

# Does Financial Inclusion Promote Financial Stability in Nigeria?

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## Abstract

*This paper empirically examined the nexus between financial inclusion and financial stability in Nigeria, using panel data for the 2014Q1-2018Q4 period. An index of financial inclusion was constructed to reflect penetration, availability and usage. The paper presented evidence that financial inclusion had positive impact on financial stability, which implies that higher levels of financial inclusion would lead to greater financial stability. In terms of dimension, both penetration and availability had a positive relationship with financial stability, while usage was found to have a negative relationship. This implies that policy makers are faced with tradeoffs of whether to focus on reforms that would promote financial inclusion, innovation, and financial access, or to focus on further improvements in financial stability. The study, therefore, recommends the designing of more proactive policies geared towards enhancing credit risk management systems in order to promote financial inclusion and stabilise the financial sector.*

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Keywords: Financial Inclusion, Financial Stability, Panel Data, Panel Autoregressive Distributed Lag (PARDL)

JEL Classification: E52

## I. Introduction

The idea that financial inclusion plays a vital role in ensuring financial system stability is built on the fact that it facilitates financial intermediation and could fortify banks against financial shocks. In recognition of its importance, the Financial Stability Board for Implementation of the Basel III recently expressed the commitment to promote financial inclusion to enhance financial stability (Chiwira et al., 2013). Furthermore, the G-20 countries have recognised financial inclusion as one of the four pillars of the financial sector reforms, following the global financial crisis. Despite being recognised as a means of ensuring financial stability, some country-specific and cross-country analysis have challenged this received wisdom (Han & Melecky, 2014 and Amatus & Alireza, 2015). Against this background, an important research question is whether financial inclusion promotes financial stability, especially in the context of a developing economy, like Nigeria.

Following the global financial crisis (GFC), a number of financial reforms have been implemented in Nigeria, one of which is the National Financial Inclusion

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Strategy (NFIS), that commenced in 2012. The strategy is aimed at reducing financial exclusion from 46.3 per cent in 2010 to 20.0 per cent in 2020, and increasing adult access to payment services from 21.6 per cent to 70.0 per cent, pensions from 5.0 per cent to 40.0 per cent and insurance from 1.0 per cent to 40.0 per cent (CBN 2015). After the launch of the strategy, Central Bank of Nigeria (CBN), with other stakeholders, also introduced mobile money, agent banking and cashless policy, to deepen financial inclusion in Nigeria. These initiatives seek to promote economic development, employment generation and wealth creation, and financial stability in Nigeria.

Following the launch of the NFIS in 2012, financial inclusion outcomes have been observed to have a positive association with financial stability, as indicated by the ratio of non-performing loans to total gross loans issued in the financial system. For example, when the rate of financial inclusion increased from 53.7 per cent in 2010 to 60.3 and 60.5 per cent in 2012 and 2014, respectively, a marked reduction in the ratio of NPL was witnessed during the same period. The NPL reduced from 20.1 per cent in 2010 to 3.7 per cent and 3.0 per cent in 2012 and 2014, respectively. Similarly, the association was observed in 2016 when the NPL rose to 12.8 per cent, following a drop in the rate of financial inclusion to 58.4 per cent in the same year. Furthermore, a rise in financial inclusion rate to 63.6 per cent in 2018 was accompanied by improved financial stability outcome, as NPL reduced to 11.7 per cent during the year. The co-movement of this indicator with financial inclusion was, however, not entirely the case when using z-score - another measure of financial stability, as a positive relationship with financial inclusion was not established for the period 2010 and 2012, as well as 2014 to 2016.

In view of the aforementioned, it is imperative to establish an empirical relationship between financial inclusion and financial stability in Nigeria. Understanding the interlinkages between financial inclusion and financial stability could help strengthen stability in the financial system as well as avoid costly financial crises. The paper adopts a Panel Autoregressive Distributed Lag (PARDL) approach, using quarterly data spanning 2014 - 2018. The approach is appropriate as it provides an avenue to quantify the long-run and short-run dynamics in the financial inclusion- financial stability nexus.

The rest of the paper is structured as follows. Following the introduction, section II reviews the relevant literature, while section III examines financial inclusion and financial stability policy initiatives in Nigeria. Section IV focuses on data and methodology, while section V discusses the empirical results. Section VI concludes the paper and proffers policy recommendations.

II. Literature Review

II.1 Conceptual Issues

II.1.1 Financial Inclusion

Financial inclusion is defined as the delivery of financial services, such as savings, credit and insurance to the disadvantaged and low-income segments of the society at affordable costs (Mbutor & Uba, 2016). It could also be defined as a process or situation that allows for ease of access to, or availability and usage of, formal financial system by economic agents. It describes a process where all members of the economy do not have difficulty in opening bank accounts and can afford access to credit conveniently, and consistently use financial products and facilities without difficulty (Kama & Adigun, 2013).

According to Hannig and Jansen (2010), financial inclusion can be measured in four ways, namely: access, quality, usage and impact. Access refers to the ability to use available financial services and products from formal institutions, while usage relates to the availability and depth of financial service and products. Quality entails the relevance of the financial service or product to the lifestyle needs of the consumer, while impact includes measuring changes in the lives of consumers that can be attributed to the usage of a financial device or service. Information on these dimensions of financial inclusion can either be sourced from the demand side (that is, at the individual, household, or firm level) or from the supply side (that is, at the level of a financial institution), or from a combination of both.

The IMF Financial Access Survey, which started in 2004, adopted the following indicators of financial access and usage, as shown in Table 1.

Table 1: Indicators of Financial Inclusion

Access Indicators	Usage Indicators
<ul style="list-style-type: none"> <li>▪ Number of Commercial bank branches per 1000km<sup>2</sup></li> <li>▪ Number of Commercial bank branches per 100,000 adults</li> <li>▪ Number of ATMs per 1000km<sup>2</sup></li> <li>▪ Number of ATMs per 100,000 adults</li> </ul>	<ul style="list-style-type: none"> <li>▪ Number of borrowers from commercial banks per 1000 adults</li> <li>▪ Outstanding loans from commercial banks (per cent of GDP)</li> <li>▪ Number of depositors with commercial banks per 1000 adults</li> <li>▪ Outstanding deposits with commercial banks (per cent of GDP)</li> </ul>

Source: IMF Financial Access Survey.

