

ASSESSMENT OF THE FINANCIAL SOUNDNESS OF NIGERIAN BANKS:  
ALTMAN'S Z-SCORE AND BANKOMETER MODELS APPROACH.

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**Abstract:**

In the past years, the unstable macroeconomic environment continued to exert pressure on the financial soundness of the Nigerian banking sector. The study, therefore, investigates the financial soundness of the listed Nigerian deposit money banks for the period between 2016 and 2019, to predict the susceptibility of any of the banks to potential bankruptcy. The study employs Altman's Z-Score models, a multivariate discriminant analysis (MDA) statistical tool and the Bankometer S-Score model to predict potential bankruptcy in the banking sector. The results from Altman's Z-Score show that six out of the twelve banks, were in a grey zone while the remaining ones were in a potential bankruptcy zone. Bankometer, on the other hand, classifies all the banks except one, to be in the safety zone. The study, therefore, concludes that because Altman's Z-Score analysis could not find any of the banks in the safety zone, in contrast to the Bankometer S-Score results, the financial soundness of the banking sector in the country could be fragile. The two methods, therefore, complement each other in evaluating the financial soundness of the banks.

**Keywords:** Altman's Z-Score, Bankometer S-Score, financial soundness, bankruptcy

**JEL:** G13, G33

**Introduction**

Over the last few decades, the Nigerian banking sector has witnessed series of crisis periods that compelled the regulatory authorities to institute several reforms. Most of these crises are due to the combination of both internal weaknesses of the banking institutions themselves and shocks from the macroeconomic environment. The internal weaknesses can be characterized by persistent illiquidity, non-performing loans, insolvency, undercapitalization, and poor corporate governance. External shocks, on the other hand, are largely due to the boom and bust of the economy and instability in the foreign exchange market in the country.

The Nigerian economy slipped into recession in the second quarter of 2016. The economy witnessed negative growth in two consecutive quarters of the year. The recession was exacerbated by a sharp decline in crude oil production during a period of falling oil prices in the international market. The aggregate economic activities in the country represented by the gross domestic product (GDP) that stood at 4% at the end of 2015 contracted to -2.16% in the third quarter of 2016 recording contraction in consecutive two quarters. Consequently, the economy was officially declared to be in recession. At the same period, oil production which was at an average of

2.05mbpd in 2015, fell to 1.61mbpd by the third quarter of 2016 (NBS, 2020). Similarly, the average annual brent crude oil price crashed from USD98.92p/b in 2014 to USD52.32p/d in 2015 and further dropped to USD43.67p/b in 2016. The combined effect of the drop in daily oil production and the fall in price had a devastating effect on the economy. The Nigerian economy, being a monolithic economy became dampened by the crisis in the oil sector which invariably, negatively impacted the non-oil sectors of the economy through the foreign exchange channel. The banking sector became one of the sectors of the economy that was badly hit. The Nigerian banking sector with its huge exposure to companies in the oil & gas sector of the economy was, no doubt, negatively impacted (Osuma, et al., 2019).

A sound banking system is important because of the key roles it plays in the economy. Banks perform intermediation roles between the surplus units and deficit units and maturity transformation of financial assets. Banks facilitate efficient credit allocation and provide important positive externalities such as the provision of liquidity and payments services (Lindgre, Garcia & Saal, 1996). The vulnerability of the banking sector usually creates public policy concerns. Lindgren, et al. (1996) further assert that the negative externalities related to bank failures occur when bank failures spill over to harm other banks and other economic agents. These negative externalities can trigger contagious bank runs with their attendant domino effects which invariably can lead to payments system disruptions, financial system instability and economic crisis.

Before the year 2000, there had been two phases of bank failure (1930-1968 & 1968-2000) in the country. The 1930-1968 bank failure can be traced to the unregulated banking era which existed before the introduction of the Banking Ordinance of 1952. Thus, many banks were established at random, and some of them failed as quickly as they emerged (Marshal, 2017). The second phase (1968-2000) of bank failure in the Country, saw many banks losing their operating licenses. Similarly, in 2004, the Central Bank of Nigeria (CBN) undertook another banking sector reform which led to the merger of some banks and outright acquisition of many others. The 2004 Banking Reform introduced a mandatory recapitalization of the banks to a minimum of N25billion. "Before the 2004 Banking Sector Reform, many Nigerian banks were undercapitalized, and this accounted for their poor performance in terms of low profitability, low liquidity, low return on investments and lack of sustainability" (Aliyu, 2019). One of the major aims of the reform was the attempt of the government to create a reliable and efficient banking sector that could guarantee a stable and efficient banking system. Similarly, the reform was intended to strengthen the banks to be able to play active roles not only within the domestic economy but also compete effectively in the global financial market. Many of the banks, however, could not meet the deadline for the recapitalization, and as a consequence lost their operation licenses, at the end of the recapitalization exercise. At the end of the exercise in 2005, the number of banks in the Country became reduced from eighty-nine (89) to twenty-five (25). Unfortunately, the 2007-2008 Global Financial Crisis negatively impacted a section of the Nigerian banking sector. Many of the banks were having liquidity problems (Umejiaku, 2017). The CBN together with the National Deposit Insurance Corporation (NDIC) in 2009, because of another round of financial fragility observed in the sector, carried out a comprehensive audit of the twenty-five banks operating in the Country. The result of the audit showed that many of the banks were, indeed, technically insolvent. (Sanusi, 2009).

