EVALUATION OF ALTMAN Z SCORE ON NIFTY 50 SELECTED STOCKS

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Abstract :

The recent developments in the banking and corporate sector has called for an urgent need to verify the bankability of the corporate sector. RBI has initiated a clean-up of the banking sector and has advised the Banks to recognise their correct NPAs and get provisioning done for cleaning up the Balance Sheets. With this Background in mind a study was undertaken to evaluate the NIFTY 50 selected companies with Altman Z score model. The paper has examined relationship of important dimensions of the companies' financial statements and also stock market performance of the companies. Out of Nifty 50 companies the study selected 40 companies. The study has excluded Banking and Financial Services firms. Z-scores are used to predict corporate defaults and are an easy-to-calculate control measure for the financial distress status of companies in academic studies. The Z-score uses multiple corporate income and balance sheet values to measure the financial health of a company.

Key Words: credit rating, bankruptcy, financial distress, Z-Score, etc.

Introduction:

The recent developments in the banking and corporate sector has called for an urgent need to verify the bankability of the corporate sector. RBI has initiated a clean-up of the banking sector and has advised the Banks to recognize their correct NPAs and get provisioning done for cleaning up the Balance Sheets. With this Background in mind a study was undertaken to evaluate the NIFTY 50 selected companies with Altman Z score model. The Z-score formula for predicting bankruptcy was published in 1968 by Edward I. Altman, The formula may be used to predict the probability that a firm will go into bankruptcy within two years. Z-scores are used to predict corporate defaults and are an easy-to-calculate control measure for the financial distress status of companies in academic studies. The Z-score uses multiple corporate income and balance sheet values to measure the financial health of a company. The variables in the Z score model are:

- R1 = Working Capital / Total Assets
- R2 = Retained Earnings / Total Assets
- R3 = Earnings Before Interest and Taxes / Total Assets
- R4 = Market Value of Equity / Total Liabilities
- R5 = Sales / Total Assets

Z score bankruptcy model:

$$Z = 1.2R1 + 1.4R2 + 3.3R3 + 0.6R4 + .999R5$$

Objectives of the Study

- To study the financial status of select companies in the NIFTY 50 companies by calculating the Altman's Z score and evaluate the status of companies.

Research Methodology

A dataset of the NIFTY 50 companies' balance sheet and P&L Account for year ending Dec 2014/March 2015 was procured from Ace Analyser. The value for market capitalisation was estimated as an average of the period between 14th Dec 2014 and 15th April 2015.

1.1 Table showing selected Nifty 50 stocks and their respected Industry

Company Name	Industry
ACC Limited	Cement and cement products
Adani ports Limited	Shipping
Ambuja Cements Limited	Cement and cement products
Asian Paints Limited	Paints
Bajaj Auto Limited	Automobiles - 2 and 3 wheelers
Bharat Heavy Electricals Limited	Electrical equipment
Bharat Petroleum Corporation Limited	Refineries
Bharti Airtel Limited	Telecommunication – services
Bosch Limited	Auto ancillaries
Cairn India Limited	Oil exploration/production
Cipla Limited	Pharmaceuticals
Coal India Limited	Mining
Dr.Reddy's Laboratories	Pharmaceuticals
GAIL India Limited	Gas
Grasim Industries Limited	Cement and cement products
HCL Technologies Limited	Computers – software
Hero Motocorp Limited	Automobiles - 2 and 3 wheelers
Hindalco Industries Limited	Aluminium
Hindustan Unilever Limited	Diversified
ITC Limited	Cigarettes
Idea Cellular Limited	Telecommunication – services
Infosys Limited	Computers – software
Larsen & Toubro Limited	Engineering
Lupin Limited	Pharmaceuticals
Mahindra & Mahindra Limited	Automobiles - 4 wheelers
Maruti Suzuki India Limited	Automobiles - 4 wheelers
NTPC Limited	Power
Oil & Natural Gas Corporation Limited	Oil exploration/production
Power Grid Corporation of india Limited	Power
Reliance Industries Limited	Refineries
Sun Pharmaceutical industries Limited	Pharmaceuticals
Tata Consultancy Services Limited	Computers – software
Tata Motors Limited	Automobiles - 4 wheelers
Tata Power Company	Power
Tata Steel Limited	Steel and steel products
Tech Mahindra Limited	Computers – software
UltraTech Cement Limited	Cement and cement products
Vedanta Limited	Mining
Wipro Limited	Computers – software
Zee Entertainment Enterprises Limited	Media & entertainment

