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Analysis Of The Effect Of Financial Technology (Fintech) On Financial Inclusion In Nigeria

OMONODE, Augustine T[1] M.Sc, EHIEDU, Victor C[2] Ph.D, Erhijiakpor Andrew E.O.[3] Ph.D

1Doctorate Research Student, *2Professor of Banking & Finance, 3Associate Professor of Banking & Finance*
[1, 2, 3] Banking and Finance Department, Delta State University, Abraka. Nigeria

Abstract: *This study examined the analysis of the effect of financial technology (FinTech) on financial inclusion in Nigeria from the period of 1993 to 2022 (30years). In order to evaluate the effect of financial technology on financial inclusion in Nigeria, the following measures financial technology, namely; Automated Teller Machine (ATM), Point of Sale (POS), Internet Banking (INTB), Nigeria Interbank Settlement System (NIBSS) and Nigeria Electronic Fund Transfer (NEFT) in relation to financial inclusion proxied with Number of Bank Branches (NBB) in Nigeria. The CBN Statistical Bulletin, CBN Annual Report and CBN Bank Supervisory Annual Report from 1993-2023 were used to acquire data for the research. Descriptive statistics, correlation analysis, diagnostics tests, unit root test, and multiple regression analysis were used to assess the research hypotheses. Based on the results of the previous chapter, ATM has a negative significant effect on NBB, POS has a positive significant effect, INTB has a negative insignificant effect on NBB, and MOB has a positive significant effect on NBB. NIBSS has a positive significant effect on NBB with a p-value (sig. value) of 0.0000, while NEFT has a negative significant effect on NBB with P-value of 0.0540. The study recommended that managers of financial institution should from time to time train customers with regard to ATM, its benefits, risk exposure, physical and electronic security to avoid financial loss in the hands of hackers, trainings should be held for bank staff in short periods to acquaint them with modern developments of the sophisticated technology in changing times to improve the financial inclusion in Nigeria.*

Key Words: Financial, Technology, Automated, Point of Sale, Internet, Banking (INTB),

Interbank, Settlement and Inclusion

Introduction

The 21st-century economic and financial policy objectives include the realization of inclusive economic and financial development through FinTech resourceful mobilization and allocation of economic and financial resources to economic agents particularly the active poor (Odeleye & Oyeneye, 2022). Largely comprising of the rural dwellers most commonly referred to as the "*Base of the Pyramid*" (BoP) living in extreme poverty on an income of less than $2.00 per day (Udo, et al, 2019). According to the Ephraim, et al, (2023) for inclusive financial development, more than 200 million small- and medium-sized businesses in emerging economies are financially and data excluded, thus limiting their competitiveness and ability to thrive. Despite extensive progress made by banks, microfinance, savings and loans institutions, credit unions, and cooperative societies in extending financial services to marginalized groups, about 2.5 billion of the world's adult population, are excluded from the formal financial services (Udo, et al,, 2023; Udo, et, al 2019).

In Nigeria, about 38.3 million adults are data and financially excluded out of which 21.3 million are adult women representing 20% and 17 million men (Udo, et, al 2023). The United Nations (2021) report disaggregated financial exclusion into; voluntary and involuntary exclusion. Voluntary exclusion arises from economic agents' decision not to use financial services either because they have no immediate need for them or due to cultural and religious beliefs. Others also cite inadequate household incomes, commuter distances from financial service providers, cumbersome documentation, market failures, and imperfections associated with the free market as reasons for their involuntary exclusion (Chen, et al, 2021).

FinTech involves the integration of information and communication technology into the operational and business activities of classical financial systems for financial transactions, payment, insurance, and peer-to-peer lending (Chinoda, et al, 2019). The incorporation of financial technology (FinTech) into the mainstream operational and business activities of the classical financial systems has successfully reshaped, restyled, and eliminated some of these barriers (Udo, et, al 2023). Financial inclusion is the integration of the various FinTech platforms to make formal financial services available, accessible, and affordable to all households and enterprises, regardless of their level of income (Demir, et al, 2020).

To address the upshot of widespread involuntary exclusion, exposure of the active poor to usurious moneylenders, the inability of the poor to improve earnings, protect themselves in times of crisis, and build for the future (Udo, et, al 2023; Gosavi, A. (2018)). Also, in a bid to address the upshot of widespread involuntary exclusion, in Nigeria the Central Bank of Nigeria (CBN) in 2012, reintroduced the financial inclusion strategy to improve adult access to financial products and services from the 21.6% reported in

2010 to 70% in 2020, access to savings from 24.0% to 60%, credit from 2% to 40%, insurance from 1% to 40%, and pension from 5% to 40% (Udo, et. al 2023; Udoh, Udo, et al, 2018).

