

# Effect of Green Banking Practice on the Performance of Deposit Money Banks in Nigeria: An Electronic Banking System Approach

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## Authors' contributions

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## ABSTRACT

The study examined the effect of green banking practice on the performance of Deposit Money Banks in Nigeria. The study employed the historical data research design while the quarterly time series data spanning through the period of 2012 to 2021 were collated from the CBN Statistical Bulletin. The Johansen cointegration test, Parsimonious Error Correction model and the fully modified Least Square were used for the data analysis. The findings indicated evidence of long-run relationship between green banking and the performance of Deposit money banks. Thus, the study concludes that banks can enhance their performance and environmental protection by adopting and promoting socially responsible and environmentally sustainable investment through the vehicle of green banking. In view of the findings therefore, the researcher suggests that the Central Bank of

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Nigeria should formulate and implement relevant policies that will encourage the full adoption of green banking practices by banks. Finally, Deposit Money Banks should educate their customers as well as creating awareness regarding the benefit of utilizing the electronic banking products in order to enhance the adoption of green banking in Nigeria.

*Keywords: Carbon footprint; electronic banking; environmental banking; equator principles; green banking; sustainable banking.*

## 1. INTRODUCTION

One of the most prominent issues facing the world today is the problem associated with climate change or greenhouse effect which is largely traceable to the pollution and degradation of our environment [1]. Both the Households and Business firms are responsible for these environmental ills but the contribution of the household is very infinitesimal in this regard when compared to corporations [2].

As in White [3], “recent years have seen an explosion of concern by individuals, businesses and governments regarding the use of the natural environment. The 'greening' of business is underway as environmental issues impact and change managerial practices throughout the world. Global integration of the world's financial markets is progressing at a breathless pace and, in some instances, has fostered and/or accelerated the degradation of natural environments. In others, the free flow of capital has facilitated a redirection of financial resources towards investment opportunities, promising overall increases in both human and environmental welfare”.

Climatic change or global warming has necessitated the need for the adoption of Green banking, Green business, Green finance, etc [4]. “In an attempt to save the environment, the World Bank, United Nations and several other bodies have put in place measures to minimize carbon footprint and other pollutants in the environment. Notable amongst these measures is the establishment of the World Bank Carbon fund in 1999, United Nations Environment Programme Finance Initiative (UNEPFI) in 1990 and the launch of Equator Principles in 2003 with the objective of integrating the environmental and social dimension of the financial performance and its associated risk in the financial sector” [1].

In is worth noting that apart from mutual funds, there has been increase in the offering of green products and services by other financial agents like brokerage firms, commercial banks,

insurance firms and credit card companies in order to satisfy their environmentally conscious customers” needs [5,6]. Prathima & Hebbar [7] noted that Green banking connotes promoting environmental friendly practices and minimizing carbon footprint from banking activities. This could be done using electronic platforms to offer banking services rather than multi- branch banks. It is akin to normal bank which considers social and environmental factors.

Banks are considered environment friendly and do not impact the environment greatly through their own “internal” operations, the “external” impact on the environment through their customers activities is substantial. The banking sector is one of the major sources of financing industrial projects such as steel, paper, cement, chemicals, fertilizers, power, textiles, etc., which cause maximum carbon emission [8]. This is also similar to the opinion of Aasa, Adepoju and Aladejebi [9] when they assert that “Banking sector, even though does not have noticeable direct impact on the environment if compare to manufacturing and extractive sectors, have a major role to play in ensuring sustainable development through their operations especially, environmental sustainability. This they do through green banking”.

Green banking is a form of banking practice that reduces carbon footprint from its activities by operating in a way that is environment friendly. Green Banking has been identified as a veritable measure for the reduction of carbon footprints from the activities of banks as well as creating awareness and consciousness about the environment [1]. The implication of green banking operation is that the environment benefits from banking since its operation is tailored in a way that it promote sustainable environment and socially responsible investments. A Deposit Money Bank can transform to a green bank by simply structuring their activities in a way that is environment friendly [1].

As stated earlier, the internal activities of banks made them to earn an environment friendly

status. This is because their contribution to carbon footprint is minimal compared to other sectors. However, the reverse is the case for the activities of their clients. This necessitated the Central Bank of Nigeria (CBN) to issue the circular number FPR/DIR/CIR/GEN/01/33 titled "Implementation of Sustainable Banking Principles by Banks, Discount Houses and Development Institutions in Nigeria". This circular was approved by the Bankers' Committee, at its retreat of July 14, 2012. The essence was to deliver positive development impacts to society while protecting the communities and environment in which financial institutions and their customers operate. Thus, banks are expected to examine and manage their activity's risk most especially in the area of project finance. The essence is to reduce carbon footprint thereby promoting a healthy environment [1].

