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FAILURE PREDICTION: AN EMPIRICAL ANALYSIS OF SELECTED INDIAN BANKS

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ABSTRACT

Purpose: *The axle of this study is to evaluate the financial distress or chance of failure in the selected Indian public and private sector banks by using Altman Z Score model.*

Design / Methodology / Approach: *Altman's z-score model evaluates and measures financial distress status of corporation, which helps in failure prediction. Five banks each in public and private sector category were selected to measure financial distress. Secondary data were collected from moneycontrol.com and economictimes.indiatimes.com for the period 2013 to 2017.*

Findings: *Results indicate that the financial position of selected banks under study is safe means they are financially sound and there is no sign of financial distress than for one bank, hence no chance of financial failure. It can be concluded that there is no chance of failure in near future for any of the select bank since none of them falls under the zone having less than 1.10 Z-score except for Axis bank in the year 2017, where it is very close to this value, which means it is difficult to predict about this bank. However, certainly the bank management needs to pay a serious attention to improve upon its financial soundness.*

Originality / Value: *The study has attempted to measure the chance of failure or financial distress in selected Indian banks. This study has tried to address the most important concern of bank customers. The study is very significant in the current situation when the depth and width of NPAs are widening every passing day and have led to so much anxiety amongst bank customers in India. The study has used widely accepted Altman's Z-score model to measure the chance of financial failure.*

JEL CODIFICATION: G21; G33

KEYWORDS

Financial Distress, NPAs, Financial Stability, Corporate Failure, Banking System etc.

1. INTRODUCTION OF STUDY

Failure prediction and bankruptcy prediction are two terms being coined in the accounting literature from long. The research works related to bankruptcy prediction can be actually divided into two categories: first category uses the phrase 'bankruptcy prediction' and second uses the term 'failure prediction'. Balcaen, Ooghe (2006) stated that most of researchers use the term 'failure prediction' but they actually mean 'bankruptcy prediction'. He further says that some studies that have used failure but actually mean bankruptcy are Zavgren (1985), Hambrick and D'Aveni (1988) and there is not even one supported theory of bankruptcy in the failure literature that would explain how firms go bankrupt. Therefore, most of the bankruptcy prediction studies are focused on finding empirically the best predictors of bankruptcy, without relying on any theory.

Irrespective of the choice for term made, it is imperative to predict the bankruptcy or failure at the earliest possible date. Dimitras et al. (1996) describes that failure of a firm has a high cost to the firm, to its stakeholders, to the society, and eventually to the country's economy. Aziz and Dar (2006) also emphasize upon the importance of bankruptcy prediction and say that corporate responsibility and liability are observed nowadays more cautiously, especially after

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the large and costly failures of WorldCom and Enron. Further, it is argued that if the early signs of financial distress are overlooked then it may lead to insolvency for a firm. Thus, timely and accurate prediction of financial distress is of utmost importance for all stakeholders.

Chen (2011) explains that more accurate financial distress prediction would certainly provide useful information for stakeholders such as shareholders, lenders, creditors, bankers, government, and even for the public. Dimitras et al. (1996) also argues in the same direction that bankruptcy prediction's role as an early warning system is important in preventing failure, but in addition, bankruptcy prediction is useful for decision makers in financial institutions in evaluating whom to co-operate with or to where to invest in. Fitzpatrick (1932) went further in his conclusion and says that there are five stages of business failure such as incubation, financial embarrassment, financial insolvency, total insolvency and confirmed insolvency.

Prediction models are used to check the bankruptcy or business failure and can be applied to modern economy to predict distress and bankruptcy of one, two and three years in advance (Sanobar Anjum 2012). Beaver (1966) is acknowledged as a pioneer who used financial ratios in corporate failure prediction. He recognized the importance of cash flow ratios and used univariate discriminant analysis method. Shortly after Beaver (1966), Altman (1968) introduced multiple discriminant analysis (MDA) to company's failure prediction modelling. Later Ohlson (1980) proposed the logit model. Most of the bankruptcy prediction models have been industry specific.

