Asian Journal of Economics, Business and Accounting

Volume 24, Issue 5, Page 510-524, 2024; Article no.AJEBA.114558
ISSN: 2456-639X

The Impact of Internet Banking on Bank Fraud in Nigeria

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Authors' contributions

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

Article Information

DOI: 10.9734/AJEBA/2024/v24i51326

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/114558

Original Research Article

Received: 26/01/2024
Accepted: 30/03/2024
Published: 12/04/2024

ABSTRACT

This study investigated the effect of internet banking on bank fraud in Nigeria. Monthly data covering from January 2008 to January 2019 representing 97 observations were utilized. The Auto Regressive Distributed Lag (ARDL) technique was used as the technique of data analysis. The independent variable is internet banking while the dependent variable is bank fraud. The control variables included measures of regulatory quality, bank development and capital market development which have strong correlation with the level of bank fraud in a financial system. Identity theft theory & software vulnerability theory were the theoretical underpinnings in this work. The findings of the study reveal overwhelming evidence of a positive interaction between internet banking and bank fraud in Nigeria which could be attributed to the regulatory quality of the Nigerian banking industry. Internet based transactions had a positive and significant effect on bank fraud in Nigeria Some of the recommendations emanating from the findings of the study are; mainstreaming regulatory sandbox, promoting favorable macroeconomic environment, strengthen AML/CFT regime, strict adherence to fraud disruption measure, biometric authentication, harmonization of industry standards, consumer education awareness.

Keywords: Nigerian banking industry; digital finance; bank fraud; biometric authentication.

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1. INTRODUCTION

The evolution of digital finance has coincided with increase of bank fraud in Nigeria. For instance, according to the Nigerian Deposit Insurance Corporation (NDIC), [1] 16,751 fraud cases were reported in Deposit Money Banks (DMBs) in 2016, representing an increase of 36.42 per cent when compared with 12,279 cases reported in 2015. In terms of the types of reported fraud and forgeries, information technology-based bank products recorded the highest frequency. Specifically, Automated Teller Machine (ATM)/card related fraud occurred most between 2015 and 2016. The number of reported cases increased to 11,224 in 2016 from 8,039 in 2015, representing 39.87 increased in the number of reported cases. ATM/card related fraud also represented 67.12 per cent of fraud cases in 2016. Web-based or internet banking recorded the second highest fraud in 2016 as it represents 22.02 per cent of the total fraud and forgeries. Web-based fraud and forgeries increased to 3,689 in 2016 from 1,396 in 2015, representing 164.26 per cent increase in the number of incidents. This phenomenon presents a conundrum for policy makers, regulators and body of academies, on whether the increasing trend in bank fraud is accidental or as a result of digital finance development.

Innovation in the banking system such as digital finance has been applauded extensively in globally, because of the associated benefits, without extensively investigating the impact on developing economies like Nigeria, with ineffective information technology and banking system regulatory environment [2,3]. For instance, would the benefit of digital finance be the same for developed economies with advance and developed regulatory information technology environment, efficient banking system, sound and credible legal system, and developed law enforcement mechanism; when compared with developing economies like with a reverse of the factors listed above [4,5].

On the other hand, despite the vast transformations that have taken place in the Nigerian banking industry, customers still prefer carrying cash and avoid to fully adopt online banking services. It was argued by Malady (2016) that “although customers may have digital banking credentials to access the digital financial system, consumers in emerging markets are not active users of the digital channels due to lack of customer trust and confidence in the new channels. Although online banking has gained prominence in Nigeria, customers’ attitudes and confidence in the system need to be changed”. Lallmahamood [6] stated that “more than half of the people who have tried using online banking services do not become active users. Findings have also indicated that inadequate telecommunications infrastructure, lack of financial literacy, lack of security, unreliable electricity supply, lack of trust and limited privacy are among the barriers to online banking acceptance in Nigeria”.

“Banking fraud is a problem to various stakeholders in Nigeria. First, it diminishes the profitability of a bank and this may lead to reduced firm value arising out of low dividends to shareholders. In the extreme case, it may threaten the going concern of the commercial bank and this may impact negatively on shareholder wealth” (Odelabu, 2014). “The depositors may be negatively affected by bank fraud especially if it leads to a bank run. This may lead to huge losses on customer deposits. As a result of banking fraud, some staff in the industry has either been dismissed, or has their appointment terminated or prematurely retired. This means that some experienced hands in the sectors are lost due to their involvement in frauds and forgeries. The employees may be affected by losing their job in case of winding up or liquidation of a bank due to fraud” (Odelabu, 2014).

Based on the studies reviewed, it is quite evident that most studies focused more on developed economies, hence this study tries to fill the gap. A study that clarifies our understanding of the effect of internet banking on bank fraud in Nigeria is inconclusive.

Despite the documented advantages and disadvantages of internet banking, one area that has received little research attention is the role of internet banking to bank fraud, particularly in an environment with poor regulatory framework. In Nigeria for instance, crime rate is very high, as the country is generally regard as a den for fraudsters. This situation is compounded by the presence of poor regulation and reactive enforcement organogram. For a country with high crime rate and inadequate regulatory framework, the role nexus between digital finance and bank fraud would be interesting to investigate. Empirical literature on this subject matter is scanty, and to the best of the researchers’ knowledge, non-existent for the case of Nigeria. This study, therefore, strives to

fill this important research gap, by investigating the impact of internet banking on bank fraud using Nigerian data.

2. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Internet banking

The term "internet banking" describes the practice of delivering financial services remotely via the Internet. These services include newer ones like electronic bill presentment and payment (which lets clients receive and pay invoices on a bank's website) and more conventional ones like opening a deposit account or moving money between accounts. Online banking is provided by banks in two primary methods. In addition to its conventional distribution routes, an established bank with physical locations can create a website and provide Internet banking to its clients. Creating a "virtual," "branchless," or "Internet-only bank" with ATMs or other distant distribution routes controlled by other organizations is a further option.