One of the prominent ways of adopting green Banking is by ensuring that the products offered by the banks are environment friendly. This could be done by offering electronic banking products through the internet, mobile and paperless banking channels etc. By so doing, there will be adequate reduction in the accumulation of wastes that are harmful to the environment [4]. In Nigeria, very few studies have been conducted in the area of green banking or sustainable banking. Interestingly, based on the Researcher's literature search, none of these studies examined how green banking from the electronic banking perspective influence the performance of Deposit Monet Banks. This created a gap which this study intend to bridge by adopting electronic banking products to measure the performance of Deposit Money Banks.

## 2. LITERATURE REVIEW

The conceptual, theoretical and empirical literatures are discussed under this subsection.

### 2.1 Conceptual Review

"Green Banking includes promoting corporate social responsibility (CSR). It starts with the aim of protecting the environment where banks consider before financing a project whether it is environment friendly and has any implications for the future. A company will be given a loan only when all the environmental safety standards are followed. Green Banking can be efficiently implemented through the use of technology and policy" [10].

In explaining the concept of Green Banking, Lalon [11] is of the opinion that Green banking is any form of banking from which the country and nation gets environmental benefits. Thus, a bank becomes green by channeling its core operations in a way that it benefits the environment. As in Gbanador [12], Green banking is a form of banking practice that reduces carbon footprint from its activities by operating in way that is environment friendly. The adoption of the sustainable banking principles makes a bank go green.

#### 2.1.1 Procedure for adopting Green Banking in Nigeria

Gbanador [1] identified the following as some of the possible procedures for adopting green Banking in Nigeria:

- i. Electronic Banking: One way of adopting Green Banking is by ensuring that the products offered by the banks are environment friendly. This could be done by offering banking products through the internet, mobile and paperless banking channels etc. By so doing, there will be adequate reduction in the accumulation of wastes that are harmful to the environment.
- ii. Green Loan facilities: Banks are expected to give preference to granting loan facilities that put into consideration, the risk factors regarding environmental conditions. That is, the extension of credit to corporations that is into green operations and others who are making genuine attempts to be green. For instance, financing of green business, such as solar energy, bio-gas plant, bio-fertilizer plant etc.
- iii. Reward for electronic banking: In an attempt to encourage electronic banking, banks could reward users of electronic banking platforms. By so doing, bank clients will opt for electronic banking products. Presently some banks are rewarding customers who buy products using Mobile banking, internet banking channel and Point of Sale (POS).
- iv. To dedicate a unit to promote Green Business: The banks could also dedicate a unit in the bank to promote and coordinate green business related activities within the banking environment and other local communities. This is a good way for banks to perform its corporate social responsibilities.

- v. Creation of Environmental trust fund: The banks and other corporate organization including the government could also create an Environmental Trust Fund. This fund could be used to provide palliative measures or basic amenities that are environment friendly. For instance, water project, solar energy, etc. This fund could also be used to tackle possible emergencies like flood, black soot, epidemics etc. It could also be used to sponsor programmes like Environment day, Friends of the earth and Earth day.
- vi. Use of solar Energy: The banks are expected to use solar energy instead of plants that will contribute to the emission of carbon. This forms part of the procedures for banks to go green. The essence is to reduce carbon footprints from banking activities. Recall, an energy plant is a source of carbon footprint in the environment.
- vii. Introduction of Green Marketing: The banks could introduce Green marketing as a way to sensitize customers about green banking products and its benefits. Some available mediums for green marketing are the customer service call Centre and other electronic means of promoting the banks' services. This encourages paperless banking since it offers alternative channels such as online banking, SMS banking, e-statement, e-payments, etc [4].

Although, the CBN adopted the Nigeria Sustainable Banking Principles in 2012, very little has been done in terms of implementation of green banking except for few aspects of electronic banking. For instance, majority of the banks are still using energy sources that contribute to carbon footprints.

### 2.1.2 Concept of e-banking systems

E-banking is the use of electronic signals or information technology to provide banking services, such that banks' customers can consummate certain financial transactions without visiting the bank. The use of e-banking platforms minimizes the use of cash and cheques for payment, and withdrawal slip for cash withdrawals. While e-banking system does not abolish cash transactions, they serve as alternative means of effecting transaction without using physical cash or payment instrument like cheque [1]. The adoption of e-banking ushered different e-payment channels: online banking,

ATM, mobile banking, POS, and NIBSS instant payment amongst others [12].

## 2.2 Theoretical Framework

The theories upon which this work hinges are the equator principles, Jeucken's Model and the Bank focused theory. These theories are hereby discussed in turns.

