
**FINANCIAL DISTRESS DIAGNOSIS OF M/s ICSA (INDIA) LTD, BY DEVELOPING A
MATHEMATICAL MODEL WITH FINANCIAL ENGINEERING APPROACH**

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ABSTRACT

Era of industrialization creates a huge economic development in India. Among various types of industrial sectors, Energy & Power sector has its own space in creating huge source of income for India. But the uncertain distress caused by different factors results severe Industrial illness in this sector. This creates restrictive outcomes like loss of production and revenue losses which ultimately generates low GDP and National Income. Hence in this study by using of financial engineering concepts and tools the illness of power industry in Telangana has been diagnosed. It has been tried to investigate level of distress in power industries in Telangana by creating a financial distress model. By using the developed model sickness of M/s ICSA (India) Ltd. has been estimated and compared with the preexistence distress model. For this purpose, among a set of financial ratios, only used and informative ratios have been taken into considerations for Energy & Power Sectors. The predictive distressed model has been developed by discriminant analysis. The outcome of this analysis and research shows that the ratios are quite significant in showing the financial strength of a company of particular industry. And these ratios are different from industry to industry i.e. industry specific. The necessity of building industry specific distressed model for its respective companies is happened due to different impact of industry characteristics on its companies.

Key Words: -Distressed Model, Industrial Illness, Financial distress, Financial Strength, Discriminant Analysis

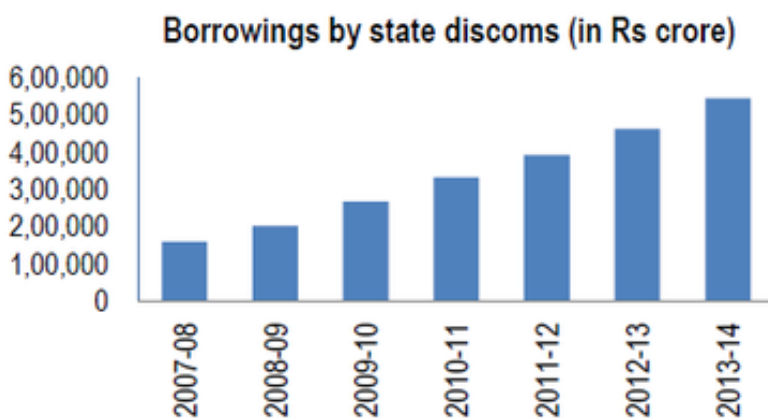
Introduction: -

Financially distressed or sick industrial unit is defined as a unit or a company which have incurred total losses that equal to or exceeding its entire net worth at the end of any financial year. According to “Sick Industrial Companies Act 1985”, we can say an industrial unit as a distressed or weak unit if its total losses will be greater than equal to 50% of its average total value at the end of any financial year. Industrial sickness or distress in a particular industry creates various socio-economic problems not only in India but also through the globe. All the dependant of a particular sick industry usually has an uncertain future in terms of employment, wages and salaries. Besides this the countries which are industrially advanced, have the numerous cases of bankruptcy of industries.

Indian power sectors also have the bad report regarding financial strength and it has the proof of financial distress having both internal and external causes for sickness. In Indian there are many power industries, as the only registered companies have been taken for research work. We have taken 15 registered sick power units and 35 registered healthy power industries.



(Source:https://commons.wikimedia.org/wiki/file:Borrowings_by_state_owned_discoms.png)



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From the above two graphs we can estimate the total estimated losses increased from Rs.11,699 crore in 2004-05 to Rs 71,271 crore in 2013-14. The found losses are caused only

because of the respective the state discoms were highly relying on short-term loans to fund their operations in power generation and distribution. During 2013-14 the amount of borrowings by the state discoms had increased to Rs 5, 45,922 crore from Rs 1, 58,003 in 2007-08. As a result the rate of interest on these loans has been increasing and creating a huge financial load on power sectors. The weak financial ability of the discoms affect their buying ability of power that results to defective performance of Indian power industries and a sign of financial distress in this sector.

M/s ICSA (India) Ltd. Belongs to energy sector company which produce related to power sectors like intelligent automatic motor reading, distribution transfer monitoring system, power quality measurement system remote street light control system, general automatic meter reading, compact modem and agricultural load management system, Micro remote terminal unit ,Theft detection device, Energy audit services and Pole top RTU. All these products related to power distribution and energy auditing system for various sectors including agricultural sectors. In the year 2013-14 this company has been declared as a sick company.

