



Fraud, Financial Literacy and Financial Inclusion in Nigeria

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Abstract

This study however, examined how banking sector fraud shapes financial inclusion outcomes in Nigeria and the role of financial literacy. Secondary data sourced from the NDIC and Global Financial Indicators database underpins the empirical analysis focusing on 2010 to 2023 as its scope. The study utilised a two-stage hierarchical regression analysis. From the first regression, the total fraud cases are strongly negatively (coefficient of -0.1017 and a p-value of 0.0000) related to financial inclusion. The coefficients presented show that, though positive with a coefficient of 0.0479 with a p-value of 0.0482, the total amount involved bears a weak and significant effect on financial inclusion, whereas in the case of the total actual loss with a p-value of 0.6601 and a coefficient of -0.0117, it thus shows no significance. The second regression included financial literacy, which has a significant and positive effect with a coefficient of 0.2333 and a p-value of 0.0009 on financial inclusion. This reduces the negative impact of fraud because the coefficient for total fraud cases drops to -0.0871 with a p-value of 0.0011. Correspondingly, the coefficient of total amount involved rises 0.0712 with a p-value of 0.0136 implying that financial literacy may raise the positive impact of larger fraud amounts. Total actual loss remains insignificant. Evidence from this study underscores the critical function of financial literacy as a buffer against fraud's adverse influence on inclusion. The study recommends that deliberate financial literacy interventions should be prioritized, especially for vulnerable and underserved populations

Keywords: Fraud, Financial literacy, Financial inclusion, Banking system

JEL Code: K42, D14, G21, G20.

Introduction

Achieving broad financial inclusion is as central to economic management as the monetary

policy decisions of central authorities. The monetary authorities require a high percentage of the citizens to participate actively in regulated

financial systems. This is very vital and necessary as the policies made by the monetary authorities are channeled and effective mainly through the formal financial system (Kidwell et al., 2016; Atkinson & Messy, 2013). Thus, it is unsurprising that majority of the monetary authorities around the world aimed at raising the rate of financial inclusion within their jurisdiction (Croxson et al., 2022; Carriere-Swallow et al., 2021; Chen & Yuan, 2021; Jenik & Lauer, 2017; Khan, 2011). In recognition of this, the Central Bank of Nigeria (CBN) announced a five-year strategy to incorporate 95% of Nigerians in the regulated financial activities of the economy between 2019 and 2024 (Nwanna & Jisike, 2021; Ngaikedi et al., 2023).

However, the financial inclusion rate of Nigeria as at 2023 is a far cry from the goal set by the Central Bank; according to Enhancing Financial Innovation and Access (EFInA) reports (2023), EFInA data indicate that only 64% of Nigerians accessed formal financial services in 2023, representing a mere 10 percentage point improvement over 2020 figures (EFInA, 2023). Following this trend, before the goal of 95% inclusion rate can be achieved in Nigeria, it will take another 8 years running into 2032. This slow growth in the financial inclusion rate is further evident in the ineffectiveness of the monetary authorities to reduce the inflation rate in the economy through monetary policy rate despite enormous increase in the rate from 13.25% in 2020 to 28.92 in 2023, a whopping 118.26% increase (Onuba, 2019; Tunji, 2024). Several factors might be responsible for the creeping growth in the inclusion rate despite the upsurge in FinTechs in the economy. Some of these factors are: access to internet, income, literacy rate, bank distance, political factors, cultural upbringing (Fasakin et al., 2023; Le et al., 2019; Kabakova & Plaksenkov, 2018; Sarma & Pais, 2011). Also, the studies of Ozili (2024)

and Hilal et al. (2022) have found that fraud in the financial system has a great propensity to deter the citizens from being included in the formal financial activities. Thus, slowing down or even reducing the rate of financial inclusion in an economy.

