



Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/13337

DOI URL: <http://dx.doi.org/10.21474/IJAR01/13337>



RESEARCH ARTICLE

A STUDY ON FINANCIAL HEALTH OF SELECTED PUBLIC SECTOR MANUFACTURING COMPANIES OF INDIA : WITH REFERENCE TO Z-SCORE ANALYSIS

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Manuscript Info

Manuscript History

Received: 29 June 2021

Final Accepted: 30 July 2021

Published: August 2021

Key words:-

Financial Health, Financial Ratio, Z-Score

Abstract

Financial distressed from a decade has become a common condition for manufacturing companies of India. Many public sector manufacturing companies have also witnessing poor financial health. This study has examined the financial health of eighteen selected public sector manufacturing companies which are further divided into four sectors as Metal, Sugar, Paper and Textile. The examination of financial health of selected companies has been performed by calculating Altman Z-score model for four year prior to become distressed. And it has been found by the analysis that most of the company was in either distressed zone or in grey zone. The study also finds that Altman Z-Score Model is a perfect tool to examine the health of public sector manufacturing companies.

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Introduction:-

Financial hardship of the company is the situation when firm is unable to meet its debt and faces financial difficulty. Due to the financial crisis organizations become bankrupt and lead to the loss of wealth. A consecutive financial loss or hardship leads to the condition of financial distress. Performance of any company can be determined by good financial health of the company. Analysis of financial health helps to make overall decisions about the functioning of any company. Financial health of any company can be analyzed by some broadly used accounting tools given below-

Analysis of Balance Sheet

it provides snapshot of assets, liabilities and owners' equity.

Analysis of Income Statement

it shows performance of the company by looking at revenue, expenses and profit earned.

Analysis of Cash Flow

It shows the clear picture that how the company has used cash during the period. It is the most important tool to judge financial health of company as it represents inflow and out flow of cash into operating, investing and financial activities separately.

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Analysis of Financial Ratios

these are Accounting Ratios which are calculated by selecting two numerical figures from financial statements of the company. They show a simple view of performance of the company in the form of ratio of percentage. Some important financial ratios those are used to check financial health are; Gross profit margin, Net profit margin, Coverage ratio, Current ratio, Quick ratio, Debt-to-equity ratio, Inventory turnover, total asset turnover, Return on equity and Return on assets.

In this study Altman Z-score model and cash flow statement have been used to analyze the financial health of selected companies.

Altman Z-score model

Altman Z-score is commonly used model to predict financial distress and bankruptcy.

This model helps the management of company to identify financial difficulties at an early stage to avoid the condition of corporate failure. This model was developed by Dr. Altman in year 1968 with the help of five financial ratios those are independent variables and it consist five rates those are dependent variables.

Z-score formula is given below:

$$\text{Z-Score} = (1.2X_1) + (1.4X_2) + (3.3X_3) + (0.6X_4) + (1.0X_5)$$

Where,

X1= Working Capital/Total Assets

X2= Retained Earning/Total Assets

X2= Earnings before Interest and Tax/Total Assets

X3= Earnings before Interest and Tax/ Total Assets

X4= Market value of equity/ Total liability

X5= Sales/ Total Assets

Financial position of the company is determined on the basis of score calculated by the above formula. When score is 2.99 and above the company is in safe zone. If score is lying between 1.81 and 2.99 the company is in grey zone, which means it need to be cautioned. And when score is below 1.81 it is said to be sick or financially distressed.

In this study Z-score model has been used for Analysis of Financial health of selected companies.

Review of Literature:-

Japneet Kaur in their study “Financial distress identification: application of black-scholes-merton model”(2018) have tried to determine the probability of default among the NSE Nifty-500 companies for a period of ten years from financial year 2007-2008 to 2016-2017. The final sample was comprised to the 171 companies among which 7 were distressed and 164 were sound. Data required for computing BSM- probability of default was accessed from corporate database maintained by Center for Monitoring Indian Economy (CMIE). Current value of assets, Asset volatility, face value of total Liabilities, size, dividend, risk-free rate and standard deviation of stock returns have been taken as variables. The researcher has used two statistical Model; Black-Scholes (1973) and Merton (1974) to know the probability of default. The study shows that the maximum percentage of company becoming Distresses was 44% in 2009. The result demonstrated that approximately 4% of the total companies were found to be financially distresses through the period 2007-2016. The highest distress being in 2009.