Industrial sickness is caused by mainly two types of reasons such as,

Table 1

Details about Internal and External Causes for Industrial sickness

Internal causes	External causes
*Wrong Project Selection	*Under/Over financing by banks and financial institutions
*Lack of Finance	*Delay in disbursement of loans
*Marketing Problems	*Negligence and delaying in detection of early symptoms of sickness.
*Inappropriate Personnel Management	*Frequent and strict policy changes of government
*Ineffective Corporate Management	*Delayed in bill payment by government department.
*Bad Production policies	*Power cuts & Erratic supply of raw materials
*Wrong demand forecasting	*Credit constraints
*Defective plant and Machinery	

Causes of sickness of ICSA (India) Ltd.

One of the main causes for sickness of ICSA (India) Ltd is non availability of sufficient fund for completion of particular undertaken projects.

As the unchanged capital structure during the accounting period creates another chance to be declared as sick unit.

The issuance of foreign currency convertible bonds (FCCB) by the company was not able to act profitably. According to research the total number of FCCBs which were outstanding and due for redemption are UDS 21 million. According to Companies Act 1956 for winding up of the company the file suited as u/s.433 and u/s.434.u/s.

Another main reason is the downfall and no transaction of the subsidiary of it i.e. ICSA Infra Limited during 2011-12.

These above mentioned losses made the directors took the decision not to issue dividend in the particular financial year which made the share holders dissatisfied with the company. It signifies the weakening process of the company.

Inappropriate Personnel Management for good corporate governance is the root cause for this company's sickness. Ineffective Corporate Management for maintain a good relationship with

supplier and customer drags it to be a sick unit.

Avoidance in detection of early symptoms of sickness for rectification by taking preventive and corrective measures is the one of the most crucial reason for high sickness. Changes in government policies towards power sectors may be the one of reasons for its sickness and the inability of tax payment in time may create a distress in this sector and unit.

In terms of financial distress estimation recent research do considers the financial ratio analyses as strong managerial tools which can be used for determining economic activity of firms. The ratios have significant impact on rational output and gained a welcoming acceptance by large scale industries irrespective of industry categories. The ratios are quite strong enough in providing clarifications and insights into financial statements in making a variety of corporate decisions for revitalizing and revival of Sick or financially distressed units.

The following table contains the detail about all the 30 ratios that have been used in the research works.

Table 2

Details about Types of ratios used for analysis along with their values for ICSA (India) Ltd.

TYPE OF RATIOS	SL.NO.	NAME OF RATIOS	Avg.Ratios for 10 years data of ICSA (India) Ltd
PROFITABILITY RATIOS	1	Return on Net worth / Equity	RNPE 64.199
	2	Return on Capital Employed	RCE -3.175
	3	Return on Assets	ROA -17.180
	4	Total Debt/Equity	DER -0.366
	5	Asset Turnover Ratio	ATR 50.789
	6	PBDIT Margin	PBDITM -267.808
	7	PBIT Margin	PBITM -300.48
	8	PBT Margin	PBTM -307.879
	9	Net Profit Margin	NPM -314.515
LIQUIDITY RATIOS	10	Current Ratio	CR 1.422
	11	Quick Ratio	QR 1.190
	12	Inventory Turnover Ratio	ITR 4.909
	13	Dividend Payout Ratio	DPR 2.188
	14	Earnings Retention Ratio	ERR 37.812
	15	Cash Earnings Retention Ratio	CERR 38.058
VALUATION RATIOS	16	EV/Net Operating Revenue	EVPOR 20.717
	17	EV/EBITDA	EVPEBITD -7.557
	18	Market Cap/Net Operating Revenue	MCPOR 0.963
	19	Retention Ratios	RR 37.808
	20	Price/BV	PPBV 1.375

	21	Price/Net Operating Revenue	PPNR	0.963
	22	Book Value [ExclRevalReserve]/Share	BVPSEXR	17.432
PER SHARE RATIO	23	Basic Earning/Share	EPS	-21.727
	24	Book Value [ExclRevalReserve]/Share	BVPS	17.432
	25	Revenue from Operations/Share	RenPS	172.493
	26	PBDIT/Share	PBDITPS	1.951
	27	PBIT/Share	PBITPS	-1.713
	28	PBT/Share	PBTPS	-11.593
	29	Net Profit/Share	NPPS	-21.733
	30	Dividend / Share	DPS	0.920

Research Objectives: -

In this research paper the main objective is to diagnosis the financial distress of registered power industries in India.