### 2.2.1 The Equator Principle

The need for Green finance necessitated the launch of the Equator Principle in Washington DC on June 4, 2003. This was built on the International Finance Corporation's social and environmental policy framework. The Equator Principles is a risk management standard or benchmark adopted by financial industry to determine access and management of social and environmental risk in project finance. Some of the earliest global banks to adopt the Equator Principles were the Citigroup Inc, The Royal Bank of Scotland and Westpac Banking Corporation.

The equator principle could be applied globally to four (4) financial products when supporting new project ([www.equatorprinciples.com](http://www.equatorprinciples.com)). These products are as follows:

- i. Project finance Advisory services
- ii. Project finance
- iii. Project-Related Corporate loans
- iv. Bridge loans

The essence of applying the equator principle to these product is to integrate environmental and social dimension of the financial performance and its associated risk in the financial sector in order to reduce carbon footprint thereby promoting a healthy environment [1]. The equator principle is relevant to this work because it shows the principle banks should adopt in order to promote sustainable environment and socially responsible investments.

The Equator Principles is a credit management framework for determining, assessing and managing environmental and social risk in project finance construction. Project finance is used to fund the development and construction of major infrastructure and industrial projects. The Equator principles financial institutions are as follows:

- a) *Review and Categorization*: This is the first principle and it concerns itself with the review and classification of projects

according to their effect on the environment. These projects are classified as Category A, B and C. Category A are for projects that possesses adverse environmental and social risk. Category B refers to projects that have limited environmental and social risks and lastly Category C refers to projects that have minimal or no environmental and social risks.

- b) Social and Environmental Assessment: at this stage, a social and environmental assessment is conducted by either the borrower or its consultant or a third party who is an expert. The assessment usually identifies the social and environmental risk as well as specifying how these risks will be minimized or managed.
- c) Applicable Social and Environmental Standards: This is the third principle and it reckons with compliance with relevant laws and regulations of the country of operation.
- d) Action Plan and Management System: this principle requires Category A and Category B projects to develop action plans regarding how the environmental and social risks will be managed in compliance to the laws and regulations of the country of operation.
- e) Consultation and Disclosure: the fifth principle makes provision for consultations between the project owner and the various stakeholders.
- f) Grievance Mechanism: It involves stating how the likely grievances or conflicts will be managed or resolved.
- g) Independent Review: The seventh principle requires a review of the assessment document by an independent environmental expert. The essence is to evaluate the compliance level of the equator principle.
- h) Covenants: The covenant checks the level of compliance to the equator principles.
- i) Independent Monitoring and Reporting: The ninth principle involves an independent monitoring and reporting by an independent environmental and social expert.
- j) Equator Principles Financial Institutions Reporting: This involves the reporting of reports publicly at least annually about its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations (www.equatorprinciples.com).

## 2.2.2 Jeucken's model

Jeuken [13] developed the Jeucken's model which shows the phases of how a bank employs environmental friendly procedures in their operations. The model is structured into phases such as defensive banking, preventive banking, offensive and sustainable banking. The essence is to ensure that both the internal and external operations of the bank meet the requirement for sustainability of the bank, clients and society.

## 2.2.3 The bank focused theory

Kapoor propounded the Bank focused theory in the year 2010 [14]. The theory stipulates that banks employed non-traditional though conventional but minimal cost delivery platforms to offer financial services to its clients. These channels are online banking, Web pay, point of sales, mobile banking, automated teller machine, etc. Thus, a bank provides arrays of financial services via these electronic payment platforms without recourse to the branch where the customers' account is domiciled. This theory is relevant to this study because it hinges on electronic payment channel which is amongst the modes of adopting green banking.

## 2.3 Empirical Review

Sahoo, Singh & Jain [15] examined "the adoption of green banking products among customers with different age groups in India. The study adopted the survey research design while ANOVA and post hoc tests are applied for analyzing the objectives. This paper finding explains that there is significant difference in the usage of green banking products across various age groups individuals, as young generation is more inclined towards green banking products than middle age and senior age groups. Therefore, more awareness is needed to be created among the middle and senior age groups individuals".

Aasa, Adepoju & Aladejebi [9] investigated "the role play by banks in sustainable development through green innovative 3P's (products, paths and processes). The study adopted cross-sectional survey of deposit money banks' customers in Akure metropolis. The relative effectiveness index (REI) and Pearson correlation were used to capture the effectiveness and the association existing

between the 3P's and sustainable development. The study found that automated teller machine, mobile banking application, mobile/SMS banking or short code banking, point of sales (POS), email, social banking and online banking are the major green innovative banking 3P's common to banks. These 3P's are more effective in areas of installation/first use experience/registration, quality and performance of the expected services unlike network/service availability, bank's response to complaint from usage of the product and cost of usage that are of least effectiveness. The 3P's effectively contribute to easy access to fund for business transactions, respect for human right and financial inclusion among others. Effective green innovative banking 3P's contribute significantly to sustainable development with a positive correlation of 0.367 and a significant probability value of 0.004 less than 0.01 (1-tailed). Despite the level of effectiveness of these 3P's customers still complain about delay in the replacement of ATM cards, frauds associated with the use of green innovative banking 3P's and inaccessibility of service centers to visually impaired people which is the reason why the study recommended timely response to complaints on the 3P's concerned as this is a major way to improve their effectiveness".