A virtual bank's main computer server may be kept in an office that also acts as its legal address, or it may be located somewhere else. Customers of virtual banks might be able to deposit money and withdraw it using ATMs or other distant delivery methods that belong to other financial organizations. E-banking, to put it simply, is the supply of banking goods and services via electronic means. Channels: Electronic payment systems, or e-banking, allow clients of financial institutions, including retail banks, virtual banks, credit unions, or building societies, to transact financial business online.

Virtual banking and Internet banking are other names for online banking. It makes it easier to access accounts, do business, and get timely information about financial services and products, including mobile phone information. Significant advancements in the information technology domain have enabled the globalization of banking industry products and services. The Internet has made financial products and services accessible, and for many banks, this has made it a vital distribution channel. Banks significantly increase their technology investment spending in order to solve issues with income, cost, and competition.

2.1.2 Benefits of internet banking

There are countless advantages this facility offers its clients. In Nigeria, internet banking is both a welcome development for consumers and a lucrative delivery system for financial institutions. From the perspective of bank consumers, the automation of banking service processing and the introduction of simple-to-maintain instruments for managing customers' funds result in significant time savings.

2.2 Bank Fraud

Fraud has been categorized using a variety of criteria and methods. However, we will use Adeyemo's (2012) perpetrators criteria for the purposes of this work. (i) Bank management, sometimes known as management fraud. (ii) Insider knowledge. The only people who are guilty of these crimes are bank workers. (iii) Adjacents. These consist of bank clients and/or non-clients (iv) Insiders and Outsiders. As said, this is a joint effort between bank employees and other parties.

i) Management Fraud: The managing directors, general managers, and directors of a reporting organization, to name a few, are often the ones that perpetrate management fraud. Investors and creditors are the target audience for management frauds, which are carried out through financial statements. Most of the time, management fraud is done with the intention of increasing investment from current and future shareholders in the company. Painting the bank in a favorable light in the eyes of regulatory bodies like the Nigerian Accounting Standards Board (NASB), Nigerian Deposit Insurance Corporation (NDIC), and Central Bank of Nigeria (CBN) is another reason for management fraud. Furthermore, management fraud can be used to obtain tax benefits from tax authorities. Management fraud, according to Fakunle (2006), is the falsification of documents and accounting, usually by senior employees of the company, with the intention of reaping indirect benefits. Management fraud, according to the "OCPS Internal Audit Department," is defined as fraud intended to benefit the business and typically results in profit by taking advantage of an unfair or dishonest advantage that may also fool an outsider.

The two components of fraud are deception and deprivation, and management fraud satisfies both requirements. The primary components of management frauds, according to the "OCPS Internal Audit Department," include intentionality, inaccurate transaction representation or valuation, assets, liabilities, or income.

(ii) Insiders or Employees Frauds- This type of fraud, usually referred to as non-management fraud, is carried out by bank or organization staff. The "OCPS Internal Audit Department" states that fraud committed against the organization's best interests is typically done so for the direct or indirect benefit of an employee. Examples of such acts include accepting bribes, diverting a potentially profitable transaction that would normally result in profits for the company to an employee, embezzlement, falsifying financial. According to Boniface (1991), some common examples of employee fraud in banks are as follows: Bank employees stealing cash from tills, counterfeiting a customer's signature with the goal of obtaining funds unlawfully from the bank account, using counterfeit checks to take money out of customers' accounts, creating and maintaining a fake account that might be used for illicit transfers and have a phony balance credited, Lending money to imaginary debtors via a fake account that was formed at a branch, claiming overtime pay for time spent not working, suppression of checks and cash.

(iii) Frauds committed by outsiders: These are scams carried out against the banks by both clients and non-clients. The following frauds fall under this category: Fraud including advance fees, forgeries, kitting, cloning of checks, money transfers, money transfer fraud, loan fraud, letter of credit fraud, account opening fraud, skimming or copying card data, and removing magnetic stripe information from a card for duplicate use are all examples of financial crimes.

iv) Fraud by Outsiders and Insiders: This category includes frauds carried out by outsiders (bank customers and non-customers) with assistance from insiders (bank employees). This kind of scam requires an insider to provide the required knowledge and other logistical support in secret for it to succeed.

2.3 Theoretical Review

2.3.1 Software vulnerability theory

A software vulnerability is an error in the specification, development or configuration of software such that its execution can violate the security policy.

The definition of software vulnerability in Fig. 1 includes mismatching between the assumption about the environment made during the development and operation of the program and the environment in which the program executes.

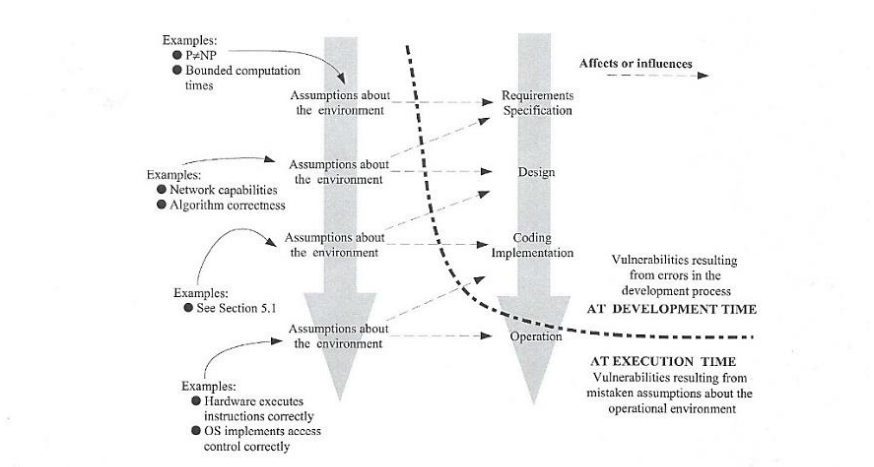

Fig. 1. Software vulnerability theory

2.3.2 Identity theft theory

Identity theft involves acquiring enough data about another person to counterfeit this link, enabling the thief to acquire goods while attributing the charge to another person's account. Identity theft is often perceived as one of the major upcoming threats in crime. However, there is no commonly accepted definition of 'identity theft' or 'identity fraud', and it is impossible to study the real threat of this phenomenon without conceptual clarity. Identity theft is primarily defined as a subsidiary crime, where an ID is abused to commit another crime. Having said this, we admit that identity 'theft' is a major issue and probably the most important subset of identity fraud and identity-related crime at large. 'Identity "theft"' is fraud or another unlawful activity where the identity of an existing person is used as a target or principal tool without that person's consent.