## II.1.2 Financial Stability

Financial stability may be defined as “a condition in which the financial system – comprising financial intermediaries, markets and market infrastructure – is capable of withstanding shocks and resolving of financial imbalances. It is the ability of the financial system to mitigate the likelihood of disruptions in the financial intermediation process that could significantly impair the allocation of savings to profitable investment opportunities” (ECB, 2007).

Financial system stability is commonly measured using financial soundness indicators. In 2000, the IMF launched a project on financial soundness indicators (FSI) to enable researchers assess and compare the soundness of financial systems of various countries. This birthed the IMF Financial Soundness Indicators: Compilation Guide 2006, a publication with definitions and procedures for compiling and calculating FSIs. The IMF also proposed two subsets of indicators: core indicators and encouraged indicators. With respect to measuring deposit-takers' soundness, given the focus of this paper, the core set consists of 16 indicators (Table 2), while the encouraged indicators are 12 in number<sup>2</sup>. After the release of the 2006 Compilation Guide, the FSIs underwent two major revisions in 2009 and 2013<sup>3</sup> (See Appendix I).

The World Bank (2017) also identified two broad categories of financial stability measures: firm-level stability measures and systemic stability measures. Examples of firm-level stability measures are the Z-score, which compares buffers (capitalisation and returns) with risk (volatility of returns) to measure a bank's solvency risk; probability of credit default; and Distance to Default (DD), both of which are derived from the Merton (1973) model, and measure both solvency risk and liquidity risk at the firm level.

On the other hand, examples of systemic stability measures are first-to-default probability<sup>4</sup>, Systemic Expected Shortfall (SES)<sup>5</sup>, and Distribution of systemic loss<sup>6</sup>.

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<sup>2</sup> See IMF (2013) for more information on the revised FSIs.

<sup>3</sup> The 2009 amendments to the Compilation Guide were to comply with International Accounting Standards and follow the compilation practice based on the guidance of the Basel Committee on Banking Supervision (Basel I and II). The 2013 modifications to the current list of FSIs adds 19 new indicators for financial soundness surveillance in response to the GFC and removes five from the list after limited reporting and comparability. The changes also consider the adoption of the new Basel III framework, which affects the definitions of regulatory capital and therefore capital-based ratios.

<sup>4</sup> It uses risk-neutral default probabilities from credit default swap spreads to assess the probability of observing one default among a number of institutions. Thus, first-to-default probability has been proposed as a measure of systemic risk for large financial institutions.

<sup>5</sup> It measures each institution's individual contribution to systemic risk by taking the individual leverage and risk-taking into account in measuring the externalities from the banking sector to the real economy when these institutions fail.

<sup>6</sup> It combines three key elements: each individual institution's probability of default, the size of loss given default, and the “contagious” nature of defaults across the institutions due to their interconnectedness to measure stability in the financial system.

Other indicators of financial soundness as discussed by the World Bank include ratio of regulatory capital to risk-weighted assets and the ratio of non-performing loans to total gross loans, as well as credit growth.

## II.2 Literature Review

There is a growing debate on how financial inclusion could impact financial stability in an economy. The landscape is two-pronged. The first prong presents a positive relationship between financial inclusion and financial stability. For instance, Khan (2011) explained three ways in which increase in financial inclusion could increase financial stability. The first is diversification of bank assets, through increase in lending to smaller firms, which reduces bank's loans portfolio risk. This will reduce the volatility of the overall portfolio. The second prong refers to the widening of the size of the deposit base by increasing the number of small savers. This in turn reduces banks' dependence on 'non-core' financing, which is subject to volatility in times of crises, hence, reducing in pro-cyclicality. Finally, increase in financial inclusion enhances transmission of monetary policy, which in turn creates conducive environment for financial stability.

The other strand entails a negative relationship between inclusion and stability. Cihak, Mare and Melecky (2016) gave three approaches in which financial inclusion may reduce financial stability. One way is through reduction in lending standards in an attempt to expand the pool of borrowers. This was one of the main causes of the savings and loans crisis in 1980s and the more recent 2007/2009 sub-prime crisis in the United States. Alternatively, reputational risk may increase by outsourcing various functions with the aim of reaching small borrowers. Finally, lack of proper regulation of microfinance institutions (MFIs) could lead to excessive lending by them, thereby diluting the effectiveness of regulation in the economy leading to financial system risks.

Hannig and Jansen (2010) buttressed the view that financial inclusion could be a source of instability through changes in the composition of the financial system. They argued that financial inclusion changes the types of client and transactions undertaken when institutions operate in newly created or expanded markets. Such changes can be a source of instability and increased bank risks. They, however, placed such risks at institutional, rather than at systemic level. Thus, this type of risk is generally manageable using prudential tools and effective customer protection strategies.

Empirically, Morgan and Pontines (2014) assessed the effects of various measures of financial inclusion on some measures of financial stability, including bank non-performing loans and bank Z-scores. They found that an increased share of lending to small and medium-sized enterprises (SMEs) aids financial stability,

mainly by reducing non-performing loans (NPLs) and the probability of default by financial institutions. This suggests that policy measures to increase financial inclusion, especially through SMEs could have the side-benefit of contributing to financial stability as well.

Han and Melecky (2014) examined the effects of access to bank deposits on the stability of deposit growth during the 2008 GFC, using a cross-sectional regression of 95 countries, categorised into low-income, middle-income and high-income countries. The study found that on average, greater access to bank deposits or **their actual use by a country's population can enhance resilience of the deposit funding base of the banking sector.** This was found to be more pronounced in middle-income countries. Thus, the study concluded that policies to promote a broader use of bank deposits could improve resilience of bank funding, thereby enhancing overall financial stability and complement the mainstream macro-prudential policies to foster stability in the financial system.