The rapid evolution in development communication, internet services, availability of mobile and smartphones, and the availability of information technology infrastructure, to the rural dwellers, has enormously transformed and provided secure, low-cost, and contactless financial instruments across ecosystems, enhanced cashless financial systems and limited traditional branch-based banking (Van, & Linh, 2019; Udo, et. 2019; Abiola, et al, 2020 and others). This is evidenced in the Nigerian Inter-Bank Settlement System (NIBSS) report (2022) on active accounts with a bank, credit union, microfinance institution, and mobile money service providers increasing by 14.41% from 97.485million to 111.54million in 2022 (Udo, et, al 2023). Total savings increased by 13.8% from N114.13 million in 2019 to N 138.91 million in May 2022. The geometric increase could be attributed to the Covid-19 safety measures of social and economic lockdown (Udo, et, al 2023; Udo, Akpan, et,al 2019), to curtail the spread of the virus. The lockdown period reinforced the importance of cost-effective, affordable, available, and flexible, agency banking channels as a vital part of the financial ecosystem. On an operational basis, most agents rebalance through the ATM to meet liquidity needs (Udo, Akpan, et, al, 2019).

To capture the essence of "out of mainstream banking and financial FinTech. This study broadened the definition of a direct measure of FinTech as the total value of transactions on retail digital platforms which include ATMs, point of sales, internet banking, mobile payment, Nigerian Interbank Settlement System Instant Payment (NIP), Nigerian Interbank Settlement System Electronic Fund Transfer (NEFT), and E-billsPay transactions. The FinTech platforms considered in this study are mobile banking [MOB], point of sales [POSs], web pay [WBP], and automated teller machines [ATM]. This study contributed by unbundling the financial inclusion indicators to access individual contributions to financial inclusion and economics in Nigeria and also help tailor specific policies to each of the individual indicators of financial inclusion.

Statement of the Problem

Despite these laudable feats, financial technology, though at its infancy has not performed to its full potentials in the financial industry, with over 48 percent of its adult being financially excluded, (adult literacy rate of 62 percent). The low coverage of banking and credit in Nigeria implies that a substantial fraction of the population may not have access to credit and liquidity. As the literacy rate increased by eleven percent over ten years (2008-2018) to 62.02% and internet penetration through GSM data usage also increased, nevertheless, more than 30 million adult Nigerians do not have or use either formal or informal financial services products. These constraints prevent relative prices from resolving disequilibria, amplifying the impact of shocks on employment, production, consumption, and causes inefficient intermediation of savings which reduce returns on real investment amongst others.

Different frameworks were also put in place by the central bank of Nigeria to foster inclusion, such as the Financial System Strategy 2020, which has financial inclusion as one of its major objectives, but the problem persists as the number of exclusion keeps increasing. Financial inclusion is a huge challenge in Nigeria. The low coverage of banking and credit services in Nigeria implies that a substantial fraction of the population may not have access to credit and liquidity. Low internet penetration and low literacy rate; shocks on employment, production, consumption and inefficient intermediation of savings aggravate the return on real investment, which consequently increase poverty among the populace. Based on this premise, the study is to evaluate the impact of financial technology (FinTech) on financial inclusion proxied with number of bank branches (NBB) in Nigeria.

2. Financial Technology (FinTech)

Financial technology is perhaps the best innovation that has happened in the banking industry in the 21st Century. It has made banking possible away from banking premises. Banking can now take place anywhere using various electronic devices like mobile phones, automated teller machines, point-of-sale systems, smart televisions, computers, tablets, among others. Today, different baking transactions can be completed or initiated from different locations outside banking premises such as transfer and receipts of funds, balance enquiry, purchase of airtime, payment of bills and account opening (Abor, et al, 2018). Financial technology (FINTECH) can be described as a process whereby firms combine financial services with modern, innovative technologies in order to distribute financial services in a more effective and less costly manner (AlMomani & Alomari, 2021). The concept of Financial Technology has been defined in many ways by researchers. Anarfo, et al (2019) defines the concept as the delivery of information and services by banks to customers via different delivery platforms that can be used on different electronic devices such as personal computers, mobile phones or digital televisions with browsers or desktop software. As good as this definition appears, it does not take into cognizance other platforms for financial technology such as automated teller machines, internet banking and point-of-sales which are the focus of this study.

Similarly, Chinoda and Mashamba, (2021) defined financial technology as any use of information and communication technology and other electronic means by a bank to conduct transactions and have interaction with stakeholders. This definition is however broader than that of Daniel as it focuses on information and communication technology. Chinoda and Mashamba, also posited that financial technology is a system of payment whereby transaction takes place electronically without the use of cash. Della-Peruta, (2018), defined financial technology as provision of banking and financial services with the help of telecommunication devices such as mobile telecommunication devices. Succintly, Lv & Xiong (2022), defined financial technology as nothing but e-business in the banking industry. From these definitions therefore, financial technology may be viewed as a generic term for describing delivery of banking services and products through electronic channels, such as mobile phones, the internet, automated teller machines and point-of-sales facilities. In simple words, financial technology implies provision of banking products and services through electronic delivery channels.

Financial technology has been around for quite some time in the form of automated teller machines and mobile phone transactions, however, in more recent times, it has been transformed by the internet—a new delivery channel that has facilitated banking transactions for both customers and banks (Kammoun, et al, 2020). The scope of offered services offered by financial technology may include facilities to conduct bank transactions, to administer accounts and to access customized information. In the broader sense financial technology enables the execution of financial services in the course of which—within a technological procedure the customer uses communication techniques in conjunction with telecommunication devices.

