

# Predicting the Factors Influencing the Probability of Failure of Central Public Sector Enterprises

<sup>1</sup>Dr. Bhushan Pardeshi, <sup>2</sup>Dr. Padmalochana Bisoyi, <sup>3</sup>Ms. Pranita Burbure

**Abstract**--In this study the researchers tried to discover the extent of internal factors explain the probability of failure of Manufacturing Central Public Sector Enterprises. This study is apparent because the increasing number of failure. The policies, regulations and new strategies should be developed to assist the management and policy makers by investigating the factors that influence the probability of failure. For the purpose of this study, 6 Medium & Light Engineering Enterprises were selected as sample, covering a study period of ten years. 15 variables were selected from the extensive review of past research which is identically correlated with the occurrence of failure. These variables were tested by using binary logistic regression. This model uses a binary dependent variable, a dummy variable for failure. The dummy variable is '0' if the Enterprise is non failure and '1' for failure. The result of logistic regression shows that working capital, net profit, return of assets, gross value added to capital employed, labour cost to sales, capital output ratio and sales to total assets significantly influence over the probability of failure. This study reveals the magnitude of firm-specific factors in determining and/or explaining the failure of enterprises. The study also examined financial health by using the Altman's Z score model. The results shows that the failure Central Public Sector Enterprises have registered negative Z score and fall under the category of distress zone. The failure of Central Public Sector Enterprises may be avoided, if indications and influencing factors are timely established and proper measures are taken to improve the financial situation. The study recommends testing the factors of failure every year after preparation of the financial report.

**Key words**--Central Public Sector Enterprises, bankruptcy, failure & non failure factors, Altman's Z Score.

## I. INTRODUCTION

As per the Article of 39(b) and (c) of the Constitution of India, state has to secure "that the ownership and control of the maternal resource of the community are so distributed as best to sub serve the common good" and "that system does not result in the concentration of wealth and means of production to the common detriment" (Agrawal, A., Varma H., Gupta R., 1989). Undoubtedly, during the last seven decades or so, India has become one of the top industrialized countries in the world because of determination of Central Public Sector Enterprises. Yet, the way the public sector has grown; it has become a subject of criticism all over. The performance of many enterprises has been a below planned targets and they either failed or likely to be failure (Venkatachalam, 1986; Sinha, S, 1988). These Inefficient Central Public Sector Enterprises were turning to be liabilities to the Government.

<sup>1</sup> Assistant Professor, Pimpri Chinchwad Education Trust's , S.B.Patil Institute of Management Sector 26, Nigdi Pradhikaran, Pune 411044, Maharashtra, India. bhushan3182@gmail.com

<sup>2</sup> Assistant Professor, Pimpri Chinchwad Education Trust's, S.B.Patil Institute of Management Sector 26, Nigdi Pradhikaran, Pune 411044, Maharashtra, India

<sup>3</sup> Assistant Professor, Pimpri Chinchwad Education Trust's, S.B.Patil Institute of Management Sector 26, Nigdi Pradhikaran, Pune 411044,

Many people think that Central Public Sector Enterprises are Government Companies and why to bother about the efficiency and profitability. The failure of Central Public Sector Enterprises stem from series of events which may be subject to financial distress. The failure can exist in various types and dimensions but it affects the stakeholders according to the magnitude of the failure. The success and failure of an enterprise is the result of interaction of many financial (internal) factors. Altman & Hotchkiss (2005) define failure *“by economic criteria, means that the realized rate of return on invested capital, with allowances for risk consideration, is significantly and continually lower than prevailing rates on similar investments somewhat different economic criteria have also been utilized, including insufficient revenues to cover costs and where average return on investment is continually below the firm’s cost of capital. These economic situations make no statements about the existence or discontinuance of the entry.”* Corporate Failure can be the unavailability of sufficient cash flow to satisfy current obligations (Wruck 1990). Miller (1977) underlined that the failure of an enterprise causes corporate downturn. The downturn of the enterprise performance begins with noticeable fall in profitability; drop in sales and operating income, negative stock returns are the indicator of decline (Opler & Titman 1994). According to Department of Disinvestment, about 10 to 15 percent of the total gross domestic savings were getting reduced on account of low savings from these Central Public Sector Enterprises. In the case of failure, the enterprise would be merged, debt restructuring, liquidated or reorganized (Gilbert et al., 1990). If the Central Public Sector Enterprises fails to make profit, ultimately it leads to the erosion of its share capital and if this situation is prolonged further the enterprises cease to exist (Marathe, 1995). Whitaker (1999) urged on the recognition of failure at the preliminary stage and immediate remedial action facilitates the enterprise to exit from the danger zone. Thus, the study has undergone in depth enquiry into the interrelationship and the consequence of the factors of the failure. The studies of these factors will be an alarming signal for the decision makers and policy designer, as and when a company fails, it has many repercussions.