Hossain and Kalince [16] examined "the impact of green banking on banks' performance using cross sectional data of 45 banks in the year 2012. They adopted loans and advances (LOAN), deposits and other accounts (DEPO), paid-up capital (PAID), investments (INV), green banking (GB) as proxy for green banking activities while profit after tax (PAT) was used as proxy for banks' performances. The ordinary least square and Granger causality test were used for the analysis and the result reveals that green banking has significant positive impact and Investment (INV) has significant negative impact on banks' performance. The Granger F test results to VAR model further revealed the bidirectional causalities between PAT and INV, between PAT and DEPO. Unidirectional causalities are found from LOAN, and PAID to PAT, from LOAN and DEPO to INV, and from LOAN to PAID. The study therefore suggests that Bangladesh banks should conduct green banking activities more to increase their profitability".

Gbanador [4] assessed the adoption of green banking in Nigeria. The paper took a snapshot at the basics of green banking and some of the

challenges identified to mitigate the implementation of green banking include the emerging nature of the Nigerian economy, technological backwardness, illiteracy, weak legal system and lack of basic infrastructure. The study disclosed that banks can enhance economic development and environmental protection by adopting and promoting socially responsible and environmentally sustainable investment through green banking. It is suggested therefore, that the government should help in creating awareness about green banking; provide basic infrastructure; monitor and supervise banking activities; strengthen the legal system and set up an environmental trust fund.

An exploratory study was conducted by Islam & Das [17], examines "green banking practices in Bangladesh. The study adopted the historical data design as mainly based on secondary data highlighting the mobile banking, online banking, green financing, and guidelines for green banking practices as well as green banking unit. The study concluded that green banking practices in Bangladesh is not satisfactory at all. This is partly because the concept of green Banking is relatively new in Bangladesh and yet to get momentum, but in the developed countries it is passing through a mature stage".

Risal and Joshi [18] evaluated the effect of 'Green Banking' practices on bank's environmental performance in Nepal'. The study adopted the survey research design and the convenience sampling technique. The study selected 5 commercial banks in Nepal where 189 responses were collated from the staff of these banks. The simple and step wise multiple regression were used for the data analysis. The findings expressed that energy efficient equipment and green policy have significant effect on the bank's environmental performance while green loan and green project does not have significant effect on the dependent variable.

### 3. METHODOLOGY

The study employed the historical data research design. The essence was because of the nature and the sources of data that were utilized for the study. A quarterly time series data spanning through the period of 2012 to 2021 were collated from the CBN Statistical Bulletin while the Ordinary Least Squares (OLS) multiple regression econometric

techniques was used to analyze the data. Deposit Money Bank Asset (DMBA) was utilized as a proxy for the performance of Deposit Money Banks which is our dependent variable while the Automated Teller Machine (ATM), Mobile Banking (MB), Web pay (WP) and Point of Sale (POS) were used as proxy for green banking which serves as the explanatory variables.

WP = Web Pay

$$LDMBA = \beta_0 + \beta_1L ATM + \beta_2LMB + \beta_3LWP + \beta_4LPOS + U_t \quad (2)$$

DMBA, ATM, MB, WP and POS are as defined in equation (1) while;  
 $\beta_0$  = Regression Constant  
 $\beta_1, \beta_2, \beta_3$  and  $\beta_4$  = Regression coefficient.  
 $U_t$  = Stochastic error term  
 L = Logarithmic form

### 3.1 Model Specification

The functional specification of the model is given as;

$$DMBA = f(ATM, MB, WP, POS) \quad (1)$$

Where;

DMBA = Gross Domestic product  
 ATM= Automated teller machine  
 MB = Mobile banking  
 POS = Point of sale

### 3.2 Pre-estimation Tests

In order to determine if the data used for the study were suitable, the Researcher did some pre-estimation tests like Augmented Dickey-Fuller, Phillips-Peron and Johansen Cointegration to test the stationarity of the data used for the study. The cointegration test is used to check if there is a long run relationship between the variables employed for the study.