Golla, Siva Krishna; Rao, K Ramachandra in their study “A Factor Analysis on the Determinants of Industrial Sickness in Small Scale Enterprises”(2019) have tried to find out the identification and classification of the factors which contribute towards industrial sickness in The researcher also tried to quantify the cross factorial impact on organizational survival or sickness in small scale enterprise and they also analyze the relationship among the factors that defines the survival or sickness and revival, for the purpose of study 300 enterprise were selected across three district of Andhra Pradesh. The collected data was analyzed through SPSS based explorative factor analysis. The factors were identified as “internal” and “External” which contribute to “market Orientation”, influence on the “ability to pay” and Threat from sickness”. The sickness was attributes to internal, external as well as market orientation grounded factors that all together shape the revival or sickness of enterprise.

Dr. PranamDhar, BidhanBaidya, Bishnupada Das, Sayantan Bose in their study “Financial Health Of Select Indian It Companies - A Study With Reference To Z-Score Analysis” (2019) has tried to find out the overall financial

performance of the ten companies selected from different sectors, efficiency in financial operation and tried to predict the financial health and viability of the selected company. For the purpose of study secondary data collected from the annual reports of the companies for the period of five years (2009-10 to 2013-14). Ratio analysis was used as the prediction tool. The researchers have found out the correlation between working and total assets, retained earnings and total assets, EBIT and total assets, market value of the equity and total liability, sales and total assets and the Z scores ratio for selected five. The study concluded that the selected companies overall financial health was very much satisfactory and they are financially healthy companies.

Bishwajeet Prakash, Dr. Vijay, Dr. Jainendra Kumar Vermain their study “Predicting financial performance of Agro Based (Tea & Coffee) Industries in India: An empirical study Using Altman Z-Score Multivariate Model” (2019) aimed to predict the financial stability of Agro & allied based (Coffee & tea) producers companies listed in NSE over the period of 2014-2018. For the study top five agro based companies were selected on the bases of largest market capitalization value. Data has been analyzed by Multiple Discriminate Analysis model (Altman z score) which concludes that 50 % of the selected companies were in the position of financial distress and some of them were in grey and safe zone.

Corina Georgiana COSTEA in their study “Blockchain-Based Solutions For Financially Distressed Or Insolvent Companies” (2019) they aimed to identify the use of blockchain technology as an instrument of insolvency treatment of companies and financial difficulty prevention. The paper analyzed the way that blockchain technology could be applied to business rescue through pre-insolvency and insolvency proceedings, in accordance with the insolvency legal framework. The research concluded that blockchain may be applied in practice, because of its properties which may be useful to detect and prevent financial difficulties and insolvency.

Egbunike, Francis Chinedu, Ogbodo, Cy. Okenwa, Ojimadu, Jerry Okechukwu in their study “The Effect of Financial Distress on Corporate Profitability: A Panel Estimated Generalized Least Squares (EGLS) Approach” (2019) aimed to identify the relationship between financial distress and corporate profitability from a developing country like Nigeria. The researcher considered all quoted consumer goods manufacturing firms listed on the Nigerian stock Exchange as at December 2017. Study was secondary data based collected from annual reports. The study used the ex-post facto research design, panel estimated generalized least squares, using cross-sectional weighting to validate the hypothesis.

Objectives Of The Study:-

1. To study the various methods to examine financial health of selected companies.
2. To examine the financial health of selected companies.

Research Methodology:-

Type of Research

The research is exploratory and descriptive in nature

Scope of the Study

The study has included sick public sector manufacturing companies. Eighteen companies have been selected on the basis of convenient sampling method, which were declared sick by BIFR. The selected eighteen companies are further classified in four industries as Metal, paper, sugar and Textile.

Sample selection criteria

For the purpose of the study 18 Indian public sector manufacturing companies have been selected, which were badly suffering from loss during the selected period. Companies have been declared sick by BIFR during the period of 2010-2011 to 2015-2016.