Amatus and Alireza (2015) studied the relationship between financial stability and financial inclusion in 35 Sub-Saharan African countries, using the Generalised Method of Moments (GMM) for dynamic panel data spanning 2004-2011. The variables utilised were bank z-scores for financial stability; outstanding deposits with commercial banks and outstanding loans from commercial banks for financial inclusion. Other variables included were GDP per capita, inflation, credit to private sector by domestic banks, and financial crisis as control variables. The findings showed that outstanding deposits with commercial banks negatively affected financial stability. This implied that deposit accounts held with the banks are less diversified in SSA. Outstanding loans from commercial banks have a positive role on financial stability.

Sahay et al. (2015) illustrated that financial stability risks increase when access to credit is expanded without proper supervision. Using selected cross-country data, **from the IMF's Financial Access Survey, the study emphasised that financial buffers show a declining trend when access to credit expands, particularly, in countries with weaker banking supervision.** In contrast, countries with strong supervision demonstrate financial stability gains from higher inclusion. The paper pointed out potential risks to financial stability from an unchecked broadening of access to credit. Thus, it suggested that increasing access to financial services other than credit does not affect financial stability adversely.

Cihak et al. (2016) conducted a cross-country analysis of the interrelationship between financial inclusion and stability using a non-parametric approach. The study found that greater financial inclusion is associated with greater stability, except in periods of crises. In addition, the study revealed that greater financial inclusion, particularly those associated with extensive borrowing by individuals,

may also increase the risk of extreme events, unexpected losses in the financial system, and ultimately, more frequent banking crises. Furthermore, the study showed that the nature of inclusion-stability nexus is highly dependent on certain factors, including financial openness, tax rates, education, and the depth of credit information systems. In particular, financial openness was found to increase trade-offs between inclusion and stability, while low tax rates, education, and credit information depth help generate synergies between the two goals.

Ozili (2018) discussed the implications of digital finance, specifically Fintech, on financial inclusion and financial stability, highlighting the pros and cons. The study identified convenience, affordability and secure-banking services as positive effects of digital finance on financial inclusion, while the expansion in economic activity via the services sector as a positive effect on economic and financial stability.

Neaime and Gaysset (2018) assessed the impact of financial inclusion on financial stability, income inequality and poverty in eight Middle East and North Africa (MENA) countries over the period 2002 – 2015. Using Generalised Method of Moments (GMM) and Generalised Least Squares (GLS) models, the results revealed that financial inclusion contributed positively to financial stability. However, the results indicated financial integration as a contributing factor to financial instability in some MENA countries. Furthermore, financial inclusion was found to decrease income inequality, population size and inflation, but have no significant effect on poverty.

Sakarombe (2018) investigated the effects of financial inclusion on bank stability in Zimbabwe, using a data spanning 2009 to 2017. Employing Generalised Method of Moments (GMM) approach, the study showed a positive relationship between financial inclusion and bank stability in Zimbabwe.

In a recent study, Ahamed and Mallick (2019) examined the impact of financial inclusion on bank stability, using a sample of 2,635 banks in 86 countries. They found that higher levels of financial inclusion contributed to greater bank stability. Furthermore, the impact was found to be sizeable and more pronounced with banks characterised by higher customer deposit funding share and lower marginal costs of providing banking services, as well as those that operated in stronger institutional quality thresholds. Thus, they concluded that financial inclusion should not only be perceived, as a developmental goal but also as a policy drive by banks to ensure their stability.

With respect to Nigeria, Mbutor and Uba (2016) discussed the role of financial institutions in promoting inclusive finance to achieve macroeconomic stability. The study noted that efficient financial intermediation by banks in terms of

product innovation, particularly, favourable savings rate and the creation of outlets in the rural areas, would go a long way in promoting financial inclusion in the country. It, however, noted that the huge operational costs incurred by banks could hamper the creation of new outlets in rural areas because they may be deemed unprofitable.

Adesanya (2017) highlighted critical areas that could facilitate the increase in financial inclusion to all stakeholders, such as: the creation of a realistic framework through regulations; an innovative approach that meets and surpasses market expectations; and remuneration that encourage all stakeholders. The study further identified the importance and the implications of promoting financial inclusion for monetary policy and financial stability in terms of regulation of banking industry and payment systems.

Against this background, there appears to be limited studies on the relationship between financial inclusion and financial stability, particularly with respect to emerging economies like Nigeria, which are characterised by a large informal sector. This paper attempts to fill this gap by providing insights into the relationship between financial inclusion and financial stability in Nigeria.

### III. Developments in Financial Inclusion and Financial Stability

Several efforts have been made by the Central Bank of Nigeria to promote financial inclusion in the country. These efforts are categorised into two – early efforts and recent efforts. Early efforts encompassed Government initiatives that promoted inclusive financial practices; these initiatives included Rural Banking Programme, establishment of **People's Bank of Nigeria** and **Community Banking Schemes**, among others.

In addition to these distinct programmes, several policies were promoted to achieve financial inclusion. These included the introduction of guidelines, which prescribed minimum levels of lending to small scale enterprises and loans extended in rural areas. Banks, which failed to meet up with these limits, were not only subjected to fines and penalties, but made to transfer whatever was the shortfall to either the Central Bank of Nigeria or development finance institutions. The initial gains were, however, short-lived owing to the widespread incidence of banking system distress, which eroded confidence in the financial industry, rising inflation, corrupt activities, as well as political uncertainty that characterised the period.

The launch of the National Microfinance Policy in 2005 marked a turning point in the effort of the Central Bank of Nigeria in driving financial inclusion. The National Microfinance Policy was launched with the aim of providing the supervisory and



regulatory framework that would not only facilitate the growth of privately-owned microfinance institutions, but also facilitate the participation of mostly third sector institutions, including market associations, cooperatives, non-governmental organisations, self-help groups, in the microfinance model.

The Policy has witnessed various reviews aimed at improving the capacity and efficiency of the sector to intermediate in the financial services industry. Other recent initiatives include the establishment of non-interest banking, National Financial Inclusion Strategy (NFIS), adoption of Financial Technologies (Fintechs) as vehicles of inclusion and establishment of Shared Agent Network Expansion Facility. In addition, other financial stability initiatives such as Asset Management Corporation of Nigeria (AMCON); Financial Stability Committee (FSC); Review of supervisory procedures/methodology; adoption of a common year-end for banks; restructuring of the Financial Sector Surveillance Directorate, among others were introduced.