Altman (1968) chose five financial variables and the model-classified bankruptcy correctly for 95% of the firms. So both Beaver (1966) and Altman (1968) had models with high prediction accuracy. Dambolema and Khoury (1980) present that the first significant analysis on internal factors causing bankruptcy was Altman's (1968) statistical Z-score model. Even 50 years later Altman's Z-Score is still seen as a great indicator to predict bankruptcy (Lawrence *ET AL.* 2015). A number of studies can identify the importance of Z-score. Its widespread use is because of its simplicity and it can be calculated using only accounting information (Laetitia Lepetit, 2015).

Now, next question is why the banking sector has been chosen to study the financial distress. In India, banking sector is the most preferred avenue for investment. Mutual funds and stock investment are limited to institutional investors though witnessing now the entry of retail investors in the recent past. However, banking sector also faces many kinds of risks. Campbell (2007) states that banking sector faces various types of risk viz. credit risk, market risk, liquidity risk, foreign exchange risk, political risk, sovereign risk, interest rate risk, operational risk etc. and high intensity of risk leads to business failure. Now a days, financial stability has become the major issue for banking sector because there are some factors such as failure of management, external forces, competition, increasing portfolio of non-performing assets (NPA), escalating incidences of fraud, inability to comply with regulatory requirements etc. form the probability of risk and leads to financial distress.

Thus, the banking sector being the most preferred destination for Indian retail investors needs to be extra proactive in analyzing their financial statements because the financial distress would hit the financial strength and earnings of banks. Therefore, proper assessment of financial distress is required to save guard the longevity of banks on which the trust of masses is dependent. The next section of the paper talks about the motivation for the study. The third section reviews relevant literature and the fourth section frames objectives for the study. The next section discusses research method followed by findings in section six and the conclusions in section seven.

2. MOTIVATION FOR THE STUDY

The amount of NPAs in Indian banks has increased manifold during last two decades. If we refer to statistics in this regard then we can make out the depth and extent of the issue. The gross non-performing assets (NPAs) of all the banks in the country amounted to Rs 8,40,958 crore in December 2017, led by industry loans followed by services and agriculture sectors, government officials reported on March 9th 2018 (www.economictimes.indiatimes.com, 2018). The increased level of NPAs in Indian banking industry has led to fear of technical bankruptcy in the mind of bank customers. Researcher wishes to measure this presumed financial distress in Indian banks by using Altzman Z score model. For carrying out this study, five public and five private sector banks had been selected from Indian banking industry. This will address concern of millions of Indian whose trust is now shattered and there is anxiety in the Indian Economy. This research would be of great interest to the government of India apart from the bank customers.

3. REVIEW OF LITERATURE

Fitzpatrick's (1932) was possibly the oldest study to predict corporate failure. Thus, he is the first person to have analysed the financial ratio in order to distinguish between active and inactive companies. The Univariate Analysis (UA) model had been used in his study, which includes 13 financial ratios to identify failure. Fitzpatrick's work was subsequently followed by studies that carried out by William Beaver. Beaver (1966) was a forerunner of corporate failure prediction models, applying a univariate model on 30 financial ratios in order to classify corporations as solvent or bankrupt at that time. Financial ratios can correctly recognize failure with a proportion of 78% for five years before bankruptcy (www.accaglobal.com, 2015). Wang and Campbell (2010) concluded that many researchers who have provided different techniques to help identify bankruptcy have used US corporations' data. It is reported that the Altman Z-score model (1968) and Ohlson's model (1980) are two models that are well accepted and commonly used at present.

Existing literature suggests that a several studies had been performed in the late 1960s to develop the failure prediction and financial distress models, which continues until this day. In general, after the financial crisis in 2008 the need for developing bankruptcy prediction models is needed more than ever. Researchers have examined many of the models in order to identify their ability to predict corporate failure. Examples of studies include Beaver (1966), Altman (1968), Deakin (1972), Ohlson (1980), Taffler (1983).

