

# Modeling Financial Distress Prediction of Indian Companies

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**ABSTRACT---** *In the times when banks are helplessly chasing corporate defaulters in legal battles, there is a need to predict the distress of the company by using some model. Studies related to financial distress are mainly focused on certain variables that may be able to make a distinction between a financially healthy and distress firm. The intend of the study is to construct a statistical model which will make use of certain financial ratios which will be helpful in finding whether a company will fall into distress or not in future. Multiple discriminant analysis has been applied to differentiate between financially distress and non-distress companies. The final model predicted 95% of the cases accurately prior to distress.*

**Keywords -** *Corporate, Defaulters, Financially distress, Model, Multiple discriminant analysis, Ratios*

## I. INTRODUCTION

The issue of financial distress has caught attention from a lot of researchers from past several years. It acts as big hurdle for economic growth. The increasing rate of industrial sickness has been a major cause for slowing down the industrial as well as the overall economic development of the nation. This illness is generally observed as a symptom of the overall malfunctioning of the industrial economy and more so of the sector in which it is predominant and in states, it is the small scale industrial sector. It is considered as a disease which has the potential to transform a strong entity into weak entity with little efficiency and can destroy an economy [17]. The common symptoms are non-payment of interests, decline in sales leading to decline in its profitability, decline in net-worth, improper diversion of funds, continuous cash losses and non-provision of depreciation, excess holding of inventory indicating that finished goods not being taken in the market [16]. Non-performing assets have become a biggest worry for the banking sector. There is a need to timely prediction of probable distress assets to maximize the profitability [2]-[10].

Similarly portfolio investors should have techniques for selecting the financially sound firms for proper asset allocation [2]. The issue of financial distress has caught attention from a lot of researchers from past several years. Studies related to financial distress are mainly focused on certain variables that may be able to distinguish between financially healthy and distress business [15]. Altman found z-model for predicting corporate bankruptcy with a cut off point of 2.675 for classifying financially sound and unhealthy firms [1]. Later on more researchers like Ohlson done classification of bankrupt companies by using various

financial variables [9]-[14]. With the advancement in the technology, many researchers used artificial intelligence algorithms such as neural networks for distinguish between healthy and distress firms [8]. Study done by researchers like Iturriaga and Sanz used neural network technique for forecasting the financial distress companies using their financial ratios [6]. There is a need to prevent and cure the sickness in order that turn-over of new investment is manifested in the economy with minimum time-lag. Moreover, it is crucial to detect distress at the earliest possible to avoid wastage and under-utilization of new investments in a capital scarce economy [5]. The intend of the study is to construct a model which will make use of certain accounting ratios which will be helpful in forecasting financial distress among listed companies in India.

## II. REVIEW OF LITERATURE

Karas and Reznakova tested different financial ratios for predicting bankruptcy in case of Czech firms. The study found ratios like ("earning before tax depreciation and amortisation/ total assets, stock turnover ratio, stock/ total Assets, earning before interest and tax /interest, earning before tax depreciation and amortisation /interest, fixed assets/ total assets, sales/operating revenue, sales/ current liabilities") most significant in predicting distress [7]. Accounting ratios like capital structure & debt coverage were found to be significant predictors for bankruptcy in Italian small and medium enterprises [11]. Bredart developed a model which can predict bankruptcy with the use of three financial ratios equity/ total assets" for the solvency, the current ratio and net income/ total Assets for Belgian's small and medium enterprises [3]. Lakshan and Wijekoon constructed a distress predicting model for listed firms in Srilanka. The results demonstrated the considerable prediction ability of various accounting variables which can be further used by the management to prevent financial distress of their firms one or two years prior of distress event [12]. Bård has studied the financial distress estimation models in Salmon industry of non-financial sector firms. The study concluded that firms can experience distress if there is a significant decrease in ratios like fixed asset turnover ratio, liquidity ratio of firms [13]. Bod'a has examined Z-score model for predictions of corporate bankruptcy for Slovak firms during economic recession periods. It was found that Altman's model is quite useful to determine exact prediction of business failures during the recession period [4].

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### III. OBJECTIVE OF THE STUDY

To construct a model to forecast the financial distress of the Indian listed companies.

