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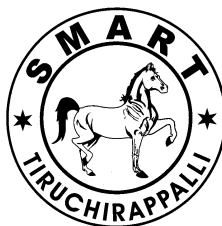
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EFFICIENT MARKET HYPOTHESES, FIRM PERFORMANCE AND FINANCIAL DISTRESS -AN EMPIRICAL ANALYSIS ON MANUFACTURING SECTOR

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Abstract

An attempt has been made in this paper to test Fama's Semi Strong Form of Efficient Market hypothesis in the Indian capital market. The Semi Strong Form of Efficient Market has the underlying assumption that all the public information is incorporated into stock price. In order to test these hypotheses, we have used market valuation measure of Tobin's Q and financial distress model of Z score analysis. The reason for choosing these measures is that they have almost used all the public information for calculation. Apart from this, this paper also tries to predict future performance of the firm through Tobin's Q. For this purpose, the Discriminate Model is constructed based on the decision rule that if firm's Q value is more than 1, then the firm has low probability of entering financial distress. This paper has following premises for constructing the Discriminate Model that If the firm secures Tobin's Q more than 1, it is financially healthy ($Q > 1$) or else, it is sick ($Q < 1$). The Tobin's Q Discriminate Model predicted that the 56 firms (from the sample of 64 firms out of the total sample of 148) are financially healthy and probabilities of going bankrupt for these firms are nil. In order to validate our model, we run Altman Z score analysis on the same sample of 64 (Where Tobin's Q value more than 1) and it predicted 52 firms (Z score is greater than 2.90) are financially sound. Hence, it is concluded that our model has predictive ability very similar to the Altman Z score analysis in predicting the future corporate performance.

1. Introduction

Corporate Valuation is a buzzword in which earnings ability of the corporate is judged. The different types of valuation measures have been practiced across industries. There are three commonly used methods of valuation, namely, earnings based method, asset based method and market value of shares for valuing the business (Ramanujam.p.353, 2000). These measures have used predominantly to assess corporate creditworthiness. . When the corporate is unable to raise revenue above its obligations, it is in financial distress and that would lead to corporate bankruptcy. Corporate bankruptcy is a tool to differentiate better performing firm from the poor. This paper chooses to address the issue of how good the corporate performance measures to predict the financial distress possibility in the firm.

Financial distress can affect the firm adversely in generating further capital from the market. It also produces substantial losses to creditors and stockholders. Firms affected by financial distress share the similar characteristics (Ran et.al, 2002). Therefore a model can be constructed to predict the corporate financial distress. Past literatures related to financial distress models such as Beaver (1966), Altman (1968), Altman, Haldeman, and Narayanan (1977), Ohlson (1980), etc. predicted the potential business failure. The proxy for corporate performance have used number of measures such as returns on asset, returns on capital employed, book value to market value, Tobin's Q etc. This paper has employed Tobin's Q as a proxy for corporate performance. The purpose of this paper is to propose a model to predict the corporate financial distress. This financial distress model can

be used to predict the firm performance in the future. So far, most of the corporate failure prediction models have extensively used ratio analysis. This paper has attempted to predict the corporate failure through corporate performance measure.

This paper is organized in the following way. The following section reviews the literature on corporate financial distress models, firm performance measure and control variables. The section thereafter presents model construction using linear discriminate model, followed by a section that describes Model validity (Altman Z Score). The last section explains analysis and conclusion.

2. Literature Review

This section reviews corporate financial distress models, firm performance measure (Tobin's Q), and control variables applied in linear discriminate model.

2.1. Semi Strong Form of Efficient Market

The efficient market is one in which the market price of a security is an unbiased estimate of its intrinsic value (Prasanna Chandra, 2005). Past literatures have proved that the Indian capital market is under semi strong form of efficient market where stock prices reflect not only all information found in the record of past prices and volumes but also all other publicly available information. It is elucidated in the following way that stock prices can deviate from the intrinsic value but the deviations are random and uncorrelated with any observable variable. Based on this assumption, this paper uses following measures. It is obvious that the Tobin's Q and Z score analysis is measured through public information. If results of those analyses are complementing each other, then, it is understood that all the public information are rightly spread in the market place.