However, a complex issue was to decide how to interpret financial distress. Although failure does not necessary always lead to bankruptcy, Karels and Prakash (1987) state that financial failure is a necessary condition of bankruptcy. Thus, risk of financial failure has been taken as proxy of financial distress and therefore studying the risk of financial failure or financial distress is of paramount importance. On the other hand, in terms of forecasting corporate bankruptcies, there are some other studies, which have used logistic regression model as a standard to predict firm's failure. For example, Ohlson (1980) to predict company bankruptcy has utilized logistic regression analysis. His study has been adapted to United States companies to estimate and determine the probability of failure for each firm separately. He believes that the logistic regression model faces less criticism than the Multiple Discriminate Analyses (MDA) approach.

Altman (1968) extended Beaver's work in his study of corporate failure prediction models by employing the MDA model to the failure classification model (www.accaglobal.com, 2015). Thus, in the 1970s and 1980s (Altman, 1968; Altman & Lavallee, 1981), it was stated that the discriminant analysis MDA technique was extensively used for corporate bankruptcy studies. As well, according to Altman (2000), the MDA approach is considered a more familiar statistical mechanism, which was utilised to classify and to forecast corporate failure. After the spread of the Altman Z-score model, studies on this model increased widely. Examples of studies include Deakin (1972); Taffler (1982, 1983); Goudie (1987); Grice and Ingram (2001); and Porporato (2007). Thus, it has been decided to use Altman Z-model (revised in 1993) for the current study.

Further, there are not many evidences in the literature suggesting any India specific study been carried out in the recent past after these issues have emerged? Thus, there is a need for predicting the risk of financial failure by means of measuring financial distress well on time for helping stakeholders taking timely curative measures in relation to financial investments. This leads to formation of objectives for our study.

4. RESEARCH OBJECTIVES

The axle of this study is to evaluate the financial distress or chance of financial failure by using Altman's Z-Score model in the selected Indian public and Private sector banks. This model evaluates the corporate defaults and measures financial distress status of corporations. The primary objectives of this research are:

- To assess the financial distress in selected Indian public and private sector banks.
- To predict possibility of failure in selected Indian public and private sector banks by using Altman' Z-Score model.

5. RESEARCH METHOD

The present study is an attempt to assess financial distress or chance of failure in Indian banking sector through the application of Altman Z-score, which would help in estimating the financial health of selected banks. Descriptive and analytical approach has been used to achieve the objectives. Five public sector banks viz. State Bank of India, Punjab National Bank, Syndicate Bank, Bank of India and Canara Bank and five private sector banks viz. ICICI Bank, Axis Bank, HDFC, Yes Bank and Indusind Bank have been selected for the purpose of this study. The present study predicts Z score for 10 Indian banks for a period of 5 years from 2013-2017. Data for the present study were collected from secondary sources such as moneycontrol.com and bank's annual reports available on their websites. Revised Z-score model for non-manufacturer or emerging markets (1993) has been applied in this study.

5.1 Data Collection & Sampling

Data for a period of 5 years from 2013-2017 had been used and the same was collected from secondary sources such as moneycontrol.com and bank's annual reports available on their websites.

5.2 Sampling Strategy and Sample Size

All private and public sector banks working in India form the population for this study. However, a conscious attempt has been made to choose those public and private banks, which have highest business and maximum span of operations. Among the selected public sector banks, the State bank of India has highest number of branches in the country followed by Punjab national bank. Bank of India and Canara banks were amongst the newest public sector banks and doing good business in the country. Whereas the span and spread of private banks is limited to big cities only and ICICI and HDFC are oldest among those private sector banks which are doing maximum business. On the other hand, Yes and Indusind banks are though not that old but are growing very fast. Thus out of a total of 27 public and 22 private commercial banks operating in India; following five private and five public sector banks have been chosen for the purpose of this study:

A. Public Sector Banks
- State Bank of India (SBI)
- Punjab National Bank (PNB)
- Bank of India (BOI)
- Syndicate Bank (SB)
- Canara Bank (CB)

B. Private Sector Banks
- ICICI Bank
- Axis Bank
- HDFC
- Yes Bank
- Indusind Bank

5.3 Data Analysis Techniques

Quantitative data analysis had been carried by applying Altman's Z-Score revised Model (1993) apart from using tabulation, percentages and ratio analysis. The Altman's Z-Score Model has been discussed in the following section.