### IV. RESEARCH METHODOLOGY

The research is done to frame a model to forecast the financial distress of the firms and distinguish between healthy and financially distressed firms. This study is conducted for the companies listed on BSE and NSE. For the further analysis of the companies, secondary data from various websites has been used. This study will help in finding best fit model to predict the financial distress of the firms under new insolvency and bankruptcy code in India. The financial data is taken from capitaline database of the listed companies on either NSE or BSE which are registered under insolvency and bankruptcy code in India. This study will help in finding financial ratios and best fit model to predict the sickness of the firm. The study is based on a sample of forty eight companies which includes twenty four healthy and twenty four financial distress companies from different industries like textile, pharma, steel, automobile etc. Healthy companies have been matched with financially distressed firms with same asset size and industry using NIC codes. Multiple discriminant analysis has been used for categorizing the observations under study and it is best suited for the prediction of the distress of the company. One of the major advantages of multiple discriminant analysis is that it considers multiple variables simultaneously and tries to find a relationship between them and one can reduce the dimensions initially used and change a complex problem into a simple one. By using this method one could easily categorize the data into two categories: healthy and distress.

### V. DATA ANALYSIS AND INTERPRETATION

This part covers the development of new model for predicting the financial distress of Indian companies. Over the past few years, various default risk models were developed using number of different methods to model the distress. But the use of financial ratios is always subjugated the literature of distress prediction. The present study developed a distress prediction model based on various accounting ratios of the distress firms. The proposed model applied discriminant analysis function to discriminate between healthy and distress firms by taking financial data of the firm two and three years prior to bankruptcy.

“Discriminant analysis model - Equation:

$$D = B_0 + B_1X_1 + B_2X_2 + \dots + B_nX_n$$

Where: D = Discriminant score  
 B's = Discriminant coefficient  
 X's = Independent variables” [1]

A. Result of two years preceding to financial distress:

**Table: I Validation Test**

Type of company	Predicted Group Membership		Total
	Financially Distress	Healthy	

Original	Count	Financially Distress	24	0	24
		Healthy	3	21	24
	%	Financially Distress	100.0	.0	100.0
		Healthy	12.5	87.5	100.0

**Source – Author calculation**

Table I shows the classification matrix which indicated that the discriminant function is able to classify 93.7% of the 48 objects correctly and showed the accuracy level of this model. Prediction (accuracy level) = [(48-3)/48]\*100= 93.7% .

**Table: II. Wilks' Lambda**

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.243	50.996	20	.000

**Source – Author calculation**

Table II shows the significance of the discriminant function by Wilks' Lambda. Its value is 0.243, so the value lies between 0 and 1, which is the indicator of good model. Close to zero value means improved discriminating power of the model.

**Table: III. Group Centroids**

Type of company	Function
	1
Financially Distress	-1.730
Healthy	1.730

**Source – Author calculation**

Table III classifying that which company is financially distress and which is healthy. Low value to High value possibility lies between financially distress (-1.730) and healthy (1.730). Therefore any negative value of the discriminant score will lead to classification as financially distress company.

**Table: IV. Canonical Discriminant Function Coefficients**

	Function
	1
ROCE	.036
CFOTA	-.652
SFTD	-.001
CFOCL	-.362
RONW	-.039
WCTA	.000



CFOS	-0.322
CFOSF	.030
CPM	.241
APATM	-0.261
PBDTM	.071
PBIDTM	-0.074
ICR	.082
NINS	2.908
DEB	.015
INV	-0.007
FA	.117
CR	.800
LTDER	-0.883
DER	.380
(Constant)	-2.403

Source – Author calculation

The discriminant function in table IV help us how to classify financially distress or healthy company. Helps in making decision about the company which will grow in near future and which will be bankrupted in coming days.

**Discriminant Function :**

$$Y = -2.403 + (-0.039)RONW + (-0.001)SFTD + (-0.652)CFOTA + .380DER + (-0.261)APATM + .800CR + (-0.082)ICR + .015DEB + (-0.074)PBIDTM + (-0.007)INV + (-0.362)CFOCL + (-0.322)CFOS + .000WCTA + 2.908NINS + .036ROCE + .030CFOSF + .117 FA + (-0.883)LTDER + .071PBDTM + .241CPM$$

The company with  $Y > 1.730$  is healthy and if  $Y < 1.730$  then the company is classified as financially distress company.

