

Meaning of Corporate Distress or Corporate Sickness

Under the purview of the topic discussed here distress means acute financial hardship/crisis. Corporate Distress/Sickness means such a situation of a firm when it is unable to meet its debt. In other words, when value of the Total Assets of a company is insufficient to discharge its Total External Liabilities, the said company can be said a 'Distress Company'. Corporate Distress also includes the following:

Unfavourable liquidity position; (b) Adverse long-term solvency position; (c) Outdated production process; (d) Deteriorating selling status; (e) Poor administrative set-up; and (f) Overall adverse economic condition.

In short, Corporate Distress is a situation when the financial status of a company moves towards bankruptcy/ insolvency.

Concept of Distress Analysis

Under the purview of the current topic, Distress Analysis refers to the process of analysis of financial crisis/hardship faced by a concern. It analyses various causes responsible for the Financial Distress/ Sickness of a firm, provides effective tools for prediction of distress and advocates remedial measures to get out of financial hardship. The process of prediction of distress plays a significant role in the revival of a firm.

Various Ways of Identification of Sick/Distress Firm

As per the Sick Industrial Companies (Special Provisions) Act, 1985, a business unit may be treated as sick if the following conditions are satisfied:

The unit must be registered for not less than 5 years period.

Its accumulated losses at the end of the financial year are equal to or exceed its net worth. As per section 253(1) of the Companies Act, 2013 [Not yet enforced] —

Where on a demand by the secured creditors of a company representing fifty per cent or more of its outstanding amount of debt; and

the company has failed to pay the debt within a period of thirty days of the service of the notice of demand or to secure or compound it to the reasonable satisfaction of the creditors;

any secured creditor may file an application to the Tribunal in the prescribed manner along with the relevant evidence for such default, non-repayment or failure to offer security or compound it, for a determination that the company be declared as a sick company.

According to the Reserve Bank of India, a Micro or Small Enterprise (as defined in the MSMED Act 2006) may be said to have become Sick, if —

Any of the borrowal account of the enterprise remains NPA for three months or more;

OR

There is erosion in the net worth due to accumulated losses to the extent of 50% of its net worth during the previous accounting year.

According to the ICICI, a sick is one whose financial viability is threatened by adverse factors present and continuing. The adverse factors might relate to management, market fiscal burden, labour relations or any other. When the impact of factors reaches a point where a company begins to incur cash losses leading to erosion of its funds, there is treat to its financial stability.

According to NCAER, an industrial undertaking may be financially viable, if its three elements are proved to be positive. The NCAER Study on Corporate Distress Prediction prescribed the following three elements/ parameters for predicting the stages of corporate sickness:

Cash profit position (a profitability measure).

Net working capital position (a liquidity measure).

Net worth position (a solvency measure).

In a firm, if any of the above three elements/parameters are found to be negative, it may be considered that the firm has a 'tendency of becoming sick'. If any two of the above three elements/parameters are found to be negative in a firm, it may be considered that the firm possesses 'incipient sickness'. If all the above three elements/parameters are found to be negative in a firm, it may be considered that the firm is 'fully sick'.

Causes of Corporate Distress

There are a number of factors responsible for Corporate Distress/Sickness. These factors may be classified into two parts, namely, internal factors and external factors. The causes within the company responsible for Corporate Distress are the internal factors, while the causes outside the company responsible for Corporate Distress are the external factors. These are individually stated in the following sections:

Distress Prediction

Distress Prediction is an essential issue in the field of finance. It is a very important tool used for the purpose of prediction of future probable financial condition of a corporate entity so that any financial crisis-that may crop up in the near future can be predicted in advance. Using various models of Distress Prediction, the management of a company comes to know about its future probable financial condition beforehand and accordingly, it may adopt appropriate remedial measures to avoid the financial crisis as predicted through the various models of Distress Prediction. Distress Prediction is considered a very significant tool for sustainment of a company in the long-run. As a company can have a predicted notion about occurrence of its financial hardship in future, it gets a scope to avoid such a situation by taking proper preventive measures in advance. Therefore, Distress Prediction plays a very significant role in the survival of a company in the long-run.

Following are the two types of models generally used for prediction of Corporate Distress/Sickness:

i. **Univariate Model:** In this model, a single variable is used for Corporate Distress Prediction.

Multivariate Model: In this model, a number of variables are used for Corporate Distress Prediction.

Univariate Model of Distress Prediction

Univariate Model of Distress Prediction refers to a model of prediction of Corporate Distress where a single variable is used. More clearly, under this model, analysis of Corporate Distress Prediction is made with the help of a single set of financial information, e.g., a single ratio. Here, variable generally refers to Accounting Ratio of the concerned corporate entity. In this model, a single Accounting Ratio, viz. Current Ratio or Debt-Equity Ratio or Total Debt to Total Asset, etc., of different corporate entities considered for analysis is taken into consideration for their Distress Prediction.

