Bureau of Statistics Publications as well as the Global Financial Development Database for the period 2012 - 2017.

Data Analysis Technique

In the course of data analysis, the Counteraction, Autoregressive Distributed Lag (ARDL) estimation techniques and Pairwise Granger causality test, were adopted in order to explain the functional and causal relationships between the variables employed in the study. The basis for the counteraction technique is to establish whether a long run relationship exists between the variables in the model. The ARDL technique is adopted to enhance the Johansen counteraction modeling. It is argued that ARDL models are especially advantageous in their ability to handle counteraction with inherent robustness to misspecification of integration orders of relevant variables (Giles, 2017). Lastly, the Pairwise Granger test examines the causality relationships.

Model Specification

The assumption of this study is that the electronic payments system (EPS) influences financial development (FDV) in Nigeria, and it is expressed as follows:

EPS = f (FDV) ……………………………… (1)

Where: EPS = Electronic Payments System, FDV = Financial Development.

However, since no single variable can be used to express financial development, three models are employed; which are expressed mathematically as follows:

$$FDN = \beta_0 + \beta_1 MOB + \beta_2 INT + \beta_3 POS + \beta_4 NIB + \mu \quad .... \quad (2)$$

$$FAS = \beta_0 + \beta_1 MOB + \beta_2 INT + \beta_3 POS + \beta_4 NIB + \mu \quad .... \quad (3)$$

$$FEF = \beta_0 + \beta_1 MOB + \beta_2 INT + \beta_3 POS + \beta_4 NIB + \mu \quad .... \quad (4)$$

Where FDN = Financial Depth

FAS = Financial Access

FEF = Financial Efficiency

MOB = Mobile banking transactions

INT = Internet Banking Transactions

POS = E-Transactions at Point of Sale

NIB = Interbank transactions on NIBSS

β_0 = Intercept, β_1, β_2, β_3 & β_4 = Slope of the regression constants

μ = Error term

The apriority expectations are: β_1, β_2, β_3, $\beta_4 > 0$

Definition/Measurement of Variables

Financial development is measured by three variables, namely: financial depth (FDN), financial access (FAS) and financial efficiency (FEF). These are defined as follows:

$$FDN = \frac{Commercial\ Banks'\ Credit\ to\ Private\ Sector}{GDP} \times \frac{100}{1}$$

$$FAS^* = \frac{100,000 \times Number\ of\ ATMs}{Adult\ Population}$$

$$FEF = \frac{Commercial\ Banks'\ Profit\ before\ tax}{Total\ Assets} \times \frac{100}{1}$$

On the other hand, the payments system indicators are measured by the value of transactions within each period.

[*]Derived from the World Bank Global Financial Development Database (June, 2016) – Indicator Code GFDD.AI.25 and IMF (2016). *Financial Development in Sub-Saharan Africa: Promoting Inclusive and Sustainable Growth*

Data Analysis

In a bid to draw logical inferences on the relationships between the variables adopted in this study, various analytical techniques were used and the results obtained are presented below.

Table 1: Descriptive Statistics

	FDN	FAS	FEF	MOB	INT	POS	NIB
Mean	51.53400	14.01250	2.450000	86.00700	18.84300	86.43000	4915.367
Median	50.83000	15.02000	2.500000	80.32000	17.75500	74.12500	4903.580
Maximum	66.24000	17.40000	2.900000	230.3100	43.63000	260.5800	12152.68
Minimum	42.97000	9.930000	1.300000	1.080000	6.380000	1.870000	306.7200
Std. Dev.	7.151428	2.743701	0.393700	68.65394	9.885042	67.40171	3172.008
Skewness	0.526338	-0.314101	-1.470680	0.652286	0.745748	0.880498	0.438710
Kurtosis	2.133356	1.486037	4.935331	2.587669	3.007640	3.342946	2.588878

Jarque-Bera	1.549333	2.238935	10.33092	1.559938	1.853851	2.682267	0.782407
Probability	0.460857	0.326454	0.005710	0.458420	0.395769	0.261549	0.676243
Sum	1030.680	280.2500	49.00000	1720.140	376.8600	1728.600	98307.33
Sum Sq. Dev.	971.7155	143.0300	2.945000	89553.91	1856.567	86316.82	1.91E+08
Observations	24	24	24	24	24	24	24

Source: Author's Computation using E-views

The result above indicates that value of transactions on NIB, which is a wholesale payment system, exceeds that of MOB, INT and POS, put together. This enforces the fact that most transactions on retail systems are usually small values.