The Nigerian banking system has been exposed to different forms of fraudulent activities which are captured and discussed through different news outlets. According to Nigerian Deposit Insurance Corporation (NDIC) (2020) reports indicated the findings underscore financial literacy's role in cushioning the adverse effects of fraud. More recently, Nweze (2024) reported that Nigeria has seen a 50 percent increase in fraud-related financial losses and a 100 percent surge in digital fraud incidents between first and third quarters of 2024. These happenings in the banking system are well known to the public. Hence, fear of losing their funds to such frauds serves as deterrent stopping many from being included in the formal financial happenings in the economy especially in this era of digital fraud (Srećković, 2023; Reznik et al., 2024). This leads to the first question of this study, what is the effect of fraud in the banking system on financial inclusion in Nigeria?

The studies of Afzal et al. (2024), Sirohi and Misra (2024), Idrees and Ullah (2024), Rey-Ares et al. (2023), and Davis (2022) established that increase in financial literacy can help reduce the rate of fraud within the banking system, as financial literate individuals are better equipped to combat frauds and other scams perpetrated in the banking system; also, financial literate individuals are equipped to take necessary steps when fraudulent activities are noticed on their accounts. This leads to the second question of this study; what role does financial literacy play on the effect of fraud in the banking system on financial inclusion in Nigeria?

Several studies have sought to understand factors affecting and determining financial inclusion in Nigeria's economy and other economies. Some of these studies are Suprapti et al. (2024), Soetan and Mogaji (2024), Pattipeilohy et al. (2024), Nnaomah et al. (2024), Adeoye et al. (2024), Umer et al. (2023), Parvin and Panakaje (2022), Wayne et al. (2020), Siano et al. (2020), Babajide et al. (2020), Kodongo et al. (2017), Wu (2017). However, studies on the effect of fraud on financial inclusion in Nigeria and the role financial literacy plays in this relationship are very limited; hence, this study bridge this gap by examining the effect of fraud in the banking system on financial inclusion in Nigeria and the role of financial literacy using the hierarchical regression analysis. The study estimate hierarchical OLS models in steps (fraud to financial literacy to interaction term) to test whether financial literacy moderates the effect of banking fraud on financial inclusion.

Information Asymmetry Theory argues that the difference in access between providers and users to relevant information may reduce market participation. In banking, fraud magnifies this gap and diminishes trust, thus reducing people's willingness to engage in formal financial services: this is why the study explicitly model fraud and financial literacy.

Since access to information and responses by institutions differ both within and across communities, a hierarchical OLS specification (including individual-level controls, such as income, education, and internet access) would help capture variation in the nested nature of factors and would test whether high financial literacy countervails the adverse effect of information asymmetry on financial inclusion.

Literature Review

Information Asymmetry Theory

Information asymmetry theory was developed by George Akerlof and associates in 1970

(Löfgren et al., 2002). According to the information asymmetry hypothesis, in any transaction where there is a situation where one of the parties has more or better information, that sets up the potential for inefficiency, distrust, and less-than-optimal outcome to occur (Akerlof, 1970). This theory therefore helps in understanding how financial inclusion, financial literacy relate to banking system frauds in Nigeria.

There is usually a wedge between institutional financial system, which often are more aware of their operational and security risks and its clients. People, disadvantaged by this asymmetry of information, especially those with limited financial knowledge. This is exactly the window exploited by fraudulent activities undermined confidence in the formal financial institutions and prevented the participation. (Beck et al., 2010). Most Nigerians cannot shift from informal to formal banking practices because of the perception of banks as high-risk institutions, especially in rural and marginalized areas. As argued as noted by Demirgüç-Kunt and Klapper (2012), mistrust deepens exclusion from financial services by depriving too many people of essential financial services.

Financial literacy can help address these issues. Atkinson and Messy (2012) contend that financially literate persons can better identify deceptive schemes, make informed financial decisions, and build trust when they use banking services. It plays a major role in closing up the gap by giving the financially disadvantaged groups knowledge necessary for understanding financial services and products.

This makes them less vulnerable to fraud and puts them in a better position to interact with formal financial systems more safely. Transparency, strong fraud prevention measures, and focused financial literacy initiatives are just some areas that must be given

top priority by stakeholders if genuine financial inclusion is to be achieved in Nigeria. These programmes should be directed to empower individuals to easily navigate the financial world with confidence in banking institutions and educate marginalized communities. Rebuilding trust, bringing more Nigerians into the formal financial system, and reducing the negative impacts of fraud are all made possible by resolving the underlying information asymmetries. This, in turn, enhances economic growth and reduces poverty levels (World Bank, 2018).