Bank failures, and financial systems crises have been linked to various factors ranging from management excesses through excessive risk-taking, poor corporate governance, macroeconomic

conditions such as sluggish economic activities, foreign exchange crisis, and unstable general price levels (Claessen & Kodress, 2014). "Although bank soundness is first an issue for individual banks, it is more likely to be systemic when unsoundness is due to macroeconomic conditions because all banks will be exposed to those conditions" (Lindgren, et al., 1996). One of the parameters of assessing the soundness of banks is the level of its non-performing loans. Central Bank of Nigeria (CBN) defines non-Performing Loans "as interest or principal that is due and unpaid for 90 days or more, as well as interest payments equal to 90 days interest or more that have been capitalized, rescheduled or rolled over into a new loan". In CBN (2015), the Nigerian banking industry showed vulnerability to the most severe shock of 200 per cent rise in NPLs but could sustain the impact of the same magnitude of shocks in December 2016 as their post-shock capital adequacy ratios fell below 10 per cent minimum prudential requirement (CBN, 2016). The rate of non-performing loans accelerated from 2015 to 2018. Asset's qualities were deteriorating and the financial health of many of the banks was becoming suspect. Fig. captures the rate at which the non-performing loans of the Nigerian banks accelerated between 2014, 2015 and 2016. A non-performing loan ratio of 2.96% in 2014 almost doubled in 2015 and jumped to 12.82 in 2016 and moved upward to 13.83 at the end of 2017q4, (Fig.1). This shows how the banking sector was seriously impacted by the economic crisis in the country. Similarly, the capital adequacy ratio has become a standard measure of bank' stability.

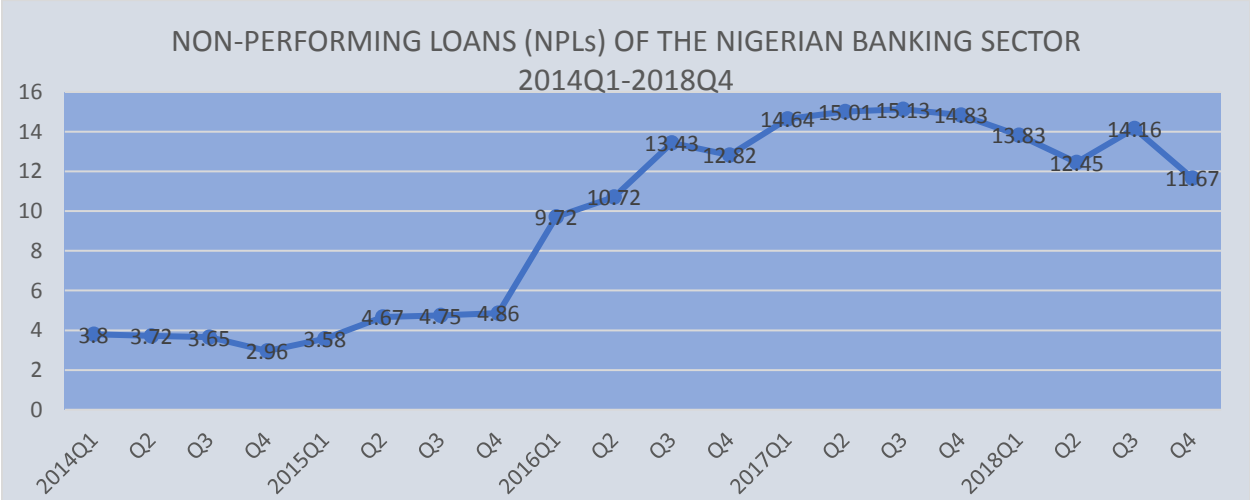


Fig. 1 Non-performing Loans of the Nigerian Banking Sector (2014q1-2018q4). Source of data: National Bureau of Statistics (NBS, 2019).

The effect of the country’s economic downturn on the banking sector is also noticeable in the deterioration in the capital adequacy of the banks. At the end of 2015 for example, the capital adequacy ratios for the sector stood at 17.7% but consequent on the recession in 2016, it fell to 14.8% and further decelerated to 10.2% in 2017. (see fig. 2).

