AN ANALYSIS OF POTENTIAL FINANCIAL DISTRESS OF SELECTED NIGERIAN BANKS USING ALTMAN Z-SCORE MODEL

Ajijola, L. A.
Department of Actuarial Science and Insurance,
Faculty of Management Sciences,
University of Lagos;
Email: lajijola@unilag.edu.ng
Mohammed Kayode AJAPE
Department of Accounting,
Faculty of Management Sciences,
University of Lagos
Email: majape@unilag.edu.ng
Habeebah Simisola FA-YUSUF Ph.D
Department of Finance,
Faculty of Management Sciences,
University of Lagos, Akoka, Nigeria
Email: hfa-yusuf@unilag.edu.ng
Oyelade, O. D.
Department of Actuarial Science and Insurance,
Faculty of Management Sciences,
University of Lagos.

ABSTRACT
The stability of financial institutions is a cornerstone for sustaining economic development, especially in emerging markets like Nigeria. This research aims to analyse the potential financial distress of some selected Nigerian banks using the Altman Z-Score model. The model is a well-established multivariate analytical tool that integrates several key financial ratios to estimate the likelihood of insolvency. The research uses secondary data from three Nigerian commercial banks, covering the period from 2017-2023. Key variables analyzed include Working capital, Retained earnings, Earnings before interest and tax (EBIT), Market value of equity, Sales, Total assets and Total liabilities. Findings indicate that there is significant relationship between the Altman Z- score and the likelihood of bankruptcy and financial distress in Nigerian banks, its predictive efficacy is often influenced by local economic factors, such as fluctuations in regulatory frameworks and broader market conditions. Therefore, the study suggests that the Altman Z-Score model might require adaptation for the Nigerian banking environment to improve its reliability in bankruptcy prediction. This research has significant implications for regulators, investors, and policymakers aiming to enhance the resilience of the financial system by identifying and mitigating risks associated with bank failures.

Keywords: Altman Z-score Model, Potential Bankruptcy, Financial Distress

1.0 Introduction

The goal of any company is profit maximization in the short-term and to increase the value of the company in the long-term (Setiawati, 2018). Financial sector of any country might suffer in a situation where the company's goals are uncoordinated. Some businesses functioning within a certain time period are compelled to fulfill their responsibilities or be liquidated due to financial issues. (Permana, Ahmar & Djadang, 2017). Rao, Atmanathan, Shankar and Ramesh (2013) defined bankruptcy as a situation where the total liability of a company exceeds its total assets or wherein the company or a person is not able to repay the creditors the debt amount. When a business goes bankrupt, it is unable to continue operating, which makes it unable to finance its regular operations and pay its debts. (Tron, 2021).

Financial distress is a worldwide occurrence that has a great impact on businesses in every industry (Zhang, Wang, & Ji, 2013). A bank is considered to be in a financial distress if it requires external support or is acquired by another bank. Financial distress leads to direct and indirect costs on the firm (Khawaja, 2023). Tangible and other expenses paid for the purpose of liquidation or reorganization in order to revitalize the failing business are considered direct costs. (Olaniyi, 2007). Lawyer expenses, bankruptcy fees, accountants' levy, and other professional services in a liquidation case are examples of these direct costs, but losing sales due to perceived failure that result in a drop in a company's profit are categorized as indirect costs. The company is negatively impacted by this damaged relationship, which could possibly make matters worse and result in bankruptcy.

Developing nations like Nigeria faced significant challenges as a result of the notable failures in the banking industry (from 89 to 19 between 1990 and 2011), brewing, textiles (from 124 to 45 between 1994 and 2005), agriculture, consumer goods enterprises, and many other industries. This is due to the fact that the repercussions are severe and have the potential to impede anticipated growth and progress. In addition to the periodic liquidity rescues of these banks by the apex bank, the Central Bank of Nigeria (CBN) implemented assets and credit evaluation techniques to detect early enough bankruptcy symptoms in Nigerian banks. The CBN acquired three deposit money banks (AfriBank Nig Plc, Spring Bank Nig Plc, and Bank PHB Plc) in 2011 due to their financial hardship as a result of the ongoing negative liquidity positions and toxic character of bank assets. The CBN established three bridge banks to take over their operations: Mainstreet Bank Ltd., Enterprise Bank Plc., and Keystone Bank Ltd. (CBN 2013). During this time, other banks purchased Oceanic Bank Plc, FinBank Plc, and Intercontinental Bank Plc, three more financially troubled institutions. The CBN provided bailouts to Wema Bank Plc and Union Bank Plc in order to somewhat alleviate their financial difficulties, with additional funding coming via rights offerings.