- **identity collision**, e.g., when two people have the same name, or when a wrong e-mail address is used; this usually occurs unintentionally;
- **identity change**, when someone takes on another identity, usually intentionally;
- **identity deletion**, e.g., revoking a digital-signature certificate, or reporting the death of Mark Twain in a newspaper;
- **identity restoration**, i.e., restoring the link between identifier and person, e.g. when Mark Twain tells the world that reports of his death are grossly exaggerated.

2.3.4 Theories of fraud

The Fraud Triangle Theory: In1950, Donald Cressey, a criminologist, started the study of fraud by arguing that there must be a reason behind everything people do. Questions such as why people commit fraud led him to focus his research on what drives people to violate trust? He interviewed 250 criminals in a period of 5 months whose behaviour met two criteria:

(i) Initially, people are accepting responsibilities of trust in good faith, and Circumstances make them violate the trust. He relates that three factors (pressure, opportunity, and rationalization) must be present for an offense to take place

2.4 Empirical Review

Statistical models were created by Furst et al. (2002) to explain why banks decide to implement Internet banking and why some decide to provide a comparatively greater range of online banking services and products. They also looked into the potential impact of Internet banking on a bank's bottom line. The profile of banks that offer Internet banking and those that do not differs significantly, according to the results. They noticed that compared to non-Internet banks, Internet banks rely less on core deposits and more on non-interest income for funding. The study also showed that compared to non-Internet banks, Internet banks have greater returns on equity and a better accounting efficiency ratio.

Using a customized electronic-commerce model, Chung & Paynter (2002) examined the websites of seven online banks to assess the condition of Internet banking in New Zealand. The findings showed that the majority of banks had current information on their websites and that the majority of the deterrents were related to Internet banking's complexity and security.

Monyoncho (2015) used optional data over a five-year period to examine the association between E-Banking advances and money-related execution of business banks in Kenya. The study's findings showed that advances in ATM technology, MasterCards, portable account management, and online money management provide the convenience of allowing customers to manage a significant amount of their savings transactions at a time that works best for them. The study assumed that the choice of E-Banking innovations had an impact on how business banks in Kenya operated and recommended that commercial banks continue to invest in cost-saving measures.

Muiruri and Ngari (2014) examined how financial innovations affected the way business banks in Kenya handled money matters, focusing on MasterCards, mobile wallets, online account management, and group savings. Four members of the administration group provided information via surveys, and the study used a sample of sixteen banks. The study found that certain banks in Kenya had benefited from financial innovations such as charge cards, mobile, web, and account management organizations. The focus also discovered that budgetary developments had a significant impact on the business banks' financial performance.

Table 1. DMB fraud and forgeries (2014 to 2016)

Quarter	Year	Total No. of Fraud Cases	Total Amount Involved (N' m)	Total Expected Loss (N' m)	Proportion of Expected Loss to Amount Involved (%)
1st	2016	4,413	2,211	538	24.33
	2015	3,702	2,444	907	37.11
	2014	1,897	3,552	1,221	34.38
2nd	2016	4,611	2,054	787	38.31
	2015	2,219	9,584	1,008	10.52
	2014	2,357	12,915	473	3.66
3rd	2016	3,946	1,210	446	36.85
	2015	3,550	2,119	479	22.61
	2014	2,173	4,002	1,538	38.43
4th	2016	3,781	3,207	626	19.5
	2015	2,808	3,874	776	20.03
	2014	4,194	5,139	2,960	57.60
Total	2016	16,751	8,683	2,396	27.6
	2015	12,279	18,021	3,173	17.61
	2014	10,621	25,608	6,192	24.18

Source: NDIC 2017

Table 2. Type and frequency of frauds and forgeries with actual losses sustained in DMBs (2015 – 2016)

S/N	Nature Of Fraud	2015		2016	
		Frequency	Actual loss Sustained (A'B)	Frequency	Actual Loss Sustained (A'B)
1	ATM/Card-Related Fraud	8,039	0.504	11,244	0.476
2	Web-Based (Internet Banking) Fraud	1,471	0.857	3,689	0.582
3	Fraudulent Transfers/ Withdrawal of Deposits	1,396	0.562	836	0.626
4	Suppression of Customer Deposits	602	0.218	357	0.224
5	Fraudulent Conversion Of Cheques	71	0.049	48	0.002
6	Presentation of Stolen Cheques	132	0.054	17	0.014

3. METHODOLOGY

A research design is referred to as a blueprint that guides a researcher in his/her investigation and analysis [7]. This study will utilise the *ex post facto* research design as it essentially investigates the effect of digital finance on bank fraud in Nigeria*. Ex post facto* as the name implies literally means “from what is done afterwards”. It is one of the frequently used research design in social science because its observation is after the event, and as such, cannot be manipulated [8].