Sampling Technique

Sample is collected on the basis of Convenient Sampling method.

Type of data

Secondary data has been used for the purpose of study.

Sources of data

The data required for the study has been collected from the Annual Reports and official websites of selected companies have been considered.

Duration of research

Six financial years during which the selected companies were declared sick i.e. from 2010-2011 to 2015-2016.

Tools for study

Altman Z-score model has been used for the purpose of examination of financial health of selected company.

Data Analysis

For the purpose of analysis of financial health of selected companies Z-scores for four years of prior to become financially distressed have been calculated for each company and financial health has been classified in different zone on the basis of score calculated.

Analysis of Financial Health of Selected Indian Metal Manufacturing Companies

Selected metal manufacturing companies are as follows

s. no.	Name of company	Year of declared financially Distressed
1	Ferro Alloys Corporation Ltd	2014-2015
2	SAL Steel Ltd	2015-2016
3	Rathi Steel and Power Ltd	2015-2016
4	Bhuwalka Steel Industries Ltd	2015-2016
5	Modern Steels Ltd	2016-2017
6	Uttam Galva Steel Ltd	2016-2017

Z-Scores of Ferro Alloys Corporation Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2013-2014	-0.024*1.2	0.397893*1.4	0.090158*3.3	0.430639*0.6	1.36619*1.0	2.450341
2012-2013	0.00356*1.2	0.376332*1.4	0.071091*3.3	0.487717*0.6	1.227053*1.0	2.28542
2011-2012	0.025634*1.2	0.419885*1.4	-0.00525*3.3	0.870163*0.6	1.222496*1.0	2.345876
2010-2011	0.177373*1.2	0.405077*1.4	0.183017*3.3	2.352994*0.6	1.542098*1.0	4.337807

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-score of Ferro Alloys Corporation Ltd is 4.33787 for the year 2010-11 which more than 2.99 which shows that the company is in safe zone but Z-Score is lying between 1.81 and 2.99 for year 2011-2012 to 2013-2014 which shows that the company is in grey zone.

Z-Scores of SAL Steel Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2014-2015	-0.73999*1.2	-0.05355*1.4	-0.04126*3.3	0.564527*0.6	1.265727*1.0	0.505333
2013-2014	-0.43119*1.2	0.04965*1.4	-0.11228*3.3	0.43347*0.6	0.793725*1.0	0.23538
2012-2013	-0.238*1.2	0.093697*1.4	-0.09728*3.3	0.58148*0.6	0.86504*1.0	0.73849
2011-2012	-0.06869*1.2	0.08447*1.4	0.002824*3.3	1.202959*0.6	0.680205*1.0	1.447131

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-Score of SAL Steel Ltd is less than 1.88 from year 2011-12 to 2014-15 that shows company is in distress position.

Z-Scores of Rathi Steel and Power Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2014-2015	0.020126*1.2	-0.01065*1.4	-0.12056*3.3	0.203458*0.6	1.070866*1.0	0.804322
2013-2014	0.111217*1.2	0.080175*1.4	-0.16739*3.3	0.178294*0.6	0.764204*1.0	0.564492
2012-2013	-0.22278*1.2	0.273124*1.4	-0.26759*3.3	0.268407*0.6	1.389652*1.0	0.782694

2011-2012	0.092462*1.2	0.215437*1.4	0.01494*3.3	0.646819*0.6	1.37732*1.0	2.227279
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Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-Score of Rathi Steel and Power Ltd is 2.227279 which is lying between 1.8 and 2.99 that shows company is in grey zone and Z-score is less than 1.88 from the year 2012-13 to 2014-15 that shows the company is in distressed zone.

Z-Scores of Bhuwarka Steel Industries Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2014-2015	0.026789*1.2	-0.1276*1.4	-0.06701*3.3	0.38281*0.6	1.376346*1.0	1.238413
2013-2014	-0.00366*1.2	0.045357*1.4	-0.08878*3.3	0.371365*0.6	0.591329*1.0	0.580286
2012-2013	0.080062*1.2	0.042478*1.4	-0.01294*3.3	0.603279*0.6	2.918809*1.0	3.393623
2011-2012	-0.11111*1.2	0.055178*1.4	-0.01306*3.3	0.964314*0.6	2.410553*1.0	2.889963

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-score of Bhuwarka Steel Industries Ltd is 2.889963 for the year 2012-13 which is lying between 1.81 and 2.99 that shows company is in grey zone. Z-score is 3.393623 for year 2013-14 which is more than 2.99 that shows company is in safe zone. But Z-score is less than 1.88 from year 2014-15 to 2015-16 that shows the company is in distressed zone.