Numerous analysts have conducted a variety of analyses to forecast the company's probable bankruptcy. Zmijewski, Altman Z-score, and Springate are the three analytical techniques used to predict bank bankruptcy (Al-Manaseer & Al-Oshaibat, 2018; Arum & Handayani, 2018; Hutomo et al., 2020; Prasandri, 2018; Saputri & Krisnawati, 2020). Using these three analysis techniques, Hertina and Kusmayadi (2020) did research and came up

with the Altman Z-Score method, which is the most appropriate and has the highest level of accuracy. Altman Z-Score operates in a sophisticated way by concentrating on five current financial ratios that relate one amount to another—working capital to total assets, retained earnings to total assets, EBIT to total assets, market value of equity to total liabilities, and sales to total assets.

The Nigerian banking sector is a vital component of the nation's economic health, playing a critical role in financial intermediation and the facilitation of economic growth (Ogbuagu & Njoku, 2017). However, the sector is increasingly vulnerable to bank failures, which can disrupt financial stability, erode public confidence, and impede national development. Predicting potential bankruptcy and financial distress among listed Nigerian banks is crucial for proactive intervention by stakeholders—including regulators, investors, and bank management—to mitigate risks before they escalate. Traditional financial analysis techniques, such as basic ratio analysis, are often inadequate for capturing the complex and dynamic financial environment in Nigeria, given the sector's exposure to systemic risks and economic volatility (Egbetokun, 2018). The Altman Z-score model, originally designed for manufacturing firms, represents a promising quantitative tool for bankruptcy prediction. This model integrates several financial ratios into a composite index that reflects a firm's overall financial health and potential distress (Altman, 1968). Despite its widespread use globally, its application within the Nigerian banking context remains limited, thereby creating a gap in knowledge concerning its reliability and adaptability in identifying banks at risk of insolvency in Nigeria (Iheanacho & Ekanem, 2017). Addressing this gap is essential for enabling regulators and other stakeholders to make informed decisions about early interventions and policy reforms aimed at strengthening the resilience of the Nigerian financial sector.

The computations from the aforementioned models will show which listed banks are at risk of going bankrupt and will give an early warning of a high bankruptcy risk. For managers, shareholders, creditors, the government, auditors, suppliers, employees, and other organizations, predicting financial crisis is a major concern. Since the study will offer valuable insights into insolvency and the dangers involved, its contents take into account the interests of a variety of stakeholders, including banks, shareholders, customers, and investors.

2.0 Literature Review

Research on financial distress was pioneered by Beaver (1966). Altman did what Beaver (1966) suggested at the end of his writing, which was to conduct a multivariate analysis. The Z-Score method proposed by Altman later became the most popular method for predicting financial distress. According to Burhanuddin and Rizky (2015), Altman's research used the step-wise multivariate discriminant analysis (MDA) method. Similar to logistic regression, this statistical method is frequently employed to develop approaches with a qualitative dependent variable. A linear equation that can differentiate between two states of the dependent variable is the result of the MDA approach. Altman's research sample consisted of 66 companies during a 20-year period (1946-1965). 33 businesses that are

deemed bankrupt and 33 other businesses that are not are the two groups into which the sample is separated. Businesses who filed for bankruptcy under Chapter X of the National Bankruptcy Act are regarded as bankrupt. Altman's company was exclusively from the manufacturing sector. The accessible data solely comes from Moody's Industrial Manual, which only contains data on manufacturing enterprises. Altman's matched-pair approach employs two criteria: industry and company size (total assets). Beaver (1966) compared the total assets of the two sample groups one by one, but Altman only observed the average difference between the two sample groups. Altman's research first gathered 22 company ratios that could be helpful in predicting financial distress, and tests are performed to determine which of these ratios will be used in the model. The tests include examining the ratio's statistical significance, correlation between the ratios, the ability to predict ratios, and the researchers' own judgment.