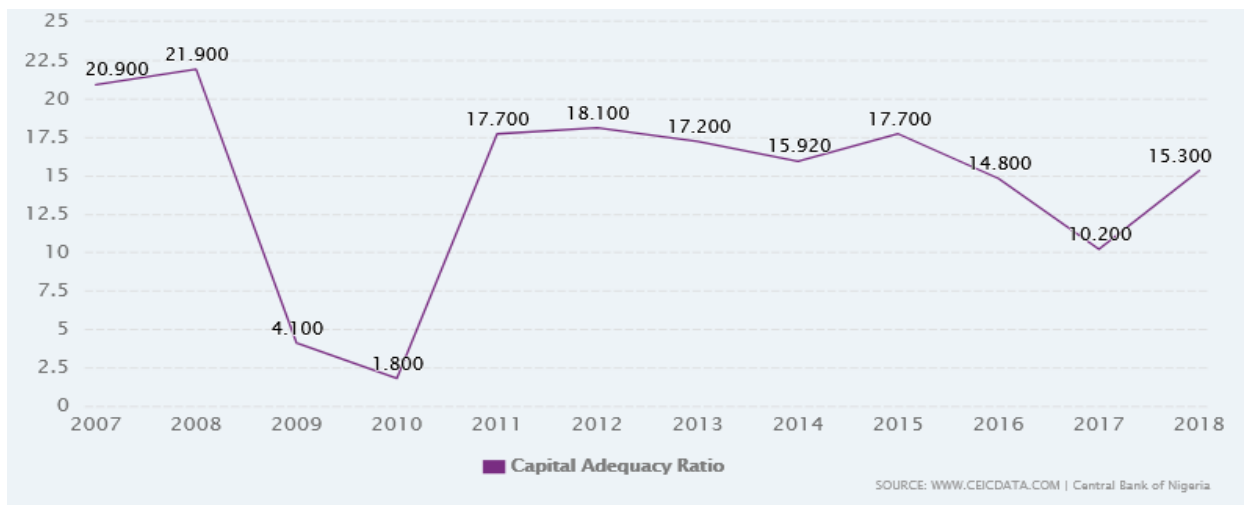


Fig.2: Capital Adequacy Ratios of the Nigerian Banks (2007-2018).

Source: Central Bank of Nigeria (CBN).

These key performance indicators suggest the sector was going through financial difficulties which if not properly examined, understood, and tackled some of the banks may eventually go into bankruptcy which may put the entire financial system into a major crisis. The banking sector is a major segment of the financial system. A crisis in the banking sector can, therefore, trigger a systemic crisis in the financial system and further compound the prevailing economic crisis. Volatilities in the macroeconomic environment can precipitate a banking crisis. For example, shocks, such as a sustained decline in real GDP growth, deterioration in the foreign exchange rates, steady rise in interest, as witnessed in the country in the last few years, and inflation rates above single digits sustained over a fairly long period which have created shock within the domestic economy could have negative effects on the balance sheet of banks. One of the immediate effects that could result is the impairment of the ability of borrowers to service their debts and thereby accentuate non-performing loans. Others are illiquidity of the banks that could arise which could eventually lead to insolvency. If appropriate actions are not taken, on time, to tackle the imbalance, it can lead to the credit crunch, further economic slump, increased financial crisis and possible bankruptcies in the financial and real sectors of the economy. Given the strategic importance of the banking sector to the stability or otherwise of the financial system and the growth and development of the economy, constant evaluation of the soundness of the sector is crucial to the maintenance of a healthy financial system. The objective of this study is, therefore, to examine the financial soundness of the Nigerian banks to identify the early warning signals towards crisis and the possibility of either individual bank's bankruptcy or total systemic banking and financial crisis.

This paper is structured into five sections. As a for the introduction makes up section one. Following section, one is section two which contains a literature review. Section three presents the methodological part of the study in which the methods of analysis were presented. Section four contains data analysis and discussion of findings, while section five contains the summary, recommendations, and conclusion of the study.

## Literature review

The issue of the financial crisis has been a major concern to both national and international financial regulatory authorities. Various definitions have been advanced for the financial crisis. Balakrishnan (2011) for example, defines financial crisis as periods when financial institutions are under strain and their ability to carry out their financial intermediation functions impaired. Balakrishnan (2011) further states that financial crisis and distress often lead to massive fluctuation of asset prices, liquidity shortage, and heightened growth of risks and uncertainty.

### Theoretical Background

The underpinning theories for this study are the “Bad luck” and “Bad Management hypotheses. The hypotheses were proposed by Berger and DeYoung (1997) which explain the relationship between cost efficiency and non-performing loans. The two hypotheses have been suggested to explain the negative sign between cost efficiency and non-performing loans widely observed in the empirical literature (Dimitrios, et.al., 2016). According to Berger and DeYoung (1997), “the ‘bad luck’ hypothesis predicts that external events increase non-performing loans in banks. This leads to the bank incurring greater operating costs to deal with these problem loans, which, in turn, hampers banking efficiency”. These extra operating costs can result from various sources, including monitoring of delinquent borrowers and the value of collateral as well as the costs of seizing and disposing of collateral in cases of default. Consequently, under this hypothesis, we expect that an increased volume of non-performing loans causes reduced cost efficiency.

