



PREDICTING THE FINANCIAL DISTRESS POSITION OF INDIAN STEEL INDUSTRY

Prof Asiya Chaudhary* Mohd Abdullah**

**Professor, Department of Commerce, Aligarh Muslim University, India.*

***Research Scholar, Department of Commerce, Aligarh Muslim University, India.*

Abstract

The study is conducted on steel industry which is one of the eight core industries sector of India. This study is conducted to find the financial health and bankruptcy position of the 208 public limited Indian steel producing firms by using Altman Z score model. The period of study taken is ten years (2013-2022) and data is extracted from the prowess database. The study revealed that the overall position of steel producing firms is of great concern, where almost half of the sample firms are found to be in distress zone whereas quarter of the sample firms are in safe zone and rest are in grey zone. At last, suggestions are provided for improving the financial position of the firm.

Keywords: *Financial Distress, Z score, Steel Industry, Financial Soundness.*

Introduction

Investors and debt holders greatly benefit from accounting information and information regarding a company's financial soundness to make investment and lending decisions. The future earnings of investors and debt holders depend on how financially sound the firm is and how efficient it is in managing wealth and making short-term and long-term financial decisions. Conversely, if investors don't have reliable information regarding financial situation and management efficiency, they risk losing their money, as the firm may not perform efficiently and may go bankrupt soon.

Various methods can determine the financial soundness of the firm, with the Altman Z-score model considered one of the best models to predict the chances of bankruptcy of manufacturing firms. Historical evidence shows that the Z-score model has 76.9 percent accuracy in predicting the bankruptcy of the underlying sample. Altman extrapolates five ratios to determine financial soundness, and they can be used to test the validity of the multivariate model. Financial ratios serve as the framework for predicting and detecting the operational and financial weaknesses and strengths of companies, both in the short term and long term.

The Z-Score model, which was developed by Edward Altman in 1968, is a valuable tool for anticipating financial difficulties in manufacturing companies in the United States. Altman is widely regarded as the pioneer of insolvency forecasting, and his model has a 95% success rate. The model employs a range of financial ratios, including liquidity, financial leverage, profitability, activity, and solvency ratios, to estimate the likelihood of bankruptcy. William Beaver was the first to effectively use some of these ratios to differentiate between prosperous and unsuccessful companies and to anticipate the possibility of bankruptcy up to five years in advance. Altman later enhanced Beaver's work by using multiple discriminant analysis. He recognized that presenting ratio analysis in a specific way could be misleading and confusing because a company with poor profitability and/or solvency records might be deemed at risk of bankruptcy. However, if the company has above-average liquidity, the situation may not be regarded as dire.



It is crucial for shareholders to determine if the company can meet their expected rate of return, while creditors need to assess the firm's ability to repay debts when setting credit terms. The financial stability of a business is essential for companies that engage in business with them, and it is also critical for the management and employees. Therefore, evaluating a company's financial capacity provides valuable information to stakeholders. This study aims to evaluate the financial strength of India's steel industry and predict its likelihood of bankruptcy using the Z-score model.

Core Industries are the industries in India which contributes to about 40.27% of index of industrial production. It includes industries of Coal, Crude Oil, natural gas, refinery products, fertilizer, cement, electricity, and steel. In our study, we have considered steel industry because India is a second largest producer of steel in the world after China and is focused on more production of steel industry through various other government programs and schemes.

Literature Review

According to a study by **Al-Rawi, Kiani, and Vedd (2008)**, the Altman z score analysis was employed to forecast the likelihood of a company's insolvency. Their findings indicated that the company had augmented its debt and was at risk of going bankrupt in the coming time.

Chowdhury and Barua (2009) utilized the Z-score model to assess the financial distress risk of Z category shares traded in DSE. To evaluate the Z-score, they employed data from 53 companies over the period 2000-2005. Their findings indicated that the Altman Z-score model, while not entirely relevant to companies in Bangladesh, still exhibits strong validity and accuracy in predicting the distressful status of Z category companies.

Gerantonis Vergos and Christopoulos (2009) aimed to determine whether Z-score models can accurately predict bankruptcies for up to three years in advance. The study found that the Altman model was effective in predicting failures. The researchers concluded that the findings could be beneficial for financing decisions by company management, stock selection by portfolio managers, and regulatory authorities.

Ramaratnam and Jayaraman (2010) utilized the Z score model to assess the financial stability of the Indian steel industry. They collected data from five firms in the industry for a period of five years (2006-2010). According to their findings, all the companies examined were financially stable throughout the study period. The significance of the Z score has been emphasized in several other studies.