This model of Distress Prediction is based on the following assumptions:

The distribution of the variable (i.e., ratio) for distressed firms (i.e., failed firms) differs systematically from the distribution of the variable for the non-distressed firms (i.e., non-failed firms).

The systematic difference can be exploited for prediction purpose.

Steps Followed Under Univariate Model of Distress Prediction

Techniques used under Univariate Model of Distress Prediction are as follows:

An Accounting Ratio, viz. Current Ratio or Debt-Equity Ratio or Total Debt to Total Asset, etc., is selected for analysis of financial distress of companies.

A number of distressed companies (i.e., failed companies) and non-distressed companies (i.e., non-failed companies) are arbitrarily chosen for analysis.

The Accounting Ratio as selected for analysis of the companies as chosen under (ii) is calculated.

Comparison of Accounting Ratios as calculated under (iii) for the companies chosen for analysis are made for prediction of their Financial Distress.

Conclusion is made about the prediction of Financial Distress of the companies on the basis of the comparison done under (iv).

Some Studies of Univariate Analysis

Univariate Model of Corporate Distress Prediction Analysis had been effectively applied by the analysts in the early 1930s. In 1931, Ramser and Foster observed that the distressed firms had lower ratios as compared to the ratios of the non-distressed firms while they studied and analysed 11 types of ratios for 173 distressed and nondistressed firms. In 1932, P. J. Fitzpatrick also observed that the distressed firms had inferior ratios as compared to the ratios of the non-distressed firms and the Net Income to Net Worth and Net Worth to Debt were the best indicators of Corporate Distress while he studied and analysed ratios of 19 pairs of distressed and non-distressed firms. In 1935, Winakor and Smith also observed a distinct deterioration in the mean values of Accounting Ratios of the distressed firms while they studied and analysed Accounting Ratios of 183 distressed firms.

All these studies though established the systematic difference between the Financial Ratios of the distressed and non-distressed firms, they were not sufficient enough to provide a well-accepted general model for Corporate Distress Prediction on a scientific basis.

The study of William H. Beaver in the year 1966 was very significant in the field of Corporate Distress Analysis as he, for the first time, scientifically emphasized on the ability of Financial Ratios for prediction of Corporate Distress. In 1979, L. C. Gupta, for the first time, studied and analysed the issue of prediction of Corporate Distress in a scientific manner from the perspective of the Indian scenario. These studies are individually discussed in the following sections.

Beaver's Study on Univariate Analysis of Corporate Distress Prediction

For the first time in the history of Corporate Distress Analysis, W. H. Beaver scientifically emphasized on the ability of Financial Ratios for prediction of Corporate Distress. Beaver selected 79 failed and 79 non-failed firms for comparison of their Financial Ratios. He defined failure as the inability of a firm to meet its financial obligations as and when they mature. For each failed firm, a non-failed firm of comparable size operating in the same industry was selected. For both types of firms, he examined 30 conventional Financial Ratios for 5 years immediately preceding the failure. Beaver's study was based on the following two stages of examination:

Stage 1: A comparison of mean values of Financial Ratios taken into consideration of two types of firms.

Stage 2: Examination of predictive power of Financial Ratio with the help of Dichotomous Classification Test.

Dichotomous Classification Test under Beaver's Model

The Dichotomous Classification Test under Beaver's study covers the following steps:

First, actual position of two types of a number of firms (i.e., failed firm and non-failed firm) is randomly chosen for consideration.

A single uniform ratio (say, Current Ratio or Debt-Equity Ratio or Operating Cost to Sales Ratio, etc.) for all the firms under consideration is calculated.

Firms are arranged in descending order of the value of ratio as calculated in (ii).

The simple average of two consecutive ratios at every stage as arranged under (iii) above is calculated. (which is called Cut-off Point).

Now, the ratio of every firm [as calculated in (ii)] is compared with the Cut-off Point (as calculated in (iv)) at every stage. Say, in a study, the ratio of Total Debts to Total Assets has been selected for consideration. In this context, it is to be remembered that lower Total Debts to Total Assets Ratio indicates better position of the firm. If the actual ratio of a firm (in such a case) is lower than the respective Cutoff Point, the condition of the firm is predicted as non-failed firm. If the actual ratio of a firm (in such a case) is higher than the respective Cut-off Point, the condition of the firm is predicted as failed firm. But where Current Ratio is taken as variable, situation would be reverse, as higher Current Ratio indicates better position of the firm, i.e., if the actual Current Ratio of a firm is higher than the respective Cut-off Point, the condition of the firm is predicted as non-failed. If the actual Current Ratio of a firm is lower than the respective Cut-off Point, the condition of the firm is predicted as failed.