## 4. RESULTS AND DISCUSSION

**Table 1. Unit root (Stationarity) Test: Augmented dickey-fuller**

Variables	Augmented Dickey-Fuller Test Statistic	Mackinnon's Critical Values at 1%, 5% & 10% respectively			Order of Integration	Prob.
LDMBA	-5.590319	-3.615588	-2.941145	-2.609066	(1)	0.0000
LATM	-8.823729	-3615588	-2.941145	-2.609066	(1)	0.0000
LMB	-7.967422	-3615588	-2.941145	-2.609066	(1)	0.0083
LWP	-6.599162	-3.615588	-2.941145	-2.609066	(1)	0.0000
LPOS	-4.209149	-3.626784	-2.945842	-2.611531	(1)	0.0022

Source: Authors' computation using Eviews 12

Table 1 shows the Augmented Dickey-Fuller stationarity test result. The result indicated that all the variables are stationary at order (1).

**Table 2. Unit root (Stationarity) Test: Phillips-Peron**

Variables	Phillips-Peron Test Statistic	Mackinnon's Critical Values at 1%, 5% & 10% respectively			Order of Integration	Prob.
LDMBA	-5.563851	-3.615588	-2.941145	-2.609066	(1)	0.0000
LATM	-9.046201	-3.615588	-2.941145	-2.609066	(1)	0.0000
LMB	-8.197802	-3615588	-2.941145	-2.609066	(1)	0.0000
LWP	-6.609821	-3.615588	-2.941145	-2.609066	(1)	0.0000
LPOS	12.78527	-3.615588	-2.941145	-2.609066	(1)	0.0000

Source: Authors' computation using Eviews 12

The Phillips-Peron test was also conducted to verify the position of the ADF and all the variables were stationary at order (1). These results satisfy the condition for the adoption of Johansen Cointegration test.

**Table 3. Johansen cointegration test**

Date: 01/17/23 Time: 14:11  
 Sample (adjusted): 2012Q3 2021Q4  
 Included observations: 38 after adjustments  
 Trend assumption: Linear deterministic trend  
 Series: LDMBA LATM LMB LWP LPOS  
 Lags interval (in first differences): 1 to 1

<b>Unrestricted Cointegration Rank Test (Trace)</b>				
Hypothesized		Trace	0.05	
<b>No. of CE(s)</b>	<b>Eigenvalue</b>	<b>Statistic</b>	<b>Critical Value</b>	<b>Prob.**</b>
None *	0.546710	78.94551	69.81889	0.0078
At most 1 *	0.438202	48.87900	47.85613	0.0399
At most 2	0.312867	26.96771	29.79707	0.1024
At most 3	0.271548	12.70904	15.49471	0.1259
At most 4	0.017460	0.669347	3.841465	0.4133

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level  
 \* denotes rejection of the hypothesis at the 0.05 level  
 \*\*MacKinnon-Haug-Michelis (1999) p-values

<b>Unrestricted Cointegration Rank Test (Maximum Eigenvalue)</b>				
Hypothesized		Max-Eigen	0.05	
<b>No. of CE(s)</b>	<b>Eigenvalue</b>	<b>Statistic</b>	<b>Critical Value</b>	<b>Prob.**</b>
None	0.546710	30.06651	33.87687	0.1334
At most 1	0.438202	21.91129	27.58434	0.2250
At most 2	0.312867	14.25867	21.13162	0.3442
At most 3	0.271548	12.03969	14.26460	0.1092
At most 4	0.017460	0.669347	3.841465	0.4133

Max-eigenvalue test indicates no cointegration at the 0.05 level  
 \* denotes rejection of the hypothesis at the 0.05 level  
 \*\*MacKinnon-Haug-Michelis (1999) p-values

Source: Authors' computation using Eviews 12

The Johansen cointegration test result is presented in Table 3. The trace statistic indicates the presence of at least 2 cointegrated equation at 5% level of significance ( $p < 0.05$ ). This result implies that there is a long-run equilibrium relationship between green banking practice and the performance of Deposit Money Bank in Nigeria.

**Table 4. Parsimonious error correction model result**

Dependent Variable: D(LDMBA)  
 Method: Least Squares  
 Date: 01/18/23 Time: 13:10  
 Sample (adjusted): 2012Q3 2021Q4  
 Included observations: 38 after adjustments