Ezejiofor and Okerekeoti, (2021) investigated corporate governance and the Altman bankruptcy prediction model through an empirical investigation of Nigerian banks. Few of these studies focused on business firms other than the banking industry, and the majority of these studies were done in Nigeria and other countries. Only a small number of these studies concluded in 2013. Additionally, there is a dearth of study on corporate governance and insolvency in Nigeria. All of the earlier studies, however, pertain to a certain period of time because of the dynamic character of Nigerian deposit money banks. Therefore, this study looked into how the Altman bankruptcy prediction model affected the corporate governance of deposit money banks in Nigeria. The study's objectives are to ascertain whether the Altman bankruptcy forecasting model affects board independence in Nigerian deposit money institutions and whether the model has an effect on board size. The ex post facto study design was used. Nine deposit money banks were selected as a sample size out of Nigeria's total of 22 banks. The annual reports and accounts of the selected banks from 2009 to 2019 were the source of the data. The study examined the hypotheses using regression analysis with the use of E-View 9.0. Board independence benefits from the Altman bankruptcy forecasting model, although the data presented indicates that this effect is not statistically significant for Nigerian deposit money institutions. Additionally, it was found that although board size is positively impacted by the Altman bankruptcy prediction model, this effect is not statistically significant in Nigerian deposit money institutions.

By using a sample of 30 commercial banks, 15 of which failed and 15 of which did not, the study employs the Logit and Multiple Discriminant Analysis (MDA) models using accounting information to predict the likelihood of failure within the Nigerian banking sector. Nkiri and Ofoegbu, (2022) investigate the relevance of accounting-based models in the prediction of financial distress and corporate failure. The empirical results show that bank characteristics derived from financial statements can be used to predict corporate failure. In particular, two important factors that influence bank failure are bank profitability and liquidity. By examining, creating, and testing a prediction model in a developing country such as Nigeria, the study contributes to the limited amount of literature on bank failure in developing countries. Additionally, this study makes policy and practice recommendations,

particularly for bank regulators and management regarding the necessity of keeping an eye on banks' profitability and liquidity status.

Nwidobie (2017) investigated the bankruptcy evaluation of Nigerian banks using Altman's z-score discriminant analysis. The purpose of this study is to use Altman's discriminant analysis model to identify the level of distress that exists in the bridge banks that the Central Bank of Nigeria established in 2011 to take over the nationalized banks. Secondary data from four sampled classified distressed and unsound banks from the declared six for two years preceding their nationalization and two years after using the stratified sampling technique were analyzed using the Altman Z-score discriminant analysis. Results shows that there are marginal improvements in the financial status of the sampled banks between 2010-2013 but they are still in a bankrupt position with Union Bank Plc, Wema Bank Plc, Keystone Bank Ltd and Mainstreet Bank Ltd having a Zscore of -0.56, 0.417, 1.5 and 0.45 respectively at 2013, all below the minimum threshold of 2.675 for classification of a bank as sound and non-bankrupt. This implies that the general broad-based monetary policy measures introduced by the CBN for the financially distressed bank are not much effective in resolving their financial crises in general, making necessary the introduction of bank specific monetary and financial policies to solve identified bank-specific problems, and the CBN directly supervising these banks with daily monitoring of their operations.

By using Altman and Sherrod z- score, Hamid, Mohammed, Omar and Haji, (2023) investigated the financial failure for the banks listed on the Iraqi stock exchange (ISE) between 2009 –2013. The Purpose of the study was to examine the validity of the Altman Z- Score and Sherrod Z- Score models in financial failure prediction. To achieve the study's goal, references from various authors who have reviewed this topic were used. The study highlights the importance of analyzing and delving into the various notions of financial failure and distress. When it comes to potential effects on the wealth of creditors, stockholders, and society as a whole, academics and researchers consider a company's distress and bankruptcy to be the most important issue to be studied. In order to maintain the goal of company survival and continuity before the disaster happens, many academics started looking for a method to identify and forecast distress and failure. Altman Z-score and Sherrod Z- score employed a multi-discriminant model to predict the financial position of ten ISE banks between 2009 - 2013, Z- Score models from Altman and Sherrod were used to determine whether the banks listed on the ISE are exposed to failing financially. Ten banks out of the forty - six banks listed on the ISE were selected. The study only used secondary data obtained from the chosen banks' financial statements in ISE. Based on Altman's Z- score model, the study examines that certain banks are particularly exposed to failure. In contrast, the Sherrod Z- Score model indicates that the chosen banks have some issues, but they are minor, and the risk of bankruptcy is low. By using a failure prediction model, it is possible to determine the likelihood that banks will experience financial failure in the future. Investors could use this information to guide their decision-making going forward. The value and importance of research related to the study of financial failure prediction models in Iraqi commercial banks. The research also seeks to explain financial failure models and the extent to which investors benefit from these models.