Now, if any deviation of such prediction from the actual position of the firm is observed, then count such a deviation as an error. If the actual position of a firm is failed but predicted as non-failed, count such an error as Type 1 Error. If the actual position of a firm is non-failed but predicted as failed, count such an error as Type 2 Error.

Determination of the Optimum Cut-off Point where the number of total errors is minimum.

Determination of percentage of error included in total prediction.

Findings of Beaver's Study

In the first stage of Beaver's Study, his findings on comparison of Mean Ratios between failed and non-failed firms reveal the following:

The Financial Ratios of the failed firms were remarkably poor than those of the non-failed firms.

The Financial Ratios of the failed firms showed deteriorating trend over the period of last 5 years.

Non-failed firms had zero slope trend line.

In the second stage of Beavers Study, his findings on application of Dichotomous Test to judge predictive ability of ratios reveal the following:

The most successful predictor of Corporate Distress is the Cash Flow to Total Debts Ratio. He found that only 10% of the firms were misclassified using this ratio in the first year before failure whereas only 22% of the firms were misclassified using this ratio in the fifth year before failure.

As per his findings, the second best Distress Predictor Ratio is the Net Income to Total Assets. He found that the percentage of misclassification using this ratio was 12% and 25% in the first year and in the fifth year, respectively, before failure.

As per his findings, the third best Distress Predictor Ratio is the Total Debts to Total Assets. He found that the percentage of misclassification using this ratio was 20% and 31% in the first year and in the fifth year, respectively, before failure.

As per his findings, the fourth best Distress Predictor Ratio is the Working Capital to Total Assets. He found that the percentage of misclassification using this ratio was 24% and 41% in the first year and in the fifth year, respectively, before failure.

As per his findings, the worst Distress Predictor Ratio is the Cash Assets to Current Liabilities. He found that the percentage of misclassification using this ratio was the maximum in the first year as well as in the fifth year before failure.

Beaver also found that the Mixed or Composite Ratio (i.e., taking one item from the Income Statement and other item from the Balance Sheet) outperformed the Liquidity or Short-term Solvency Ratio (e.g., Current Ratio) which is traditionally used as the best predictor for measuring the liquidity or short-term solvency of a firm.

Multivariate Models of Distress Prediction

When a number of variables (normally some ratios) are used in a model of Corporate Distress Prediction, it is called Multivariate Model of Corporate Distress Prediction. Under this approach, Altman's Model is significantly -unique and is discussed in the following section.

Steps Followed Under Multivariate Model of Distress Prediction

Following are the steps followed under Multivariate Model of Corporate Distress Prediction:

A number of distressed companies (i.e., failed companies) and non-distressed companies (i.e., non-failed companies) are arbitrarily chosen and classified for the analysis.

Relevant Accounting Ratios of the companies selected which are deemed effective for Distress Prediction are calculated for obtaining various economic conditions of the companies, viz. liquidity, long-term solvency, profitability, etc.

A linear function of all or some of these Accounting Ratios that best discriminates between the two classes of companies as selected under (i) has been derived in the following manner:

$$Z = a_1x_1 + a_2x_2 + a_3x_3 + \dots + a_nx_n$$

where

Z = Discriminant Index

x_i = Accounting Ratios as selected under (ii) ($i = 1, 2, 3, \dots, n$)

a_i = Co-efficient of Accounting Ratios as selected under (ii) ($i = 1, 2, 3, \dots, n$)

From the above-mentioned linear function, the value of discriminant score Z has been calculated.

If the sample companies have higher score than the calculated value of Z-score, then the companies are to be considered non-distressed companies (i.e., non-failed companies). On the other hand, if the sample companies have lower score than the calculated value of Z-score, then the companies are to be considered distressed companies (i.e., failed companies).

Edward I. Altman's Multivariate Analysis

Edward I. Altman developed a Multivariate Model of Corporate Distress Prediction on the basis of Multiple Discriminant Analysis (MDA). In his study, Altman selected 33 failed and 33 non-failed firms, of which 22 Accounting and Non-accounting Ratios, which had been deemed to be the predictors of Corporate Distress, were taken into consideration. Of the 22 Accounting Ratios, Prof. Altman selected 5 ratios which had been deemed as the best predictors of Corporate Distress Prediction. The purposes of these five selected ratios are as follows:

To measure liquidity position of the firms.

To measure reinvestment of earnings of the firms.

To measure profitability of the firms.

To measure financial leverage condition of the firms.

To measure sales-generating ability of firm's Assets.