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
D(LDMBA(-1))	0.340433	0.147528	2.307574	0.0279
D(LATM)	-0.033981	0.030930	-1.098653	0.2804
D(LMB)	0.040966	0.022980	1.782683	0.0844
D(LMB(-1))	0.020569	0.012310	1.670945	0.1048
D(LWP)	0.014328	0.005749	2.491998	0.0183
D(LPOS)	-0.012964	0.026265	-0.493580	0.6251
ECM(-1)	-0.324815	0.104103	-3.120128	0.0039
R-squared	0.134766		Mean dependent var	0.029274
Adjusted R-squared	-0.032699		S.D. dependent var	0.023402
S.E. of regression	0.023782		Akaike info criterion	-4.474971
Sum squared resid	0.017533		Schwarz criterion	-4.173310
Log likelihood	92.02444		Hannan-Quinn criter.	-4.367642
Durbin-Watson stat	2.137494			

Source: Authors' computation using Eviews 12



Table 4 depicts the short-run parsimonious error correction model result. In current quarter, ATM has a coefficient of -0.033981 indicating that a 1% rise in the value of the ATM decreased the performance of Deposit Money Bank Asset by 3.40%. In addition, it has a prob. value of 0.2804 and t-value of -1.10 which implies that the ATM has a negative and insignificant impact on the performance of Deposit Money Banks. In the current quarter, MB has a prob. value of 0.0844 and a t-value of 1.78 which shows that Mobile banking has a positive and insignificant relationship with DMBA. Its coefficient of 0.040966 reveals that a 1% increase in the performance of MB leads to a 4.10% increase in the value of DMBA. Furthermore, MB lagged 1 quarter also have a positive and insignificant effect on the performance of Deposit Money Bank Asset. Web pay (WP) has a prob. value of 0.00183 and a t-value of 2.49 which indicates that WP has a positive and significant

relationship with the performance of Deposit Money Bank Asset. The coefficient of 0.014328 shows that a 1% increase in the value of WP will enhance the value of DMBA by 1.43%. Finally, current quarter of POS had a prob. value of 0.6251 and a t-value of -0.49 implying that the POS has a negative and insignificant impact on DMBA. Its coefficient of -0.012964 indicates that a 1% rise in the performance of POS decreased the value of DMBA by 1.30%. The ECM result is negative and significant at 5% level of significance. This result validates the outcome of the Johansen Cointegration test which reveals that there is a long-run relationship between the Dependent and independent variables. The estimated coefficient of 0.324815 of the ECM or the speed of adjustment indicated that it will take a speed of 32.48% to adjust possible disequilibrium from the short-run back to the long run quarterly.

**Table 5. Fully modified least squares result**

Dependent Variable: LDMBA  
 Method: Fully Modified Least Squares (FMOLS)  
 Date: 01/18/23 Time: 12:50  
 Sample (adjusted): 2012Q2 2021Q4  
 Included observations: 39 after adjustments  
 Cointegrating equation deterministics: C  
 Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LATM	0.122102	0.063022	1.937454	0.0610
LMB	0.009425	0.033093	0.284794	0.7775
LWP	0.013164	0.009206	1.429905	0.1619
LPOS	0.101598	0.036733	2.765835	0.0091
C	15.14385	0.651813	23.23342	0.0000
R-squared	0.984465	Mean dependent var		18.41755
Adjusted R-squared	0.982638	S.D. dependent var		0.310354
S.E. of regression	0.040894	Sum squared resid		0.056859
Long-run variance	0.002552			

Source: Authors' computation using Eviews 12

Table 5 shows the fully modified least squares result used in explaining the long-run effect of green banking on the performance of Deposit Money Banks in Nigeria. Reckoning with the result, ATM had a prob. value of 0.0610 and a t-value of 1.94 indicating ATM has a positive and insignificant impact of DMBA asset. On the other hand, the coefficient of 0.122102 implies that a 1% increase in the performance of ATM increased the performance of Deposit Money Bank assets by 12.21%. Putting mobile banking into perspective, the prob. value of 0.7775 and t-value 0.28 indicates that MB has a positive and insignificant effect on DMBA. Its coefficient of 0.009425 reveals that a 1% rise in the value of MB will lead to a 0.94% increase in the value of DMBA. Furthermore, WP has a prob. value of 0.1619 and t-value of 1.43 indicating that WP has a positive and insignificant (p value=0.1619) relationship with DMBA. The Web pay's coefficient of 0.013164 shows that a 1% increase in the performance of WP increased the performance of DMBA by 1.32%. POS with a prob. value of 0.0091 and a t-value of 2.77% shows that it has a positive and significant impact on DMBA. Its coefficient of 0.101598 implies that a 1% rise in the value of POS increased the value of DMBA by 10.16%. The R<sup>2</sup> of 98.45% indicates a combined correlation between the independent variables (LATM, LMB, LWP and LPOS) with the dependent variable (DMBA). Finally, the adjusted R<sup>2</sup> of 98.26% reveals that the variations in the performance of Deposit Money Banks can be explained by the variations in the outcome of green banking practices.

