# Card Frauds and Customers' Confidence in Alternative Banking Channels in Nigeria

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**Abstract**

The need to reduce banks' operating costs and improve customer satisfaction has led to the deployment of Alternative Banking Channels (ABCs), through which banking transactions are performed. The Nigerian banking industry has aligned with this global trend leading to increased usage of ABCs by customers. However, fraudsters are taking advantage of this development to defraud unsuspecting customers resulting in customers' loss of confidence. Arising from this problem, this paper investigated the effect of card frauds on customers' confidence in ABCs in Nigeria. The study employed data obtained from Nigeria Deposit Insurance Corporation, Central Bank of Nigeria (CBN) and Nigerian Electronic Fraud Forum from 2012 to 2016. Various econometric analyses like Unit roots, co-integration test and Generalized Method of Moments were used to analyze the data. The Value of transactions on ABCs, proxied for customer confidence, was used as the dependent variable, while card frauds, proxied by value of frauds on Automated Teller Machines and Point of Sales (CPF), and web and online banking platforms (CNF) were included as independent variables. Banks' Total Assets, Prime Lending rate and Inflation rate were included as control variables. The results showed negative relationship between card frauds and customer confidence in ABCs. The paper concluded that card frauds affect customer confidence in ABCs negatively leading to customers preferring in-branch transactions. The paper recommended improved collaborations between banks and CBN to tackle frauds and leverage on the Bank Verification Number platform to improve security of transactions on ABCs through biometric authentication.

**Keywords:** Card frauds, alternative banking channels, customers' confidence, card present frauds, card not present frauds

## Introduction

With the advancement in technology, cost reduction drives, increased need to improve customer satisfaction and the need to keep pace with global banking trends, the need to electronically settle transactions with the use of electronic gadgets such as Automated Teller Machines (ATMs), Point of Sales (POS) terminals and Mobile phones become popular in the Nigerian banking industry. Banking transactions are now carried out on such platforms as online, ATM, POS, mobile phones, among others. These new platforms for transacting banking businesses are called the Alternative Banking Channels (ABCs). The ABCs are innovative service delivery modes that offer diversified financial services like cash withdrawal, funds transfer, cash deposits, payment of utility and credit card bills, cheque book requests, and other financial enquiries. Majority of transactions on these ABCs are done with the presence of card while others require card information for transactions.

The advent of these ABCs has been heralded as the latest development in the evolution of money, hence they are sometimes called e-money, since they perform most (if not all) of the functions of the conventional money (Agboola, 2006). All banking services, other than loans, can be self-accessed on these platforms leading to customers preferring their usage (Khan, 2010). The use of ABCs has allowed smooth operation in the financial system. It is now possible to pay for electricity bills, phone bills, phone top-ups, insurance premiums, travelling expenses, and television cable subscriptions using the ABCs anywhere anytime. However, fraudsters are taking advantage of the increased usage of the ABCs to defraud unsuspecting customers.

The number of reported frauds on the ABCs has been on the increase over the years. Table 1 shows that number of reported frauds on ATM and POS increased from 1539 in 2012 to 11,180 in 2016. This represents 626% growth in just five years. Similarly, the number of reported frauds on online and web platforms increased from 314 in 2012 to 3,374 in 2016 representing 974% growth in number of fraud incidents in just five years. Akinyele, Muturi and Ngumi (2015) reported that actual loss to fraud through POS increased from N5.8million in 2013 to N157.6million in 2014 while mobile banking fraud loss increased from N6.8million in 2013 to N13.3million although there are reductions in the actual loss to fraud through ATM and online banking from N1.242billion to N0.5billion and N3.196billion to N0.875billion respectively in the same period. As per Nigeria Electronic Fraud Forum 2016 annual report, actual fraud loss on ATM, internet banking, POS and web stood at N464.5million, N320.7m, N243.3m and N83.8million respectively. The current rise in fraud incidents on these ABCs can make the public to further lose confidence in this technology that is meant to provide convenience and comfort in making banking transactions. As Oseni (2006) noted, customers

are losing their trust and confidence in the banking system due to incessant frauds.

Table 1 Types of Fraud with Frequencies

| YEAR | Card Present Fraud (ATM and PoS) | Card Not Present Fraud (online and Web) |
|---|---|---|
| 2012 | 1539 | 314 |
| 2013 | 1739 | 316 |
| 2014 | 7181 | 1271 |
| 2015 | 8039 | 1471 |
| 2016 | 11180 | 3374 |

Source: NDIC annual reports (2011-2015) and Nigeria Electronic Fraud Forum annual report (2016)

The use of ABCs has become a major source of concern for users, ABCs providers, and banks with the proliferation of card frauds. Studies conducted in Nigeria reveal that banks are confronted with insecurity and inadequate operating facilities, fear of fraudulent practices, and high costs on these ABCs (Agboola, 2006; Chiemeke, Evwiekpaefe & Chete, 2006, Tade & Aliyu, 2011; Wada & Odulaja, 2012). Despite the foregoing, existing studies have not focused on how frauds on these channels affect customers' confidence to the best of our knowledge. Most authors have focussed on customer satisfaction with ABCs (Bello, 2005; Nupur, 2010; Sharma, 2012; Ogunwolore & Oladele, 2014; and Edemivwaye, 2015), customers' perception on ABCs (Singhal & Padhmanabham, 2008) and customers' adoption of ABCs (Ahmad & Al-Z'ubi, 2011). This study examined the effects of card frauds on customers' confidence in ABCs.