1.7 LITERATURE REVIEW

E.I. Altman (1968) from New York University in the late 1960's. After this pioneering work, the multivariate approach to failure prediction spread worldwide among researchers in finance, banking, and credit risk. Failure prediction models are important tools for bankers, investors, asset managers, rating agencies, and even for the distressed firms themselves. The Z-Score model has become a prototype for many of these internal-rate based models. Financial distress of the companies is on the one hand detrimental to investor returns, but on the other hand risk may give opportunities for high returns. Rating agencies assess the risk of the entities and securities issues, thus they need to have a tool to predict default. In addition, Altman (1983, 1993) has suggested that the management of distressed firms can utilize the Z-Score model as a guide to a financial turnaround.

Altman and McGough (1974) were the first to suggest the usefulness of bankruptcy prediction models for assessing going concern status. In a 1974 paper, they carried out a study the objective of which was to develop criteria to assist auditors identify situations where the status of a company as a going concern is in doubt by analysing the relationship between bankrupt companies and auditors' reports prior to bankruptcy. The model achieved an accuracy rate of 82% in predicting failed companies compared to 46% going concern uncertainty reports for the same sample of companies. For the 21 sample companies with going concern uncertainty reports, the authors found that the model indicated going concern problems earlier in six cases. The study concluded that the judgment of the auditor must be the deciding factor on the appropriate going concern opinion and that the Z-Score model may be an effective aid to the auditor in forming his judgment (Altman & McGough, 1974).

Vandana Gupta (2014) important research studies having relevance to the present work have been reviewed under broad categories viz. studies on accounting models. Accounting-based models are developed from information contained in the financial statements of a company. The first set of accounting models were developed by Beaver (1966, 1968) and Altman (1968) to assess the distress risk for a corporate. Beaver (1966) applied a univariate statistical analysis for the prediction of corporate failure. Altman (1968) developed the z-score model using financial ratios to separate defaulting and surviving firms. Subsequent z-score models were developed by Altman et al. (1977) called ZETA and Altman et al. (1995) in the context of corporations in emerging markets. Altman and Narayanan (1997) conducted studies in 22 countries where the major conclusion of the study was that the models based on accounting ratios (MDA, logistic regression, and probit models) can effectively predict default risk.

Roli Pradhan (2014) financial statements are normally used to gauge the performance of the firm and its management. The financial statements commonly used are profit and loss statement, balance sheet and cash flow statements. From the financial statements, various ratios can be calculated to assess the current performance future prospects of the concerned firm. Some of the ratios used include current ratio, quick ratio, and working capital to total debt, total debt to total assets, profit margin to sales and return on total assets. Perhaps the best way to avoid failure is to examine the myriad explanations for business failure. Studies carried out by Altman used financial ratios to predict occurrence of bankruptcy and he was able to predict 94% correctly one year before bankruptcy occurred and 72% two years before its actual occurrence.

Grice and Ingram (2001) analyses whether the application of Z-score can be generalized. The study finds negative results in application of Z-score in recent periods and to manufacturing firms, but positive results for predicting distress other than bankruptcy as it was originally developed for bankruptcy.

Bal and Raja (2013) studies the earnings management and techniques to predict solvency position. Their study uses Z-score to predict financial distress of IOCL and concludes that as per original Z-score the financial position of the company is not that much good.

Zavgren and Friedman (1988) study the utility of bankruptcy prediction models in security analysis. They found that bankruptcy predictive models can be used to assess publish financial statement in security analysis.

LIMITATION OF THE STUDY

The study is confined to only select Nifty stocks other than those belonging to the Banking and financial services industry. The model only considers five fundamental quantifiable variables as per the Z-score parameters. The limitation of the Z-score is that qualitative information is not considered, like recent changes in strategy, personnel and other qualitative factors.

THEORETICAL BACKGROUND OF THE STUDY

INTRODUCTION

The **Z-score formula for predicting bankruptcy** was published in 1968 by Edward I. Altman, The formula may be used to predict the probability that a firm will go into bankruptcy within two years. Z-scores are used to predict corporate defaults and an easy-to-calculate control measure for the financial distress status of companies in academic studies. The Z-score uses multiple corporate income and balance sheet values to measure the financial health of a company.