Under the “bad management” hypothesis, Berger and DeYoung (1997), propose “low efficiency as a signal of poor management practices which apply to day-to-day operations and managing the loan portfolio”. Poor managers do not adequately monitor loan portfolio management, owing to poor loan evaluation skills or to inadequate allocation of resources to loan monitoring. This results in a greater volume of non-performing loans (Dimitrios, et.al., 2016). Therefore, this hypothesis predicts that reduced efficiency exerts a positive influence on non-performing loans. Non-performing loans have been established in the literature as one of the major sources of financial distress in banks.

The banking sector fragility has been a subject of focus of many studies (Rahman, 2017; Permata & Purwanto, 2018; Abirami, 2018). Several factors have been found to determine the banking crisis at different times and in different operating environments. Some factors are linked to macroeconomic environments such as GDP growth (Tanimoune & Cloutier, 2009; Gammadigbe, 2012; Mngang’at, et, al., 2016; Ginevicius, R., et al., 2019), inflation (Revell, 1979;), interest rate (Beck et al., 2015) and foreign exchange fluctuations (Alder & Dumas, 1980; Beck et al., 2015). Beck et al. (2015) for example, conclude that the most significant factors affecting non-performing loans are GDP growth, share prices, interest rates and the exchange rate. Similarly, studies such as (Shahbaz, Shamim & Amir, 2010; Jahn & Kick, 2012; Mngang’at, et, al., 2016; Yakubu, et al., 2020) also conclude that the soundness of the financial system is a function of the macroeconomic fundamentals (i.e., GDP, exchange rate stability or volatility and inflation). Examining the factors that significantly influence the performance of Chinese banks, Zhang, and Daly (2014) find that macroeconomic variables suggest a positive relationship between China's financial services sector performance and economic growth. The study further finds that an increase in the banking sector performance coincides with the country's increasing economic integration through improved trade

and capital flows. Similarly, other studies such as (Fosu, et. al., 2014; Mwang'at, et. al., 2016) also found significant changes to financial assets arising from changes in macroeconomic factors such as GDP, interest rates, inflation rates, exchange rates and money supply. For example, Mwang'at, et. al. (2016) find a significant relationship between interest rate and financial assets. Large depreciation of a country exchange rates vis-à-vis other major currencies such as US dollars could bring about a significant increase on banking sector nonperforming loans where the majority of the major banks in the system carry foreign currency-denominated loans on their balance sheets (Beck, et.al., 2015). Also, in capturing the impact of the macroeconomic environment on the fragility of banks, using the estimated coefficients of the logit regression, Demirguc-Kunt & Detragiache (2000) concludes that "low GDP growth, a high real interest rate, high inflation, ... are all associated with a high probability of a banking crisis".

In the Nigerian environment, the study conducted by Abdurraheem, et al., (2018) concludes that GDP growth rate, interest rate, inflation and exchange rates are the main determinants of the credit risk of the Nigerian banks. The study particularly, concludes that a decline in the government revenue accompanied by a persistent rise in the interest rate and inflation no doubt, have serious implications for the quality of the banks' risk assets and the financial system stability. In summarizing the effect of macroeconomic conditions on the financial health of banks, Lindgren, Garcia and Saal (1996) state that "although bank soundness is first an issue for individual banks, it is more likely to be systemic when unsoundness is due to macroeconomic conditions because all banks will be exposed to those conditions".

On the other hand, are the studies that conclude that the resilience of the banking sector to shocks in the macroeconomic environment is largely determined by bank-specific variables such as bank profitability, capital adequacy, and liquidity. For example, Dimitrios, et. al. (2016), find that bank insolvency has been a major issue in many countries worldwide, particularly, in many European countries post-2007-2008 global financial crisis. They argue that one of the main factors that often precipitate insolvency in banks is asset quality deterioration. They further argue that asset quality deterioration heightens increasing pressure on bank's balance sheets thus, preventing them from undertaking their intermediation roles with a dire consequence on economic growth. Another important factor that received attention is capital adequacy. For instance, Oshinsky and Olin (2006) argue that well-capitalized banks are less likely to suffer. Even though capital adequacy has been taken as a major financial soundness indicator, the existence of sound and strong banks depends greatly on the quality of their risk assets and credit administration effectiveness (Yakubu, et al., 2020).

Regular measurement of the financial soundness of the banks is not important only to the owners and managers of the banks but also is of great concern to the government, regulatory authority, and researchers. Various tools have been developed and employed to measure the soundness of the health of banks. CAMEL(S) model has been variously applied (Sangmi & Nazir, 2010; Anjum, 2012; Roman & Sargu, 2013). Other techniques that have been used are Altman Z-Score and Bankometer models.