5.4 Altman's Z-Score Revised Model

The original Z-score model was constructed in 1968 for manufacturing firms where the Z-score is calculated by multiplying the coefficients by each of financial ratio. In the original model, linear combination of 5 common financial ratios has been widely used to predict financial distress. Altman's model has found 95.0% accuracy rate and called Zeta. This model is internationally accepted. Altman again developed the Z score for private companies in 1983. This

model was further developed for emerging market companies and for non-manufacturers in 1993. So, the revised model of 1993 having four ratios and corresponding coefficients, can be safely adopted for banking sector being a non-manufacturing sector.The model calculates the financial soundness of a business in terms of Z values as explained below:

Variables in the revised Z-score: Z = 6.56 X1 + 3.26 X2 + 6.72 X3 + 1.05 X4

Whereas:

Z = Overall score
X1 = Working Capital / Total Assets
X2 = Retained Earnings / Total Assets
X3 = Earnings Before Interest and Taxes / Total Assets
X4 = Book Value of Equity / Total Liabilities

Altman's benchmark

Z Score > 2.60 indicates firms are in safe zone, Z < 1.10 means firms are in distress zone, Z score of 1.10< 2.60 depicts firms are in grey zone and difficult to predict.

6. DISCUSSION ON Z-SCORE OF SELECTED PUBLIC SECTOR INDIAN BANKS

This section will discuss results based on Z-score model. Since, the present study is an attempt to assess the financial distress in selected Indian public and private sector banks using Altman's Z-Score model. So, an average Z-score have been calculated for all selected public sector banks from 2013 – 2017and the results have been presented here in this section.

Table-1: Calculation of Z-Score for State Bank of India

Variables	2013 (Rs. in Cr.)	2014 (Rs. in Cr.)	2015 (Rs. in Cr.)	2016 (Rs. in Cr.)	2017 (Rs. in Cr.)
X1=Working Capital / Total Asset	0.756642093	0.76040486	0.735991645	0.767773496	0.682871918
X2=Retained Earnings / Total Assets	0.066765875	0.069308972	0.066840899	0.068358889	0.061120934
X3=Earnings Before Interest &Taxes / Total Asset	0.072346401	0.070277346	0.071344537	0.071485403	0.064493825
X4=Book Value of Equity / Total Liabilities	0.000465072	0.000440241	0.000390796	0.0003698	0.000312597
Z Score	**5.667885019**	**5.686929149**	**5.525852146**	**5.740214312**	**5.112620759**

Sources: Author Compilation

Table-1 shows that Z-score>2.60 for State bank of India for five consecutive years from (2013 to 2017). According to Altman's benchmark, this indicates that SBI is in safe zone. However, the Z-score is showing a gradual decline in the year 2017. Z-score has been calculated by multiplying the values of X1 to X4 by their prescribed coefficients as per the model. This can be concluded that SBI is in safe zone and there are no signs of financial distress.

Table-2: Calculation of Z-Score for Punjab National Bank

Variables	2013 (Rs. in Cr.)	2014 (Rs. in Cr.)	2015 (Rs. in Cr.)	2016 (Rs. in Cr.)	2017 (Rs. in Cr.)
X1=Working Capital / Total Asset	0.712726952	0.725017825	0.735836451	0.749555391	0.7259765
X2=Retained Earnings / Total Assets	0.006660618	0.063746277	0.05822112	0.053865383	0.05348586
X3=Earnings Before Interest & Taxes / Total Asset	0.081801347	0.071847277	0.07116959	0.068081395	0.06651573

X4=Book Value of Equity / Total Liabilities	0.000762022	0.000676354	0.000632813	0.000603149	0.00060426
Z Score	**5.210896983**	**5.447453666**	**5.495812071**	**5.550824787**	**5.3843899**

Sources: Author Compilation

Table-2 shows that Z-score>2.60 of Punjab National Bank for five consecutive years from (2013 to 2017). Thus, according to Altman's benchmark this indicates that PNB is in safe zone. Further, the Z-score is showing a gradual improvement from 2014-16 with a slight decline in 2017. According to Altman's benchmark, this indicates that PNB is in safe zone. However, the Z-score is showing a gradual decline in the year 2017. Z-score has been calculated by multiplying the values of X1 to X4 by their prescribed coefficients as per the model. This can be concluded that PNB is in safe zone and there are no signs of financial distress.