Z-Scores of Modern Steels Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2016-2017	-0.10877*1.2	0.04211*1.4	-0.07754*3.3	0.382714*0.6	1.215246*1.0	1.117415
2015-2016	0.002764*1.2	0.082502*1.4	-0.07056*3.3	0.578433*0.6	1.219134*1.0	1.452158
2014-2015	0.113109*1.2	-0.0015*1.4	-0.06707*3.3	0.540068*0.6	1.129114*1.0	1.365461
2013-2014	0.14827*1.2	0.189765*1.4	-0.10994*3.3	0.63894*0.6	1.428899*1.0	1.893041

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-score of Modern Steel Industries Ltd is 1.893041 for the year 2013-14 which is lying between 1.81 and 2.99 which shows that the company is in grey zone. Z-score is less than 1.81 from the year 2014-15 to 2016-17 that shows the company is in distressed zone.

Z-Scores of Uttam Galva Steel Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2015-2016	-0.37225*1.2	0.197848*1.4	-0.07037*3.3	0.443263*0.6	0.660093*1.0	0.524107
2014-2015	-0.0666*1.2	0.199282*1.4	0.00621*3.3	0.915594*0.6	0.780159*1.0	1.549084
2013-2014	-0.05458*1.2	0.137958*1.4	0.009809*3.3	1.478948*0.6	0.683016*1.0	1.730397
2012-2013	-0.05428*1.2	0.152611*1.4	0.016879*3.3	1.851667*0.6	0.865111*1.0	2.180331

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-score of Uttam Galva Steel Ltd is 2.180331 for the year 2013-14 which is lying between 1.81 and 2.99 which shows that the company is in grey zone. Z-score is less than 1.81 from the year 2014-15 to 2016-17 that shows the company is in distressed zone.

Analysis of Financial Health of Selected Indian Paper Manufacturing Companies

Selected paper manufacturing companies are as follows

s. no.	Name of company	Year of declared financially Distressed
1	Shree Bhawani Paper Mills Ltd	2013-2014
2	Rama Paper Mills Ltd	2010-2011
3	Shree Krishna Paper Mills & Industries Ltd	2015-2016
4	The Sirpur Paper Mill Ltd	2014-2015

Z-Scores of Shree Bhawani Paper Mills Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2012-2013	-0.10713*1.2	-0.15342*1.4	-0.17048*3.3	0.572261*0.6	0.452757*1.0	-0.10983
2011-2012	0.064561*1.2	-0.07248*1.4	-0.14705*3.3	1.422283*0.6	0.448176*1.0	0.792272
2010-2011	-0.00088*1.2	-0.02823*1.4	-0.06623*3.3	0.840513*0.6	0.721739*1.0	0.966912
2009-2010	-0.06475*1.2	-0.00102*1.4	-0.04095*3.3	0.775493*0.6	0.847575*1.0	1.098619

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-score of Shree Bhawani Paper Mills Ltd is less than 1.81 from year 2009-10 to 2012-13 which shows that the company is in distresses zone.

Z-Scores of Rama Paper Mills Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2009-2010	0.211218*1.2	0.181556*1.4	0.000492*3.3	1.262435*0.6	0.766852*1.0	2.033577
2008-2009	0.068266*1.2	0.176199*1.4	0.031673*3.3	0.690077*0.6	0.822494*1.0	1.669658
2007-2008	0.077178*1.2	0.178318*1.4	0.058692*3.3	3.138028*0.6	0.758503*1.0	3.177262
2006-2007	0.09028*1.2	0.176716*1.4	0.089182*3.3	5.898206*0.6	0.921472*1.0	5.110434

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-score of Shree Rama Paper Mills Ltd is more than 2.99 from the year 2006-07 to 2007-08 which shows that the company is in safe zone. But the Z score is lying between 1.81 and 2.99 from the year 2008-09 to 2009-10 which shows that the company is in grey zone.

