Banking Innovation on Sustainable Development of Nigeria during the Pre and Post Covid Era

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Abstract

The research critically examined the nexus between Banking Innovation and Sustainable Development of Nigeria during the Pre and Post Covid Era between the year 2005 – 2020 respectively. The data employed for the study were basically obtained from CBN Statistical Bulletin 2020, in analyzing the data obtained; econometric techniques were used, such as Autoregressive Distributed Lag (ARDL), bounce test, granger causality, unit root and major diagnostic techniques were deployed to ascertain the impact of Banking Innovation on Sustainable Development in Pre and Post Covid Era in Nigeria. The result obtained shows positive and significant relationship between Banking Innovation (POS, ATM, MB) and Sustainable Development provided by human development Index. In the light of the above result, we recommend an immense and total improvement on the usage of banking innovative products.

Keyword: ARDL, Sustainable Development, Bounce Test, Banking Innovation.

Background to the Study   Financial innovation is the unanticipated improvement in the array of financial products and instruments that are stimulated by unexpected changes in customer needs and preferences, tax policy, technology and regulatory impulses (Tyavambiza, & Nyangara, 2015).

The debate on financial innovation and its effect on economic growth and development can be traced to the work of Schumpeter (1934). The author was the first to give us an idea of the connection between innovation and performance of an economy and the functioning of its credit and capital markets. A good understanding of the relationship between finance, innovation, and growth begins with understanding the character of innovation. (Mazzucato, 2013).

The development in the financial sector have not only led to the increase in the number of financial institutions, but also the development in the level of sophistication with new payment systems and asset alternatives to holding money. This has resulted mainly from technological advancement and increase in competition as the number of institutions increased. Developments in payment systems have started to create close substitutes for hard currency, thus affecting a core part of banking.

Research studies on financial innovation in developing countries have so far focused mainly on welfare issues, particularly on its impact on financial inclusion (Adu-Asare Idun & Aboagye, 2014). Financial innovation has transformed and restructured banking services globally, and its impact on economies is becoming increasingly noteworthy. The available literature confirms that financial innovation drives economic growth (Sekhar, 2013). From a historical perspective, Laeven, Levine and Michalopoulos (2015) point

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out that financial innovation has been a driving force behind financial deepening and economic development over the past centuries. In turn, Štreimikien, (2014) contends that "leapfrog" (financial) innovation is a driving force for broad economic growth. Despite mixed evidence on causality, there is also a broad consensus that a well functioning banking system promotes economic growth (Owusu & Odhiambo, 2014).

Economic growth is defined as 'a rise in the total output (goods or services) produced by). It is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. Economic growth occurs whenever people take resources and rearrange them in ways that are more valuable. Economic growth refers only to the quantity of goods and services produced; but say nothing about the way in which they are produced (Mackinnon, 1973). The quest for profit forces companies, households and economic agents to look for new

Statement of the Problem

The significance of financial innovation on economic development has led to various controversies among renowned scholars as to whether to adopt or reject the significance of financial innovation as a determinant to stimulating economic development. Various authors such as; Tunde, 2015; Levine et'al 2015; Adu-Asare, & Aboagye, 2014; Ajimobi et'al 2013 argued that financial innovation is grossly significant to economic development whereas Becky & Augustine, 2014Owusu and Odhiambo (2014) in their separate studies, argued that financial innovation is grossly insignificant to economic development in Nigeria. These controversies had indeed created a vacuum in relationship with human development index in Nigeria academic stance on the impact of financial innovation on economic development in Nigeria.

However, in Nigeria and other less developing economics, the significance of financial innovation on economic development is yet to be optimized appropriately due to the inadequate use of automated teller machine, point of sale, mobile banking and internet banking by the banking public which has resulted into low growth in the economic development. To this end, the research study is centered on the effect of financial innovation on economic development in Nigeria

and improved products, services, processes and forms or structures of companies that decrease their production costs, satisfy in a great range, their customers' demand and bring higher profits. Sometimes this quest is made through official Research and Development (R&D) programmes or sectors of a company. Today, more than ever before, innovation, enterprise and intellectual assets drive economic growth and development a country (Laeven, Levine & Michalopoulos, 2015 and increase standards of living. Innovation is instrumental in creating new jobs, providing higher incomes, offering investment opportunities, solving social problems, curing diseases, safeguarding the environment, protecting our security and transparency in organizations and governments (Štreimikien, 2014).
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where appropriate variables such as; automated teller machine, point of sale, mobile banking, internet banking(proxy of financial innovation) and aggregate output, human development index, per capital income, human poverty index and educational index as proxy of economic development are used to study the empirical relationship existing between them.