Z-Score model developed by Edward I. Altman (1968). The model was originally applied to predict the bankruptcy of manufacturing companies but revised severally to apply to other types of business structures such as private companies and banks (Qamruzzaman, 2014). Altman Z-

Score model is a multivariate discriminant analysis (MDA) technique (Anjum, 2012). Anjum (2012) further asserts that Z-Score can be applied to predict financial distress and bankruptcy one to three years in advance. Badea, et al. (2016) similarly states that Altman's Z-Score is used to examine the liquidity, profitability, leverage, solvency, and activity ratios of an organization. Qamruzzamaan (2014) used Z-Score and Bankometer models to analyze the financial position of some selected private commercial banks in Bangladesh for the period 2008-2012 to predict the susceptibility of the banks to bankruptcy. The study found that the two models presented similar results indicating the health position of the banks in the consecutive three years of 2008, 2009 and 2010. The two models, however, differed in their results for the years 2011 and 2012. While, according to the results presented under the Bankometer model, a continuous healthy position of the banks was indicated, while the Z-Score model presented likely bankruptcy for the banks. "It can be safely said that Altman's Z-score model can be applied to modern economy to predict distress and bankruptcy one, two and three years in advance" (Anjum, 2012).

Bankometer is another model used to predict the likelihood of financial distress in banks. Bankometer was developed by the International Monetary Fund (IMF) in 2002. Bankometer is a modification from CAMELS (Capital adequacy, Asset quality, Management Efficiency, Earning capacity, Liquidity position, and Sensitivity) and CLSA (Credit Leona's Securities Asia) stress test parameters (Permata & Purwanto, 2018). Similarly, Shamanth and Rajgopal (2016) employed Bankometer to examine the financial soundness of some banks in India. The result of the study found the banks to be financially sound. Rahman (2017) investigated the financial condition of twenty-four (24) private commercial banks in Bangladesh between 2010 and 2015 using the Bankometer model. The study reveals that all the banks were in sound financial condition. The study further concludes that the Bankometer model will assist the management of banks to avoid insolvency problems by controlling their operations properly.

## **Methodology**

The study employs Altman's Z-score a Multivariate Discriminant Analysis (MDA) model and a Bankometer model for the analysis. The models essentially employ financial ratios to predict the financial stability and potential bankruptcy of firms, well in advance. To compute Z-Score, the values of the banks' working capital, earnings before interest and tax, retained earnings, total assets, total liabilities, market value of share holders' equity, and the book value of total liabilities are collected from the end of the year's audited financial statements of the banks in the Securities and Exchange Commission database. Similarly, for the computation of S-Score, the financial ratios employed are Capital/Asset ratio, Equity/Asset ratio, Capital Adequacy ratio, non-performing loans/Total Loans ratio, Cost/Income ratio and Loans/Asset ratio.

### **Altman Z-score model**

Altman Z-score model employs four (4) financial ratios, weighted by coefficients.

According to the Altman Z score model (Altman, 1968), the following equation for bankruptcy or possibility of bankruptcy of the non-manufacturing or service industry has been revised from the original equation with five variables.

Altman's Z-Score model is represented by:

$$Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

Where:

Table 1: Parameter and variable measurement

Variable	Measurement	Interpretation
X <sub>1</sub>	Working Capital/Total Assets	The WC/TA ratio is a sign of a bank's liquidity and ability to meet creditor's short-term obligations. Working capital represents the difference between current assets and current liabilities. A decrease of this ratio indicates signs of financial deterioration of the bank, whereas a high level of the ratio reflects good liquidity position of the bank
X <sub>2</sub>	Retained Earnings/total assets	This is "the account which reports the total amount of reinvested earnings and/or losses of a firm over its entire life" (Altman, 2000, p.10). This ratio shows the capacity of the bank to accumulate profit based on its assets.
X <sub>3</sub>	Earnings before interest and taxes/total assets, <b>(EBIT/TA),</b>	The ratio shows "the ability of the company in generating profits from their assets base" (Othman, 2012, p.162). This ratio measures the productivity of a banks' total assets notwithstanding any interest or tax elements.
X <sub>4</sub>	The market value of equity/book value of total liabilities.	This is the ratio of Market Value of shareholder's Equity to total liabilities. This ratio indicates the performance of the fair market value of the bank's stock in comparison to the total liabilities. The higher the ratio, the higher the market price of the firm's share is. The ratio expresses the financial stability of the bank on a long term

Source: Altman (1968).

Table 2: Zones of discriminations (Z Value)

Z > 2.6	Healthy Firm (Safety Zone)	The firm with a Z value greater than 2.6 is financially sound
Z = 1.1 – 2.6	Firm in the grey area (The Zone of Ignorance)	Any bank within the grey area has a high possibility of facing financial distress soon.
Z < 1.1	Bankrupt Firm (Bankruptcy zone)	The bank is in a vulnerable position.