Santosh (2023) uses Altman's Z" score model to investigate the financial crisis of a few Nepalese commercial banks. In order to evaluate financial distress, this study used a descriptive research methodology based on a quantitative research approach. This study has easily chosen 16 sample banks from a total of 24 private commercial banks. Inferences have been made using Altman's updated Z" score (1993). As secondary data, the 2019–20 annual financial reports of the individual banks were used. Ten commercial banks are in the uncertain zone, while six of the sixteen sampled institutions are in the zone of difficulty. Likewise, this study has demonstrated that the Z" score model is ineffective at forecasting financial difficulty. Introducing Altman's Z" score model for emerging market and non-manufacturing businesses in connection with Nepalese commercial banks.

Using the Altman Z-score to determine the size of the bankruptcy prediction for the banking industry between 2011 and 2013, Muammar (2017) examined the bankruptcy predictions of the banking companies listed on the Indonesia Stock Exchange, calculating the bankruptcy prediction for each of the 29 banks. The study's data used was the Exchange Indonesia annual financial statements. The analysis technique used is a bankruptcy prediction model Altman Z-score. By using the formula $Z - score = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$. When a company's Z-score is greater than 2.99, it is considered to be in extremely good health. Since 1.81 < Z-score < 2.99 fall into the gray area, the management company's decision-making discretion will determine the likelihood of bankruptcy and the chances of saving the same amount of money. A company with a Z-score of less than 1.81 is considered to be in serious financial trouble and is at high danger of collapsing. According to the research data, several of the 29 banks that went public during that time were still in bankruptcy. While there were 10 banks in good health, 14 banks in bankruptcy, and 5 banks in gray area in 2012, there were 11 banks in 2013 that were in healthy condition, 4 in gray area, and 14 in bankruptcy, which remained constant from year to year. In 2011, there were 13 banks in a healthy condition, as indicated by the Z-score being above 2.99, and 14 banks in bankruptcy, as well as two in the grey area.

3.0 Material and Methods

3.1. Data sources and Collection Instrument

The secondary data sources for this study are total assets and liabilities, working capital, retained earnings, earnings before interest and tax, market value of equity and sales obtained from Financial Statements and the Nigerian Stock Exchange for the years 2017 to 2023. The data encompasses yearly financial ratios of Guaranty Trust bank (GTB), Union bank and First City Monument Bank (FCMB) along with the market index data necessary for calculating the Altman Z-score. These banks were selected based on their ranking among their peers in Nigerian as well as their rating by the rating agencies. Guarantee Trust Bank was selected base on its pedigree as a leading Tier 1 banks in Nigeria christened FUGAZE (First Bank, United Bank for Africa, Guarantee Trust Bank, Access Bank and Zenith Bank). GT is also ranked 7th among the Africa's Top 100 banks, 2024 with $1 billion Tier 1 Capital (Minney, 2024). Union Bank and First City Monument Bank (FCMB) were ranked 10th and 11th in same ranking as well with total Tier 1 capital of $577 million and $547 million respectively.

The data collection instrument involves downloading historical Financial Statements and market index data from the NSE website. The collected data will be organized and analysed using Excel to ensure accuracy and reliability in the findings.

3.2. Methods of Data Analysis

To achieve the research objectives, we must ensure the collected financial data is accurate, complete, and free from errors. Address any missing values or inconsistencies in the financial statements. Standardize data to ensure consistency across different banks or periods. Compute the Z-Score for each bank using the Altman Z-Score formula:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$$

Where:

X_1 = Working Capital/ Total Assets (This measures the liquidity and efficiency of the bank in using assets).

X_2 = Retained Earnings/ Total Assets (This measures the profitability and reinvestment of earnings of the bank)

X_3 = Earnings before Interest and Taxes/ Total Assets (This measures the operating efficiency of the bank).

X_4 = Market Value of Equity/ Total Liabilities (This measures the solvency and financial leverage of the bank).

X_5 = Sales/ Total Assets (This measures the asset utilization and efficiency of the bank)

To predict the potential bankruptcy of the selected banks, X_i for $i = 1$ to 5 in the Altman Z-score model are the independent variables while Z (Bankruptcy/Financial Distress) is the dependent variable. Next, we extract the required financial ratios from the banks' financial statements and calculate each component of the Z-Score. We classify each bank into one of the three zones based on the Z-Score:

Safe Zone	Grey Zone	Distress Zone
$Z > 2.99$	$1.81 < Z < 2.99$	$Z < 1.81$

We perform this classification for multiple time periods to analyze trends. We then identify any trends, such as improving or deteriorating financial health and compare the trends in Z-Scores among different banks to determine which banks are showing consistent distress signals. We also perform One Sample t-test of the mean of the variables.