## Literature Review

### Conceptual Literature

Alternative Banking Channels as a term has undergone varying conceptual definitions. It is mostly referred to as electronic banking or e-banking and new age banking system. Authors vary greatly with respect to their conceptualization of electronic banking depending on their orientations. Some call it internet banking (El-Kasheir, Ashour, & Yacout, 2009; Akinci, Aksoy & Atilgan, 2004), while some refer to it as online banking (Auta, 2010; Laukkanen & Pasanen, 2008). Yet, Costanzo, Keasey and Short (2003) and Al-Ashban and Burney (2001) described it as telephone or telebanking, while Li and Zhong (2005) preferred the use of virtual banking to describe the concept. In Laukkanen and Pasanen's (2008) explications, mobile banking was the most suitable term to describe those electronic banking services delivered via the use of cell or mobile phones. Despite these conceptual discrepancies in the literature, the most important thing about e-banking is that it is a banking system fostered via the new market space. Therefore, e-banking

houses the other terms which researchers at one time or the other employed to define the concept (Izogo, Nnaemeka, Onuoha & Ezema, 2012). In this study ABCs and electronic banking (or e-banking) are used interchangeably and they are defined as including all channels of delivering banking services to customers other than a bank branch.

The origin of ABCs technology in Nigeria can be traced to year 1990 when Societe Generale Bank (SGBN) launched the first Automated Teller Machine (ATM) in Nigeria. In 1996, the CBN granted All States Trust Bank approval to introduce a closed system automation. In 1997, Diamond Bank introduced a similar product called 'Paycard' (Bello, 2005). Between 1998 and 2000, many banks in Nigeria launched their websites with a view to starting internet banking while a consortium of more than 20 banks under the auspices of Gemcard Nigeria Limited obtained CBN approval in November 1999 to introduce the 'Smartpay' scheme (Bello, 2005). Since the introduction of modern alternative banking services, other channels of banking services such as mobile banking, internet banking, Automated Teller Machine (ATM), and Point of Sale terminals (POS) have been developed and offered by most banks around the globe (Puopiel, 2014). Edemivwaye (2015) identified telephone banking, mobile banking, online banking, point of sales terminals, automated teller machines, and smart card as the ABCs currently in use in Nigeria although there are recent additions like MVISA.

Telephone banking services use automated phone answering system while interacting with the platform using telephone keypad response or voice recognition capability (Okechi & Kepeghom, 2013). Shah and Clarke (2009) and Auta (2010) described Mobile banking as an e-banking platform that allows customers to carry out banking transactions and make enquiries through the use of a digital mobile phone that is connected to a telecommunication network or wireless network. Online banking (also known as Internet banking) provides a platform for bank customers to carry out financial transactions on their own through the use of a secured internet website operated by the commercial bank, a retail or virtual bank, credit union or building society. With the exception of cash withdrawal almost all banking transactions ranging from payment of bills to making financial investments can be carried out using internet banking platforms (Ahmad & Al-Zu'bi, 2011). Okechi and Kepeghom (2013) described the Point-Of-Sale (POS) as an e-banking channel allows customers to make payment for goods and services to clients known as merchants, in the premises of the merchants. A Point of Sale terminal is a portable device that allows customers with cards to carry out banking transactions outside the bank's environment. Automated Teller Machine (ATM) is a computerized telecommunications machine that provides customers of a financial institution access to carry out financial transactions (cash withdrawals, fund transfers, bill payments, among others) within or

outside the banking premises without the need for a human bank teller (Danlami & Mayowa, 2014; Okechi & Kepeghom, 2013).

Scholars have found various reasons for the deployment of ABCs by banks. DeYoung, Lang and Nolle (2007) suggested that addition of ABCs to an existing portfolio of service delivery channels results in improved bank profitability through attraction of high net worth customers with greater profit potentials. Sheshunoff (2000) noted employment of full service e-banking by banks prevents customers leaving for competitors thereby ensuring banks retain their customers. According to Edemivwaye (2015), banks would deploy ABCs because of their cost saving benefits especially overhead costs. Gbadeyan and Akinyosoye-Gbonda (2011) also posited that the overall costs of doing banking transactions with e-banking are reduced compared to doing the transactions using the conventional offline method. Shah and Clarke (2009) noted that in some countries, routine branch transactions such as cash/cheque deposit related activities are also being performed using ATMs, which has further helped in reducing the workload of the bank employees, and enabling them to use the saved time in providing better quality services to customers. Due to possible increase in the number of customers, retention of existing customers, and cross selling opportunities, the revenue base of e-banking operators is most likely to increase (Edemivwaye, 2015).