2.1.2 Financial inclusion

Financial inclusion, on the other hand is seen as a process where all members of an economy do not have difficulty in opening bank accounts; can access credit; and can conveniently, easily and consistently use financial system products and facilities without difficulty (Georgios, et al, 2020). Financial inclusion is a process by which all households, individuals, and businesses regardless of income level have access to affordable, flexible, eco-friendly, and appropriate financial services that meet their daily financial and economic needs to improve their lives (Gosavi, 2018). The maxim of financial inclusion fundamentally inferred connecting the unbanked and under banked individuals, businesses, and households to far-reaching economic benefits and financial services (Siddik et al., 2019; Udo, et, al 2023). Financial development and financial inclusion are broadly two inseparable concepts (financial inclusion is a basic determining element of financial development), it is imperative to establish that a country may be financially developed with several individuals, businesses, and households and data excluded from the mainstream financial system (Ene, et al, 2019). Both promote economic growth with divergent magnitudes.

Comprehensively, Ene (2019) outlined financial inclusion as a delivering of basic banking services at an affordable cost to all sections of the society, especially the vast disadvantaged and low-income groups who tend to be excluded from formal banking system. Financial inclusion requires that attention is given to human and institutional issues, such as quality of access, affordability of products, provider sustainability, and outreach to the most excluded populations. Financial inclusion can therefore be defined as access to finance and financial services for all in fair, transparent and equitable manner at an affordable cost (Nwafor, 2018).

2.2 Theoretical Review

2.2.1 Schumpeterian Theory of Creative Destruction

Enueshike and Okpebru (2020) cited Schumpeter (1928, 1939), who saw technical upheavals as constant gales of creative destruction that drove capitalism progress. Some academics have contrasted Schumpeter's early theory, which focused on entrepreneurs taking risks as "an act of will," from his later thinking, which acknowledged major businesses as orchestrating and encouraging technological upheavals. He concentrated on oligopolies and innovation, which was misconstrued as his key contribution (Frost, 2021), quoting Schumpeter (1928), stressed the discontinuous and disruptive nature of technical progress under capitalism, which leads to an inextricable combination of short-term instability and long-term growth. He was conscious of social and organisational forces in his cyclical industrial transformation process but not a technological determinist.

Schumpeter believed that entrepreneurs—whether solitary inventors or R&D engineers in large companies—created new profit opportunities with their ideas. Thus, imitators tempted by super-profits would invest, diminishing the innovation's profit margin. Schumpeter's Kondratiev cycles would restart the business cycle before the economy could rebalance (Georgios, Panos & Wilson, 2020). He further, showed how little neoclassical economics could explain. Solow analysed US economic data from 1909 to 1949 to show that higher capital utilisation accounted for only 12.5% of per capita output growth. Solow attributed the massive 87.5 percent residual to technical change. Gosavi (2018) agrees with Solow and urges technological disruption theorists to include Fintech in their models. Schumpeter's foundation's study on Fintech concentrated on its emergence and spread throughout firms, industries, and regions.

The Schumpeterian theory is relevant to this study because new technology has replaces old technology, which is better because new technology increases efficiency, leading to better financial inclusion in Nigeria, especially the rural areas.

2.3 Empirical Review

Ephraim, et al (2023) explored the nexus between FinTech and financial inclusion in Nigeria employed the indirect measures of FinTech. Previous studies in this area also adopted a bundle indicator of financial inclusion ignoring the individual indicators effect. This study contributes to the extant literature by expanding the generic FinTech frontier to capture the direct measures (automated teller machine, web pay, mobile banking, and point of sale) and also test the model on Nigeria by unbundling financial inclusion indicators individual index to examine the degree of contribution. The autoregressive distributed lag (ARDL) bounds test cointegration approach was used to estimate the respective equations and find evidence of a long-run nexus between FinTech, financial inclusion, and economic growth. The direct measures of FinTech positively and significantly impact financial inclusion and economic growth. The negative nexus between automated teller machines, financial inclusion, and economic growth can be attributed to the closure of most automated teller machine galleries in bank branches and outside the branches due to, high maintenance costs and insecurity around galleries. This is evident in the long waiting time to use the automated teller machine and the growing number of bank customers further suggests that the current 22,500 automated teller machines are insufficient to enhance inclusive growth in Nigeria. Individual financial inclusion indicators positively impact economic growth while the usage dimension of financial inclusion improves economic growth but not significantly. Also, bank branches had a positive and significant impact on economic growth, and credit to private had a non-significant effect.

Odeleye and Oyeneye (2022) examined the impact of financial technology on financial inclusion in Nigeria is the focus of this paper. ARDL method was employed to test the relationship between Fintech and financial inclusion on a quarterly time-series data from 2009 to 2019. The empirical result of the study shows that financial technology has significant and negative impact on financial inclusion; implying that the current state of the country's financial technology does not translate to improvement in financial inclusion in the short-run. In addition, it shows that economic growth significantly influenced financial inclusion in Nigeria on short-run and long-run basis respectively. Therefore, we recommend the need for radical collaboration among all stakeholders in Fintech industry, ministry of science, technology, National Communication Commission, and traditional saving institutions, to enhance the long-run positive impact of Fintech on financial inclusion in Nigeria.