### **Research Questions**

The research questions that try to shed light on are as:

- Measuring financial health of the Central Public Sector Enterprises by using Altman’s Z Score Model.
- The extent of financial factors that affect the probability of failure of Central Public Sector Enterprises.

## **II. LITERATURE REVIEW**

According to G.D. Sharma (1978) Public Enterprises is said to be a neat label for a very untidy concept. Talha, Mohd. (1986); Sinha, S.L.N. (1988) observed that the public enterprises were incurred heavy loss and accounted for wastages of physical and human assets. The failure or exit of a firm causes a lot to its stakeholders. These underperforming enterprises are the great encumber to the overall economy. Ehsan ul Hassan, Zaemah Zainuddin and Sabariah Nordin (2017) presents a review of literature for early prediction of financial bankruptcy. In the study of Ericson and Pakes (1995); Olley and Pakes (1996) firm efficiency depends on the return on investment, plant-level data, among other factors by demonstrate that the probability of exit depends on firm efficiency. Furthermore, the empirical results also hold up the estimation that firm efficiency and the probability of exit are negatively related. The models introduced by Jovanovic (1982) and Ericson and Pakes (1995) implicitly assume that firms' financial situations have no impact on exit decisions. Jenkin, G.P. (1980) outlined the approach of evaluating

the performance of public sector enterprises on the basis of financial, economic and social objectives. Tomasz Korol (2017) presented answer two research questions – what are the causes of corporate bankruptcies in Poland and how to more effectively predict the scale of bankruptcies in the country. The author has conducted a study to analyze the specific endogenous and exogenous causes of company bankruptcy depending on the type of the bankruptcy. Lilia Aleksanyan & Jean-Pierre Huiban (2016) focuses on the economic and financial determinants of firm exit due to bankruptcy in the French food industry and compares them with those for other manufacturing industries.

Pinches, Mingo & Caruthers (1973) and Chen & Shimendra (1981), identified seven variable which were used in the bankruptcy prediction model. Scott (1981), derived the model from two period model of a enterprise with access to capital market. Altman (1968); Ohlson (1980); Zmijewski (1984) and Avenhuis (2013) suggested that the bankruptcy model should be used with caution. This is due to the fact of frequency of type I errors is high or the accuracy rate is low.

The following literature is used as a base in our model building process. In 1968 Altman constructed a model to predict bankruptcy with a multiple discriminant analysis, found that ratios measuring profitability, liquidity and solvency were the most significant factors in predicting bankruptcy. Until the 1980s, the frequently used method to predict the failure was discriminate analysis. In 1980s, Ohlson (1980) with his logistic regression model explains four different factors: the size of the company, a measure of financial structure, a measure of performance and a measure of liquidity to predict the bankruptcy. Bernhardsen, (2001) selected the variables in 6 categories- Liquidity, Profitability, Solidity, Age, Size and Industry characteristics. Jackson & Wood (2013) also assess the efficacy of thirteen selected models using post-IFRS UK data and investigate the distributional properties of model efficacy. Ma-Ju Wang and Heng-Ruei Shiu (2014) the results show that the variables of liquidity, profitability, capital structure and corporate governance have significant differences in their level of influences among the three models.