In their study on the pharmaceutical industry in Bangladesh, **Mizan, Amin, and Rahman (2011)** utilized the Altman Z-score Model to predict the possibility of bankruptcy. The sample size included six leading companies in the industry. Their findings indicated that two companies were financially stable and had a low risk of bankruptcy in the near future, while other companies showed unsatisfactory results and had a significant likelihood of facing financial crises in the near future.

Alkhatib and Al Bzour (2011), they investigated the impact of financial ratios on bankruptcy prediction in listed companies in Jordan. They used both Altman and Kida models and recommended that Jordanian listed companies should adopt at least one of these highly credible models for the prediction of corporate bankruptcy.



Diakomihalis (2012) suggests that the complexity of working with insolvency prediction models has limited their widespread adoption. Here, the author applied all three versions of Altman's model to predict the probability of bankruptcy for different classes of hotels in Greece. The study showed that 40 percent of the sampled firms were in the distress zone. The Z1 model was the most accurate, with a Z1 score below 1.8 and Z2 and Z3 model percentages of 44.5 and 36.3 percent, respectively, predicting bankruptcy a year ahead of the other models with an accuracy rate of 88.2 percent in 2007. The study also found that one-quarter of the selected firms in the distress zone were likely to file for bankruptcy.

Bardia (2012) conducted a study on two major steel manufacturing companies in India, one from the public sector and the other from the private sector (which at that time was the largest private company in the country), to predict and compare their financial distress using Altman's Z-Score model, which incorporated several financial ratios. The Z-Score model helped the researchers conclude that both companies were at risk of bankruptcy and recommended that the management of the studied companies carefully assess their solvency positions.

Kumari (2013) conducted a study that aimed to predict the likelihood of bankruptcy for MMTC using Altman's Z-score model. The conclusion drawn from the study was that MMTC had a good overall financial health, and that it could be considered a company that is friendly to investors.

A study conducted by **Mizan and Hossain (2014)** aimed to evaluate the financial health of the cement industry in Bangladesh. The findings of the study indicate that out of the five firms analyzed, two firms have a higher Z-score than the benchmark of 2.99 and are financially sound. One firm is in the grey area, meaning that although it is financially sound, the management needs to pay special attention to improve the financial health of the organization. On the other hand, the remaining two firms are at serious risk of financial crisis.

Gunathilaka (2014) conducted a study on 82 firms from different industries listed on the Colombo Stock Exchange in Sri Lanka. The aim was to predict financial distress using Altman and Springate's Z-score models, with data collected from 2008 to 2012 and analysed using multivariate discriminant analysis (MDA). Both models were used independently, and Altman's Z-Score model was found to be more accurate in predicting financial distress at least a year before it occurred. The study concluded that Altman's model has the potential to reduce the error of classifying a firm as safe when it is not safe.

Sanesh (2016), conducted a study to evaluate the Altman Z-Score of companies listed on the Nifty 50 index, except for banks and financial companies. The purpose was to use the score to forecast the likelihood of the companies defaulting due to financial distress, based on their current financial indicators.

The Altman Z-score has been utilized in various sectors such as telecommunications, wood industry, pharmaceuticals, and others, to predict financial distress situations accurately. Many researchers have successfully applied Altman's models in different areas of finance, including investment decisions, distressed securities, and capital structure and strategic management.



Methodology

This study is based on empirical research conducted using financial data from Indian steel companies. Initially, there were 709 public limited companies in the CMIE Prowess database that belonged to the steel sector. After data mapping and clipping, the analysis focused on only 208 companies for which financial data is available for the past 10 years, or annually from 2013 to 2022.

The objective of the study is to find the financial distress position of Indian steel producing firms and to suggest the measures to improve the financial health of the Indian steel producing firms.

Altman's original Z-score formula is as follows:

$$Z = 1.2y_1 + 1.4y_2 + 3.3y_3 + 0.6y_4 + 0.99y_5$$

where:

$$y_1 = WC / TA;$$

$$y_2 = RE / TA;$$

$$y_3 = EBIT / TA;$$

$$y_4 = MV \text{ of equity} / BV \text{ of total liabilities};$$

$$y_5 = \text{sales} / \text{total assets}; \text{ and}$$

Z = overall index.

The original Z-score was revised in 1990 by MacKie-Mason, who eliminated the market value of equity scaled by book value of total liabilities from the equation. This was done because it was important to analyze the firm's capital structure and define the debt ratio as a separate variable. Following the MacKie-Mason study, a number of researchers (such as Güner et al., 2008 and Graham et al., 1998) adopted the updated Z-score.