4. RESULTS

4.1 Monetary Value of Web-Based Transactions

The figure presents a trend analysis of the web-based digital finance with monthly series from January 2008 to March 2019. The trend reveals a cautious approach on the part of bank customers in the use of internet banking platforms, because of sustained and gradual increase in the use of internet-based platforms recorded within the period under review. The trend also signals low acceptability of internet

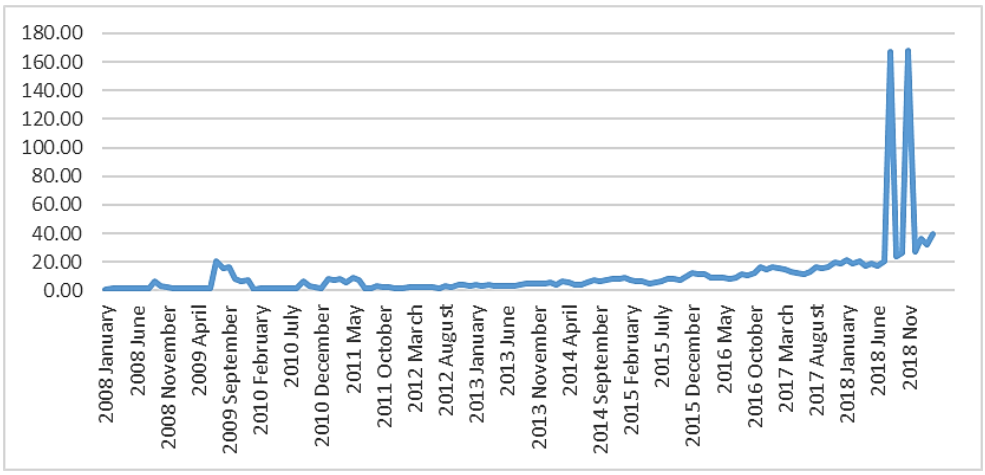

Fig. 2. Web transactions
Source: Authors' Computation

banking among Nigerians from inception, largely due to the unethical climate, fraud related issue, infrastructure deficit, low level of internet access, resistance to change, distrust, and belief system. The data revealed strong preference for cash-based transactions as against the use of internet platforms on the basis of the reasons highlighted above.

The spike from Naira1.51 billion to Naira6.86 billion between August and September 2008 represents 354% increase and coincided with the global financial crises. It will be recalled that due to the adverse effect of the 2007/2008 global financial crises, the Central Bank of Nigeria (CBN) directed banks in June 2008 to reduce their operating cost through the deployment of digital platforms. This directive resulted in a quantum leap in the value of internet banking within the period, as few banks use their investment in information technology infrastructure as a bragging right, albeit low compliance level. The low-compliance on the part of some banks compelled the CBN to introduce the cash-less policy in April 2011. The objective of the policy is to eliminate the negative consequences of cash-based transactions such as high cost of cash handling, inefficiencies and corruption, and increasing informal sector.

The policy prohibits banks from rendering cash-in-transit lodgement services to merchant customers and transferred the function to licensed cash-in-transit companies. Similarly, the policy prohibits over-the-counter encashment of third-party cheque above Naira150000. The policy further imposes cash handling charges on cash withdrawals and deposits above Naira500,000 cumulative. For instance, an individual that withdraws Naira130,000 via ATM and Naira480,000 over the counter on the same day will pay cash handling charges for the Naira110,000, which is above the daily limit of Naira500,000.00 (CBN, 2011). The cash-handling charges also applied to cash brought into the bank through the cash-in-transit companies. The start-date for the implementation of the policy was staggered across the states, while the nationwide implementation was fixed for July 1st, 2014. The policy was suspended by the CBN during the implementation phase and reintroduced on September 17, 2019. Between 2014 and the first quarter of 2019, the Central Bank of Nigeria made massive investment in the development of the Nigerian payment system, in anticipation of the reintroduction of cash handing towards the last quarter of 2019. This development also explained the spikes in web transactions towards the end of 2017 and 2018, which remained uptick from November 2018 to March 2019.

4.2 Measure of Bank Fraud

Fraud can be seen as a predetermined dubious process or device usually carried out by an individual or group of individuals with the objective of deceiving another person or organisation in order to receive ill-gotten advantage which would not have been possible in the absence of such deceptive procedure [9]. The rate of fraud in Nigeria is alarming and its resulting to a level where stakeholders and the populace at large are losing trust and confidence in the banking industry,

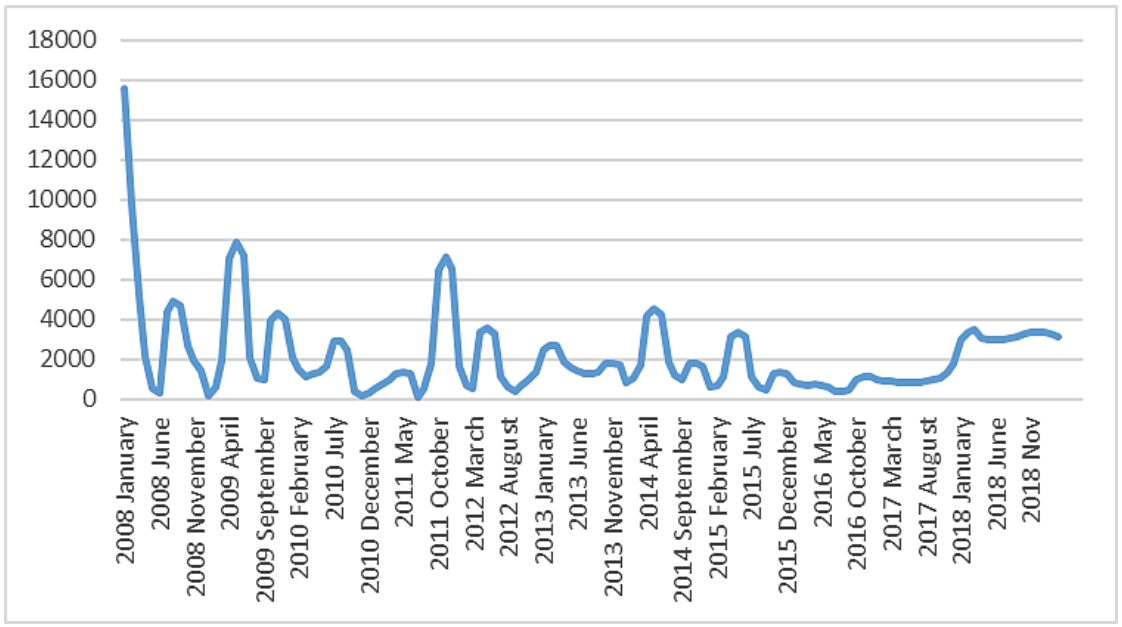

Fig. 3. Bank fraud
Source: Authors' Computation

which heightened the concerns of the regulators going by the magnitude of loss recorded by the system to the fraudsters over the years. Fig. 3 shows the graph of value of bank fraud for the period under review. Occurrence of fraud in the banking system has been a major concern to the regulatory authorities considering the magnitude of loss. Fraudsters' are lurking around, constantly testing for any potential vulnerability. NeFF raised alarm over the high rate of bank fraud recently [10].