Empirical Review

AlSuwaidi & Mertzanis (2024) have found out that there is significant linkage between financial literacy levels and FinTech sector growth across 114 nations from 2013 to 2019. The study developed a new index of financial literacy measured by the amount of financial education incorporated into the curriculum of schools on an education policy basis through the use of World Bank's Global Financial Inclusion and Consumer Protection Survey. Moreover, a new market-based index of financial literacy which was developed through the help of Standard & Poor's Global Financial Literacy Survey measures financial knowledge of the individuals. Financial literacy and its correlation with the growth of the FinTech sector have been confirmed through extensive sensitivity analysis and endogeneity testing under different contexts regarding institutions, technology, and economics.

Suprapti et al. (2024) explored financial inclusion strategies via a systematic literature review approach. This research identifies, categorizes, and evaluates relevant studies through the use of certain keywords in online scholarly databases. Key issues that arise from the results of this research and its debate include, among others, financial technology, financial

literacy, financial infrastructure, regulations, consumer protection, gender equality, intersectoral cooperation, and contextual adaptability.

In their investigation of Nigeria's financial inclusion environment, Soetan and Mogaji (2024) looked at the opportunities, obstacles, and advancements in increasing access to financial services. Notwithstanding notable advancements, obstacles like ignorance, mistrust, and legal limitations continue to stand in the way of complete inclusion. The chapter examines important facilitators, such as the growth of agent banking networks and the participation of telecom firms in mobile money services. Additionally, it emphasizes the significance of customized financial products and focused awareness initiatives to meet the unique requirements of marginalized groups, including low-income earners, women, and rural communities.

The important demographic and socioeconomic factors affecting the probability of an individual becoming a victim of investment scams and digital frauds are examined by Sirohi and Misra (2024). It goes on to examine how financial literacy lowers the likelihood of victimization in both situations. According to the study, males between the ages of 40 and 59 who have completed or are post-graduation (including professionals) and who are middle-class are more likely than other groups to become victims of fraudulent investment schemes. Similarly, males under 60 who have completed high school or more, belong to middle-class and lower socioeconomic groups, and are victims of digital financial fraud are more likely to become victims than other groups. Additionally, compared to investment-related fraud, the likelihood of an individual becoming a victim of digital fraud is higher, according to the study.

In addition, Rey-Ares et al. (2024) examine the factors which could make Spanish consumers vulnerable to consumer financial fraud (CFF), emphasizing the role of financial literacy. Empirical analysis is conducted through regression analysis drawing on responses from over 6,200 randomly sampled Spanish participants through the Financial Competences Survey following an exhaustive review of the most relevant literature in the field. Both objective and subjective financial information show strong correlation with CFF exposure through email, although neither of them can serve as a safeguard against CFF victimization. In a similar vein, overconfidence in financial knowledge has a positive relationship with the former but does not drive the latter. In addition to raising the risk of this exposure, financial inclusion as indicated by the quantity of financial products held also plays a role in its eventual victimization.

Rahman and Ahsan (2024) looked at usability issues, dependence on middlemen, fraud risks, and a lack of financial literacy as barriers to the adoption of mobile financial services (MFS) in rural Bangladesh. The results of in-depth qualitative engagements with mobile financial service users, field agents, and technology specialists show how users' reliance on middlemen is increased and their vulnerability to fraud is increased by low digital and financial literacy combined with insufficient security measures. In order to foster trust and hasten the adoption of MFS, the study emphasizes the critical need for user-centered design enhancements, financial literacy initiatives, and strong fraud prevention techniques.

FinTech effect on financial inclusion of women in Nigeria was analyzed by Olusegun and Ado (2024). For the study "an asymmetric panel covering over a thousand microfinance institutions observed across a nine-year window

was used. The findings reveal that the expansion of FinTech does not pose any risks to the financial inclusion of women in Nigeria. It is also evident that women are more likely to refrain from using those platforms that are susceptible to cyberattacks.