We used Pearson correlation analysis to compare the variables used in computing each bank Z-Scores with the computed Z-Score. The Pearson correlation for two objects, with paired attributes, sums the product of their differences from their object means, and divides the sum by the product of the squared differences from the object means. The formula for the Pearson correlation is given below

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - (\sum x)^2} \times \sqrt{n(\sum y^2) - (\sum y)^2}}$$

4.0 Data Presentation and Analysis

Table 1: Summary GT BANK Financials and Z-Score

YEAR	X_1	X_2	X_3	X_4	X_5	Z-Score	Zone
2017	0.221802	0.05123	0.19467	3.94537	0.09768	3.445	Safe
2018	0.210103	0.04537	0.21642	3.69311	0.09338	3.339	Safe
2019	0.219426	0.04441	0.14982	3.89365	0.04601	3.202	Safe
2020	0.198234	0.045	0.12075	3.44319	0.04148	2.807	Grey
2021	0.053319	0.03649	0.04926	3.92672	0.08238	2.716	Grey
2022	0.013392	0.03333	0.04347	3.95225	0.08365	2.661	Grey
2023	0.033947	0.05985	0.07464	3.72207	0.12243	2.727	Grey
Mean	0.13574614	0.0451	0.12129	3.79662	0.081	2.98526	
Standard Deviation	0.08941831	0.00818	0.064	0.1748	0.02657	0.30707	

Source: Authors Computation, 2024

Table 2: Summary UNION BANK Financials and Z-Score

YEAR	X_1	X_2	X_3	X_4	X_5	Z-Score	Zone
2017	0.283171	0.01569	0.03156	0.98217	0.11257	1.1678	Distress
2018	0.184962	0.04244	0.0416	0.57947	0.09941	0.8657	Distress
2019	0.161738	0.01603	0.04379	0.49537	0.08896	0.7472	Distress
2020	0.144764	0.01495	0.03912	0.43625	0.07316	0.6587	Distress
2021	0.118018	0.00529	0.03478	0.41169	0.06829	0.5791	Distress
2022	0.133346	0.01583	0.04277	0.39584	0.02372	0.5845	Distress
2023	0.076019	0.01669	0.03542	0.34162	0.01502	0.4515	Distress
Mean	0.15743114	0.01813	0.03843	0.52034	0.06873	0.72207	
Standard Deviation	0.06036661	0.01058	0.00427	0.20133	0.03423	0.21926	

Source: Authors Computation, 2024

Table 3: Summary FCMB Financials and Z-Score

Year	X_1	X_2	X_3	X_4	X_5	Z-Score	Zone
2017	0.1684	0.025	0.02086	0.30069	0.13874	0.62505	Distress
2018	0.136099	0.01821	0.02577	0.23564	0.11763	0.53285	Distress
2019	0.144321	0.02869	0.03981	0.25182	0.10863	0.60445	Distress
2020	0.132406	0.0323	0.03513	0.22845	0.09689	0.55399	Distress
2021	-0.00307	0.02522	0.0376	0.19588	0.08504	0.35827	Distress
2022	-0.06672	0.025	0.04496	0.18259	0.09486	0.30772	Distress

2023	-0.06942	0.03378	0.06341	0.16372	0.11716	0.38864	Distress
Mean	0.06314514	0.02688	0.03822	0.22268	0.10842	0.48157	
Standard Deviation	0.09754878	0.00486	0.01281	0.04299	0.01666	0.1181	

Source: Authors Computation, 2024

4.1. Results and Findings of the Z-Score

The analysis results for each bank were extracted through excel spreadsheets, and the results of the overall analysis. The table above shows the results of the Z value of all the banks included in the study. The analysis was undertaken based on the size, the volume of traded equities, the number of employees, and nationwide spread.

For Guaranty Trust bank (GTB), the Z-scores are generally high, indicating that the bank's performance has been consistently above average over the 7-year period. There is a noticeable decline in Z-scores over the years, with the highest scores in the first three years (3.445, 3.339 and 3.202) and lower scores in the last four years (2.807, 2.716, 2.661, and 2.727). The last four years have relatively consistent Z-scores, ranging from 2.661 to 2.727, indicating a period of stable but lower performance. The largest drop in Z-score occurs between year 3 (3.202) and year 4 (2.807), suggesting a significant change in performance. The data suggests that the bank's performance was exceptionally strong in the first three years, followed by a decline and then a period of stability at a lower level. This could be due to various factors such as changes in market conditions, increased competition, or shifts in the bank's strategy.