Customers' adoption of ABCs is based on a number of factors. Shah and Clarke (2009) opined that in modern business environment, customers demand greater choice and the conventional range of banking services to be improved by the convenience of online capabilities and a stronger focus by banks on developing personal relationships with customers. With ABCs, customers can conduct their businesses on 24 hours' basis at very low or no cost although cost of internet subscription has been found to be inhibiting factor to customers' usage of online and mobile banking (Sathye, 1999). Alternative Banking Channels provide accounts aggregation services which enable customers to be presented with their account (current account, saving account, mortgage account) details on a single page. Customers can have their financial data from many banks on one page but it currently requires customers to provide their account passwords to the aggregator (Sathye, 1999).

**Card Fraud**

Fraud encompasses a wide range of illicit practices and illegal acts involving intentional deception or misrepresentation (Oloidi & Ajinaja, 2014). Card frauds are frauds perpetrated with card or card information. The commonest types of card frauds are lost or stolen card fraud, counterfeit card fraud, card not present fraud and identity theft on cards. A Report on Global ATM Frauds (2007) identified the following types of ATM Frauds:

*Shoulder Surfing:* This is a fraud method in which the ATM fraudster use a giraffe method to monitor the information the customer keys in into the ATM machine unknown to the customers.

*Lebanese Loop:* This is a device used to commit and identify theft by exploiting Automated Teller Machine (ATM). Its name comes from its regular use among Lebanese financial crime perpetrators, although it has now spread to various other international crime groups.

*Using Stolen Cards:* This is a situation in which the ATM card of a customer is stolen and presented by a fake presenter.

*Card Jamming:* Once the ATM card is jammed, fraudster pretending as a genuine sympathizer will suggest that the victim re-enter his or her security code. When the card holder ultimately leaves in despair the fraudster retrieves the card and enters the code that he has doctored clandestinely.

*Use of Fake Cards:* Fraudsters use data collected from tiny cameras and devices called 'skimmers' that capture and record bank account information.

Duplicate cards*:* The fraudsters use software which records the passwords typed on those machines. Thereafter duplicate cards are manufactured and money is withdrawn with the use of stolen Passwords. Sometimes such frauds are insiders' job with the collusion of the employees of the company issuing the cards.

*Card Swapping:* This is a card theft trick whereby a fraudster poses as a "Good Samaritan" after forcing the ATM to malfunction and then uses a sleight of hand to substitute the customer's card with an old bank card. As the customers is endlessly trying to push the card through, the fraudster offer assistance by pretending to help the customer push through the card.

**Conceptual Link Between Card Fraud and Customers' Confidence**

Security of transactions is a major factor in customers' adoption of alternative banking channels globally. Authors are united in the view that security of transactions is critical to adoption of electronic banking and its continuous usage. Attah-Botchwey and Nsowah (2014), Puopiel (2014), Ahmad and Al-Zu'bi (2010), Singhal and Padhmanabhan (2008), and Sathye (1999) all found security as a critical factor in the usage of alternative banking channels in Jordan, United Kingdom, India and Ghana respectively. Ogunwolore and Oladele (2014) discovered insecurity as a major challenge to alternative banking channels utilisation in Nigeria. Weak security on these alternate banking channels and/or compromise of security lead to the occurrence of frauds. Most frauds on alternative banking channels are card related.

Being a fraud victim has negative effects on customers not only in terms of monetary losses but also in terms of the efforts they have to make to restore the pre-loss condition (Malphrus, 2009; Douglass, 2009). More so, confidence and trust in the bank (and alternate channels) may be shaken by fraud occurrences (Hoffmann & Birnbrich, 2012). Customers might develop a wrong perception as a result of their negative experience (Singhal & Padhmanabhan, 2008), that the bank (or its channels) is not safe and incapable of protecting its clients' assets (Krummeck, 2000) leading to loss of trust (confidence) and dissatisfaction (Varela-Neira, Vázquez-Casielles, & Iglesias, 2010), and may switch to a different financial services provider or other banking channels (Gruber, 2011; Bodey and Grace, 2006). The loss of confidence occasioned by the perceived insecurity in the alternative banking channels may consequently lead to reduced transactions (in both volume and value) done through the alternative banking channels.

This paper develops an innovative conceptual framework that integrates these findings from previous researches. In the framework, card fraud on alternative banking channels (POS, ATM and online banking) is negatively linked to (or lead to loss of) customer confidence. Loss of customer confidence in turn leads to reduction in the value and volume of transactions consummated through the alternative banking channels. As transaction volume and value reduce, customer confidence is further impaired. Figure 1 provided a graphical summary of the conceptual framework that this paper examined.