In 1968, the following Discriminant Function was developed by Altman:

$$Z = 1.2 X_1 + 1.4 X_2 + 3.3 X_3 + 0.6 X_4 + 1.0 X_5$$

Where

Z = Overall Index of Multiple Index Function

And the five variables are

X_1 = Working Capital to Total Assets (a liquidity measure)

X_2 = Retained Earnings to Total Assets (a measure of reinvestment of earnings)

X_3 = EBIT to Total Assets (a profitability measure)

X_4 = Market Value of Equity & Preference to Book Value of Total Debt (a measure of leverage)

X_5 = Sales to Total Assets (a measure of sales-generating ability of the firm's assets)

Analysis of Value of Z-score

If the calculated value of Z-score is greater than 2.99, it is predicted that the firm belongs to non-bankrupt class (i.e., non-failed firm).

If the calculated value of Z-score is smaller than 1.81, it is predicted that the firm belongs to bankrupt class (i.e., failed firm).

If the calculated value of Z-score of a firm falls between 1.81 and 2.99 (referred to as Grey Area), it is predicted that the firm consists of both bankrupt and non-bankrupt class (i.e., mixture of failed and non-failed elements) and, therefore, requires further investigation to determine its solvency status.

As per Altman's Multivariate Model of Distress Prediction

If $Z > 2.99$: Non-failed or non-distressed firm.

If $Z < 1.81$: Failed or distressed firm.

If $Z \geq 1.81$ but ≤ 2.99 : Mixture of failed and non-failed elements which requires further investigation to determine its solvency status.

In 1983, Altman developed a revised Z-score model for privately held firms. "Credit analysis, private placement dealers, accounting auditors, and firms themselves are concerned that the original model is only applicable to publicly traded entities (since X_4 requires stock price data)". The revised Z-scores substitute the book value of equity for the market value in X_4 . The new Z-score model ratios are listed below:

X_1 = Working capital / total assets

X_2 = Retained earnings / total assets

X_3 = EBIT / total assets

X_4 = Book value of Equity/total liabilities

X_5 = Sales / total assets

A change in the weight factor is also calculated.

The revised Z-Score formula follows :

$$Z = 0.717(X_1) + 0.847(X_2) + 3.107(X_3) + 0.420(X_4) + 0.998(X_5)$$

Zones of Discrimination:

$Z > 2.9$ – "Safe" Zone

$1.23 < Z < 2.9$ – "Grey" Zone

$Z < 1.23$ – "Distress" Zone

Z-score estimated for manufacturers, industrials, non-manufacturers & emerging markets

$X_1 = (\text{Current Assets} - \text{Current Liabilities}) / \text{Total Assets}$

$X_2 = \text{Retained Earnings} / \text{Total Assets}$

$X_3 = \text{Earnings before Interest and Taxes} / \text{Total Assets}$

$X_4 = \text{Book Value of Equity} / \text{Total Liabilities}$

Z-Score bankruptcy model: $Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$

Zones of discriminations:

$Z > 2.60$ – “Safe” Zone

$1.1 < Z < 2.60$ – “Grey” Zone

$Z < 1.1$ – “Distress” Zone

L. C. Gupta's study (1979) for Distress Analysis

Gupta's sample consisted of 41 cotton textile companies (comprising 20 sick and 21 non-sick companies) and also 39 non-textile companies (comprising 18 sick and 21 non-sick companies). Although Gupta was able to make a good match between sick and non-sick companies in the textile group, no proper matching could be done for many sick companies in the non-textile group. So, his finding was essentially based on the study of textile samples.

Gupta selected 63 financial ratios based on data extracted from published financial statements. Seven of them were subsequently excluded from the study as they did not appear to have any relevance. The ratios selected by him were classified into (a) Profitability ratios and (b) Balance Sheet ratios. He employed the criterion of 'percentage classification error' to judge the predictive power of financial ratios. The ratio which showed the least 'percentage classification error' at the earliest possible time was deemed to have the highest predictive power.

The findings of Gupta's study can be summarised as below:

Two best ratios of about equal merit in predicting corporate sickness were

Earnings before depreciation, interest and taxes (EBDIT) to sales, and

Operating cash flow (OCF) to sales

EBDIT was considered superior to EBIT (Earnings before interest and tax) as it could be used for comparing profitability of different companies regardless of their varying policies of depreciation and size and age of fixed assets. It was also revealed that cash flow generating capacity per unit of sales was closely related with survival prospect of the firm.

The next best three ratios were:

EBDIT to Total Assets (gross)

OCF to Total Assets (gross)

EBDIT to (Interest + 0.25 of debt)

Gupta's study revealed that while studying sickness, more emphasis should be given on income statement than balance sheet as predictive ability of best balance ratios was much less than that of best profitability ratios.

