



# APPLICATION OF ALTMAN Z SCORE MODEL ON SELECTED INDIAN COMPANIES AND PUBLIC AND PRIVATE SECTOR BANKS TO PREDICT BANKRUPTCY

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## Abstract

This research was carried out to study the bankruptcy prediction model and to verify the accuracy of the model on Indian Companies and Public and Private Sector Banks. Companies are classified into two category Manufacturing and Non-manufacturing and banks are classified into Public and Private Sector Banks. The existing literature primarily consists of companies and banks financial data like working capital and total assets , retained earnings and total assets , Earning before interest and tax and total assets , Market value of equity and total liabilities and sales and total assets. The data is taken for five financial years. This study seeks to study the financial health of companies and banks using prediction models. Model used in this study is Altman Z Score Model.

Keywords : Bankruptcy Prediction Model , Altman Z Score , Manufacturing companies , Non-manufacturing companies , Private banks , Public banks.

## 1. Introduction:

Bankruptcy prediction is the art of predicting bankruptcy and various measures of financial distress of a firms. It is a vast area of finance and accounting research. The importance of the area is due in part to the relevance for creditors and investors in evaluating the likelihood that a firm may go bankrupt. Bankruptcy can be predicted using different prediction models. Financial data of company for previous year(s) is used.

The Altman's Z-score formula is written as follows:

$$\text{➤ } Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + .999X5$$

X1 = Working Capital / Total Assets

X2 = Retained Earnings / Total Assets

X3 = Earnings before Interest and Taxes / Total Assets

X4 = Market Value of Equity / Total Liabilities

X5 = Sales / Total Assets

- ✓  $Z > 2.99$  -"Safe" Zone
- ✓  $1.81 < Z < 2.99$  -"Grey" Zone
- ✓  $Z < 1.81$  -"Distress" Zone

$$\text{➤ } Z = 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4$$

X1 = working capital / total assets.

X2 = retained earnings / total assets.

X3 = earnings before interest and taxes / total assets.

X4 = Market value equity/ total liability

- ✓  $Z > 2.6$  -"Safe" Zone
- ✓  $< Z < 2.6$  -"Grey" Zone
- ✓  $Z < 1.1$  -"Distress" Zone

In this paper Manufacturing Companies are taken i.e. Jyoti Structures Limited and ABG Shipyard Ltd that proves the accuracy of model because it has gone in bankruptcy, and other companies i.e. Varroc Engineering Limited and TATA Motors Limited are taken to predict bankruptcy in near future .

In Non-Manufacturing Company i.e. Lanco Infratech Ltd and Reliance Communications Ltd proves the accuracy of model because it has gone in bankruptcy, and other companies i.e. PVR and SpiceJet Ltd are taken to predict bankruptcy in near future.

In Public Sector Banks i.e. IDBI Bank , Bank Of India and Central Bank Of India are taken to predict bankruptcy in near future.

In Private Sector Banks i.e. Dhanlaxmi Bank , CSB Bank and UCO Bank are to predict bankruptcy in near future.

## 2. Literature Review :

(Harpanahalli, 2020) In this research paper the main objective of this study is to foresee the bankruptcy position of the company SME by using the model Altman Z-Score. The Altman ZScore is an empirical model which predicts the corporate insolvency; the financial health of the organisation can be studied, by this tool particularly about the liquidity position of the companies. The research paper focuses on four financial ratio's indicators of Altman Z-score in order to predict or ascertain the financial distress and the bankruptcy position of the company. The ratio's indicators include Working capital to Total Assets, Retained Earnings to Total Assets, Earnings before income and tax to Total Assets and Book value of equity to Total Liabilities.

(Joshi, 2020) In this paper researcher aims to assess the financial performance of select public sector banks, having the highest level of gross non-performing assets, using the Altman's Z-Score model. It was found that all the select banks were in the safe zone, with the average Altman's Z-Score value being higher than the prescribed safe zone cut-off limit of 2.9. The Altman's Z-Score values differed significantly between the banks, possibly due to their varying asset sizes. This may be on account of the increase in the non-performing assets in the last five year period. However, for every 1% increase in the net profits, the Altman's Z-Score increased by about 15.31%. Hence the public sector banks not only have to keep their non-performing assets under control but also devise innovative ways to increase their profits.