For Union bank, the Z-scores are generally moderate, indicating that the bank's performance has been around or slightly above average over the 7-year period. There is a noticeable downward trend in Z-scores over the years, with the highest score in year 1 (1.1678) and the lowest score in year 7 (0.4515). The decline in Z-scores is relatively steady, with a slight fluctuation in years 5 and 6 (0.5791 and 0.5845). The last four years have relatively low Z-scores, ranging from 0.6587 to 0.4515, indicating a period of below-average performance. The data suggests that the bank's performance was above average in the first year but has been declining steadily over the 7-year period, with a significant drop in the last year. This could be due to various factors such as increased competition, changes in market conditions, or internal issues. These results also corroborated the bank's rating by FITCH which downgraded the bank's Long-Term *IDRs* of "B-" and National Long-Term Ratings of "BBB+(nga)" and "BBB(nga)", respectively. IDR stands for Issuer Default Rating, which is a Fitch Ratings assessment of an entity's likelihood of defaulting on financial obligations. Fitch Ratings uses IDRs to evaluate the relative vulnerability of entities across countries and industry groups

For FCMB, the Z-scores are generally low to moderate, indicating that the bank's performance has been around or slightly below average over the 7-year period. There is a decline in Z-scores over the years, with the highest score in year 1 (0.62505) and the lowest score in year 6 (0.30772). The decline is not steady, with some fluctuations: Years 1-3

(relatively stable), Year 4 (slight decline), Year 5 (significant decline), and Year 6 (lowest score), Year 7 (slight recovery). The last three years have relatively low Z-scores, ranging from 0.35827 to 0.38864, indicating a period of below-average performance. The data suggests that the bank's performance was around average in the first year, then declined over the 7-year period, with some fluctuations. The significant drop in year 5 and the low score in year 6 may indicate internal issues or external factors affecting the bank's performance. The slight recovery in year 7 may indicate efforts to address these issues or external factors influencing the bank's performance.

The results of Union Bank and FCMB corroborated the by Fitch who maintained the RWN on First City Monument Bank's (FCMB) and Union Bank of Nigeria PLC's (UBN) Long-Term IDRs of "B-" and National Long-Term Ratings of "BBB+(nga)" and "BBB(nga)", respectively (Fitch, 2024). IDR stands for Issuer Default Rating, which is a Fitch Ratings assessment of an entity's likelihood of defaulting on financial obligations. Fitch Ratings uses IDRs to evaluate the relative vulnerability of entities across countries and industry groups

4.2. Correlation Analysis

A Pearson correlation coefficient was computed to determine the relationship between the six variables including the Z-Scores for each of the three banks as showed in tables 4, 5, and 6. For GT Bank, the results indicate a significant positive relationship not only between Z-Score and $X_1\left(\frac{Working\ Capital}{Total\ Assets}\right)[r(0.838), p = 0.019]$ but also with $X_3\left(\frac{EBIT}{Total\ Assets}\right)\ [r(0.948), p = 0.001]$. This implies that the working capital, EBIT (Earnings Before Interest and Tax) and total assets are the main factors in their positive Z-Score.

In the case of Union Bank, there is a significant and positive relationship between $X_1\left(\frac{Working\ Capital}{Total\ Assets}\right)$, $X_4\left(\frac{Market\ Value\ of\ Equity}{Total\ Liabilities}\right)$, and $X_5\left(\frac{Sales}{Total\ Assets}\right)$ and the bank Z-Score with $[r(0.992), p = 0.00], [r(0.971), p = 0.000]$ and $[r(0.856), p = 0.014]$ respectively. An indication that the ratio of market value of equity to total liabilities outweigh the combine ratios of other variables with the total assets This resulted to the bank having a Z-Scores in the distress zone.

Lastly, First City Monument Bank (FCMB) have a significant and positive relationship between its Z-Score and $X_1\left(\frac{Working\ Capital}{Total\ Assets}\right)[r(0.992), p = 0.00]$ and $X_4\left(\frac{Market\ Value\ of\ Equity}{Total\ Liabilities}\right)[r(0.992), p = 0.00]$. This implies that the ratio of market value of equity to total liabilities outweigh the combined ratios of other variable. This is the main factor for the bank distress Z-Score.