Illustration

From the information given below relating to Bad Past Ltd., calculate Altman's Z-score and comment:

$$\frac{\text{Working capital}}{\text{Total assets}} = 25\%$$

$$\frac{\text{Retained earnings}}{\text{Total assets}} = 30\%$$

$$\frac{\text{Earnings before interest and taxes}}{\text{Total assets}} = 15\%$$

$$\frac{\text{Market value of equity}}{\text{Book value of total debt}} = 150\%$$

$$\frac{\text{Sales}}{\text{Total assets}} = 2 \text{ times}$$

Solution:

As per Altman's Model (1968) of Corporate Distress

$$\text{Prediction } Z = 1.2 X_1 + 1.4 X_2 + 3.3 X_3 + 0.6 X_4 + 1.0 X_5$$

Here, the five variables are as follows:

$$X_1 = \text{Working Capital to Total Assets} = 25\%$$

$$X_2 = \text{Retained Earnings to Total Assets} = 30\%$$

$$X_3 = \text{EBIT to Total Assets} = 15\%$$

$$X_4 = \text{Market Value of Equity Shares to Book Value of Total Debt}$$

$$= 150\% \quad X_5 = \text{Sales to Total Assets} = 2 \text{ times}$$

$$\begin{aligned} \text{Hence, Z-score} &= (1.2 \times 25\%) + (1.4 \times 30\%) + (3.3 \times 15\%) + (0.6 \times 150\%) + (1 \times 2) \\ &= 0.30 + 0.42 + 0.495 + 0.90 + 2.00 = 4.115 \end{aligned}$$

Note : As the calculated value of Z-score is much higher than 2.99, it can be strongly predicted that the company is a non-bankrupt company.

Illustration

From the information given below relating to Unfortunate Ltd., calculate Altman's Z-score and comment:

$$\frac{\text{Working capital}}{\text{Total assets}} = 0.45$$

$$\frac{\text{Retained earnings}}{\text{Total assets}} = 0.25$$

$$\frac{\text{Earnings before interest and taxes}}{\text{Total assets}} = 0.30$$

$$\frac{\text{Market value of equity}}{\text{Book value of total debt}} = 2.50$$

$$\frac{\text{Sales}}{\text{Total assets}} = 3 \text{ times}$$

Solution:

As per Altman's Model (1968) of Corporate Distress Prediction

$$Z = 1.2 X_1 + 1.4 X_2 + 3.3 X_3 + 0.6 X_4 + 1.0 X_5$$

Here, the five variables are as follows:

$$X_1 = \text{Working Capital to Total Assets} = 0.45$$

$$X_2 = \text{Retained Earnings to Total Assets} = 0.25$$

$$X_3 = \text{EBIT to Total Assets} = 0.30$$

$$X_4 = \text{Market Value of Equity Shares to Book Value of Total Debt} = 2.50$$

$$X_5 = \text{Sales to Total Assets} = 3 \text{ times}$$

$$\text{Hence, Z-score} = (1.2 \times 0.45) + (1.4 \times 0.25) + (3.3 \times 0.30) + (0.6 \times 2.50) + (1 \times 3) = 0.54 + 0.35 + 0.99 + 1.50 + 3 = 6.38$$

Note: As the calculated value of Z-score is much higher than 2.99, it can be strongly predicted that the company is a non-bankrupt company (i.e., non-failed company).

Illustration

Using Altman's Multiple Discriminant Function, calculate Z-score of S & Co. Ltd., where the five accounting ratios are as follows and comment about its financial position:

$$\text{Working Capital to Total Assets} = 0.250$$

$$\text{Retained Earnings to Total Assets} = 50\%$$

$$\text{EBIT to Total Assets} = 19\%$$

$$\text{Book Value of Equity to Book Value of Total Debt} = 1.65$$

$$\text{Sales to Total Assets} = 3 \text{ times}$$

Solution:

As the Book Value of Equity to Book Value of Total Debt is given in the problem in place of Market Value of Equity to Book Value of Total Debt, the value of Z-score is to be computed as per Altman's 1983 Model of Corporate Distress Prediction instead of Altman's 1968 Model of Corporate Distress Prediction that we followed earlier.