The impact of publications on digital financial inclusion and literacy on economic inequality and financial well-being is examined by Gumilar et al. (2024). Using Scopus database from 2020 to 2024, this article employs the systematic literature review methodology. The findings showed that digital financial inclusion can promote greater financial well-being; adoption of digital financial services can lessen economic and social inequalities; and digital financial literacy is necessary to optimize digital financial inclusion. Although, there are still obstacles in the usage dimension, the coverage dimension of financial services is increased by their technological expansion.

In a sample of local governments in Oyo State, Babatunde (2024) assessed the impact of financial self-efficacy as an intermediary factor in the connection between demand factors and the financial inclusion of MSMEs. For data collection purposes, the research employed a cross-sectional survey design, utilized structured questionnaires for primary data collection, and adopted a structural equation model to analyze the results. The results revealed a strong positive connection between financial attitude and financial inclusion. Additionally, financial inclusion was found to have a strong positive correlation with both subjective norms and personal experience. One point worth mentioning is that financial self-efficacy emerged as one of the main barriers to financial inclusion.

According to Afzal et al. (2024), cybercrime has a significant impact on trust and adoption intention. This research offers relevant data regarding the consequences of digital financial

inclusion. In particular, the results showed that cyber fraud is likely to have a negative influence on trust and the adoption of payment banking. Knowledge about cybersecurity, favorable conditions, and trust play an important role in adopting payment banking, thus promoting digital financial inclusion in rural India.

Umer et al. (2023) studied the effect of financial inclusion, financial literacy, and cognitive ability of women in the context of Gwadar. Data for analysis was gathered quantitatively through surveys. The research used the cross-sectional method to collect data from a sample size of 306 cases. The results show that women's degree of financial inclusion is highly influenced by cognitive ability and financial literacy. Furthermore, taking demographics and control variables into account, financial inclusion is directly impacted by both cognitive ability and financial literacy.

Siano et al. (2020) analyzed the developments in financial inclusion in addition to the challenges and determinants associated with the use of mobile banking as an innovative way to enhance financial inclusion in SSA, especially Nigeria. The combination of pertinent information obtained from the Central Bank of Nigeria reports on developments in financial inclusion and insights derived from past scholarly studies through qualitative meta-synthesis (QMS) research paradigm is employed to provide an analytical framework for the inquiry topic. The study results reveal that the main determinants of the adoption of mobile banking in Nigeria include the simplicity of utilizing mobile technology to perform one's banking activities, including obtaining quick notifications on savings or withdrawals via SMS services (ease of managing my account), the threat of fraud and theft, and peer pressure from friends, families, policymakers, and social dynamics.

The connection between financial inclusion and regulation was analyzed by Kodongo (2017) using data from Kenya. Below are some of the findings from the study based on the analysis of fixed effect regression on banking panel data and Probit regression on household-level survey data: "Agency banking regulations and financial literacy will lead to better access to formal financial services whereas capital and liquidity macroprudential regulation and know your customers regulations may hinder financial inclusion."

Methodology

An ex-post facto design guides this study, the scope of the study ranges from 2010 to 2023, which is fourteen years; scope. The study draws its data in secondary form from the NDIC database and Global Financial Indicators. The study adapted the measures used by Onwuemele and Ogbuji (2024) and Olabamiji and Suleiman (2021) to capture fraud in the banking system with total fraud cases, total amount involved, and total actual loss; while also adapting the study of Obayori and George-Anokwuru (2020) to proxy financial inclusion with number of branches of deposit money banks; financial literacy is measured with savings rate in adaptation of the studies of Lusardi and Mitchell (2011), Mandell (2008), and Atkinson and Messy (2012). The study adopted the hierarchical regression technique. Hence, the models of the study are presented below:

$$FNI = f(TFC, TAI, TAL) \text{-----}$$

-- (1)

The regression equation is presented in equation (2):

$$LFNI_t = \beta_0 + \beta_1 LTFC_t + \beta_2 LTAI_t + \beta_3 LTAL_t + \varepsilon_t \text{-----}$$

----- (2)