*B. Result of three years preceding to financial distress:*

**Table: V. Validation Test**

		Type of company	Predicted Group Membership		Total
			Financially Distress	Healthy	
Original	Count	Financially Distress	23	1	24
		Healthy	2	22	24
	%	Financially Distress	95.8	4.2	100.0
		Healthy	8.3	91.7	100.0

Source – Author calculation

Table V shows the classification matrix which indicated that the discriminant function is able to classify 95.83% of the 48 objects correctly and showed the accuracy level of this model. Prediction (accuracy level) =  $[(48-2)/48] * 100 = 95.83\%$

**Table: VI. Group Centroids**

Type of company	Function
	1
Financially Distress	-1.945
Healthy	1.945

Source – Author calculation

Table VI classifying that which company is financially distress and which is healthy. Low value to High value possibility lies between financially distress (-1.945) and healthy (1.945). Therefore any negative value of the discriminant score will lead to classification as financially distress company.

**Table: VII. Wilks' Lambda**

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.202	57.566	20	.000

Source – Author calculation

Table VII shows discriminant function significance by Wilks' Lambda. Its value is 0.202, so the value lies between 0 and 1, which is the indicator of good model. Close to zero value means improved discriminating power of the model.

**Table: VIII. Canonical Discriminant Function Coefficients**

	Function
	1
DER	.320
DEB	-0.001
ICR	-0.107
INV	.006
PBIDTM	-0.479
PBITM	.499
FA	-0.190
APATM	-0.214
RONW	-0.121
CFOTA	-2.923
SFTD	.001
ROCE	.188
CFOCL	-0.157
CFOSF	-0.226
CFOS	4.436
WCTA	.000
NINS	-2.567



PBDTM	.265
CR	-2.031
LTDER	.520
(Constant)	2.182

Source – Author calculation

The discriminant function coefficient in Table VIII help us how to classify financially distress or healthy company.Helps in making decision about the company which will grow in near future and which will fall into distress in coming days.

Discriminant Function :

$$Y = 2.182 + (-.121)RONW + (-.001)SFTD + (-.923)CFOTA + .320DER + (-.214)APATM + (-2.031)CR + (-.107)ICR + (-.001)DEB + (-.479)PBIDTM + .006INV + (-.499)PBITM + (-.157)CFOCL + 4.436CFOS + .000WCTA + (-2.567)NINS + .188ROCE + (-.226)CFOSF + (-.190)FA + .520LTDER$$

The company with  $Y > 1.945$  is healthy and if  $Y < 1.945$  then the company is classified as financially distress company.

## VI. CONCLUSION

The research was done to construct a statistical model using accounting ratios to forecast financial distress among Indian listed companies registered under new insolvency and bankruptcy code. The model was developed using different financial ratios for both financially distress as well as healthy companies. Multiple discriminant analysis was used to discriminate the companies with between financially distress from healthy ones. According to results, financial ratios are quite effective for discriminating between potentially distress and non distress firms. The result found that financial ratios can precisely predict the distress among Indian firms both two years as well as three years in advance quite effectively. So the proposed models can be used to find out the listed companies in India which can face distress in future well in advance.

## APPENDIX

List of ratios used in the study

Symbol	Ratio
ROCE	“Adjusted net profit+tax+interest / share capital+reserve+total debt *100”
CFOTA	“Cash flow from operations/total assets”
SFTD	“Shareholder funds/total debt”
CFOCL	“Cash flow from operations/current liabilities”
RONW	“Adjusted net profit-preference dividend/ equity paid up+reserves*100”
WCTA	“Working Capital/ total assets”
CFOS	“Cash flow from operations/total sales”
CFOSF	“Cash flow from operations/share holder funds”
CPM	“Adjusted net profit +depreciation / sales*100”
APATM	“Adjusted net profit / sales*100”

PBDTM	“Adjusted gross profit / sales*100”
PBIDTM	“Adjusted gross profit +interest/ sales*100”
PBITM	“Adjusted gross profit +interest-depreciation/ sales*100”
ICR	“Adjusted net profit+tax+interest / interest)*100”
NINS	“Net income/net sales”
DEB	“Sales /sundry debtors”
INV	“Sales/total inventory”
FA	“Sales/gross fixed assets”
CR	“Current assets/current liability”
LTDER	“Total long term debt/total equity”
DER	“Totaldebt/total equity”

Source:Capitaline database

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