The modified version is, therefore:

$$3.3(EBIT/TA) + 1.0(Sales/TA) + 1.2(WC/TA) + 1.4(RE/TA)$$

In this investigation, the variables used include EBIT (Earnings Before Interest and Taxes), WC (Working Capital), RE (Retained Earnings), and TA (Total Assets). The version of Z-score used in this study is the improved one by MacKie-Mason (1990) as suggested by Lee et al. (2011), which takes into account the leverage ratio. A higher Z-score indicates a financially healthier and less distressed company compared to a lower Z-score. Table 1 illustrates the different Z-score zones.

Table 1: Z score

| Z Score | Zone | Comments |
|----------------------|----------|---|
| Below 1.8 | Distress | The probability of the company experiencing financial trouble soon is significant, and it may need to take severe actions to remain operational. |
| Between 1.8 and 2.99 | Grey | Based on its financial performance, the company falls under the grey category, indicating that the possibility of encountering financial difficulties in the near future is relatively low. |
| 3.0 and above | Safe | The company's financial condition is secure, and the probability of encountering financial difficulties in the future is minimal. |

Source: Authors Compilations from literature.



Results and Discussion

The financial position of 208 steel companies during the period 2013-2022 is shown in Table 2 which indicates that out of the sample, 46 companies are in a safe zone, 64 companies are in the grey zone, and 98 companies are in the distress zone. These findings suggest that the financial standing of these companies is weak, and they need to focus on enhancing their working capital, profitability, sales, and leverage positions. By improving these areas, these companies can improve their future financial stability.

Table 2- Financial Distress Position of Steel Companies in India

| S. No | Company Name | Z Score | Zone |
|-------|---------------------------------------|----------|----------|
| 1 | A M L Steel Ltd. | 1.649536 | Distress |
| 2 | A P Steel Re-Rolling Mill Ltd. | 2.171832 | Grey |
| 3 | Aamor Inox Ltd. | 0.800061 | Distress |
| 4 | Aarti Steels Ltd. | 2.354658 | Grey |
| 5 | Abhishek Steel Inds. Ltd. | 2.631061 | Grey |
| 6 | Adhunik Corporation Ltd. | 1.890441 | Grey |
| 7 | Aditya Ispat Ltd. | 1.76276 | Distress |
| 8 | Aeroflex Industries Ltd. | -0.12816 | Distress |
| 9 | Alaknanda Sponge Iron Ltd. | 3.3791 | Safe |
| 10 | Allied Recycling Ltd. | 3.546514 | Safe |
| 11 | Allied Strips Ltd. | 1.048221 | Distress |
| 12 | Amba Shakti Ispat Ltd. | 2.753548 | Grey |
| 13 | Amba Shakti Steels Ltd. | 2.610001 | Grey |
| 14 | Ambica Steels Ltd. | 2.525582 | Grey |
| 15 | Amit Metaliks Ltd. | 1.888474 | Grey |
| 16 | Amritvarsha Industries Ltd. | 2.252081 | Grey |
| 17 | Anil Special Steel Inds. Ltd. | 1.503549 | Distress |
| 18 | Anjani Steels Ltd. | 1.708748 | Distress |
| 19 | Antarctic Industries Ltd. | 4.043462 | Safe |
| 20 | Anugraha Valve Castings Ltd. | 2.38367 | Grey |
| 21 | Arcelormittal Nippon Steel India Ltd. | 0.147815 | Distress |
| 22 | Ashiana Ispat Ltd. | 3.079121 | Safe |
| 23 | Ashiana Manufacturing India Ltd. | 4.02979 | Safe |
| 24 | Asian Colour Coated Ispat Ltd. | 0.368244 | Distress |
| 25 | Avon Ispat & Power Ltd. | 3.020939 | Safe |
| 26 | Avtar Steel Ltd. | 2.77723 | Grey |
| 27 | B D G Metal & Power Ltd. | 2.55458 | Grey |
| 28 | B P Alloys Ltd. | 2.143261 | Grey |
| 29 | Bansal Roofing Products Ltd. | 3.687297 | Safe |
| 30 | Bansal Steel & Power Ltd. | 1.36598 | Distress |
| 31 | Beekay Steel Inds. Ltd. | 2.347196 | Grey |
| 32 | Bhandari Foils & Tubes Ltd. | 1.519777 | Distress |
| 33 | Bhilai Engineering Corpn. Ltd. | 1.825872 | Grey |