Table 6: Correlation Analysis- GT Bank

	X_1	X_2	X_3	X_4	X_5	Z-Scores
X_1	1					
X_2	0.221	1				
X_3	.897**	0.356	1			
X_4	-0.284	-0.32	-0.178	1		
X_5	-0.463	0.461	-0.068	0.285	1	
Z-Scores	.838*	0.291	.948**	0.132	-0.007	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 7: Correlation Analysis- Union Bank

	X_1	X_2	X_3	X_4	X_5	Z-Scores
X_1	1					
X_2	0.24	1				
X_3	-0.265	0.384	1			
X_4	.970**	0.172	-0.462	1		
X_5	.820*	0.303	-0.122	.755*	1	
Z-Scores	.992**	0.314	-0.271	.971**	.856*	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 8: Correlation Analysis- FCMB

	X_1	X_2	X_3	X_4	X_5	Z-Scores
X_1	1					
X_2	-0.262	1				
X_3	-.800*	0.663	1			
X_4	.910**	-0.316	-.837*	1		
X_5	0.46	-0.131	-0.309	0.614	1	
Z-Scores	.954**	-0.052	-0.623	.889**	0.613	1

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

5.0 Conclusion

The discriminant functions predicted are working capital/total asset, retained earnings/total asset, EBIT/total asset, market value of equity/total liabilities and sales/total asset with a cut off score. The Z model given as $Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$. However, the results of the analysis revealed that two (2) banks are financially

unhealthy/weak performance and are likely to experience bankruptcy if no rejuvenation is attempted. Only GT bank is classified as safe with some grey classification in the latter period of our investigation. The enormous ramifications of distress are far-reaching since failure would result in job loss, direct and indirect expenses, a decline in GDP, and other similar outcomes that Nigeria is currently facing. According to the trend study, distress indicators start to show up before the seventh year. Nevertheless, MDA does more than just forecast corporate failure; it also demonstrates that the warning signs were evident a few years prior to the failure's actual occurrence. This finding aligns with the research conducted by Uchenna and Okelue (2012), who believed that MDA not only predicted business failure but also demonstrated that failure signals of imminent risk appeared months before actual collapse. Additionally, the performance of the weak and healthy companies differed significantly based on the financial ratios identified, which supported the findings of Maishanu (2013), Enyi (2013), Olaniyi (2007), and Bello (2010), whose studies confirmed the feasibility of the Multiple Discriminant Analysis prediction model in Nigerian banking and manufacturing sectors, respectively.

References

Al-Manaseer, S., & Al-Oshaibat, S. (2018). Validity of Altman Z-score model to predict financial failure: Evidence from Jordan. *International Journal of Economics and Finance, 10*(8), 181–190.

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *Journal of Finance, 23*(4), 589-609.

Arum, D. P., & Handayani, S. R. (2018). Analisis perbandingan metode Altman (Z-score), Springate (S-score), dan Zmijewski (X-score) dalam memprediksi kebangkrutan perusahaan. *Jurnal Administrasi Bisnis, 60*(1), 109–118.

Beaver, W. (1966). Financial ratios as predictors of failure. *Journal of Accounting Research, 5*, 71-111.

Bello, A. (2010). An Assessment of Multiple Discriminant Analysis Model in Predicting Corporate Failure in Nigeria. *Journal of the Department of Accounting. Ahmed Bello University, Zaria 7(4), 45 - 64*

Burhanuddin, & Rizky, A. (2015). Analisis penggunaan metode Altman Z-Score dan metode Springate untuk mengetahui potensi terjadinya financial distress pada perusahaan manufaktur sektor industri dasar dan kimia sub sektor semen periode 2009-2013. *Jurnal Ekonomi dan Bisnis*.

Enyi, P. E. (2013). A comparative analysis of the effectiveness of three solvency management models. Department of Accounting, Covenant University, Ota, Nigeria

Egbetokun, A. A. (2018). Predicting bankruptcy in Nigerian banks: An empirical analysis using Altman Z-score model. *Journal of Financial Management and Analysis, 31*(1), 34-47.

Ezejiofor, R. A. & Okerekeoti, C. U. (2021). Altman Bankruptcy Prediction Model and Corporate Governance: An Empirical Study of Nigerian Banks. *International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456- 6470, 5(6), 159-171.*

Hamid, G. M., Mohammed, G. A., Omar, K. M. T. & Haji, S. M. R. (2023). Using Altman and Sherrod Z-Score Models to Detect Financial Failure for the Banks Listed on the Iraqi Stock Exchange (ISE) Between 2009 –2013. *International Journal of Professional Review, Miami, 8(4), 1-22.*

Hertina, D., & Kusmayadi, D. (2020). Comparative Analysis Of The Altman, Springate, Grover, And Zmijewski Models As Predicting Financial Distress. *Journal of Archaeology of Egypt, 17(5), 552–561.*

Hutomo, A., Marditama, T., Limakrisna, N., Sentosa, I., Lee, J., & Yew, K. (2020). Green Human Resource Management, Customer Environmental Collaboration and the Enablers of Green Employee Empowerment: Enhanching an Environmental Performance. *DIJEF, 1(2), 358–372. https://doi.org/10.38035/DIJEFA*

Iheanacho, E. N., & Ekanem, I. (2017). Altman Z-score models and Z-score models in predicting corporate failure: Evidence from Nigeria. *Journal of Finance and Accounting, 14*(2), 12-25.