Table 2: Correlational Statistics

	FDN	FAS	FEF	MOB	INT	POS	NIB
FDN	1.000000	0.848978	-0.169091	0.767029	0.696986	0.746503	0.793836
FAS	0.848978	1.000000	-0.263159	0.914580	0.888734	0.891796	0.937771
FEF	-0.169091	-0.263159	1.000000	-0.540143	-0.499039	-0.557750	-0.492030
MOB	0.767029	0.914580	-0.540143	1.000000	0.958567	0.983050	0.983141
INT	0.696986	0.888734	-0.499039	0.958567	1.000000	0.976744	0.967168
POS	0.746503	0.891796	-0.557750	0.983050	0.976744	1.000000	0.990763
NIB	0.793836	0.937771	-0.492030	0.983141	0.967168	0.990763	1.000000

Source: Authors' Computation using E-views

The correlation statistics above show that all the variables have high positive correlations with the financial development indicators, except financial efficiency (FEF), which exerts a negative relationship with all other variables.

Table 3: Johansen Counteraction Test (Model 1)
Sample (adjusted): 2012Q3 2017Q4
Series: LOG(FDN) LOG(INT) LOG(MOB) LOG(NIB) LOG(POS)
Lags interval (in first difference): 1 to 1
Unrestricted Counteraction Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.925203	97.77786	69.81889	0.0001
At most 1 *	0.774779	51.10434	47.85613	0.0240
At most 2 *	0.535153	24.27222	29.79707	0.1892
At most 3 *	0.441434	10.48339	15.49471	0.2454
At most 4 *	2.85E-05	0.000514	3.841466	0.9839

Unrestricted Counteraction Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.925203	46.67352	33.87687	0.0009
At most 1 *	0.774779	26.83211	27.58434	0.0622
At most 2	0.535153	13.78883	21.13162	0.3826

| At most 3 | 0.441434 | 10.48288 | 14.26460 | 0.1821 |
| At most 4 * | 2.85E-05 | 0.000514 | 3.841466 | 0.9839 |

Trace test indicates 2 counteracting eqn(s) while Max-eigenvalue test indicates 1cointegratingeqn(s) at the 0.05 level

Source: Author's Computation using E-views

The result above indicates long-run relationships between the variables in the model. This means that the explanatory variables can exert sustainable impact on the dependent variable.

Table 4: Johansen Counteraction Test (Model 2)
Sample (adjusted): 2012Q3 2017Q4
Series: LOG(FAS) LOG(INT) LOG(MOB) LOG(NIB) LOG(POS)
Lags interval (in first difference): 1 to 1
Unrestricted Counteraction Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.948867	114.6214	69.81889	0.0000
At most 1 *	0.848813	61.10161	47.85613	0.0018
At most 2 *	0.584113	27.09535	29.79707	0.0993
At most 3 *	0.443661	11.30322	15.49471	0.1935
At most 4 *	0.040727	0.748424	3.841466	0.3870

Unrestricted Counteraction Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.948867	53.51982	33.87687	0.0001
At most 1 *	0.848813	34.00625	27.58434	0.0065
At most 2 *	0.584113	15.79214	21.13162	0.2372
At most 3	0.443661	10.55479	14.26460	0.1780
At most 4 *	0.040727	0.748424	3.841466	0.3870

Trace test and Max-eigenvalue tests both indicate 2 counteracting eqn(s) at the 0.05 level

Source: Author's Computation using E-views

The result above indicates long-run relationships between the variables in the model and it mean that the explanatory variables can exert sustainable impact on the dependent variable.

Table 5: Johansen Counteraction Test (Model 3)

Sample (adjusted): 2012Q3 2017Q4
Series: LOG(FEF) LOG(INT) LOG(MOB) LOG(NIB) LOG(POS)
Lags interval (in first difference): 1 to 1
Unrestricted Counteraction Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.996078	157.5799	69.81889	0.0000
At most 1 *	0.866757	57.83937	47.85613	0.0044
At most 2 *	0.581637	21.55896	29.79707	0.3237
At most 3 *	0.269951	5.873676	15.49471	0.7104
At most 4 *	0.011604	0.210095	3.841466	0.6467

Unrestricted Counteraction Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.971855	99.74051	33.87687	0.0000
At most 1 *	0.867463	36.28041	27.58434	0.0030
At most 2 *	0.727243	15.68529	21.13162	0.2438
At most 3	0.466003	5.663581	14.26460	0.6567
At most 4 *	0.341009	0.210095	3.841466	0.6467

Trace test and Max-eigenvalue tests both indicate 2 counteracting eqn(s) at the 0.05 level

Source: Author's Computation using E-views

The result above indicates long-run relationships between the variables in the model. This means that the explanatory variables can exert sustainable impact on the dependent variable.