| | | | |
|----|-----------------------------------|----------|----------|
| 34 | Bhushan Power & Steel Ltd. | 0.515674 | Distress |
| 35 | Brahmaputra Metallics Ltd. | 0.31475 | Distress |
| 36 | Capacite Structures Ltd. | 1.461469 | Distress |
| 37 | Captain Steel India Ltd. | 4.0582 | Safe |
| 38 | Chandan Steel Ltd. | 1.737488 | Distress |
| 39 | Chandi Steel Inds. Ltd. | 1.467753 | Distress |
| 40 | Chase Bright Steel Ltd. | 0.751996 | Distress |
| 41 | Dayal Steels Ltd. | 2.359579 | Grey |
| 42 | Dewas Metal Sections Ltd. | 2.479926 | Grey |
| 43 | Dina Iron & Steel Ltd. | 2.692247 | Grey |
| 44 | Dina Metals Ltd. | 4.484555 | Safe |
| 45 | Divy Rollform Ltd. | 1.102361 | Distress |
| 46 | Emco Ltd. | 0.991105 | Distress |
| 47 | Facor Steels Ltd. | 0.968084 | Distress |
| 48 | Fortune Metals Ltd. | 2.965938 | Grey |
| 49 | Gallantt Ispat Ltd. [Merged] | 1.415323 | Distress |
| 50 | Gallantt Metal Ltd. | 2.621703 | Grey |
| 51 | Ganesh Foundry & Castings Ltd. | 2.086648 | Grey |
| 52 | Garg Furnace Ltd. | 1.713942 | Distress |
| 53 | Gontermann-Peipers (India) Ltd. | 0.5839 | Distress |
| 54 | Goradia Special Steels Ltd. | 0.488525 | Distress |
| 55 | Gyscoal Alloys Ltd. | 0.331131 | Distress |
| 56 | H M M Infra Ltd. | 1.743804 | Distress |
| 57 | Hans Ispat Ltd. | 1.681532 | Distress |
| 58 | Harisons Steel Ltd. | 4.255478 | Safe |
| 59 | Haryana Foils Ltd. | 2.670296 | Grey |
| 60 | Hexa Steel & Power Pvt. Ltd. | 4.719199 | Safe |
| 61 | Hira Steels Ltd. | 2.473815 | Grey |
| 62 | Hisar Metal Inds. Ltd. | 2.717689 | Grey |
| 63 | I U P Jindal Metals & Alloys Ltd. | 1.892854 | Grey |
| 64 | Incredible Industries Ltd. | 2.670239 | Grey |
| 65 | Ind Synergy Ltd. | -0.1089 | Distress |
| 66 | India Steel Works Ltd. | 1.177739 | Distress |
| 67 | Indian Steel Corpn. Ltd. | 0.666814 | Distress |
| 68 | Indore Steel & Iron Mills Ltd. | 1.392993 | Distress |
| 69 | Indus T M T Inds. Ltd. | 5.165609 | Safe |
| 70 | Isinox Ltd. | 2.491328 | Grey |
| 71 | J G Foundry Ltd. | 3.794787 | Safe |
| 72 | J S W Steel Ltd. | 1.276725 | Distress |
| 73 | J V Strips Ltd. | 3.023965 | Safe |