Table-3: Calculation of Z-Score for Bank of India

Variables	2013 (Rs. in Cr.)	2014 (Rs. in Cr.)	2015 (Rs. in Cr.)	2016 (Rs. in Cr.)	2017 (Rs. in Cr.)
X1=Working Capital / Total Assets	0.75925697	0.75958406	0.77215883	0.76908499	0.75942677
X2=Retained Earnings / Total Assets	0.05152755	0.05108265	0.04975141	0.0495090	0.0474361
X3=Earnings Before Interest and Taxes / Total Assets	0.06704208	0.0619383	0.0639633	0.0592009	0.0593914
X4=Book Value of Equity / Total Liabilities	0.0013182	0.0011217	0.0010758	0.0013400	0.0016851
Z score	**5.60061242**	**5.56671298**	**5.65842979**	**5.6057658**	**5.53728716**

Sources: Author Compilation

Z-score of Bank of India is greater than 2.60 benchmark of Altman's model and the same is true for all five years during the study period (2013 to 2017) as shown in table-3. Thus, according to Altman's benchmark this indicates that Bank of India is in safe zone. Further, the Z-score is showing a constant value for all the five years of study. This can be concluded that Bank of India is not facing any kind of financial distress.

Table-4: Calculation of Z-Score for Syndicate Bank

Variables	2013 (Rs. in Cr.)	2014 (Rs. in Cr.)	2015 (Rs. in Cr.)	2016 (Rs. in Cr.)	2017 (Rs. in Cr.)
X1=Working Capital / Total Assets	0.7744172	0.7657954	0.7594573	0.7634853	0.7675746
X2=Retained Earnings / Total Assets	0.0429476	0.0433043	0.0389159	0.0333725	0.0399835
X3=Earnings Before Interest and Taxes / Total Assets	0.0724265	0.0683756	0.0681544	0.0683937	0.0717302
X4=Book Value of Equity / Total Liabilities	0.0288413	0.0256595	0.0224464	0.0234211	0.0309539
Z score	**5.7371754**	**5.6513423**	**5.5904718**	**5.609365**	**5.680164**

Sources: Author Compilation

Z-score of Syndicate Bank is also greater than 2.60 benchmark of Altman's model and the same is true for all five years during the study period (2013 to 2017) as shown in table-4. Thus, according to Altman's benchmark this indicates that Syndicate Bank is in safe zone. Further, the Z-score is showing almost the constant value for all the five years of study with a slight improvement in 2017.

Table 5: Calculation of Z-Score for Canara Bank

Variables	2013 (Rs. in Cr.)	2014 (Rs. in Cr.)	2015 (Rs. in Cr.)	2016 (Rs. in Cr.)	2017 (Rs. in Cr.)
X1=Working Capital / Total Assets	0.6907968	0.7205251	07133910	0.7222436	0.7230539
X2=Retained Earnings / Total Assets	0.0558618	0.0495433	0.0488889	0.0475888	0.0487541

X3=Earnings Before Interest and Taxes / Total Assets	0.0800188	0.0783112	0.0772280	0.0769234	0.0711210
X4=Book Value of Equity / Total Liabilities	0.0110469	0.0096583	0.0089428	0.0100877	0.0105070
Z score	**5.7371754**	**5.6476303**	**5.5904720**	**5.6014557**	**5.6801641**

Sources: Author Compilation

Z-score of Canara Bank has been calculated using four variables of revised Altman model (1993). Table-5 shows that Z-score is greater than 2.60 benchmark of Altman's model and the same is true for all five years during the study period (2013 to 2017). Thus, according to Altman's benchmark this indicates that Canara Bank is in safe zone. Further, the Z-score is showing almost a constant value for all the five years of study and a conclusion can be drawn that there is no sign of financial distress in Canara Bank.