As per Altman's Model (1983) of Corporate Distress

$$\text{Prediction, } Z = 0.717 X_1 + 0.847 X_2 + 3.107 X_3 + 0.420 X_4 + 0.998 X_5$$

Here, the five variables are as follows:

$$X_1 = \text{Working Capital to Total Assets} = 0.250$$

$$X_2 = \text{Retained Earnings to Total Assets} = 0.50$$

$$X_3 = \text{EBIT to Total Assets} = 0.19$$

$$X_4 = \text{Book Value of Equity Shares to Book Value of Total Debt} = 1.65$$

$$X_5 = \text{Sales to Total Assets} = 3 \text{ times}$$

$$\text{Hence, Z-score} = (0.717 \times 0.25) + (0.847 \times 0.50) + (3.107 \times 0.19) + (0.420 \times 1.65) + (0.998 \times 3) = 0.17925 + 0.4235 + 0.59033 + 0.693 + 2.994 = 4.88$$

Note: As the calculated value of Z-score is much higher than 2.9, it can be strongly predicted that the company is a non-bankrupt company (i.e., non-failed company).

Illustration

From the information provided relating to a company, calculate Altman's Z-score and comment on the financial condition of the company:

Particulars	₹
Equity Share Capital (of ₹ 10 each)	2,00,000
12% Preference Share Capital (of ₹ 100 each)	1,00,000
Fixed Assets	3,00,000
Current Assets	2,00,000
Fictitious Assets	25,000
Current Liabilities	1,00,000
10% Debentures	2,00,000
General Reserve	75,000
Profit & Loss A/c (Cr.)	50,000
Sales	10,00,000
Earnings before Tax	1,30,000
Interest on Debentures	20,000
Market Value of each Equity Share	15
Market Value of each Preference Share	150

Solution:

As per Altman's Model (1968) of Corporate Distress Prediction

$$Z = 1.2 X_1 + 1.4 X_2 + 3.3 X_3 + 0.6 X_4 + 1.0 X_5$$

Here, the five variables are as follows:

$$X_1 = \text{Working Capital to Total Assets} = \frac{1,00,000}{5,00,000} = 0.20$$

$$X_2 = \text{Retained Earnings to Total Assets} = \frac{1,00,000}{5,00,000} = 0.20$$

$$X_3 = \text{EBIT to Total Assets} = \frac{1,50,000}{5,00,000} = 0.30$$

$$X_4 = \text{Market Value of Equity and Preference Shares to Book Value of Total Debt} = \frac{4,50,000}{3,00,000} = 1.50$$

$$X_5 = \text{Sales to Total Assets} = \frac{10,00,000}{5,00,000} = 2 \text{ times}$$

$$\begin{aligned} \text{Hence, Z-score} &= (1.2 \times 0.20) + (1.4 \times 0.20) + (3.3 \times 0.30) + (0.6 \times 1.50) + (1 \times 2) \\ &= 0.24 + 0.28 + 0.99 + 0.90 + 2 = 4.41 \end{aligned}$$

Notes:**1. Calculation of Working Capital**

Working Capital = Current Assets - Current Liabilities

Here, Working Capital

$$= ₹ (2,00,000 - 1,00,000) = ₹ 1,00,000$$

2. Calculation of Total Assets

Total Assets = Fixed Assets + Current Assets

Here, Total Assets = ₹ (3,00,000 + 2,00,000) = ₹ 5,00,000

3. Calculation of Retained Earnings

Retained Earnings = Reserves & Surplus - Miscellaneous Expenditure

= General Reserve + Profit & Loss A/c (Cr.) - Fictitious Assets = ₹ (75,000 + 50,000 - 25,000) = ₹ 1,00,000

4. Calculation of Earnings before interest & Tax (EBIT)

EBIT = EBT + Interest on Debts

Here, EBIT = ₹ (1,30,000 + 20,000) = ₹ 1,50,000

5. Calculation of Market Value of Equity & Preference Shares

Market Value of Equity Shares	20,000 shares x ₹15	₹ 3,00,000
Market Value of Preference Shares	1,000 shares x ₹150	₹ 1,50,000
		₹ 4,50,000

6. Calculation of Book Value of Total Debts

Book Value of Total Debts = Long-term Debts + Current Liabilities

Here, Book Value of Total Debts = 10% Debentures + Current Liabilities = ₹ (2,00,000 + 1,00,000) = ₹ 3,00,000

As the calculated value of Z-score is much higher than 2.99, it can be strongly predicted that the company is a non-bankrupt company (i.e., non-failed company).

Illustration**Balance Sheet (extract) of Q Ltd. as on 31 March 2014.**

Liabilities	₹ in Crores	Assets	₹ in Crores
Equity Shares	20.80	Fixed Assets	105.60
Long-term Liabilities	104.00	Current Assets	57.60
Current Liabilities	78.40	Profit & Loss A/c	40.00
	203.20		203.20

Additional Information :

Depreciation written off ₹ 8 crores.

Preliminary Expenses written off ₹ 1.60 crores.

Net Loss ₹ 25.60 crores.

Ascertain the stage of sickness.