Research Objective

The broad objective of the study centre on the effect of financial innovation on economic development in Nigeria; whereas, the specific objectives are to:

1. Investigate the relationship between automated teller machine and human development index
2. Examine the nexus between point of sale and human development index in Nigeria
3. Determine the relationship between mobile banking and human development index in Nigeria

Research Questions

The following research questions are formulated to guide this research work:

1. To what extent has automated teller machine affected human development index in Nigeria?
2. To what degree has point of sale affected human development index in Nigeria?
3. What is the relationship between mobile

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banking and human development index in Nigeria?

Research Hypotheses

The hypotheses are formulated in null form to aid in the empirical analysis in the research work:

Ho1: Automated teller machine has no significant relationship with human development index in Nigeria

Ho2: Point of sale has no significant and human development index in Nigeria

Ho3: Mobile banking has no significant relationship with human development index in Nigeria

Significance of the Study

This study will benefit a broad range of people and institutions such as;

Policy Makers: The study will aid policy makers and monetary authorities, in formulating appropriate monetary policies that will enhance financial innovation and reforms and stimulate growth and development

Concept of Financial Innovation

Innovation in the financial sector is the act of creating and then popularizing new financial instruments as well as new financial technologies, institutions, and markets (Makur, 2014). It may be viewed as the design, development, and implementation of innovative financial instruments and processes, and the formulation of creative solutions to problems in finance. According to Korir (2014), financial innovations is one of the most important competitive weapons and generally seen as a firm's core value capability. It is considered as an effective way to improve firm's productivity due to the resource constraint issue facing a firm.

Ignazio (2007) groups financial innovations into; new products for example adjustable rate mortgages and exchange-traded index funds; new services for example on-line securities trading and Internet banking; new "production" processes for example electronic record keeping for securities and credit scoring and new organizational forms for example a new type of electronic exchange for trading securities and Internet-only banks.

According to Makur (2014), commercial banks in

Stakeholders in the Banking Sector: The study will benefit various stakeholders in the banking industry and aid bank borrowers in taking lending and borrowing decisions that will optimize their investment activities

Social and Financial Analysts: Financial innovation in the banking sector in Nigeria through electronic banking has been recognized to play an important role in financial sector development on the basis of its ability to create liquidity in the economy through financial intermediation. This will offer a platform where banks' products and services can be accessed and utilized with ease, thus encouraging banking culture and serving as a catalyst for economic growth and development

Researchers and Students: Academics, including students of finance, banking and other related fields and other researchers will find this study useful for further studies in this area

Kenya have continuously been innovating new products, services and governance in order to improve their financial performance. The financial sector has over time developed successfully with innovation products and services available in financial market. Some of these products are debit cards, credit cards, ATM cards, M-pesa and others which facilitate the use of electronic means of payment and sometimes substitute for the use of physical cash. Similarly these products gain a wider recognition in financial market leading to reduction of holding amount of money.

That latest service innovation will lead to furthering of financial inclusion and innovative service offerings for all Kenyans by presenting their financial services offering on to a single platform which will make banking services more accessible, flexible convenient and more affordable.

Financial innovation is the improvement in the array of financial products and instruments that are stimulated by unexpected change in customer needs and preferences, tax policy, technology and regulatory impulses (Venkatesh, & Davis, 2000). Innovation in the financial sector is the act of creating and then popularizing new financial instruments as well as new financial technologies, institutions, and markets (Waweru, 2012). It may be viewed as the design, development, and

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implementation of innovative financial instruments and processes, and the formulation of creative solutions to problems in finance. According to Makur (2014), financial innovations is one of the most important competitive weapons and generally seen as a firm's core value capability. It is considered as an effective way to improve firm's productivity due to the resource constraint issue facing a firm.