Employing the panel analysis for 49 Sub-Saharan countries for the period 2000- 2012, Asongu and Le Roux (2017), reported that broadband and mobile phone penetration positively impacted inclusive growth, suggesting that growth was sustained over a period due to the penetration of broadband and mobile phones. In another study, Abor, et al (2018), confirmed that mobile ownership reduced the chance of individuals falling into poverty. Also, the result of Peruta (2018) on the pattern of mobile money adoption in emerging and developing countries, for the period 2011 to 2014, showed that it had a positive and significant influence on access to formal bank services. Similarly, Gosavi (2018) reported that mobile phones based on financial technology had positive influence on financial transactions. This suggests that the adoption of mobile money by firms can help them mitigate the problem of access to finance. Findings of Asongu and Odhiambo (2019), on 48 African countries, showed that mobile, internet and broadband penetration impacted negatively on inequality in Africa for sustainable development. Employing the system Generalized Method of Moments between 1996 and 2014, for 48 African countries, Tchamyou, et al (2019), found that ICT reduced income inequality via formal financial sector and non-formal financial sector respectively.

Cross-country analyses were conducted by some authors (Ouma, et al, 2017; Tah, 2019; Enueshike & Okpebru, 2020; Wale-Awe, et al, 2020). They showed that technology increased savings among the poor; transfers of funds had significant effects on financial services, as well as increase in rural areas' deposits and loans availability to SMEs respectively. Anarfo, et al (2019) investigated the relationship between monetary policy and financial inclusion in Sub-Saharan Africa and found the existence of a bi-directional relationship between financial inclusion and monetary policy. It contradicts Evans (2016) that found a unidirectional relationship from monetary policy effectiveness to financial inclusion. However, the work of Bakari, et al (2019) showed that financial inclusion had a strong correlation on poverty reduction when examining the impact of financial inclusion on poverty alleviation in the sub-Saharan region between 1980 and 2017. It also showed that the causality flowed from monetary policy effectiveness to financial inclusion and not vice versa. In another study, Chinoda and Mashamba (2021) investigated the effects of financial technology, and financial inclusion on income inequality in 25 African countries using Foreign Financial Institution (FFI) model for the period 2011 to 2017. The result of the study shows that financial inclusion interacted with financial technology positively and significantly reduced income inequality in Africa. In addition, employing the provincial panel data over the period 2011 to 2018, Lv and Xiong (2022) reported that Fintech positively and significantly improved corporate investment efficiency in China. This suggests that the development of regional Fintech promotes corporate investment efficiency in China.

2.4 Literature Gaps: Recent studies on the subject matter are relatively few, especially in Nigeria. More so, existing literature employed quarterly data while ours is annual. Annual data are generally more detailed than quarterly data, as its data cover a longer period; hence, its findings can be forecasted for long-term goals. Our study therefore contributes to extant literature on the impact of

financial technology on poverty reduction. Also, previous studies has mixed findings, which implies that there is gap in literature this study intends to fill by investigating financial technology on financial inclusion in Nigeria.

Research Methodology

The research design for this study was based on the ex-post facto research design. Ex-post facto research design involves the ascertaining of the impact of past factors on the present happening or event. It is also used because it is structured to find, describe and interpret a social phenomenon which this study is aimed at. The method of data collection used in this study is the secondary source of data (time series data), from the CBN Statistical Bulletin, CBN Annual Report and for the period 1994-2023. The statistical technique of data analysis was adopted in this study. The study conducts a unit roots test for the time series data in order to ascertain if they are stationary or not. After which, the descriptive statistics and the correlation analysis was used to determine the nature of relationship between the independent and dependent variables. In view of the hypothesis formulated for this research, the method of data analysis chosen were the ordinary least squares multiple regression analysis which was used through the Regression model, using the computer software, E-VIEWs 9.0. This is the appropriate measures taken to analyze data as regards the study in question.

The study adapted the model from the study of Chinoda and Mashamba (2021) and Lv and Xiong (2022), those their respective study made used of single and double independent variable, which is quite different from the six independent variables used in this study. Hence, the introduction of more independent variables made the model unique and different from the adapted model. The model which specifies that financial inclusion proxied by Number of Bank Branches (NBB) is significantly influenced by the financial technology (Automated Teller Ma chine (ATM) transactions, Point of Sale (POS) transactions, Internet Banking (INTB) transactions, Mobile Banking (MOB) transactions, Nigeria Interbank Settlement System (NIBSS) transactions and Nigeria Electronic Fund Transfer (NEFT) transactions) is formulated as follows: With a functional model of:

NBB = f(ATM, POS, INTB, MOB, NIBSS, NEFT)
Econometrically expressed as:
$NBB = \beta_0 + \beta_1 ATM + \beta_2 POS + \beta_3 INTB + \beta_4 MOB + \beta_5 NIBSS + \beta_6 NEFT + U$
Where:
NBB = Number of Bank Branches
β_0 = Constant Term
β_1 = Coefficient of Automatic Teller Machine Transactions
ATM = Automatic Teller Machine Transactions
β_2 = Coefficient of Point of Sale Transactions
POS = Point of Sale Transactions
β_3 = Coefficient of Internet Banking Transactions
INTB = Internet Banking Transactions
β_4 = Coefficient of Mobile Banking Transactions
MOB = Mobile Banking Transactions
β_5 = Coefficient of Nigeria Interbank Settlement System (NIBSS) Transactions
NIBSS = Nigeria Interbank Settlement System (NIBSS) Transactions
β_6 = Coefficient of Nigeria Electronic Fund Transfer Transactions
NEFT = Nigeria Electronic Fund Transfer Transactions
U = Disturbance Term (other variable not mentions in the model)
The a priori expectation is $\beta 1, \beta 2, \beta 3, \beta 4, \beta 5, \beta 6 > 0$

Table 3.1: Variable Descriptions

Variables	Category of Variables	Description
Number of Bank Branches (NBB)	Dependent Variable	Is a proxy on financial inclusion, measures number of bank branches in Nigeria
Automated Teller Machine (ATM)	Independent Variable	ATM is described in the study as the total value of ATM transactions in Nigeria. ATM = Total value of ATM transactions or usage by the number of people.
Point of Sale (POS)	Independent Variable	POS is described as the total value of POS transactions in Nigeria. POS = Total value of POS transactions
Internet Banking (INTB)	Independent Variable	INTB is described as an online service that transfer funds

		from a customer to another. INTB =Total value of web payment transactions
Mobile Banking (MOB)	Independent Variable	MOB is described as the total value of mobile payment transactions in Nigeria. MOB = Total value of mobile payment transactions
Nigeria Interbank Settlement System (NIBSS)	Independent Variable	NIBSS is described as electronic funds from the account of beneficiary maintained with any other bank branch. NIBSS= Total volume of interbank transfer.
Nigeria Electronic Fund Transfer (NEFT)	Independent Variable	NEFT is an irrevocable electronic fund transfer instruction for payment to a 3rd party bank.

Results and Discussion

Under this sub-heading, various analyses was conducted, this was done below;

Table 4.1: Descriptive Statistics

	NBB	ATM	POS	INTB	MOB	NIBSS	NEFT
Mean	30.15200	1651.647	635.2960	79.75033	440.7650	14948.31	20132.11
Median	22.10500	95.84000	9.140000	24.14000	1.190000	190.3000	8782.070
Maximum	106.7100	7900.140	9400.160	675.9200	5080.960	72879.83	195785.2
Minimum	-60.07000	2.030000	1.010000	5.120000	1.010000	15.89000	552.7800
Std. Dev.	32.49869	2478.709	1816.958	145.2853	1046.275	24167.63	45757.85
Skewness	0.449031	1.302374	4.039035	3.103706	3.265502	1.318338	3.372925
Kurtosis	3.816572	3.253445	19.50164	12.17008	14.19805	3.179596	12.59448
Observations	30	30	30	30	30	30	30

Source: EVIEW, 9.0 Outputs, 2024.

Table 4.1 above is the presentation of the descriptive statistics. The mean value for the NBB recorded a mean value of 30.1520 with a standard deviation of 32.4987. Also, ATM, recorded a mean of 1651.65 and standard deviation of 2478.71, POS recorded that a mean of 635.30 with a standard deviation of 1816.96, INTB recorded that a mean of 79.7503 with a standard deviation of 145.2853, MOB recorded an average value of 440.7650 with a standard deviation of 1046.375, NIBSS recorded an average of 14948.31 with standard deviation of 24167.63 and NEFT recorded an average of 20132.11 and standard deviation of 45757.85. Since the standard deviations for all the variables are greater than respectively means, it shows that the data are widely dispersed.

The normal distribution has a kurtosis of three, which indicates that the distribution has neither fat nor thin tails. Consequently, if an observed distribution has a kurtosis greater than three, the distribution has heavy tails when compared to the normal distribution. Since some the kurtosis coefficients in Table 4.1 are lesser than 3, this shows that NBB, ATM and NIBSS have thin tails while POS, INTB, MOB and NEFT thick tails because the kurtosis is greater than 3 when compared to the normal distribution.

Table 4.2: Correlation Matrix

	ROE	ATM	POS	INTB	MOB	NIBSS	NEFT
ROE	1.000000						
ATM	-0.200770	1.000000					
POS	-0.074228	0.740401	1.000000				
INTB	-0.158503	0.727692	0.440898	1.000000			
MOB	-0.079182	0.750264	0.635740	0.794510	1.000000		
NIBSS	-0.148624	0.918991	0.732104	0.736206	0.801271	1.000000	
NEFT	-0.100715	0.415811	0.719635	0.119810	0.345841	0.622895	1.000000

Source: EVIEW, 9.0 Outputs, 2024.

The correlation test is presented in Table 4.2 and it shows the absence of multi-co linearity among the variables since the correlation values are less than 0.7. Furthermore, the result shows the explanatory variables namely; ATM, POS, INTB, MOB, NIBSS and NEFT has negative strong correlation with NBB in Nigeria.