Thus, in this study we have chosen the variables due to their different characteristics in the method used. This study adds to the empirical evidence concerning Central Public Sector Enterprises characteristics and their failure. Most existing studies use data from large private listed companies, but it is important to consider the links between public sector enterprises and their characteristics on their failure. We want to develop our models based on a combination of these features, and supply them with our own ideas.

### **III. METHODOLOGY**

The sample Central Public Sector Enterprises are obtained from the Medium & Light Engineering Sector. The sample consists of six medium & light engineering Central Public Sector Enterprises, out of which 3 Central Public Sector Enterprises are (Hindustan Cable Limited., Richardson & Cruddas (1972) Limited and Instrumentation Limited.) referred to the Board of Industrial and Financial Reconstruction (BIFR)/Board for Reconstruction of Public Sector Enterprises (BRPSE) and 3 are non failure Central Public Sector Enterprises (Balmer Lawrie & Co. Limited, Bharat Electronics Limited and HMT Limited) during the specified ten years period. According to BRPSE a company is considered to be failure if it has accumulated losses in any financial year equal to 50 percent or more of its average networth during the last 4 years immediately preceding such financial year. And or a company which

is a sick company within the meaning of Sick Industrial Companies (Special Provisions) Act, 1985 (SICA) is referred to BRPSE. In this study, to avoid the modeling issues, the financial statements are derived from the period 2007-08 to 2016-17. The data collected from various Public Enterprises survey published by Department of Public Enterprises, Government of India.

By extensive literature review, key figures and financial ratios have been developed for the study. The key variables that are selected as an independent;

### **Profitability**

Profitability 1 - Net Profit Margin

Profitability 2 - Return on Assets

Profitability 3 - Retained profit to total assets (Altman, 1968)

Profitability 4 – Earning Before Interest &Tax to total assets (Altman, 1968)

Profitability 5 - Sales to total assets (Altman, 1968)

### **Liquidity**

Liquidity 1 - Current ratio

Liquidity 2 - Working capital to Total Assets (Altman 1968;Ohlson 1980)

Liquidity 3 - Total current liabilities to total assets

### **Solvency**

Solvency 1 - Debt Equity

Solvency 2 - Long term debt to total assets

### **Managerial efficiency**

Managerial 1 - Gross value added (GVA) to total assets

Managerial 2 - Gross value added to capital employed

Managerial 3 - Sales to labour cost

### **Capital output ratio Growth of equity**

Market value of equity or book value of equity to total debt/liabilities (Altman 1968)

### **Dependent variable**

The failure the CPSE is a binary variable that considered a value of 1 failure and 0 non failure CPSE.

$$y = \begin{cases} 1 & \text{failure} \\ 0 & \text{non failure} \end{cases}$$

## **IV. MULTIPLE LINEAR REGRESSIONS**

Regression analysis is a powerful statistical tool to analyse the cause and effect relationship between dummy dependent variable as failure and the factors predicting probable failure as an independent variables. The

multiple regressions are used to check whether any relationship exists and to determine whether the independent variables explain a significant variation towards the dependent variable.

$$Y = a + b_1X_1 + b_2X_2$$

### Logistic Regression

To understand the probability of failure of the selected Central Public Sector Enterprises a logit regression model is used. This model uses a binary dependent variable, a dummy variable for failure. The dummy variable is 0 if the CPSE is non failure, and 1 for failure.

$$y = \begin{cases} 1 & \text{failure} \\ 0 & \text{non failure} \end{cases}$$

The probability estimation of this model will be between 0 and 1.

$$(y = 1/x) = (y = 1/x_1, x_2, \dots, k) \text{ (Wooldridge, 2014).}$$

Since the dependent variable is binary, it doesn't satisfy the assumptions of linear regression like normality, linearity and homoscedasticity of independent variable. Failure is measured on an ordinal scale, thus logit model is the appropriate technique. This model is being used by Ohlson, 1980; Daily, et.al 1994; Bernhardsen, 2001; Wooldridge, 2014. The logit model based on function to maximize the probability of observed  $y$  values, 0 and 1 (Tuft, 2000). The maximizing problem is estimated by finding the coefficient, which gives the highest probability to estimate dependent variable. In a logit model, an increase in the variable  $x$  will make the probability of  $y$  more or less likely.