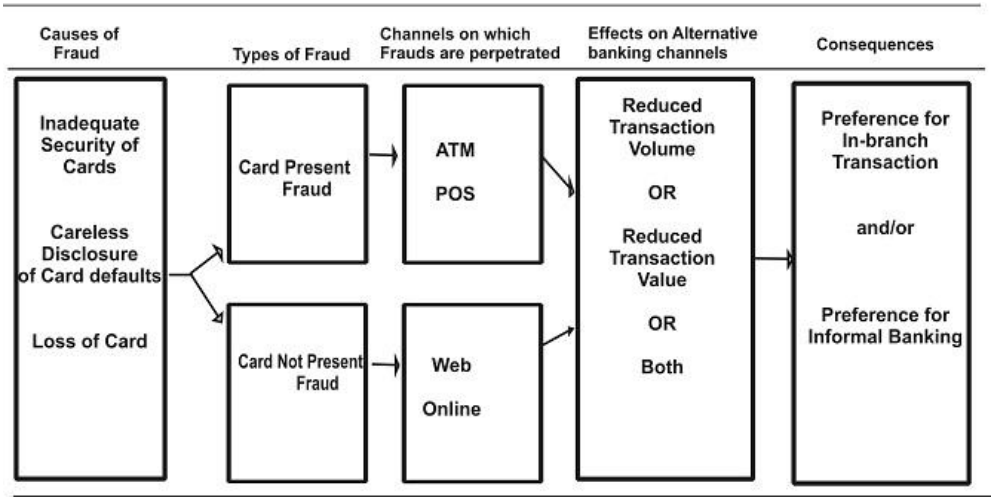


Figure 1: Conceptual Link Between Card Fraud and Customer Confidence in ABCs
Source: Authors' Perception (2018)

## Theoretical Literature

The paper reviews the differential opportunity theory of fraud and technology acceptance model.

**Differential Opportunity Theory**

Opportunity theory is simply the idea that people look for opportunity, whether through legitimate means or otherwise, to gain what they desire. It is a crucial element of the theory of deviance. The origination of opportunity theory lays in the way that society functions. In a society, there is the concept of "norms" and the concept of "deviance." The "norms" of a society are a system of shared values that determine how a society evaluates those within it. These norms include values that dictate a standard of acceptable lifestyle. When a standard lifestyle established by a society becomes unachievable, people become deviant in attempts to achieve that standard in order to continue to be perceived as within the realm of norm. Opportunity theory is complex in some ways, because there is not only the deviance of deciding to go outside of cultural norms to attain those things valued by society, but the deviance of them looking for opportunities to attain them in the fastest and most reasonable way possible. Those who commit crime as the result of their deviance also look for opportunities that make the crime efficient. A criminal wanting to rob a store, for instance, might look first for one with minimum security and easy accessibility.

According to Owolabi (2010) this theory puts forward the fact that all people have the opportunity to commit fraud, against their employers, against suppliers and customers of their employer, against third parties and against government departments. However, such opportunity is guided or regulated by accessibility of the perpetrator to the accounts, assets, premises and to computer systems; skill required to identify that such opportunity exists and to be used; and availability of sufficient time to plan and execute the fraud. Differential opportunity is a theory that suggests that one's socio-economic environment serves to predetermine their likelihood of achieving financial success through legitimate or illegitimate means. Implied here is the fact that fraud is likely to be more in a control lax environment than environment with stringent controls. It can also be inferred that careless people are more prone to be defrauded than people that are very careful. Since most card related frauds occur through careless disclosure of card details and/or misplacement of cards thereby creating opportunities for fraudsters to strike, the differential opportunity theory can be said to apply to card frauds.

**Technology Acceptance Model (TAM)**

Existing Literatures have accepted the technology acceptance model (TAM), proposed by Davis, Bagozzi and Warshaw (1989) as one of the most utilized models in studying information system acceptance (Mathieson, 1991; Venkatesh and Davis., 1996; Gefen and Straub, 2000). Technology Acceptance Model is based on two beliefs, namely: perceived ease of use and perceived Usefulness. Davis *et. al*. (1989) defined perceived usefulness (PU),

as the degree to which a person believes that using a particular system would enhance his or her job performance. He also defined perceived ease of use (PEOU) as 'the degree to which a person believes that using a particular system would be free of effort,' in terms of physical and mental effort as well as ease of learning. These two beliefs, according to TAM, determine one's intention to use technology. System acceptance will suffer if users do not perceive a system as useful and easy to use. TAM has emerged as a salient and powerful model that can be used to predict potential information system usage by measuring users' beliefs after they are exposed to the system even for a short period of time through training, prototype or mock-up models (Venkatesh & Davis, 1996).