Source: Altman (1968).



## Bankometer Model

This model measures the soundness of a bank by a score which is called the solvency score, (S-Score).

The deterministic model is presented as:

$$S = 1.5X_1 + 1.2X_2 + 3.5X_3 + 0.6X_4 + 0.3X_5 + 0.4X_6$$

Table 3: Variable Measurement and the set criteria

Variable	Variable Ratio	What it measures	Measurement
X <sub>1</sub>	CA (Capital to Asset ratio)	This ratio measures the extent to which the bank's assets are being financed by total capital (total long-term funds). A higher capital/asset ratio indicates that the bank relies more on long term funds to finance its operations and therefore less susceptible to insolvency and therefore, bankruptcy.	The minimum threshold is 4%
X <sub>2</sub>	EA (Equity to Assets ratio)	This ratio also measures the extent to which the bank's assets are being financed by equity capital. A higher equity/asset ratio indicates that the bank relies more on shareholders' funds to finance its operations and therefore less susceptible to insolvency and therefore, bankruptcy.	The Ratio > 2%
X <sub>3</sub>	CAR (Capital Adequacy Ratio)	This is the ratio of regulatory capital to risk-weighted assets. The ratio measures the capital adequacy to withstand shocks in their balance sheets. A high ratio of CAR indicates the high level of financial safety and ability of the bank to meet its long-term financial obligations.	The minimum limit set by IMF is 8% (Erari et al., 2013)
X <sub>4</sub>	NPL (Non-performing loans)	This is the proportion of non-performing loans to total loans. A higher ratio shows a deteriorating asset quality for the bank. And this indicates a high proportion of loans as non-productive.	The ratio should be less than 15%
X <sub>5</sub>	CI (Cost to Income ratio)	This indicates the proportion of operating expenses to total operating income	The ratio should be below 40%
X <sub>6</sub>	LA (Loan to Assets ratio)	The ratio measures the total loans outstanding as a percentage of total assets. A high ratio indicates a bank is loaned up and its liquidity is low. It also means that the higher the ratio, the riskier a bank may be to higher defaults.	The ratio should be lower than 65%

Table 4: Interpretation of the Bankometer S-Score value.

S > 70	The bank is in very sound health
50 < S < 70	The bank is in a grey area and is vulnerable to experience a financial crisis.
S < 50	The bank is in financial difficulties and has a high possibility of going into bankruptcy.

## Data collection

The study applied secondary data collected from the audited financial reports submitted by selected banks to the Securities & Exchange Commission (SEC). The banks whose data were used in the study were twelve (12) out of the Thirteen (13) banks listed on the Nigeria Stock Exchange (NSE) as of December 31, 2019. A purposeful sampling method was adopted for the selection of banks. The banks selected for the study account for more than eighty per cent of the listed banks on the Nigeria Stock Exchange in terms of the total assets and market capitalization. The data collected are annual financial statements of the banks for the period between 2016 and 2019.

## Results of analysis and Findings

The data were computed and analyzed by Altman's Z-Score Business Bankruptcy Calculator. The results are presented in Tables 5 and 6.

TABLE 5: Altman's Z-Scores of the banks (2016-2019).

Bank	Z-Score	Comment
Access Bank	0.547	The Z-Score is in the low range. The bank is, therefore, likely to be vulnerable to bankruptcy.
FBN	0.926	The Z-Score is in the low range. The bank is, therefore, likely to be vulnerable to bankruptcy
FCMB	1.430	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to keep the bank avoid bankruptcy.
Fidelity Bank	1.738	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to keep the bank avoid bankruptcy.
GTB	1.579	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to keep the bank avoid bankruptcy.
Stanbic	0.618	The Z-Score is in the low range. The bank is, therefore, likely to be vulnerable to bankruptcy
Sterling Bank	2.425	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to keep the bank avoid bankruptcy.
UBA	1.504	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to keep the bank avoid bankruptcy.
UBN	0.443	The Z-Score is in the low range. The bank is, therefore, likely to be vulnerable to bankruptcy
Unity Bank	(6.646)	The Z-Score is negative. The bank is in a very precarious situation. Urgent remedial actions are required to avoid bankruptcy.
WEMA Bank	0.088	The Z-Score is in the low range. The bank is, therefore, likely to be vulnerable to bankruptcy
Zenith Bank	2.343	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to keep the bank avoid bankruptcy.

Source: Author's computations (2020).