The developments in the financial sector have not only led to the increase in the number of financial institutions, but also the development in level of sophistication with new payment systems and asset alternatives to holding money. This has resulted mainly from technological advancement and increase in competition as the number of institutions increase. Developments in payment systems have started to create close substitutes for hard currency, thus affecting a core part of banking. The quest for

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Concept of Sustainable Economic Development

Economic development encompasses progress in providing livelihood on a sustainable basis, access to education and basic healthcare for the majority of the population (Belshaw & Livingstone, 2002). Economic development' is a process in which a nation is being improved in the sector of the economic, political, and social well being of its people. The term has been used frequently by economists, politicians, and others in the 20th and 21st centuries. The concept, however, has been in existence in the West for centuries. "Modernization, westernization and especially industrialization are other terms often used while discussing economic development. Economic development has a direct relationship with the environment and environmental issues Economic development is very often confused with industrial development, even in some academic sources. Whereas economic development is a policy intervention endeavor with aims of improving the economic and social well being of people, economic growth is a phenomenon of market productivity and rise in GDP. Consequently, economic growth is one aspect of the process of economic development.

Economic development is the overall development in the economy standard of living. The meaning of the term "development" becomes clearer with the understanding of the term "economic growth". By economic growth, economists generally mean the increase over time in a country's real output per capita.

profit forces companies, households and economic agents to look for new and improved products, services, processes and forms or structures of companies that will decrease their production costs, will satisfy, in a great range, their customers' demand and will bring higher profits. Sometimes this quest is made through official Research & Development (R&D) programs or sectors of a company. Other times, it is a hazardous result of control processes or of the trial and mistake method. Today, more than ever before, innovation, enterprise and intellectual assets drive economic growth and increase standards of living. Hence Innovation is instrumental in creating new jobs, providing higher incomes, offering investment opportunities, solving social problems, curing disease, safeguarding the environment, protecting our security and transparency in organization and governments

Though other measures can be used, output is most conveniently measured by the gross national product (GNP). This implies that economic growth is measured by the increase in a country's per capita GNP.

Economic growth is thus sustained expansion of production possibilities measured as an increase in the real GDP over a given period. Rapid economic growth maintained over a number of years can transform a poor nation into a rich one, as has been the experiences of Hong Kong, South Korea, Taiwan and other Asian economies (Bade & Parkin, 2002). According to Malizia and Feser (2000), growth and development is complementary, because one makes the other possible. They are also alternating processes that occur sequentially. Growth is an increase in output, development is a structural change, for example technological or legal. Growth expands the economy, while development must lead to more equal distribution of income and wealth. Overall, growth and development lead to a greater range of economic choices. Economic development could also involve development in different sectors of the economy. It involves efficient economic management, good governance, sustainable development and poverty reduction; all of these are goals to which development stakeholders have to contribute (Sako, 2002). Ruttan (1997) explains that the basic needs approach represents a radical departure from conventional development strategy. In the basic human needs approach, poverty is defined not in

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terms of income, but rather as a lack of good nutrition, good health, educational opportunities and similar dimensions of welfare (Lewis, 2003).

According to this view, usually referred to as the basic (human) need approach, economic development is defined in terms of progress towards reducing the incidence of poverty, unemployment and income inequalities. Beneria (2003) advocates a vision of development based on an intuitive idea of life that is worthy of the dignity of human beings for each and every person, a view that is in tune with the basic objectives of feminist economics. Meeting the basic needs of the vast majority of the population of a country is at the centre of this view. Ruttan (1997) further argues that growth objectives are replaced in this approach by consumption targets translated into specific programme goals, namely a life expectancy

of 65 years, a literacy rate of at least 75 percent, an infant mortality rate of 50 or less per thousand births and a birth rate of 25 or less per thousand of the population. Sen (1999) asserts that "development has to be more concerned with enhancing the lives we lead and the freedom we enjoy," rather than economic growth being treated as an end in itself. In the same vein, Blignaut and De Wit (2004) explains that ignoring the impact of social capital or environmental preservation in the conventional growth models may be a problem when predicting the possibility of sustained growth. This suggests that the linkage and interactions between the economy and the environment are constrained, since growth does not automatically lead to increased welfare.