From the beginning of the period under review, the value of fraudulent activities was on the high side. The 2008 Global financial meltdown affected the Nigerian banking sector. There has been a decreasing volume of bank fraud in Nigeria in later times precipitated by the global financial meltdown. It is noteworthy that the year 2008 witnessed the highest fraud value. January 2008 had a value of naira15610 while June had a value of naira536 which showed a 97% decrease in the value of fraud. January 2009 had a value of naira137 while may had a value of naira7846 which showed a 98% increase in the value of fraud. July 2011 had a value of naira48 while November had a value of naira7128 which showed a 99% increase in the value of fraud. Electronic frauds however dominated, accounting for 70percent of fraud incidents. There was a high reported case of fraud in 2018 involving majorly digital payment channels in Nigeria.

4.3 Objective-Based Data Analysis

4.3.1 Web-based transaction and bank fraud

In this era of massive utilization of internet banking, internet frauds arising from cyber-attacks and crimes has resulted into a very threatening dimension. The increase in fraudulent practices in the banking sector has been worrisome and a source of concern [11]. With the disruptions happening in the banking industry, criminals are also looking for ways to devour innocent victims of their money. They utilize various methods such as identity theft, cloning, card attack, skimming, phishing, PIN Attack, software vulnerability, pharming, cloning, malware attack etc (Olaleye & Fashina, 2019).

The anecdotal evidence from the figure tend to suggest positive relationship between internet banking and bank fraud. The factors that could be responsible for an upsurge in information technology bank fraud are poor regulatory framework, weak internal control system, and increased banking innovations. The anecdotal evidence provides strong justification for introducing regulatory quality as controlled variables. Regulatory quality is expected to reduce unethical climate, ensures that banks

strengthen their anti-money laundering (AML) and Counter Terrorism Financing (CFT) compliance, to guide against financial crimes. This also justifies our decision to use the identify theft and technology vulnerability theories in developing the theoretical framework of the study. It has been observed that the reported cases of bank fraud have been alarming, and its impact on the Nigerian banking sector is of great concern to regulators (NDIC Report, 2015). Other factors accountable for internet fraud include broader ecosystem scope, evolution of channels and adaptability to disruptive innovation [10].

Fig. 5 presents the transformed variables. The natural logarithm of bank fraud and value of web-based transactions displayed similar trend with the untransformed data, connoting that the transformation did not alter the original properties of the variables.