**Table 6: Z-Score values and financial soundness ranking**

Bank	Z-Score	Rank	Comments
Sterling Bank	2.425	1 <sup>st</sup>	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to avoid bankruptcy
Zenith Bank	2.343	2 <sup>nd</sup>	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to avoid bankruptcy
Fidelity Bank	1.738	3 <sup>rd</sup>	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to avoid bankruptcy
GTB	1.579	4 <sup>th</sup>	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to avoid bankruptcy
UBA	1.504	5 <sup>th</sup>	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to avoid bankruptcy
FCMB	1.430	6 <sup>th</sup>	The Z-Score is in the medium range. The bank is out of the crisis zone. It is, however, necessary to take precautionary steps to avoid bankruptcy
FBN	0.926	7 <sup>th</sup>	The Z-Score is in the low range. The bank is, therefore, likely to be vulnerable to bankruptcy
Stanbic	0.618	8 <sup>th</sup>	The Z-Score is in the low range. The bank is, therefore, likely to be vulnerable to bankruptcy
Access Bank	0.547	9 <sup>th</sup>	The Z-Score is in the low range. The bank is, therefore, likely to be vulnerable to bankruptcy
UBN	0.443	10 <sup>th</sup>	The Z-Score is in the low range. The bank is, therefore, likely to be vulnerable to bankruptcy
WEMA Bank	0.088	11 <sup>th</sup>	The Z-Score is in the low range. The bank is, therefore, likely to be vulnerable to bankruptcy
Unity Bank	(6.646)	12 <sup>th</sup>	The Z-Score is negative. The bank is in a very precarious situation. Urgent remedial actions are required to avoid bankruptcy.

Source: Author's computations (2020)

The results of the analysis of the data using Z-Score for the 2016-2019 period as presented in Table 5 and Table 6 indicate that there was no bank in the safety zone of financial soundness as per the criteria of the model. Six of the banks were in the grey zone ( $Z = 1.1 - 2.6$ ). This means that the banks (Sterling banks, Zenith Bank, GT Bank, Fidelity Bank, UBA, and FCMB) though, out of the crisis zone need to pay more attention to the financial conditions of the banks to avoid potential crisis which can precipitate bankruptcy. The results also show that five of the banks (FBN, Access

Bank, UBN, Stanbic and WEMA Bank) were in the bankruptcy zone because their Z-Score values were less than 1.1 by the criteria. Unity Bank on the other hand has a negative Z-Score value. This means that the bank is already in a very precarious situation. It urgently requires remedial actions to save the bank from bankruptcy.

Table 7: Bankometer S-Score values of the banks for the 2016-2019 period

BANK	1.5X1	1.2X2	3.5X3	0.6X4	0.3X5	0.4X6	ΣX1-6
ACCESS	41.03	14.02	64.77	2.16	38.77	19.52	180.26
FBN	26.36	13.65	55.96	12.27	9.66	19.33	137.23
FCMB	41.06	16.80	58.07	2.73	10.11	19.80	148.58
FIDELITY	39.19	15.42	59.68	4.23	23.54	21.37	163.42
GTB	42.19	23.19	76.02	3.77	28.38	18.04	191.58
STANBIC	35.63	17.19	80.24	3.41	5.78	23.50	165.75
STERLING	36.79	11.73	43.71	4.05	23.06	22.27	141.61
UBA	42.68	15.03	70.34	2.93	21.23	15.76	167.97
IBN	39.60	22.53	51.19	6.29	24.77	14.47	158.85
UNITY	-73.39	-108.46	-550.76	14.55	20.39	11.84	-685.83
WEMA	27.00	12.90	49.87	3.15	26.23	20.37	139.52
ZENITH	39.86	17.07	81.38	2.55	15.59	16.71	173.16

Source: Author's computation (2020).

Table 7 presents the result of the analysis of the data using Bankometer' S-Score. Unlike the results obtained under the Z-Score model, all the banks except one were found to be in a very sound financial position from the S-score analysis. The S-Score values of all the selected banks but one, exceed the criteria of  $S > 70$  prescribed by the International Monetary Fund (IMF). The only bank (Unity Bank) that falls in the bankruptcy zone under Bankometer is the only bank that is in a precarious zone under the Z-Score models. The bank has a negative S-Score value of -685.

**Table 8: Summary of the S-score values and soundness ranking of the banks**

BANK	S-SCORE	REMARK	RANKING OF THE BANKS		
ACCESS	180.26	Very sound	GTB	191.58	1 <sup>st</sup>
FBN	137.27	Very sound	ACCESS	180.26	2 <sup>nd</sup>
FCMB	148.6	Very sound	ZENITH	173.16	3 <sup>rd</sup>
FIDELITY	163.42	Very sound	UBA	167.97	4 <sup>th</sup>
GTB	191.58	Very sound	STANBIC	165.75	5 <sup>th</sup>
STANBIC	165.75	Very sound	FIDELITY	163.42	6 <sup>th</sup>
STERLING	141.61	Very sound	UBN	158.85	7 <sup>th</sup>
UBA	167.97	Very sound	FCMB	148.6	8 <sup>th</sup>
UBN	158.85	Very sound	STERLING	141.61	9 <sup>th</sup>
UNITY	-685.85	possibility of bankruptcy	WEMA	139.52	10 <sup>th</sup>
WEMA	139.52	Very sound	FBN	137.27	11 <sup>th</sup>
ZENITH	173.16	Very sound	UNITY	-685.85	12 <sup>th</sup>

Source: Author's computation (2020).