Table-6: Z-Score Based Ranks of Select Public Sector Banks for Five Years

Sr. No.	Banks	Z-Score 2013	Z-Score 2014	Z-Score 2015	Z-Score 2016	Z-Score 2017
1	State Bank of India	Rank 3	Rank 1	Rank 4	Rank 1	Rank 5
2	Punjab National Bank	Rank 5	Rank 5	Rank 5	Rank 5	Rank 4
3	Bank of India	Rank 4	Rank 4	Rank 1	Rank 4	Rank 3
4	Syndicate Bank	Rank 2	Rank 2	Rank 3	Rank 2	Rank 1
5	Canara Bank	Rank 1	Rank 3	Rank 2	Rank 3	Rank 2

Sources: Author Compilation

Thus, from Table-6, we can conclude that Public sector banks got Z value more than 2.6 means there is no chance of financial distress among banks. This proved that banks under observations could not face the chance of financial distress or insolvency. Altman Z-score suggest that banks are in safe zone as they secured more than 2.6. Another observation is that out of five banks, the Punjab National Bank has lowest values of Z-score during all the years of study. This is supported by the fact that PNB has highest level of non-performing assets and the cases as if NeeravModi and Chauski have just came into the knowledge of public domain.

6.1 Discussion on Z-Score of Selected Private Sector Indian Banks

This section will discuss results based on Z-score model. Since, the present study is an attempt to assess the financial distress in selected Indian public sector banks using Altman's Z-Score model. So, an average Z-scores have been calculated for all selected banks from 2013 – 2017.

Table-7: Calculation of Z-Score for ICICI Bank

Variables	2013 (Rs. in Cr.)	2014 (Rs. in Cr.)	2015 (Rs. in Cr.)	2016 (Rs. in Cr.)	2017 (Rs. in Cr.)
X1=Working Capital / Total Assets	0.611656605	0.633602427	0.652148906	0.715584161	0.733055602
X2=Retained Earnings / Total Assets	0.122003281	0.120713428	0.122170461	0.11846034	0.123507035
X3=Earnings Before Interest and Taxes / Total Assets	0.073350324	0.074214228	0.076714943	0.076505441	0.07599178
X4=Book Value of Equity / Total Liabilities	0.035901362	0.033233253	0.03655943	0.033495237	0.034022618
Z score	**4.940808634**	**5.083572225**	**5.230284345**	**5.629699367**	**5.757866193**

Sources: Author Compilation

Table 7 shows that Z-score>2.60 of ICICI for five consecutive years from (2013 to 2017). Thus, according to Altman's benchmark this indicates that ICICI is in safe zone. Further, the Z-score is showing a constant improvement from 2013-17. According to Altman's benchmark, this indicates that ICICI is in safe zone. This can be concluded that ICICI bank

is in safe zone and there are no signs of financial distress, which means the bank is financially sound. Further, the data shows a high value for working capital to total assets ratio. The value of EBIT to total asset is hovering around seven percent in all through these years and is somewhat stable, though not showing growth.

Table-8: Calculation of Z-Score for Axis Bank

Variables	2013 (Rs. in Cr.)	2014 (Rs. in Cr.)	2015 (Rs. in Cr.)	2016 (Rs. in Cr.)	2017 (Rs. in Cr.)
X1=Working Capital / Total Assets	0.6478531	0.6861368	0.69822295	0.048651	0.03581004
X2=Retained Earnings / Total Assets	0.0990071	0.10217899	0.0989141	0.10323783	0.09611648
X3=Earnings Before Interest and Taxes / Total Assets	0.0813518	0.08159459	0.07751556	0.07888308	0.07655718
X4=Book Value of Equity / Total Liabilities	0.0014194	0.00127171	0.00106092	0.00093379	0.00083281
Z score	**5.1208533**	**5.38381184**	**5.42482104**	**1.18678071**	**1.06359229**

Sources: Author Compilation

Z-score of Axis Bank has been calculated using four variables of revised Altman model (1993).