### Altman Z Score Model (1968)

In the model the Z Score which is a survival indicator, classifies companies based on their solvency position. The higher the value of Z score is, the lower the risk of bankruptcy. A low or negative Z Score indicates the high likelihood of failure of a firm (Altman, 2000). Altman showed that companies with a Z Score of less than 1.81 (distress zone) are highly risky and likely to go bankruptcy; companies with a Z Score more than 2.99 (safe zone) are healthy and stable company where bankruptcy is unlikely to occur. Companies that have a Z Score between 1.81 to 2.99 are in the gray zone with uncertain result and bankruptcy is not easily predicted one way or the other (Altman, 1968).

The original Altman Z Score (1968) is as follow:

$$Z = 0.012(X_1) + 0.014(X_2) + 0.033(X_3) + 0.006(X_4) + 0.999(X_5)$$

Where,

- X1 = working capital/total assets
- X2 = retained earnings/total assets
- X3 = earning before interest and taxes/total assets
- X4 = market value of equity/book value of total debt
- X5 = sales/total assets

## V. RESULT AND DISCUSSION

Failure enterprises have different characteristics than non-failure enterprise. Table 1 provides the descriptive statistics on non failure and failure enterprises. Table 1 also reveals difference between the failure and non failure manufacturing Central Public Sector Enterprises. There is mean value of Gross Value Added to Capital employed in non failure Central Public Sector Enterprises is 54.9839, whereas in case of failure it is 61.0983, which represent that the Central Public Sector Enterprises add more social value against the capital employed. The net profit margin is 13.6133 in non failure Central Public Sector Enterprises, however, in case of failure the margin is -22.7818. The sample Central Public Sector Enterprises Return on Assets is 8.4037 and -76.5112 respectively. The study shows that performance of non failure Central Public Sector Enterprises are significantly high than the failure Central Public Sector Enterprises.

**Table 1** Descriptive Statistic Table

Variable	Non Failure			Failure		
	Mean	S D	Variance	Mean	S D	Variance
Current Ratio	1.5563	0.56009	0.314	0.6455	0.7368	0.543
Working Capital To Total Assets	0.23	0.18765	0.035	-1.2045	2.76184	7.628
Current Liabilities to Total Assets	0.4016	0.14627	0.021	2.919	2.72658	7.434
Net Profit Margin	13.6133	24.8265	127.095	-22.7818	55.04741	3030.217
Return on Assets	8.4037	16.86292	146.551	-76.5112	269.0867	72407.66
Retained Profit to Total Assets	0.0461	0.03238	0.001	5.4128	7.86936	61.927
EBIT to Total Assets	0.0813	0.0876	0.008	2.394	4.00584	16.047
Debt Equity	0.0212	1.92063	3.689	1.0147	2.40205	5.77
Long term debt to Total Assets	0.0758	0.12309	0.015	5.9975	16.02472	256.792
GVA to Total Assets	0.3147	0.33577	0.113	0.4438	1.43539	2.06
GVA to Capital Employed	54.9839	84.37532	7119.195	61.0983	171.4196	29384.69
Labour Cost to sales	7.4095	5.80231	33.667	18.8427	21.2492	451.528
Capital Output Ratio	2.5258	1.97497	3.901	-1.4766	4.87284	23.745
Book value of Equity to Total Liabilities	0.0016	0.00264	0	1.4427	3.13519	9.829
Sales to Total Assets	2.7813	0.76832	0.59	0.5701	0.48694	0.237

The Altman's Z Score is used to assess the financial health of the selected Central Public Sector Enterprises. It is found from **Table 2** that BLCL (2.79) is in gray zone ( $1.80 < Z < 2.99$ ), whereas Bharat Electronics Limited (1.37) and HMT Limited (0.02) fall under distress zone ( $Z < 1.80$ ). In case of Hindustan Cable Limited (-7.12), Richardson & Cruddas (1972) Limited (-2.25) and Instrumentation Ltd (-0.10) are in the distress zone and their financial health is negative. In the next couple of year these Central Public Sector Enterprises are certain to fail.