Hence, the respective objectives of the paper are,

1. To identifying the financial distress of M/s ICSA (India) Ltd., Telangana, India.
2. To generate a financial distress model to diagnosis illness of the Indian Power Industry by using financial ratios.

Data Source:-

The total data that have been used in the research work have been collected from BSE and NSE websites and BIFR online portal. As the total data set contains 50 companies (sample size), all belongs to power industry of India. Among these data set 35 companies are healthy companies whose financial data have been taken from BSE and NSE sites as all are registered companies and rest of 15 companies are financially distressed industry as they are registered in BIFR for restructuring. In this research the independent variables are all the 30 ratios and the dependent variable is company's health status whether it's financial distress or healthy as financial health condition of a company has been derived from the respective financial ratios.

Literature Review: -

Beaver (1966) studied by using financial ratios, by collecting the ratios from respective company's financial statement to predict failure. The main aim and objective was to develop the predictive ability of financial statement in providing empirical proof to the health of the particular industry.

Hall (1994) had developed model by logistic regression method which could distinguish distressed firms from non distressed firms by using non financial variables. The developed model had the accuracy of 95%.

Laitinen & Kankaanpaa (1999) used Discriminant Analysis instead of Logistic Analysis for a better efficient result in prediction of accuracy in terms of classifying healthy and unhealthy industries with their respective predicting variables.

Kenneth W. Jones (1976) has explained about sick industries and its revival programs in his research articles. According to him Industrial Sickness causes due to mismanagement, defective financial activities, Flaw full operational process.

Jay Desai and Nisary A Joshi (2015) have tried to examine the performance of the Z Score Model as an output of logistic analysis. Based on this model he has proved the illness of industries along with various steps to overcome from the sickness.

S. Christina Sheela and K. Karthikeyan (2012) had taken Edward I Altman's Z Score Model for prediction of the financial health of the selected companies. As output he revealed that financial statement is not much effective in providing perfect information about the performance of the company which has a great impact share holders and stake holders in terms of investment.

Ezzamel et al (1987), Pinches et al (1973), Yli-Olli and Virtanen (1985) in his research work has suggested that, financial ratios can be used in development of financial distress modeling for prediction of bankruptcy if they show stable patterns over the years irrespective of industries.

Chen and Shimerda (1981), Laurent, (1979) and Pohlman and Hollinger (1981) had used component analysis and or canonical correlation analysis to separate more impactful ratios from the ratios having very less impact. This causes limitation to multi co linearity among the selected financial ratios for the selection of most useful ratios in financial distress prediction.

Shannon (1948) had examined the information content of financial ratios for investigating the level of uncertainty within companies by using entropy method. The method used to calculate the amount of uncertainty by estimating entropy score.

Collins and Green (1982) had compared the predicting output of financial health of by developing logistic model, a linear probability model and by discriminant analysis. The results show that the logistic model had the most effective and most predictive output which has shown the company or industry status in a better way.

Methodology: -

In this research only the registered power industries are for the work. The data set covers 10 years of data. The total data set is made as two variables such as dependent variables and independent variables. All the 30 ratios those have been taken are independent or predictive variables and the company's health condition is dependent variable. The dependent variable is the status of the company which is dichotomous in nature. It is denoted as "1" if the company is healthy and "0" if the company is unhealthy.

For analysis of the data set IBM SPSS has been used. All experiment results in this report are done by using IBM SPSS Statistics 20.0 and Office 365.

The analytical method is as follows.

Discriminate Analysis:-

As a multivariate technique discriminate analysis is used to differentiate two or more groups of samples be in a same data set with respect to several independent variables at a time. Mainly Discriminant Analysis can be used for classification of an observation. The classification totally depends upon the individual characteristics of each sample in the set of observation. In this method the variables which have very little distinction characteristics are discarded. The most popular analytical tool in the business world DA helps in testing the predictor variables to find the significant differences that exist among the groups. Along with these the most influential predictor variable scan be identified which contribute highest for intergroup differences.

The Discriminant Analytical Model is a linear combination of predictive discriminate variables such as,

$$D = P_0 + P_1X_1 + P_2X_2 + \dots + P_kX_k$$

Where,

D → Discriminant score

X₁ X₂... X_k → values of the independent variables,

P → Coefficient of constant,

P₀, P₁ to P_k → Discriminant Coefficients estimated from the data

K → number of independent variables.