LFNI = Log of Financial Inclusion

LTFC = Log of Total Fraud Cases

LTAI = Log of Total Amount Involved

LTAL = Log of Total Actual Loss

β_0 = Constant

$\beta_1 - \beta_3$ = Coefficients

ε = error term

The study included financial literacy to see the hierarchical effects on the model in equation 1 and 2:

$$FNI = f(TFC, TAI, TAL, FNL) \text{-----} (3)$$

The regression equation is presented in equation (4):

$$LFNI_t = \beta_o + \beta_1LTFC_t + \beta_2LTAI_t + \beta_3LTAL_t + \beta_4LFNL_t + \varepsilon_t \text{-----} (4)$$

LFNL = Log of Financial Literacy

β_o = Constant

$\beta_1 - \beta_4$ = Coefficients

ε = error term

The study employed the hierarchical regression techniques as its estimation technique, it also

estimated descriptive statistics, inter-variable correlations, stationarity diagnostics, multicollinearity checks, heteroscedasticity and serial correlation tests, alongside a structural stability assessment.

Results

Table 1: Summary Statistics

	FNI	TFC	TAI	TAL	FNL
Mean	5.063775	59054.79	47322.32	7017.786	12.90857
Std. Dev.	0.828720	72968.93	53331.73	4188.594	2.534391
Skewness	0.653638	1.020467	2.150543	0.720620	1.752850
Kurtosis	1.922986	2.468764	6.638912	2.145696	5.946455
Jarque-Bera	1.673543	2.594447	18.51559	1.637422	12.23339
Probability	0.433107	0.273290	0.000095	0.441000	0.002206
Observations	14	14	14	14	14

Source: Authors Computation, 2024.

Table 1 shows the summary statistics for the five variables of FNI, TFC, TAI, TAL, and FNL. From the mean values, FNI has a mean score of 5.06, indicating it is in the category of a moderate financial inclusion average; meanwhile, the mean value of TFC was 59,054.79, which indicates that the variability of fraud cases has a high dispersion. TAI and TAL are 47,322.32 and 7,017.79, respectively, indicating a big gap between the amount involved and the actual loss. A mean of 12.91 for FNL suggests that a fair level of financial literacy can be expected from these individuals.

These standard deviations are very high for the data series under analysis, reflecting huge fluctuation in caseload and losses stemming from frauds. It reflects positive asymmetry; especially for the TAI at 2.15 and FNL 1.75 showing strong skews towards low values, the distribution leans right.

Kurtosis values indicate that TAI is highly peaked at 6.64 and FNL at 5.95, showing extreme values. The Jarque-Bera statistic and probability prove that TAI and FNL are not normally distributed, while the rest of the variables are normally distributed since the p-value is less than 0.05. All variables' analysis has taken 14 observations each to maintain the sample size consistency.

Table 2: Correlation Matrix

	LTFC	LTAI	LTAL	LFNL
LTFC	1			
LTAI	0.55	1		
LTAL	0.26	0.43	1	
LFNL	0.73	0.13	0.25	1

Source: Authors Computation, 2024.

Table 2 presents the correlation matrix showing the relationships among four variables: Total Fraud Cases, Total Amount Involved, Total Actual Loss, and Financial Literacy.

There is a very strong positive correlation of 0.73 between LTFC and LFNL, hence, with increased financial literacy, fraud cases are most likely better reported or detected. This very strong correlation does raise a red flag in respect of potential multicollinearity in the case that both variables will eventually be included in the same regression model, distorting statistical results.

LTFC and LTAI are related positively with a correlation of 0.55, indicating that as the cases of fraud increase, there is usually a corresponding increase in the amount involved in fraud. This also makes intuitive sense and does not result in serious problems of multicollinearity.

LTAL and LTAI have weak correlation of 0.43, to indicate that not all the amount involved in fraud translate to actual losses, probably due to partial recoveries or fraud attempts that were not successful. Similarly, the correlation between LTAL and LFNL is 0.25, and that between LTAI and LFNL is 0.13, showing a very low direct relationship between these variables.

In a nutshell, though most of the associations are moderate or weak, strong association between LTFC and LFNL may imply some multicollinearity that needs to be cautiously sorted out in further analysis.