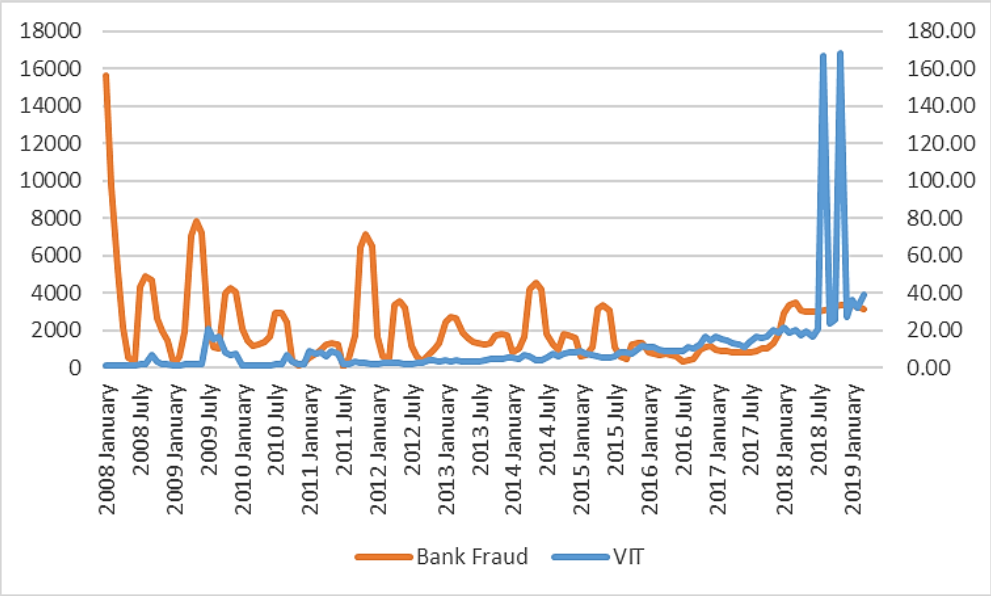

Fig. 4. Web-based transaction and bank fraud
Source: Authors' Computation

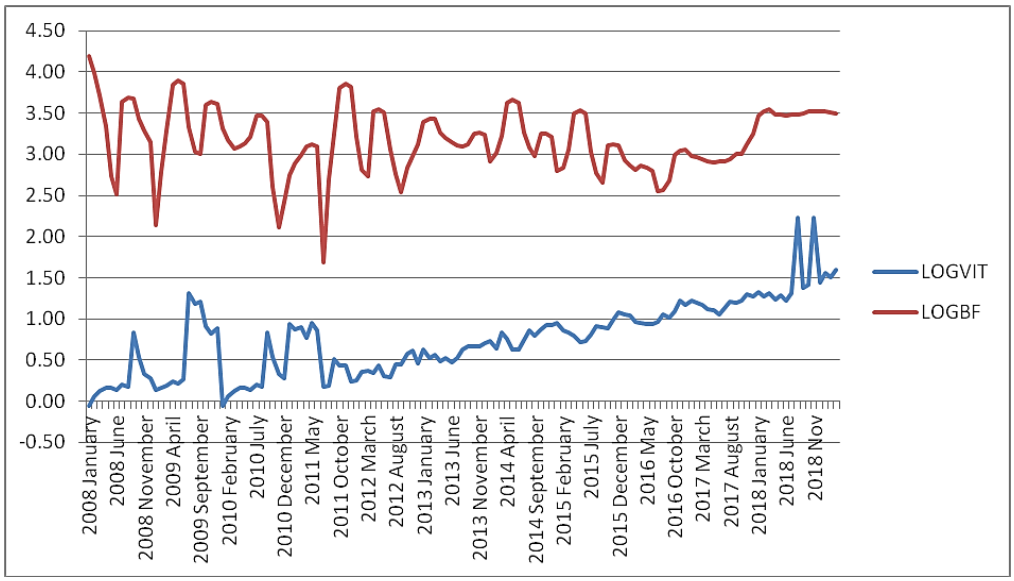

Fig. 5. Transformed web-based transaction and bank fraud
Source: Authors' Computation

Table 3. Descriptive results

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Skew	Kurtosis	J-Bera	Prob
Bank_fraud (N'Million)	2169.41	1411.53	15610.04	48.43210	2097.496	2.87	15.56580	1072.90	0.00
VCBT (N'Billion)	1190.91	607.89	5490.66	370.8600	1039.766	1.54	4.994540	75.77	0.00
MKTCAP (N'Million)	9649.66	9744.46	15895.88	4483.500	2770.053	0.021	2.051119	5.07	0.08
GDP (N'Million)	9140431	8820513	17448459	5371499.	2691200.	1.32	4.790597	57.11	0.00
M2 (N'Million)	16178532	15483848	27078829	6527673	5609252.	0.19	1.851625	8.233	0.02
Reg, Quality	3.55	3.33	7.33	2.333333	1.280752	1.12	3.302427	28.60	0.00
VATMBT (N'Billion)	257.92	242.42	670.98	18.48000	187.1932	0.33	1.859460	9.82	0.01
VPOSBT (N'Billion)	46.12	14.26	271.95	0.040000	66.09991	1.64	4.624853	75.34	0.00
VMBT (N'Billion)	40.58	24.26	227.16	0.020000	48.82662	1.52	5.106569	77.04	0.00
VWBT (N'Billion)	10.44	6.23	168.20	0.876820	20.72255	6.57	49.83022	13306.36	0.00

Note: N is Naira
Source: Authors' Computation

Table 3 presents the descriptive results. The average monetary value of internet transactions for the review period is Naira10.44billion. The value of the standard deviation of Naira20.72billion represents high deviation or distance from the mean, which could be interpreted as large range of values due to the exponential increase in the use of internet banking. This is reinforced by the maximum and minimum value that indicate high rate of variability in the series. The maximum value of web-based transaction is Naira168.20billion, while the minimum value was Naira877illion. This reveals a quantum leap in the value of internet banking in Nigeria. Improvement in internet band-weight, increased internet access and the cashless policy is expected to increase the acceptance rate or exponential growth in the use of internet banking in the future.

4.3.2 Unit root results

The Augmented Dickey –Fuller (ADF) tests were used to ascertain the order of integration and ensure stationarity of the variables used. The results of the ADF unit root tests are reported in the Table. The results revealed that all the variables considered were not stationary at level except one of the measures of digital finance. Furthermore, the decision rule for this unit root test is that there is no unit root, as such; the statistical value for each of the dimensions of the test must be less than the critical value for the null to be rejected. Most of the variables were stationary at first difference while only one was stationary at level and which satisfies the initial condition for using ARDL co-integration bound test.

4.4 Test of Hypotheses

4.4.1 ARDL bound TEST

There is cointegration and long run relationship if the F-Statistics is greater than the lower and upper bounds and no cointegration when it is less than the lower and upper bounds. If it falls within the lower and the upper bounds, the case becomes inconclusive. For this study, the F-Stat 9.96 is greater than the upper bound at all the levels of significance, shows that the variables are cointegrated at 1% significance level. The Bound test result provide evidence of long-run relationship between the variables in hypothesis one and satisfies the second condition for using the ARDL estimation technique. This is consistent with the findings of Salimon et al. [12] and Olaleye and Fashina (2019).

4.4.2 Hypothesis

Restatement of Hypothesis in Null and Alternate form:

HO: Internet based digital finance transactions did not have significant effect on bank fraud in Nigeria
HA: Internet based digital finance transactions have significant effect on bank fraud in Nigeria

Decision Criteria: Reject alternate hypothesis if δ_1 (coefficient of web-based digital finance) is negative and p-value <0.05.

4.5 Results

The objective of this hypothesis is to establish the effect of internet banking (web-based transactions) on bank fraud in Nigeria. The ARDL results established the presence of long-run and short-run relationship among the variables. The results also indicate that in the long run, the coefficient of internet banking has positive and significant effect on bank fraud. Specifically, 1% increase in the value of internet banking transaction will probably lead to 13.88% increase in bank fraud. This finding is consistent with technology vulnerability and identity theft theory. The theory argues that internet-based transactions do not have full proof against fraud. That is, as the frequency and value of internet banking increase, fewer person are likely to fall victim to internet fraudsters due largely to vulnerabilities associated with the use of internet and identity theft through the cloning of financial instruments and compromise of password. The theory further argues that despite the level of mitigants regulators are putting in place, internet fraud will still occur, because of identity theft and that effective regulation could, however, reduce the frequency and value in the long run.

The long run results further revealed negative and significant effect of regulatory quality on bank fraud, which implies that 1% improvement in regulatory quality reduces bank fraud by 10.49%. The effect bank development and market capitalisation are also positive and statistically significant, as 1% increase in the measures of bank development and capital market development increases bank fraud by 14.18% and 6.65%, respectively. This finding

provides strong justification for the inclusion of the controlled variables. Specifically, as digital finance improves the payment system, the banking sector and capital market activities also increase, which could also induce bank fraud. For regulation to be effective in preventing bank fraud, it must be robust, broad, and proactive, as depicted by the result, since most financial fraud are through the banking system.