The Coefficient of covariance of failure Central Public Sector Enterprises shows the inconsistency in reporting the financial performance and financial risk. Within the sample Central Public Sector Enterprises, we observe significant difference in financial health.

**Table 2** Analysis of Financial Health (Z Score) Table

Year	BLCL	HMT	BEL	HCL	RCL	IL
2007-08	2.07	-0.40	1.48	-8.064	-1.88	-1.58
2008-09	2.69	-0.31	1.30	-18.658	-3.97	-1.89
2009-10	2.85	0.17	1.40	-17.662	-2.65	-1.04
2010-11	2.79	0.16	1.27	-12.285	-3.37	-0.52
2011-12	3.12	0.06	1.20	-5.296	-3.37	-0.26
2012-13	2.99	0.26	1.07	-4.244	-3.98	-0.26
2013-14	2.86	0.28	1.21	-4.291	-4.31	0.40
2014-15	2.69	-0.01	1.49	-0.256	0.37	1.58
2015-16	2.89	-0.04	1.53	-0.203	0.33	1.67
2016-17	2.92	0.01	1.71	-0.236	0.34	0.94
Average	2.79	0.02	1.37	-7.1195	-2.25	-0.10
SD	0.28	0.23	0.19	6.94	1.92	1.24
CV	10.19	1209.98	14.08	-97.51	-85.48	-1298.53

### Multiple Regressions

In order to know the factors influencing the failure of Central Public Sector Enterprises, multiple regression analysis is used, with dummy variable failure as the dependent variable and the selected independent variables were estimated. The results are tabulated in table 3, table 4 and table 5.

$$\begin{aligned}
 Y = & 0.620 + 0.010 * \textit{profitability 1} + 0.020 * \textit{profitability 2} - 0.072 * \textit{profitability 3} \\
 & + 0.056 * \textit{profitability 4} - 0.030 * \textit{profitability 5} + 0.228 * \textit{liquidity 1} \\
 & + 0.103 * \textit{liquidity 2} - 0.043 * \textit{liquidity 3} - 0.007 * \textit{solvency 1} + 0.048 * \textit{solvency 2} \\
 & - 0.063 * \textit{managerial 1} - 0.001 * \textit{managerial 2} - 0.011 * \textit{managerial 3} \\
 & + 0.012 * \textit{capital output} + 0.033 * \textit{growth of equity}
 \end{aligned}$$

Table 3 shows the  $r^2$  value of 0.756, which provides an indication of the percentage of variance in the dependent variable (75.6 %) explained by independent variable.

**Table 3** Model Summary Table

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.870 <sup>a</sup>	.756	.673	.288

Note: a. Predictors: (Constant), Sales to Total Assets, Sales to Labour Cost, GVA to Total Assets, Current Liabilities to Total Assets, Net Profit Margin, EBIT to Total Assets, Debt Equity , Current Ratio, GVA to Capital Employed, Capital Output Ratio, Assets, Net Profit Margin, EBIT to Total Assets, Debt Equity , Current Ratio, GVA to Capital Employed, Capital Output Ratio, Total Assets, Return on Assets

The result for F-test is significant as tabulated in **Table 4**, this shows that dependent variable is statistically influenced by the independent variables.