Theoretical Review
The Innovation Diffusion Theory

Diffusion Theory (IDT) that explains individuals' intention to adopt a technology as a modality to perform a traditional activity. The theory is developed by Roger's (1983). The critical factors that determine the adoption of an innovation at the general level are the following: relative advantage, compatibility, complexity, trial ability and observability. (Rogers, 1995). Researchers such as Tan and Teo (2000), Gerrard and Cunningham (2003) and MdNor and Pearson (2008) had tested the theory on the e-banking adoption. The nominalized factors are complexity, triability and observability.

The underpinning theory employed in this work is a theory arising from the decomposed theory of planned behaviour. This theory considers that the use of technology is influenced by attitude, subjective norm and perceived behavioural control. The theory argues that the lesser the ratio of currency outside banks to broad money supply the higher the intermediation efficiency and vice-versa. This suffices that when the currency outside banks diminishes as a result of the increase in the use of electronic forms of payment, particularly ATM and other e-card products, as well as banking habits, the intermediation efficiency will be positive, otherwise it will be negative.

Empirical Review

Nzyuko and Jagongo, (2018) investigated financial innovations adopted by commercial

banks in Kenya. The study is centered on the use of technology such as Automatic Teller Machines (ATMs), mobile phone banking internet banking and agency banking and its impact on financial performance of commercial banks in Kenya .The study used time series data from central bank of Kenya (CBK) and Kenya Bankers' Association (KBA) annual bank supervisory reports (2010-2016). Through multiple regressions and correlation analysis the study found that there is a strong positive relationship between financial inclusion strategies and financial performance. Based on these results, the study recommends that financial inclusion innovations should be emphasized in the financial sector through regulatory and advisory bodies since it leads to improved financial efficiency. In addition, the study also recommends that financial institutions should embrace agency, internet banking and ATM banking to include the excluded people in financial services and products throughout the country since they proved significant in influencing financial performance.

Ibenta, and Anyanwu (2017)evaluated the relationship between financial innovation and bank efficiency as well as the impact of financial innovation on efficiency ratio of deposit money banks in Nigeria from 2006 to 2014. Secondary data covering the period of the study were sourced from the Central Bank of Nigeria Statistical Bulletin. The unit root test was performed to ensure that the variables were free from stationarity defect linked with almost all time

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series data due to the nature they were generated. A multiple regression model was used and estimated to evaluate the relationship among the variables concerned. The finding reveals that the value of transactions on Automated Teller Machine (ATM) and Point of Sale (POS) are negatively related with efficiency ratio while web/internet and mobile banking are positively related but only that of web/internet was significantly related. The granger impact assessment depicts that financial innovation products reflected by value of transaction on ATMs, web/internet, POS and mobile banking has no significant impact on efficiency ratio of deposit money banks in Nigeria. The study found evidence that banks efficiency ratio exerted statistically significant impact on value of transactions on ATMs. The study recommends that, banks should invest more in ATMs and POS platforms as it reduces the operating expenses to net income ratio while ensuring effective utilization of existing web/internet and mobile banking infrastructure rather than acquiring new ones that will gulp a large fraction of their net operating income. Web/internet and mobile banking should be redesigned in such a way that customization will enable customers access all the banking services which would indeed reduce its transaction costs. This calls for dialogue and negotiation with mobile service providers operating in Nigeria.

Chukwunulu, (2019) investigated the effect of financial innovations on economic growth in Nigeria. Data on the e-payment system were used as financial innovation variables spanning 2008 to 2017. The Generalised Methods of Moments (GMM) employed for data analysed revealed that transactions through ATM, Mobile Banking, Internet Banking and Point of Sale terminals have significant positive effect on economic growth. Further results from the adjusted coefficient of determination (Adj R2) showed that about 79% of changes in economic growth can be explained by financial innovations. The study therefore concludes that financial innovation has high predictive power on economic growth of Nigeria and has impacted positively in determining

Nigeria's economic growth. However, care should be taken to identify and eliminate the risk associated with these innovations before promoting them.

Okafor, Ezeaku and Anyalechi (2017) employed quarterly data covering 2009:Q1-2014:Q4 to examine the effectiveness of financial innovation in driving growth in Nigeria. The Least Squares (Gauss-Newton/Marquardt steps) based on vector autoregressive (VAR) system was used to estimate the system model whereas Johansen co-integration test was utilized to test for long-run relationship among the series. The results showed a long-run relationship between growth and financial innovation. The findings indicate that financial innovations do not jointly have positive effect on growth as the responsiveness of growth to the individual innovation channels varied. ATM, mobile and internet transactions all have relative positive effect on growth, while transactions via POS channel had a negative influence on growth. The study therefore concluded that financial innovations have not had the desired effect on the Nigerian economy.