Table 6: ARDL Test (Model 1)

Dependent Variable: LOG(FDN)
Method: ARDL
Date: 08/10/18   Time: 21:06
Sample: 2012Q1 2017Q4
Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(FDN(-1))	0.226793	0.197383	1.149000	0.2729
LOG(INT)	-0.018214	0.161585	-1.112721	0.9121
LOG(INT(-1))	0.350800	0.104458	3.358292	0.0057
LOG(MOB)	-0.060360	0.119372	-0.505644	0.6223
LOG(NIB)	0.323994	0.489977	0.661244	0.5209
LOG(POB)	-0.283917	0.449130	-0.632150	0.5391

C	0.877384	2.503424	0.350473	0.7321

R-squared	0.852580	Mean dependent var	3.940993
Adjusted R-squared	0.778871	S.D. dependent var	0.134947
S.E. of regression	0.063458	Akaike info criterion	-2.399568
Sum squared resid	0.048323	Schwarz criterion	-2.051617
Log likelihood	29.79589	Hannan-Quinn criter.	-2.340681
F-statistic	11.56672	Durbin-Watson stat	1.949739
Prob(F-statistic)	0.000219		

Source: Author's Computation using E-views

In Table 6, the Adjusted R^2 of 0.7778871 reveals that the explanatory variables determine over 77% of changes in the dependent variable. Only INT is found to have a positive and significant relationship in the short run at 1%, while the other variables are insignificant. However, the independent variables have joint significant relationship with FDN also at 1%.

Table 7: ARDL Test (Model 2)

Dependent Variable: LOG(FAS)
Method: ARDL
Date: 08/10/18   Time: 21:05
Sample: 2012Q1 2017Q4
Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(FAS(-1))	0.666212	0.079690	8.360061	0.0000
LOG(INT)	-0.020824	0.041134	-0.506243	0.6237
LOG(INT(-1))	0.059102	0.028353	2.084522	0.0637
LOG(MOB)	0.065216	0.028832	2.261968	0.0472
LOG(MOB(-1))	0.056300	0.029060	1.937364	0.0814
LOG(NIB)	0.323286	0.150078	2.154113	0.0567
LOG(POS)	-0.232052	0.118110	-1.964710	0.0778
LOG(POS(-1))	-0.121432	0.037078	-3.275030	0.0084
C	-0.927252	0.716529	-1.294088	0.2247

R-squared	0.996694	Mean dependent var	2.637545
Adjusted R-squared	0.994049	S.D. dependent var	0.196613
S.E. of regression	0.015167	Akaike info criterion	-5.233895
Sum squared resid	0.002000	Schwarz criterion	-4.786529
Log likelihood	58.72200	Hannan-Quinn criter.	-5.158183
F-statistic	376.8578	Durbin-Watson stat	1.764057
Prob(F-statistic)	0.000000		

Source: Author's Computation using E-views

Table 7 reveals that the explanatory variables determine over 99% of changes in the dependent variable. The result indicates that MOB and NIB have positive significant relationship while POS has negative significant relationship with FAS at 5%. INT has negative and insignificant relationship with FAS. However, the independent variables also have joint significant relationship with FAS at 1%.

Table 8: ARDL Test (Model 3)

Dependent Variable: LOG(FEF)
Method: ARDL
Date: 08/10/18 Time: 21:13
Sample: 2012Q1 2017Q4
Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(FEF(-1))	0.927882	0.260419	3.563038	0.0052
LOG(INT)	0.234521	0.267786	0.875777	0.4017
LOG(INT(-1))	0.420677	0.163157	2.578365	0.0275
LOG(MOB)	-0.053209	0.254989	-0.208672	0.8389
LOG(NIB)	0.167094	0.986546	0.169373	0.8689
LOG(NIB(-1))	1.402845	0.615985	2.277400	0.0460
LOG(POS)	-0.931384	0.813041	-1.145551	0.2787
LOG(POS(-1))	-0.796445	0.317194	-2.510910	0.0309
C	-7.325050	4.616953	-1.586555	0.1437

R-squared	0.844640	Mean dependent var	0.893375	
Adjusted R-squared	0.720352	S.D. dependent var	0.186835	
S.E. of regression	0.098801	Akaike info criterion	-1.485896	
Sum squared resid	0.097617	Schwarz criterion	-1.038530	
Log likelihood	23.11601	Hannan-Quinn criter.	-1.410184	
F-statistic	6.795836	Durbin-Watson stat	1.909257	
Prob(F-statistic)	0.003350			

Source: Author's Computation using E-views

From table 8, the Adjusted R^2 of 0.720352 indicates that the explanatory variables determine over 72% of changes in the dependent variable. The result also reveals that INT, NIB and POS are all significant at 5% in the short-run while MOB with negative coefficient is insignificant. However, the independent variables were also found to have joint significant relationship with FDN.