Table 8 shows that Z-score is greater than 2.60 benchmark of Altman's model for three years i.e. from 2013-15. However, there is sudden decline in the Z-score for the year 2016 and 2017. In fact, the score falls in grey zone for the year 2016 and in distress zone in 2017 as per the categories described by the Altman. This indicates as situation of financial distress or not been financially sound. The possible explanation for this could be that the NPAs for Axis bank are showing a great hike in the last two to three years, which incidentally is the same time when the Z-score is falling under grey category. Also important to mention that the ratio of working capital to total assets, which indicates liquidity position has gone down significantly, from 69% in 2015 to 48% and 36% respectively in the year 2016 and 2017. The book value of equity to total liabilities is also showing a noticeable decline. These factors should be a matter of concern to the bank.

Table-9: Calculation of Z-Score for HDFC Bank

Variables	2013 (Rs. in Cr.)	2014 (Rs. in Cr.)	2015 (Rs. in Cr.)	2016 (Rs. in Cr.)	2017 (Rs. in Cr.)
X1=Working Capital / Total Assets	0.68720445	0.72484267	0.6961003	0.75119176	0.7297959
X2=Retained Earnings / Total Assets	0.09908987	0.09549837	0.11022593	0.10737976	0.11020498
X3=Earnings Before Interest and Taxes / Total Assets	0.083951	0.08220447	0.07791624	0.08033303	0.0766903
X4=Book Value of Equity / Total Liabilities	0.00130211	0.00106564	0.00089836	0.00075231	0.00063498
Z-Score	5.39661207	5.61982556	5.45029488	5.81850385	5.66275489

Sources: Author Compilation

Table 9 shows that Z-score of HDFC bank for five consecutive years from (2013 to 2017) is greater than 2.60. Thus, according to Altman's benchmark this indicates that HDFC is in safe zone. Further, the Z-score is showing a constant improvement from 2013-17. Value of X1 and X2 indicate that HDFC has improved upon in liquidity as well as profitability, which could have increased the overall value of Z-score. This can be concluded that HDFC is financially sound and there are no signs of financial distress.

Table-10: Calculation of Z-Score for Yes Bank

Variables	2013 (Rs. in Cr.)	2014 (Rs. in Cr.)	2015 (Rs. in Cr.)	2016 (Rs. in Cr.)	2017 (Rs. in Cr.)
X1=Working Capital / Total Assets	0.460592409	0.505769669	0.558218118	0.594989841	0.652314899

X2=Retained Earnings / Total Assets	0.054983077	0.062019548	0.082707029	0.08087737	0.100425826
X3=Earnings Before Interest and Taxes / Total Assets	0.08073266	0.087981475	0.080739127	0.077046214	0.072870203
X4=Book Value of Equity / Total Liabilities	0.003618618	0.003308053	0.003067774	0.002544604	0.002122618
Z score	**3.747054057**	**4.11474172**	**4.477323862**	**4.687215973**	**5.098490441**

Sources: Author Compilation

Table 10 depicts the calculation of Z score for the Yes bank over a period of five years. As we can see that z-score of Yes Bank for the five consecutive years from i.e.2013 to 2017 is greater than 2.6.According to Altman's benchmark this indicates that the bank is in safe zone and there are no signs of distress. We can easily conclude that the bank is financially sound. The value of retained earnings to total asset ratio has gone double from 2013 to 2017, showing a constant rise every year. However, the book value of the equity to total liability ratio has slipped down from 2013 to 2017. Whereas, the liquidity position of the bank has improved as the value of the working capital to total assets ratio has risen from 2013 to 2017. Thus, we can say that the financial position of the bank is very sound with no sign of distress on any parameter of the model.