Results and interpretations:-

Discriminate Analysis:-

The main purpose of this multivariate technique is to differentiate financially healthy and unhealthy companies on the basis of 30 independent variables. Stepwise regression method has been used for testing the equality of the group mean. This test had shown that 4 independent variables out of 30 independent variables have a unique statistically significant contribution to the model such as Return on Net worth / Equity, Return on asset, debt equity ratio and dividend payout ratio. Amongst these set of ratios only, Return on Net worth / Equity, Return on Assets were the most important and significant independent variables which have the strong ability in discriminating the functions.

Table 3

Canonical Discriminant Functions were used in the analysis

Eigen Values

Function	Eigen Value	% of Variance	Cumulative %	Canonical Correlation
1	0.734	100.0	100.0	0.651

The canonical correlation is used to estimate the strength of relation between dependent variable and the predicting variables. The value of this correlation should be very close to 1. In this case the canonical correlation value is 0.651 which is very close to 1 so it signifies that the predicting variables are quite strong enough in proofing the dependent variables.

Table 4

Wilk's Lambda value

Test of Function(s)	Wilks' Lambda	Chi-Square	df	Sig.
1	0.577	25.865	2	0.000

Wilk Lambda shows the significant level of the discriminant function. As per its standard value the value should be greater than or equal to 0.05 .In the above SPSS output table Wilks' Lambda value that we had got is $0.577 > 0.05$, which undoubtedly shows that the functions or the mathematical discriminant model are statistically significant.

Table 5

Standardized Canonical Discriminant Function Coefficients

	Function
	1
RNPE	-0.537
ROA	0.907

Standardized Canonical Discriminant Function Coefficients has indicated only Return on Net worth / Equity, Return on asset, which have had a very strong contribution to classifying companies as healthy and unhealthy.

Table 6

Fisher's linear discriminant functions

Classification Function Coefficients

	Industry Type	
	Unhealthy Industry	Healthy Industry
RNPE	0.019	0.001
ROA	-0.189	0.166
(Constant)	-1.537	-1.003

Using Fisher's Linear Discriminant Function, 2 equations were derived from the analysis. Those are as follow

For Unhealthy Industry (0)

$$D = -1.537 + 0.019RNPE - 0.189ROA \dots\dots\dots \text{Equation-1}$$

For Healthy Industry (1)

$$D = -1.003 + 0.001RNPE + 0.166ROA \dots\dots\dots \text{Equation-2}$$

Table 7

84.0% of original grouped cases correctly classified

Classification Results

		Industry Type	Predicted Group Membership		Total
			Unhealthy Industry	Healthy Industry	
Original	Count	Unhealthy Industry	10	5	15
		Healthy Industry	3	32	35
	%	Unhealthy Industry	66.7	33.3	100.0
		Healthy Industry	8.6	91.4	100.0

In order to check the correctness of classification the Linear Discriminant Function reported that 84.00%, that means 32 cases out of 50 cases were correctly classified as healthy firms and 10 cases out of 50 cases correctly classified as unhealthy firms.

After the analysis the final criteria for discriminant score range to identify financial distress in Indian power sector are as follows,

- i) If $D < (-1)$, then company is Highly Distressed
- ii) If $(-1) < =D < = (-0.6)$, then company is Distressed
- iii) If $(-0.6) < D < (-0.4)$, then company is in inclusion stage
- iv) If $(-0.4) < = D < 0.8$, then company is Somehow Healthy
- v) If $D > 0.8$, then company is Highly Healthy

Analysis and discussions: -

As per the objective for identification the financial distress of M/S ICSA (India) Limited the Equation..... (1) Has been considered so the equation is

$$D = -1.537 + 0.019RNPE - 0.189ROA$$

Where,

D →Discriminant score

P1 = 0.019 and P2= - 0.189→ Discriminant Coefficients estimated from the data

P0= -1.537→Coefficient of constant,

X1= RNPE (Return on Net worth / Equity) and X₂ = ROA (Return on Assets)

→Discriminant Coefficients estimated from the data

K= 2 → Number of independent variables.