According to (Prof. Vandana Samba, 2020), in the paper "A study on bankruptcy using Altman Z-Score prediction model", the main aim of the study was to study the financial distress and bankruptcy of VAMA Infrastructures Pvt. Ltd. company using Z-Score. For the study the data taken was for five years (2013-14 to 2018-19). From the study it was found that it indicated grey zone stating that they have chances of getting bankrupt in near future.

According to (Arpita Agarwal, 2019), in the paper "Bankruptcy prediction models: an empirical comparison", the main aim of the study was to study and evaluate the efficiency and accuracy of five bankruptcy prediction model and also to compare the results of each model results. For the study five bankrupt companies were taken into consideration for a time period of 10 years data to understand when they

would have got the alarm for bankruptcy. From the study it was found that all the models are accurate enough but not properly comparative to each other.

(Mourhij, 2017) This study differs from other previous studies in the field of performance evaluating, where the researcher developed a quantitative and composite model to assess the performance of private sector banks. The proposed model takes into account a range of financial ratios related to the main objectives of the private sector Bank (profitability, liquidity and safety), and links them to reflect the actual performance compared with the planned performance, thus, the performance level is determined on a relative scale ranging from 0% to 100%. The calculated ratio of proposed model shows the effectiveness and quality of performance in the private sector banks, while the remaining percentage of that ratio indicates the level of performance that needed to achieve good and acceptable objectives. (Muammar Khaddafi, 2017) In this research paper researcher aimed to test the predictions of bankruptcy in the banking companies listed in the Indonesia Stock Exchange using the Altman Z-score to see how big the bankruptcy prediction during period of 2011-2013 in the banking Industry. Calculating each bank's bankruptcy prediction on each 29 banks institution. The data used in this study is the annual financial statements that are Exchange Indonesia. The analysis technique used is a bankruptcy prediction model Altman Z-score. By using the formula  $Z\text{-score} = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6 + 1.0X_4 + X_5$ . The criteria for assessing a Z-score  $> 2.99$  categorized as a very healthy company.  $1.81 < Z\text{-score} < 2.99$  are in the grey area so the chances saved and the possibility of bankruptcy the same amount depends on the discretion of the management company's decision as a decision maker. Z-score  $< 1.81$  categorized as a company that has enormous financial difficulties and are at high risk so that the possibility of the collapse of very large. During the period show that the research data of 29 banks that go public are still some who are in a state of bankruptcy. In 2011, there were 13 banks that are in a healthy condition is indicated by the results of the Z-score were above 2.99, and the 14 banks that are in a state of bankruptcy, and two banks that are in Grey area. Whereas in 2012 there were 10 banks in good health, 14 banks were in a state of bankruptcy, and 5 banks in conditions of grey area. In 2013 increased at a healthy bank that there are 11 banks, in conditions of grey area 4 and in a state of bankruptcy remains the same in each year i.e. 14 banks.

### 3. Objectives :

- To analyse and verify the accuracy and effectiveness of the Altman Z score model in order determine whether it is optimal in predicting the financial distress or bankruptcy using banks and companies.
- To compare selected public and private sector banks and manufacturing and non-manufacturing companies through Altman Z Score model.

## 4. Research Methodology :

### 4.1: Research Design

Descriptive research study

### 4.2: Population

- Public Sector Banks
- Private Sector Banks
- Manufacturing Companies
- Non-Manufacturing Companies

### 4.3: Sampling Frame

Banks: Dhanlaxmi Banks, CSB Banks, IDBI Bank, Central Bank of India, UCO Bank, Bank of India.

Companies: Jyoti Structure's LTD, ABG Shipyard LTD, Lanco Infratech LTD, Reliance Communication LTD , Jyoti Structure's LTD, ABG Shipyard LTD, Lanco Infratech LTD, Reliance Communication LTD

### 4.4: Sampling Method

Non probability convenience sampling method

### 4.5: Statistical Tool and Techniques

Microsoft Excel as statistic tool and Altman Z Score model used as statistical techniques.