Table-11: Calculation of Z-Score for IndusInd Bank

Variables	2013 (Rs. in Cr.)	2014 (Rs. in Cr.)	2015 (Rs. in Cr.)	2016 (Rs. in Cr.)	2017 (Rs. in Cr.)
X1=Working Capital / Total Assets	0.669372247	0.679711897	0.695117449	0.652065991	0.687005219
X2=Retained Earnings / Total Assets	0.096808169	0.097744431	0.092571551	0.122001908	0.112135171
X3=Earnings Before Interest and Taxes / Total Assets	0.086298327	0.086073771	0.082301556	0.075207599	0.071104747
X4=Book Value of Equity / Total Liabilities	0.007132653	0.006040039	0.004852179	0.004248199	0.003348197
Z score	**5.294090612**	**5.362314676**	**5.41991497**	**5.185134799**	**5.353654399**

Sources: Author Compilation

Table 11 shows that Z-score of IndusInd Bank for the five consecutive years from 2013 to 2017 is greater than 2.6.According to Altman's benchmark this indicates that the bank is in safe zone, thus financially sound. The bank is keeping almost same ratio when it comes to liquidity as is indicative by the value of X1. However, it is evident from the data in table 5 that the bank has increased value of X2 in last two years. A mature firm is expected to have higher ratio than a beginner. Which is though not true for IndusInd Bank as the bank is not very old. The companies with low TA compared to RE are reported to have not used as much debt and have depended on the retention of profits to finance their assets (Altman, 2000). Moreover, the leverage of a company is also measured by this ratio. In the year 2016 and 2017, the bank has used more retained earnings than previous three years to fund its assets, which show less dependency on debt. Since, the rise in this ratio is not very significant, so we cannot make very conclusive inference out of this.

Table-12: Z-Score Based Ranks of Select Private Sector Indian Banks for 5 Years

Sr. No.	Banks	Z-Score 2013	Z-Score 2014	Z-Score 2015	Z-Score 2016	Z-Score 2017	Zone
1	ICICI	Rank 4	Rank 4	Rank 4	Rank 2	Rank 1	Safe
2	Axis	Rank 3	Rank 3	Rank 2	Rank 5	Rank 5	Grey
3	HDFC	Rank 1	Rank 1	Rank 1	Rank 1	Rank 2	Safe
4	Yes	Rank 5	Rank 5	Rank 5	Rank 4	Rank 4	Safe
5	IndusInd	Rank 2	Rank 2	Rank 3	Rank 3	Rank 3	Safe

Sources: Author Compilation

Table 12 shows that IndusInd, Yes and HDFC are marinating constant ranks over the five years of study. However, the ICICI and Axis bank have shown a significant change in their overall rank under private sector banks category. ICICI has shown significant improvement in its rank, whereas the Axis bank has shown a significant decline in its rank amongst the selected private banks. IndusInd bank is though maintaining almost the same rank but falls in the last quadrant in overall ranking. However, we can't draw very conclusive idea from the above table but this much is very clear that almost all the banks than Axis Bank in private sector can be considered financially sound.

7. CONCLUSION

Results indicate that the financial position of selected banks under study is safe means they are financially sound and there is no sign of financial distress than for one bank, hence no chance of financial failure. The present study concludes that though all selected banks fall in 'safe Zone' as per Z-score criteria and there is not any chance of financial distress or failure but one bank falls under grey area. It can be concluded that there is no chance of failure in near future for any of the select bank since none of them falls under the zone having less than 1.10 Z-score except for Axis bank in the year 2017, where it is very close to this value, which means it is difficult to predict about this bank. However, certainly the bank management needs to pay a serious attention to improve upon its financial soundness.

Research is a never-ending thrust and it is very truly applicable here as well. There is a scope of future study where all the banks operating in Indian economy could be studied to draw more reliable results, since only ten selected banks have been studied in this research. Future researcher may use other existing models like logit or probit or ANN and compare it with the results drawn with the help of Altman's model. Foreign banks operating in Indian economy may be included in the study and a comparison can be made between Indian public and private banks with that of foreign banks. The scope of the study is limited to India considering only Indian banks have been selected for the purpose of this study. Further, the conclusions of the study are based on Altman Z-Score model and the model has few limitations, which are inevitable here.

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