### III.1 Trends in Financial Inclusion and Financial Stability Indicators

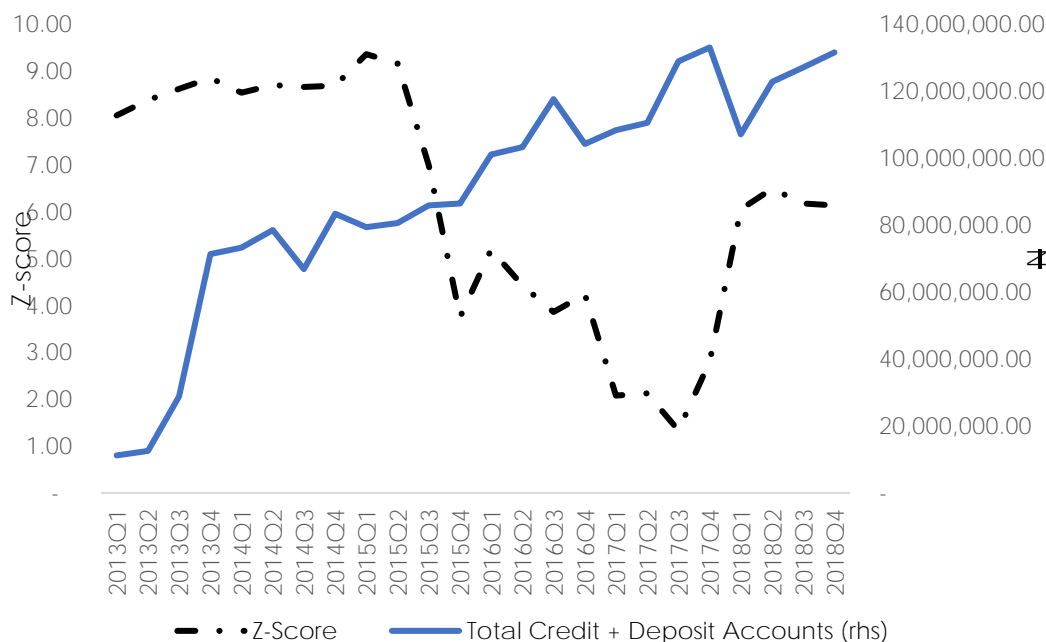
Discussion on the effectiveness of financial inclusion initiatives in Nigeria is presented in line with the work of (Sarma, 2008), where an assessment of the level of financial inclusion was viewed from three dimensions – Penetration of Banking Institutions; Availability of, or Access to Banking Services; and, Usage of such Banking Services. The number of deposit accounts held by commercial and microfinance banks per 1,000 adults was used to measure the penetration dimension. Availability of/or access to banking services dimension was measured by the number of bank branches per 1,000km or per 0.1m adults and number of ATMs and POS per 1,000km or per 0.1m adults.

The following indices were used under the usage dimension; the average of the weighted index of the total outstanding deposit as per cent of real GDP per capita; outstanding credit as per cent of real GDP per capita; and, total payments using electronic channels such as internet and mobile payments, electronic billers and web-based payment platforms as a ratio of real GDP per capita, were used.

With regard to penetration, available data indicated that the number of deposit and credit accounts increased consistently, from 11.244 million in 2013Q1 to 131.541 million in 2018Q4. The consistent increase in the number of accounts from both the commercial and microfinance banks could be attributed to the policies initiated by the CBN, such as the launch and implementation of the NFIS in 2012, the introduction of the Shared Agent Network and Financial Technology Firms in performing financial services. However, except in 2018, the increase in the number of credit and deposit accounts did not correspond with increases in

financial stability, as proxied by z-scores, suggesting that increase in the number of accounts could not be attributed to increased financial stability.

Figure 1: Penetration of financial services and financial stability (2013Q1-2018Q4)

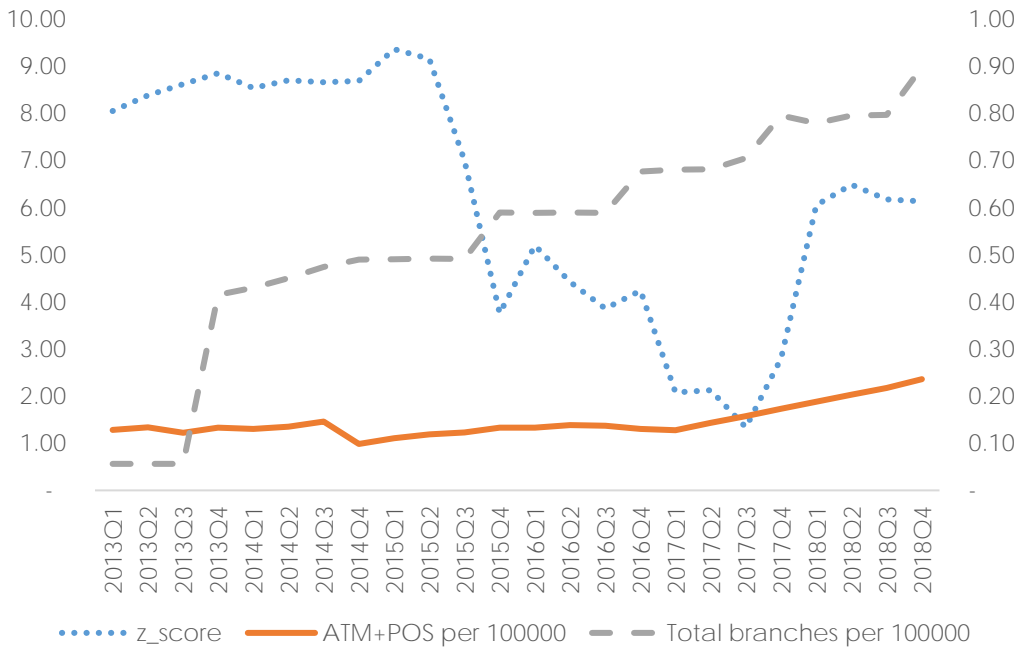


Source: Authors' computation using data from Financial Analysis Database (FinA)