Estimation of the formula

The Z-score is a linear combination of four or five common business ratios, weighted by coefficients. The coefficients were estimated by identifying a set of firms which had declared bankruptcy and then collecting a matched sample of firms which had survived, with matching by industry and approximate size (assets).

Altman applied the statistical method of discriminant analysis to a dataset of publicly held manufacturers. The estimation was originally based on data from publicly held manufacturers, but has since been re-estimated based on other datasets for private manufacturing, non-manufacturing and service companies.

The original data sample consisted of 66 firms, half of which had filed for bankruptcy under Chapter 7. All businesses in the database were manufacturers, and small firms with assets of < $1 million were eliminated.

The original Z-score formula was as follows.

Z = 1.2R1 + 1.4R2 + 3.3R3 + 0.6R4 + 0.99R5.

R1 = Working Capital / Total Assets. Measures liquid assets in relation to the size of the company.

R2 = Retained Earnings / Total Assets. Measures profitability that reflects the company's age and earning power.

R3 = Earnings Before Interest and Taxes / Total Assets. Measures operating efficiency apart from tax and leveraging factors. It recognizes operating earnings as being important to long-term viability.

R4 = Market Value of Equity / Book Value of Total Liabilities. Adds market dimension that can show up security price fluctuation as a possible red flag.

R5 = Sales / Total Assets. Standard measure for total asset turnover (varies greatly from industry to industry).

Practices

Altman's work built upon research by accounting researcher William Beaver and others. In the 1930s and on, Mervyn and others had collected matched samples and assessed that various accounting ratios appeared to be valuable in predicting bankruptcy. Altman's Z-score is a customized version of the discriminant analysis technique of R. A. Fisher (1936).

William Beaver's work, published in 1966 and 1968, was the first to apply a statistical method, t-tests to predict bankruptcy for a pair-matched sample of firms. Beaver applied this method to evaluate the importance of each of several accounting ratios based on univariate analysis, using each accounting ratio one at a time. Altman's primary improvement was to apply a statistical method, discriminant analysis, which could take into account multiple variables simultaneously

Accuracy and effectiveness

In its initial test, the Altman Z-Score was found to be 72% accurate in predicting bankruptcy two years before the event, with a Type II error (false negatives) of 6% (Altman, 1968). In a series of subsequent tests covering three periods over the next 31 years (up until 1999), the model was found to be approximately 80%–90% accurate in predicting bankruptcy one year before the event, with a Type II error (classifying the firm as bankrupt when it does not go bankrupt) of approximately 15%–20% (Altman, 2000).

From about 1985 onwards, the Z-scores gained wide acceptance by auditors, management accountants, courts, and database systems used for loan evaluation (Eidleman). The formula's approach has been used in a variety of contexts and countries, although it was designed originally for publicly held manufacturing companies with assets of more than $1 million. Later variations by Altman were designed to be applicable to privately held companies (the Altman Z'-Score) and non-manufacturing companies (the Altman Z"-Score).

The Interpretation of Altman Z-Score:

Z-SCORE ABOVE 3.0 –The Company is considered 'Safe' based on the financial figures only.

Z-SCORE BETWEEN 1.8 and 2.99 – Good chances of the company going bankrupt within 2 years of operations from the date of financial figures given.

Z-SCORE BELOW 1.80- Probability of Financial embarrassment is very high

Variable Selection

Balance sheet and income statement data are collected. Because of the large number of variables found to be significant indicators of corporate problems in past studies, a list of 22 potentially helpful variables (ratios) was compiled for evaluation. The variables are classified into five standard ratio categories, including liquidity, profitability, leverage, solvency, and activity. The ratios are chosen on the basis of their popularity in the literature and their potential relevancy to the study, and there are a few "new" ratios in this analysis. The Beaver study (1967) concluded that the cash flow to debt ratio was the best single ratio predictor. This ratio was not considered in my 1968 study because of the lack of consistent and precise depreciation and cash flow data. The results obtained, however, were still superior to the results Beaver attained with his single best ratio. Cash flow measures were included in the ZETA model tests (see later discussion). From the original list of 22 variables, five are selected as doing the best overall job together in the prediction of corporate bankruptcy. This profile did not contain all of the most significant variable measured independently. This would not necessarily improve upon the univariate, traditional analysis described earlier. The contribution of the entire profile is evaluated and, since this process is essentially iterative, there is no claim regarding the optimality of the resulting

discriminant function. The function, however, does the best job among the alternatives which include numerous computer runs analysing different ratio profiles.