Table 9: Pairwise Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
MOB does not Granger Cause FDN	22	9.29991	0.0031
FDN does not Granger Cause MOB		0.30492	0.7423
INT does not Granger Cause FDN	22	18.6605	0.0002
FDN does not Granger Cause INT		13.6239	0.0006
POS does not Granger Cause FDN	22	8.49565	0.0044
FDN does not Granger Cause POS		1.41293	0.2784
NIB does not Granger Cause FDN	22	12.0069	0.0011

FDN does not Granger Cause NIB		0.76532	0.4850
NIB does not Granger Cause FAS	22	0.72717	0.5019
FAS does not Granger Cause NIB		4.74343	0.0284
NIB does not Granger Cause FEF	22	4.64806	0.0300
FEF does not Granger Cause NIB		1.36851	0.2888

Source: Author's Computation using E-views

The table above reveals that all the variables have uni-directional causality relationship with financial depth (FDN), which runs to FDN while only NIB exhibits the same nature of causality on FEF. On the other hand, causality runs from FAS to NIB.

Discussion of Findings

First, the variables were tested for linearity, using the ADF Unit Root Test, and were found to be stationery but integrated at varying orders. Furthermore, the Johansen Counteraction test was applied to determine the existence of long-run relationships between the variables, which revealed 1 and 2cointegrating equations at both Trace and Max-Eigenvalue in the first model; while 2 counteractions equations were established at both Trace and Max-Eigenvalue in the second and third models. Second, the ARDL estimation modeling revealed that only internet payment (INT) has a significant positive impact on financial depth (FDN) in the short run. In the second model, MOB is positive and significant in the long run while POS is negative and significant in the short run at 5% level.

On the other hand, INT, NIB and POS all establish significant short run relationship with FEF. On the whole, the ARDL result gives an indication that electronic payments can jointly influence chosen financial development indicators both in the short run and the long run.

The result of the Pairwise Granger Causality Test indicates that there is causal relationship between all the payments variables and Financial Depth (FDN), which is uni-directional and runs to FDN. On the other hand, none of the variables had causality on Financial Access (FAS), although causality was found to run from FAS to NIB; while only NIB exerted causality on Financial Efficiency (FEF). The absence of causality on Financial Access and Financial Efficiency can be explained by the evolving nature of retail payments instruments in Nigeria; most of which are just gaining popularity in the last few years.

Conclusion

This study examined the relationship between the efficiency of the electronic payments system and financial development in Nigeria. Four explanatory variables: mobile payments, internet payments, POS payments and NIBBS payments were regressed against financial depth, financial access and financial efficiency; based on quarterly data drawn from 2012 to 2017. The findings reveal long run relationships between EPS and financial development variables. Specifically, only internet payments (INT) have a significant positive impact on financial depth (FDN) in the short run. In the second model, MOB is positive and significant in the long run while POS is negative and significant in the short run at 5% level. On the other hand, INT, NIB and POS all establish significant short run relationship with FEF. Causality relationships were also established by the Granger Causality Test. A uni-directional relationship, which runs to FDN, was found. Also, none of the variables had causality on

Financial access (FAS), although causality was found to run from FAS to NIB; while only NIB exerted causality on financial efficiency (FEF).

In the course of this study, certain inferences were drawn. First, the electronic payments system in Nigeria is still evolving, and thus, operates at a low level of efficiency; especially the retail payments system. However, the electronic payments system has a sustainable positive and significant impact on financial development. Thus, the efficiency of the electronic payments system can determine the level of financial development in any country. In terms of value of transactions, retails payments (MOB, INT, POS,) have very low efficiency while large payments, like NIBSS, have very high efficiency; and increase remarkably in volume.

In Nigeria, the level of financial development is still very low, and this reflects the low level of development of the financial infrastructure, such as the payments system. Thus, remarkable advancement in the level of financial development can only be achieved through a remarkable improvement in the electronic payments system; which will serve as an incentive in promoting the current cashless policy in the country.