Khawaja, M J. (2023). Predicting Financial Failure using Altman's Z-Score Model: Evidence from Commercial Banks in Pakistan. *Annals of Social Sciences and Perspective, 4(1), 91-102.*

Khaddaf, M., Falahuddin, Heikal & Nandari, A. (2017). An Analysis Z-score to Predict Bankruptcy in Banks Listed in Indonesia Stock Exchange. *International Journal of Economics and Financial Issues, 2017, 7(3), 326-330.*

Maishanu, M. (2013). Predicting Bank Distress in Nigerian Banking Industry: A new Discriminant Analysis Model. *Journal of the Department of Business Administration, Usmanu Dafodiyo University, Sokoto4(6), 56 – 78.*

Minney, T. (2024). Africa's Top 100 Banks 2024: Going global. https://african.business/2024/09/finance-services/africas-top-100-banks-2024-going-global

Nkiri, J. E. & Ofoegbu, G. N. (2022). Predicting Financial Distress and Corporate Failure: Empirical Evidence from the Nigerian Banking Sector. *Universal Journal of Accounting and Finance, 10(2), 433 - 443. DOI:* 10.13189/ujaf.2022.100207

Nwidobie, B. M. (2017). Altman's Z-Score Discriminant Analysis and Bankruptcy Assessment of Banks in Nigeria. *Covenant Journal of Business & Social Sciences (CJBSS), 8(1), 1-15.*

Ogbuagu, A. O., & Njoku, E. C. (2017). Predicting corporate failure in Nigeria: An application of Altman Z-score model. *Journal of Finance and Accounting, 14*(1), 1-12.

Olaniyi, T.A. (2007). Predicting Potential of Failure in Nigerian Banking Sector A Comparative Analysis Of First Bank Plc, And Trade Bank Plc*. Babcock Journal of Management and Social Sciences, Babcock University, 6(1), 64-73*

Permana, R. K., Ahmar, N., & Djadang, S. (2017). Prediction bankruptcy using Altman Z-score model: Evidence from Indonesian banking industry. *Journal of Economics and Finance*, 123-135.

Prasandri, E. F. (2018). Analisis Financial Distress dengan Menggunakan Metode Z-Score (Altman),Springate, dan Zmijewski untuk Memprediksi Kebangkrutan Perusahaan Rokok yang TerdaftarDi Bei Pada Tahun 2013-2016. *Jurnal Penelitian Ekonomi dan Akuntansi (JPENSI), 3(2), 713-724*

Rao, N., Atmanathan, G., Shankar, M. and Ramesh, S. (2013). Analysis of Bankruptcy Prediction Models and Their Effectiveness: An Indian Perspective. *Great Lakes Herald, 7(2), 3-17.*

Santosh, G. (2023). Exploring financial distress through Altman Z" score: example of selected private commercial banks in Nepal. *Journal of Emerging Management Studies, 1(1), 94-107*

Saputri, H.A. & Krisnawati, A. (2020). Comparative Analysis of Modified Altman Z-Score, Springate, Zmijewski, Bankometer, Grover, and RGEC Models for Financial Distress Prediction. *International Journal of Multicultural and Multireligious Understanding (IJMMU) Vol. 7, No. 4, May 2020*

Setiawati. (2018). Altman Z-score bankruptcy prediction and financial distress. *Journal of Finance Accounting and Economics*.

Tron, A. (2021). Common characteristics of firms in financial distress and prediction of bankruptcy or recovery: An empirical research carried out in Italy. *Emerald Publishing Limited*.

Uchenna, A. W. & Okelue, U.D. (2012). Predicting Corporate Business Failure in the Nigerian Manufacturing Industry European Journal of Business and Management www.iiste.org 4(10).

Zhang, Y., Wang, S., & Ji, G. (2013). A rule-based model for bankruptcy prediction based on an improved genetic ant colony algorithm. *Mathematical Problems in Engineering, 753251*.