**Table 4** ANOVA Table

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	11.344	15	.756	9.103	.000 <sup>b</sup>
	Residual	3.656	44	.083		
	Total	15.000	59			

Note: a. Dependent Variable: Dummy Variable

b. Predictors: (Constant), Sales to Total Assets, Sales to Labour Cost, GVA to Total Assets, Current Liabilities to Total Assets, Net Profit Margin, EBIT to Total Assets, Debt Equity , Current Ratio, GVA to Capital Employed, Capital Output Ratio, Working Capital To Total Assets, Book value of equity to Total Liabilities, Long term debt to Total Assets, Retained Profit to Total Assets, Return on Assets

**Table 5** Coefficient Table

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.620	.148		4.202	.000
	Current Ratio	.228	.092	.360	2.473	.017
	Working Capital To Total Assets	.103	.168	.423	.612	.044
	Current Liabilities to Total Assets	-.043	.099	-.196	-.437	.664
	Net Profit Margin	.010	.010	-.068	-.677	.020
	Return on Assets	.020	.004	.826	.512	.011
	Retained Profit to Total Assets	-.072	.067	-.876	-1.065	.293
	EBIT to Total Assets	.056	.080	.340	.704	.049
	Debt Equity	-.007	.027	-.032	-.276	.784
	Long term debt to Total Assets	.048	.058	1.112	.832	.410
	GVA to Total Assets	-.063	.300	-.128	-.208	.836
	GVA to Capital Employed	-.001	.001	-.152	-.577	.046



	Labour Cost to Sales	-.011	.008	-.351	-1.348	.019
	Capital Output Ratio	.012	.026	.093	.453	.043
	Book value of equity to Total Liabilities	.033	.142	.152	.233	.817
	Sales to Total Assets	-.030	.093	-.039	-.325	.047

Note:  $p < 0.05$

**Table 5** shows that sales to total assets, labour cost to sales, net profit margin, EBIT to total assets, current ratio, gross value added to capital employed, capital output ratio, working capital to total assets, return on assets the  $p < 0.05$ , have significant influence on the failure of Central Public Sector Enterprises, but in case of retained profit to total assets, long term debt to total assets, current liabilities to total assets, debt equity, gross value added to total assets and book value of equity to total Liabilities the  $p > 0.05$ , do not have significant impact on failure of Central Public Sector Enterprises.

### Logistic Regression

The effect of the variables on the probability of failure can be determined through logistic regression. The Logit model is a model that uses binary dependent variables. The results of this binary model are interpreted as the percentage likelihood of the corporate failure.  $Q_1$  is the proportion of failure enterprises in the sample and  $H_1$  is the proportion of non failure enterprises.

$$\log L = \sum_{i=1}^N w_i \log F(q_i(\alpha_i + X_i\beta))$$

$$y = \begin{cases} 1 & \text{failure} \\ 0 & \text{non failure} \end{cases}$$

**Table 6** Logistic Regression Table

Variables		B	S.E.	Sig.
Step 1 <sup>a</sup>	Current Ratio	11.600	5.831	.047
	Working Capital To Total Assets	2.086	5.670	.017
	Current Liabilities to Total Assets	8.408	4.279	.049
	Net Profit Margin	-.211	.121	.038
	Return on Assets	-1.452	.807	.027
	Retained Profit to Total Assets	.731	1.419	.606
	EBIT to Total Assets	.107	1.473	.029
	Debt Equity	-2.003	5.760	.728
	Long term debt to Total Assets	-34.042	16.903	.044
	GVA to Total Assets	35.659	23.440	.128
	GVA to Capital Employed	.267	.122	.028
Labour Cost to Sales	-2.291	.981	.020	

	Capital Output Ratio	.854	.946	.036
	Book value of equity to Total Liabilities	-7.882	5.104	.123
	Sales to Total Assets	1.273	4.793	.029
	Constant	-9.601	5.115	.061

**Table 6** shows, the co-efficient of book value of equity to total liabilities (-7.882) is negatively correlated and insignificant at 5 percent level of significance, however, the co-efficient of Gross value added to total assets is 35.659 which is positively correlated and statistically insignificant. The retained profit to total assets and debt-equity is insignificant at 5 percent level of significance. The current ratio (11.600), working capital to total assets (2.086), current liabilities to total assets (8.408), net profit margin (-0.211), return on assets (-1.452), Earning before interest and tax to total assets (0.107), long term debt to total assets (-34.042), gross value added to capital employed (0.267), labour cost to sales (-2.291), capital output ratio (0.854) and sales to total assets (1.273), the  $p < 0.05$ , shows significant impact on the failure of the Central Public Sector Enterprises. The study shows that ratio have significant impact Central Public Sector Enterprises failure.