| | | | |
|-----|------------------------------------|----------|----------|
| 74 | Jahaan Steels Ltd. | 4.185762 | Safe |
| 75 | Jai Balaji Jyoti Steels Ltd. | 0.828353 | Distress |
| 76 | Jai Raj Ispat Ltd. | 4.02039 | Safe |
| 77 | Jalan Con Cast Ltd. | 1.604932 | Distress |
| 78 | Jay Jagdamba Ltd. | 1.819335 | Grey |
| 79 | Jindal Stainless Ltd. | 1.06811 | Distress |
| 80 | Jindal Stainless Steelway Ltd. | 4.159763 | Safe |
| 81 | Juhi Alloys Ltd. | 3.577266 | Safe |
| 82 | K L Rathi Steels Ltd. | 5.279862 | Safe |
| 83 | Kalyani Steels Ltd. | 2.288217 | Grey |
| 84 | Kamdhenu Ltd. | 3.201397 | Safe |
| 85 | Kamper Concast Ltd. | 1.639777 | Distress |
| 86 | Karthik Inductions Ltd. | 3.576732 | Safe |
| 87 | Keyur Ispat Ltd. | 2.555171 | Grey |
| 88 | Kharewali Steel Pvt. Ltd. | 3.369506 | Safe |
| 89 | Kothi Steel Ltd. | 3.89498 | Safe |
| 90 | Loha Ispaat Ltd. | 1.41852 | Distress |
| 91 | M & B Engineering Ltd. | 2.097155 | Grey |
| 92 | M P I L Steel Structures Ltd. | 1.592207 | Distress |
| 93 | M S P Steel & Power Ltd. | 0.736322 | Distress |
| 94 | Maa Mahamaya Inds. Ltd. | 0.05214 | Distress |
| 95 | Maa Shakambari Steel Ltd. | 1.937109 | Grey |
| 96 | Maan Steel & Power Ltd. | 2.178879 | Grey |
| 97 | Madhusudan Special Sections Ltd. | 2.991619 | Safe |
| 98 | Magppie International Ltd. | 1.644524 | Distress |
| 99 | Mahamaya Steel Inds. Ltd. | 2.256741 | Grey |
| 100 | Mahavir Concast Ltd. | 2.050152 | Grey |
| 101 | Mahavir Steel Inds. Ltd. | 2.28938 | Grey |
| 102 | Mahindra Intertrade Ltd. | 3.145793 | Safe |
| 103 | Mahindra Steel Service Centre Ltd. | 1.3727 | Distress |
| 104 | Maithan Ispat Ltd. | -0.91777 | Distress |
| 105 | Maithan Steel & Power Ltd. | 3.732548 | Safe |
| 106 | Mangal Steel Enterprises Ltd. | 2.316556 | Grey |
| 107 | Mangalam Alloys Ltd. | 1.70281 | Distress |
| 108 | Met-Rolla Iron & Strips Co. Ltd. | 4.242807 | Safe |
| 109 | Mittal Corp Ltd. | -1.52449 | Distress |
| 110 | Modern Steels Ltd. | 0.976483 | Distress |
| 111 | Monga Brothers Ltd. | 3.838636 | Safe |
| 112 | Mukand Ltd. | 0.994799 | Distress |
| 113 | Mukesh Steels Ltd. | 3.136823 | Safe |



| | | | |
|-----|----------------------------------|----------|----------|
| 114 | Nabha Steels Ltd. | 6.32865 | Safe |
| 115 | Nandan Steels & Power Ltd. | 2.474083 | Grey |
| 116 | Narayani Steels Ltd. | 2.883309 | Grey |
| 117 | National General Inds. Ltd. | 1.71695 | Distress |
| 118 | National Steel & Agro Inds. Ltd. | 1.864107 | Grey |
| 119 | Orient Steel & Inds. Ltd. | 1.746757 | Distress |
| 120 | P D P Steels Ltd. | 3.068091 | Safe |
| 121 | P M P Iron & Steels (India) Ltd. | 2.174828 | Grey |
| 122 | Panchmahal Steel Ltd. | 1.488176 | Distress |
| 123 | Paramount Steels Ltd. | 2.82801 | Grey |
| 124 | Pashupati Castings Ltd. | 1.445311 | Distress |
| 125 | Pennar Industries Ltd. | 1.957931 | Grey |
| 126 | Prakash Industries Ltd. | 1.728734 | Distress |
| 127 | Prakash Steelage Ltd. | 0.233821 | Distress |
| 128 | Premier Ispat Ltd. | 3.389772 | Safe |
| 129 | R G T L Inds. Ltd. | 1.45662 | Distress |
| 130 | R H L Profiles Ltd. | 4.633109 | Safe |
| 131 | R L Steels & Energy Ltd. | 1.693292 | Distress |
| 132 | R S Infra-Transmission Ltd. | 2.82749 | Grey |
| 133 | Raajratna Metal Inds. Ltd. | 2.451529 | Grey |
| 134 | Raghuv eer Metal Inds. Ltd. | 2.656208 | Grey |
| 135 | Rajputana Stainless Ltd. | 1.864356 | Grey |
| 136 | Ramanasekhar Steels Ltd. | -1.98655 | Distress |
| 137 | Rashtriya Ispat Nigam Ltd. | 0.678041 | Distress |
| 138 | Rathi Bars Ltd. | 2.915134 | Grey |
| 139 | Rathi Industries Ltd. | 3.417661 | Safe |
| 140 | Rathi Special Steels Ltd. | 2.978874 | Grey |
| 141 | Rathi Steel & Power Ltd. | -0.43947 | Distress |
| 142 | Real Ispat & Power Ltd. | 3.433904 | Safe |
| 143 | Real Strips Ltd. | 1.131652 | Distress |
| 144 | Rimjhim Stainless Ltd. | 1.275103 | Distress |
| 145 | S M C Power Generation Ltd. | 1.64189 | Distress |
| 146 | Sail-S C L Kerala Ltd. | 0.159733 | Distress |
| 147 | Sanvijay Rolling & Engg. Ltd. | 1.954964 | Grey |
| 148 | Scan Energy & Power Ltd. | 0.850192 | Distress |
| 149 | Seven Star Steels Ltd. | 0.727407 | Distress |
| 150 | Shah Alloys Ltd. | 0.210724 | Distress |
| 151 | Shah Foils Ltd. | 2.64883 | Grey |
| 152 | Shah Sponge & Power Ltd. | 1.041673 | Distress |
| 153 | Sharda Ispat Ltd. | 3.142694 | Safe |
| 154 | Shimoga Steels Ltd. | -0.65555 | Distress |