Similarly, the availability of, or access to financial institutions indicator showed that the number of bank branches and ATM/PoS machines per 100,000 persons increased remarkably during the period. The number of ATMs and PoS machines increased from 128,158 in 2013Q1 to 235,898 in 2018Q4. The number of ATMs and PoS deployed witnessed a sharp and persistent increase from 2017, following the release of the "Guide to Charges by Banks and Other Financial Institutions in Nigeria" in April 2017. The Guide clarified the position of the Bank on various charges permissible for financial transactions in the country, including electronic transactions. Increase in the number of commercial and microfinance bank branches was also witnessed during the period rising from 5,625<sup>7</sup> in 2013Q1 to 89,768 in 2018Q4. However, despite the marked increase in the number of bank branches and ATM/PoS machines over the period, noticeable increase in financial stability was only witnessed between 2017 and 2018 as shown in Figure 2.

<sup>7</sup> This number is not truly representative as it comprises only that of commercial bank branches up till 2013Q3 when MFB branches data was added.

Figure 2: Availability of Financial Services and Financial Stability (2013Q1-2018Q4)

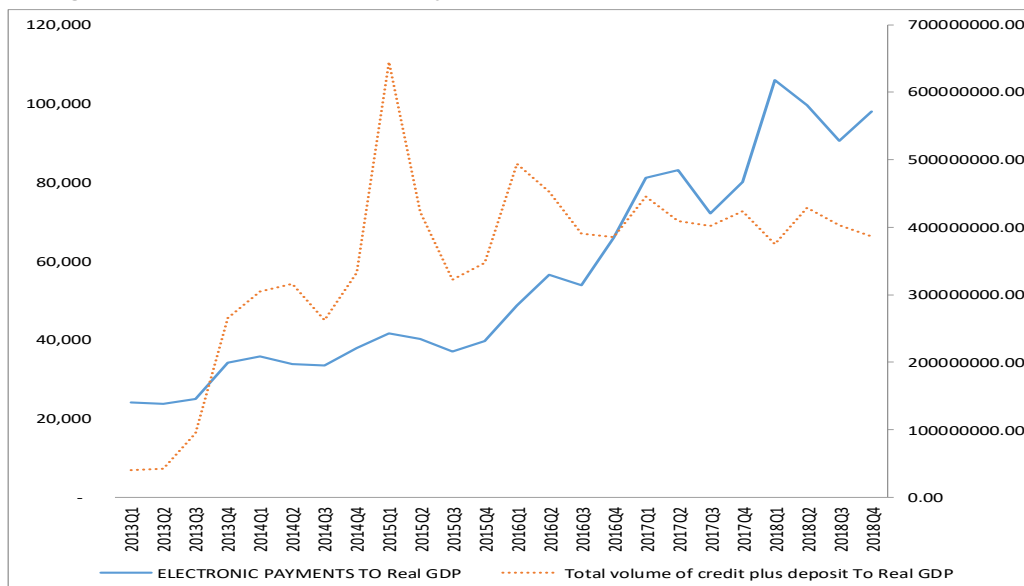


Source: Authors' computation

Available statistics indicate that the volume of credit and debit, as well as, electronic payments witnessed an upsurge during the period. Volume of credit and debit increased from ₦3.343 trillion in 2013Q1<sup>8</sup> to ₦37.526 trillion in 2018Q4. Similarly, the volume of electronic payments increased from ₦2.028 billion in 2013Q1 to ₦9.524 billion in 2018Q4. The increase in electronic payments could be attributed to various policies of the Bank and other supporting payments system and telecommunication infrastructure that enabled the deepening of electronic payments in the country during the period. It was observed that after a peak of ₦49.4 trillion in 2016Q1, the volume of credit and deposit to GDP remained relatively stable. However, electronic payments increased steadily from 2013Q1 TO 2018Q1. It experienced a drop through 2018Q3, but then recovered by 2018Q4, following the launch of the Shared Agent Network Expansions Facilities (SANEF) by the CBN in November 2018.

<sup>8</sup> This number is not truly representative as it comprised only that of commercial banks up till 2013Q3 when MFB data was added.

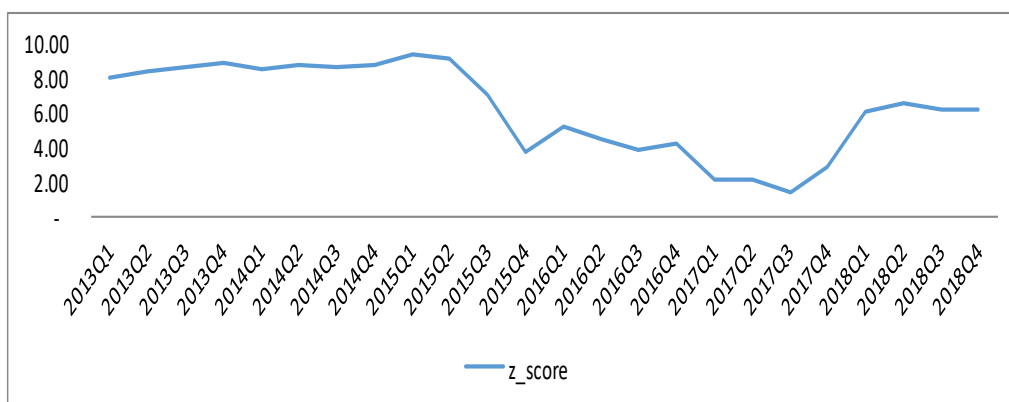
Figure 3: Ratio of Electronic Payments and Credit plus Deposit to real GDP



Source: Authors' computation

The trend in financial stability, measured by z-scores, indicated that the stability of the financial system followed same pattern. Lower stability was noticed between 2015 and 2017, coinciding with the period of economic contraction and eventual recession which was exited in 2017.