Davis *et al*. (1989) result indicated that while ease of use is clearly significant, usefulness is even more important in determining user acceptance. The TAM has been tested widely with different situations and proved to be a valid and reliable model in explaining information system acceptance and usage (Mathieson, 1991; Venkatesh & Davis, 1996).

**Empirical Literature**

Authors have studied adoption of, customer satisfaction with, and factors influencing adoption of ABCs by banks and customers. Daniel (1999) revealed that as at 1999, up to two-third of retail banks in the United Kingdom and Republic of Ireland have either adopted alternative banking services or are developing them. Karjaluoto's (2002) study identified personal banking experience and prior computer and technology experience as the major factors underlying formation of attitude towards ABCs by customers. Wan, Luk and Chow (2005) found in Hong Kong that customers' demographic backgrounds strongly affect their adoption of banking channels while Karjaluoto (2002) identified negative attitude towards technology, valuing personal services and demographic characteristics as the most substantial barriers to adoption of ABC in Finland. Hoffmann and Birnbrich (2012) revealed, in a study of Germany, a positive relationship between customer familiarity and knowledge of fraud prevention measures and the quality of customers' relationship as measured by satisfaction, trust and commitment.

Ahmad and Al-Zu'bi (2010) indicated, in the case of Jordan, that security of transactions, privacy and content of ABC services significantly impact on customers' satisfaction. Nupur's (2010) study of Bangladesh revealed that customers were generally satisfied with reliability, responsiveness, assurance and empathy which come from quick services, affordable service charges, ease of transaction and error free records. In a study of Indian customers, Sharma (2012) found satisfaction with ABC services in terms of reliability, functionality, network availability, accuracy and speed of transactions, user friendliness of ABCs and compensation. In

Ghana, Attah-Botchwey and Nsowah (2014) found security issues, unreliable network system, high utilisation fees/charges, daily transaction limits, dispense error or wrong debits as constraining reasons to customers' acceptance of ABCs. The study revealed that banks adopt alternative banking strategies in response to customers' needs and the changing market trend in the banking industry. Makosana (2014) reported lack of awareness, complexity of the system and insecurity as the major causes of non-adoption of ABCs by Zimbabwean customers.

Odumeru (2012) found in Nigeria that acceptance of ABC is significantly influenced by age, educational background, income, perceived benefits, perceived ease of use, perceived risk and perceived enjoyment. Similarly, Izogo *et al*. (2012) found significant relationship between marital status, age and educational level and adoption of ABCs in Nigeria and concluded that there were convincing evidences that demographic variables do influence customers' adoption of ABCs in Nigeria.

In Nigeria, Odumeru (2012) found that acceptance of ABC is significantly influenced by age, educational background, income, perceived benefits, perceived ease of use, perceived risk and perceived enjoyment. Similarly, Izogo *et al*. (2012) revealed significant relationship between marital status, age and educational level and adoption of ABCs in Nigeria and concluded that there were convincing evidences that demographic variables do influence customers' adoption of ABCs in Nigeria. Studies conducted by Balogun, Ajiboye and Dunsin (2013), Ogunwolore and Oladele (2014) and Edmivwaye (2015) showed that availability of ABCs improve customers' satisfaction.

**Methodology**

The paper employed monthly time series data of card frauds and value of transactions on ABCs from 2012 to 2016 obtained from the Central Bank of Nigeria, Nigeria Deposit Insurance Corporation, Nigerian Electronic Fraud Forum. The variables employed included: Value of transaction on ABCs (VABC) as the dependent variable, Card Present Fraud (CPF) and Card Not-Present Fraud (CNF) as the independent variables, while Prime Lending Rate (PLR), Inflation rate (INF) and Banks' Total Assets (BTA) were used as control variables. The Augmented Dickey Fuller test was used to test the presence of stationarity, while co-integration test was used to determine existence of long run relationship between the variables. The paper employed Generalized Method of Moments (GMM) estimation technique to establish the relationship between card frauds and customer confidence on ABCs.

The estimated model is specified thus:

$$Log(VABC) = \beta_0 + \beta_1 Log(CPF) + \beta_2 Log(CNF) + \beta_3 Log(BTA) + \beta_4 INF + \beta_5 PLR + \mu_{it}$$

Where,
VABC = value of transactions consummated on alternative banking channels (ATM, POS, web and online banking Platforms, a proxy for customer confidence in usage of Alternative Banking Channels.
CPF = Value of card related frauds perpetrated on Automated Teller Machines and Point of Sales terminals
CNF = Value of card related frauds perpetrated on web and online banking platforms
BTA= Total Asset of all banks
INF= Inflation rate
PLR= Prime Lending Rate
$\beta_0$, $\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$ and $\beta_5$ are parameters for estimation
$\mu$ is the stochastic error term
The *a priori* expectations are $\beta_1, \beta_2, \beta_4, \beta_5 \leq 0$; $\beta_0, \beta_3 > 0$

## Analysis and Results

The results of the unit roots test are shown in Table 2.