The short-run result is consistent with the long-run except for bank development. Web-based transaction has positive and significant effect on bank fraud, as 1% increase in internet banking increases bank fraud by 6.66%. Additionally, 1% increase in the ratio of broad money to gross domestic product reduces bank fraud by 3%. This could be linked to the rigidity of reforms compare to money creation by banks. 1% increase in regulatory quality decreases fraud by 12.09%, while 1% increase in market capitalisation increases bank fraud by 3.35%. 1% increase in regulatory quality decreases fraud by 2.76%.

Table 4. Bound test

F-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
			Asymptotic: n=1000	
F-statistic	9.962907	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	131		Finite Sample: n=80	
		10%	2.303	3.22
		5%	2.688	3.698
		1%	3.602	4.787

Short and Long Run ARDL Results

ARDL Cointegrating And Long Run Form
Dependent Variable: LNBF
Selected Model: ARDL(3, 0, 0, 1, 0)
Date: 06/21/20 Time: 04:31
Sample: 2008M01 2019M02
Included observations: 131

Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LNBF(-1))	0.311628	0.081702	3.814184	0.0002
D(LNBF(-2))	0.203716	0.083512	2.439363	0.0162
D(LOGVWBT)	0.066651	0.121411	0.548974	0.0040
D(RQ)	-0.027608	0.120894	-0.228368	0.0097
D(M2_GDP)	-0.032731	0.194246	-0.168502	0.0165
D(MKTCAP_GDP)	0.033541	0.024418	1.373625	0.0121
CointEq(-1)	-0.673073	0.087321	-7.708033	0.0000
Cointeq = LNBF - (0.1388*LOGVIT -0.1049*RQ + 0.1418*M2_GDP + 0.0665 *MKTCAP_GDP + 1.0365)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(VWBT)	0.138786	0.081191	1.709368	0.0399
RQ	-0.104877	0.074580	-1.406231	0.0422
M2_GDP	0.141830	0.125787	1.127546	0.0017
MKTCAP_GDP	0.066495	0.023015	2.889168	0.0046
C	1.036468	0.179781	5.765157	0.0000

The long run higher coefficient of 10.49 relative to short run coefficient of 2.76% on the effect of regulatory quality on bank fraud signals lag in regulatory lag in the Nigerian financial system. The regulatory lag or slow response on improving regulatory quality in Nigeria is reinforced by the error correction which shows speed of adjustment of 67.31%, which indicates that any shock to the model will take approximately 7 months for short run disequilibrium to be restored to normal. This means that if internet bank fraud occurs in the Nigerian banking system, it will take regulators 7 months to address such fraud and restore public confidence. The results are consistent with the findings Salimon et al. [12] which also found positive relationship between internet banking and bank fraud. The results however, contrast with the findings of Okafor and Isibor (2016) and Kanu and Isu (2016) who found negative relationship between internet banking and bank fraud.

Table 5. Breusch-godfrey serial correlation LM test

Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.406210	Prob. F (2,119)	0.6671
Obs*R-squared	0.888281	Prob. Chi-Square (2)	0.6414

Heteroskedasticity test: Breusch-pagan-godfrey			
Null hypothesis: Homoskedasticity			
F-statistic	1.262093	Prob. F (9,121)	0.2645
Obs*R-squared	11.24222	Prob. Chi-Square (9)	0.2595
Scaled explained SS	71.69438	Prob. Chi-Square (9)	0.0000