A jide (2016) used bank competition to moderate the effect of financial innovation on sustainable development in eight West African countries covering the period between 2000 - 2013. Two variables of competition and two variables of financial innovation, with other control variables were regressed on a growth indicator. The dependent variable was adjusted net savings while the independent variables included bank competition, bank return, financial innovations, and banking sector development. The results from panel data estimations indicated that increase in banking efficiency driven by competition and financial innovation improved economic growth and development. It was also discovered that the effect of financial innovation on growth and development depends on the variable adopted, as one of the variables showed a negative relationship while the other had a positive relationship with development though the two were insignificant. However, the two proxies of competition were significant. The researcher concluded that a reduction in demand for money caused by financial innovations could deter economic growth and developme

Methodology

The research work is design to empirically examine the impact of financial innovation on sustainable economic development in a post covid era in Nigeria; sophisticated econometrics tools such Error correction model, Jargue

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Bera normality, unit root, co-integration, impulse response analysis and Granger causality. Below are specifications of the econometric tools;

Impulse Response Analysis

Impulse response traces out the responsiveness of the dependent variables in the vector error correction (VAR) to shock of each of the variables. So for each variable from each equation separately, a unit shock is applied to the error, and the effect upon the VAR system over time are noted. Thus, if there are g variable in the system, a total of g2 impulse responses could be generated. The impulse response test is estimated from the bivariate VAR (1) equation; thus

$Y_t = A_1 y_{t-1} + \mu t$

Where A1 = [0.5 0.3] & [0.0 0.2] respectively.

Error correction model or equilibrium correction model

The equilibrium correction or error correction model is used to combine first differenced and lagged levels of co-integrated variables. The model measures the proportion of last period's equilibrium error that is corrected for and describes the speed of adjustment back to equilibrium. Symbolically, the model $yt = \beta 1xt + \beta 2 (yt-1 - \gamma xt-1) + ut$ is known as the error correction model or equilibrium correction model while $yt-1 - \gamma xt-1$ is known as the correction model. Provided that yt and xt are co-integrated with co-integrating coefficient γ then $(yt-1 - \gamma xt-1)$ will be I(0) even though the constituents are I(1).

Bera and Jargue Normality

BJ uses the property of a normally distributed random variable that the entire distribution is characterized by the first two moments – the mean and the variance. The standardized third and fourth moments of a distribution are known as its skewness and kurtosis. Skewness measures the extent to which a distribution is not symmetric about it mean value and Kurtosis measures how fat the tails of the distribution are. A normal distribution is not skewed and is defined to have a coefficient of Kurtosis of 3. A normal distribution will thus have a coefficient of excess Kurtosis of zero. A normal distribution is symmetric and said to be meosokurtic.

Bera and Jargue (1981) formalize these ideas by testing
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whether the coefficient of Skewness and the coefficient of excess Kurtosis are jointly zero. Denoting the error by u and their variance by σ^2, it can be proved that the coefficients of skewness and Kurtosis can be expressed respectively as:

$$B_1 = \frac{E(u^3)}{(\sigma^2)^{3/2}} \quad \text{and} \quad b_2 = \frac{E(u^4)}{(\sigma^2)^2}$$

The Kurtosis of the normal distribution is 3 so its excess Kurtosis (b_2 -3) is zero.

The Bera – Jargue test statistic is given by

$$W = T \frac{(b^2_1}{6} + \frac{(b_2 -3)^2}{24}$$

Where T is the sample size, the test statistics asymptotically follows a $x^2(2)$ under the null hypothesis that the distribution of the series is symmetric and mesokurtic.

Model specification

The impact of financial innovation on sustainable economic development in Nigeria is anchored on the econometric model below;

HDI $= \beta_0 + \beta_1 ATM + \beta_2 POS + \beta_3 MB + \mu$

Where: ATM = Automated teller machine
HDI = - Human development index
POS = Point of sale
MB = - Mobile banking
, σ_t = the error term at time interval T.