| | | | |
|-----|---|----------|----------|
| 155 | Shivagrigo Implements Ltd. | 1.598045 | Distress |
| 156 | Shivalik Bimetal Controls Ltd. | 2.023326 | Grey |
| 157 | Shivam India Ltd. | 0.883241 | Distress |
| 158 | Shree Electromelts Ltd. | 3.728942 | Safe |
| 159 | Shree Ganesh Metaliks Ltd. | 0.8862 | Distress |
| 160 | Shree Krishna Rolling Mills (Jaipur) Ltd. | 4.445503 | Safe |
| 161 | Shree Parashnath Re-Rolling Mills Ltd. | 1.523177 | Distress |
| 162 | Shree Sai Rolling Mills India Ltd. | 0.321531 | Distress |
| 163 | Shree Sidhballi Ispat Ltd. | -0.9991 | Distress |
| 164 | Shree Venkatesh Steels Ltd. | 2.527805 | Grey |
| 165 | Shree Yogi Steel Ltd. | 5.746318 | Safe |
| 166 | Shreeyam Power & Steel Inds. Ltd. | 0.216732 | Distress |
| 167 | Shri Badrinarain Alloys & Steels Ltd. | 1.217493 | Distress |
| 168 | Shri Bhagavati Bright Bars Ltd. | 0.427735 | Distress |
| 169 | Shri Radhakrishna Steels Ltd. | 1.240178 | Distress |
| 170 | Shri Rathi Steel (Dakshin) Ltd. | 5.134709 | Safe |
| 171 | Shri Rathi Steels Ltd. | 4.412511 | Safe |
| 172 | Shyam Steel Inds. Ltd. | 2.843686 | Grey |
| 173 | Shyam Steel Mfg. Ltd. | 1.657861 | Distress |
| 174 | Siddhartha Tubes Ltd. | -0.29236 | Distress |
| 175 | Signode India Ltd. | 1.986628 | Grey |
| 176 | Singhal Strips Ltd. | 2.837206 | Grey |
| 177 | Sisco Industries Ltd. | 1.808988 | Grey |
| 178 | Sova Electrocasting Ltd. | 0.864143 | Distress |
| 179 | Star Wire (India) Ltd. | 1.605958 | Distress |
| 180 | Steel Authority of India Ltd. | 1.094893 | Distress |
| 181 | Steel Exchange India Ltd. | 0.910337 | Distress |
| 182 | Steelco Gujarat Ltd. | 0.979368 | Distress |
| 183 | Stelco Ltd. | 3.498084 | Safe |
| 184 | Sunflag Iron & Steel Co. Ltd. | 1.960977 | Grey |
| 185 | Super Smelters Ltd. | 1.010747 | Distress |
| 186 | Surya Alloy Inds. Ltd. | 1.12319 | Distress |
| 187 | Swarup Rolling Mills Ltd. | 3.958348 | Safe |
| 188 | Synergy Steels Ltd. | 2.811787 | Grey |
| 189 | Tarun International Ltd. | 1.414379 | Distress |
| 190 | Tata Steel Downstream Products Ltd. | 2.804858 | Grey |
| 191 | Tata Steel Ltd. | 1.213013 | Distress |
| 192 | Thangam Steel Ltd. | 2.575044 | Grey |
| 193 | Tinplate Co. Of India Ltd. | 1.852363 | Grey |
| 194 | Tulsyan N E C Ltd. | 0.655324 | Distress |
| 195 | Twenty First Century Steels Ltd. | 3.54283 | Safe |
| 196 | Unison Metals Ltd. | 1.756906 | Distress |



| | | | |
|-----|---|----------|----------|
| 197 | Upper India Steel Mfg. & Engg. Co. Ltd. | 1.026868 | Distress |
| 198 | Uttam Galva Steels Ltd. | 0.201759 | Distress |
| 199 | Uttam Strips Ltd. | -0.64085 | Distress |
| 200 | Uttam Value Steels Ltd. | 0.453283 | Distress |
| 201 | Valley Iron & Steel Co. Ltd. | 0.686801 | Distress |
| 202 | Vardhman Industries Ltd. | 1.848144 | Grey |
| 203 | Vardhman Special Steels Ltd. | 1.725261 | Distress |
| 204 | Varun Foils Ltd. | 3.70569 | Safe |
| 205 | Vinayak Steels Ltd. | 2.720889 | Grey |
| 206 | Viraj Profiles Pvt. Ltd. | 1.776488 | Distress |
| 207 | Welspun Steel Ltd. | 1.251891 | Distress |
| 208 | Zodiac Metal Strips Ltd. | 2.544266 | Grey |