Table 2 Augmented Dickey-Fuller (ADF) Unit Root Test Result

| Variable | Method | At Level | | At First Difference | | Order |
|---|---|---|---|---|---|---|
| | | ADF statistics | 5% critical value | ADF statistics | 5% critical value | |
| LOG(CNF) | ADF | -1.684848 (0.4336) | -2.911730 | -7.322310** (0.0000) | -2.912631 | I (1) |
| LOG(CPF) | ADF | -2.045003 (0.2674) | -2.911730 | -7.328061** (0.0000) | -2.912631 | I (1) |
| INF | ADF | 1.047033 (0.9966) | -2.911730 | -3.645322** (0.0077) | -2.913549 | I (1) |
| PLR | ADF | -4.089150** (0.0021) | -2.911730 | - | - | I (0) |
| LOG(BTA) | ADF | -0.294307 (0.9190) | -2.911730 | -7.284939** (0.0000) | -2.912631 | I (1) |
| LOG(VABC) | ADF | -0.415194 (0.8992) | -2.912631 | -8.634032** (0.0000) | -2.913549 | I (1) |
| LOG(VOABC) | ADF | -0.060409 (0.9484) | -2.912631 | -10.94526** (0.0000) | -2.912631 | I (1) |

* Implies significant at 5% meaning that the variable is stationary at that order
** Implies significant at 1% meaning that the variable is stationary at that order
Source: Authors' computation using data extracted from NDIC annual (2012-2015), NEFF annual reports (2016) and CBN (2017, Q1) Statistical Bulletin

The variables of Value of transactions on Alternative Banking Channels (VABC), Volume of Transactions on Alternative Banking Channels (VOABC), Card Present Fraud, Card Not Present Fraud (CNF), Inflation rate (INF), Prime Lending Rate (PLR) and Total Assets of Banks (BTA) were tested. From Table 2, the ADF reported PLR to be stationary at levels as their ADF statistics were significant at 5% while other variables were stationary at first difference. This finding implies that the series contains no unit root at the level and at first difference; hence, their seasonal variation has been corrected, making them fit for regression.

From Table 2, some of the variables are stationary at level and some of them are stationary at first difference, there is a practical difficulty that has to be addressed when we conduct F-test. Exact critical values for the F-test are not available for an arbitrarily mix of I(0) and I(1) variables. However, Pesaran, Shin and Smith (2001) prescribe a technique to investigate the appropriate order in which the variables are co-integrated. Pesaran *et al.* (2001) supplied bound for the critical value for the asymptotic distribution of the F-statistic. For various situation (e.g. different numbers of variables, (k+1)), they give lower and upper bound on the critical values. In each case, the lower bound is based on the assumption that all the variables are I(0), and the upper bound is based on the assumption that all the variables are I(1). If the computed F-statistic falls below the lower bound we would conclude that the variables are I(0), so no co integration is possible, by definition. If the F-statistics exceeds the upper bound, we conclude that we have co-integration. Finally, if the test statistic falls between the bounds, the test is inconclusive.

Table 3: ARDL Bounds Wald statistic Result

| LOS | I(0) | I(1) |
|---|---|---|
| 10% | 2.26 | 3.35 |
| 5% | 2.62 | 3.79 |
| 2.5% | 2.96 | 4.18 |
| 1% | 3.41 | 4.68 |
| F-Stat | 6.884949 | |
| D.F | 5 | |

Source: Authors' computation using data extracted from NDIC annual (2012-2015), NEFF annual reports (2016) and CBN (2017, Q1) Statistical Bulletin

Table 3 shows that for the equation estimated, computed F-statistics is greater than the 5% upper bound, we conclude that the variables are I(1) as in 6.88 > 3.79.

Table 4: Generalized Method of Moments (GMM) Result
Dependent Variable: Value of Transactions on Alternative Banking Channels (VABC)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(CPF) | -0.186186** | 0.015895 | -11.71335 | 0.0000 |
| LOG(CNF) | -0.027543* | 0.011700 | -2.354074 | 0.0222 |
| LOG(TA) | 1.382486** | 0.051231 | 26.98538 | 0.0000 |
| INF | 0.024806** | 0.006604 | 3.756027 | 0.0004 |
| PLR | -0.008431 | 0.047441 | -0.177713 | 0.8596 |

* Implies significant at 5% ** Implies significant at 1%
Source: Authors' computation using data extracted from NDIC annual (2012-2015), NEFF annual reports (2016) and CBN (2017, Q1) Statistical Bulletin

Table 4 showed the GMM result. The result from Table 4 revealed that Value of card related frauds perpetrated on Automated Teller Machines and Point of Sales terminals (CPF) has negative effect on Value of Transactions on Alternative Banking Channels (VABC). The implication of this is that the higher the value of fraud committed on ATM and POS, the lower the Value of Transactions on Alternative Banking Channels. This result conforms to *a priori* expectation. The result also shows a negative impact of the Value of card related frauds perpetrated on web and online banking platforms (CNF) on the Value of Transactions on Alternative Banking Channels.