R1: Working Capital/Total Assets (WC/TA).

The working capital/total assets ratio, frequently found in studies of corporate problems, is a measure of the net liquid assets of the firm relative to the total capitalization. Working capital is defined as the difference between current assets and current liabilities. Liquidity and size characteristics are explicitly considered. Ordinarily, a firm experiencing consistent operating losses will have shrinking current assets in relation to total assets. Of the three liquidity ratios evaluated, this one proved to be the most valuable. Two other liquidity ratios tested were the current ratio and the quick ratio. There were found to be less helpful and subject to perverse trends for some failing firms.

R2: Retained Earnings/Total Assets (RE/TA).

Retained earnings is the account which reports the total amount of reinvested earnings and/or losses of a firm over its entire life. The account is also referred to as earned surplus. It should be noted that the retained earnings account is subject to "manipulation" via corporate quasi-reorganizations and stock dividend declarations. While these occurrences are not evident in this study, it is conceivable that a bias would be created by a substantial reorganization or stock dividend and appropriate readjustments should be made to the accounts.

In addition, the RE/TA ratio measures the leverage of a firm. Those firms with high RE, relative to TA, have financed their assets through retention of profits and have not utilized as much debt.

R3: Earnings Before Interest and Taxes/Total Assets (EBIT/TA).

This ratio is a measure of the true productivity of the firm's assets, independent of any tax or leverage factors. Since a firm's ultimate existence is based on the earning power of its assets, this ratio appears to be particularly appropriate for studies dealing with corporate failure. Furthermore, insolvency in a bankrupt sense occurs when the total liabilities exceed a fair valuation of the firm's assets with value determined by the earning power of the assets. As we will show, this ratio continually outperforms other profitability measures, including cash flow.

R4: Market Value of Equity/Book Value of Total Liabilities (MVE/TL).

Equity is measured by the combined market value of all shares of stock, preferred and common, while liabilities include both current and long term. The measure shows how much the firm's assets can decline in value (measured by market value of equity plus debt) before the liabilities exceed the assets and the firm becomes insolvent. This ratio adds a market value dimension which most other failure studies did not consider. The reciprocal of X4 is a slightly modified version of one of the variables used effectively by Fisher (1959) in a study of corporate bond yield-spread differentials. It also appears to be a more effective predictor of bankruptcy than a similar, more commonly used ratio; net worth/total debt (book values). More recent models, such as the KMV approach, are essentially based on the market value of equity and its volatility. The equity market value serves as a proxy for the firm's asset values.

R5: Sales/Total Assets (S/TA).

The capital-turnover ratio is a standard financial ratio illustrating the sales generating ability of the firm's assets. It is one measure of management's capacity in dealing with competitive conditions. This final ratio is quite important because it is the least significant ratio on an individual basis. In fact, based on the univariate statistical significance test, it would not have appeared at all. However, because of its unique relationship to other variables in the model, the sales/total assets ratio ranks second in its contribution to the overall

discriminating ability of the model.

Data analysis and Interpretation

Data analysis

The Altman Z score is calculated for select companies of NIFTY 50. The required financial data is collected from respected Companies financial statements as on Dec 2014/March 2015 and calculated Z score and Interpretation is shown in the below table.

Table 1.1 Companies under Safe zone as per Altman Z score Prediction

Company Name	Altman Z score	Interpretation
ACC Limited	5.33	Safe zone
Ambuja Cements Limited	4.83	Safe zone
Asianpaints Limited	6.72	Safe zone
Bajaj Auto Limited	43.35	Safe zone
Bharat Petrolium corporation Limited	9.13	Safe zone
Bharti Airtel Limited	3.22	Safe zone
Bosch Limited	8.52	Safe zone
Cairn India Limited	3.56	Safe zone
Cipla Limited	4.98	Safe zone
Coal India Limited	9.62	Safe zone
Dr.Reddy's Laboratories	4.66	Safe zone
GAIL India Limited	3.26	Safe zone
Grasim Industries Limited	3.77	Safe zone
HCL Technologies Limited	7.69	Safe zone
Hero Motocorp Limited	11.71	Safe zone
Hindustan Unilever Limited	33.64	Safe zone
ITC Limited	5.28	Safe zone
Infosys Limited	7.34	Safe zone
Larsen & Toubro Limited	17.19	Safe zone
Lupin Limited	9.48	Safe zone
Mahindra & Mahindra Limited	4.94	Safe zone
Maruti Suzuki India Limited	38.20	Safe zone
Reliance Industries Limited	8.84	Safe zone
Tata Consultancy Services Limited	17.49	Safe zone
Tata Motors Limited	3.17	Safe zone
Tech Mahindra Limited	6.72	Safe zone
UltraTech Cement Limited	4.23	Safe zone