**Table 9: Altman’s Z-Score’ ranking and Bankometer’s S-score’s ranking compared.**

Altman’s Z-score ranking			Bankometer S-score ranking.		
Bank	Z-Score	Rank	Bank	S-score	Rank
Sterling Bank	2.425	1 <sup>st</sup>	GTB	191.58	1 <sup>st</sup>
Zenith Bank	2.343	2 <sup>nd</sup>	Access Bank	180.26	2 <sup>nd</sup>
Fidelity Bank	1.738	3 <sup>rd</sup>	Zenith Bank	173.16	3 <sup>rd</sup>
Guaranty Trust Bank (GTB)	1.579	4 <sup>th</sup>	UBA	167.97	4 <sup>th</sup>
UBA	1.504	5 <sup>th</sup>	Stanbic	165.75	5 <sup>th</sup>
FCMB	1.430	6 <sup>th</sup>	Fidelity Bank	163.42	6 <sup>th</sup>
First Bank of Nigeria (FBN)	0.926	7 <sup>th</sup>	UBN	158.85	7 <sup>th</sup>
Stanbic	0.618	8 <sup>th</sup>	FCMB	148.6	8 <sup>th</sup>
Access Bank	0.547	9 <sup>th</sup>	Sterling Bank	141.61	9 <sup>th</sup>
UBN	0.443	10 <sup>th</sup>	WEMA	139.52	10 <sup>th</sup>
WEMA Bank	0.088	11 <sup>th</sup>	FBN	137.27	11 <sup>th</sup>
Unity Bank	(6.646)	12 <sup>th</sup>	Unity Bank	-685.85	12 <sup>th</sup>

Source: Author’s computation (2020).

Table 9 presents a ranking of the soundness of the banks according to the two models employed. Altman's Z-score ranks six of the banks in the grey zone, five in the potential bankruptcy zone while one in the bankruptcy zone. Z-Score indicates the first to the sixth in ranking to be Sterling bank, Zenith Bank, Fidelity Bank, Guaranty Trust Bank, UBA, and FCMB respectively. On the other hand, in the case of Bankometer S-Score, the order of ranking from first to sixth is different. GTB, Access Bank, Zenith Bank, UBA, Stanbic and Fidelity bank were ranked as first to sixth respectively by the S-Score model. The two models, though, differ in some respects, are largely consistent in their categorization of the financial position of the banks. For example, banks such as Zenith Bank, Guaranty Trust Bank, Fidelity Bank, and UBA are consistently among the first six under the two models. Similarly, banks such as UBN, FBN, WEMA banks are consistently grouped among the laggards. The two models classified Unity bank as in the bankruptcy zone.

The findings of the study concerning the predictive capacity of the models and similarities and differences in their classification of firms into safety, grey or bankruptcy zones are supported by similar studies (Qamruzzamaan, 2014; Permata & Purwanto, 2018). The findings of the study are also supported by the underpinning principles of “Bad luck” and “Bad management” hypotheses.

The performance of the underlining variables of the study obtained from the bank's financials can be attributed to bad management of some of the banks while some of the factors can be linked to externalities. The findings of the study, therefore, suggest that since the variables of interest are bank-specific which capture the cost efficiency of the banks, the findings support more of the bad management hypothesis.

## **Conclusion and policy recommendations**

The study investigated the financial soundness of Nigerian commercial banks in order to predict the fragility of the banking sector and susceptibility of any of the banks to potential bankruptcy. The study employs two of the methods widely acceptable for predicting bankruptcy in banks. The two methods employed are Altman's Z-Score models and the Bankometer S-Score model.

The results from Altman's Z-score model analysis show that six out of the twelve banks were in a grey zone while the remaining banks were in a potential bankruptcy zone. Bankometer, on the other, classifies all the banks except one, to be in the safety zone. The study, therefore, concludes that because Altman's Z-Score analysis could not find any of the banks in the safety zone, in contrast to the Bankometer S-Score results, the financial soundness of the banking sector in the country could be fragile. The two methods, however, complement each other in evaluating the financial soundness of the banks and predicting bankruptcy.

The study will provide early warning signals to the relevant stakeholders such as regulatory authorities, and shareholders to prevent the occurrence of bankruptcies in the sector which can trigger a national wide financial crisis. The findings of the study will, therefore, make a significant contribution to the management of the banking sector in the country.

The study, therefore, recommends strict supervision and monitoring of the banks to the regulatory authorities to ensure that financial reports of the banks reflect the underlining books and records of their operations. It is also recommended that the government is to continue to strive to stabilize the macroeconomic environment to provide a conducive operating environment within the economy.

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