Solution:

The NCAER Study on Corporate Distress Prediction prescribed the following three parameters for predicting the stage of Corporate Sickness:

Cash profit position (a profitability measure)

Net working capital position (a liquidity measure)

Net worth position (a solvency measure)

In the given case, we need to judge the above-mentioned parameters to ascertain the stage of sickness of the company.

Cash profit = Net profit + (Non-cash expenses/losses debited to profit & Loss A/c) – (Non-cash incomes/Gains credited to Profit & Loss A/c)

Here, Cash Profit = Net Profit + Depreciation Written Off + Preliminary Expenses Written Off

$$₹[(25.60) + 8 + 1.60] = ₹ 16 \text{ crores}$$

Net Working Capital = Current Assets – Current Liabilities

$$₹[57.60 - 78.40] = ₹ 20.80 \text{ crores}$$

Net Worth = Share Capital + Reserves & Surplus - Miscellaneous Expenditure - Profit & Loss A/c

(Dr.) Here, Net Worth = Equity Share Capital - Profit & Loss A/c (Dr.)

$$₹[20.80 - 40.00] = ₹ 19.20 \text{ crores}$$

Prediction about Corporate Sickness: As per NCAER Research Study, out of mentioned three parameters, if any one parameter becomes negative in case of a firm, it can be predicted that the firm has a tendency towards sickness. In the given company, all the three parameters [as calculated under (a), (b) and (c)] show negative value. Therefore, it can strongly be predicted that the company is a sick company and its stage of sickness is 'fully sick'. Immediate necessary drastic revival measures are essentially required for the survival of the company.

Illustration

Following information is available in respect of five companies:

Company	Total Debt to Total Assets	Actual Status of the Company
P	0.50	Non-failed
Q	0.80	Non-failed
R	0.40	Non-failed
S	0.60	Failed
T	0.70	Failed

Determine the Optimum Cut-off Point for the ratio of Total Debt to Total Asset.

Determine the percentage of error in Corporate Distress Prediction.

Solution:

Company	Total Debts to Total assets	Actual status	Cut-off Ratio	Type 1 Error	Type 2 Error	Total Error
Q	0.80	NF				
			$\frac{(0.8 + 0.7)}{2} = 0.75$	2	1	2+1=3
T	0.70	F				
			$\frac{(0.7 + 0.6)}{2} = 0.65$	1	1	1+1=2
S	0.60	F				
			$\frac{(0.6 + 0.5)}{2} = 0.55$	0	1	0+1=1
P	0.50	NF				
			$\frac{(0.5 + 0.4)}{2} = 0.45$	0	2	0+2=2
R	0.40	NF				

Observations of the Study

The ratio considered for the study is Total Debts to Total Assets. Accordingly, lower Total Debts to Total Assets Ratio indicates better solvency position of the business and higher Total Debts to Total Assets Ratio indicates worse solvency position of the business.

Sample companies are arranged in descending order of their, Total Debts to Total Assets Ratio. For every two consecutive ratios as arranged, a 'Cut-off Ratio' is calculated by simple average of two ratios.

Now, each ratio is compared with every Cut-off Ratio as calculated in 3 in the following manner:

If the actual ratio of a company is lower than the respective Cut-off Ratio, then the company is predicted as non-failed (NF). If the actual status of the company is non-failed, then there is no error in the study. If the actual status of the company is failed (F), but it is predicted as non-failed (NF), then there exists an error in the study, which is termed as Type 1 Error.

If the actual ratio of a company is higher than the respective Cut-off Ratio, then the company is predicted as failed (F). If the actual status of the company is failed, then there is no error in the study. If the actual status of the company is non-failed (NF), but it is predicted as failed (F), then there exists an error in the study, which is termed as Type 2 Error.

Selection of 'Optimum Cut-off Ratio' where the number of total error is minimum. Companies having Total Debts to Total Assets Ratio above this 'Optimum Cut-off Ratio' can be predicted as failed firms and companies having Total Debts to Total Assets Ratio below this 'Optimum Cut-off Ratio' can be predicted as non-failed firms.

Observations at different Cut-off Ratios:

At the Cut-off Ratio of 0.75

Actual ratio (i.e., 0.80) of Company Q is greater than the Cut-off Ratio of 0.75. Hence, Company Q is predicted as failed firm, but its actual status is non-failed firm. Therefore, there is an error in the study which is marked as Type 2 Error (i.e., one Type 2 Error).

Actual ratios of Company T (i.e., 0.70) and Company S (i.e., 0.60) are lower than the Cut-off Ratio of 0.75. Hence, Companies T and S can be predicted as the non-failed firms, but their actual status is failed firm. Therefore, there is an error in the study which is marked as Type 1 Error (i.e., two Type 1 Errors).