Based on the findings and conclusion of this study, the following policy recommendations will significantly improve overall payments system efficiency; viz-a-viz financial development in Nigeria.

Aggressive enlightenment programs should be carried out by the CBN, especially in rural and remote areas where mass media cannot effectively reach; so as to increase the awareness of electronic payments instruments in the country;

The cost of e-payments should be reduce end more in order to enhance its comparative cost advantage over traditional instruments; the recent 50% reduction in transactions cost is laudable.

The CBN, in collaboration with financial institutions and the government, should take urgent steps to improve on existing financial infrastructure in the country which has significant implication on the level of financial development. Commercial banks and other financial institutions should improve on their problem resolution mechanisms so as to ensure speedy resolution of issues arising from e-payments transactions, which will enhance confidence in the e-payments system.

Commercial banks, should also improve on their system networks so as to remove clogs in the wheels of e-payments transactions to enhance confidence and general efficiency of the system in the country.

References

AL-Adwan, M. M.,AL-Zyood, M. & Ishfaq, M. (2013). The impact of electronic payment on Saudi banks profitability: Case study of Sadad payment system, *IJRRAS*, 14(1):100-113

Balago, G. S. (2014). Financial sector development and economic growth in Nigeria: An empirical investigation, *International Journal of Finance and Accounting*, 3(4): 253-265

Bank for International Settlement (BIS) & World Bank Group (WBG) (2016). *Payment aspects of financial inclusion*. Committee on Payments and Market Infrastructures World Bank Group.

Bank Negara Malaysia (2011). *Financial sector blueprint 2011-2020*. Central Bank of Malaysia

Beck, T. (2006). Creating an efficient financial system: challenges in a global economy, Policy Research Working Paper Series 3856, The World Bank.

Beck, T., Loayza, N. & Levine, R. (2000). Financial intermediation and growth: Causality and causes, *Journal of Monetary Economics*, 46: 31–77

Briggs, A. & Brooks, L. (2011). Electronic payment systems development in a developing country: the role of institutional arrangements; *The Electronic Journal on Information Systems in Developing Countries. EJISDC,* 49, 3, 1-16

Central Bank of Nigeria (2011). The Nigerian payments system, *Understanding Monetary Policy Series No 6*

Cirasino, M. & Garcia, J. A. (2008). *Measuring payment system development Working Paper*, World Bank: Financial Infrastructure Series Payment Systems Policy and Research

European Central Bank (2010). *The payment system: Payments, securities and derivatives, and the role of the Euro system*

Federal Government of Nigeria (2007). FSS2020 a blue print for the Nigerian financial system, July.

Giles, D. (2017). Autoregressive distributed lag (ARDL) estimation. Part 1 – Theory, retrieved from http://blog.eviews.com/2017/04/autoregressive-distributed-lag-ardl.html, 16th August, 2018.

Hasan, I., De Renzis, T. & Schmiedel, H. (2012). Retail payments and economic growth, *Bank of Finland Research Discussion Papers*, No. 19.

Malaguti, M. C. (2015). Payments system regulation for improving financial inclusion, *Center for Global Development Policy Paper 070*, December.

Omoruyi, A. & Ede, U. A. (2014). Financial system development and economic growth: The Nigerian stock market and bank perspective, *Asian Journal of Business Management*, 6(4): 155-172

Oyewole, O. S., El-Maude, J. G., Abba, M. & Onuh, M. E. (2013). Electronic payments system and economic growth: A review of transition to cashless economy in Nigeria, *International Journal of Scientific Engineering and Technology*, 2(9), 913-918

Pereira, C. (2013). *Global Payments Systems Development and Successes: World Bank Perspective.* World Bank: Payments System Development Group.

Racocha, P. (2004). *The payments system and the financial stability*. Keynote presentation at conference "Payments System in Central and Eastern Europe", Prague, July 8-9.

Sanusi, S. L. (2013). Foreword In: *Nigeria payments system vision 2020,* Release 2.0

Tijani, J. A. & Ilugbemi, A. O. (2015). Electronic payment channels in the Nigerian banking sector and its impacts on national development, *Asian Economic and Financial Review*, 5(3) 521 – 531

Turakpe, M. J., Alobari, C. & Fiiwe, J. L. (2017). Financial development and economic growth nexus: Evidence from Nigeria, *Abstra International Journal of Economics and Finance*, 6(3), 111-131

World Economic Forum (2012). *The Financial Development Report,* World Economic Forum, USA Inc.