Table 3: Augmented Dickey-Fuller Unit Root Test

At Level					
	LFNI	LTFC	LTAI	LTAL	LFNL
t-Statistic	-2.1933	2.7906	0.1088	-0.0993	1.5153
Prob.	0.0321	0.9963	0.6999	0.6306	0.9594
	**	n0	n0	n0	n0
At First Difference					
	d(LFNI)	d(LTFC)	d(LTAI)	d(LTAL)	d(LFNL)
t-Statistic	-2.8672	-4.0707	-2.8019	-4.7033	-2.3237
Prob.	0.0082	0.0377	0.0098	0.0002	0.0250
	***	**	***	***	**

Source: Authors Computation, 2024.

The ADF unit root test in Table 3 presents the stationarity of the variables at their levels and after first differencing. These variables are Financial Inclusion, Total Fraud Cases, Total Amount Involved, Total Actual Loss, and Financial Literacy.

At the level, most of the variables are non-stationary since their t-statistics are insignificant, and their probabilities are above the conventional thresholds of 0.05 and 0.01. Only LFNI has a t-statistic of -2.1933 with a probability of 0.0321, hence stationary at the 5% level of significance. However, LTFC, LTAI, LTAL, and LFNL fail to reject the null

hypothesis of unit root at level, hence non-stationarity.

The important point to note here is that all the variables are stationary after first differencing. The t-statistics for each variable are significant because the probabilities are below 5%. For example, the t-statistic for d(LFNI) is -2.8672 with a probability of 0.0082. d(LTAL) is very significant with a t-statistic of -4.7033 and a probability of 0.0002. This again verifies that the problem of non-stationarity disappears after differencing.

The series are integrated of order one, I(1), and would need first differencing to achieve stationarity for reliable econometric analysis.

Table 4: Effect of Fraud on Financial Inclusion in Nigeria

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTFC	-0.101710	0.010112	-10.05801	0.0000
LTAI	0.047856	0.021270	2.249974	0.0482
LTAL	-0.011709	0.025842	-0.453114	0.6601
C	2.025066	0.224999	9.000339	0.0000
R-squared	0.919487	Durbin-Watson stat		1.765856
Adjusted R-squared	0.895333			
F-statistic	38.06775			
Prob(F-statistic)	0.000009			

Source: Authors Computation, 2024.

The first regression in the two-step hierarchical analysis explores how fraud-related factors relate to financial inclusion in Nigeria. These variables are Total Fraud Cases, Total Amount Involved, and Total Actual Loss. This model thus presents a baseline of the relationship between fraud and financial inclusion.

Results indicate that TFC significantly negatively influences financial inclusion with a coefficient of -0.1017 ($p = 0.0000$). This finding infers that increasing fraud cases weaken trust in financial institutions and subsequently diminish the level of financial inclusion. In contrast, the effect of TAI on financial inclusion is positively strongly significant at 0.0479 with a p -value of 0.0482. Though against expectation, this result could mean that greater levels of fraud encourage awareness and regulatory reforms

that unconsciously help improve financial inclusion. TAL shows a negative but statistically insignificant effect, with $p = 0.6601$, suggesting that actual financial losses due to fraud are not a direct determinant of financial inclusion.

The baseline model accounts for approximately 90% of observed variation in inclusion levels ($R^2 = 0.9195$; adjusted $R^2 = 0.8953$). Overall, the significance of the model is assured by the F-statistic being 38.068, $p = 0.000009$, while the Durbin-Watson statistic is 1.766, showing no significant issues of autocorrelation.

This first regression underlined TFC as a critical challenge to financial inclusion, while TAI has portrayed an unexpected positive relationship. These insights provide the foundational basis for further probing at the next hierarchical step of analysis.