Table 4.3: Variance Inflation Factors Multicollinearity Test

Variance Inflation Factors
Date: 01/15/24 Time: 01:29
Sample: 1994 2023
Included observations: 29

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	76.47617	2.297524	NA
ATM	0.000129	34.85651	3.250911
POS	8.50E-05	9.501951	8.398498
INTB	0.007643	6.356742	4.803544
MOB	0.000156	6.079915	5.104478
NIBSS	2.32E-06	56.72571	4.108785
NEFT	1.90E-07	13.82719	1.151798

Source: EVIEW, 9.0 Outputs, 2024.

Since the data for the study are annual time series, the multicollinearity test was conducted to ascertain if the data contained multicollinearity, this is presented in table 4.3 above. Multicollinearity occurs in a data set when two or more independent variables in multiple regression models are highly correlated. In order to ensure that the results of this study are valid, the variance inflation factor (VIF) computed as shown in Table 4.3. Furthermore, the Centered Variance Inflation Factor (CVIF) statistics for all the independent variables consistently lies between 3.2509, 8.3985, 4.8035, 5.1045, 4.1088 and 1.1518 for ATM, POS, INTB, MOB, NIBSS and NEFT respectively. This indicates the absence of multicollinearity problems among the variables under investigation because the cut off value of VIF is 10. Values of VIF that exceed 10 are often regarded as indicating multicollinearity.

Table 4.4a: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.333244	Prob. F(2,20)	0.7205
Obs*R-squared	0.935241	Prob. Chi-Square(2)	0.6265

Source: E-VIEW, 9.0 Outputs, 2024.

Prior to estimating the models, residuals of the variables were ascertained to check for the presence of serial correlation. This was done using the serial correlation LM test. The serial correlation LM test in Table 4.4a details that there is no element of serial correlation in the models owing to the fact that the p-values of the f-statistics are insignificant at 5% level of significance.

Table 4.4b: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.427927	Prob. F(6,22)	0.8524
Obs*R-squared	3.030796	Prob. Chi-Square(6)	0.8050
Scaled explained SS	2.722576	Prob. Chi-Square(6)	0.8428

Source: E-VIEW, 9.0 Outputs, 2024.

The situation in which the variability of a variable is unequal across the range of values of a second variable that predicts it leads to problem of heteroskedasticity. To ensure that there is homoscedasticity in the model estimation, the heteroskedasticity test via the Breusch-Pagan-Godfrey was performed. With the result there is no problem of heteroskedasticity in the models as the p-values of the f-statistics are insignificant at 5% significance level.

Table 4.4c: Ramsey RESET Test

Equation: UNTITLED

Specification: NBB C ATM POS INTB MOB NIBSS NEFT

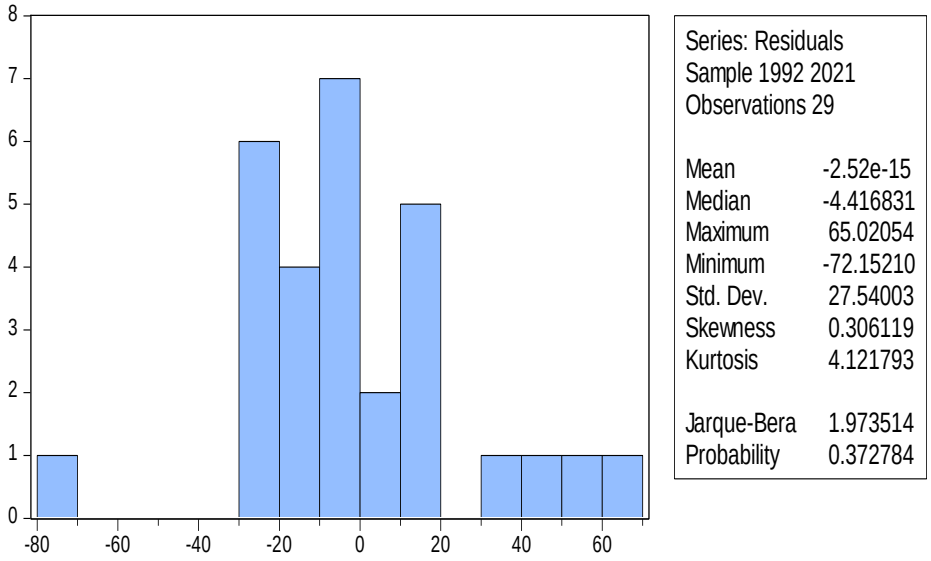
Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	1.179840	21	0.2513
F-statistic	1.392022	(1, 21)	0.2513
Likelihood ratio	1.861287	1	0.1725

Source: E-VIEW, 9.0 Outputs, 2024

From the Table 4.4c above, it confirms that the Durbin Watson stat that our data has no traits of autocorrelation. Indicates that the model is homoskendastic since the probability values of three parameters are greater than 0.05 level of significance. Ramsey test result reveals that our model is correctly specified and is stable for regression analysis.

Table 4.4d: Normality Histogram Test



Source: E-VIEW 9.0 Output, 2024.