2.2. Financial Distress Models

Corporate financial distress models have been successful in classifying the firms. This topic has attracted continuous interest due to volatile nature of corporate performance over the years. Altman (1968) has developed a model for predicting corporate financial distress based on the reported financial statements of firms. He used weighted combination of five ratios to predict the financial health of the firm. The results out of his analysis have predicted 95% future bankruptcy. It is evident that the firms analysed by him went bankrupt on the average of seven and one-half months after the financial year. This is the motivation behind this paper that if any firm scoring below 2.9 in Z score analysis will have high chance of going bankrupt in seven and half months after submitting financial statements. Beaver (1968) constructed a similar model but he used a dichotomous classification test to determine failure and non-failure firms. He also used combination of 14 ratios as tool to predict the corporate failure. Amy and Ling (1987) used five financial states to approximate the continuum of corporate financial health. Their model estimated the probability that the firm enters each of five financial states such as financial stability, reducing dividend, default on loan payment, protection under bankruptcy act, and liquidation. Edward (1972) found that discriminate analysis can be used to predict business failure from accounting data. Marc (1974) The failing company model was developed to predict corporate failure. He used discriminant analysis to test the hypothesis that the Failing Company Model can distinguish between failing and nonfailing firms. His model distinguished failing from non-failing firms with an accuracy of approximately 94 percent, when failure occurred within one year from the date of prediction, 80 percent for failure two years into the future and 70 percent

for failure three, four, and five years distant. Financial distress studies after 1980 predominantly used logistic regression analysis. It is evident from Ohlson, (1980), and Ran et.al, (2002). Dhumale (1998) used cash management model and earning retention, by using logistic regression to predict corporate failure.

2.3. Market Valuation Measure (Tobin's Q)

Tobin's Q is a very widely used measure of corporate performance in past literatures. It is defined as the ratio of market value of the firm to replacement value of the assets. Interestingly, original definition of Q has few practical limitations such as availability of timely and accurate Q date. It is understood that even computational procedure also is difficult to employ. Kee and Prulti (1994) found approximation for original Q value and it is computed by book value of debt plus market value of equity plus book value of preference shares over book value of total asset. Wolfgang (2002) stated that Q value greater than 1 indicates that the firm has performed well and it is implied that the firm has created a positive cash flow over the expenditure. In contrast, a value of Q lower than 1 showed that the firm did not generate revenue over its expenditure and it created only negative cash flow. This is sufficient motivation for this paper to adopt nature of Q value for predicting the corporate performance.

2.4. Control Variables

The following control variables are used in this study. It is understood that these variables can affect Tobin's Q value

- a. Returns on Assets: The profitability of an organization is measured through ROA. It indicates the effectiveness and efficiency of an organization in generating earnings. It is calculated by dividing earnings before interest and taxes (EBIT) by total assets. This has been used in previous studies as firm performance indicators by Jira Yammeesri & Sudhir C.Lodha, 2004. It is denoted by FR
- b. Log Sales: This factor has a significant influence on the performance of a firm. Hence, size is measured by the logarithm of sales (Jira Yammeesri & Sudhir C.Lodha, 2004), It is denoted by FS
- c. Log Asset: It is measured as the natural logarithm of the book value of total assets as of the latest year-end. Chi (2004) found that firm's asset is significantly related to firm performance. Bigger asset size helps firms to borrow money from the bank at cheaper rate of interest, because those firms had the least chance of going bankrupt. Firms with more fixed assets can easily expand their business through debt financing. It is denoted by FAs.
- d. Earnings to Price: It is more appropriate to calculate shareholders' returns with reference to the market price of a company's shares. It is measured by dividing earnings per share by market price at the end of the year (Jira Yammeesri & Sudhir C.Lodha, 2004). It is denoted by FE_p
- e. Current Ratio: It is calculated by dividing current assets by current liability. It is a measure of the firm's short-term solvency (Pandey, P 520, 2005). It is denoted by FC_r
- f. Price to Book Value: It is calculated by dividing market price of equity to book price. This measure can explain the amount of premium an investors willing to pay for equity shares with respect to book value. It is denoted by FP_b.

2.5. Research Questions:

This paper has following hypothesis for study

1. To test Fama's Semi Strong Form of Efficient Market in the Indian capital market.
2. To formulate the statistically significant model to capture the similar characteristics exhibited by firms to predict future performance
3. Reliability of firm performance prediction model is tested against Altman Z score.