Table 5: Effect of Fraud in the Banking System on Financial Inclusion in Nigeria and the Role of Financial Literacy

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTFC	-0.087102	0.015801	-5.512446	0.0011
LTAI	0.071242	0.023299	3.057680	0.0136
LTAL	-0.002826	0.024785	-0.114015	0.9117
LFNL	0.233275	0.030681	7.603240	0.0009
C	1.544545	0.337645	4.574462	0.0013
R-squared	0.940539	Durbin-Watson stat		1.957053
Adjusted R-squared	0.914112			
F-statistic	35.58999			
Prob(F-statistic)	0.000016			

Source: Authors Computation, 2024.

At the second level of the hierarchical regression, as shown in Table 5, the coefficients of the variables have changed from the first step of the model, showing the effect caused by adding FNL into the model.

TFC still reduces its adverse impact on financial inclusion, as its coefficient changed to -0.0871 from -0.1017 in the first stage. This decline does not take away the statistical significance of the negative relationship at $p = 0.0011$, which suggests that fraud cases still significantly hamper financial inclusion; however, adding financial literacy weakens this effect a little.

The positive association between TAI and financial inclusion has increased, with the coefficient going up from 0.0479 in the first stage to 0.0712. This means that after the introduction of financial literacy, the amount involved in fraud is more strongly related to greater financial inclusion; this may be due to increased awareness or regulatory responses attached to larger fraud amounts.

TAL remains insignificant at an effect that is statistical. The coefficient of -0.0028 and p-value of 0.9117, showing that the actual financial loss from fraud does not greatly affect financial inclusion in the first and second stages of the regression.

FNL added during the second stage has an immense positive effect on financial inclusion, with a coefficient of 0.2333 ($p = 0.0009$). This goes to imply that financial literacy significantly boosts inclusion, likely by equipping individuals to navigate and avoid fraudulent exposures within the banking system.

The constant term has dropped from 2.0251 in the first stage to 1.5445 but is still statistically significant at $p = 0.0013$, showing that a baseline level of financial inclusion exists independent of the fraud-related factors and financial literacy.

Overall, the strength of explanation has increased from the model: R-square of 0.9405, adjusted R-squared of 0.9141, with about 94% variation in financial inclusion explained by the variables. The overall significance of the model was reinforced by an F-statistic of 35.59, $p = 0.000016$. The Durbin-Watson statistic, 1.9570, suggested no significant autocorrelation in the residuals.

The inclusion of financial literacy in the second regression model reinforces the positive nexus between the amount of fraud involved and TAI, furthering financial inclusion, somewhat weakening the negative impacts of fraud cases, TFC. However, financial literacy proves to be an important factor in developing financial inclusion even within challenges related to fraud in banking systems.