The test of residuals for normality was conducted to assess the distribution normality of the model residuals. When residuals are not normally distributed, it denotes the presence of significant outliers in the data which affects the standard errors and then the significance levels of the coefficients. From the test result, it indicates that the residuals are normally distributed as the histogram assumes a bell-shape and the J-B statistic probability value is 0.3728 which is greater that 0.05(5%), this form the premise to reject the null hypotheses that the residuals are not normally distributed.

Augmented Dickey-Fuller (ADF) Unit Root Test

Testing for the existence of unit roots is a principal concern in the study of time series models and co-integration. The rationale behind this test is to avoid the problem of spurious regression which is commonly associated with time series data. The presence of a unit root implies that the time-series data under investigation is non-stationary; while the absence of a unit root shows that the stochastic process is stationary. The unit root test was conducted using the Augmented Dickey-Fuller (ADF) Unit root test as presented in table 4.5 below:

Table 4.5: Augmented Dickey-Fuller Unit root Test

Test Variables	ADF Test Statistic Value	Mackinnon Critical Value @ 5%	Order of Integration	P-Value	Decision
@Level					
NBB	-3.548069	-3.967767	1(0)	0.0737	Non-Stationary
ATM	-3.832469	-3.998064	1(0)	0.0984	Non-Stationary
POS	4.001880	-5.004861	1(0)	0.1231	Non-Stationary
INTB	-2.400930	-2.967767	1(0)	0.1502	Non-Stationary
MOB	-2.400930	-3.679322	1(0)	0.1702	Non-Stationary
NIBSS	1.646180	-2.967767	1(0)	0.9993	Non-Stationary
NEFT	0.414901	-3.029970	1(0)	0.9780	Non-Stationary
@1st Difference					
NBB	-5.181379	-2.976263	1(1)	0.0003	Stationary
ATM	-3.395119	-3.004861	1(1)	0.0544	Stationary
POS	3.645139	-3.012363	1(1)	0.0375	Stationary
INTB	-3.894809	-3.012363	1(1)	0.0528	Stationary
MOB	8.578086	-3.012363	1(1)	0.0000	Stationary
NIBSS	-3.949972	-2.971853	1(1)	0.0053	Stationary
NEFT	-3.892374	-3.040391	1(1)	0.0093	Stationary

Source: E-VIEW, 9.0 Outputs, 2024.

The summary of the ADF unit root test output in table 4.5, above revealed that all the variables under investigation i.e. ROE, ATM, POS, INTB and MOB are not stationary at level but contain unit root test at their first difference 1(1). Evidence of this could be seen from the value of their respective ADF statistics which is more than the critical value at 5%. Moreover, additional evidence of stationary series could also be seen from the p-value for all variables which is less than 5% level of significance greater than 95% confidence level. They all attained stationarity at first difference i.e. at order one, hence, the data are suitable for regression.

Table 4.6: Multiple Regression Analysis

Dependent Variable: NBB
Method: Least Squares
Date: 01/15/24 Time: 01:16
Sample: 1994 2023
Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	43.41754	8.745065	4.964804	0.0001
ATM	-0.024253	0.011376	-2.131983	0.0444
POS	0.026820	0.009222	2.908263	0.0518

INTB	-0.115378	0.087423	-1.319770	0.2005
MOB	-0.005605	0.012498	-0.448502	0.6582
NIBSS	0.012897	0.001522	8.473719	0.0000
NEFT	-0.000879	0.000435	-2.017604	0.0540

R-squared	0.912017	Mean dependent var	28.09586
Adjusted R-squared	0.831775	S.D. dependent var	31.02457
S.E. of regression	31.06934	Akaike info criterion	9.916825
Sum squared resid	21236.69	Schwarz criterion	10.24686
Log likelihood	-136.7940	Hannan-Quinn criter.	10.02019
F-statistic	0.986561	Durbin-Watson stat	1.904056
Prob(F-statistic)	0.048096		

Source: EVIEW, 9.0 Outputs, 2024.

The multiple regression results in Table 4.6 above, the coefficient of ATM is -0.0243 with a t-value of -2.1320 and an associated p-value (sig. value) is 0.0444. This suggests that ATM have a negative significant effect on NBB. This relationship is significant given the fact that the p-value of 0.0444 is lesser than 0.05 (5%) level significance, hence, the alternate hypothesis is accepted and null hypothesis is rejected; which says that ATM does not have significant effect on NBB in Nigeria, this may due to high level illiteracy in the country. The coefficient of ATM is -0.0243, which imply that ATM has a negative trend with NBB. One percent (1%) movement in ATM would lead to 2.43% decrease in NBB in Nigeria. This finding is in tandem with the findings of but Ephraim, Etima and Udo, (2023) contradicts the findings of

Also, the multiple regression results in Table 4.6 above, the POS coefficient of 0.0268 with a t-value of 2.9083 and an associated p-value (sig. value) of 0.0518. This suggests that POS have a positive significant effect on NBB. This relationship is significant given the fact that the p-value of 0.0518 is equal to 0.05 (5%) level significance, thus, the null hypothesis which says that POS does not have significant effect on NBB is rejected and alternate hypothesis is accepted. The coefficient of POS is 0.0268 which imply that POS has a positive trend with NBB. One percent (1%) movement in POS would lead to 2.68% increases in NBB in Nigeria. The finding is in agreement with the findings of Ephraim, Etima and Udo, (2023) and Odeleye and Oyeneye (2022) but contradicts the findings of Peruta (2018).