### Predicting bankruptcy

$H_0$  = an enterprise is likely to be failure = 1

$H_1$  = an enterprise is not likely to be failure = 0

In order to evaluate the accuracy of our model we use regression analysis on a variable Z that indicate failure. The model that sets as Z inspired from Ohlsons (1980) logistic regression model.

$$Z = \beta_0 + \beta_1 * F_1 + \beta_2 * F_2 + \beta_n * F_n + \varepsilon$$

Where  $\beta_0, \beta_1, \dots, \beta_n$  are regression coefficient and  $\varepsilon$  the error terms.

In the logit model, Z then denotes the probability of failure  $p(\text{failure}=1|Z) = F(Z)$

Where F is cumulative distribution (between 0 and 1), which shows the probability for failure.

$$p = F(\beta_0 + \beta_1 * F_1 + \beta_2 * F_2 + \beta_n * F_n)$$

To find p, we assume this cumulative distribution is logically distributed

$$F(Z) = \frac{e^z}{1 + e}$$

Such that our probability p can be

$$p = \frac{1}{1 + e^{-z}}$$

Z is given by the logistic regression. A higher Z means probability p is higher.

If  $p \leq Z$  then an enterprise grouped as 0. If  $p \geq Z$  this means enterprise grouped as 1 described as probable failure.

The type I error occurs when the null hypothesis is rejected, type II errors occurs when null hypothesis is not rejected; in our study this would be predicting that an enterprise is likely to be failure, when in the reality they are not.

## **Research Implication**

The failure prediction research has suffered from lack of unified theory since 1930s. In spite of this the prediction results are promising. So, the study is based on the Medium & Light Engineering Sector. The model developed in this study is significant and it can be used for predicting the failure of an enterprise. An elaboration of large sample from different sectors could provide more accuracy for the model. Developing a model using longer panel data would make it less biased. The group of quantitative indicators should encompass bankruptcy prediction indices, while the group of qualitative indicators should encompass the insolvency symptoms and external factors that affect solvency.

## **Theoretical and Managerial Implications**

The purpose of this paper is to assess the factors that affect the probability of Central Public Sector Enterprises' failure. The emphasis was laid on how different financial and endogenous factors influence the probability of failure. This study is apparent because of increasing number of failure in Central Public Sector Enterprises. Therefore, the policies, regulations and new strategies should be developed to reduce the failure of the Central Public Sector Enterprises. This model we have formulated can give the Central Public Sector Enterprises insight to avoid failure, if the failure indication and influencing factors are timely established and proper measures will be taken to improve the financial position but the complexity of model make it some degree uncertain. The current decision maker considered the financial results to judge the failure of the Central Public Sector Enterprises, other factor like gross value added to capital employed, capital output ratio, labour cost to sales should also be considered as the primary objective of the Central Public Sector Enterprises is not to earn profit but to have social equity in the country and support the economic development. The results have shown that the failure of Central Public Sector Enterprises, do not earn economic profit but also fails to register the social profit. This study will act as an alarming signal to judge and find the probability of failure. This study raises the potential for regulatory and policy reforms that may increase the possibility of survival of the Central Public Sector Enterprises. The factors considered in the study and working on these factors will definitely enhance the chances of survival and better performance of the Central Public Sector Enterprises. In this study, different internal factors that explain the probability of failure were discovered. The application of log it model based on factors scientifically better approach to the user for timely detect the enterprise's failure and avoid the erosion of investment.