Actual ratios of Company P (i.e., 0.50) and Company R (i.e., 0.40) are lower than the Cut-off Ratio of 0.75. Hence, Companies P and R can be predicted as the non-failed firms and their actual status is also non-failed firm. Therefore, there is no error in this area of the study.

Therefore, at the Cut-off Ratio of 0.75, there exists two Type 1 Errors and one Type 2 Error.

Hence, number of total errors is 3 at the Cut-off Ratio of 0.75.

At the Cut-off Ratio of 0.65

Actual ratio (i.e., 0.80) of Company Q is greater than the Cut-off Ratio of 0.65. Hence, Company Q is predicted as failed firm, but its actual status is non-failed firm. Therefore, there is an error in the study which is marked as Type 2 Error (i.e., one Type 2 Error).

Actual ratio of Company T (i.e., 0.70) is higher than the Cut-off Ratio of 0.65. Hence, Company T can be predicted as the failed firm and its actual status is also failed firm. Therefore, there is no error in this area of the study.

Actual ratio of Company S (i.e., 0.60) is lower than the Cut-off Ratio of 0.65. Hence, Company S can be predicted as the non-failed firms, but its actual status is failed firm. Therefore, there is an error in the study which is marked as Type 1 Error (i.e., one Type 1 Error).

Actual ratios of Company P (i.e., 0.50) and Company R (i.e., 0.40) are lower than the Cut-off Ratio of 0.65. Hence, Companies P and R can be predicted as the non-failed firms and their actual status is also non-failed. Therefore, there is no error in this area of the s

Therefore, at the Cut-off Ratio of 0.65, there exists one Type 1 Error and one Type 2 Error. Hence, the number of total errors is 2 at the Cut-off Ratio of 0.65.

At the Cut-off Ratio of 0.55

Actual ratio (i.e., 0.80) of Company Q is greater than the Cut-off Ratio of 0.55. Hence, Company Q is predicted as failed firm, but its actual status is non-failed firm. Therefore, there is an error in the study which is marked as Type 2 Error (i.e., one Type 2 Error).

Actual ratios of Company T (i.e., 0.70) and Company S (i.e., 0.60) are higher than the Cut-off Ratio of 0.55. Hence, Companies T and S can be predicted as the failed firm and their actual status is also failed. Therefore, there is no error in this area of the study.

Actual ratios of Company P (i.e., 0.50) and Company R (i.e., 0.40) are lower than the Cut-off Ratio of 0.55. Hence, Companies P and R can be predicted as the non-failed firms and their actual status is also non-failed. Therefore, there is no error in this area of the study.

Therefore, at the Cut-off Ratio of 0.55, there exists no Type 1 Error, but there is one Type 2 Error. Hence, the number of total errors is 1 at the Cut-off Ratio of 0.55.

At the Cut-off Ratio of 0.45

Actual ratios of Company Q (i.e., 0.80) and Company P (i.e., 0.50) are greater than the Cut-off Ratio of 0.45. Hence, Companies Q and P can be predicted as failed firms, but their actual status is non-failed. Therefore, there is an error in the study which is marked as Type 2 Error (i.e., two Type 2 Error).

Actual ratios of Company T (i.e., 0.70) and Company S (i.e., 0.60) are higher than the Cut-off Ratio of 0.45. Hence, Companies T and S can be predicted as the failed firms and their actual status is also failed. Therefore, there is no error in this area of the study.

Actual ratio of Company R (i.e., 0.40) is lower than the Cut-off Ratio of 0.45. Hence, Company R can be predicted as the non-failed firms and its actual status is also non-failed. Therefore, there is no error in this area of the study.

Therefore, at the Cut-off Ratio of 0.45, there exist no Type 1 Error, but there are two Type 2 Errors. Hence, the number of total errors is 2 at the Cut-off Ratio of 0.45.

From the above study, it has been observed that the minimum number of total errors has occurred at the Cut-off Ratio of 0.55. Therefore, 0.55 is the Optimum Cut-off Ratio. This Optimum Cut-off Ratio of 0.55 indicates that the company having Total Debts to Total Assets Ratio equal to or above 0.55 can be predicted as failed firm and the company having Total Debts to Total Assets Ratio below 0.55 can be predicted as non-failed firm.

At the Optimum Cut-off Ratio of 0.55, error in prediction of distress has been occurred in case of Company Q only (i.e., only one error). At this Optimum Cut-off Ratio, there is no error in prediction of distress in case of other four companies (i.e., Companies P, R, S and T). Therefore, while studying five companies at the Optimum Cut-off Ratio of 0.55, error occurred in case of only one company.

∴ Percentage of error at the Optimum Cut-off Ratio of 0.55 = $1/5 \times 100 = 20\%$.