Figure 4: Trend in z-scores (2013-2018)



Source: Authors' computation

#### IV.0 Data and Methodology

##### IV.1 Econometric Method: Panel Auto-Regressive Distributed Lag (PARDL)

The study employed a panel autoregressive distributed lag (PARDL) model to examine the financial inclusion-financial stability nexus in Nigeria. The ARDL model relates a dependent variable to its lags as well as contemporaneous and lag levels of all other variables in the model. A typical ARDL ( $p, q_1, \dots, q_k$ ) could be specified as:

$$y_{it} = \sum_{j=1}^p \lambda_{ij} y_{i,t-j} + \sum_{j=0}^q \delta'_{it} x_{it-j} + \mu_i + \varepsilon_{it} \quad (1)$$

with the cross-sections  $i = 1, 2, \dots, N$ ; the number of periods  $t = 1, 2, \dots, T$ ;  $x_{it}$  is the  $k \times 1$  vector of explanatory variables for group,  $i$ ,  $\lambda_{ij}$  and  $\delta_{it}$  are scalars and  $k \times 1$  coefficients; and  $\mu_i$  is the cross-section specific effects, which are expected to be correlated with individual cross-sections. The error term,  $\varepsilon_{i,t}$ , is expected to be independently distributed across  $i$  and  $t$ , with expected zero means and constant variances. They are also distributed independently of the regressors,  $x_{it}$ -a requirement for consistent estimation of the short-run coefficients.

We assume that the relationship between financial stability and financial inclusion alongside other specified determinants can be represented by the following equation:

$$Y_{i,t} = \alpha_{0i} + \alpha_{1i} X_{it} + \beta_{1i} K_{it} + e_{i,t}; \quad i = 1, 2, \dots, N; \quad t = 1, 2, \dots, T \quad (2)$$

where  $Y_{i,t}$ , is the dependent variable (financial stability),  $X$  and  $K$  are vectors of macroeconomic and bank-specific independent variables, respectively; and  $e_{i,t}$  is a white noise error term. If the variables are a combination of  $I(0)$  and  $I(1)$  series and cointegrated, such that the error term,  $e_{i,t}$ , is an  $I(0)$  process for all  $i$ , then the relationship can be expressed by a dynamic ARDL model.

The dependent variable is bank Z-score (LZ) while the regressors include: index of financial inclusion (IFI), macroeconomic variables including: real rate of GDP growth (RYG), the yearly change in Headline consumer price index (LHCPI), and nominal exchange rate (LUSD). Size of banks proxied by total assets (LTA) represents the bank-specific variable. All variables, except the headline consumer price index are considered in log forms. The definitions and a priori expectations of all variables in the model are presented in Table 2.

##### IV.2 Data

The study employed quarterly data spanning 2014Q1 to 2018Q4. The scope of data was informed primarily by availability of data and the need to capture the

periods in which the selected banks had consistent data and uniform reporting period. The bank specific panel data were extracted from the Financial Analysis System (FinA) of the Central Bank of Nigeria. Data on macroeconomic variables were sourced from the Central Bank of Nigeria Statistical Bulletin and National Bureau of Statistics (NBS) database.

Table 2: Variable Description

Variables	Definition	<i>a priori</i> Expectations
Z-SCORE (Dep.Var.)	Indicator of financial stability	Dependent variable
IFI	Index of Financial Inclusion	+
LTA	Bank Size (Total Assets)	+
RYG	Growth rate of real GDP	+
CPI	Headline CPI	-
USD	Nominal exchange rate	-
D1	Penetration (No. of Accounts)	+
D2	Availability of Financial Services (No. of bank branches)	+
D3	Usage Dimension (Credit to Private sector + electronic payments)	+

Source: Authors' Compilation

#### IV.2.1 Measuring Financial Stability

The Z-score was computed with three important financial soundness indicators: Equity/Assets ratio, the return on assets (ROA) and the standard deviation of return on assets – a proxy for return volatility. The computation could be denoted as follows:

$$Z - score_{it} = \frac{ROA_{it} + EQA_{it}}{\sigma(ROA)_{it}} \quad (3)$$

#### IV.2.2 Measuring Financial Inclusion: Index of Financial Inclusion

In exploring the nexus between financial inclusion and growth in Nigeria, this paper adapted, with some modifications, the work by Sarma (2008) using three dimensions to explain financial inclusion. These dimensions are: penetration of banking institutions; availability or access to banking services and, usage of such banking services.

The number of deposit accounts held by commercial and microfinance banks per 1000 adults and the number of loan accounts held by commercial and microfinance banks per 1,000 adults was used to measure the penetration dimension; availability or access to banking services dimension was measured by the number of bank branches per 1,000km or per 0.1m adults and number of ATMs and PoS per 1,000km or per 0.1m adults. Even though the availability of access included such indicators as internet and mobile banking, these were excluded in this study due to non-availability of data.

Considering the usage dimension, the average of the weighted index of the total outstanding deposit as a percentage of real GDP per capita, outstanding credit as a percentage of real GDP per capita and total payments using electronic channels such as internet, mobile payments, electronic billers and web based payment plaforms as a ratio of real GDP per capita were used.

In addition to these dimesions, a composite index of financial inclusion was constructed in line with the works of (Sarma, 2008) and (Kamar, 2016). A dimension index was first calculated for each of the dimensions. Thus, the measurement index for the  $i^{th}$  dimension is given below:

$$d_i = \omega_i * \frac{A_i - m_i}{M_i - m_i} \tag{4}$$

Where:

$\omega$  = weight attached to dimension  $\epsilon$ ,  $0 \leq \omega_i \leq 1$

$A_i$  = actual value of dimension  $\epsilon$

$m_i$  = lower bound on dimension  $\epsilon$ , fixed by a predetermined rule

$M_i$  = upper bound on dimension  $\epsilon$ , fixed by a predetermined rule

A country's achievements in these dimensions would be represented by a point  $x = (d_1, d_2, d_3, \dots, d_n)$ . The point  $0 = (0, 0, 0, \dots, 0)$  represents the point indicating the worst situation (no achievement), while the point  $W = (w_1, w_2, w_3, \dots, w_n)$  represents the ideal situation indicating the highest achievements in all dimensions. A simple average of the normalised Euclidian distance between  $X$  and  $0$  (denoted by  $X_1$  in equation (5) and the normalised inverse Euclidian distance between  $X$  and  $W$  denoted by  $X_2$  in equation (6) are as shown below:

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2 + \dots + d_n^2}}{\sqrt{(w_1^2 + w_2^2 + \dots + w_n^2)}} \tag{5}$$

$$X_2 = 1 - \sqrt{\frac{(w_1-d_1)^2+(w_2-d_2)^2+\dots+(w_n-d_n)^2}{(w_1^2+w_2^2+\dots+w_n^2)}} \quad (6)$$

$$IFI = \frac{(X_1+X_2)}{2} \quad (7)$$

Table 3 presents the descriptive statistics for all variables. Economic growth exhibits the highest level of volatility as indicated by the standard deviation, followed by z-score, total assets, exchange rate, inflation rate and then the index of financial inclusion. Furthermore, all the variables are found not to follow a normal distribution as indicated by the probability values of the Jarque-Bera statistics.

Table 3: Descriptive Statistics

	LZ	IFI	LTA	RYG	LHCPI	LUSD
Mean	3.33	0.73	27.84	2.03	5.32	5.67
Median	3.67	0.74	27.82	2.00	5.32	5.85
Maximum	5.53	0.97	29.25	6.54	5.62	6.16
Minimum	-0.85	0.51	23.92	-2.34	5.05	5.13
Std. Dev.	1.20	0.14	0.81	2.65	0.19	0.34
Skewness	-1.52	-0.04	-0.85	0.21	0.08	-0.40
Kurtosis	5.21	1.73	5.21	2.18	1.57	1.66
Jarque-Bera	199.87	22.87	109.77	12.06	29.39	34.45
Probability	0.00	0.00	0.00	0.00	0.00	0.00

Source: Authors' computation

## V. The Results

### V.1 Unit Root Tests

The stationarity of the variables was investigated using unit root tests. Panel-based unit root tests are found to have higher power than individual time series unit root tests (Atoi, 2018). Three standard tests namely, Levin, *et al.*, (2002), Im, Pesaran and Shin (IPS) (2003), ADF-Fisher Chi-Square and Philip Peron (PP) unit root tests were employed. The null hypothesis of Levin, Lu and Chu (LLC) technique assumes common unit root process, while that of IPS, ADF and PP assumes individual unit root process. The overall results show that all variables were of mixed order of integration. The mixture of I(0) and I(1) variables suggests the use panel ARDL methodology.



Table 4: Panel Unit Root Tests

Variables	Levin, Lu & Chu t*	Breitung t-stat	Im, Pesaran and Shin W-stat	ADF – Fisher Chi-square	ADF – Fisher Chi-square	Decision
Z_SCORE	-7.29***		-7.4495***	130.564***	197.963***	I(0)
IFI	-19.78***	-4.85***	-15.4052***	228.03***	333.83***	I(0)
LTA	-13.66***	-5.36***	-12.19***	178.22***	214.22***	I(1)
RYG	-5.36***		-2.98***	53.47***	27.66	I(1)
LHCPI	-4.34***	2.87	-2.51***	49.74**	25.78	I(0)
LUSD	-1.86**		-2.23**	44.72*	95.30***	I(1)

Note: \*\*\*, \*\* and \* indicate statistical significance at 1%, 5% and 10%, respectively

Source: Authors' computation

### V.3 Long-Run Results

The long-run results from the estimated panel autoregressive distributed lag (PARDL) models are presented in Table 5. From column (1), the measure of financial inclusion (index of financial inclusion) is found to have a contemporaneous positive relationship with financial stability. Thus, higher levels of financial inclusion lead to higher bank z-score. This relationship was also found to be statistically significant, therefore, conforming to the theoretical proposition of positive inclusion-stability nexus.

Table 5: PARDL Long-Run Results

Variable	Model 1	Model 2	Model 3	Model 4
	ARDL(2,2,2,2,2,2)	ARDL(2,2,2,2,2,2)	ARDL(2,2,2,2,2,2)	ARDL(2,2,2,2,2,2)
IFI	0.854** [0.370]	2.097*** [0.039]	1.034*** [0.116]	-1.374*** [0.169]
LTA	0.517*** [0.041]	0.657*** [0.009]	0.511*** [0.022]	-0.280*** [0.055]
RYG	-0.041** [0.019]	-0.048*** [0.007]	0.006 [0.004]	0.418*** [0.050]
LHCPI	-1.834*** [0.460]	-2.982*** [0.073]	-3.064*** [0.109]	-3.599*** [0.373]
LUSD	-0.306 [0.275]	-0.033 [0.096]	0.882*** [0.035]	5.387*** [0.559]

Note: \*\*\*, \*\* and \* indicate statistical significance at 1%, 5% and 10%, respectively. Standard errors are in []

Source: Authors' computation

In addition, the bank specific variable, i.e. the size of respective banks (proxied by total assets - LTA) is positively related to and significantly affects financial stability. This is in line with *a priori* expectations as increase in bank size improves its resilience.

Macroeconomic variables such as inflation and exchange rate were found to have negative relationships with financial stability as expected. Increases in the general price level and exchange rate (depreciation) are signs of unstable macroeconomic environment, which could heighten domestic risks and cause financial instability. However, the relationship established by the sign of the coefficient of output is counter intuitive, suggesting that banks take on more risk in terms of the supply of loanable funds, as the economy expands. It is pertinent to mention that this is not the case in the short-run as economic expansion is associated with greater financial stability, (Table 6).