Wipro Limited	6.30	Safe zone
Zee Entertainment Enterprises Limited	8.17	Safe zone

### Table 1.2. Companies under Bankruptcy zone as per Altman Z score Prediction

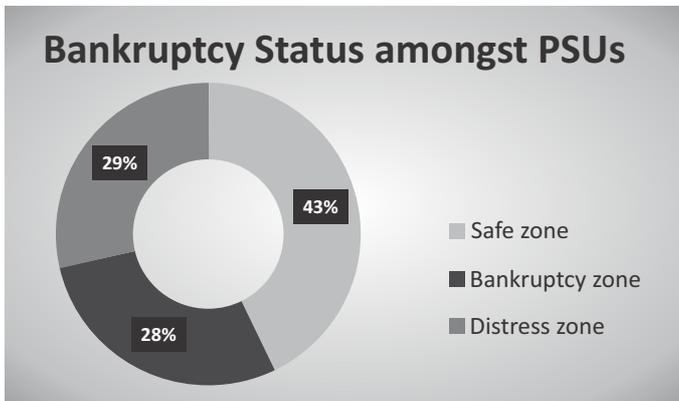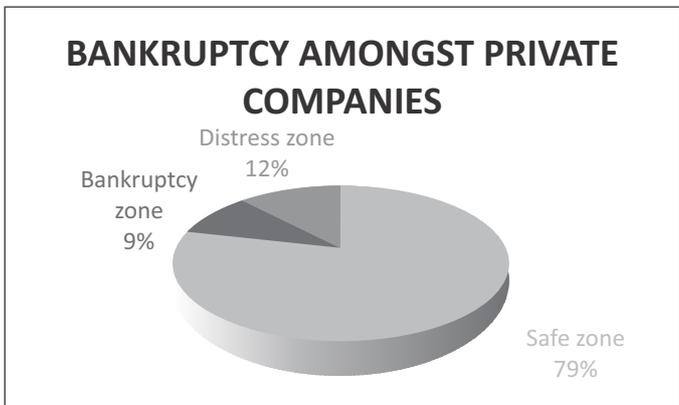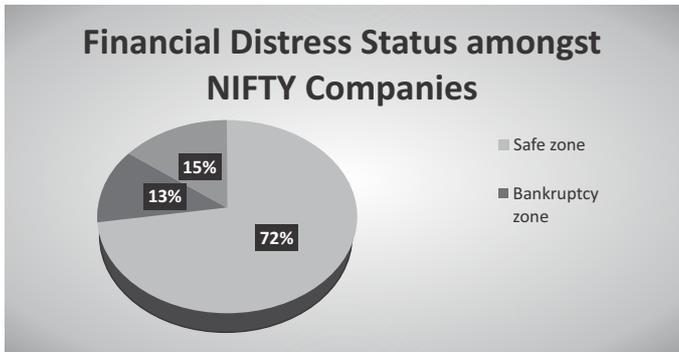| Company Name	Altman Z score	Interpretation
Adani ports Limited	2.84	Bankruptcy zone
Bharat Heavy Electricals Limited	2.67	Bankruptcy zone
Idea Cellular Limited	2.15	Bankruptcy zone
Oil & Natural Gas Corporation Limited	2.62	Bankruptcy zone
Sun Pharmaceutical industries Limited	1.84	Bankruptcy zone

Table 1.3. Companies under Distress zone as per Altman Z score Prediction

Company Name	Altman Z score	Interpretation
Hindalco Industries Limited	1.71	Distress zone
NTPC Limited	1.66	Distress zone
Power Grid Corporation of india Limited	0.80	Distress zone
Tata Power Company	1.63	Distress zone
Tata Steel Limited	1.75	Distress zone
Vedanta Limited	1.53	Distress zone