Z-Scores of Shree Krishna Paper Mills & Industries Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2014-2015	-0.22906*1.2	-0.30527*1.4	0.00594*3.3	5.940606*0.6	0.992321*1.0	3.874028
2013-2014	-0.14543*1.2	-0.32858*1.4	0.038279*3.3	1.087606*0.6	1.111619*1.0	1.255968
2012-2013	-0.14178*1.2	-0.19905*1.4	-0.01771*3.3	1.78765*0.6	1.13607*1.0	1.701427
2011-2012	-0.08514*1.2	-0.18031*1.4	0.01509*3.3	1.301428*0.6	1.33097*1.0	1.807025

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-score of Shree Krishna Paper Mills & Industries Ltd is less than 1.81 from year 2011-12 to 2013-14 which shows that company is in distress zone. While Z-score is greater than 2.99 for year 2014-15 this shows that the company is in safe zone.

Z-Score of Sirpur Paper Mill Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2013-2014	-0.07558*1.2	0.156379*1.4	-0.16114*3.3	0.470538*0.6	0.744771*1.0	0.623558
2012-2013	0.02187*1.2	0.291214*1.4	-0.16111*3.3	0.865845*0.6	0.555397*1.0	0.977193
2011-2012	-0.02897*1.2	0.330867*1.4	-0.03542*3.3	1.31216*0.6	0.625171*1.0	1.724017
2010-2011	-0.02617*1.2	0.361551*1.4	-0.02912*3.3	2.506335*0.6	0.584532*1.0	2.467026

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-score of Sirpur Paper Mill Ltd lying between 1.81 and 2.99 for the year 2010-11 which shows that the company is in grey zone. And the Z-Score is less than 1.81 from the year 2011-12 to 2013-14 this shows that the company is in distressed zone.

Analysis of Financial Health of Selected Indian Sugar Manufacturing Companies

Selected Sugar manufacturing companies are as follows

s. no.	Name of company	Year of declared financially Distressed
1	SBEC Sugar Ltd	2013-2014

2	K.M. Sugar mills Ltd	2013-2014
3	Mawana Sugar Ltd	2013-2014
4	Gayatri Sugar Ltd	2015-2016
5	Empee Sugar & Chemical Ltd	2014-2015

Z-Scores of SBEC Sugar Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2012-2013	-0.12491*1.2	-0.07544*1.4	-0.11858*3.3	0.625008*0.6	0.606739*1.0	0.334911
2011-2012	-0.29396*1.2	-0.00658*1.4	-0.04802*3.3	0.854589*0.6	0.68212*1.0	0.674429
2010-2011	-0.28112*1.2	-0.01858*1.4	-0.03645*3.3	1.853974*0.6	0.888962*1.0	1.517704
2009-2010	-0.01975*1.2	-0.01347*1.4	0.018914*3.3	2.456145*0.6	0.508689*1.0	2.002234

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-Score of SBEC Sugar Ltd is lying between 1.81 and 2.99 for the year 2011-12 which show that the company is in grey zone. And the Z-score is less than 1.81 from year 2012-13 to 2014-15 this shows that the company is in distressed zone.

Z-Scores of K.M. Sugar Mill Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2012-2013	-0.0532*1.2	-0.13678*1.4	0.083649*3.3	0.150588*0.6	1.781401*1.0	1.89247
2011-2012	-0.04121*1.2	-0.14489*1.4	-0.05554*3.3	0.409796*0.6	2.517395*1.0	2.327672
2010-2011	-0.31199*1.2	-0.02676*1.4	-0.08542*3.3	0.645561*0.6	2.272562*1.0	1.966176
2009-2010	0.26077*1.2	0.152619*1.4	-0.1726*3.3	1.833998*0.6	1.2342*1.0	2.291616

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-Score of K.M. Sugar Mill Ltd is lying between 1.81 and 2.99 from the year 2009-10 to 2012-13 which shows that the company is in grey zone.