## 5. Analysis and Interpretations :

Table 1 :

Companies	2012-13	2013-14	2014-15	2015-16	2016-17
Jyoti Structures LTD	0.02	0.14	1.04	0.73	0.38
ABG Shipyard LTD	0.53	0.49	0.19	0	-1.6
Lanco Infratech LTD	0.94	0.3	0.01	-0.38	-0.4
Reliance Communications LTD	1.79	1.56	2.03	0.83	-0.79

Table 2 :

<b>Companies</b>	<b>2015-16</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>	<b>2019-20</b>
Varroc Engineering Limited	2.29	2.41	2.45	2.13	1.43
TATA Motors Limited	0.64	2.46	33.3	0.54	0.45
PVR	0.98	1.53	1.66	1	0.85
SpiceJet LTD	-0.23	-0.09	0.26	-0.4	-0.33

The details used for Z Score are total asset and total liabilities, difference of current asset with current liability, companies, retained earnings, companies, earnings before interest and tax, companies market value of equity and its' sales for the year.

Above table 1 shows manufacturing companies and non-manufacturing companies which have already gone in bankruptcy and so it proves the accuracy and effectiveness of this model.

Companies having their Z Score above 2.99 is said to be in healthy zone which means that the company is nowhere near facing financial distress, if the Z Score is between 1.8 to 2.99 means the company is in grey zone and to avoid financial distress they need to manage their finances so that they can jump back to healthy zone and not fall down to distress zone and if Z Score is below 1.8 that means the company is facing financial distress, they are likely to face bankruptcy in upcoming two or three years.

So in above table 2 it was found that in manufacturing companies i.e Varroc Engineering Limited which is in safe zone and in grey zone and TATA Motors Limited which is in distress zone. In non-manufacturing companies PVR and SpiceJet LTD are in distress zone throughout 5 years.

Table 3 :

<b>Banks</b>	<b>2014-15</b>	<b>2015-16</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>
IDBI Bank	7.96	0.73	0.69	0.67	0.75
Bank of India	0.43	6.68	-4.07	-7.62	-10.31
Central Bank of India	29.87	-25.57	-4.43	-10.02	39.48
CSB Bank	30.57	27.24	21.98	21.86	-3.00
Dhanlaxmi Bank	-4.88	19.11	22.45	20.17	20.91
UCO Bank	5.17	10.17	0.59	0.49	0.49

From the Z score , It can be said that in the Public Sector Banks i.e. IDBI Bank , Bank Of India Central Bank Of India , there is High chances of IDBI Bank to go in bankruptcy in the near future because this bank has gone for four years continuously in losses.

From the Z score , It can be said that in the Private Sector Banks i.e. Dhanlaxmi Bank , CSB Bank , UCO Bank , there is High chances of UCO Bank to go in bankruptcy in the near future because this bank has gone for three years continuously in losses.

## 6. Conclusions :

It is found that companies and banks go through ups and downs in terms of performance because of the impact of business cycles and other macro-economic variables. Measuring the financial health of a firm and banks has been an extremely important need for both managers as well as investors. Several tools were developed to diagnose the financial strength of a Company and bank based on the Financial Statements and balance sheet. Edward I. Altman's discriminant analysis, which employs a combination of various ratios to form an index of liquidity, profitability, sustainability and feasibility, has been highly accurate in analysing the present state of financial health of a firm and banks as well as to enable one to predict the future, particularly in terms of probability of bankruptcy. It is proven to be very accurate to forecast bankruptcy in a wide variety of contexts and markets. The old "garbage in, garbage out" motto applies, however: if the company financials are misleading or incorrect, the Z-Score will be, too.

In this research we conclude that in manufacturing companies Jyoti Structures LTD and ABG Shipyard LTD and in non-manufacturing companies Lanco Infratech LTD and Reliance Communications LTD are already filed for bankruptcy and by applying z score model it is found that this model is accurate and another rest of the companies which are in losses for last five years which is taken to found out that in future there are chances to filed bankruptcy.

The empirical results suggest the Z' score model is a reliable predictor of current position of 3 public sector banks and 3 private sector banks. The Altman Z score of (IDBI Bank, Central Bank of India, UCO Bank, Bank of India) are currently relatively low as compared to the dhanlaxmi bank and CSB bank with maximum safe zoned years. The low Z score possibly mean future failure. By applying Z score model it is found that this model is accurate and for rest of the banks which are in losses for last 3-4 years which are taken into consideration to find out that in future there are chances to go towards bankruptcy.

In spite of new models developed and used the Altman's Z score is the most popular and used one, and one of the best tool to be used to predict bankruptcy, and insolvency.



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