Table 5: Statistical Properties and Post Diagnostic Results of Value of Transactions on Alternative Banking Channels (VABC)

| Statistical Properties of Results | | Post Diagnostic Tests Result | |
|---|---|---|---|
| | | Weak Instrument Diagnostics: | 22.914 |
| R-squared | 0.946 | Cragg-Donald F-Stat | |
| Adj R-squared | 0.943 | Q-Stat Serial Correlation | 3.9398 |
| J-statistic | 14.24* | Q-Stat Serial Correlation Prob | 0.047 |
| Prob(J-statistic) | 0.000 | Endogeneity Test: Difference in J-stats | 9.2050 |
| Durbin-Wat Stat | 1.83 | Difference in J-stats Probability | 0.0026 |
| Instrument Rank | 7 | Jarque-Bera Statistics | 0.2467 |
| Instruments Used | $Log(VABC)_{t-1}$, $log(CPF)_{t-1}$, $log(CNF)_{t-1}$, $log(TA)_{t-1}$, $INF_{t-1}$, $PLR_{t-1}$ | Jarque-Bera Prob | 0.8840 |
| | | Orthogonality C Test: | 4.2420 |

Source: Authors' computation using data extracted from NDIC annual (2012-2015), NEFF annual reports (2016) and CBN (2017, Q1) Statistical Bulletin

The Weak Instrument Diagnostics view provided diagnostic information on the instruments used during estimation. This information includes the Cragg-Donald statistic. The Cragg-Donald statistic and its critical values are available for equations estimated by TSLS, GMM or LIML. The

Cragg-Donald statistic is proposed by Stock and Yogo (2002) as a measure of the validity of the instruments in an Instrumental Variable (IV) regression. Instruments that are only marginally valid, known as weak instruments, can lead to biased inferences based on the IV estimates, thus testing for the presence of weak instruments is important. The statistic does not follow a standard distribution, however Stock and Yogo (2002) provided a table of critical values for certain combinations of instruments and endogenous variable numbers. Given that the instruments are 7, hence the Stock and Yogo $K_2$ is 7 and the 5% critical value is 19.79. comparing this with the Cragg-Donald statistic of 22.914 (Table 5), we therefore reject the null hypothesis of weak instrument diagnostics and accept the alternative meaning that the instruments $Log(VABC)_{t-1}$, $log(CPF)_{t-1}$, $log(CNF)_{t-1}$, $log(TA)_{t-1}$, $INF_{t-1}$, $PLR_{t-1}$ used are strong.

The Endogeneity Test, checks whether a subset of the endogenous variables is actually exogenous or not. This is calculated by running a secondary estimation where the test variables are treated as exogenous rather than endogenous, and then comparing the J-statistic between this secondary estimation and the original estimation. The test statistic is distributed as a Chi-squared random variable with degrees of freedom equal to the number of regressors tested for endogeneity. From the analysis, the result test the null hypothesis that LOG(CPF) and LOG(CNF) are exogenous and the J-stats Probability was 0.0026 (Table 5) which is less than 5%, thereby rejecting the null hypothesis that LOG(CPF) and LOG(CNF) are exogenous and accepting the alternative that LOG(CPF) and LOG(CNF) are endogenous in the model. This result implies that the GMM is suitable to use.

Considering the statistical properties of the GMM result reported in Table 5, the R-squared value of 0.943 indicated that about 94.3% variation in Value of Transactions on Alternative Banking Channels is explained in the model by the explanatory variables. The J-statistics of 14.24 is statistically significant and this shows that there is a considerable harmony between Value of Transactions on Alternative Banking Channels and the explanatory variables put together. This confirms that all the independent variables jointly have significant influence on the dependent variable. The Durbin-Watson statistic of 1.83 indicates that there was no serial correlation associated with the regression result as this can be approximated as 2.

Considering the Post Diagnostic test results, the Q-stat Serial Correlation Lagranger Multiplier test is used to test for higher order Autoregressive Moving Average (ARMA) errors and is applicable whether or not there is lagged dependent variable(s). The Q-stat tests the null hypothesis of serial correlation against the alternative hypothesis of no serial correlation. The result of the Q-stat Correlation probability was 0.047 (Table 5) and this less than 5%, hence we reject the null hypothesis and accept the alternative of

no serial correlation implying that the model has no higher order ARMA(*p*) correlation.

The Jarque-Bera statistics test for the normality distribution of the equation, against the alternative hypothesis. The probability of the Jarque-Bera test concludes that the equation was normally distributed as the probability value was greater than 5%.

In examining the objective of this paper, value of transaction has so far been used as a measure of customers' confidence. However, it is possible for value of transactions to be negatively affected by frauds and not volume or for value not to be negatively affected while volume is affected. Consequently, the model was re-estimated with volume of transactions as the dependent variable.