Table 8

Discriminant Score Calculation

YEAR	Return on Net worth / Equity (%)	Return on Assets (%)	DISCREMINANT SCORE
	RNPE	ROA	
2016	1.82	-5.64	-0.43646
2015	30.69	-86.49	15.39272
2014	80.09	-80.45	15.18976
2013	555.75	-49.18	18.31727
2012	-26.36	-8.4	-0.45024
2011	14.83	5.91	-2.37222
2010	17.12	7.49	-2.62733
2009	25.6	13.34	-3.57186
2008	29.8	14.93	-3.79257
2007	54.87	16.69	-3.64888

(Source: - Company Balance sheet)

From the analysis as in the above table we can see that in last 10 years the financial status is fluctuating as from 2007 to 2011 the Discriminant Score is $(D) < (-1)$. Hence it signifies M/S ICSA (India) Ltd. is financially highly distressed In the year 2012 the value shows that the company is in inclusion stage as value is less than (-0.4) and greater than (-0.6) . From 2013 to 2015 the discriminant score is showing greater than 0.8 which signifies the company was highly healthy condition and again the current scenario in 2016 it is showing the company is financially distressed as the 2016 Discriminant score is falling in the range of (-1) to (-0.6) .

To check again the developed Discriminant Analysis Model's reliability the Edward I Altman Z Score Model had taken into consideration which was developed in 1968 for set of manufacturing, non manufacturing and service industries.

The Model by Edward I Altman is

$$Z = 0.012X1 + 0.014X2 + 0.033X3 + 0.006X4 + 0.999X5 \dots \dots \dots \text{Equation 3}$$

Where,

X1 → (Working Capital / Total Assets) which quantify all the liquid assets in relation to the total Assets of the Company.

X2 → (Retained Earnings / Total Assets), It measures profitability of the company that shows one Company's earning power

X3 → (Earnings before Interest and Taxes / Total Assets) which shows the operating efficiency of the company except tax and leveraging factors which give a proof to long-term viability.

X4 → (Market Value of Equity / Book Value of Total Liabilities). It shows the dimension of fluctuation of market security price.

X5 → (Sales / Total Assets) shows about the Standard measure for total asset turnover of the industry.

Table 9

Discriminant Score (Z score) Calculation

	X1	X2	X3	X4	X5	
YEAR	Working Capital/Total Assets	Retained Earnings/Total Assets	Earnings Before Interest and Taxes/Total Assets	Market Value of Equity/Book Value of Total Debt	Sales/ Total Asset	Altman Z Score
2016	-3.468	-0.177	-0.056	0.605	0.012	-0.030
2015	-3.239	-0.180	-0.865	0.605	0.059	-0.007
2014	-1.330	-0.123	-0.801	0.796	0.074	0.035
2013	-0.035	-0.023	-0.301	0.043	0.251	0.240
2012	0.203	0.115	-0.030	0.144	0.432	0.435
2011	0.148	0.161	0.128	0.412	0.661	0.671
2010	0.458	0.180	0.147	2.632	0.761	0.789
2009	0.460	0.223	0.215	5.836	0.961	1.011
2008	0.487	0.237	0.256	5.862	0.919	0.971
2007	0.614	0.173	0.226	21.772	0.949	1.096

(Source: - Company Balance sheet)

By applying the Altman’s Z score We found the Z score from 2007 to 2016 values are less than 1.81 so it signifies M/S ICSA (India) Ltd. is financially distressed from 2007 to 2016 and till now. In the year 2015 and 2016 the Z score is moving towards the negative Z score which signifies the respective company is highly distressed and sick unit.

The developed model output by discriminant analysis and the default model by Edward I Altman which was developed by logistic analysis are giving same results. It is proving that M/s ICSA (India) Ltd. is now a financially distressed company and the developed model are showing the correct result with high significance level.

Concluding Remarks:-

Financial Distress modeling and its use in Industrial sickness diagnosis shows a significant and effective impact for research field and the concerned industries. To have a good control over financial distress is quite difficult but to reduce the distress can be achieved by proper strategic procedures. Not only India but also so many developing countries along with some developed countries are facing the problem due to industrial sickness in different sectors throughout the globe. The main objectives and aim for these companies to revive from this sickness by removing the financial distress. Financial Engineering is the most effective and empirical procedures including many tools and statistical analytical methodologies to identify the healthy condition of industries and giving the corrective and preventive measures for it. In this research work the developed discriminant model is showing correctly the sickness of respective industries. Current paper is based on M/S ICSA (India) Ltd. sickness identification which has been

proved and done effectively and efficiently by discriminant analysis.

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