The study revealed that most of the prominent steel producing firms such as Arcelormittal Nippon Steel India, Jindal Stainless Ltd, Steel Authority of India Ltd, Uttam Galva Ltd, Prakash Industries Ltd., Mukand Ltd., are at high risk of financial distress (below 1.80) and management should take necessary measures to reverse this situation. Whereas 46 firms are in safe zone and other firms like JSW Steel Ltd and Tata Steel Ltd falls in the grey area where it is financially sound but requires special attention from management to improve its financial health in the long run. Investors should also exercise caution when investing in the stocks of these companies. These findings can aid managers in making financial decisions, stockholders in selecting investment options, and others in safeguarding their interests in the steel manufacturers of the country. Therefore, it can be inferred that the financial condition of the steel firms is not sound.

Conclusion, Suggestions, and future direction

The financial health of a business is a crucial factor for stakeholders in determining their involvement with a particular firm. The Altman Z-score is an effective measure that can influence stakeholder decisions. The purpose of the current study is to evaluate the financial health of steel firms in India. Overall, the financial health of the steel producing firms in India is not very good and the firms need to improve their financial positions to avoid the bankruptcy.

It is advisable that prominent market leaders, such as Arcelormittal Nippon Steel India Ltd., Jindal Stainless Ltd., Steel Authority of India Ltd., Uttam Galva Steels Ltd., Prakash Industries Ltd., Mukand Ltd., among others, focus on debt and interest payment restructuring and devise new strategies to overcome financial distress. Meanwhile, JSW Steel Ltd and Tata Steel Ltd are categorized in the Grey Zone of the Z-Score, indicating the need for close attention to their debts and interest payments to ensure effective business operations. The firm needs to improve their working capital, profitability as well as sales position to improve their financial distress position.

The study can be done on various other core industries sector of industry which helps in the nation building. Similarly, a comparative industry between the core industries can also be done to get the comparative results of all the eight sectors of economy (i.e., Coal, Crude Oil, natural gas, refinery products, fertilizer, cement, electricity, and steel.).



References

1. Abbas, Q. and Rashid, A. (2011). Modeling Bankruptcy Prediction for Non-Financial Firms: The Case of Pakistan. MPRA Paper No. 28161, available at <http://mpra.ub.uni-muenchen.de/28161>, retrieved on January 26, 2012.
2. Al-Rawi, K, Kiani, R. and Vedd, R.R. (2008). The Use of Altman Equation for Bankruptcy Prediction in an Industrial Firm (Case Study). *International Business & Economics Research Journal*, 7(7): 115-127.
3. Alkhatib, K. and Al Bzour, A.E. (2011). Predicting Corporate Bankruptcy of Jordanian Listed Companies: Using Altman and Kida Models. *International Journal of Business and Management*, 6(3): 208-215.
4. Altman, E.I. (1968). "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy", *The Journal of Finance*, 23(4): 589-609.
5. Altman, E. I. (2000). Predicting financial distress of companies: revisiting the Z-score and ZETA models. *Stern School of Business, New York University*, 9-12.
6. Back B., Laitinen T., Sere K., Wezel M. Chooking, Bankruptcy Predictions Using Discriminant Analysis, Logit Analysis, and Genetic Algorithms. Technical Report, Turku Center for Computer Science (1996) 40.
7. Bardia, S. C. (2012). Predicting Financial Distress and Evaluating Long-Term Solvency: An Empirical Study. *The IUP Journal of Accounting Research & Audit Practices*, XI (1), 47-61.
8. Beaver W. H., Financial Ratios as Predictors of Failure, *Journal of Accounting Research* 4 (1966) 71-111.
9. Begley J., Ming J. and Watts S. (1996). "Bankruptcy classification errors in the 1980s: An empirical analysis of Altman's and Ohlson's models". *Review of Accounting Studies*, 1(4):267-284.
10. Calandro, J. (2007). Considering the utility of Altman's Z-score as strategic assessment and performance management tool. *Strategic & Leadership*, 35(5), 37-43.
11. Chava, S. and Jarrow, R.A. (2004). "Bankruptcy Prediction with Industry Effects", *Review of Finance*, 8: 537-569.
12. Chowdhury, A. and Barua, S. (2009). "Rationalities of z-category shares in Dhaka Stock Exchange: are they in financial distress risk?", *BRAC University Journal*, 1(1): 45-58.
13. Chung K. C., Tan S. S., Holdsworth D. K., *International Journal of Business and Management* 3(1) (2008) 19-29.
14. Deakin, E. B. (1972). A Discriminant Analysis of Predictors of Business Failure. *Journal of Accounting Research*.
15. Diakomihalis, M. (2012). The accuracy of Altman's models in predicting hotel bankruptcy. *International Journal of Accounting and Financial Reporting*,
16. Gerantonis, N., Vergos, K. and Christopoulos, A.G. (2009). "Can Altman Z-score Models Predict Business Failures in Greece?", *Research Journal of International Studies*, 12: 21-28.
17. Gunathilaka, C. (2014). Financial Distress Prediction: A Comparative Study of Solvency Test and Z-Score Models with Reference to Sri Lanka. *The IUP Journal of Financial Risk Management*, XI(3), 40-50.
18. Huda,S.(2013). Z-Score Analysis of Co-operative Sugar Mills in Haryana. *International journal Research Journal* 51(5)
19. Jayadev, M. (2006). Predictive power of financial risk factors: An empirical analysis of default companies. *The Journal for Decision Makers*, 31(3), 45-56.
20. John Wiley & Sons. Scott, W. R. (1997). *Financial accounting theory* (Vol. 2, No. 0, p. 0). Upper Saddle River, NJ: Prentice Hall.