## **VI. CONCLUSION**

The study identifies the role of different financial factors in predicting the corporate failure. The Central Public Sector Enterprises are considered to be the barometer of the Indian economy. The Central Public Sector Enterprises should be considered as living entity and throughout their existence, they can also become sick and the fatal disease may cause them in the form of financial distress. The best method to cure this cause is defining the symptoms and taking remedial action. The result of logistics regression shows that book value of equity to total liabilities, gross value added to total assets, retained profit to total assets and debt equity is insignificant, they do not increase the failure risk. These results suggest that policies to measure the factors must be designed and the implementation should be most efficient for reduction in the failure of Central Public Sector Enterprises. Consequently, the early warning system is worthwhile technique in predicting financial failure.

## REFERENCES

1. Agrawal, A.N., Varma, H.O. and Gupta, R.C. (1989). India - Economic Information Year Book. New Delhi: National Publishing House. p.32.
2. Altman, E. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. The Journal of Finance, 23(4), p.589.
3. Avenhuis, J. (2013). Testing the generalizability of the bankruptcy prediction models of Altman, Ohlson and Zmijewski for Dutch listed companies. Netherlands: University of Twente.
4. Bernhardsen, E. (2001). A Model of Bankruptcy Prediction. Oslo: Norges bank
5. Blanchard P., Huiban J.-P. and Mathieu. C. (2012). The determinants of firm exit in the French food industries, Review of Agricultural and Environmental Studies, Vol. 93(2), pp. 193-212.
6. Bureau of Public Enterprises. (1992). Public Enterprises Survey 1990-91 Vol.1. New Delhi: Ministry of Industry, Government of India. p. 27.
7. Daily, C.M. and Dalton, D.R. (1994). 'Bankruptcy and corporate governance: The Impact of Board Composition and Structure', Academy of Management Journal, 37(6), pp. 1603-1617.
8. Department of Public Enterprises.(2008). Second Pay Revision Committee Report. Department of Public Enterprises, Government of India.
9. Department of Public Enterprises.(2014). Public Enterprise Survey 2012-13 Vol. I. New Delhi: Ministry of Heavy Industries and Public Enterprises, Government of India.
10. Jackson, R. and Wood, A. (2013). The performance of insolvency prediction and credit risk models in the UK: A comparative study. The British Accounting Review, 45(3), pp.183-202.
11. Jovanovic, B. (1982). Selection and the Evolution of Industry, Econometrica, Vol. 50(3), pp. 649-670.
12. Lukason, O., Hoffman, R. (2014). Firm Bankruptcy Probability and Causes – An Integrated Study. International Journal of Business and Management, vol. 9, issue 11, 80.
13. Mackevicius, J. and Sneideris, R. (2010). Insolvency of an Enterprise and Methods of Financial Analysis for Predicting it. Ekonomika, Vol. 89(1).
14. Ma-Ju Wang and Heng-Ruei Shiu (2014). Research on the common characteristics of firms in financial distress into bankruptcy or recovery. Investment Management and Financial Innovations, 11(4-1).
15. Marathe, S.S. (1995, March). Re-assessing the Public Sector. Indian Management. p 22.
16. Mohd. Talha. (1986, September 16-30). Public Undertaking: White Elephants. Yojana Vol 30, No. 17, p.1.
17. Ohlson, J. (1980). Financial Ratios and the Probabilistic Prediction of Bankruptcy. Journal of Accounting Research, 18(1), p.109
18. Ohlson, J. A. (1980). Financial Ratios as Predictors of Failure. Journal of Accounting Research 4, 71-102
19. Olley G.S. and Pakes, A. (1996). The dynamics of Productivity in the Telecommunications Equipment Industry, Econometrica, Vol. 64(6), pp. 1263-1297.
20. Skogsvik, K. (1990). Current cost accounting ratios as predictors of business failure; the Swedish case. Journal of Business Finance & Account.
21. Tomasz Korol, Evaluation Of The Factors Influencing Business Bankruptcy Risk In Poland. Financial Internet Quarterly e-Finance” 2017, vol.13/ nr 2, s. 22-35.
22. Venkatachalam, C. (1986). Financing of Public Enterprises in India. Bombay: Himalaya Publishing House. p.1.
23. Wooldridge, J. (2014). Introduction to econometrics. Europe, Middle east and Africa edition. United Kingdom: Cengage learning.