More also, the multiple regression results in Table 4.6 above, the coefficient of INTB is -0.1154 with a t-value of -1.3198 and an associated p-value (sig. value) is 0.2005. This suggests that INTB have a negative insignificant effect on NBB. This relationship is not significant given the fact that the p-value of 0.2005 is greater than 0.05 (5%) level significance; hence, the null hypothesis which says that INTB does not have significant effect on NBB is accepted while the alternate hypothesis is rejected. The coefficient of INTB is -0.1154, which imply that INTB has a negative trend with NBB. One percent (1%) movement in INTB would lead to 11.54% decrease in NBB in Nigeria. The finding is in agreement to the findings of Ephraim, Etima and Udo, (2023), Peruta (2018) and Odeleye and Oyeneye (2022).

Similar, the multiple regression results in Table 4.6 above, the coefficient of MOB is -0.0056 with a t-value of -0.4485 and an associated p-value (sig. value) is 0.6582. This suggests that MOB have a negative insignificant effect on NBB. This relationship is not significant given the fact that the p-value of 0.6582 is greater than 0.05 (5%) level significance, the null hypothesis which says that there is no significant relationship between MOB and NBB is accepted and the alternate hypothesis is rejected. The coefficient of MOB is -0.0056 which imply that MOB has a negative trend with NBB. One percent (1%) movement in MOB would lead to 0.56% decrease in NBB in Nigeria. This finding is in tandem with the findings of Ephraim, Etima and Udo, (2023) and Peruta (2018)but contrary to the findings of Odeleye and Oyeneye (2022).

Furthermore, the multiple regression results in Table 4.6 above, the NIBSS coefficient of 0.0129 with a t-value of 8.4737 and an associated p-value (sig. value) of 0.000. This suggests that NIBSS have a positive significant effect on NBB. This relationship is significant given the fact that the p-value of 0.000 is lesser than 0.05 (5%) level significance, thus, the null hypothesis which says that NIBSS does not have significant effect on NBB is rejected and alternate hypothesis is accepted. The coefficient of NIBSS is 0.0129 which imply that NIBSS has a positive trend with NBB. One percent (1%) movement in NIBSS would lead to 1.29% increases in NBB in Nigeria. The finding is in agreement with the findings of Ephraim, Etima and Udo, (2023) but contrary to the findings of Odeleye and Oyeneye (2022) and Peruta (2018).

Finally, the multiple regression results in Table 4.7 above, the coefficient of NEFT is -0.0009 with a t-value of -2.0176 and an associated p-value (sig. value) is 0.0540. This suggests that NEFT have a negative significant effect on NBB. This relationship is significant given the fact that the p-value of 0.0540 is greater than 0.05(5%) level significance, hence, the alternate hypothesis is accepted and null hypothesis is rejected; which says that NEFT does not have significant effect on NBB in Nigeria. The coefficient of NEFT is -0.0009, which imply that NEFT has a negative trend with NBB. One percent (1%) movement in NEFT would lead to 0.09% decrease in NBB in Nigeria. This finding is in tandem with the findings of Odeleye and Oyeneye (2022) but contradicts the findings of Ephraim, Etima and Udo, (2023).

5.1 Conclusion

In the light of the findings, it evident that measures of financial technology (FinTech) used has mixed effects on financial inclusion in Nigeria. However, majority of the independent variables such ATM, POS, NIBSS and NEFT has significant effects on NBB in Nigeria while INTB and MOB established an insignificant effects on NBB in Nigeria. Hence, the study concluded that a financial technology (FinTech) on financial inclusion in Nigeria.

5.2 Recommendations

In line with the objectives and findings, we recommend that:

1. Managers of financial institution should from time to time train customers with regard to ATM, its benefits, risk exposure, physical and electronic security to avoid financial loss in the hands of hackers, trainings should be held for bank staff in short periods to acquaint them with modern developments of the sophisticated technology in changing times to improve the financial inclusion in Nigeria.

2. Managers of financial institution should improve service quality and customer responsiveness in cases of lost or stolen cards, frauds, and other customer complaints in relation to point of sale to enhance the financial inclusion in Nigeria.

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

4. Managers of DMBs should improve service quality and customer responsiveness in cases of lost or stolen cards, frauds, and other customer complaints in relation to point of sale, USSD and mobile apps to enhance the financial inclusion in Nigeria

5. Financial products are the engine of sustainable economic growth. Faster and more secure payment systems such as NIBSS spur development of businesses and economic growth in all other sectors in addition to facilitating financial inclusion. Government should work toward these because this is one of the keys to attainment economic independence objectives in Nigeria.

6. Banks as well as the regulatory bodies should strive to innovate for better and cheaper ways of serving customers. With shorter transaction turnaround times, transactions volumes can be significantly increased with the aid of an improved NEFT.

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