4.0 Results and Discussion

This section of the research work present, analyze and report the result of the model estimation conducted: the table below shows Quarterly Data on financial innovation in billions proxied by automated teller machine (ATM), point of sale (POS), mobile banking (MB) and internet banking (ITB) serving as control variables and economic development proxied by human development index

Yr	ATM	POS	MB	HDI
2009				
Q1	548.6	11.03	1.27	8226.443
Q2	251.6612	36.7184	2.6185	8556.945
Q3	294.9517	44.9361	2.9962	9811.363
Q4	310.3243	44.0459	4.1506	10219.34
2010				
Q1	399.71	12.72	6.65	10050.67

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Q2	321.8144	25.1297	63.85358	10102.82
Q3	319.1671	29.8247	75.76033	10336.11
Q4	341.2412	27.8778	74.59405	9830.344
2011				
Q1	1561.74	31.02	18.98	9446.946
Q2	376.7717	17.0436	43.25328	9957.95
Q3	420.2379	14.2152	46.81272	11110.74
Q4	400.1608	19.3586	49.23296	14183.59
2012				
Q1	1984.659	48.00831	31.50933	14119.89
Q2	538.1143	48.9505	727.4112	14701.06
Q3	586.2737	56.9129	714.9556	14754
Q4	599.0307	68.6625	722.3069	15151.76
2013				
Q1	2828.939	161.0163	142.7971	15261.94
Q2	4132.896	71.0286	563.713	15692.04
Q3	4122.578	80.1375	602.829	16279.27
Q4	4375.027	81.2041	615.1409	16191.47
2014				
Q1	3679.878	312.0717	346.4673	16452.3
Q2	4311.833	13.7841	494.9443	16927.98
Q3	4620.815	14.134	513.3734	17694.08
Q4	4990.504	12.8185	642.3882	18126.05
2015				
Q1	3970.252	448.5126	442.3538	18650.34
Q2	5381.59	71.0286	466.4944	18898.67
Q3	5511.069	80.1375	456.3068	18733.46
Q4	5322.282	81.2041	457.9778	18720.51
2016				
Q1	4988.133	758.9965	756.8975	18883.44
Q2	5811.744	26.5522	59.81573	21452.18
Q3	5125.3	27.4633	72.20069	22739.69
Q4	5586.178	29.1016	96.1665	21982.15
2017				
Q1	6437.592	1409.813	1101.999	22371.83
Q2	6332.073	1631.933	9365.598	21985.95
Q3	5884.873	1628.825	9181.208	22021.9
Q4	6053.095	1341.864	9155.799	22290.66
2018				
Q1	1568.949	474.7313	329.1158	22363.23
Q2	1603.166	543.6256	410.5659	22281.87
Q3	1591.014	650.4066	498.0817	22967.44
Q4	1716.957	714.3454	592.9377	22708.22
2019				

Q1	1539.26	633.81	100.69	23994.74
Q2	1699.16	749.82	1155.64	24758.24
Q3	1622.93	856.86	1428.12	25486.51
Q4	1651.25	964.27	1687.1	26636.61

Source: CBN statistical bulletin 2019

4.2 Econometric Analysis

The model specified in chapter three is analyze using various econometric tools to determine the nexus between financial innovation and sustainable economic development in a post covid era in Nigeria, in analyzing the data, we therefore began the analysis with the use of lease squared estimates,

Lease Squared Estimates

The technique was introduced to determine the short run equilibrium relationship between the variables estimated in the model; the result is shown below;

ependent Variable: HDI
fethod: Least Squares
ate: 15/02/2021   Time: 08:42
ample: 2009 2019
icluded observations: 44

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	97.83878	6.593009	14.83978	0.0000
ATM	0.008702	0.001961	4.436851	0.0044
POS	0.018850	0.018350	1.027238	0.0439
MB	0.004724	0.005439	0.868596	0.4185
ITB	-0.070254	0.084796	-0.828510	0.4391

R-squared	0.985959	Mean dependent var	137.6336
Adjusted R-squared	0.976599	S.D. dependent var	34.94579
S.E. of regression	5.345829	Akaike info criterion	6.493465
Sum squared resid	171.4673	Schwarz criterion	6.674327
Log likelihood	-30.71406	Hannan-Quinn criter.	6.379457
F-statistic	105.3316	Durbin-Watson stat	1.505933
Prob(F-statistic)	0.000011		

The result of adjusted R- squared estimates revealed that 97.6% variations in human development index is caused by changes in automated teller machine, point of sale, mobile banking and internet banking. Though, the result of Durbin-Watson shows the presence of serial correlation in the model which implies that the variables are inter-related and the F-statistics indicates that the model is a good

Individual coefficient in the relative results shows that automated teller machine and point of sale are positive and significant to human development index which implies that positive

changes in those variables will lead to positive outcome on economic development proxy by human development index while mobile banking and internet banking are positive, negative and insignificant to human development index which implies changes of the variables will impact insignificantly on human development index respectively.