Z-Scores of Mawana Sugar Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2012-2013	-0.68664*1.2	0.051652*1.4	-0.20758*3.3	0.039137*0.6	2.001458*1.0	0.588252
2011-2012	-0.46487*1.2	0.123056*1.4	-0.15632*3.3	0.0496*0.6	1.660502*1.0	0.788837
2010-2011	-0.14436*1.2	0.138576*1.4	-0.04425*3.3	0.077876*0.6	1.225045*1.0	1.146523
2009-2010	-0.03905*1.2	0.22122*1.4	-0.05369*3.3	0.12396*0.6	0.620555*1.0	0.780604

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-Score of Mawana Sugar Ltd is less than 1.81 from the year 2009-10 to 2012-13 which shows that the company is in distressed zone.

Z-Scores of Gayatri Sugar Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2014-2015	-0.36669*1.2	-0.21011*1.4	-0.09343*3.3	0.380125*0.6	0.799295*1.0	-0.01512
2013-2014	-0.18981*1.2	-0.11554*1.4	-0.00383*3.3	0.210911*0.6	0.639696*1.0	0.364074
2012-2013	-0.17752*1.2	-0.07886*1.4	0.035482*3.3	0.471878*0.6	0.665261*1.0	0.742053
2011-2012	-0.33787*1.2	-0.02933*1.4	0.036905*3.3	0.639673*0.6	0.865924*1.0	0.925

Where: Z-Score = $(1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$

Z-Score of Gayatri Sugar Ltd is less than 1.81 from the year 2011-12 to 2014-15 which shows that the company is in distressed zone.

Z-Score of Empee Sugar & Chemical Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2013-2014	-0.0172*1.2	-0.13861*1.4	-0.10105*3.3	0.332138*0.6	0.390294*1.0	0.041413
2012-2013	0.048955*1.2	-0.0848*1.4	-0.06932*3.3	0.447422*0.6	0.50683*1.0	0.486556
2011-2012	-0.02887*1.2	-0.04127*1.4	-0.08264*3.3	0.896951*0.6	0.584198*1.0	0.757244
2010-2011	0.146809*1.2	-0.01207*1.4	0.001003*3.3	5.45028*0.6	0.079174*1.0	3.51193

Where: Z-Score = $(1.2X_1) + (1.4X_2) + (3.3X_3) + (0.6X_4) + (1.0X_5)$

Z-score of Empee Sugar & Chemical Ltd is more than 2.99 for year 2010-11 that is 3.51193 which shows that the company is in safe zone. But the Z-Score is less than 1.81 from the year 2011-12 to 2013-14 which shows that the company is in distressed zone.

Analysis of Financial Health of Selected Indian Textile Manufacturing Companies

Selected Sugar manufacturing companies are as follows

s. no.	Name of company	Year of declared financially Distressed
1	Runeecha Textile Ltd	2015-2016
2	Alps Industries Ltd	2010-2011
3	Gangotri Textile Ltd	2013-2014

Z-Score of Runeecha Textile Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2014-15	-0.20974*1.2	0.240217*1.4	-0.13171*3.3	1.409136*0.6	0.001501*1.0	0.496953
2013-14	0.07103*1.2	0.308566*1.4	-0.10818*3.3	2.798963*0.6	0.018768*1.0	1.858377
2012-13	0.192082*1.2	0.346959*1.4	-0.05438*3.3	2.97097*0.6	0.341815*1.0	2.661178
2011-12	0.344656*1.2	0.157303*1.4	-0.05226*3.3	2.521457*0.6	0.428665*1.0	2.402892

Where: Z-Score = $(1.2X_1) + (1.4X_2) + (3.3X_3) + (0.6X_4) + (1.0X_5)$

Z-score of Runeecha Textile Ltd is lying between 1.81 and 2.99 from the year 2011-12 to 2013-14 which shows that the company is in grey zone. But the Z-Score is less than 1.81 for the year 2014-15 which shows that the company is in distressed zone.