Table 6: Generalized Method of Moments (GMM) Result
Dependent Variable: Volume of Transactions on ABCs (VOABC)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(CPF) | -0.022525 | 0.071748 | -0.313943 | 0.7550 |
| LOG(CNF) | -0.040462* | 0.019952 | -2.028009 | 0.0482 |
| LOG(TA) | 1.123996** | 0.097015 | 11.58576 | 0.0000 |
| INF | 0.037822** | 0.006290 | 6.013325 | 0.0000 |
| PLR | -0.061303 | 0.093684 | -0.654359 | 0.5161 |

* Implies significant at 5% ** Implies significant at 1%

Source: Authors' computation using data extracted from NDIC annual (2012-2015), NEFF annual reports (2016) and CBN (2017, Q1) Statistical Bulletin

The result from Table 6 revealed that Value of card related frauds perpetrated on Automated Teller Machines and Point of Sales terminals (CPF) has negative effect on Volume of Transactions on Alternative Banking Channels (VOABC). The implication of this is that the higher the value of fraud committed on ATM and POS, the lower the Volume of Transactions on Alternative Banking Channels. This result conformed with *a priori* expectation. Also, the result showed a negative impact of the Value of card related frauds perpetrated on web and online banking platforms (CNF) on the Volume of Transactions on Alternative Banking Channels. This result provided an interesting insight and confirms that fraud leads to reduction in both volume and value of transactions conducted via those channels.

Table 7: Statistical Properties and Post Diagnostic Results of Volume of Transactions on Alternative Banking Channels (VOABC)

| Statistical Properties of Results | | Post Diagnostic Tests Result | |
|---|---|---|---|
| | | Weak Instrument Diagnostics: Cragg-Donald F-Stat | 28.662 |
| R-squared | 0.78 | | |
| Adj R-squared | 0.76 | Q-Stat Serial Correlation | 18.429 |
| J-statistic | 6.92* | Q-Stat Serial Correlation Prob | 0.0000 |
| Prob(J-statistic) | 0.042 | Endogeneity Test: Difference in J-stats | 8.8020 |
| Durbin-Wat Stat | 1.80 | Difference in J-stats Probability | 0.0062 |
| Instrument Rank | 7 | Jarque-Bera Statistics | 0.0590 |
| Instruments Used | $Log(VOABC)_{t-1}$, $log(CPF)_{t-1}$, $log(CNF)_{t-1}$, $log(TA)_{t-1}$, $INF_{t-1}$, $PLR_{t-1}$ | Jarque-Bera Prob | 0.9709 |
| | | Orthogonality C Test: | 8.3102 |

Source: Authors' computation using data extracted from NDIC annual (2012-2015), NEFF annual reports (2016) and CBN (2017, Q1) Statistical Bulletin

Considering the statistical properties of the GMM result reported in Table 4.16, the R-squared value of 0.76 indicated that about 76% variation in Volume of Transactions on Alternative Banking Channels was explained in the model by the explanatory variables. The J-statistics of 6.92 is statistically significant and this showed that there was a considerable harmony between Volume of Transactions on Alternative Banking Channels and the explanatory variables put together. This confirmed that all the independent variables jointly have significant influence on the dependent variable. The Durbin-Watson statistic of 1.80 indicated that there was no serial correlation associated with the regression result as this could be approximated as 2.

**Conclusion and Recommendations.**

The results of this study revealed the interaction between the value and volume of transactions on various alternative banking platforms and frauds perpetuated via that same channel The paper revealed that frauds committed on ATM, POS, web and online platforms generally affect value and volume of transactions on alternative banking channels.

The paper concluded that card frauds experience leads to reduced patronage of alternative banking channels by user in terms of both value of transaction and volume of transaction. Hence, card fraud experience impairs customers' confidence in alternative banking channels thereby constituting a limiting constraint to banking technology and innovations.

The paper therefore recommended improved collaboration among banks and regulatory interventions on the part of the CBN to bring down the

rate of fraud occurrences as well as deployment of improved transaction authentication technology on ABCs. Currently banks have fraud desk to track suspicious transactions and the NEFF (in collaboration with CBN) that monitors electronic frauds. However, there is need for more collaborations in tracking down fraud beneficiaries hidden in banks, deployment of advanced technology and collaboration with internet services providers to track web and online fraudsters as well as extension of Know Your Customer (KYC) requirement to all merchants who accept card or online payments (by the CBN in collaboration with the Federal Government of Nigeria). Transactions are mostly authenticated with personal identification number and token codes currently. Bank should take advantage of the BVN technology to deploy biometric authentication of transactions on the ABCs. This will greatly reduce incidence of frauds on these channels. In addition, or as alternative further security of transactions, transactions beyond a certain limit should not be allowed through without verification by a bank staff.

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