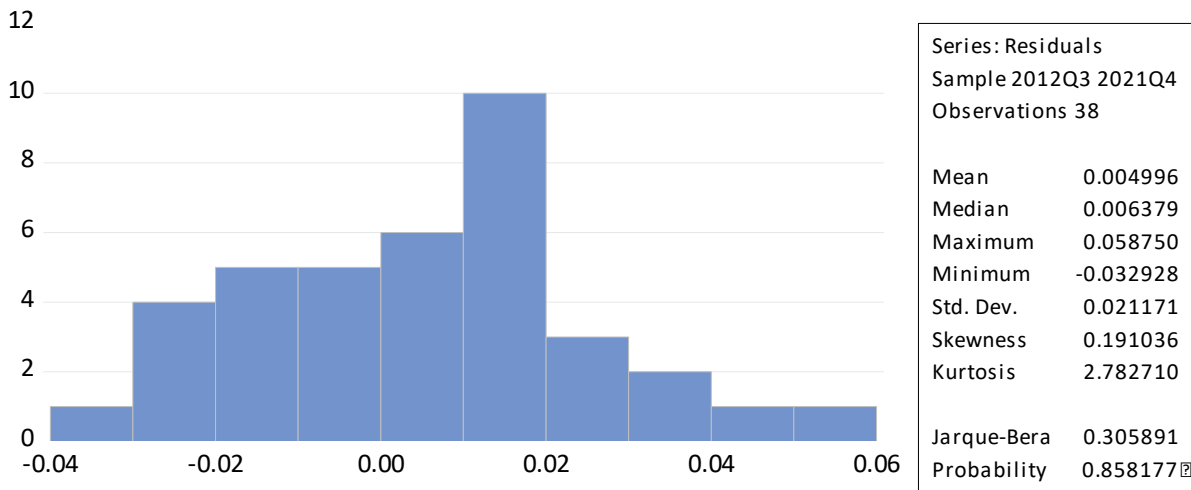
**Table 6. Correlogram Q-statistic**

Date: 01/18/23 Time: 13:13  
 Sample (adjusted): 2012Q3 2021Q4  
 Q-statistic probabilities adjusted for 7 dynamic regressors

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*	
. *   .	. *   .	1	-0.142	-0.142	0.8235	0.364
.   * .	.   * .	2	0.173	0.156	2.0844	0.353
. *   .	. *   .	3	-0.130	-0.091	2.8195	0.420
.   **	.   * .	4	0.215	0.172	4.8768	0.300
.   .	.   .	5	-0.024	0.052	4.9027	0.428
.   **	.   **	6	0.279	0.236	8.5983	0.197
.   .	.   * .	7	0.013	0.114	8.6072	0.282
.   * .	.   * .	8	0.175	0.121	10.157	0.254
. *   .	. *   .	9	-0.128	-0.078	11.020	0.274
. *   .	. **   .	10	-0.141	-0.320	12.105	0.278
.   **	.   * .	11	0.219	0.202	14.818	0.191
.   .	. *   .	12	-0.029	-0.096	14.867	0.249
.   .	.   .	13	0.070	-0.024	15.165	0.297
. *   .	. *   .	14	-0.118	-0.076	16.046	0.311
.   * .	.   .	15	0.095	0.056	16.646	0.340
. **   .	. *   .	16	-0.262	-0.160	21.376	0.165

\*Probabilities may not be valid for this equation specification  
 Source: Authors' computation using Eviews 12

Table 6 shows the result of the Correlogram Q-statistic test. The result reveals the absence of serial correlation amongst the variables.



**Fig. 1. Histogram-normality test**  
 Source: Authors' computation using Eviews 12

Fig. 1, shows the Histogram-Normality test result. The Jarque-Bera probability indicates that the variables are normally distributed.

**Table 7. Breusch-Godfrey serial correlation LM test**

Breusch-Godfrey Serial Correlation LM Test:  
 Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.973164	Prob. F(2,29)	0.3899
Obs*R-squared	2.389958	Prob. Chi-Square(2)	0.3027

Source: Authors' computation using Eviews 12

The Breusch-Godfrey Serial Correlation LM test as shown in Table 7 was used to test for the presence of serial correlation amongst the variables. The outcome of the result indicated that there is no serial correlation amongst the variables.