Z-Score of Alps Industries Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2009-10	0.149772*1.2	0.017516*1.4	-0.08628*3.3	0.324383*0.6	0.384041*1.0	0.498196
2008-09	0.036617*1.2	0.226074*1.4	-0.2058*3.3	0.234282*0.6	0.843731*1.0	0.665603
2007-08	0.161305*1.2	0.231208*1.4	0.013984*3.3	1.74538*0.6	0.582771*1.0	2.193404
2006-07	0.247934*1.2	0.300943*1.4	0.050287*3.3	4.139949*0.6	0.608235*1.0	3.976992

Where: Z-Score = $(1.2X_1) + (1.4X_2) + (3.3X_3) + (0.6X_4) + (1.0X_5)$

Z-score of Alps Industries Ltd is more than 2.99 for the 2006-07 which shows company is in safe zone. And Z-Score is lying between 1.81 and 2.99 for the year 2007-08 which shows that the company is in grey zone. But the Z-Score is less than 1.81 from the year 2008-09 to 2009-10 which shows that the company is in distressed zone.

Z-Score of Gangotri Textile Ltd

All the financial figures have been taken in Crores Rupees.

Year	X1	X2	X3	X4	X5	Z-Score
2012-13	-1.01195*1.2	-0.25441*1.4	-0.18166*3.3	0.095159*0.6	0.290841*1.0	-1.82207
2011-12	-0.68306*1.2	-0.08566*1.4	-0.11545*3.3	0.166066*0.6	0.436059*1.0	-0.78489
2010-11	-0.5263*1.2	-0.03538*1.4	-0.03969*3.3	0.335726*0.6	0.462532*1.0	-0.1481
2009-10	0.074336*1.2	0.040445*1.4	-0.07824*3.3	0.355434*0.6	0.31451*1.0	0.415411

Where: Z-Score = $(1.2X_1) + (1.4X_2) + (3.3X_3) + (0.6X_4) + (1.0X_5)$

Z-score of Gangotri Textile Ltd is less than 1.81 from the year 2009-10 to 2012-13 which shows that the company is in distressed zone.

Findings and Conclusion:-

Findings of the study are as follows:

Z-scores calculated for Indian Metal manufacturing companies have found that,

1. Ferro Alloys Corporation Ltd. was in grey zone during the period of 2011-12 to 2013-14.
2. SAL Steel Ltd. was in distress zone from 2011-12 to 2014-15.
3. Rathi Steel & Power Ltd. was in distress zone from 2012-13 to 2014-15.
4. Bhuwalka Steel Industries Ltd. was in distress zone from 2014-15 to 2015-16.
5. Modern steel Ltd. was in distress zone from 2014-15 to 2016-17.
6. Uttam Galva Steel Ltd. was in distress zone from 2014-15 to 2016-17.

Z-scores calculated for Indian Paper manufacturing Companies have found that,

1. Shree Bhawani Paper mills Ltd. was in distressed zone from 2009-10 to 2012-13.
2. Rama Paper Mills Ltd. was in grey zone from 2008-09 to 2009-10.
3. Shree Krishna Paper Mills & Industries Ltd was in distressed zone from 2011-12 to 2013-14.
4. Sirpur Paper Mill Ltd. was in distressed zone from 2011-12 to 2013-14.

Z-scores calculated for Indian Sugar manufacturing Companies have found that,

1. SBEC Sugar Ltd. was in distressed zone from 2012-13 to 2014-15.
2. K.M. Sugar Mill Ltd. was in grey zone from 2009-10 to 2012-13.
3. Mawana Sugar Ltd. was in distressed zone from 2009-10 to 2012-13.
4. Gayatri Sugar Ltd. was in distressed zone from 2011-12 to 2014-15.
5. Empee Sugar & Chemical Ltd. was in distressed zone from 2011-12 to 2013-14.

Z-scores calculated for Indian Textile manufacturing Companies have found that,

1. Runeecha Textile Ltd. was in distressed zone from 2012-13 to 2014-15.
2. Alps Industries Ltd. was in distressed zone from 2008-09 to 2009-10.
3. Gangotri Textile Ltd. was in distressed zone from 2009-10 to 2012-13.

This study concludes that all selected public sector manufacturing companies were in either distressed or in grey zone at the time of declared sick. And this can be also concluded that Altman Z-score model efficiently examines the financial health of company whether it is in safe, grey or distressed zone.

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