3. Corporate Performance Prediction Model

This section deals with construction of corporate performance prediction model and sampling plan. This paper has following premises for constructing the discriminate model, if firm secures Tobin's Q value of more than 1 then it is called financially healthy firm ($Q > 1$) or else, it is sick ($Q < 1$). It is evident from the past research that if Q value is more than 1, it is understood that the firm creates positive cash flow and has low probability of falling bankrupt.

3.1. Data

The data that have been used in this paper were obtained from PROWESS, a financial database of Center for Monitoring Indian Economy (CMIE). The data sample consists of manufacturing firms alone chosen from firms listed in CNX MIDCAP index of National Stock Exchange (NSE) as on 31st March 2005. The total number of firms taken for study is 200 but only 148 firms belong to manufacturing sector. There are 64 firms who have obtained Q value more than 1 and remaining firms (84) have secured Q value of less than 1.

3.2. Discriminate Analysis.

This statistical technique is chosen after thoughtful consideration of the problem

and objective of the paper. It is used to classify objects into two or more groups based on the knowledge of some variables related to them (Nargundkar, p.284, 2002). The objective of this analysis is to find linear relationship among the variables which best discriminates between the groups which are being classified. This technique is predominantly used to make predictions in problems where dependent variables appear in categorical data. Perhaps, the foremost advantage of discriminate analysis in dealing with classification problems is the potential of analyzing the entire variable profile of the object simultaneously rather than sequentially examining its individual characteristics (Altman, 1968). This paper is concerned with two categorical groups, consisting of Q value greater than 1 (qualitative value assigned 2) on the one hand, and Q value less than 1 (qualitative value assigned 1) on the other. The discriminate equation is,

$$\text{Tobin's Q (1 and 2)} = \alpha (\beta_1 \times \text{FR} + \beta_2 \times \text{FS} + \beta_3 \times \text{FA} + \beta_4 \times \text{FEP} + \beta_5 \times \text{FCr} + \beta_6 \times \text{FPb}) + \bullet$$

This firm performance prediction model is used to classify the cases into two groups namely better performing firms and poor performing firms. There are 64 firms which have secured Q value more than 1 and the remaining 84 firms obtained Q value of less than 1. The ultimate objective of this analysis is to classify all cases into two groups based on their Q value.

The variables used in the discriminate analysis are reported in Table 1. It is proved that all variables have significant relationship with discriminate model. The Wilk's Lambda is the ratio of within group sum of square to the total sum of squares. All the variables in the discriminate analysis have Wilk's Lambda of less than 1, which shows that these variables are indicating strong group differences. The F

test is the ratio of between groups variability to within group variability. The F test value is used to obtain observed group significance level. It is observed from the table that all the variables are statistically significant.

In addition to this, Box's test of equality of covariance matrices is done. Box's M statistics tests the null hypothesis of equal population covariance matrices. The Box's M statistics for above problem is 173.251 (Approximation 7.879), which is significant at 0 level. According to Classification Matrix, 85.8 percentages of cases are correctly classified. This shows that this model has 85 percent of predictive power over variables submitted, assuming the input data is relevant and scientifically collected

Table above provides information regarding statistical significance of discriminate model. The Eigenvalue is an indication of the length of the corresponding Eigenvector. This value shows that model is statistically fit. The canonical correlation measures the association between the discriminant scores and the groups. The canonical value is approximately 0.7, which indicates a strong correlation between the discriminant scores and the groups. Wilk's Lambda ranges between 0 and 1. The result of Wilk's Lambda is 0.530, which indicates the group means are different. The chi-square test indicates that the discrimination between the two groups is highly significant. This is because p value is significant at the confidence level of 100 percent.

In order to classify the groups according to their characteristics, the result of Canonical Discriminant Function Coefficients and Functions at Group Centroids are used.