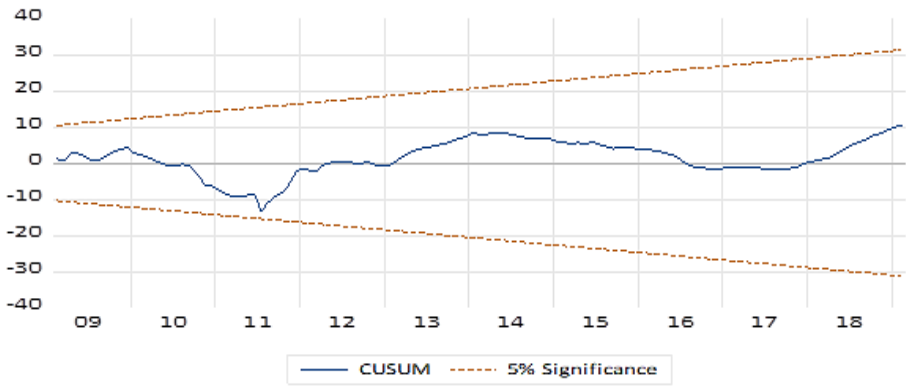

Fig. 6. Cusum test

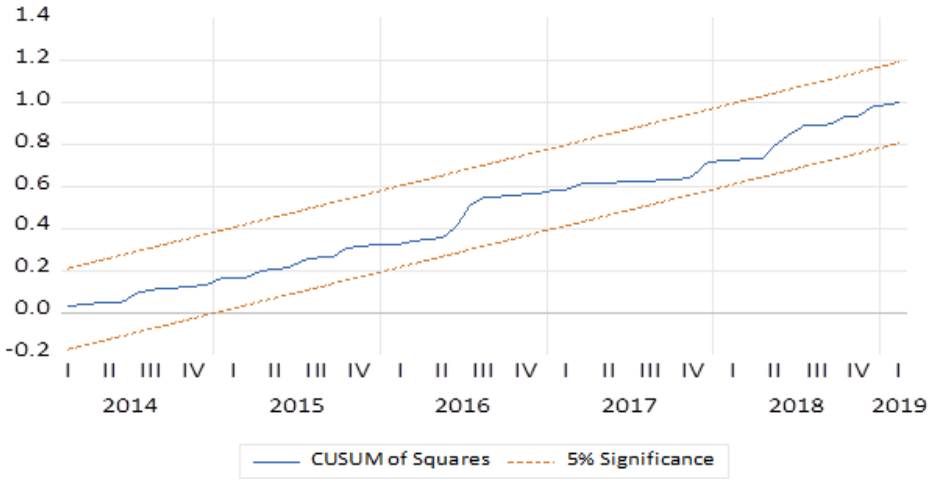

Fig. 7. Cusum of squares

To ensure that the results are not highly serially correlated errors, with implausible parameter estimates, and persistent over-prediction, we present the results of the diagnostic tests. The CUSUM and CUSUM of squares were used to test the stability of the models, and the two tests indicate that the models are stable. The Breusch-Godfrey Serial Correlation LM Test is used to test for the presence of serial correlation, and the F-Static indicates that the null hypothesis of non-serial correlation cannot be rejected since the probability of the probability value (0.667) is greater than the 0.05 level of significance thereby ruling out any form of serial correlation that may influence or bias the result. The Breusch-Pagan-Godfrey homoskedasticity is used to test for the presence of heteroskedasticity, and the probability value (0.2645), which is greater than 5% rejects the presence of heteroscedasticity in the model.

4.6 Decision

Given that coefficient of Web-based transaction in table is positively signed and the p-value is less than the level of significance (0.05) at 95% confidence interval; the result is consistent with apriori expectation, hence we reject alternate hypothesis and conclude that Web-based transactions has positive and significant effect on bank fraud. This is consistent with the findings of Salimon et al. [12].

5. DISCUSSION

This objective is judiciously met as the ARDL results reveals positive and significant effect of internet banking on bank fraud in Nigeria, both on the short and long-run. The result is consistent with the findings of Hartmann-Wendels et al., [13], Nia & Said (2015), and Rahman & Anwar (2014). Internet banking is considered as the most susceptible digital financial product to bank fraud, because of the global nature of such transaction. The positive link between bank fraud and internet banking have been attributed to the increasing level of internet fraud, hacking and cloning of bank customer's identity, near absence of internet fraud prevention techniques such as protection software/application, irregular IT audit, poor password protection policy, and ineffective internal control. More importantly, the Nigerian ethical climate may also be a major driver of the positive link between bank fraud and internet banking. For instance, internet fraud risk is highly sensitive to demographic socioeconomic and demographic variables, such as unfavourable macroeconomic environment, literacy rate, large informal sector that promotes the use of cash, age distribution of the population, occupational distribution, high unemployment rate, low regulatory quality, gender distribution of the population, and patriotism level. Specifically, crime rate is traditionally high in economies with predominance of poverty rate, large informal sector, and unethical climate. These factors, coupled with the absence of regulatory sandbox, may have accounted for the result. On a global scale, it is expected that web based digital finance transactions will have a significant effect on bank fraud largely due to software vulnerabilities and identity theft. Software vulnerabilities are flaws that exist in software that can cause a software or system to behave abnormally which could probably be triggered by user either coincidentally or exploited without hesitation. These technologies are majorly poorly designed, programming errors implemented without adequate provisions for safe and secure functioning. Programming errors are regarded as the most fatal because majority of the known vulnerabilities are linked to an inefficient way of handling the inputs supplied by a user of the system, if these inputs are not properly processed before using them inside the application, they can generate unforeseen behaviour of the system. This signifies that a rise in online activities seems to have increased the exposure of Nigerians to victimization through the internet.

6. SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDA-TIONS

The proxy of web-based transactions (internet banking) had a positive and significant effect on bank fraud during the period. This implies that as internet-based transactions are increasing dramatically, financial losses to bank customers will also be on the rise. This could be attributed to the ethical climate, demographic factors, and regulatory quality. It also highlights the imperativeness of designing regulation and demographic characteristics to reduce bank fraud during this era of exponential increase in internet-based transactions.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Nigeria Deposit Insurance Corporation Annual report, Nigeria Deposit Insurance Corporation (NDIC) Publication, Abuja; 2017. Retrieved February 2, 2019 DOI:www.ndic.org.
2. Central Bank of Nigeria. Bankers committee resolution on the use of automated teller machines (ATM) and others; 2016.
3. Centre for Corporate Governance. A study of Corporate Governance Practices in the Commercial Banking Sector in Kenya. 2013;30.
4. Cressey D. Other people's money: A study in the social psychology of embezzlement. New Jersey: Patterson Smith Publishing Corporation; 1973.
5. Sanusi LS. The Nigerian banking industry – What went wrong and the way forward; 2010. Available:https://www.bis.org/review/r100419c.pdf
6. Lallmahamood M. An examination of individual's perceived security and privacy of the Internet in Malaysia and the influence of this on their intention to use E-commerce*:* Using an Extension of the Technology Acceptance Model". PhD dissertation, Malaysian Institute of Management; 2007.
7. Onwumere JUJ. Business and Economic Research Methods, Lagos: Don-Vinton Ltd; 2008.
8. Marilyn K, Jim G. Ex post facto research. Dissertation and Scholarly Research; 2013. ISBN 978-1451517300
9. Nwaze A. Due process and accountability: Advanced fee fraud. Zenith Economic Quarterly. 2012;8(2):24-28.
10. Nigeria Deposit Insurance Corporation Annual report. Nigeria Deposit Insurance Corporation (NDIC) Publication, Abuja; 2017. Retrieved February 2, 2019 DOI:www.ndic.org.
11. Okpala K, Enwefa C. War against Corruption in Nigerian Public sector; An Analysis of Stakeholders' Role; 2017.
12. Salimon G, Yusoff B, Mokhtar M. The Mediating role of hedonic motivation on the relationship between adoption of e-banking and its determinants. International Journal of Bank Marketing; 2017.
13. Hartmann-Wendels T, Mählmann T, Versen T. Determinants of banks' risk exposure to new account fraud–Evidence from Germany. Journal of Banking & Finance. 2009;33(2):347-357.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/114558