Table 6: PARDL Short-Run Results

Variable	Model 1 Index of Financial Inclusion ARDL(2,2,2,2,2,2)	Model 2 Penetration Dimension ARDL(2,2,2,2,2,2)	Model 3 Availability Dimension ARDL(2,2,2,2,2,2)	Model 4 Usage Dimension ARDL(2,2,2,2,2,2)
ECM	-0.528*** [0.166]	-0.862*** [0.285]	-0.633*** [0.222]	-0.496*** [0.154]
D(LZ(-1))	-0.094 [0.159]	0.203 [0.202]	-0.079 [0.162]	-0.147 [0.186]
D(FI)	-1.796 [2.219]	-1.769 [1.297]	4.571* [2.830]	-1.737 [1.275]
D(FI(-1))	3.909 [2.461]	-0.281 [0.823]	6.808*** [2.481]	0.344 [0.880]
D(LTA)	-0.219 [0.899]	-0.775 [0.701]	0.66 [0.916]	0.369 [0.700]
D(LTA(-1))	0.431 [0.438]	0.511 [0.526]	1.323 [1.327]	0.816* [0.449]
D(RYG)	0.312** [0.130]	0.133** [0.064]	0.089 [0.094]	-0.061 [0.151]
D(RYG(-1))	-0.167 [0.144]	-0.159 [0.122]	-0.255** [0.106]	-0.095 [0.152]
D(LHCPI)	5.707 [7.459]	6.632 [5.710]	-2.181 [3.329]	3.764 [6.378]
D(LHCPI(-1))	-3.552 [4.303]	-6.523 [4.484]	0.869 [5.754]	-4.281 [5.041]
D(LUSD)	2.067 [1.354]	-0.065 [0.715]	-1.049 [0.943]	0.165 [1.477]
D(LUSD(-1))	-2.403 [1.884]	-2.267 [1.912]	-1.742* [1.069]	-0.259 [1.535]

Note: \*\*\*, \*\* and \* indicate statistical significance at 1%, 5% and 10%, respectively. Standard errors are in []

Source: Authors' computation

To examine, in detail, what shapes the financial inclusion-stability nexus in the Nigerian banking system, a disaggregated analysis was conducted using the components of the index of financial inclusion – penetration (d1), availability (d2) and usage (d3). The results from this analysis are presented in columns 2, 3 and 4, respectively. The results reveal that financial inclusion positively impacts financial stability, as in the case of the penetration and the availability dimension. However, a negative relationship was found between the usage dimension of financial inclusion and financial stability. This outcome is not unexpected due to the following reasons.

First, the relationship observed between financial penetration (proxied by number of accounts in financial institutions) and financial stability could be explained from the theoretical perspective that greater deposit mobilisation, through products offered by financial institutions, improves the resilience of banks, thus, promoting financial stability. Second, the relationship between the availability of financial services (proxied by the number of bank branches) support the hypothesis that increased number of financial outlets improves the deposit mobilisation, thereby ensuring financial stability of deposit-demanding financial institutions. Third, the negative relationship between the usage of financial services (proxied by the electronic payments, credit and savings) and financial stability may not be unconnected with the preference of banks to supply credit to the oil and gas sub-sector, which is characterised by high risk. Thus, improved financial inclusion through usage may be detrimental to financial system stability, due to concentration of credit risk.

Furthermore, it is worth mentioning that among the various dimensions of financial inclusion, penetration recorded the highest impact on financial stability (approximately 2.1 per cent), followed by availability (about 1.0 per cent). This indicates that financial innovation with respect to products offered by institutions, to a great extent, improves deposit mobilisation, thus, strengthening resilience in the banking sector. In addition, positive and significant short-run relationship between financial inclusion and financial stability was recorded in the case of availability, which reiterates the fact that creation of more financial outlets would improve the financial inclusion-stability nexus in Nigeria.

## VI. Conclusion

The paper empirically examined financial inclusion-financial stability nexus in Nigeria using panel data analysis during the 2014Q1-2018Q4 period. An index of financial inclusion was constructed using the Sarma (2008) methodology, comprising three dimensions – penetration, availability and usage. The results indicate that financial inclusion had positive impact on contemporaneous

financial stability, implying that higher levels of financial inclusion led to higher financial stability. In terms of dimension, penetration and availability had a positive relationship with financial stability, while usage was found to have a negative relationship. Moreover, banks' size was found to have positively and significantly affected financial stability. This conformed to a priori expectations, as increase in bank size improved its resilience. However, changes in macroeconomic variables, such as rising inflation and exchange rate depreciation, heightened domestic risks and tended to heighten financial instability.

These findings have important policy implications as policy makers face tradeoffs when deciding whether to focus on reforms to promote financial inclusion, innovation, and financial access, or whether to focus on further improvements in financial stability. The paper, therefore, recommends more proactive policies in the direction of financial inclusion, as more inclusion stabilises the financial sector. Specifically, financial inclusion initiatives geared towards improving penetration, such as no-thrills accounts and availability such as agent banking, which increases the number of financial outlets should be sustained, and improved upon, leveraging information technology, particularly in the area of digital finance solutions. Finally, the monetary authority is urged to implement regulatory policies that could mitigate credit risk, such as: stipulating lending standards and improving prudential guidelines, as a result of the negative relationship found between the usage dimension of financial inclusion and financial stability.

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Appendix

Appendix I: Financial Soundness Indicators (FSIs) – Core and Encouraged Set

Core Set	
Deposit-Takers	
Capital Adequacy	Regulatory capital to risk-weighted assets
	Regulatory Tier 1 capital to risk-weighted assets
	Capital to Assets
	Common equity Tier 1 to risk-weighted assets [Solvency ratio]
Asset Quality	Nonperforming loans to total gross loans
	Nonperforming loans net of provisions to capital
	Provisions to Non-performing loans*
	Sectoral distribution of loans to total loans
	Liquid Assets to total assets
	Liquid Assets to short-term Liabilities
Earnings and Profitability	Return on assets
	Return on equity
	Interest margin to gross income
	Noninterest expenses to gross income
Sensitivity to Market Risk	Net open position in foreign exchange to capital
	Available amount of stable funding to required amount of stable funding (net stable funding ratio)
Encouraged List	
Deposit-Takers	Large exposures to capital
	Geographical distribution of loans to total loans
	Gross asset position in financial derivatives to capital
	Gross liability position in financial derivatives to capital
	Trading income to total income
	Personnel expenses to noninterest expenses
	Spread between reference lending and deposit rates (base points)
	Spread between highest and lowest interbank rates (base points)
	Customer deposits to total (non-interbank) loans
	Foreign-currency-denominated loans to total loans
	Foreign-currency-denominated liabilities to total liabilities
	Credit growth to private sector*

Source: IMF (2013).