According to the analysis, the canonical unstandardised discriminant function is

$$Y = 2.638 + 6.819(\text{ROA}) - 2.216(\text{EP}) + 0.237(\text{PB}) + 0.257(\text{CR}) - 0.153(\text{Log Sales}) - 1.147(\text{Log Asset})$$

Where Y would be the discriminate score of any firm whose data is submitted according to model requirement, this model classified 85 percent of the cases correctly. So out of 64 firms (which have Q value of more than 1), only 56 firms are correctly classified as group 2 in discriminate analysis. This paper is very much concerned about firms with Q value of more than 1. The reason is that these are better performing firms, which have high chance of sustaining its revenue streams in future. Finally, it is observed that these 56 firms can perform well in near future. In order to validate our discriminate model, Altman Z score analysis was applied to 64 firms (which belong to group 2)

4. Altman Z Score – Model Validation

Altman Z score analysis is used here as a tool to validate fitness of discriminate model used in the previous section. Altman Z score analysis is used predominantly to identify the firms which are on the verge of financial distress in near future. This analysis is based on the past year financial data of the firm. To be precise, it predicts the probability of a company entering into financial distress within 12 months. This paper applies Z score analysis only to 88 firms, which secured Tobin's Q value of more than 1. In order to find out how many firms has high probability of entering into financial distress, it is computed in linear equation

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1X_5$$

X1 = Working Capital / Total Assets

X2 = Retained Earnings / Total Assets

X3 = Earnings before Interest and Tax / Total Assets

X4 = Market Value of Equity / Total Liabilities, and

X5 = Sales / Total Assets.

The scores of this analysis are used to classify firms into three categories

Score	Interpretation
2.90 and above	Firm has low probability of financial distress
2.90 – 1.23	Grey area – Firm requires careful monitoring
1.23 and below	Likelihood of insolvency within 12 months

Out of 64 firms analysed, only 52 firms have secured score of 2.9 and above and remaining 12 firms have obtained score below 2.90.

Conclusion

Fama's semi strong form of efficient market has stated that all the public information is reflected in the performance of the company. This paper has empirically proved the semi strong form of efficient market through following measures

Criteria	Tobin's Q (QValue<1)	Z score (score < 2.9)
Number of firms correctly Classified	64	52

From the Table, it is understood that market valuation measure has predicted 64 firms are financially sound. But the Z score analysis revealed only 52 firms and these firms are in the Tobin's Q 64 firms. It is evident that first hypothesis is statistically proved. In order to prove second hypothesis, this paper has decision rule that if any firm scores Tobin's Q value of more than 1 then it can be considered better performing. In order to prove this, linear discriminate model is applied to classify the firms into two groups - firms with Q value of more than 1 and firms with Q value of less than 1. The CNX Midcap index consisting of 148 manufacturing firms are used for analysis. These firms are classified according to their Q value. Finally, out of 148 firms, there are 84 firms (Q<1) belonging to group 1 and the remaining 64 firms (Q>1) belonging to group 2. The discriminate analysis has classified 85.8 percentage of cases correctly. At the end, there are 56 firms out of 64 firms, which are correctly

classified into group 2. According to decision rule, these 56 firms continued to perform well in future. In order to support this claim, Altman Z score analysis is used to find worthiness of these 64 firms, which are having Q value of more than 1. The Z score analysis of financial distress has predicted 52 firms are out of bankrupt situation in the near future.

In the light of above observation, this paper has concluded that linear discriminate model formulated according to decision rule is proved to be right. The finding of the corporate performance prediction model (Discriminate Analysis) is similar to Altman Z score analysis. Hence, this model can be used as an alternative model to predict the firm's performance.

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Table1: Tests of Equality of Group Means

Variables	Wilks' Lambda	F	df1	df2	Sig.
ROA	0.811	34.116	1	146	.000
Earnings to Price	0.911	14.229	1	146	.000
Price to Book	0.816	32.889	1	146	.000
Current Ratio	0.903	15.703	1	146	.000
LOG SALES	0.722	56.102	1	146	.000
LOG ASSET	0.891	17.791	1	146	.000

Table 2: Discriminate Function Analysis Results

Functions	EigenValue	Canonical Correlation	Wilk's Lambda	Chi-square	df	P value
1	0.885	0.685	0.530	90.688	6	.000

Table 3: Functions at Group Centroids

Groups	Root 1
1.00 (Q value less than1)	-0.816
2.00 (Q value greater than1)	1.071
Unstandardized canonical discriminant functions evaluated at group means	