**Table 8. Heteroskedasticity Test: Breusch-Pagan-Godfrey**

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
Null hypothesis: Homoskedasticity			
F-statistic	0.102154	Prob. F(7,30)	0.9978
Obs*R-squared	0.884676	Prob. Chi-Square(7)	0.9965
Scaled explained SS	0.577940	Prob. Chi-Square(7)	0.9991

Source: Authors' computation using Eviews 12

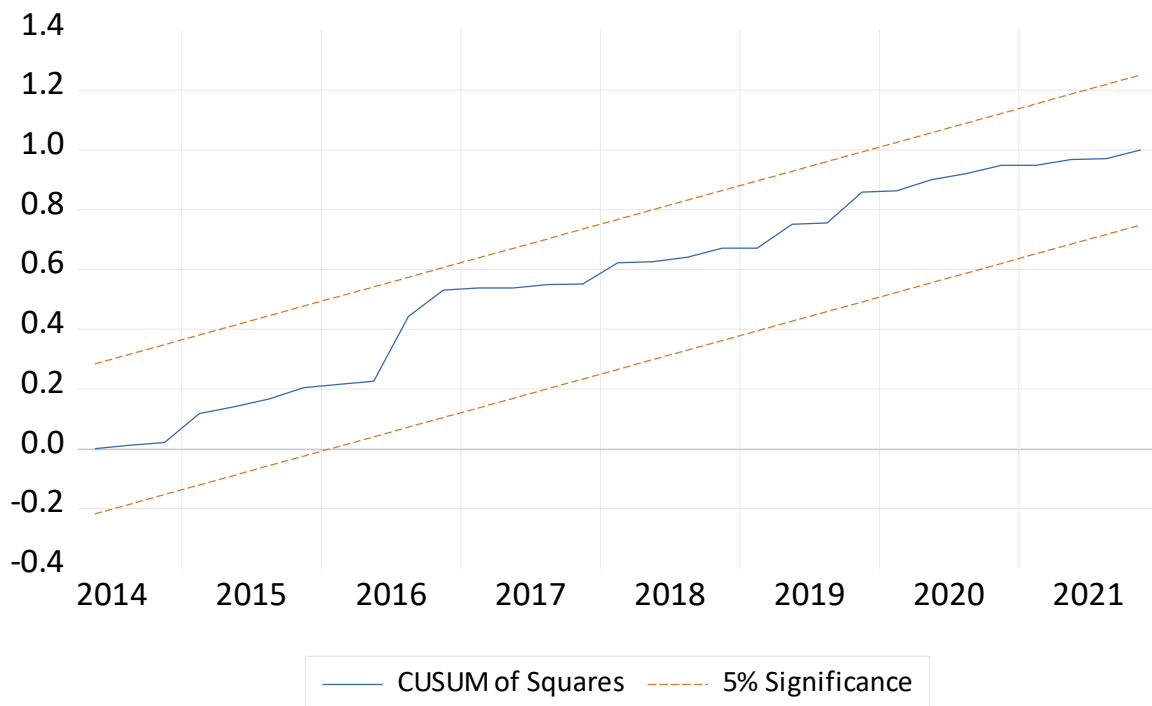
The Breusch-Pagan-Godfrey test result as shown in Table 8 indicates that the model is Homoskedastic. Therefore, there is no issue of heteroskedasticity in the outcome of the test.

**Table 9. Heteroskedasticity test: ARCH**

Heteroskedasticity Test: ARCH			
F-statistic	0.051495	Prob. F(1,35)	0.8218
Obs*R-squared	0.054358	Prob. Chi-Square(1)	0.8156

Source: Researcher's computation using Eviews 12

The ARCH test for heteroskedasticity also confirmed the absence of the problem of heteroskedasticity in the result as indicated in Table 9.



**Fig. 2. CUSUM Squared test result**

Source: Authors' computation using Eviews 12

Fig. 2 shows the CUSUM squared test result used in testing the stability of the model. The outcome indicates that the model is stable and well specified.

## 5. CONCLUSION AND RECOMMENDATIONS

The study was carried out to investigate the impact of green banking practice on the performance of Deposit Money Banks in Nigeria. The findings from the parsimonious error correction model result reveals that the automated teller machine, web banking and point of sale component of green banking practice have insignificant effect on the performance of Deposit Money Bank except Web banking whose performance is significant. The outcome of the long-run analysis indicated that ATM, MB and WP have positive but insignificant impact on DMBA while the effect of POS is positive and significant. The result also indicated evidence of long-run relationship between green banking and the performance of Deposit money banks. The result from the Johansen Cointegration and the fully modified least squares shows evidence of long-run relationship between the Dependent and independent variables. Thus, the study concludes that banks can enhance their performance and environmental protection by adopting and promoting socially responsible and environmentally sustainable investment through the vehicle of green banking. In view of the findings therefore, the researcher suggests as follows:

- a) The Central Bank of Nigeria should formulate and implement relevant policies that will encourage the full adoption of green banking practices by banks.
- b) Deposit Money Banks should educate their customers as well as creating awareness regarding the benefit of utilizing the electronic banking product in order to enhance the adoption of green banking in Nigeria.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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