Chart 1.1 shows selected companies Altman Z score in all the Predicted zones

CHART SHOWING ALTMAN ZSCORE
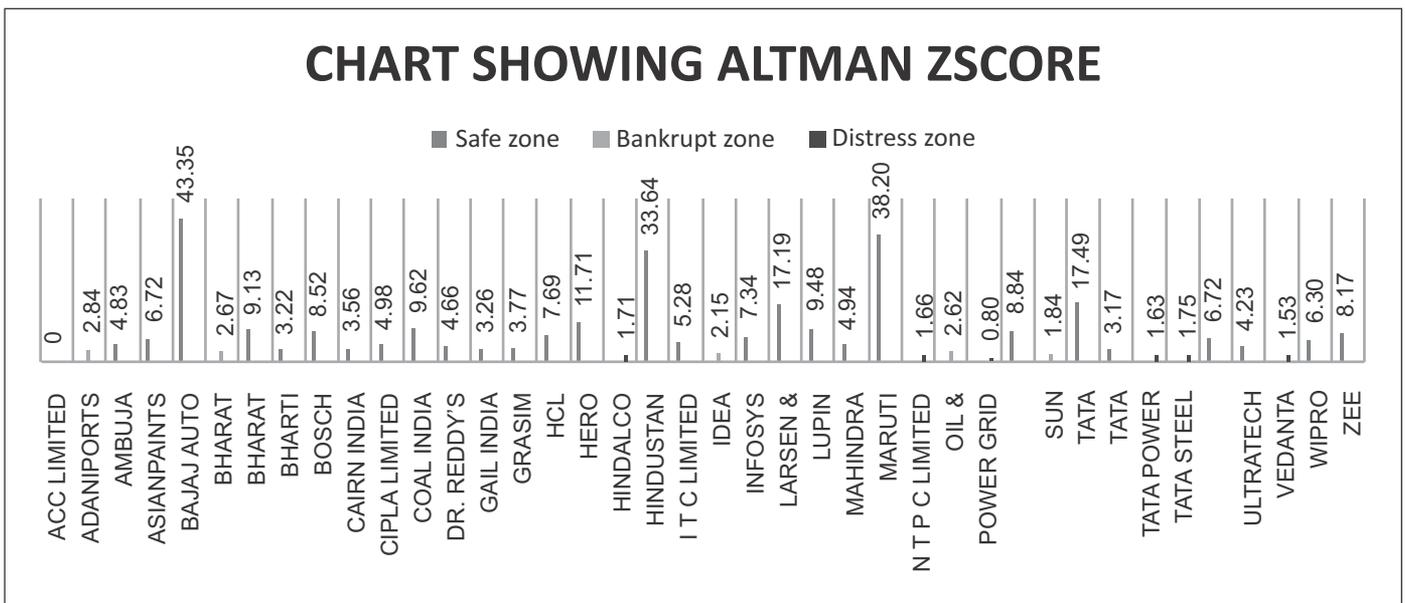
The above chart (Figure 1.1) shows NIFTY selected companies prediction of Altman Z score model based on the resulting scores there are 29 companies in safe zone and 5 companies in bankruptcy zone and rest 6 companies in financial distress zone. The results are a revelation, these companies are the bell weather stocks of the Stock markets. When 11 out of 40 companies are either in the distress or the bankrupt zone, it rings alarm bells in the corporate sector.

Financial Distress Status amongst NIFTY Companies

BANKRUPTCY AMONGST PRIVATE COMPANIES

Bankruptcy Status amongst PSUs

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CONCLUSION

Out of selected 40 companies 29 companies are in safe zone. There are 6 companies in financial distress zone and there are 5 companies in grey zone i.e. Bankruptcy zone. The public sector companies are more in distress zone. Private sector companies are performing well. Distress zone companies need urgent strategic and financial direction to bring them out of the quagmire and turn them around.

The objective of the study was to evaluate the NIFTY 50 selected companies exact financial positions with Altman Z score model. The paper has examined relationship of important dimensions of the companies' financial statements and also stock market performance of the companies. The study helps us to understand both internal financial factors and external financial factors impact on the financial standing of the company in the market.

According to findings and results it can be concluded that in the current scenario the Altman Z score model can be used to predict the financial performance of Indian companies. The mentioned Altman model factors are enough for predicting the companies' financial standing.