21. John Wiley & Sons. Abbas, Q. and Rashid, A. (2011). "Modeling Bankruptcy Prediction for Non-Financial Firms: The Case of Pakistan", MPRA Paper No. 28161, available at <http://mpa.ub.uni-muenchen.de/28161>, retrieved on January 26, 2012.
22. Kida, C.Y. (1998). Financial Ratios as Predictors of Bankruptcy in Japan: An Empirical Research. *Journal of Finance*, 123: 589-609
23. Lupu, D., & Petrisor, M. B. (2013). The Forecast of Bankruptcy Using Altman Model. *The USV Annals of Economics and Public Administration*, 13, 154-161.
24. Niresh & Pratheepan, (2015). The Application of Altman's Z-Score Model in Predicting Bankruptcy: Evidence from the Trading Sector in Sri Lanka. *International Journal of Business and Management*; Vol. 10, No. 12
25. Miller, W. (2009). Comparing Models of Corporate Bankruptcy Prediction: Distance to Default vs. Z-Score.
26. Mizan and Hossain. Financial Soundness of Cement Industry of Bangladesh: An Empirical Investigation Using Z-score. *American Journal of Trade and Policy*.1, page no. 16-22, 2014
27. Mizan, A.N.K., Amin, M.R. and Rahman, T. (2011). "Bankruptcy Prediction by Using the Altman Z-score Model: An Investigation of the Pharmaceutical Industry in Bangladesh", *Bank Parikrama*, 36(2-4): 33-56.
28. N.R.V., Ramana Reddy and K. Hari Prasad Reddy. *International Journal of Marketing Financial services & Management Research*. Vol. 1 No. 4, pp64-69, 2012
29. Nilanjana Kumari. Evaluation of Financial Health of MMTC of India: A Z Score Model. *European Journal of Accounting Auditing and Finance Research* Vol.1 No. 1, pp.36-43, March 2013.
30. Ramaratnam, M.S. and Jayaraman, R. (2010). "A study on measuring the financial soundness of select firms with special reference to Indian steel industry – An empirical view with Z score", *Asian Journal of Management Research*, Online Open Access publishing platform for Management Research, pp. 724-735.
31. Reddy, D. N. R., & Reddy, K. H. P. (2012). Financial status of select sugar manufacturing units z-score model. *International Journal of Marketing Financial Services and Management Research*, (4).
32. Sanesh (2016) The analytical study of Altman Z score on NIFTY 50 Companies. *IRA International Journal of Management & Social Sciences* 3 (3). (ISSN 2455-2267)
33. Shumway, T. (2001). Forecasting bankruptcy more accurately: A simple hazard model. *Journal of Business*, 74(1): 101-124
34. Sudarsanam, S., & Lai, J. (2001). Corporate financial distress and turnaround strategies: An empirical analysis. *British Journal of Management*, 12(3), 183-199.