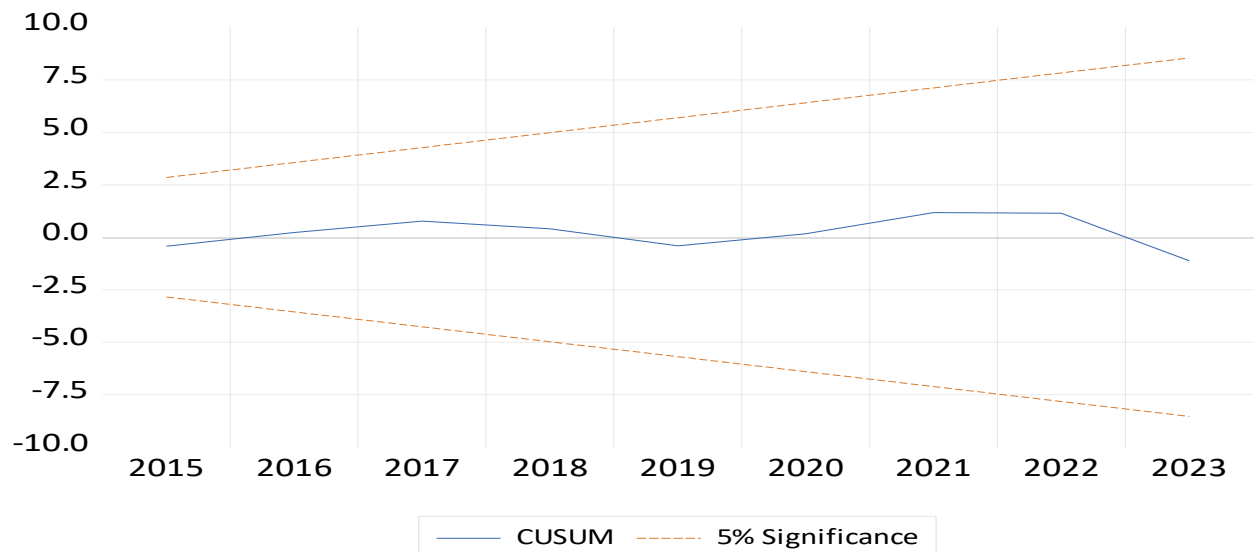
Table 6: Diagnostic Tests

Test	Output
	Prob.
Autocorrelation	0.447
Heteroskedasticity	0.0870
Normality	0.702747
VIF (mean)	2.81654

Source: Authors Computation, 2023.

The result of the diagnostics shows that probability value of autocorrelation test is insignificant, this indicates that the model's residuals do not have autocorrelation issues. Also, the probability value of the Heteroskedasticity test shows that model's residuals are homoscedastic. Residuals are normally distributed as confirmed by the insignificant normality test statistic. Also, the VIF is value id below 5 which indicates that there are no multicollinearity issues in the model.

Figure 1: Stability Test



Source: Authors Computation, 2023.

The CUSUM line of the stability test remains in the 5% significant boundary; thus, the model is stable.

Discussion

The two-step hierarchical regression analysis underlines the interrelationship between fraud in the banking system, financial literacy, and financial inclusion in Nigeria. From the first regression, as represented in Table 4, the total fraud cases are strongly negatively related to financial inclusion, thus indicating that increased fraud cases significantly reduce financial inclusion. The coefficients presented show that, though positive, the TAI bears a weak and significant effect, whereas in the case of the TAL, it shows absolutely no significance.

The regression in table 5 included financial literacy and it has a significant and positive effect. This means that financial literacy has a positive effect on financial inclusion. This reduces the negative impact of fraud because the coefficient for TFC drops to -0.0871. Correspondingly, the coefficient of TAI rose to 0.0712, implying that financial literacy may raise the positive impact of larger fraud amounts. TAL remains insignificant. Financial literacy also improved the model fit because R-squared

rose from 0.9195 to 0.9405 and the adjusted R-squared from 0.8953 to 0.9141.

The findings are in line with literature that identifies financial literacy as critical to improving financial inclusion and reducing fraud. AlSuwaidi and Mertzanis (2024) indicate that financial literacy enables individuals to identify fraud, hence trusting financial systems. In the same light, Atkinson and Messy (2012) argue that financial literacy enables one to acquire knowledge on how to safely use financial services. In this study, financial literacy mitigates the adverse impact of fraud, which corroborates the argument of Rahman and Ahsan (2024) that financial literacy programs reduce fraud vulnerability.

The findings also support Sirohi and Misra (2024), who established that financial literacy contributes to decreasing the likelihood of fraud victimization. Additionally, in support are Beck et al. (2010) and Demirgüç-Kunt and Klapper (2012), who reported that increased financial literacy has the potential to restore trust and ultimately further financial inclusion. On the other hand, Afzal et al. (2024) have documented how cyber fraud affects digital inclusion and indicate that financial literacy may reduce these risks. Overall, the analysis underlines the

importance of financial literacy in reducing the impact of fraud and improving financial inclusion in Nigeria.

Conclusion

This research examined the influence of fraud within the banking sector on financial inclusion in Nigeria. Financial literacy played an important part in the analysis. The outcomes demonstrated that fraud negatively affected financial inclusion since there existed a significant negative association between fraud incidents and the level of inclusion. When financial literacy was introduced into the regression equation, however, there appeared to be some evidence of its potential ability to mitigate any negative effects of fraud on financial inclusion. Financial literacy is positively determinative of financial inclusion. It can be concluded that financial literacy could help individuals use financial institutions more safely and protect themselves against fraud. These findings support the conclusion that financial literacy programs need to be given due consideration, particularly targeting marginalized groupings, if significant advances are to be made both in expanding the nation's financial inclusiveness and limiting fraud within its banking sector.

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