Serial correlation LM test

The technique was introduced by Breusch – Godfrey to determine serial correlation among the estimated variables in the model; the result of

serial LM test superseded that of Durbin –Watson   statistics. The result below
:

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.021610	Prob. F(2,4)	0.9787
Obs*R-squared	0.117584	Prob. Chi-Square(2)	0.9429

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 11/12/20   Time: 05:44
Sample: 2009 2019
Included observations: 11
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.005880	10.15476	0.099055	0.9259
ATM	-0.000401	0.003597	-0.111608	0.9165
POS	0.003861	0.030715	0.125702	0.9060
MB	-0.001723	0.010946	-0.157407	0.8826
ITB	-0.008509	0.112639	-0.075546	0.9434
RESID(-1)	0.164608	0.859524	0.191511	0.8575
RESID(-2)	-0.046715	0.669110	-0.069816	0.9477

The test technique is asymptotic test that relied heavily on the result of chi-squared test. The result shows that absence of serial correlation among the variables as evidence from the Chi-squared coefficient and probability result of 0.9787 and 0.9429. The result of LM supersede the result of Durbin –Watson statistics above. We therefore conclude that our variables exhibit the absence of ser

Heteroskedasticity Test

The test technique was introduced by Breusch Pagan – Godfrey to determine the constant variance of the variables in the model. It is a diagnostic technique for constant variance determination; below is the econometricutput;Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.251157	Prob. F(4,6)	0.8989
Obs*R-squared	1.577656	Prob. Chi-Square(4)	0.8128
Scaled explained SS	0.431337	Prob. Chi-Square(4)	0.9798

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 15/12/20   Time: 08:58
Sample: 2009 2019
Included observations: 44

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	26.38233	32.66026	0.807781	0.4500
ATM	0.004788	0.009715	-0.492788	0.6397
POS	0.028961	0.090904	0.318588	0.7608
MB	-0.020802	0.026944	-0.772055	0.4694
ITB	0.002376	0.420059	0.005657	0.9957

R-squared	0.723423	Mean dependent var	15.58794
Adjusted R-squared	0.627628	S.D. dependent var	22.16377
S.E. of regression	26.48202	Akaike info criterion	9.693764
Sum squared resid	4207.784	Schwarz criterion	9.874626
Log likelihood	48.31570	Hannan-Quinn criter.	9.579756
F-statistic	0.251157	Durbin-Watson stat	2.225686
Prob(F-statistic)	0.898911		

The result of the Chi-squared probability figures indicates that variance of the variables are constant which conforms to the classical linear regression model

Recommendation

Based on the findings, we recommend the following;

1. There is significant need for increased public education and awareness on the benefits of automated teller machine to enhance financial innovation in Nigeria.

2. The banks must improve service quality and customer responsiveness in cases of lost or stolen cards, frauds, and other customer complaints in relation to point of sale.

3. There is additional need for ensuring ease of use, and customer interactive features in mobile and on-line shopping systems in Nigeria.

4. Management of banks should from time to time train customers with regard to internet banking, its benefits, risk exposure, physical and internet security to avoid financial loss in the hands of hackers. This will enhance their technical competence which will rob off positively on their operations with a positive spill-over effect on the entire economy.

5. The study equally recommends that the monetary authorities in Nigeria should harmonize monetary policy rate to encourage banks in allocating credits to the different sectors of the economy.

6. The government should adopt policies that will alleviate poverty and increase the income per capita of citizenry in the country.

7. Educational promotional tools should be actively encouraged in the country because the level of education is another measure of economic development.

8. The government should give incentives to companies and enterpreneur to enable them increase their aggregate output which will lead to economic development

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